AN ABSTRACT OF THE DISSERTATION OF

Frank K. Lake for the degree of Doctor of Philosophy in Environmental Sciences presented on May 10, 2007.

Title: Traditional Ecological Knowledge to Develop and Maintain Fire Regimes in Northwestern California, Klamath-Siskiyou Bioregion: Management and Restoration of Culturally Significant Habitats

Abstract approved:

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Steve R. Radosevich

The use of Native American fire regimes evolved in the Klamath-Siskiyou bioregion over millennia. A mixture of Native American and Euro-American socio-cultural management has developed from adaptations to climate, topography, ecological processes, and land use practices. This research incorporates Traditional Ecological Knowledge (TEK) to partially examine the role of tribal fire uses and ethnobotany. Research methods use an interdisciplinary approach to characterize fuels and fire management issues in culturally significant riparian and terrestrial habitats. Tribal fuels and fire management practices were investigated. Understanding past tribal fire management systems is needed to place contemporary Native American fuels and fire management issues in to context for government agencies and private interest that have altered tribal opportunities to continue fire uses.

This study examined fire effects on sandbar willow (*Salix exigua*) in valley riparian zones along the lower mid-Klamath River. Prescribed fire was used to induce sprouting of sandbar willow and reduce insect populations to improve basket material quantity and quality. Results indicate that flooding had greater affects on the structure, composition, and abundance of vegetation and fuels than prescribed fire. A second

experiment to compare the effect of propane burning and pruning sandbar willow indicated that propane burning was less effective than pruning to improve stem morphology for basket weaving. Consultation with tribal basket weavers and research of the proportion of useable willow shoots, amount of insect damage and the relationship of stem diameter and length revealed these attributes were important criteria for determining usability for weaving. This research also included other basketry plants.

TEK is used to better understand fire effects on culturally significant resources and the consequences of fire suppression on terrestrial and riparian habitats. The mechanisms of how fire suppression impacts tribes, resources and tribal land uses are presented. Recommendations are presented for additional research to improve collaboration with tribes, tribal organizations and communities based on contemporary tribal values and priorities for fuels and fire management.

Traditional Ecological Knowledge to Develop and Maintain Fire Regimes in Northwestern California, Klamath-Siskiyou Bioregion: Management and Restoration of Culturally Significant Habitats

by
Frank K. Lake

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APPROVED:

Major Professor, representing Environmental Sciences

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I understand that my dissertation will become part of the permanent collection of Oregon State University libraries. My signature below authorizes release of my dissertation to any reader upon request.

Frank K. Lake, Author

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Acronyms and Abbreviations

A.D.	after date
AD	administratively determined
AIRFA	American Indian Religious Freedom Act
ANOVA	analysis of variance
BAER	burned area emergency rehabilitation
BC	before Christ
BIA	Bureau of Indian Affairs
BOR	Bureau of Reclamation
BP	before present
C	Celsius
CA	California
CCC	Civilian Conservation corps
CDF	California Department of Forestry and Fire
CEMP	cultural environmental management practices
cfs	cubic feet per second
CIBA	California Indian Basketweavers Association
CIFFMC	California Indian Forest and Fire Management Council
CIG	Climate Investigation Group
cm	centimeters
CRAFT	comparative risk assessment framework and tools
CWM	coarse woody material
D	dead
D/L	diameter to length ratio
dbh	diameter at breast height
DE	FIREMON density
DFC	desired future condition
DOI	Department of the Interior
DWM	dead woody material
e.g.	for example
ENSO	El Niño/Southern Oscillation
ESA	Ecological Society of America
et al.	and elsewhere; and others
F	Fahrenheit
FAO	Food and Agriculture Organization
FEIS	Fire Effects Information System
FERC	Federal Energy Regulatory Commission
FIREMON	fire effects monitoring
FL	FIREMON fuel load
FL	flame length

FMP	fire management plan
FPA	fire program analysis
FRCC	fire regime condition class
FRI	fire return interval
FSH	Forest Service Handbook
ft	feet
FWM	fine woody material
GIS	geographic information system
H	hypothesis
HRV	historical range of variability
HUMCO	Humboldt County
HVIR	Hoopa Valley Indian Reservation
i.e.	In other words
ITC	Intertribal Timber Council
kg	kilogram
KIB	Karuk Indigenous Basketweavers
KNF	Klamath National Forest
L	living
LMKWA	Lower Mid Klamath Watershed Analysis
LSMEANS	least square means
LW	Low
m	meter
MD	Medium
MIST	minimum impact suppression techniques
n	number
n.d.	no date
NAAC-CDF	Native American Advisory Council-Cal. Dept. of Forestry and Fire
NCAI	National Congress of American Indians
NHPA	National Historic Preservation Act
NNFP	National Network of Forest Practitioners
NOAA	National Oceanographic and Atmospheric Administration
NRCS	Natural Resource Conservation Service
NWCG	National Wildfire Coordinating Group
obs.	observations
OCFR	Orleans Community Fuels Reduction and Forest Health project
PDO	Pacific Decadal Oscillation
pers. com.	personal communication
PIT	Passport in Time
PNW	Pacific Northwest
RAWS	remote area weather station

REML	restricted maximum likelihood
ROS	rate of spread
SAS	statistical analysis systems
SEK	scientific ecological knowledge
SM	Small
SOD	sudden oak death
sp.	species (singular)
SPLAT	strategically placed landscape area treatment
spp.	species (plural)
SRNF	Six Rivers National Forest
ssp.	sub-species
T.R.S.	Township Range Section
TEK	traditional ecological knowledge
TL	Tall
UC	University of California
USDA	United States Department of Agriculture
USDI	United States Department of the Interior
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Service
VT	Very Tall
WA	Watershed Analysis
WUI	Wildland Urban interface

ANIMAL AND PLANT NAMES: COMMON AND SCIENTIFIC

Common	**Scientific**
Animal	
Antelope, Prong-Horned	*Antilocapra americana*
Ducks, Mallard	*Anas platyrhynchos*
Geese	*Branta* spp.
Beaver	*Castor canadensis*
Elk	*Cervus canadensis*
Snake, Rattle western	*Crotalus viridis*
Mosquitoes	*Culex* spp., *Ochlerotatus* spp., *Aedes* spp. *Culiseta* spp.
Weevils	*Curculio* spp., *Conotrachelus* spp.
Filbert worm	*Cydia latiferreanna* (Walsingham)
Beetle, pine	*Dendroctonus* spp.
Tick, Pacific Coast	*Dermacentor occidentalis*
Tick, American Dog	*Dermacentor variabilis*
Flies, Black	*Diptera: Simuliidae, Simulium*sp.
Woodpecker, Pileated	*Dryocopus pileatus*
Porcupine	*Erethizon dorsatum couesi*
shoot-galling sawfly	*Euura exiguae*
Beetle, engraver	*Ips* spp.
Tick, western black-legged	*Ixodes pacificus*
Lamprey eels	*Lampetra tridentata*
Rabbit, Jack Black-tailed	*Lepus californicus*
Woodpecker, Acorn	*Melanerpes formicivorus*
Mouse, domestic house	*Mus musculus*
Wood rat, Dusky-footed	*Neotoma fuscipes*
Wood rats	*Neotoma* spp.
Deer, Black-tail	*Odocoileus hemionus*
Coho salmon	*Oncorhynchus kisutch*
Salmon	*Oncorhynchus* spp.
Chinook salmon	*Oncorhynchus tschawytscha*
Mouse, deer	*Peromyscus* spp.
gall midges	*Rabdophaga* spp.
Rat, Norway brown	*Rattus norvegicus*
Mouse, harvest or field	*Reithrodontomys* spp.
Rabbit, Brush bunny Cotton-tail	*Sylvilgus bachmani*
Gopher	*Thomomys* spp
Bear, Black	*Ursus americanus*

Plants	
White fir	*Abies concolor* (Gordon & Glend.) Lindley
California red fir	*Abies magnifica* Andr. Murray
Maple; Pacific, big leaf	*Acer macrophyllum* Pursh.
Buckeye, California	*Aesculus californica* (Spach) Nutt.
Bent grass	*Agrostis capiilis* L.
Fine top	*Aira caryophyllea* L.
Alder, Red	*Alnus rubra* Bong.
Service berry	*Amelanchier alnifoila* Nutt.
Chamomile	*Anthemis cotula* L.
Bur chervil	*Anthriscus caucalis* M. Bieb.
Dogbane, Indian hemp	*Apocynum cannabinum* L.
Madrone	*Arbutus menziesii* Pursh.
Manzanita	*Arctostaphylos* spp.
Mugwort	*Artemisia douglasiana* Besser
Goat beard	*Aruncus dioicus* (Walter) Fern. var. *pubescens* (Rydb.) Fern
Wild oat	*Avena fatua* L.
Coyote brush	*Baccharis pilularis* DC.
Oregon grape	*Berberis aquifolium* Pursh
Black mustard	*Brassica nigra* (L.) Koch
Grass, Rattlesnake	*Briza minor* L.
Brodiea lily, Indian potato	*Brodiaea* spp.
Brome, California	*Bromus carinatus* Hook. & Arn.
Brome, Rescue	*Bromus catharticus* Vahl
Brome, Soft	*Bromus (mollis) hordeaceus* L.
Brome, Rip gut	*Bromus (ridglus) diandrus* Roth
Starry cheat	*Bromus tectorum* L.
Epos	*Calochortus* spp.
Incense cedar	*Calocedrus decurrens* (Torrey) Florin
Camas	*Camassia* spp.
Bitter cress	*Cardamine* sp.
Sedge	*Carex* sp.
Sedge 1	*Carex* sp. 1
Sedge 2	*Carex* sp. 2
Sedge, Nebraska	*Carex nebrascensis* Dewey
Sedge, Slough	*Carex* sp. 3
Wild lilac, Deer brush	*Ceanothus integerrimus* Hook. & Arn.
Star thistle	*Centaurea solstitialis* L.
Knapweed	*Centaurea sp.*

Moss, fire	*Ceratodon purpureus*
Port Orford cedar	*Chamaecyparis lawsoniana* A. Murray
Prince's pine	*Chimaphila umbellata* (L.) Bartram
Jerusalem oak	*Chenopodium botrys* L.
Chicory	*Cichorium intybus* L.
Thistle, Canada	*Cirsium arvense* (L.) Scop.
Thistle rossette sticky	*Cirsium* sp.
Thistle, Bull	*Cirsium vulgare* (Savi) Ten.
Farewell to Spring	*Clarkia* sp.
Miner's lettuce	*Claytonia perfoliata* Willd.
Giant, Golden Chinquapin	*Chrysolepis chrysophylla* Hjelmq.
Collomia, varied-leaf	*Collomia heterophylla* Hook.
Poison hemlock	*Conium maculatum* L.
Horseweed	*Conzya canadensis* (L.) Crong.
Dogwood, Mountain, Pacific	*Cornus nuttallii* Audubon
California hazel, Filbert	*Corylus cornuta* Marsh. var. *califorinica*
Hawkbeard, smooth	*Crepis capillaris* (L.) Wallr.
Bermuda grass	*Cynodon dactylon* (L.) Pers.
Hedge Dog	*Cynosurus echinatus* L.
Nutsedge, Purple	*Cyperus rotundus* L.
Queen Anne's Lace	*Daucus carota* L.
Tufted hair grass	*Descampsia cerpitosa* (L.) Beauv.
Brodiaea, Fire cracker	*Dichelostemma ida-maia* (A.W. Wood) E. Greene
Brodiaea, Blue dicks	*Dichelostemma capitatum* (Benth.) A.W. Wood
Barnyard grass	*Echinochloa crus-golli* (L.) P. Beauv.
Blue wildrye	*Elymus glaucus* Buckley
Quackgrass	*Elytrigia repens* (L.) Nevski
Willowherb, Purple leaf	*Epilobium ciliatum* Raf.
Willowherb	*Epilobium minutum* Lehm.
Willow herb	*Epilobium* spp.
Horsetail	*Equisetum* spp.
Buckwheat	*Eriogonum* spp.
Storkbill	*Erodium cicutarium* (L.) L'Hér.
Fescue	*Festuca arundinacea* Schreber
California fescue	*Festuca californica* Vasey
Fescue grass unknown	*Festuca* sp.
Oregon ash	*Fraxinus latifolia* Benth.

Cleaver catchweed	*Galium aparine* L.
Sweet Bedstaw	*Galium triflorum* Michaux
Salal	*Gaultheria shallon* Pursh
Dovefoot	*Geranium molle* L.
Cudweed	*Gnaphalium purpureum* L.
Fuzzy sunflower, Telegraph weed	*Heterotheca grandiflora* Nutt.
Hawkweed white flower	*Hieracium albiflorum* Hook.
Velvet grass	*Holcus lantus* L.
St John's Wort, Klamath Weed	*Hypericum perforatum* L.
Hairy cat's-ear, rough cat's-ear	*Hypochaeris radicata* L.
iris grass	*Iris* spp.
Dyer's woad	*Isatis tinctoria* L.
Rush, Toad	*Juncus bufonius* L.
Juncus	*Juncus* spp.
Prickly lettuce	*Lactuca serriola* L.
Dead nettle	*Lamium amplexicaule* L.
Lilies	*Lilium* spp.
Tanoak	*Lithocarpus densiflorus* Hook. & Arn.
Ryegrass, Italian Ryegrass	*Lolium multiflorum* Lam.
Honeysuckle, Orange Honeysuckle	*Lonicera ciliosa* (Pursh) Poiret
Small Flower Lotus	*Lotus micranthus* Benth.
Spanish clover	*Lotus purshianus* (Benth.) Clements & E.G. Clements var. *purshianus*
Lupine small flower, Miniature Lupine	*Lupinus bicolor* Lindley
Lupine, small flower lupine	*Lupinus polycarpus* Greene
Lupine	*Lupinus* spp.
Tarweed, common madia	*Madia elegans* Lindley
Pineapple weed, disc mayweed	*Matricaria discoidea* DC.
Black medick, Yellow trefoil	*Medicago lupulina* L.
White Sweetclover	*Melilotus alba* Medikus
Alfalfa	*Melilotus spp.*
Mint Pennyroyal	*Mentha pulegium* L.
Monkey flower yellow	*Mimulus* sp.
Tobacco, Indian	*Nicotiana attenuata* Torrey

Tobacco	*Nicotiana* spp.
Mt. Sweet Cicely	*Osmorhiza chilensis* Hook. & Arn.
Witchgrass	*Panicum acuminatum* Sw.
Yampah	*Perideridia*
Coltsfoot	*Petasites frigidus* (L.) Fries var. *palmatus* (Aitone) Cronq.
Hairypink	*Petrorhagia dubia* (Raf.) G. Lopez & Romo
Sitka spruce	*Picea sitchensis* (Bong.) Carr.
Knobcone pine	*Pinus attenuata* Lemmon
Jeffrey pine	*Pinus jeffreyi* Grev. & Balf.
Sugar pine	*Pinus lambertiana* Douglas
Ponderosa pine	*Pinus ponderosa* Laws.
pine	*Pinus* spp.
Plantain, English Plantain	*Plantago lanceolata* L.
Bluegrass	*Poa annua* L.
Unknown grass Poa	*Poa* sp.
Knotweed pigweed white flower, Willow weed	*Polygonum lapathifolium* L.
Rabbitfoot , Annual beard grass	*Polypogon monspeliensis* (L.) Desf.
Sword fern	*Polystichum californicum* D. Eaton
Black cottonwood	*Populus balsamifera* spp. *trichocarpa* Torrey & A .Gray
Douglas-fir	*Pseudotsuga menziesii* (Mirbel) Franco var. *menziesii*
Bracken fern	*Pteridium aquilinum (*L.) Kuhun var. *pubescens* L. Underw.
Oregon white oak	*Quercus garryana* Hook.
Kellogg's oak, California black oak	*Quercus kelloggii* Hook.
Canyon, Interior Live Oak	*Quercus wislizeni* A.DC
cascara	*Rhamnus purshiana* DC.
Himalayan blackberry	*Rubus discolor* Weihe & Nees; *R. ameriacus*
Blackcap raspberry	*Rubus leucodermis* Torrey & A .Gray
Thimbleberry	*Rubus parviflorus* Nutt.
wild strawberry	*Rubus* spp.
Salmonberry	*Rubus spectabilis* Pursh
Trailing blackberry, California blackberry	*Rubus ursinus* Cham. & Schldl.

Sorrel, Sheep	*Rumex acetosella* L.
Curly dock	*Rumex crispus* L.
Willow, Sandbar, Coyote, Narrow leaf, Gray, Blue	*Salix exigua* Nutt.
Scouler's willow	*Salix scouleriana* Hook
Bouncing bet	*Saponaria officinalis* L.
Tule	*Scirpus acutus* Bigelow var. *occidentalis* (S. Watson) Beetle
Groundsel, Wood	*Senecio sylvaticus* L.
Redwood, Coast	*Sequoia sempervirens* (D.Don) Endl.
Green brittle grass	*Setaria* sp.
Mallow	*Sidalcea* spp.
Catchfly	*Silene* sp.
Prickly sowthistle	*Sonchus asper* (L.) Hill ssp. *asper*
Sand-spurrey	*Spergularia marina* (L.) Griseb.
Salt cedar	*Tamarix ramosissima* Ledeb.
Dandelion	*Taraxacum officinale* Wigg.
Penny-cress	*Thlaspi arvense* L.
Incense cedar	Cupressaceae *Calocedrus decurrens* (Torr.) Florin
Western red cedar	*Thuja plicata* D. Don
Poison oak	*Toxicodendron diversilobum* Torrey & A. Gray
Pom pom, rabbitfoot clover	*Trifolium arvense* L.
White clover	*Trifolium repens* L.
Clover	*Trifolium* spp.
Trisetum Nodding	*Trisetum cernuum* Trin.
Deer potato, Ithuriel's spear	*Triteleia laxa* Benth.
Hemlock, Western-coast	*Tsuga heterophylla* (Raf.) Sarg.
Hemlock, Mountain	*Tsuga mertensiana* (Bong.) Carr.
Cattail, common	*Typha latifolia* L.
California bay laurel, myrtlewood	*Umbellularia californica* (Hook & Arn.) Nutt.
Huckleberry	*Vaccinium* spp.
Mullen, woolly	*Verbascum thapsus* L.
Speedwell	*Veronica arvensis* L.
Brooklime, Am.	*Veronica beccabunga* L.
American Vetch	*Vicia americana* Willd. var. *americana*

Tufted Bird vetch	*Vicia cracca* L.
Giant vetch	*Vicia gigantea* (Hook.)
Common Vetch	*Vicia sativa* L.
vetch	*Vicia* spp.
Periwinkle, greater	*Vinca major* L.
Wild grape	*Vitis californica* Benth.
Rattail	*Vulpia myuros* (L.) C. Gmelin
Cocklebur	*Xanthium strumarium* L.
Beargrass	*Xerophyllum tenax* (Pursh) Nutt.

DEDICATION

I dedicate the information and research results presented in this dissertation to my son Jason *Paarak* Hensher-Lake, wife Luna Lisa Latimer Lake, family, and friends who supported me in various ways with my graduate studies. Sorry it took away spending some quality time with you.

Chapter 1 Traditional Ecological Knowledge for Fire Regimes in Northwestern California, Klamath-Siskiyou Bioregion: Management and Restoration of Culturally Significant Habitats

This dissertation addresses the question: "Can the incorporation of tribal traditional ecological knowledge (TEK) with western science restore biodiversity and improve management of valley sandbar willow (*Salix exigua* Nutt.) riparian areas and fire-adapted habitats of cultural value in the Klamath-Siskiyou bioregion?" The environmental condition of watersheds found in Northwestern California and Southwestern Oregon have been greatly altered over the last 200 years by anthropogenic, climatic, and biophysical influences. Changes in land management practices from that of indigenous peoples to private and public land managers modified culturally significant habitats, water quality, fish and wildlife populations, and the composition and structure of habitats of high tribal value. Additional landscape effects have resulted from changes in the use of fire, mining, American settlement, use of forests, shrubs and grasslands, logging, road construction, agriculture, and dam construction. An analysis of TEK combined with western research can demonstrate practical and sustainable approaches to many natural resource restoration efforts.

The goal of this dissertation is to develop an understanding of how TEK, incorporated with western science, could be used to restore biodiversity and attain conservation goals in riparian zones in low- to mid-elevation sites. A further goal is to examine how TEK and western science can be used to reintroduce prescribed fire in the Klamath-Siskiyou bioregion. Major themes of this research are historical ecology, tribal land use practices, fire and riparian ecology, management of sandbar willows for basket material, effects of fire suppression and exclusion to tribal communities tribal priorities for fuels and fire management, and lastly, recommendations related to the findings of this dissertation research. Specific issues addressed are: Traditional Ecological Knowledge, ethnobotany/basketry, disturbance ecology, fuels and fire management, cultural versus natural fire regimes, and tribal community-based restoration and management of riparian zones and fire-dependant ecosystems in Northwestern California, Klamath-Siskiyou bioregion. The lower mid-Klamath River, northwestern California was selected as a case study area to illustrate examples of the issues addressed by this research (Figure 1.1)

Research questions

1) What factors have influenced the development of tribal cultural fire regimes in the Klamath-Siskiyou bioregion?
2) Can traditional ecological knowledge of tribal elders and practitioners be used with other lines of evidence to better understand changes associated with non-tribal management of sandbar willow dominated riparian zones and culturally valued terrestrial fire-adapted habitats?
3) What are the affects of prescribed fire and flooding on riparian sandbar willow communities along the lower mid-Klamath River?
4) What are the results of propane burning or pruning to produce sandbar willow shoots suitable for basketry use?
5) How have fire suppression policies and management affected tribal communities and culturally significant habitats?
6) What are tribal values and priorities for fuels and fire management?

Historical landscape and fire regime changes

The development of cultural fire regimes compared to natural fire, considering the dominant influences of climate, physical and biological conditions, and changes in the management practices of Native American and non-native peoples were studied. Paleo-climate data for the Klamath-Siskiyou and adjacent California and Pacific Northwest regions are reviewed to describe how climate has influenced vegetation communities, cultural adaptive strategies, tribal demographics, and fire frequency and behavior.

Archaeological and ethnographic data of indigenous people inhabiting the Klamath-Siskiyou bioregion for the last 9,000 years was used to review potential cultural land use practices. Archaeological data provide insights into how early tribal people evolved and adapted to physical and biological conditions, and human socio-cultural systems. Examination of Native American material culture also reflects what people used, where they lived, and what effects they may have had on the environment. Changes in material culture reflect "cultural phases" and immigration/emigration of different tribal groups, as well as the continuity of cultural traits from the time period of tribal peoples contact with non-indigenous people.

Ethnographic and archaeological data, documenting cultural practices and material culture since the period of contact with Europeans and Americans, provides details of Native American tribal similarities for various geographic areas. Of particular interest were the cultural uses of fire in different vegetation communities and habitats. Cross-referencing the various lines of evidence e.g., paleoclimatology, dendrochronology, photography, archaeology, and anthropology/ethnography, for tribal groups across different vegetation communities provides an understanding of the interplay of anthropogenic and natural fire effects on biodiversity and ecological processes for the region.

Fire history and dendrochronology studies were also reviewed to put in context more specific vegetation community changes and fire effects at local scales. Fire scar and tree ring growth have been used to indicate the signature of natural lightning and human ignition patterns across the landscape, frequency and seasonality of fire events. Selected historical photographs and repeat photography were used to depict vegetation conditions for particular areas across northwestern California, coast to mountains. Photographs reveal changes or effects of land management practices on vegetation and habitat quality; the observer can interpret how conditions present in the image reflect natural or anthropogenic causes.

Traditional Ecological Knowledge (TEK) and Cultural Environmental Management Practices (CEMP)

Ethnographies of Native American cultural practices and traditional ecological knowledge provide interpretations of how and where indigenous people interacted with their environment. Ethnographic material from the late 1800s to early 1900s on various aspects Native American culture reflects the research interest of anthropologists and geographers at a time when Native Americans were rapidly declining from diseases, genocide, relocation, forced assimilation, and acculturation.

Some sources of ethnographic information are not easily available, e.g., unpublished field notes, nor do they specifically provide details for questions of interest today. In addition, as more recent research has been conducted, former interpretations have been reconsidered or were found to be inaccurate about tribal cultures and people. This dissertation builds on former information regarding management of culturally significant resources, indigenous fire use and ethnobotany, with particular focus on northwestern California. Divergent academic perspectives span a continuum about the effects of indigenous fire use; some scholars limit the ecological extent Native American fire use while others hold a broader view. This research further defines the spatial and temporal extent of Native American versus natural fire across the landscape, and provides insights about what fire-induced ecological conditions were desired by Native Americans in the region.

Building upon past tribal oral histories, additional Native American elders were selected and asked about traditional uses of fire; their understanding of the linkages between fire and wildlife populations, past and present environmental conditions; and what their priorities would be for fuels reduction, fire management and watershed restoration. These interviews document traditional ecological knowledge (TEK) related to fire use and fire effects for various habitats in northwestern California. Past and present cultural environmental management practices and Native American natural resources issues are discussed.

Sandbar willow communities as culturally significant habitats

Professional experience with riparian and fisheries habitat related to fire effects influenced the selection of valley sandbar willow (*Salix exigua* Nutt.) communities along the lower-mid Klamath River for research. Sandbar willow communities are the ecotonal fringe of up-slope and riverine communities along the continuum of the river corridor. Several members of the Karuk Indigenous Basketweavers also suggested the need for research on sandbar willow since it was and is an important basket material and ceremonial use plant for the Karuk people.

The lower mid-Klamath River riparian vegetation has changed as a result of regulated flow from dams and irrigation in the upper Klamath basin. Some Karuk basket weavers believe that sandbar willow communities do not experience the rejuvenating disturbances that they historically did. This lack of disturbance results in decreased quantity and quality of willow shoots and roots for basketry. In the past pruning and some burning had been used as willow management practices, but no research had been conducted to test those effects. It was from these interests that two aspects of the sandbar willow research emerged. One aspect was to study prescribed fire effects on sandbar willow community vegetation and fuels, and the second was to determine how willow growth responded to propane burning and pruning.

Sandbar willow fire and flooding effects

Studying fire effects on sandbar willow communities involved measuring changes in vegetation structure, composition, and distributions of fuel. Sandbar willow communities have experienced various impacts resulting from non-Indian policies and land management practices. Past, pre-dam, vegetation community condition is dissimilar to that of the present. Exotic invasive plant species are now a major component of the sandbar willow communities. Understanding fire effects on exotic species is important for ecological and socio-cultural values. Thus, fire effects on exotic plant species emerged as a part of this research. Sampling and research design used transects and quadrats for vegetation and fuels inventories. Prescribed fires were conducted in fall 2005, and were followed by Winter 2005/2006 flooding. Flooding was of sufficient magnitude to compound the ability to study fire effects from those of flooding on vegetation and fuels, so the two disturbances were studied as a synergistic event. Differences between prescribed fire and flooding were reported where possible.

Sandbar willow ethnobotany and experimental treatments

Pruning is used as the primary management tool by contemporary Native American basket weavers to create quality willow shoots desired for basket material. Historical burning of sandbar willow is reported. Burning willows is viewed as a contemporary adaptive management practice that can substitute flooding’s rejuvenating effects, although at much reduced effects ecologically. An experiment was designed to examine the effect of propane burning, pruning, and no treatment (control) on the mean number and proportion of "good" usable shoots to "bad" non-usable stems. Other shrub characteristics of individual willow plants were collected relative to the number of emergent stems at ground level, height, and observable signs of insect damage. Propane burning was found not be very effective at producing a greater number of stems of useable quality for basket weaving compared to natural growth or pruning. A "good" shoot has particular morphological stem characteristics. Generally, a stem with a small diameter butt end with long even taper free of kinks or defects qualifies as a good stem or shoot. The experiment evaluated the effects of the treatments on the mean number of good stems, the proportion of good stems, and the morphological quality (stem diameter to length ratios). Many stems/shoots of similar diameter and length are needed for weaving good quality baskets. Not every willow shrub produces sufficient or adequate shoots to make a particular type of basket.

Ethnobotany of basketry sticks: Sandbar willow and other species

This research used stem diameter and length of willow stems/shoots to compare other plants also used for weaving, and to characterize the types and sizes of stems used for different baskets. The stem diameter to length ratio is a quantitative way to assess the taper of a stem. Various willow stems were measured; bark-on, peeled, burned, pruned, wild/natural, time since disturbance, and potential combinations of "treatments." Stems from California hazel (*Corylus cornuta* Marsh. var. *califorinica*) and Douglas-fir (weepy fir-type) (*Pseudotsuga menziesii* (Mirbel) Franco var. *menziesii*) also were measured to compare similarities between common basket weaving materials. Seasonality of treatments and time of harvest are described, relative to morphological variation among species and their growth responses. The various management practices for willow and related basket materials are discussed.

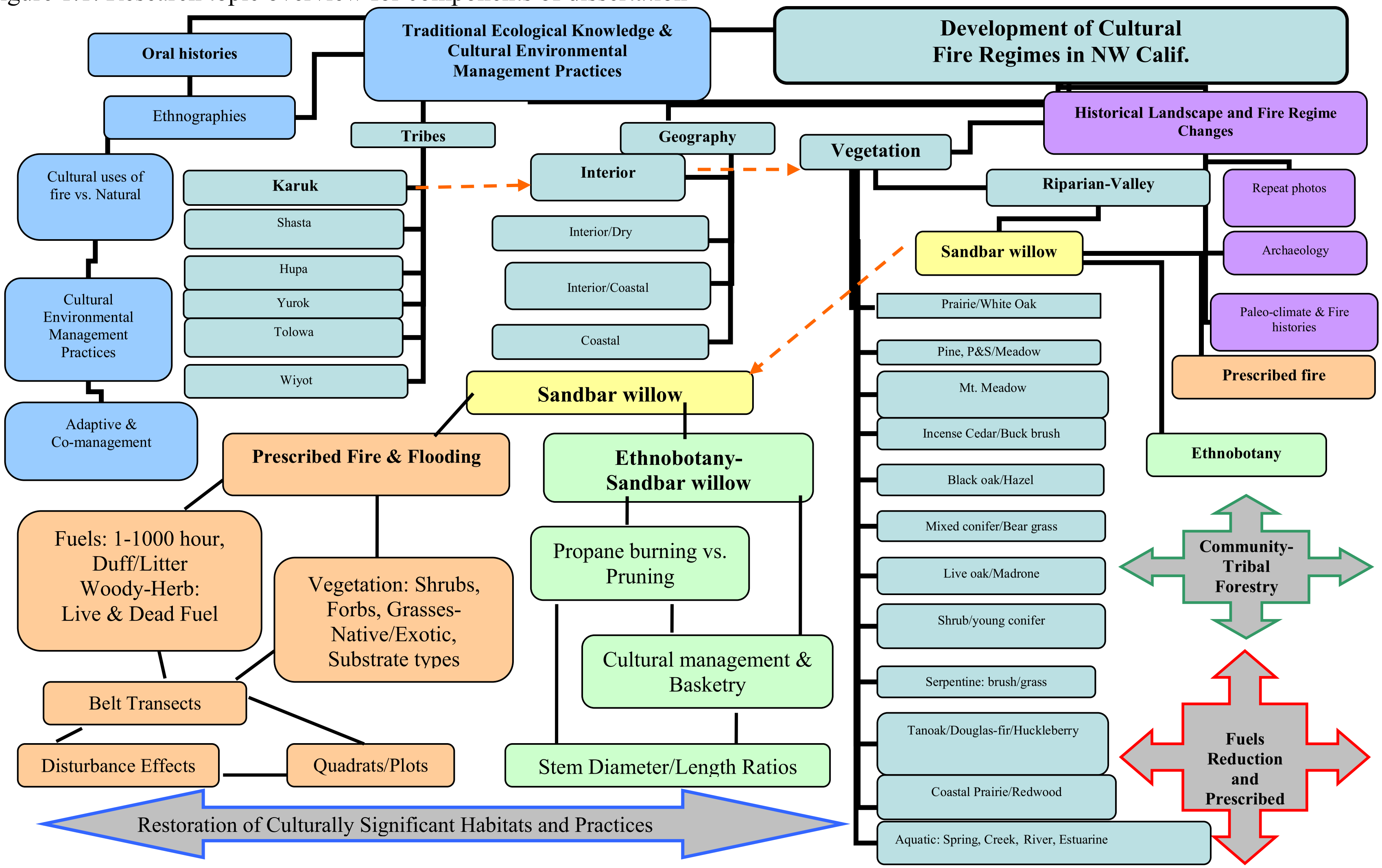
Effects of fire suppression on tribal communities and culturally significant habitats

How fire suppression and exclusion has changed culturally significant habitats and impacted cultural use quality was evaluated. Western scientific methods of evaluating changes to the environment e.g., fire regime condition class, and how tribal use quality was modified is presented. The direct and indirect effects of fire suppression on tribal communities and culturally significant habitats are also discussed. The impacts of fire suppression activities to culturally significant resources and the tribal community compared to the generalized public are used as examples. As a case study the effects of fire suppression and exclusion resulting in changes in fire frequency, fuel loading and habitat quality, as well as the direct effects of past fire suppression activities on tribal natural resource values are presented for the lower-mid Klamath River area.

Tribal values and prioritization of fuels and fire management and recommendations for research and cooperative management in northwestern California

The final chapter of this dissertation explores similarities and differences between western science and tribal-community forestry for selected management practices to restore and conserve biodiversity with an emphasis on fuels reduction and prescribed fire. Perspectives of tribal elders and practitioners regarding priorities for fuels reduction and prescribed fire treatments are presented. Emergent issues affecting tribal versus federal government natural resource management were compared. The potential impacts of climate change and exotic invasive species are discussed. The results and discussion pertain to the tribal trust responsibility the federal government has to tribes and tribal communities. Potential solutions are offered to improve the ability of scientists and managers to work effectively with tribes and tribal communities. Lastly, the need for additional research which could further the incorporation of TEK and values with western science are suggested.

Figure 1.1: Research topic overview for components of dissertation



Chapter 2: The Development of Cultural Fire Regimes by Native Americans in the Klamath-Siskiyou Bioregion

Overview of information for the Klamath-Siskiyou Bioregion

This research focuses on the evolution of fire use by Native people in the Klamath-Siskiyou bioregion before A.D.1850, approximately 155 years before the present (B.P.) (Figure 2.1). Archaeological, ethnographic, and regional climate data are used to examine the potential spatial and temporal extent of cultural fire use. Native Americans have inhabited the Klamath-Siskiyou bioregion for at least 8,000 years (Fredrickson 2004). Over thousands of years some cultural land management practices developed *in situ*, while others were imported or adapted to meet the needs of various groups (Fredrickson 2004). During the last 3,000 years, several other cultural groups have come to the region, established territories, and adapted to local environmental conditions (Connolly 1988, Connolly 1989a, Fredrickson 2004). Indigenous traditions and customs evolved as a result of cultural exchange, environmental adaptation, and geographic settings to form tribal territories circa A.D.1850 (Figure 2.2 Tribal territory map).

Over the last 8,000 years climate change in western North America for Pacific Northwest and California regions affected human-fire-vegetation interactions (Chatters et al. 1995, Jones et al. 1999, Hildebrandt and McGuire 2002, Whitlock et al. 2004, Briles et al. 2005, Marlon et al. 2006, Trouet et al. 2006). Changes in climate that affected fire potential, vegetation conditions, hydrology, fisheries and wildlife habitat also affected the immigration and emigration of various populations of Native people with different languages, customs and survival practices (Baumhoff 1963, Fladmark 1979, Borden 1979, Hildebrant 1981, Connolly 1988, Ames 1994, Chatters et al. 1995, Jones et al. 1999, Fagan 2000, Richardson et al. 2001, Fredrickson 2004, Prentiss et al. 2006). Climate change in the Klamath-Siskiyou bioregion shifted through several phases between warm and dry to cool and moist (Whitlock 1992, Whitlock et al. 2004, Briles et al. 2005) influencing species abundance and biodiversity which tribal cultures utilized (West 1985, Lewis 1993, Pullen 1996, Anderson 2005).

The biodiversity of the Klamath-Siskiyou bioregion, circa A.D.1850, has been attributed to the effects of geology, climate, and ecological processes (Whittaker 1960, Whitlock 1992, DellaSala et al. 1999, Whitlock et al. 2004). The cultural diversity of tribal inhabitants reacted and interacted with similar biophysical processes (Baumhoff 1963, Fredrickson 2004). Climate, geo-topography, vegetation, and human management all interacted to influence the extent and frequency of fires in the Klamath-Siskiyou bioregion over the last 8,000 years (Table 2.1).

Table 2.1: Climate and Archaeological phases for the Klamath-Siskiyou bioregion and southern Pacific Northwest bioregion.

<table>
<tr><th rowspan="2">Location</th><th>South</th><th colspan="4">Klamath-Siskiyou Mountains to Western Cascades</th><th>North</th><th colspan="2">Climatic phases</th></tr>
<tr><th>Southeast Klamath Mountains Trinity Alps</th><th>Southeast Klamath Mountains Trinity Alps</th><th>Southeast Klamath Mountains Trinity Alps</th><th>Southeast Klamath Mountains Trinity Alps</th><th>Northern Siskiyou Mountains</th><th>Western Central Cascades Mountains</th><th>Trinity Alps</th><th>Siskiyou Mountains</th></tr>
<tr><th>Age (calendar years Before Present)</th><th>Mumbo Lake</th><th>Cedar Lake</th><th>Bluff Lake</th><th>Crater Lake</th><th>Boland Lake</th><th>Indian Prairie</th><th colspan="2">Time Periods</th></tr>
<tr><td>200</td><td rowspan="8">Cooler & Wet</td><td rowspan="10">Cool & Moist</td><td rowspan="5">Cool & Wet</td><td rowspan="4">Modern Climate</td><td rowspan="5">Modern Climate</td><td rowspan="4">Modern Climate</td><td rowspan="15">Late to Middle Holocene (c. 7000 cal. yr B.P. to present)</td><td rowspan="10">Late Holocene (ca. 4500 cal yr B.P. to present</td></tr>
<tr><td>500</td></tr>
<tr><td>1000</td></tr>
<tr><td>1500</td></tr>
<tr><td>2000</td><td rowspan="8">Cooler & Wetter</td><td rowspan="9">Cooler & wetter</td></tr>
<tr><td>2500</td><td rowspan="5">Cool & Moist</td><td rowspan="5">Cooler & wetter</td></tr>
<tr><td>3000</td></tr>
<tr><td>3500</td></tr>
<tr><td>4000</td><td rowspan="7">Cool & Moist</td></tr>
<tr><td>4500</td></tr>
<tr><td>5000</td><td rowspan="8">Some-what Cooler & Dry</td><td rowspan="5">Warm & Slightly Wetter</td><td rowspan="11">Warmer & Drier</td><td rowspan="11">Early Holocene (ca. 10,900 to 4500 cal yr B.P.</td></tr>
<tr><td>5500</td></tr>
<tr><td>6000</td><td rowspan="9">Warmer & Drier</td></tr>
<tr><td>6500</td><td rowspan="8">Warmer & drier</td></tr>
<tr><td>7000</td></tr>
<tr><td>7500</td><td rowspan="4">Warm & Dry</td><td rowspan="4">Warm & Dry</td><td rowspan="6">Early Holocene (ca. 11000 to 7000 cal. yr B.P.)</td></tr>
<tr><td>8000</td></tr>
<tr><td>8500</td></tr>
<tr><td>9000</td><td rowspan="3">Warm & Dry</td></tr>
<tr><td>10000</td><td rowspan="3">Cool & Moist</td><td rowspan="2">Transitional</td></tr>
<tr><td>11000</td></tr>
<tr><td>12000</td><td rowspan="4">Cool & Moist</td><td rowspan="2">Cool & Moist</td><td rowspan="5">unknown</td><td rowspan="4">Warmer & wetter</td><td rowspan="4">Warmer and wetter</td><td rowspan="5">Early Holocene to Late Pleistocene (> 11000 cal. yr B.P.)</td><td rowspan="5">Late-glacial period > 10,900 cal yr B.P. Pleistocene</td></tr>
<tr><td>13000</td><td rowspan="3">Cold & Dry</td></tr>
<tr><td>14000</td><td rowspan="2">Cold & Dry</td></tr>
<tr><td>15000</td></tr>
<tr><td>16000</td><td colspan="3">unknown</td><td>Cooler and Drier</td><td>Cooler and Drier</td></tr>
<tr><td>Reference</td><td>Daniels et al. 2005</td><td>West 1989</td><td>Mohr et al. 2000</td><td>Mohr et al. 2000</td><td>Briles et al. 2005</td><td>Sea and Whitlock 1995</td><td>Daniels et al. 2005</td><td>Briles et al. 2005</td></tr>
</table>

Lightning ignitions are assumed to have been the main source of fires (Agee 1993, Sweeney and Frost 2000, Skinner et al. 2006). The judicious use of fire by Native people is generally unaccounted or dismissed as having substantial influence on vegetation or fire regimes (Sweeney and Frost 2000, Whitlock and Knox 2002, Vale 2002). However, evidence support ubiquitous fire use by American Indians for a multitude of reasons (Heffner 1984, Lewis 1993, Pullen 1996, Anderson 2005, Chapter 3). Natural fire regimes were influenced by tribal fire uses since humans inhabited the region, although the spatial and temporal extent of cultural burning has not been fully investigated (Busam 2006, Chapter 3). Some areas of the landscape most likely still reflect cultural fire regimes, meaning that the influence of human (tribal) fire use is more responsible for the condition of vegetation than that of lightning (see Bonnicksen et al. 1999, Chapter 3 for definition of cultural fire regime). The frequency and extent of fire is inferred from pollen and charcoal samples taken from aquatic habitats, and can be compared with tree ring/fire scar (dendrochronological) studies (Whitlock et al. 2004, Briles et al. 2005, Skinner et al. 2006). However, the source of ignition is often not revealed by such studies. Thus the spatial and temporal effects of American Indian fire use cannot be separated from those of lightning which has often led to Indian ignitions being devalued (Lewis 1993, Stuart 1997, Whitlock and Knox 2002, Vale 2002).

Socio-cultural data derived from archaeological, ethnographic, and linguistic research is also used to reconstruct the evolution of cultural fire regimes. Prior to Euro-American settlement, the Klamath-Siskiyou bioregion was inhabited by many linguistically unique tribal groups with different languages and dialectics and a range of similarity in cultural traditions, customs, and practices (Whistler 1977, Moratto 2004, Figure 1.1 and Figure 2.2). The archaeological record provides evidence of how tribal cultures and their established tribal territories evolved (Connolly 1988, Fredrickson 2004). The cultures of Native people at the time of Euro-American settlement reflected a reliance and dependence on fire-induced landscape conditions (Boyd 1999, Anderson 2006). Archaeological and ethnographic data for different areas of the Klamath-Siskiyou bioregion provides evidence for the development and evolution of cultural dependency on certain types of fire regimes, for example low intensity/high frequency fires.

The extent and effect of Native American fire use on vegetation, wildlife habitat, and resultant biodiversity has been debated (Sweeney and Frost 2000, Whitlock and Knox 2002, Vale 2002). Some estimates of the extent of Native American impacts were attempted by Vale (2002). When describing the influence of fire on vegetation in creating historical fire regimes some authors mention the contribution of Native American fire use, but often do not describe the extent of use (Pullen 1996, Stuart 1997, Skinner et al. 2006). Other authors demonstrate the extent or influence attributed to Native people for particular areas or habitats (Keter 1985, Busam 2006, Chapter 3). The influence of Native American fire use has been reported but the methods to define the actual extent of influence has not been fully attempted for the region or larger areas within the region.

Hypotheses

H_1: The development of cultural fire regimes can be inferred from the archaeological record of tribes.

H_2: The strongest lines of evidence (Archaeological, ethnographic, or linguistic) can be used to demonstrate continuity of a cultural fire regime known to exist at A.D. 1850.

H_3: Some tribes or cultural groups had greater reliance on fire-induced vegetation and contributed to the development of cultural fire regimes than others.

Cultures display adaptive responses to environmental conditions (Baumoff 1963, Hildebrant 1981). As environmental conditions change, Native cultures change as well (Jones et al. 1999, Hildebrandt and McGuire 2002). “When existing eco-niches no longer suffice, people will seek out new eco-niches which appear to offer resources and settings similar to those traditionally known” (Clewett and Sundahl 1989:37). It is hypothesized that Native people would have to find new eco-niches or modify local conditions, i.e. develop complex adaptive responses such as a cultural fire regime, in the face of potentially greater influencing physical factors such as climate change (Jones et al. 1999).

Methods

Archaeological data from other studies were used as evidence of cultural adaptations to a fire-dependant culture. Lines of evidence are:

1. The transition from stone bowl mortars to basket hopper mortars (indication of basketry material that required burning for management).
2. The development of sedentism (indication of food storage capacity) reflective of strategies for diversified and complex subsistence.
3. Refinement of fishing strategies (indication of adaptive terrestrial, aquatic and marine subsistence practices) corresponding with increased habitat quality.
4. A change from atlatl to bow and arrows (indication of hunting specialization and potential burning to increase prey forage and habitat quality).

These adaptations may or may not have coincided with changes in climate (Whitlock et al. 2004, Briles et al. 2005). Hopper basket mortars and fish-net sinkers are used as proxies for the longevity of reliance on fire induced-modified habitat quality by Native American tribal groups. Other utilitarian baskets, e.g., pack baskets, made of similar sized shoots and plant species were used for subsistence activities such as acorn collection, fuel wood gathering, and of vegetable, fish or game products (transportation) (Figure 2.3, Figure 2.4, Figure 2.5). High quality basketry materials required scheduled burning and habitat modification in specific forest and shrub communities (Heffner 1984, Lewis 1993, Pullen 1996, Anderson 1999, Anderson 2005). Diversification of food and material resources managed with fire were needed to support a fire dependent culture. Over 80% of the tribal material cultures, circa A.D. 1850, are estimated to have depended on fire-induced habitat change (Tripp pers. com. 2007). Subterranean house pits indicate presence at year-round villages and increased storage capacity (Connolly 1988, Connolly 1989a, Fredrickson 2004). The development of fish-net sinkers demonstrated intensification of fishing techniques and management practices coinciding with increased salmon (*Oncorhynchus* spp.) abundance in marine, estuarine, and riverine environments (Kroeber and Barrett 1960, Chatters et al. 1995, Butler and Campbell 2004). Successful adaptations to fisheries resources (Kroeber and Barrett 1960, Swezey and Heizer 1993) increased human populations; cultural complexity likely fostered the ability to further develop land management practices (e.g., burning) or specialized subsistence strategies (Osborne 1958, Baumhoff 1963, Hildebrant 1981). Changes in technology with projectile points, such as atlatls to bow and arrows, demonstrate the exchange of intellectual property and increase in sophistication of burning to foster desired vegetation conditions for subsistence and ceremonial activities (Connolly 1989b, Pullen 1996, Turner 1997, Berkes and Turner 2006).

Findings

Cultural phases

The terminology for cultural phases varies among archaeology, paleoclimate, and fire history studies (Abbot 1972, Moss and Erlandson 1998, Fredrickson 2004, Whitlock et al. 2004, Briles et al. 2005, Skinner et al. 2006). Archaeological classifications for cultural patterns are the most diverse and can be confusing (Moss and Erlandson 1998, Fredrickson 2004). Paleoclimate and fire history classification systems vary among the time periods studied (Whitlock et al. 2004, Briles et al. 2005, Skinner et al. 2006). The most widely used system that integrates multiple research techniques the for various time classification periods is Before Present (B.P.) system (Moss and Erlandson 1998), and will be primarily used here for historical reference.

Analysis of cultural artifacts in the region identifies several cultural phases related to ecological adaptations, duration of presence, and immigration of prehistoric Native American people (Abbot 1972, Moss and Erlandson 1998, Fredrickson 2004). Most researchers divide the prehistory of the Klamath-Siskiyou bioregion into phases, periods, patterns, or complexes (Abbot 1972, Moss and Erlandson 1998, Fredrickson 2004) (Table 2.1). Cultural attributes were most frequently recognized as 'early' or 'late,' or as belonging to the interior Shasta Complex or the coastal Gunther Pattern based on projectile points. Artifacts predating 1500 B.P. (A.D. 500) are recognized by foliate and broad-necked projectile points (Hayes 1985, Connolly 1988, Connolly 1989b, Fredrickson 2004). Sites of this age have been found both along the coast and in interior valleys (Fredrickson 2004). Early coastal sites were along the high bluffs with evidence of cultural reliance on hunting terrestrial game rather than utilization of available marine resources (Moss and Erlandson 1998, Davis et al. 2002). The time of coastal occupation is debated because some sites eroded by the rising Pacific Ocean may be now under water (Matson and Coupland 1995, Moss and Erlandson 1998, Ames and Maschner 1999, Losey 2003). Artifacts recovered from sites attributed to the Late period are often narrow-necked and barbed projectile points, post-dating 1500 B.P. (A.D. 500). For the Late period an increased number of village sites signify an increase in human populations and sedentism.

In the mid upper-Klamath River, Mack (1989) described pre-historic Native American cultural phases as Basin and River, which occurred during a warmer-dry to cooler-wet climate. The Basin Phase culture (4500 to 2500 B.C., 6000 to 4500 B.P.) used groundstone tools, portable mortars, mullers, and stone bowls (Fredrickson 2004). The River Phase (2500 to 250 B.C., 4500 to 2250 B.P.) reflects the first evidenced indication of fishing by the presence of bone and antler harpoons or fishing gear. The use of nets, fish traps and weirs likely predated physical evidence of bone or antler (Hostler pers. com. 2007). The exploitation of fish was well established by 600 B.C. (2600 B.P.) (Mack 1989), a climatically optimal time period in the Pacific Northwest for salmon habitat and population abundance (Chatters et al. 1995). During the climate optimum for salmon, the precipitation and extent of forested landscape was greater (Chatters et al. 1995). Tribal groups dependant also on early seral stage grassland or open forest understory habitats would have likely needed to burn to supplement lightning ignitions (Lewis 1993, Pullen 1996, Boyd 1999 and references there in)

Northern California and southern Oregon have shared at least two major cultural traditions over the last 6,000 years. Conflicting theories exist. Potentially one exchange occurred when northern California cultural groups advanced northward into Oregon (Penutian groups). A more recently accepted theory of migration put the Penutian groups moving in from east of the Cascades into the Klamath-Siskiyou bioregion and settling in the upper Rogue, Sacramento, and Trinity River systems (Whistler 1977, DeLacey and Golla 1997, Morratto 2004). Another cultural exchange developed within the last 2,000 years resulting in advancement southward from the interior lowlands of southwestern Oregon into the foothills and river valleys of northern California of the Algic/Algonquians and Athapascans (Baumoff 1958, Clewett and Sundahl 1989, Fredrickson 2004). These groups of people reflected different ancestral linguistic and genetic diversity (Morratto 2004). Radiocarbon samples collected from sites across the Klamath-Siskiyou bioregion ascribe early subgroups between 9,000 and 2,500 years ago, with recent subgroups dating between 3,500 and 300 years ago. Several lithic pattern sequences are described as: Glade (8000 to 4000 B.P., with isolates continuing up to 300 B.P.), Siskiyou (4000 to 300 B.P.), Gunther Pattern (1500 to 150 B.P.), which have material assemblages that reflect cultural subsistence and settlement patterns (Connolly 1988, Fredrickson 2004).

Stone to Hopper mortar transitions

In the Glade tradition time period of 8,000 to 4,000 years ago cultural groups living in the Klamath-Siskiyou bioregion were predominately using stone bowl mortars (Connolly 1989a). Traits characterized by the Glade Tradition were related to the regional development of a Pacific Northwest-wide Cascade Pattern (Connolly 1986). The Glade Tradition covers almost the entire prehistoric record for southwestern Oregon and northwestern California. Artifacts of the Glade tradition have associated radiocarbon dates that ranged from 9,000 to 300 years ago (Fredrickson 2004). The conservative Glade Pattern was modified, adapted, or replaced by the later developing Siskiyou and/or Gunther Patterns associated with immigrant tribal groups (Connolly 1986, Fredrickson 2004). Adoption of new cultural traits is believed to be brought about through expanded knowledge exchange, trade relationships, intermarriage, and slave-trade (Fredrickson 2004, Berkes and Turner 2006).

Around 1600 B.P. (A.D. 400) the Siskiyou Pattern appeared in the Klamath-Siskiyou bioregion (Connolly 1988, Connolly 1989). During the era of the Siskiyou Pattern, cultural groups inhabiting southwestern Oregon adopted cultural traits and practices from new immigrant tribal groups and began to use hopper mortar bases, net weights for fishing, and nucleated semi-terranean pit house villages. “This change in a broad range of assemblage traits suggests that new influences were impinging on the region” (Connolly 1989:58). The exchange of intellectual capital also related to cultural uses of fire for land management (Ames 1994, Butler and Campbell 2004).

Potentially more complex knowledge of the bioregion, ecological processes, habitats, and species populations allowed for a tradition of exploitation that enhanced rather than depleted ecosystem diversity. Such exchanges allowed ecological systems to be more resilient to human perturbations (Berkes and Turner 2006).

Archaeological evidence indicates an increase in the exchange of imported goods between the coast and interior regions, and was grouped with the Siskiyou and Gunther periods (Connolly 1988, Fredrickson 2004). The Gunther Pattern is associated with continuously occupied prehistoric and historic sites linked with tribal people of Athapascan and Algic origin. The Gunther Pattern period falls within the last 1,100 years and is represented by continued use of hopper bases and fish-net weights, as well as advanced uses of stone, ceramic, and oils (Connolly 1989). It has been debated whether the Athapascan and Algic speaking people, as immigrants, were responsible for importing the Gunther Pattern, which reflects cultural associations with coastal groups of the north Pacific Coast (Jorgensen 1980 in Maston and Coupland 1995, Fredrickson 2004). Cultural settlements may also reflect the amount of fire use by tribes of different cultural origins. It is suggested that the southernmost Athapascans (e.g., Hupa and Chilula), who are believed to have imported the use of bow and arrow, were adapted to terrestrial prey (e.g., ungulates, small game, birds, etc.) and had extensive uses of fire or reliance on fire-induced change (Zybach pers. com. 2007). More northern Athapascan groups who established earlier, such as the Tolowa and Tututni, rapidly adapted to marine and coastal subsistence strategies (Drucker 1937, Gould 1975). Other scientists have distinguished between the two Athapascan subgroups present circa A.D. 1850 in southwestern Oregon and northwestern California (Baumhoff 1958).

Tribal settlement patterns

Habitation patterns such as dispersed camps with relatively low human populations developed into specialized seasonal resource camps once permanent villages were developed for food storage (Ames 1994). These settlement patterns resulted in human populations along coastal areas and inland valleys (Fladmark 1979, Fredrickson 2004). Connolly (1986) suggests that cultural stability existed in isolated areas of the Klamath-Siskiyou bioregion which were removed from centers of cultural development and exchange, such as along the Klamath, Rogue, Umpqua, and Columbia Rivers (Hayden and Schulting 1997).

The ancestral Shasta, Karuk, and Chimariko tribal people belonging to the Hokan cultural group are believed to have occupied territories in the region since 9000 B.P. Contemporary tribal territories are recognized. The Penutian groups that established in the interior parts of the region about 1100 B.P. are theorized to have become the Takelma and Wintu (Rogers et al. 1990, DeLacey and Golla 1997). The Algic-Algonquian cultural groups which formed the Wiyot and Yurok tribes are thought to have migrated around 1100 B.P. into the Klamath-Siskiyou coastal region and settled in coastal northwestern California and the lower-Klamath River before the Athapascan intrusion (Fredrickson 2004). The Athapascan cultural groups that were the predecessors of the Chasta Costa, Dakubetede, Gusladada, Taltuctunteda, Tututni-Chetco, Tolowa, Hupa, Chilula, Whilkut, Nongatl, Lassik, and Wailaki tribes are believed to have initially inhabited southwestern Oregon from circa 3000 B.P. It is thought that some tribelets broke off and migrated to northern California in the last 1000 years and established tribal territories by circa A.D.1850, some of whom still survive and persist in their ancestral territories (Baumhoff 1958, Kroeber 1976, Connolly 1988, Connolly 1989, Fredrickson 2004). Differences in linguistic dialectics, material culture, and subsistence practices are recognized between the more northern Tolowa and other Oregon Athapascans compared to the more southern Hupa-Chilula and other related California Athapascans (Baumhoff 1958).

Table 2.2: Time periods of tribal group establishment into circa A.D. 1850 territories

Tribe circa 1850	Language family	Estimated Establishment	Location and River system inhabited	Source
Coos	Penutian	Before 6000 Before Present	SW Or. Coos Bay coastal area	Rogers et al. 1990, DeLancey and Golla 1997
Takelma	Penutian	Circa 1100 Before Present	SW Or. upper-Rogue River	Rogers et al. 1990, Gray 1987, DeLancey and Golla 1997.
Tolowa	Athapascan	Circa 3000 Before Present	NW Ca. coastal Smith River	Fredrickson 2004
Tututni-Chetco	Athapascan	Circa 3000 Before Present	SW Or. coastal lower Chetco, Winchuck, and Rogue Rivers	Fredrickson 2004
Gusladada	Athapascan	Circa 3000 Before Present	SW Or. Illinois River, lower-Rogue River	Pullen 1996

Taltuctunteda	Athapascan	Circa 3000 Before Present	SW Or. Galice Creek	Gray 1987
Dakubetede	Athapascan	Circa 3000 Before Present	SW Or., Applegate River	Gray 1987
Chasta Costa	Athapascan	Circa 3000 Before Present	SW Or., Mid lower-Rogue River and lower-Illinois River	Gray 1987
Karuk	Hokan	Before 8000 Before Present	NW Ca. Mid-lower Klamath and Salmon Rivers	Fredrickson 2004
Shasta	Hokan	Before 8000 Before Present	Northern Ca. Mid-Klamath River, Shasta, Scott and upper Salmon River systems.	Fredrickson 2004
Chimariko	Hokan	Before 8000 Before Present	NW Ca. middle Trinity River	Sundahl and Henn 1993
Wintu	Penutian	Circa 1100 Before Present	Northern Ca. upper Sacramento River and Trinity River Systems.	Rogers et al. 1990, Morrato 2004 Linguistic chapter, DeLancey and Golla 1997
Wiyot	Algic	Circa 1100 Before Present	NW Ca. coastal, Humboldt bay, Lower Mad and Eel Rivers.	Fredrickson 2004
Yurok	Algic	Circa 900 Before Present	NW Ca. coastal, lower-Klamath River.	Fredrickson 2004
Hupa	Athapascan	Circa 700 Before Present	NW Ca. lower-Trinity River	Wallace 1978, Fredrickson 2004
Chilula	Athapascan	Circa 700 Before Present	NW Ca. Redwood Creek	Wallace 1978, Fredrickson 2004
Whilkut	Athapascan	Circa 700 Before Present	NW Ca. upper-Mad River and upper Redwood Creek	Wallace 1978, Fredrickson 2004
Nongatl	Athapascan	Circa 700 Before Present	NW Ca. upper-Mad, Eel and Van Duzen Rivers	Elsasser 1978
Lassik	Athapascan	Circa 700 Before Present	NW Ca. mid upper-Eel and North Fork Eel Rivers	Elsasser 1978
Wailaki	Athapascan	Circa 700 Before Present	NW Ca. upper-Eel and North Fork Eel River	Elsasser 1978

The information presented in Table 2.2 was derived from theories of estimates of time based on physical and linguistic evidence (Fredrickson 2004, Morratto 2004), and do not necessarily reflect the traditions and belief systems of Native American descendants of these groups. These tribal people have their own creation accounts and perception of how and why they came to inhabit their ancestral territories (Moore pers. com 2007, Hostler pers. com. 2007). Similarly, earlier archaeological theory about the

Bering land bridge migration of Paleo-Indians into western North America was refuted or challenged by alternate methods, e.g., coastal water routes (Fladmark 1979, Maston and Coupland 1995).

Results of compiled data by area or subregion

The different areas of the Klamath-Siskiyou bioregion presented below reflect changes in cultural phases and related material traits. Because of various cultural-linguistic group migrations to, from, and within the Klamath-Siskiyou bioregion different tribes established and developed at different time periods (Table 2.2, Connolly 1988, Connolly 1989, Jones et al. 1999, Fredrickson 2004). Tracking change over time for subregions correlated to potential fire use within different ecological settings. Climate influenced tribal development of various subregions over different time periods, from coastal (west) to interior (east) valleys, to mountain ridges, as did exterior cultural influences from California (south), Great Basin (east), Plateau (northeast), and coastal Pacific Northwest-lower Columbia River Basin (north) (Connolly 1988, Ames 1994, Fredrickson 2004, Prentiss et al. 2005).

Northern California/Southeastern Klamath Mountains

Paleo-environmental studies conducted by West (1985, 1988) show that between 8000 to 5000 B.P. corresponded with a slightly warmer climatic period than of recent (A.D. 1988), vegetation pattern migrated upslope approximately 200 to 300 meters (600 to 900 feet). From as early as 5000 B.P. to 3000 B.P. economic adaptations of that time period differed from former patterns. Adaptations represent small highly mobile groups of Native "people whose annual rounds took them from low elevation river terraces to high elevation ridge tops where they practiced a generalized hunting and gathering subsistence pattern" (Clewett and Sundahl 1989:38, West 1988). Populations became more concentrated at fewer but larger sites. In response to cooling, and changing weather patterns, high elevation ridges were less utilized (Clewett and Sundahl 1989). Mortar and pestle technology appeared in northern California about 4000 B.P. Approximately 3000 B.P. to 2000 B.P. populations of Native people began to concentrate in settlements along foothills adjacent to valley floors which coincides with salmon abundance (Chatters et al. 1995). Use of high elevation ridges was less frequent but use was retained up to A.D.1850, or 155 years B.P., and continued by Indian families through the historic period to the present (Fredrickson 2004, Six Rivers National Forest Interviews: I-177, I-183, I-206, I-210, I-229, I-230, I-286, I-288, I-290, I-299, I-353, I-355, I-380, I-381, and I-382).

By 700 B.P., cultural groups in the Klamath-Siskiyou bioregion adopted the bow and arrow (Fredrickson 2004) and the hopper basket mortar resulting in reduced use of bowl mortars (Figure 2.3). Increase evidence of fish net weights (Figure 2.4) at river and stream-side sites (villages and camps) (also see Figure 3.8a) indicates a stronger reliance on fishery and riverine resources (Fredrickson 2004).

During this time period subsistence activities increased at high elevation sites and foothill and valley riverside sites potentially suggesting increased human population and territoriality pressures (West 1985, Clewett and Sundahl 1989).

Around 1000 B.P. the use of hopper basket mortars and pestles, harpoon points and semi-subterranean houses were well established. This same time period supported the introduction of the Penutian-speaking Wintu among the more mobile Hokan-speaking groups (Morrato 2004). “Economic adaptations practiced by the Willits and Tehama Pattern people of northern California seem, however, to be indigenous, gradually changing to meet local conditions” (Clewett and Sundahl 1989:44). These adaptive practices could have been the expansion and refinement of cultural uses of fire which further influenced ecologically diverse Klamath-Siskiyou bioregion. Archaeological traits that existed at 1100 B.P. were shown to “have exact duplicates in the literature of southwestern Oregon but no known antecedents in northern California” (Clewett and Sundahl 1989:44).

Coastal Southwestern Oregon

Research conducted in Camas Valley, southwestern Oregon provides evidence of different material cultures and subsistence-settlement regimes associated with the Siskiyou Pattern. This pattern replaced the former Glade Pattern (Connolly 1986). The change from Glade to the Siskiyou subsistence-settlement pattern could be analogous with the development of a more refined cultural fire regime in the northern Klamath-

Siskiyou bioregion. The coast and adjacent river valleys of southern Oregon and northern California were occupied by Athapascan speaking people at the beginning of the historic era, circa A.D.1850 (Table 2.1), with northern and eastern Penutian neighbors (DeLacey and Golla 1997). Some Athapascan Native people are thought to have migrated to the Klamath-Siskiyou bioregion about 1300 to 700 years ago (Connolly 1986, Fredrickson 2004). At two sites (Tututni villages) located six miles north of the Chetco River, similarities were found with artifacts from late cultures of northwestern California and the Pacific Northwest Coast cultures. Artifacts recovered included hopper mortars and notched and grooved net sinkers (Berreman 1944 in Gould 1975).

These artifacts were recovered from the Pistol River Site (35CU61), the historic village of *Chetlessentan*, of the Athapascan-speaking Tututni. The Blundon site (Archaeological site: 35CU106) located in Port Orford (Tututni village), was similar to those at Point St. George (Tolowa village), approximately 80 miles (129 km) south, in having two distinct components. The lowest component was radiocarbon dated to 2050 +/- 80 B.P. (95 B.C.), and the upper component to 630 +/- 55 B.P. (A.D. 1360). Pullen's (1981) analysis for the coastal drainages of southwestern Oregon concluded that artifacts of prehistoric Native people from the Early period characterized a dependence upon upland resources, primarily along the upper reaches of the coastal rivers. Late period artifacts characterized dependence on riverine and maritime resources primarily with occupation along coastal bays and estuaries. These patterns may reflect occupation by two separate ancestral cultural groups or adoption of new technology and subsistence practices.

<u>Coastal Northwestern California</u>

Ancestral Wiyot and Yurok in coastal northwestern California have been classified as the Algic language stock and are thought to have arrived to the area after A.D. 900, or 1100 B.P. (Fredrickson 2004). Archaeological investigations and radiocarbon dated materials on Gunther Island in Humboldt Bay place Native American occupation at least since 1050 +/- 200 years B.P. (A.D. 900 or 950). Hopper mortars and notched and grooved net sinkers were recovered from the Gunther Island site (Wiyot village), but no approximate age was reported (Connolly 1986).

Archaeological investigation of the Patrick's Point site (Archaeological site: 4-Hum-118) (Yurok village) estimates occupation since 640 +/- 90 years B.P. (A.D. 1405). Archaeological investigation of the Trinidad, *Tsurai* (Archaeological site: 4-Hum-169) indicates that a Yurok village there was occupied from early A.D. 1600 until the early A.D. 1900's (Heizer and Mills 1991). Tribal inhabitants relocated to rancherias or reservations, or moved to American towns (Heizer and Mills 1991). At Point St. George, a Tolowa village and camp, radiocarbon dates of a hearth were 2260 +/- 210 B.P. (405 B.C.).

<u>Interior Umpqua/Rogue Valleys</u>

Archaeological evidence for multiple sites in the vicinity of the mid upper-Rogue River support two cultural phases and occupation patterns, the former about 2000 to 4000 B.P. reflecting foliate projectile points and stone bowl mortars, and the later or second type being within the last 1000 years with Gunther barbed points and smaller projectile points, metates, and hopper mortar bases. Glade Tradition elements persisted in the Umpqua and Coquille river basins until late prehistoric times, centuries after they disappeared in the Rogue River basin. The Siskiyou Pattern was persistent throughout the Rogue River watershed by 1,700-1,500 years ago (Connolly 1988).

At the Gold Hill site (Takelma village) along the mid upper-Rogue River, Cressman (1933:13) found hopper mortar bases, and stated that such artifacts were an "obviously very late or intrusive element which is absolutely not found in the rest of the mound" (Connolly 1986:54). At the Lost Creek Dam site (upper Takelma) on the mid-upper Rogue River (near Trail, Oregon) hopper mortar bases were found associated with the later or second most recent cultural phase. The Ritsch site (Archaeological site: 35J04) (Dakubetede or Takelma village) near the confluence of the Applegate and Rogue Rivers contained artifacts belonging to two cultural phases similar to the Lost Creek Dam sites. Carbon samples taken from house floors containing hopper mortars at the Ritsch site were aged at 1400 +/- 80 B.P. (A.D. 595 or A.D. 550) and 1470 +/- 100 B.P. (Connolly 1986). Further down-river at the confluence of the Illinois and Rogue Rivers, at the historic Chasta Costa (Athapascans) *Tlegletlinten* village, upper terrace cultural materials suggest essentially a single component with little diversity (Connolly 1986). This observation could support the hypothesis expressed by Connolly (1986) that some more remote isolated groups were less cultural diversity or sophisticated or resisted the adoption of different technologies. On the north bank of the Rogue River near the mouth of Mule Creek, the Marial site (Tututni village) was found to be similar to the *Tlegletlinten* site (Archaeological site: 35CU59). The persistence of artifacts at the two sites, Marial and *Tlegletlinten*, indicate a distinct "technological tradition throughout much of the area's prehistoric past" (Connolly 1986:60).

Interior Upper Klamath River

Human occupation has occurred on the upper Klamath River for at least 8000 years (Connolly 1986). Based on archaeological investigation cultural elements/artifacts reflect cultural influences of the Klamath Basin, Northwestern California and Southwestern Oregon. A site at Cash Creek (Archaeological site: CASIS13) (Shasta village) revealed basket material. Lithic scatter suggested hunting, epos (*Calochortus* spp.), root or bulb and/or acorn gathering. Large midden sites and villages were generally located on the first or second terraces above the Klamath River (Mack 1989). The midden sites and villages were in close proximity of each other. The Klamath Shoal Midden had artifacts from the last 7,000 years (Mack 1989). Groundstone artifacts include mullers, milling stones, pestles, hopper mortar bases, basalt bowls, portable mortars, hammer stones, rubbing stones, net sinkers, and sandstone shaft smoothers. Fiber and textile artifacts were observed at Border village (Archaeological site: 35KL16, radio carbon dated 580+/-120 B.P., A.D. 1370) (Shasta village). Tule (*Scirpus acutus* Bigelow var. *occidentalis* (S. Watson) Beetle) and juncus (*Juncus* spp.), and hazel (*Corylus cornuta* Marsh. var. *califorinica*) and pine (*Pinus* spp.) root basketry with pitch were also found at the archaeological site (CASIS13), and Foster Site (Archaeological site: CASIS262) (Shasta villages). Plant material, macrofloral remains, were present at the CASIS13 site. Acorns (*Quercus garryana* Hook.), camas bulb coats (*Camassia* sp.), lily corms (*Brodiaea* sp.), epos (*Calochortus* sp.) and buckeye seed (*Aesculus* sp.) were found. The majority of taxa composing the plant material found at the Cash creek site were habitat associates which require frequent fire to sufficiently persist and sustain human harvesting

(Turner 1997, Anderson 2005). Evidence of occupation of the upper Klamath River was determined at 7646+/-400 B.P.. "From the presence of plant processing groundstone tools such as milling slabs, mullers, and bowl mortars, the exploitation of seed plants in the canyon begins" by 7000 B.P. (Mack 1989:23).

Mid-Klamath and Trinity River Systems

Archaeological work in connection with the construction of Shasta, Trinity, and Lewiston, and Whiskeytown dams revealed the Shasta complex is believed to post dated A.D. 900. The Shasta complex is characterized by hopper mortars, and Gunther barbed projectile points. On the upper Trinity River, Treganza (1959) concluded that there was no prehistoric Native occupation of the area before A.D. 900, or 1200 B.P. "Subsequent investigations have produced evidence of an earlier occupation characterized by atlatl points, manos, and metates (Clewett 1977), but the Shasta Complex is still interpreted as intrusive, appearing rather suddenly in the area (Whistler 1977, Sundahl 1981)" (Connolly 1986: 74). For example, it is thought the Wintu settled the upper Sacramento Valley area around 1100 B.P. (A.D. 900), appearing rather suddenly and leaving archaeological assemblages identified as the Shasta Complex (Sundahl 1981). Fire pits and rock-lined baking ovens located outside domestic structures were recovered at a prehistoric village in Redding, California. Based on radiocarbon dates, initial occupation at this site was approximated at 800 B.P. (A.D. 1200), with other artifacts supporting continuous occupation until the nineteenth century (Connolly 1986). "Many Trinity and Hayfork Wintu place-names were originally Chimariko, an indication that the Wintu entered the Trinity River country and supplanted the older Hokan group only recently" (Morrato 2004:562-563).

Northwestern California: Upper Redwood Creek, Upper Mad River, and North Fork Eel River

The southwestern end of the Klamath-Siskiyou bioregion is bound by the Eel River drainage. This area circa A.D.1850 was primarily inhabited the Nongatl, Lassik and Pitch Wailaki tribal groups of Athapascan origin. It was a cultural fringe region between the Central California and Pacific Northwest Cultural complexes (Kroeber 1920, Elsasser 1978, Keter 1985). These groups had similar basketry and subsistence practices as the other Athapascans (Chilula and Hupa) to the north (Elsasser 1978). Limited amounts of archaeological research have been conducted for these southern Athapascan groups (Keter 1989a). Native American burning was an important factor on vegetation composition (oaks/grassland versus Douglas-fir) in the area. “Much of Trinity County, now chocked with thick brush, was almost open prairie before the white man came” (Essene 1945 in Keter 1986:4). There are limited data on the spatial and temporal extent of American Indian fire use by tribal groups for this subregion (Six River National Forest Interviews on-file, Eureka, Ca., Appendix B).

How hypotheses are addressed by this research

H_1: Development of cultural fire regimes is inferred from the archaeological record of tribes.

Different regions adopted hopper basket mortar use at different time periods. Changes in projectile points, from atlatl spears to bow and arrows do not necessarily reflect increased use of burning to improve range habitat or during hunting to drive game. Historical accounts strongly suggest cultural burning was an influence on game abundance, habitat quality or range condition (Six Rivers National Forest Interviews Appendix B, Pullen 1996, Biswell 1999). Changes in projectile points reflect specialization of hunting techniques, but not necessarily the amount of hunting, or fire use. Fish-net sinkers reflect increased harvesting and specialization of fish harvesting methods (Kroeber and Barrett 1960). Climate affected salmon habitat quality, fish distribution and abundance. When climate was optimal for salmon conditions were cooler and moister (Chatters et al. 1995). The area and extent of vegetative forest cover compared to grasslands increased as a result (Chatters et al. 1995). Tribal groups adapted to terrestrial prey/game, other foods, and materials may have increased burning to maintain early seral stage vegetation to offset influences of climate. Ancestral TEK reflected subsistence strategies over warm/dry to cool/moist conditions were likely applied to the medieval climatic anomaly and the subsequent the little ice age that occurred (Keter 1986, Rogers et al. 1990, Jones et al. 1999, Millar and Wolfenden 1999).

Establishment of year round villages, increased salmon harvesting, and improved storage capacity fostered cultural niche specialization. Specialization in basketry, management and harvesting of vegetative foods or game (hunting or trapping), which required burning to influence habitat quality may also be inferred from the archaeological evidence. “Evidence suggests that the new technologies, which allowed people to harvest salmon and other riverine and maritime resources, were quickly adopted by indigenous groups (such as the Karok) and by subsequently entering Athapascan groups, most notably the Hupa” (Fredrickson 2004:484).

H_2: Are there lines of evidence (Archaeological, ethnographic, or linguistic) that can be used to demonstrate continuity of the cultural fire regime known to exist at A.D.1850?

The strongest archaeological evidence available was changes from stone to hopper basket mortars. People in various areas in the Klamath-Siskiyou adopted hopper basket/mortars at different time periods (Fredrickson 2004). Maintenance of basketry materials required burning of certain plant materials at specific conditions, seasons, and frequencies to promote desired morphological form, e.g., hazel shoots and bear grass. Assuming basketry skills and management practices were similar circa A.D.1850 in continuity, the extent of burning can be inferred from ethnographic data (Chapter 3, 7, and 8). Linguistic data are inferior compared to other evidence in ability to infer the continuity of cultural fire regimes. Linguistic data provides additional evidence of when and from where tribal groups immigrated to the Klamath-Siskiyou bioregion. Linguistic similarity can be compared to material cultural similarity. In many cases across the Pacific Northwest and California, tribal groups maintained their languages but incorporated or adopted land management practices (e.g., burning and harvesting)(Turner et. al. 2003, Fredrickson 2004, Anderson 2005). Other studies in the coastal Pacific Northwest have demonstrated correlations between linguistics, tribal knowledge of ancestry, and genetic ancestry, e.g., DNA (Ward et al. 1993). Circa A.D.1850, many tribal groups of divergent linguistic and genetic origins exhibit similar cultural traditions, beliefs, and customs (Whistler 1979, Rogers et al. 1990, Ward et al. 1993). It is proposed by Rogers et al. (1990) that linguistic or genetically similar groups adapted to different vegetation communities and changes of climate. Climate influenced vegetation which is a contributing factor to cultural/tribal movement to new territories. Tribal groups potentially followed, tracked or relocated to the vegetation communities of particular altitude and/or latitude that they were most ancestrally familiar with.

H_3: Tribes or cultural groups had a greater reliance on fire induced vegetative change and contributed to the development of cultural fire regimes.

If tribal groups of divergent linguistic or genetic origin followed particular vegetation communities during climatic shifts (Rogers et al. 1990), the Klamath-Siskiyou bioregion offers great potential for cultural niche specialization based on its diversity of geology, vegetation, and elevation (Whittaker 1961, DellaSala et al. 1999). The Klamath-Siskiyou bioregion has biophysical similarities to the Oregon coastal mountain forest/grassland (geologically sandstone and north coastal vegetation), Cascades (geologically volcanic and northern interior vegetation), Sierra Nevada (geologically granite and interior Southern vegetation), and California coastal mountain forested/shrub/grassland (geologically sandstone/metamorphic and southern coastal vegetation) (DellaSala et al. 1999). The high level of biophysical diversity from coastal beaches to river valleys to mountain ridges to montane meadows allows a high degree of separation between groups of similar or different linguistic/genetic origin (Keter pers. com. 2007). Those environments influenced by fire that promote culturally desired conditions would be favored by tribes or tribal families retaining ancestral familiarity to that type of vegetation and associated biodiversity. For example, the Penutian groups were closely associated with the "Sierra Conifer Forest" vegetation type across the California and the Pacific Northwest (Rogers et al. 1990). "It is presumed that the ancestors of the California Athapascans were at all times adapted to and utilized interior forested environments, and that their movements into and settling in California involved no essential changes in their habitat" (Fredrickson 2004:484). Cultural groups tracked "biophysical comfort zones" of latitude or altitude (elevation), allowing them higher success at maintaining core territories based on ancestral familiarity of fire to vegetation to hydrology to fisheries and wildlife population relationships.

The abundance of salmon fostered cultural specialization, but the extent of specialization was likely influenced by whether tribal groups were ancestrally familiar with fishing (marine, estuarine, or riverine) versus terrestrial resources (game, seeds, berries, etc.) and understood how ecological processes effected fisheries habitat (Chatters et al. 1995, Fredrickson 2004). Some groups were likely more mobile, adaptive, and socially organized than others. Turner et al. (2003) suggest that tribal groups in areas that are near the convergence of one or more bioregions or geologic provinces (e.g., Columbia Plateau and coast Pacific Northwest) are more adaptive and resilient due to their familiarity with multiple cultural traditions and subsistence strategies. The high biophysical and cultural-linguistic diversity of the Klamath-Siskiyou bioregion would reflect the hypothesis proposed by Turner et al. (2003)

Cultural groups are described as searchers or pursuers (Hildebrandt 1981, Fredrickson 2004). "Searchers exploit a wider range of prey dispersed over an extensive area, whereas pursuers seek specialized resources, predictable in their occurrences at particular times and places" (Fredrickson 2004:478). Specialized cultural burning with a sophisticated understanding of fire effects on vegetation and habitat quality could temporarily shift the proportion of searchers to pursuers for terrestrial resources, versus the predictable annual timing of salmon runs (Kroeber and Barrett 1960, Swezey and Heizer 1993, Pullen 1996, Bonnicksen et al. 1999, Anderson 2005). This theory supports the archaeological and ethnographic data of high cultural specialization and tribal diversity of the Klamath-Siskiyou bioregion (Connolly 1988, Connolly 1989, Fredrickson 2004). Based on available archaeological, linguistic, and ethnographic data, tribes belonging to Hokan and Penutian (searcher increasing proportion to pursuer) were more reliant on fire induced landscape level changes during their development, than the later arriving Algic-Algonquian or Athapascan tribal groups (pursuers changing proportion to more searcher). These later groups migrated into the Klamath-Siskiyou bioregion after the Hokan and Penutian (Fredrickson 2004), were heavily focused on aquatic resources but may have adopted and adapted landscape level fire use to expand the spatial extent of American Indian burning patterns that were documented circa A.D.1850 (Lewis 1993, Pullen 1996, Chapter 3).

> The Yurok "apparently brought with them a fishing and woodworking technology highly suitable for their new riverine home, and presumably, the technology for preserving and storing fish resources. The Karok adopted the technology of their new neighbors (Wiyot and Yurok),

> shifting from their diversified interior lifeways to the specialized riverine adaptation, heavily dependant upon salmon, that marked their ethnographic culture" as known circa A.D.1850 (Fredrickson 2004:483).

Linguistics has been used to examine names of plants and animals, and whether tribes borrowed them from predecessors (Whistler 1977, DeLacey and Golla 1997). The tribes with borrowed or newer names for plants or animals encountered in their relatively new habitats and territory are thought to be most recent. Although this assumption may not hold true for groups that followed similar vegetation communities to new locations of suitable habitat as climate changed (Rogers et al. 1990, DeLacey and Golla 1997). The comparison of the relative importance of marine, estuarine, riverine, and terrestrial resources based on cultural subsistence reconstruction for various tribes was discussed by Baumhoff (1963).

Discussion

It is been argued that climate, which in turn affects vegetation and subsequently wildlife and fisheries habitat, is responsible for the diversity of tribal groups present circa A.D.1850. The lower Klamath River was the core zone of Northwest California cultural traits representative of the Klamath-Siskiyou bioregion (Kroeber 1920). "The cause of this predominance could be laid theoretically to one or both of two causes: exposure to external ethnic influences can be dismissed in this case… Natural environment therefore must be the direct or indirect cause; and sufficient explanation is found in the fact that the Klamath (River)" is the largest stream between the Sacramento and the Columbia along the Pacific coast (Kroeber 1920:162). The effect of environment in influencing tribes' cultural development and specialization was recognized prior to more sophisticated archaeological, linguistic, and genetic analysis techniques (Fredrickson 2004, Morrato 2004). Although how tribal cultures adapted to their environment needs further investigation. Tribal specialized management practices, such as burning and fish harvesting methods, facilitated their ability to manipulate vegetation conditions through increased population and niche partitioning (Kroeber and Barrett 1960, Lewis 1993, Swezey and Heizer 1993, Busam 2006, Chapter 3).

> "Another measure of environmental productivity and the Indians' ability to utilize the available plants and animals is the density of population. By way of example, let us take tribal densities per square mile of territory in a west-to-east line running from the Yurok on the northwestern coast past the riverine Hupa and Karok, whose tribal lands adjoined on the east, and proceed further east to the Pit Rivers and the Modoc, who lived in the high, semi-desert plateau beyond the range of salmon and oaks. The figures are Yurok, 4.66 persons per square mile; Hupa, 5.20; Karok, 2.42; Achomawi, 0.70; Atsugewi, 0.30; and Modoc, 0.30. Such population densities directly reflect the productiveness of the land in terms of available food resources. The richer the land, the more people, and vice versa." (Heizer and Elsasser 1980:27 in Pullen 1996).

Characterizing fire regimes: Natural or Cultural

Fire intervals from 9,000 to 6,850 calendar years B.P. averaged 110 ± 20 years, when the climate was warmer and drier than today and xerophytic vegetation dominated (Fry and Stephens 2006). From c. 6850 to 2750 calendar years B.P., the mean fire interval lengthened to 160 ± 20 years in conjunction with the onset of cool humid conditions. Fire-sensitive species, such as incense cedar (*Thuja plicata* D. Don), Western hemlock (*Tsuga heterophylla* (Raf.) Sarg.), and Sitka spruce (*Picea sitchensis* (Bong.) Carr.) increased in abundance (Fry and Stephens 2006). At circa 4000 calendar years B.P., increases in allochthonous sedimentation increased the delivery of secondary charcoal (Fry and Stephens 2006). From ca. 2750 calendar years B.P. to present, the mean fire interval increased to 230 ± 30 years as cool humid conditions increase with mesophytic taxa (Fry and Stephens 2006). Cessation of American Indian burning, fire suppression enforcement, and exclusion prevailed more frequently after 1911 (Weeks Act 1911, Harley 1918, USFS-KNF map 1928, Six Rivers National Forest Interview: I-346).

Climate, fire, vegetation, hydrology, and salmon

The slowly rising sea level (circa 3500 B.P.) and final stabilization to an elevation near present day directly affected the geomorphic condition of estuaries and lower sections of creeks and rivers entering the Pacific Ocean (Byram 1998, Losey 2003). The geomorphic and hydrologic changes to marine, estuarine, and riverine environments resulted in “poor” conditions for salmon before 5500 B.P., transitioning into “optimum conditions” (4000 B.P. to 2000 B.P.) and then reducing to “good” by 1000 B.P. to 150 B.P. (Chatters et al. 1995). The availability of salmon provided nutritional capital for cultural groups to develop into specialized tribal environmental managers (Baumhoff 1963).

In the greater Pacific Northwest, landscape level coverage of forests expanded over former grasslands (pre 6000 B.P.) during the cooler and moister periods (3000 to 1500 B.P.) (Chatters et al. 1995). Then the region experienced a warming and drying period from 1500 to 1000 years B.P. (Medieval Climatic Anomaly) which negatively affected tribal groups (A.D. 800 to A.D. 1350 in Jones et al. 1999). The region then transitioned to a cooler and moister condition from 1000 B.P. to 250 B.P. (Little Ice Age) (Millar and Wolfenden 1999**)** (Table 2.3).

Table 2.3: Comparison of climate, cultural phases, and salmon occurrence.

Location	**Klamath-Siskiyou Region**	**Southeast Klamath Mt. Trinity Alps**	**Northwest California Coast Range**	**Northwest California and Southwestern Oregon Coast Range**		**North Siskiyou Mountains**	**Interior Klamath Mountains and River**	**Southern Pacific Northwest and Northern California**
Age (cal. yr BP) < 2000AD	**Climatic Time Period**	**Crater Lake**	**Tribal groups**	**Archaeological material traits**	**Cultural Phases**	**Boland Lake**	**Upper Klamath River**	**Columbia River**
(1750 AD) 250	Little Ice Age	Modern Climate	Athapascans enter: Hupa, Chilula, and Tolowa	**Gunther Pattern (1000 BP) Hopper Baskets, Bow-Arrows, Fish net sinkers, Art and Trade Coast to Interior**	**Emergent**	Modern Climate		**Good for Salmon in the PNW and Northern California**
(1500AD) 500								
(1250AD) 750								
(1000AD) 1000	Medieval Climatic Anomaly		Yurok enter	**Siskiyou Pattern Hopper Baskets, Metates, Trade Increased Populations Pit house villages**				
(750AD) 1250			Wiyot enter					Climatic transition period
(500AD) 1500	Decreasing temperature California north coast ranges		**Karuk-Hokan cultural complex inhabits Northwestern California from the upper-mid Klamath River west to the coast, south to Humboldt Bay, and east to the mid-Trinity River. Arid conditions cause human migration from Great Basin west.**	**Glade Pattern**	**Upper Archaic**			**Optimum for Salmon in the PNW: Sea level stable. Cool climate with high precipitation .**
1750		Cooler & Wetter						
(0AD) 2000								
2250						Cooler & Wetter	**Salmon use River Phase**	
(500BC) 2500								
2750								
(1000BC) 3000								
3250					**Middle Archaic**			
3500								Climatic transition period
3750								
(2000BC) 4000	Arid mid-Altithermal period Great Basin and California low lands. Sea level rising along Pacific coast							
4250								
4500								
4750						Warmer & Drier	**Basin Phase**	**Poor for Salmon in the PNW: Sea level rising. Low stream flow**
(3000BC) 5000								
5250					**Lower Archaic**			
5500								
5750								
(4000BC) 6000	Warming of							
6250								

6500	Pacific West	Warmer & Drier						
6750								
(5000 BC) 7000								
7250								
7500								
7750								
(6000BC) 8000								
8250								
8500			**Paleo-Indian groups settling Klamath-Siskiyou bioregion**		**Paleo-Indians Migrants**			**Salmon status unknown**
8750								
(7000BC) 9000								
9500								
10000								
10500								
11000								
Citation: **Paleoclimate** **Archaeology**	Fagan 2000, Jones et al. 1999. Moratto 2004.	Mohr et al. 2000	Fredrickson 2004	Connolly 1988	Fredrickson 2004	Briles et. al. 2005	Mack 1989	Chatters et al. 1995.

"The Medieval Climatic Anomaly impacted the availability of food and water to the point that human societies experienced significant demographic stress" (Jones et al. 1999:139). Changing precipitation was correlated to stream flow/hydrology and vegetation productivity, and affected the extent and severity of fires across the landscape (Chatters et al. 1995, McKenzie et al. 2004).

> "Much of lowland California was inhabited only sparsely or intermittently during the warm-dry climatic interval before circa A.D. 1430. 'Improved' (relatively cool-moist) conditions between circa A.D. 1430 and 1850 coincided with population growth and cultural elaboration in many regions. Population shifts and language spreads during this period brought California's ethnogeography to its early historic configuration" (Morrato 2004:567).

Regional patterns for precipitation, vegetation productivity, fire susceptibility, hydrology, and aquatic habitat quality were influenced by climate. Patterns have been inferred from the El Niño/Southern Oscillation (ENSO) which is the major source of inter-annual climate variability in the Pacific Northwest (PNW). ENSO variations are more commonly known as El Niño (the warm phase of ENSO) or La Niña (the cool phase of ENSO) (CIG web). Mantua et al. (1997) documented a connection between salmon abundance and the Pacific Decadal Oscillation (PDO). The warm phase PDO is generally associated with reduced abundance of coho (*Oncorhynchus kisutch*) and chinook (*O. tschawytscha*) salmon in the Pacific Northwest (PNW). Spring and Fall chinook and coho salmon are the main fish species harvested by native people in the Klamath-Siskiyou bioregion (Snyder 1931, Kroeber and Barrett 1960, Swezey and

Heizer 1993, Pullen 1996). "Warmer, drier years, often associated with El Niño events and/or the warm phase of the Pacific Decadal Oscillation, tend to be associated with below-average snowpack, streamflow, and flood risk, below-average salmon survival, below-average forest growth, and above-average risk of forest fire" (Mote et al. 2003:45).

Climate variations associated with the Pacific Decadal Oscillation (PDO) affect Pacific Northwest forests both directly and indirectly. The Climate Impacts Group examined the effects of PDO on forest growth and on forest fire activity. The Group reported that there was no discernible effect of the El Niño/Southern Oscillation (ENSO) on increased fire activity. However, the "PDO may influence broader fluctuations in forest structure, composition, and function through drought-related forest fire activity, which is generally higher during warm phases of the PDO" (CIG web page 4/4/2007).

Shifting climatic conditions likely prompted the use of fire by tribal people to maintain predictable vegetation conditions across the Klamath-Siskiyou landscape (Figure 2.5). Historic and prehistoric occupants for all cultural phases extensively modified low elevation vegetation (Connolly 1986, Lewis 1993, Pullen 1996, Chapter 3). The skillful and intended use of fire by tribes to manipulate vegetation directly and indirectly affected wildlife and fisheries habitat quality. The specialized and extensive use of fire developed into the cultural fire regime (Chapter 3). Salmon centric cultural aspects developed or adopted by tribes required them to observe and predict fire effects on ecosystem processes (Swezey and Heizer 1993, Pullen 1996). Some key ecosystem processes that affected salmon habitat qualities were fire, hydrology, and nutrient cycling (Bisson et al. 2003). TEK guided the application of fire when needed to supplement lightning ignition to improve or maintain landscape level vegetative patterns necessary to support tribal economies and populations (Baumhoff 1963, Heizer and Elsasser 1980, Lewis 1993, Anderson 2005, Chapter 3). Over millennia, tribal people developed an understanding of the relationship between the extent and severity of fires, changes in vegetation composition, structure and function, modified (reduced) transpiration levels, affected (increased) springs flow/hydrology, and aquatic habitat quality to support healthy and productive fisheries (Biswell 1999, Reece pers. com. 2002, Salter 2003, McKenzie et al. 2004, Reed pers. com. 2006, Tripp pers. com. 2006).

Some upslope fire management practices can be linked to fishing techniques; for example Karuk World renewal ceremonies, Yurok Kepel fish dam ceremony, Tututni salmon ceremony (Kroeber and Gifford 1949, Hubbard 1861 in Pullen 1996). Fire use also fostered plant growth that was important to fishing technology. Iris grass (*Iris* spp.) found predominately in open habitats as prairies and oak woodlands, or openings in mixed hardwood-conifer forests, flourishes after low intensity burning (Author's collection and use to make cordage). Areas of iris grass were specifically burned by Native Americans to enhance iris growth or as a component of multiple objectives for broadcast burning (Six Rivers National Forest interviews: I-190, Erwin in Riley-Thron 2001). Iris fibers extracted from leaves are used to make cordage to construct nets, bags, and other cultural items (Kroeber and Barrett 1960, Baker 1981, Six Rivers National Forest interviews: I-296, Davis and Hendryx 2004).

> "The places I remember people burning were along the Klamath River, and along the coast. They had to burn along the coast because there's a lot of this…I don't know the proper name, but I call it the wild iris. It grows in abundance along the coast, especially at Split Rock and Patrick's Point. They burned that. And the older men used to gather that after it burned. They wove all their twine from the iris. There's thread in each leaf. They had special bone tools that they scraped each little fiber out and then they made their string and their ropes and all kinds of things from the iris, so that had to be burned off." (Erwin interviewed May 15, 2001 by Riley-Thron (2001).

Concept of indigenous fire-regimes

The concept of indigenous fire-regimes put forward by Lewis and Anderson (2002:6) is described as "fire-regimes specific to certain ecosystems and plant communities created and maintained primarily by the specific and intended application of fire by indigenous people which may or may not have been in conjunction with natural fires ignited by lightning." Indigenous and cultural fire regimes are defined as humans affects on the composition and characteristics of particular habitats, and especially the culturally defined resources therein. The distinguishing features and properties of cultural fire regimes include (Figure 2.7):

1. alternate seasons of burning for different kinds of habitats (seasonality),
2. frequencies with which fires are applied and reapplied over varying periods of time (frequency),
3. corresponding intensities with which fuels can be burned affecting severity (intensity/severity),
4. the specific selection of sites fired and, alternately, those that are not (specificity),
5. a range of natural and artificial controls that humans employ in limiting the spread of human-set fire, such as times of day, winds, fuels, slope, relative humidity, and natural fire breaks that affect the distribution and connectivity of fuels (topography/fuels) (Bonnicksen et. al. 1999:444), and
6. ignition patterns to promote desired fire behavior and associated intensities (ignition).

At the most basic level, a fire regime is the description of the functional role fire has in an ecosystem.

> "Fire history data (more specifically, fire frequency or return interval) have been combined with descriptions of fire intensity and fire size to form the basis of the concept of fire regimes. A fire regime is intended to characterize the features of the *historic, natural* fires that have been typical for a particular ecosystem or set of ecosystems" (Pyne et al. 1996:173).

The properties of cultural fire regimes contain the same elements as natural fires, but also include the purposeful and intended applications for desired fire behavior and effects due to human management. Humans have historically been the main source of fire in ecosystems with the number of fires and area burned. Lightning is commonly assumed as the primary determinant of *natural* fire regimes for many ecosystems (DeBano et al. 1998).

Pyne et al. (1996) in comparison to DeBano et al. (1998) define *natural* as the Pre-Columbian fire regime. Other authors additionally consider any human and natural ignitions prior to European/American settlement of the Klamath-Siskiyou bioregion as part of the "natural" fire regime. This definition generally has lead to less research to distinguish between Native American and lightning ignitions prior to A.D.1850 and under values the contribution of human caused fires (Chapter 3).

Climate is a driving factor of ecological processes which in turn affect fire's influence on the landscape and the people inhabiting those various areas (Mohr et al. 2000, Whitlock et al. 2004, Briles et al. 2005). The cultural practices that were similar at A.D.1850, at a minimum were developed over the last 1000 years (since 900 A.D.) concurrently with two significant climatic events. It is hypothesized that traditional ecological knowledge implemented with cultural environmental management practices allowed human adaptation to account for changes in climate. Distribution of plant communities during the Medieval Warming Period (900-600 B.P.) potentially required less intensified, or more specific, cultural fire use because climate favored more frequent fire, which in turn allowed development of particular species mixtures and structures for more xeric conditions (Fry and Stephens 2006, Skinner et al. 2006). Furthermore, the extent of Native American burning was potentially at its greatest developmental state during the later phase of the "Little Ice Age" (600-100 B.P.). More extensive cultural fire uses would have been necessary to maintain plant composition and structures similar to that created during the former xeric conditions. Keter (pers. com. 2007) mentioned the importance of understanding that plant communities, through adaptive mechanisms, that try to maintain a state of homeostatic dominance. For example, plants, in face of climate or anthropogenic influences will maintain core range or site dominance. Native American management assisted particular species with site dominance leading to an ecological optimization of species diversity and productivity to accommodate tribal needs (Miller 1982, Keter 1995, Keter 1997, Anderson 2005).

The extent of Native American burning was likely greatest circa 1776 (230 years before present) before introduced diseases from Spanish, Russian, and Americans, and subsequent genocide and removal during non-Native settlement which caused Native American populations to decline (Cook 1955, Boyd 1999b). The sophistication of Native American land management practices, especially cultural burning developed out of a need for cultural adaptation in the face of climate change

(Briles et al. 2005, Fredrickson 2004). The development of Native American cultural traits occurred in response climate change (Table 2.4).

Table 2.4: Past climate episodes affecting tribal group dynamics (modified from Busam, 2006).

Climatic Episode	**Date Range (years ago)**	**Description**	**Reference**
Current	100-Present	Warm/Wet	Millar and Woolfenden 1999:1209
Little Ice Age	600-100 BP	Cold	Millar and Woolfenden 1999:1209
Medieval Warm Period	900-600 BP	Warm/Dry	Sawyer et al. 2000:33

Factors related to the development of the cultural fire regime

Climatic, biophysical, and socio-cultural factors affecting tribal groups pertain to the development of the cultural fire regime. Season of burning is important as it relates to how fire effects vegetation during physiological condition and how wildlife may be negatively affected by fire at critical life history phases (e.g., nesting or birthing). Observations of fire and how it affected plants and animals contributed to the accumulation of TEK. How frequency and severity of fires affected culturally important resources for tribal groups likely prompted them to develop strategies to employ fire (ignition and specificity) at times (frequency or seasonality) and under particular conditions (topography and fuels).

Conclusion

Traditional ecological knowledge of fire effects derived from observations of lightning ignitions leading to fires and how biophysical conditions influenced fire behavior would have taken generations. Tribal people likely began to supplement lightning fires or used prescribed fire to reduce catastrophic wildfires to reduce negative impacts to valued habitat quality and conditions (Lewis 1993, Salter 1993, Keter 1995, Keter 1997). As vegetation conditions changed by climate and fire induced effects, tribal ancestral groups had to have shared “lessons learned” with new groups, or brought with them familiarity of fire behavior and effects for similar habitats. Likewise, recent immigrants who may have had a higher or lower reliance on fire-induced habitat quality would have potentially encounter conflict when setting fires or harvesting resources in disputed territories. Whatever maximized the greatest potential productivity of promoting foods, medicines, materials, and items of wealth or value would have been favored by those tribal individual or groups wishing to increase reproductive fitness, social status and ability to maintain or expand territories. If fire was important to maintain terrestrial diversity and productivity, and anadromous fish was important to have in aquatic ecosystems, then understanding the effects of fire on vegetation, wildlife habitat, anadromous fish habitat quality and population viability of culturally significant species would have been central to cultural observances. Tribal groups refined aspects of their cultural fire regimes over generations of living in-place, exchanging knowledge, and carefully observing environmental responses to fire induced change (Hillman and Salter 1997, Anderson 2005, Berkes and Turner 2006).

The role of climate influencing fire regimes is important. Climate and fire interacted synergistically across spatial and temporal scales influencing landscape level vegetative patterns, which affected terrestrial, riparian and aquatic habitats (Briles et al. 2005, Skinner et al. 2006). When conditions were warmer and drier, tribal use of fire was likely used less, or differently from when the conditions became cool and moist within interactions of decadal and seasonal variations. Based on the presence of hopper baskets mortars and fish-net sinker use, as proxy indicators of ancestral groups having similar cultural traits to tribal groups present at A.D.1850, cultural fire regimes have developed at a minimum over 700 years in northwestern California, perhaps longer. More descriptive accounts of specifically how cultural fire regimes influenced biodiversity and productivity of the Klamath-Siskiyou bioregion are offered in the next chapter (Chapter 3).

Figure 2.1: Klamath-Siskiyou bioregion (with permission LaLande 1991)

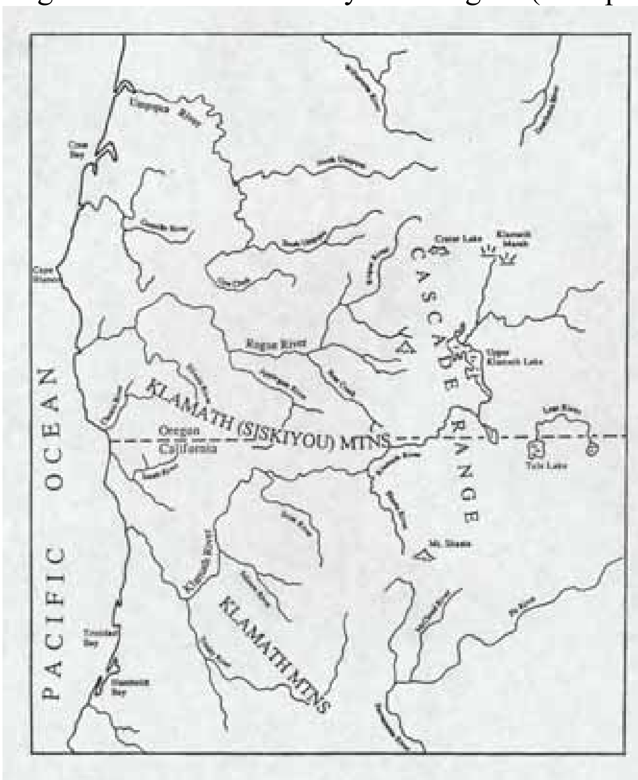


Figure 2.2: Tribal territory map (with permission LaLande 1991)

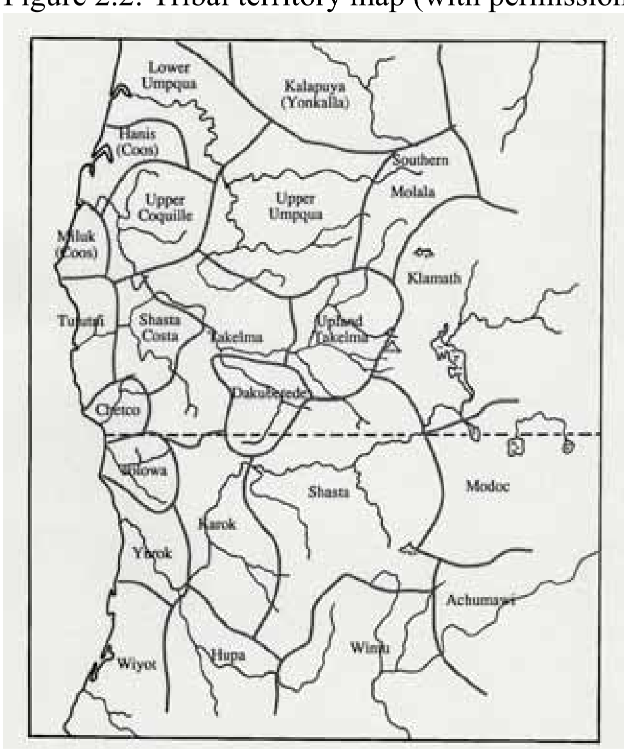


Figure 2.3: Hopper basket used for grinding acorns

Figure 2.4: Fish-net sinker weights with iris cordage

Figure 2.5: Pack basket with fall Chinook salmon and Oregon white oak acorns

Figure 2.6: Comparison of temporal fire effects on hydrology, salmon, ungulates, and vegetation

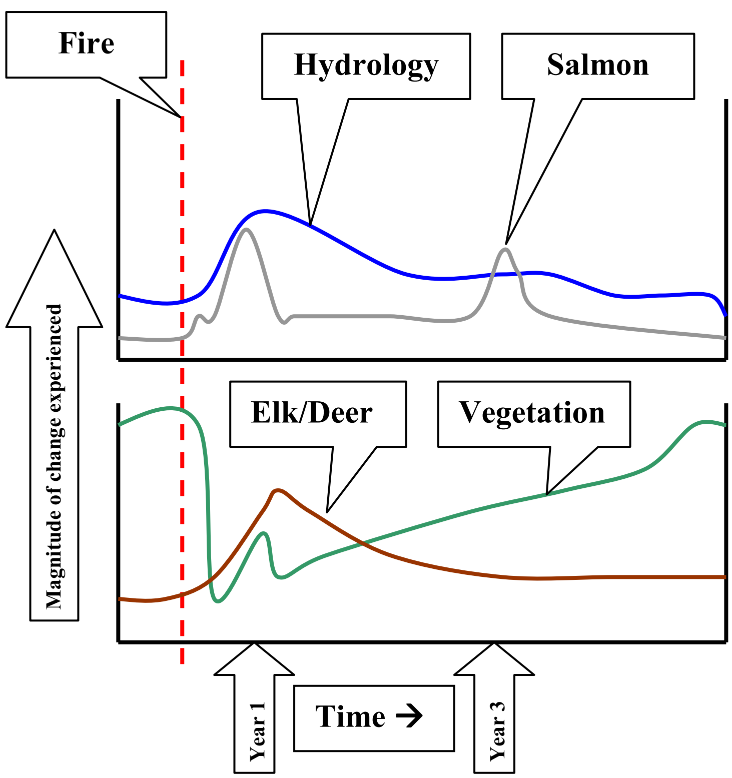
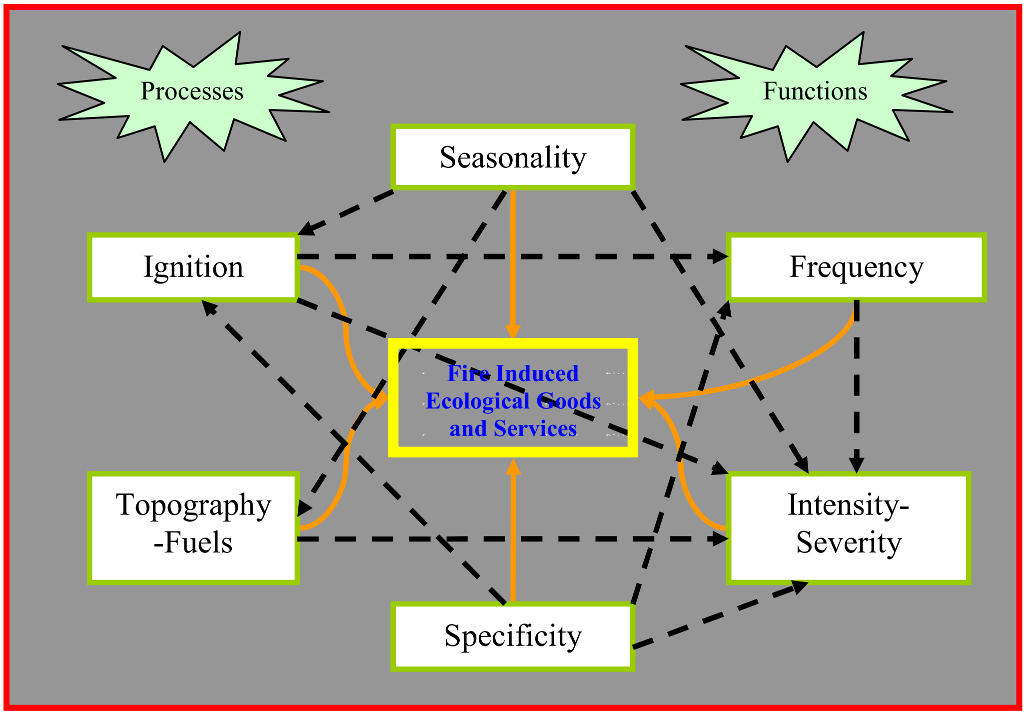


Figure 2.7 Cultural fire regime interactive properties



Chapter 3: Traditional Ecological Knowledge, Historical Landscape Change, and Fire Regimes

Incorporation of TEK and Western Science

This chapter accumulates, synthesizes, and presents descriptions of Native American land management practices especially uses of fire in forest, shrub, and grassland habitats, and in particular low elevation riparian areas that were historically inhabited by Native people prior to displacement by Euro-Americans (Lake in ESA 1999). It also examines fire use following Euro-American settlement, and the fire suppression policy era which started circa 1910 into the post-World War II fire suppression circa late1940s to the present. Descriptions of fire use by indigenous people in the Klamath-Siskiyou bioregion were developed and supported from expedition journals, anthropological studies, ethnographic accounts, unpublished field notes, oral history interviews, historical photographs, and encompasses cultural environmental management practices, environmental history and traditional ecological knowledge (TEK) (Lake in ESA 1999, Anderson 2001, Edmonds 2001).

This chapter also incorporates TEK with western science which could be beneficial to federal, state, tribal and private land managers, based on research conducted elsewhere (Freeman n.d., Turner 1997, Freeman and Carbyn 1998, Turner 1999, Berkes 1999, Anderson 2005). TEK guides the reasons and processes behind cultural environmental management practices. TEK can be used to invigorate rural economic viability, restore and conserve biodiversity, and improve watershed/forest and community health (Raish et al. 2005, Karuk Tribe Draft 2007). Traditional land use practices, uses of fire, and historical landscape change are the broad themes of this chapter. Information on the naturalization of formerly utilized and managed areas and specific vegetation communities by Native people are also documented.

TEK is the intellectual capacity behind the skillful application of fire for intended and specific reasons by indigenous people (Lewis and Anderson 2002). TEK is a culmination of indigenous people's experiences with the natural environment transcending and unifying spiritual, cultural, and ecological relationships (Turner 1997). Traditional ecological knowledge is defined as:

> "A cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with the environment… is both cumulative and dynamic, building on experience and adapting to changes." (Berkes 1999:8).

TEK guides the holistic approach taken by indigenous people when conducting burning, subsistence, ceremonial, or other land use practices (Freeman n.d., Turner 1997, Freeman and Carbyn 1998, Turner 1999, Anderson 2005). Knowledge of fire effects on culturally significant natural resources and ecological conditions are often acquired during subsistence activities and religious functions (Anderson 2005). For tribal practitioners, TEK is rarely acquired from published literature but is largely transmitted in the context of close relationships between individuals and their environment (Freeman n.d., Turner 1997, Freeman and Carbyn 1998, Grenier 1998, Berkes 1999, Lake in ESA 1999, Ford and Martinez 2000).

Cultural environmental management practices (CEMP) are defined as: "Practices employed by indigenous people often mimicking natural disturbance processes in the management and utilization of natural resources" (Lake 11/2003). CEMP are also referred to as indigenous land use practices, Native American land management or traditional land management by other authors (Pullen 1996, Bonnicksen et al. 1999, Anderson 2005). Cultural environmental management practices are based on long-term experience with local environments. Through various experiences Native Americans learned to work with the "natural" conditions of the local environment across many different habitats of various ecological scales (Anderson 1997, Peacock and Turner 2000, Anderson 2005). As experience accumulates with members of the community, so does their ecological literacy. Ecological literacy defined here is: The ability of an individual or community to observe, understand, and predict ecological processes and phenomena. When a high degree of ecological literacy develops through specialization of social roles, tribal people were and are able to foster biodiversity and productivity of various ecosystems through the application of TEK and CEMP (Karuk Tribe 1996, Peacock and Turner 2000, Turner et al. 2000, Anderson 2005, Karuk Tribe Draft 2007). Biodiversity can be characterized as genetic, species, or structural diversity. Genetic diversity is the variation within a population, variety of species, genera, and family within a population or community. Species diversity is the relative abundance of species in a community. Structural diversity is the growth form or age classes of individual species (Peacock and Turner 2000, Anderson 2005).

The refinement of TEK and CEMP by native people over generations led to the maintenance and/or enhancement of ecosystem diversity and productivity (Anderson 1997, Turner 1999, Turner et al. 2000, Anderson 2005). The goals of CEMP were to ensure predictability in securing ecological goods and services (Christensen et al. 1996, Campos et al. 2005). CEMP were developed to mimic natural physical and biological disturbance processes, most commonly disturbances associated with fire or animals, within the evolutionary adaptive range of natural variability (Anderson 1997, Anderson 1999). While CEMP mimic natural processes, they differ in specific ways. For example, American Indian fire use differed from lightning ignited fire in frequency, seasonality, and location (specificity). CEMP differed from effects of animals in the spatial extent and temporal duration of harvesting or intentional management to foster desired change to habitat quality or abundance of resources. Native Americans utilized specific areas of the landscape for single or multiple resources (Bonnicksen et al. 1999). When used with a high degree of ecological literacy, CEMP can potentially buffer against extreme ranges of natural variability by distributing the harvesting pressure over multiple resources and not placing any single resource at additional risk. The scale of such disturbance affects were generally short term impacts on individual fungi, plants, and animals, with longer-term benefits at the population and genetic fitness level (Peacock and Turner 2000, Anderson 2005).

Theories and models of TEK as applied to the Klamath-Siskiyou bioregion

Native people have been in the Klamath-Siskiyou bioregion for more than 9,000 years (Connolly 1986, Frederickson 2004.). Specialized forms of knowledge about fire ecology and related fire effects were developed by Native people during a history of experiences with changing climate, natural processes, vegetation, and associated fire effects (Lewis 1993, Dawning n.d., Stewart 2002, Anderson 2005). Tribal specialists were an extension of cultural niche partitioning.

Models and theories used in this research assess the evolution of TEK and CEMP associated with fire in forests, shrub, grasslands, and low to mid-elevation riparian zones of the Klamath-Siskiyou bioregion. Research from this study builds upon existing examples that integrate TEK with ethnobiology (Berkes 1999, Turner et al. 2000). The documentation and synthesis of TEK, related cultural burning and associated land management practices have generally been misunderstood, or not sufficiently accounted for when reconstructing the historical interplay of natural and anthropogenic fire in the Klamath-Siskiyou bioregion (Frost and Sweeney 2000, Vale 2000, Sherry and Myers 2002).

> "Indigenous people's detailed traditional knowledge about fire, although superficially referenced in various writings, has not for the most part been analyzed in detail or simulated by resource managers, wildlife biologists, and ecologists… Instead, scientists have developed the principles and theories of fire ecology, fire behavior and effects models, and concepts of conservation, wildlife management and ecosystem management largely independent of native examples." (Lewis and Anderson 2002:4).

Table 3.1 describes the context of TEK beliefs, its application, and methods of maintenance.

Table 3.1: TEK and cultural expression (Adapted from Turner 1997)

World View	Strategies for Sustainable Living	Exchange of Knowledge
Belief in the spirituality and innate power of all things Respect of other life forms and entities Ideological systems that enforce sustainable use of resources (social sanctions, sharing) Concepts of interactive relationships with other life forms Close identification with ancestral lands	Knowledge and application of sustainable practices: inventory, monitoring, use of ecological indicators; environmental modifications; harvesting strategies Understanding of major principles of ecology; relationships among all life forms and the environment; ecological succession Adaptation to change in resource availability and living conditions	Exchange of knowledge and resources within and among groups Language: classification and naming of culturally important features Development of social structures and institutions to promote sustainable living Development of culturally appropriate ways of teaching and learning about the environment and traditional knowledge and attitudes.

For example, women who were expert basket weavers understood the effects of fire on plants and the habitats of their preferred basket material sources (O'Neale 1995, Anderson 2002, Fites-Kaufman et al. 2006). These women observed and passed down to younger weavers the ecological knowledge of "cause and effect" relationships on plant communities as a result of their management actions (Anderson 2002, Anderson 2005). Likewise, fishermen were experts in hydrology, geomorphology, fisheries habitat, and riverine ecology (Kroeber and Barrett 1960, American Indian Technical Services 1982). Cross training existed between specialized disciplines that were reflected through cultural role shifts based on gender, age, and social status. Individual and community world view was influenced by subsistence and religious activities involving the acquisition and exchange of knowledge (Turner 1997). Knowledge was social capital that could facilitate the accumulation of valued resources resulting in increased individual or family wealth or status, thus increasing their resiliency (Turner et al. 2003).

Some authors document tribal land use and management practices at different scales and different geographic areas of the Klamath-Siskiyou bioregion (Harrington 1932, Gifford 1939/1940, Kroeber 1976, Heffner 1984, Six Rivers National Forest Interviews, Lewis 1993, Pullen 1996, LaLande and Pullen 1999, Anderson 2005, Busam 2006). The systems for TEK documentation are similar to the acquisition and exchange of scientific ecological knowledge (Agrawal 2005).

Comparison of Traditional Ecological Knowledge and Scientific Ecological Knowledge-Western Science

Understanding differences and similarities between communication styles of SEK and TEK assists in the incorporation of tribal knowledge and management systems with research, monitoring, modeling, and presentation of other results to facilitate sustainable management of natural resources (Agrawal 2005). Methods of investigation utilized by both Western science and TEK are inductive and deductive systems to address or substantiate conclusions.

Table 3.2: Comparison of communication styles between TEK and SEK

Traditional Ecological Knowledge	**Scientific Ecological Knowledge-Western Science**
Annual ceremonies and seasonal activities	Conferences/Presentations
Acquired resources	Publications
Elders/ Mentors	Major Professors/Supervisors
Inherited or entrusted knowledge	Intellectual property
Shared knowledge or resources	Technology transfer
Socio-cultural responsibility	Policy and management mandates
Individual vs. Community goals	Professional directives/goals
Scale: Individual, Family, Community	Scale: Micro to Macro
Predictive power: Past trends and anticipated correlated response validation	Predictive power: Modeling and/or confidence interval/p-values
Deductive methods	Inductive and deductive methods

However, general differences between TEK and SEK exist and are presented in Table 3.3.

Table 3.3: General differences between TEK and SEK (modified from Johnson 1992)

Traditional Ecological Knowledge	**Scientific Ecological Knowledge**
Based on diachronic data (long time series of information from one location)	Based on synchronic data (short time series over a large area)
Based on data generated by the resource users	Conducted by a specialized cadre of researchers
Inherently holistic-value based	Uses reductionism
Has moral spiritual component	“Value-free” objective
Mainly qualitative	Quantitative by practice

Based on empirical observations and direct experience with the local environment	Based on prior written information with limited direct experience with the local environment
Does not aim to control nature, but rather works with natural processes and variations	Aims to control nature through experiments or mechanical manipulation
Deductive method of testing	Inductive method of testing
Predictive power: Based on past experiences and relationships	Predictive power: Based on modeling and simulations

The duality of TEK and SEK can potentially increase the knowledge of natural resources and human management systems (Mazzocchi 2006). The commonalities found between TEK and SEK serve as supporting lines of evidence (Berkes and Folke 1998, Berkes 1999) but have been thought of as social and ecological sciences, respectively. TEK has been used to improve scientific research, assist in providing environmental baseline data in the absence of quantitative data, used as a decision-making tool in environmental impact assessments, the development of natural resource management plans, and used to monitor impacts of development or policy-management or impacts to social-cultural, economic, or environmental conditions (Grenier 1998, Karjala et al. 2004, Agrawal 2005). TEK and SEK have developed different strategies to acquire and transmit knowledge. It is difficult to evaluate one form of knowledge using the criteria of another convention (Mazzocchi 2006).

The success of integrating TEK and SEK has been debated (Grenier 1998). Academics, resource managers, and non-Native people have generally viewed TEK as supplementary information to best available ("good") western science (Pierotti and Wildcat 2000). Some Native people have expressed concerns that integration will be disjointed and that the two ways of knowing are more parallel (Happynook 2003). Institutional barriers and misunderstandings thwart both western scientists and native people from acknowledging the value of each other's knowledge system (Johnson 1992). Furthermore, disagreement among social and natural scientists, and tribal governments and practitioners complicates potential integration. External issues related to political power/representation, participation willingness, accountability for knowledge acquired or management decisions and funding can complicate the integration of TEK with western science (Johnson 1992, Grenier 1998). Incorporation versus integration of TEK may be most appropriate for addressing tribal and western management issues. Incorporation of TEK is thought of as a stand alone body of knowledge that is more equitably utilized with SEK compared to integration of TEK which is thought of as considering how TEK can fit with or is supplemental to SEK.

Scientific Method and Traditional Ecological Knowledge

The foundation of contemporary science is the scientific method (Perry 1998, Ford 2000, Jones 2001). Scientists formulate hypotheses and develop predictions about environmental conditions or ecological processes. Then experiments are designed and conducted to test these hypotheses. The steps of the inductive versus deductive method involve different ways of substantiating or verifying conclusions (Chamberlin 1967, Jones 2001, Bencze and Elshof 2004). The inductive method includes the development of a research question/hypothesis, a quantitative way to test the effect(s) of a treatment, statistical analysis of results, and the potential elimination of a once expected causal factor. The deductive method includes the development of a research question/hypothesis, a qualitative way to substantiate or support the hypothesis furthering knowledge about the research topic resulting in the choice of one factor over others.

TEK is more similar to an inquiry system of the deductive method than the inductive method (Mazzocchi 2006). Scope of inference related to a potential causal factor differs between inductive and deductive scientific methods and TEK. TEK relies on past and current experience and familiarity with ecological processes and ecosystem responses for a discrete location or bounded area.

SEK has a scope of inference limited by sampling area. Scientific methods are founded upon the premise that the greater the geographic area in which research or treatments are conducted, the greater the scope of inference for scientific application. Western scientific studies of fire effects on various ecosystems may be broader in scope than local TEK of a particular tribal group. However, the details or connections between ecological processes and ecosystem condition may be more refined with TEK than the sampling methodology of science. Criteria and indicators may vary between

TEK and SEK (Karjala et al. 2004, Mater 2005). The associated strength of predictive power between modeling and accumulated TEK may vary (Jones 2000). The predictive power of modeling is proportional to the accuracy of the data from which the model was constructed. The incorporation of TEK with SEK through models is likely a stronger method of achieving predictive power that more accurately reflects conditions or operates at an appropriate ecological or meaningful socio-cultural scale (Hobbs 2003, Karjala et al. 2004, see Fire Regime Condition Class fire assessment Chapter 7). Furthermore, modeling may be used to determine thresholds of significance for the influence of treatments or uses by theoretically testing acceptable or known limits.

Research questions

Research questions of interest in this chapter are:

1. What are the reasons for cultural uses of fire and desired fire induced effects?
2. What is the frequency, extent, and specificity of Native American burning use compared to natural lightning ignition caused fires across the landscape of the Klamath-Siskiyou bioregion for various habitats?
3. What are the reasons for the cessation or reduction of Native American fire use?

Historical Native American fire use differed from natural lightning fire in seasonality, frequency, extent, and specificity across the landscape in various habitats. However it is difficult to quantify, or to provide enough supportive data to substantiate this perspective (Lewis 1990, Lewis 1993, Pullen 1996, Anderson 2005). Visual tools, photographs or maps which represent multiple lines of evidence, are useful in this case. “Difference” is detected as visual changes in vegetation conditions, habitat distribution, composition, and structure to that which would be naturally occurring without human influences (Hann and Strohm 2003, Chapter 7). This approach does not encompass all the potential methods for significance testing, but instead focuses on deductive methods qualitatively representing the difference between the “natural” versus the “cultural” fire regime for selected vegetation types within various ecosystems (Bonnicksen et al. 1999). The extent of tribal fire use is described in relation to dominant forest, shrub, grassland, or riparian communities. Presentation of results rely more on qualitative than quantitative criteria of measurements.

Methods: Collection of Traditional Ecological Knowledge and Cultural Environmental Management Practices

While this research draws from similar primary sources of information and uses similar methods of analysis as previous authors, it also includes new sources of data, different methods of synthesis, analysis, and presentation. It also draws from the strengths of a multidisciplinary approach (Egan and Howell 2001, Karjala et al. 2004) to address the complexity of issues involving traditional indigenous management systems.

Collection and documentation of TEK to guide cultural environmental management practices uses multiple lines of evidence and various methods of analysis (Egan and Howell 2001). Data about the selectivity and specificity of historical and contemporary Native American burning of forests, shrublands, grasslands and riparian areas was collected through literature searches of published and unpublished sources, and oral history interviews with tribal and non-Native residents of Klamath-Siskiyou and Pacific Northwest bioregions (Anderson 2005). Examples of the earliest material are from explorer and non-Native settler accounts, followed by ethnographers and anthropologists, then various oral histories. Information was complied in geographic information systems (GIS), or analyzed using meta-data analysis techniques (Egan and Howell 2001).

Oral histories conducted with tribal elders and practitioners

Huntington (2000) discusses four primary methods for documenting TEK: semi-directive interviews, questionnaires, analytical workshops, and collaborative field work. Semi-directive interviews are conducted when the conversation is guided allowing the participants to follow ideas or issues they generate in response to a broadly asked question. Semi-directive methods were used here as informal events when opportunities arose where tribal elders, practitioners, and managers could be asked about various topics and knowledge were directly transmitted. In some instances, the person consulted is referenced as a personal communication. Questionnaire methodology uses a predetermined set of questions which guide the conversation. This method is more formal than the semi-directive style and can involve recording. Questionnaire interview sessions to collect TEK involved audio-recording of tribal elders or practitioners. This required formal documentation. Semi-directive interviews and questionnaires were the two primary methods used for collecting TEK of tribal elders in northwestern California.

Oral history interviews of selected tribal elders conducted in this research followed the standards of informed consent required by the Institutional Review Board, Oregon State University. Interviews related to cultural burning, fire-vegetation-wildlife relationships, historical landscape change and recommendations for fuels and fire management from a Native American perspective, specifically from individuals indigenous to the region under study. Interviews followed a list of questions (Appendix A: Survey forms/questionnaire).

Interviews were transcribed following word use and sentence structure of the Native person interviewed to retain elements of originality. However, minor edits of "speaking style" were performed. Interviews were indexed by subject of interest. Edited copies of interviews were provided to Native elders who were given opportunities to review transcriptions and make edits on content and sensitive information. Oral history interviews followed methods established by Fogerty (2001) where cultural and monetary payment to interview participants enhanced the ability to elicit additional information that may have not been acquired by someone unfamiliar with cultural practices and norms of the Native elders (Johnson 1992). Variation in the responses to the questions during oral histories are attributed to gender, age, family continuity of TEK, individual familiarity with traditional practices, cultural-community role, inherited position, and acculturation from relocation or western education (Heffner 1984, Grenier 1998). The accumulation of various oral histories and ethnographic information were two types or lines of evidence used to describe the extent and specificity of Native American burning. Interpretation and presentation of results are provided below.

Existing oral histories and ethnographic data were used to strengthen the interview material collected in this study. Published or non-published works were used (Gifford 1939/1940, Heffner 1984, Six Rivers National Forest Interviews, Karuk Tribe and Cultural Solutions 1999, Salter 2003, Appendix A and B). Most existing oral history interview materials about tribal elders' knowledge, belief systems, and practices of the area were located in university library special collections, county library, historical society, governmental agency, and tribal publications or files. Oral history interviews were used to document six factors contributing to cultural fire regimes: potential frequencies, intensities/severities, specific areas treated, extent, ignition patterns, and season of Native American burning practices of forest, shrub, grassland habitats, and riparian zones. Questions were asked of tribal elders regarding historical and contemporary uses of fire for land management. In addition to questions about cultural uses of fire, other questions included fire effects and associated environmental conditions, fire and wildlife relationship, and priorities for fuels reduction and prescribed fire. This information was incorporated with prior ethnographic data and tribal member testimony to substantiate the extent and specificity of Native American uses of fire for land management (Appendix A and B).

Analytical workshops are meetings that were organized to convene community members as holders of TEK in which multiple parties addressed questions or topics. Elders or tribal practitioners were asked questions to which any or all present could reply. In most cases, these gatherings consisted of 2 to 5 people who were familiar with, related, or regularly consulted each other. Examples of gatherings were basket classes in Orleans and Happy Camp, basket weaver gatherings or during conversation at local events in the communities of Klamath, Hoopa, Weitchpec, Orleans, Somes Bar, and Happy Camp, California.

Collaborative field work involves consultation with traditional knowledge holders to design experiments or focus research on particular topics. Collaborative field work was conducted with the Karuk Indigenous Basketweavers and US Forest Service near Orleans and Happy Camp, CA. Projects related to this collaborative effort are described in other chapters of this dissertation (Chapters 4, 5, and 6).

Where possible the various sources of data were separated among low-elevation river corridors, and different culturally significant habitats. Forest habitats are characterized by those culturally significant places dominated by grasses, forbs, oaks, and pines (*Pinus* spp.). Shrub lands are characterized as those associated with ultramaphic-serpentine, shallow soils, areas that formerly experienced higher severity fires or high elevations. Grasslands are characterized as low-mid elevation prairies, ridges with southern exposure or associated with open oak and pine habitats, fescue bunchgrass (*Festuca californica* Vasey) dominated ultramaphic-serpentine or shallow soils, and higher elevation meadows.

Methods: Repeat aerial and landscape photography

Historical landscape photographs taken by early ethnographers, anthropologists, or other photographers of places and Native Americans from 1880 to 1954 were collected and examined. Additionally, US Forest Service, other government agency, photographers' landscape photographs and fire lookout and aerial photographs from 1920 to 2005 were collected and examined for vegetation patterns. These photographs were used to evaluate the assumption that conditions for a habitat or landscape resulted potentially from Indian-set fire or related land use practices (Bricknell et al. 1988, Bricknell et al. 1992). Repeat landscape photographs taken in color with a digital camera were transformed to gray scale in Adobe Photoshop (version CS1). Aerial photographs were digitally scanned at high resolution (Mid-Klamath Watershed Council staff with USFS Six Rivers National Forest), transformed to gray scale and rubber sheeted to match projection boundaries of the earlier photos using Adobe Photoshop (version CS1) (Dunklin Photography 2007).

Repeat photography was used to support ethnographic data about historical landscape changes resulting from cessation of Native American burning, other land management practices (mining, grazing, agriculture, road building, and timber harvesting), and fire suppression. Maps or pictorial sketches of Native American tribal and village territories, resources areas, villages, and trails that connected to other ecological features were compiled, examined, and pertinent information was collected and analyzed during this study (McKee 1851 [in Heizer 1972], Loud 1918, Waterman

1920, Heffner 1984, Six Rivers National Forest interviews mid-1970s to mid-1980s, Gates 1995, Busam 2006).

Methods to integrate multiple lines of evidence into Geographic Information Systems

Sources of information about Native American fire use and other land management practices were organized into a Geographic Information System (GIS) model. Historical or oral history accounts related to places, vegetation condition, or fire induced effects were used to develop a map-based representation of the data (Figure 3.1). Information was spatially projected in NAD 83 using ArcView program by ESRI. The GIS layer was created by Janet Werren (USFS-Pacific Southwest Research Station) and includes tribal villages and camps, trails or traversable ridge systems, resources areas, and human and lightning ignition data (1909 to 2005) for the lower mid-Klamath River. In addition to information collected in this study, data from Gates (1995), Karuk Tribe oral history interviews, and Six Rivers National Forest interviews were included in the analysis. Information about traversable ridge system locations was gathered from oral histories and older historic maps (Belcher Land and Title Co. 1922, Klamath National Forest 1928, USGS topographic: Sawyers 1923, Preston Peak 1923, Hoopa 1921, Heizer 1972 of McKee 1851, Gates 1995).

Because the Klamath-Siskiyou bioregion is expansive, particular areas where the highest availability of interdisciplinary data and more detailed analysis existed were used as case study locations (USFS Lower Mid-Klamath Watershed Analysis 2003, Busam 2006). These focus areas are similar to adjacent habitats or tribal territories where less data was available (Skinner 1995, Six Rivers National Forest Forest Management Plan-FRCC, Taylor and Skinner 1998, Taylor and Skinner 2003). The focus areas also allow extrapolation of the potential influence of Native American fire uses and management practices across the Klamath-Siskiyou bioregion.

Results: TEK collected by oral histories and ethnographic data

Oral histories for TEK and cultural uses of fire

Tribal elder and practitioner interviewed participants were Karuk, Yurok, and Hupa descendants or tribal members. Many participants were knowledgeable of traditional uses of fire, trail locations, tribal resource areas and related subsistence activities. The interviews conducted for this research consisted of 8 males and 7 females. Ages of fifteen participants ranged from 55 to 92 with an average age of 73.53 years old. Interview material used from the Six Rivers National Forest Heritage Program included tribal members of primarily Karuk, Yurok, Wiyot, Hupa, Chilula, Tolowa, other tribes, with several identified as non-Native American. The ages of participants in the Six Rivers National Forest Heritage Program data set were not often provided, but were given for some (Appendix B).

Visual models

A theoretical model of how TEK and SEK accumulate as a reservoir of knowledge and predictive power capable of understanding the range of natural variability for ecological processes and ecosystem responses is presented (Figure 3.1). Both forms of knowledge have an origin point. The range of variability for climate, fire effects, and ecosystem responses is depicted by the peak and trough and the diameter of the circle in Figure 3.1. When the diameter of the circle is greater than or equal to the distance between the highest peak and lowest trough, the knowledge system has accumulated sufficient predictive power about potential natural variation that could be encountered.

Adaptive responses can be employed by management practitioners to increase the likelihood of survival or attainment of management goals (Berkes et al. 2000). Breadth of knowledge is subject to changes in individual and group knowledge. For example contact between indigenous and non-Native people and subsequent disease, genocide, displacement, relocation, and acculturation over several episodic events have reduced TEK (Cook 1943a, Cook 1943b, Cook 1955, Boyd 1999b). This loss of TEK takes decades to reestablish, and changes in TEK will reflect knowledge of more contemporary interactions of tribal people with their environment as well (Berkes and Turner 2006).

Oral histories of historical landscape change and fire as a landscape process

Published documents (Harrington 1932, Kroeber 1976, Heffner 1984, Lewis 1993, Pullen 1996, Hillman and Salter 1997, Salter 2003, Anderson 2005) establish many reasons for tribal fire use in northwestern California, and the Klamath-Siskiyou bioregion (Appendix A and B). In addition to the former documentation, the following reasons for tribal fire use specific to this study are presented. These reasons are similar to others documented by Williams (2000, on-line bibliography), Bonnicksen et al. (1999), and Stewart (2002), and locally Heffner (1984) or Pullen (1996). Additionally, USFS fire patrol reports describe fire causes attributed to Native American burning (Indian incendiarism) until the 1920s (Klamath National Forest 1928, Six Rivers National Forest LMKWA 2003, Busam 2006). Newly collected reasons for tribal fire use are also incorporated. The condensed version of the information is presented in Table 3.5, for fully indexed quotations see Appendix A and B.

The contribution of gender, age, and social status for burning culturally significant habitats

Native American fire use varied by gender, age, and social status for various reasons and purposes. For tribal groups circa 1850, middle-aged adult men and woman were primarily responsible for most fire starts prior to extensive influence of disease, genocide, relocation of tribal people, and fire suppression and exclusion. Men were responsible for fires to drive game, convert habitat for range quality, warfare, maintenance of at higher elevation ridge travel systems and meadow openings, and maintenance of ceremonial grounds or sacred sites (e.g., Kroeber and Gifford 1949 for Karuk ceremonial burning for world renewal and Yurok burning mountains surrounding Kepel associated with fish-dam construction). Men also may have conducted burns that would benefit primarily women’s objectives (e.g., basketry plants or acorn grounds). Among the Karuk, men are said to have been most responsible for burning in the historic era (1850 to present), but among the Yurok, women were the predominant fire starters (M. McCovey pers. com. 2002). Children were generally not allowed to conduct burning due to the responsibility or liability for fire damages. Social status related to ownership of resources areas, subsistence skills, artistic talents or ceremonial status was related to the right to burn across the landscape. Generally lower socio-economic status individuals who did not own rights to resources areas or functions in which burning was a requirement would not burn because of the liability or lack of tenure. In one such case, a Yurok slave burned a track of land and accidentally destroyed property concealed there by a wealthy man. The owner of the slave transferred the slave to the wealthy man as payment for the destroyed items (Kroeber in see Busam 2006).

The starting of fires was considered a spiritual act capable of serious consequences. Prayer formulas and other beliefs were associated with burning. Once lit, fires were often spoken to as to how they should behave and conduct themselves to achieve desired resource objectives of the igniter. Traditional knowledge and beliefs of fire use that continue today among tribal communities are different from western fire managers and ecologists. Beliefs, philosophies, and values associated with burning have affected tribal and federal agency relationships over fuels and fire management (Karuk Tribe 1996, Karuk Tribe Draft 2007, Chapter 7 and 8).

Native American uses of fire: Fire, Patch, and Broadcast

The reasons for Native American fire use are organized into three broad types of burning employed by tribal people. These practices are firewood, patch, and broadcast burning to reduce fuels and modify fire behavior (Lake and Zybach, unpublished). These practices can accomplish single or multiple objectives of maintaining the quality of culturally significant habitats.

Firewood gathering was primarily intensified through cooking and heating fires that were started and maintained constantly in and near homes, camping spots, campgrounds, and other gathering places (M. McCovey pers. com. 2002). These fires were concentrated within permanent settlements and communities near the mouths of rivers and streams, and at other key locations along the coastline, riparian zones, and riverbanks, or higher elevation lakes, ponds or springs (Moore pers. com. 2007).

Seasonal cooking and heating fires were located in favored hunting and gathering spots, dependent on social, food gathering, and processing activities (Thom pers. com. 2002). These fires depended on the systematic gathering, storage, and use of firewood, which was also used for other purposes, such as constructing bonfires and heating sweat lodges (M. McCovey pers. com. 2002, Thom pers. com. 2002).

Firewood gathering and use was likely a daily process for most families, hunters, gatherers, and travelers for thousands of years throughout the PNW and Klamath-Siskiyou bioregion (Gifford 1939/1940). Principal areas were located along the shores of estuaries or lagoons at the mouths of major tributaries, along trails, or near resource areas. Low gradient riverbank floodplains were also locations of home sites and campgrounds (see Figure 5.1). In addition to smaller fuels, other larger wood products, mostly redwood (*Sequoia sempervirens* (D.Don) Endl.) or cedars (*Thuja plicata,* and *Chamaecyparis lawsoniana* A. Murray) would be specifically harvested. Indian people used large wood products throughout the coastal Pacific Northwest, southwestern Oregon and northwestern California over long periods of time (Mastson and Coupland 1995, Ames and Maschner 1999).

Springs, peaks, waterfalls, meadows, berry patches, root fields, hazel-filbert orchards, oat fields, camas and Indian potato patches, pea fields, and other favored locations were also the likely sites of seasonal camping and food processing activities that required intensive, localized firewood gathering activities. The likelihood of most bonfires, campfires, earth oven fires, and sweathouse fires resulting in catastrophic wildfire events was probably very low (Jackson pers. com. 2002). Fires left unattended for the purpose or desire of spreading were probably fairly common, but such fires were intended to spread when possible and cannot be considered escapements. The cumulative results of widespread and systematic firewood gathering over time undoubtedly had a major impact on the location, distribution, and quantity of fuels consumed during wildfire, field clearing, or crop management processes (Georgia Orcutt interviewed by Gifford 1940, Moore pers. com. 2007).

Patches and fields were located along trails that typically ran adjacent to rivers and streams, the coast, and along ridgelines, directly connecting communities, peaks, campgrounds, waterfalls, springs, and other favored subsistence and ceremonial locations. Fires were also used to clear and maintain trails; rejuvenate berry patches, wild pea fields, root and bulb fields, and orchards; for hunting; for weed control; and to cure large fields of tarweed (*Madia elegans* Lindley) and grass seeds ("Indian oats"). Daily and seasonal trail clearing activities, combined with seasonal and occasional brush clearing, hunting, seed curing, and sprout-inducing burns were nearly year-around activities (Pullen 1996). The escapement potential of such fires was probably moderate, depending on weather, the fuels being burned, and the condition of former burn boundaries. Many areas (specific habitats or patches) across the landscape within different ecosystems were nationally, family or individual owned (Kroeber 1976). Ownership of productive areas across the landscape was viewed as a care-taking socio-ecological responsibility (Peacock and Turner 2000). Indians managed many of the most productive hunting and gathering areas with fire. Parcels of land that could provide productive, abundant, and predictable natural resources provided ecological goods as foods, materials and medicines for Indian people (Waterman 1920).

Broadcast fires were used to regularly burn vast areas of oak savannah, grassy prairies, southern exposure of ridge systems, forest understory habitats with hazel or bear grass, and berry grounds contained within the coastal PNW and Klamath-Siskiyou bioregion (Pullen 1996, SRNF Interviews: I-209, I-210, I-281, I-288, and I-292, Erwin in Riley-Thron 2001, Foseide pers. com. 2005, Moore pers. com. 2005). Broadcast fires were also used to drive game, and establish and maintain burning in areas where lighting fire was largely absent (Powers 1877 in Pullen 1996). Seasonal broadcast burning activities varied from firewood and patch burning actions in two important ways: fire boundaries were not so clearly defined, and there were multiple objectives for burning. Large grass or fern prairies and extensive oak savannahs were maintained by seasonal broadcast burns for a wide variety of purposes; land clearing, hunting, seed processing, weeding, insect harvesting, and enjoyment (Lewis 1993, Pullen 1996, Williams 2000, Anderson 2005). Escapement likelihood of these actions was, like patch burning, probably moderate. The application of broadcast burning by Indians was viewed essential to maintain diversity and productivity of the landscape (Glaze pers. com. 2002, Hillman pers. com. 2002, M. McCovey pers. com. 2002, Aubrey pers. com. 2005, Colegrove pers. com. 2005). The scale of such broadcast burning varied but could result in much larger expanses of land base if climate or weather intensified fire behavior (Klamath National Forest 1928, Elford and McDonough 1964, Six Rivers National Forest LMKWA 2003 fire history data). Most historical accounts of Indian broadcast burning activities in the coastal PNW, southern Oregon and northern California occur primarily during two fire seasons: late winter/early spring "fern-thatch burning" and late summer/early fall "field-forest burning" (Zybach 2003). In this manner, seasonally desiccated ridgeline brakes and bald peaks could be burned whenever a drying or freezing wind came up for a few days anytime from late February to early May. Valley grasslands, coastal headlands, oak woodlands, and tarweed fields were more likely to be burned in September or October after vegetation had been dried by summer drought, but following a heavy fall rain (Erwin in Riley-Thron 2001).

Table 3.5: Types of Native American burning: Firewood, Patch, and Broadcast

Type of burning	Products and purposes	Timing
Firewood gathering and burning	1 to 2 purposes: heat, light, cooking, boiling, cleaning, fuel stores, celebration, ceremony, security.	Daily: concentrated near homes, trails, settlements and campgrounds.
Patch burning	1 to 2 purposes: hunting, berry patch maintenance, root fields/harvesting, pest control, weaving materials, trail maintenance, and habitat conversion.	Seasonal and situational.
Broadcast burning	Multiple purposes: stable wildlife habitat and conversion; improving crops, curing seeds; facilitate hunting; improving visibility; clearing trails/transportation; induce basket weaving materials; facilitate acorn and other nut harvesting.	Seasonal: late summer, early fall for grasslands; late winter, early spring for bracken fern.

Purposes of burning

<u>Basket Materials.</u> High quality and quantities of materials for baskets are needed to support the culture of American Indian people in the Klamath-Siskiyou bioregion. The majority of materials needed to support the cultures of American Indians required fire for maintenance and to increase quality. Examples of target species and objectives for burning are:

Willows (*Salix exigua* Nutt.) -- increase straight shoots and reduce pests (Glaze pers. com. 2002, M. McCovey pers. com. 2002, Reece pers. com. 2002, this dissertation).

Bear grass -- reduce thatch and increase leaf pliability (Rentz 2003)

Ceanothus, Deer brush/lilac (*Ceanothus integerrimus* Hook. & Arn.) -- induce sprouting and increase the number of straight shoots (Glaze pers. com. 2002, Reece pers. com. 2002).

Hazel (*Corylus cornuta* Marsh. var. *califorinica*) --reduce deformed growth and increase the number of straight shoots (O'Neale 1932, Heffner 1984, Pullen 1996, Glaze pers. com. 2002, Reece pers. com. 2002, D. McCovey pers. com. 2002, M. McCovey pers. com. 2002, Aubrey pers. com. 2005, Colegrove pers. com. 2005, Foseide pers. com. 2005).

Clearing Riparian Areas. Indians used fire to clear brush and debris from riparian areas and marshes to stimulate new grass, plant growth, and shrub and tree sprouts. Target species were cottonwoods (*Populus balsamifera* spp. *trichocarpa* Torrey & A. Gray), willows (*Salix* spp.), tules (*Scirpus acutus* Bigelow var. *occidentalis* (S. Watson) Beetle), cattails (*Typha latifolia* L.), sedges (*Carex* spp.), and grasses. Low gradient, low elevation sites near the confluence of major stream and river systems were the locations of villages (Heizer 1972, Bright 1978, Pullen 1996). Riparian areas around villages were one of the most fire intensively managed areas on the landscape (Pullen 1996, Bonnicksen 2000, Vale 2002). Fire often served a similar role to flooding as a disturbance agent (Anderson 1999). Riparian areas were a source of firewood (Gifford 1939/1940, Moore pers. com. 2005 and 2007).

Clearing Travel-ways/Trails. Indians used fire to clear overgrown trails for improved travel conditions (SRNF Interviews: I-189, I-209, I-210). In forests and brushlands burning along travel routes improved visibility for hunting, reduced attacks by predators and enemies, and assisted in warfare. Ignition locations and fuel breaks were located along trails, changes in fuel load or type, and natural barriers of rock or high moisture levels (Salter 2003). Trail systems divided the landscape into large-scale areas that could be patch or broadcast burned between natural fuel breaks as fuels and weather conditions permitted (Bonnicksen 2000). Many important resource patches were in close geographic proximity to trails or were connected by trails. Trails were about two feet wide, worn into bare mineral soil, and served as fire lines in many cases for low intensity surface fires (Gates 1995, Six Rivers National Forest Interviews: I-175, I-177, I-189, I-193, I-209, I-210, I-229, I-230, I-350, I-375, and I-384, Moore pers. com. 2005).

Crop Management. Native Americans used fire to improve the harvest of foods and medicines, especially for collecting greens, tarweed (*Madia* spp.), grass seeds, acorns (*Lithocarpus densiflorus* Hook. & Arn., *Quercus* spp.), and herbs. They also burned to improve yields of camas (*Camassia* spp.), brodiaeas (*Brodiaea* spp., *Triteleia* spp., *Dichelostemma* spp.) lilies (*Lilium* spp.), yampah (*Perideridia* spp.), and various berries (especially raspberries (*Rubus* spp.), strawberries (*Rubus* spp.), and huckleberries (*Vaccinium* spp.) (Bonnicksen 2000). Fire was used to prevent grasslands from growing over with non-desired vegetation and to clear areas for tobacco (*Nicotiana* spp.) and grass (Harrington 1932). Burning facilitated the gathering of acorns by clearing the ground of vegetation and duff/litter under oak trees (Heffner 1984, Six Rivers National Forest Interviews, Jackson pers. com. 2002, Salter 2003). Often, an area would be burned as soon as enough fuels had accumulated or non-desired vegetation had encroached sufficiently on the desired crops. The timing of patch burns can be inferred by the length of time it took for fruits and berries to set, ripen, and be harvested, or the appropriate time to clear land for root digging or bracken (*Pteridium aquilinum* (L.) Kuhun var. *pubescens* L. Underw.) fiddlehead picking (Peacock and Turner 2000). The term "crops" can be used because of the intensity and specificity of management required to maintain and harvest foods, medicines, and materials in discrete locations in which the dominant species was established (Anderson 2005's discussion of proto-agriculture). This approach creates an "even-aged" management condition of diversified mosaics (Kimmerer and Lake 2001). Access to croplands or getting places was provided by foot trails and canoes, depending on location (Gates 1995, Six Rivers National Forest Interviews). The harvest of fire-induced foods was significant, and productivity of many habitats was increased with the appropriate season, frequency and severity of fire. "Practices such as landscape burning, pruning, tilling, and even picking are said to improve the resources, making them more bountiful and enhancing their quality" (Peacock and Turner 2000:134).

Pest Management. Burning was used to reduce pest populations, including rodents (*Neotoma* spp., *Peromyscus* spp., *Reithrodontomys* spp., *Thomomys* spp., *Mus musculus, Rattus norvegicus,* and others), poisonous snakes (Rattlesnake *Crotalus viridis*), ticks (*Ixodes pacificus*, *Dermacentor occidentalis, Dermacentor variabilis*) black flies (*Simulium* sp.), mosquitoes (*Culex* spp., *Ochlerotatus* spp., *Aedes* spp. *Culiseta* spp.), seed/nut weevils (*Curculio* spp., *Conotrachelus* spp., *Cydia latiferreanna* (Walsingham)), basket plant parasites (*Rabdophaga* spp., *Euura exiguae*), forest beetle (*Dendroctonus* spp., *Ips* spp.) infestations, and to kill mistletoe in oak trees, tree lichens and mosses, and invasive native plant species (Bonnicksen 2000). Many tribal groups prescribed fire to patches of vegetation when insect infestation was observed. Fire was commonly used to reduce seed weevils in important nut crops, stem borers in basketry plants, and to reduce tick densities in leaf litter and forest duff where ungulates bedded (Klamath River Jack 1916, Barlow n.d., Strike 1994, Anderson 1999, Salter 2003, W. Colegrove pers. com. 2005).

Warfare. Fire was used to burn vegetation to fend off enemies, or aid in ambush or escape. Fire was also used to burn enemy resources, houses or villages, destroy valuable commodities, injury or to kill enemies (Barlow n.d., Kroeber 1976, Moore pers. com. 2005). "*Rekwoi* (Yurok village) was attacked and burned much the same as *Takimitlding* (Hupa village) had been" (Kroeber 1976:51).

Hunting. Indians burned areas to force deer (*Odocoileus hemionus*), elk (*Cervus Canadensis*), antelope (*Antilocapra americana*), rabbits (*Lepus californicus*, *Sylvilgus bachmani*), and other prey into small unburned or formally burned areas for easier hunting. Fire was also used to drive game over cliffs or into impoundments, narrow chutes, and river or lakes where they could be easily killed. Indians used fire for hunting both directly and indirectly (Bonnicksen 2000): directly, when driving game (Shasta see Powers 1887); indirectly by reducing, modifying, or increasing habitat quantity and quality to influence the location of game (Six Rivers National Forest Interviews: I-209, Hillman pers. com. 2002, M. McCovey pers. com. 2002, Aubrey pers. com. 2005, Colegrove pers.com. 2005).

Range Management. Fire was used to keep prairies and meadows open from encroaching shrubs and trees and to improve browse for bears, deer, elk, antelope, horses, cattle, and waterfowl (*Anas platyrhynchos*, *Branta* spp.), and to increase the quality of vegetation structure, forage, palatability, and nutrition (SRNF Interviews: I-209, I-288, I-349, I-351, and I-396, Hillman pers.com 2002, Aubrey pers. com. 2005, Colegrove pers.com. 2005, Bonnicksen 2000, Salter 2003,). Many of the plants and wildlife species used and managed by tribal people were also important to other plants and animals for habitat, cover, or forage (Norton et al. 1984). Thus burning changed the value of vegetation patterns to other species (often desired species) that used the same foods, or took advantage of bettered conditions of mobility, visibility, and cover (Six Rivers National Forest Interviews: I-209, I-210, I-309, B. Tripp in Salter 2003, Colegrove pers. com. 2005, Aubrey pers. com. 2005, Moore pers. com. 2005).

Tree Felling/Fuel Wood. Indians used fire in different ways to fell trees. After fire swept through chaparral or woodland areas, branches or stems were broken off for firewood. Target species of fuel depended on location and cultural activity. Fallen branches and twigs were routinely gathered, stored, and brought back to the camps or villages (Gifford 1939, M. McCovey pers. com. 2002, B. Tripp in Salter 2003, Moore pers. com. 2007). In northwestern California and other mountainous regions of the Pacific west, hardwood logs and branches were utilized for smoking and preservation of meats or drying berries (Bonnicksen 2000, Davis and Hendryx 2004). Conifer "pitch logs" were used for heating at high elevation camps or in emergencies (Thom pers. com. 2002).

Fireproofing. Indians used fire to clear vegetation from areas around settlements and near special medicinal plants to protect them from wildland fires. Many "patches" or areas that required frequent burning also served as fuel breaks against unintended or undesired effects of wildfire (Bonnicksen 2000, Lewis and Anderson 2002:15). Indians used frequent low intensity fires to alter the structure of different forest/plant communities to reduce the buildup of fuels, thus decreasing catastrophic wildland fires (Karuk Tribe and Cultural Solutions 1999, Aubrey pers. com. 2005, Colegrove pers. com. 2005, Moore pers. com. 2005).

Nutrient cycling. Low and moderate intensity fires were frequently used by Native Americans to promote nutrient cycling and reduce the litter, duff, and down woody material. Native people observed the increase in productivity of grasses, forbs, and stimulated shrub sprouting or fungus/mushroom proliferation following burning. Low-intensity fire fosters decomposition of litter and results in a flush of nutrients that would be tied up in soil litter, woody material, and understory vegetation. Darkened soil surfaces after burning increases soil temperature and encourages soil microbial activity (Oliver and Larson 1990, Paustian et al. 1999, Aubrey pers. com. 2005, Anderson 2005, Wohlgemuth et al. 2006).

Results of repeat photography

Repeat photography characterizes changes in vegetation attributed to the cessation of Native American fire use and other recent land management practices. At the broadest level, the changes seen in the photographs represent the effects of cessation of Native American fire use, fire suppression, fire prevention, industrial forest management, agriculture, mining, and urbanization. Landscape level changes are shown from the coastal plains, up river corridors, to interior mountains.

Coastal plains

Figure 3.2a is photograph by T.T. Waterman of Patrick's Point in 1928, looking south compared to Figure 3.2b is a repeat photograph by F.K. Lake Patrick's Point in 2006 looking south in the same direction. Figure 3.3a is a photograph by T.T Waterman in 1928 of Patrick's Point, looking southeast compared to Figure 3.3b repeat photograph by F.K. Lake in 2006 at Patrick's Point, looking southeast. In both sets of photographs in the comparison of 1928 to 2006 substantial changes had already occurred from 1850 to 1928. Bricknell (et al. 1988) conducted soil pollen content analysis and historical research from Patrick's Point north to the mouth of the Klamath River to determine potential vegetation change. Shrubs, bracken fern, and coastal prairie existed pre-1850. After Euro-American settlement, shrubs and young trees were cleared for farming and grazing from 1860 to 1920s (Barlow no date). The 2006 photographs indicate the vegetation change from coastal prairie/farmland to increased maturity of shrubs and trees in the protected status of State Parks. Figure 3.4a is photograph by A.L. Kroeber (Photograph 15-1357) circa 1920 of Freshwater Lagoon used to compare to Figure 3.4b photograph by F.K. Lake in 2006. Bricknell's (1992) analysis of soil pollen content revealed similar vegetative change as that of State Park lands near Freshwater Lagoon. Coyotebush (*Baccharis pilularis* DC.), lupine (*Lupinus* spp.), bracken fern (*Pteridium aquilinum* (L.) Kuhun var. *pubescens* L. Underw.), and coastal prairie grasses and forbs existed before 1850. The 2006 photograph shows the successional change from coastal prairie/farmland to increased maturity of shrubs and trees in the protected status of the State and National parks. Sitka spruce (*Picea sitchensis* (Bong.) Carr.), coast redwood (*Sequoia sempervirens* (D.Don) Endl.), western-coast hemlock (Tsuga heterophylla (Raf.) Sarg.), red alder (*Alnus rubra* Bong.), cascara (*Rhamnus purshiana* DC.), salmonberry (*Rubus spectabilis* Pursh), and salal (*Gaultheria shallon* Pursh) are the dominant vegetation that has expanded and now cover former coastal prairie. Before this land was classified as parks, Euro-American settlers practiced prescribed burning to promote coastal prairie for stock animals (Barlow no date). This practice mimicked former American Indian practices (Erwin in Riley-Thron 2001).

<u>Coastal: Oregon White oak and prairies</u>

Figure 3.5a is a photograph by C**.**H. Merriam (Photograph Identifier 3) along Bald Hills looking south on July 23, 1934 and is compared to Figure 3.5b photograph taken on September 16, 2006 by F.K. Lake near the same spot along Bald Hills, looking south. Figure 3.6a is a photograph by C.H. Merriam (Photograph Identifier 2) taken on July 23, 1934 Bald Hills looking south with Dr. Rock and back side of Lyons ranch in the image is compared to Figure 3.6b photograph by F.K. Lake looking south taken on September 16, 2006 near the same spot along Bald Hills with a view of Dr. Rock and back side of Lyons ranch. As a result of frequent American Indian fire use, this area historically had low conifer and shrub densities, with old to mature age classes of oak with low percent crown cover (Underwood et al. 2003). The Bald Hills region, between Redwood Creek and the Klamath-Trinity River, was among the first

places visited by Euro-Americans traveling across the land to explore, trap furs (Smith in 1824), military (McKee in 1851), mine gold (1850s), or graze cattle and grow agricultural products, circa 1850-1920s (Barlow no date, Gates 1995). Early American settlers kept the brush and young trees reduced by frequent burning (Erwin in Riley-Thron 2001). Broadcast burning was restricted in California by the Department of State Forestry, and subsequent reduction in range improvement fostered the expansion of brush and trees after the 1930s (Biswell 1999). Since acquisition of lands by State and National Parks, the historic pre-1920s vegetation composition and structure has been favored by Park management restoration practices to maintain ethnographic landscapes (Egan 2003, Underwood et al. 2003). The difference in the relative cover, density, composition, and structure of vegetation between the two photographs reflects recent restoration efforts. Some areas within the view of the photographs which experienced clearcutting of old-growth redwood forests between 1960 and 1980 have begun reforesting, although successional development has been hindered.

Mixed Conifer/Hardwood-Interior Klamath River corridor

Figure 3.7a is a photograph by R. Roberts (Photograph RM 10) looking down-river from Martin's Ferry bridge circa 1926 and is compared to Figure 3.7b photograph by J. Lipe in August 2000 from the Martin's Ferry bridge, looking down-river. This scene is looking downstream from Martin's Ferry Bridge on the Klamath River, below Weitchpec, California. The top photograph was taken in the early 1920s. The bottom photograph on the right was taken in 2000, mid-day. The riparian vegetation is representative of flooding disturbance in 1996 as indicated by alders (*Alnus* spp.) on the lower slope on the left bank. Conifer densification and increased height are visible along ridge lines and the hillside in the upper center of the photos. The hills on the north side of the river with southern aspect were historically burned more frequently to reduce brush and young tree encroachment into prairies, for maintenance of acorn tree health and nut collecting areas, and for promoting hazel's growth for nuts and shoots for basketry (Waterman 1920, D. McCovey pers. com. 2002, Six Rivers National Forest Interviews: I-300 and I-303).

Hoopa Valley

Figure 3.8a is a photograph by L. Thompson circa 1890 looking east at Tish-Tang ranch (former village) is compared to Figure 3.8b a photograph by J. Lipe taken in 2000. The ridge beyond the Tish-Tang ranch in 1890 was inhabited by mature conifers with grasslands and oak woodlands at mid-slope. An Indian trail started near the confluence of Tish-Tang Creek and the Trinity River and went up the ridge in an east-southeast direction towards Sign Board Gap and beyond (Six Rivers National Forest interviews: Interview-229 and I-380). Oregon white oak (*Quercus garryana* Hook.) and California black oak (*Quercus kelloggii* Hook.) interspersed with madrone (*Arbutus menziesii* Pursh.) are common of the forest habitat adjacent to the village. Smoke obscures the distant ridges that are visible in the 2000 photograph. The 2000 photograph, originally in color but transformed to grayscale, shows an increase in conifers (mostly Douglas-fir (*Pseudotsuga menziesii* (Mirbel) Franco var. *menziesii*)) as dark trees in the upper left, and along the nearest ridge. Notice individual mature conifers in each photo and the distance of height to the vegetation below them. The 2000 photograph indicates densification of conifers, hardwoods, and the conversion of the prairies present in the 1890 photograph to hardwoods and shrubs on the main slope beyond the village in center right of the photograph.

Orleans to Somes Bar

Figure 3.9a was photographed by A.W. Ericson Looking west/southwest from Big Rock to Orleans in 1894 and is compared to Figure 3.9b that was photographed by F.K. Lake in September 2006 of the similar viewscape. Figure 3.10a was photographed by A.W. Ericson in 1894 that was looking north, upriver from Big Rock towards Pearch Creek near Orleans. Figure 3.10b was photographed by F.K. Lake in September 2006 looking north, upriver from Big Rock. Areas shown in the photographs reflect initial changes in land use practices from Karuk to Euro-Americans. The most significant changes that occurred from 1850 to 1894 were mining of the creeks, terraces near the river, and some vegetation conversion from forest, shrub, and grassland to homesteads and agricultural development. Fire was frequently used by Karuk in all directions around Orleans prior to 1850, and less extensively between 1850 and 1920 (Gifford 1939/1940, Hillman pers. com. 2002, M. McCovey pers.com. 2002, Salter 2003, Smith pers. com. 2007). Government fire suppression policies, Civilian Conservation Corps, and USFS fire patrols were effective in suppressing and extinguishing fires between 1920 and 1945. Rangeland grazing was also greatly reduced by 1945. After World War II, construction of roads, timber harvesting, equipment and workforce to suppress fires increased (Hillman pers. com. 2002, M. McCovey pers. com. 2002, Six Rivers National Forest Interviews: I-207, I-209, I-210, I-281, and I-332). Changes observed in the photos are in agreement with Skinner (2005) and USFS Six Rivers National Forest LMKWA (2003). Fire starts and Fire Regime Condition Class, and Fire Extent maps are supporting evidence of the vegetative changes observed between the photos. Figure 3.11a was photographed Ruth K. Roberts (Photograph Collection, RX23) of Sugar Loaf Mountain, circa 1920s, and is used for comparison to Figure 3.11b that was photographed by J. Lipe in August 2000. Figure 3.12a is photograph by A.L. Kroeber (Photograph No. 15-1396) taken in 1907 looking upstream at Sugar Loaf Mountain is used to compare differences over time in the vicinity of Sugar Loaf Mountain shown with Figure 3-12b that was photographed by F.K. Lake in September 2006.

Figure 3.13a was photographed by R. Roberts (Photograph RX20) circa 1920s looking upriver towards Ike's Falls. Figure 3.13b photographed in August 2000 by J. Lipe was looking upriver towards Ike's Falls. Figure 3.14a was photographed circa 1920s by R. Roberts (Photograph RX21) looking downstream at Upper Ike's Falls. Figure 3.14b photographed by J. Lipe is taken in August 2000 looking downstream at Upper Ike's Falls. The changes that occurred from 1850 to 1894 were mining of creeks, terraces near the river, and some vegetation conversion from forest, shrub, and grassland for homesteads. Fire was frequently used along the river corridor from Ike's Falls to Somes Bar prior to 1850, and less extensively 1850 to1920 (Gifford 1939/1940, Six Rivers National Forest Interview: I-210). Government fire suppression policies, Civilian Conservation Corps, and USFS fire patrols were effective at suppressing and extinguishing fires from 1920 to 1945 (Hillman pers. com. 2002). After World War II, construction of roads, timber harvesting, and equipment and workforce to suppress fires greatly increased. Changes observed in the photographs are in agreement with Six Rivers National Forest LMKWA 2003 Fire starts and Fire Regime Condition Class, and Fire Extent maps.

Repeat aerial photography

<u>Deerhorn Mountain and lower Trinity River near Weitchpec</u>

Figure 3.15a is an aerial photograph taken in 1954 of Deerhorn Mountain and lower Trinity River vegetation southeast of Weitchpec and compares changes in landscape vegetation patterns to 1990, Figure 3.15b, which was photographed by US Forest Service. Photographs were provided with permission from the California Indian Basketweavers Association. The 1954 photograph (above left) is bisected by the lower Trinity River flowing from the lower right to the upper left. The lower left section is mixed conifer/hardwood mesic forest dominated by Douglas-fir and a co-dominant understory of tanoak (*Lithocarpus densiflorus* Hook. & Arn.), madrone (*Arbutus menziesii* Pursh.), with big leaf maple (*Acer macrophyllum* Pursh.) and red alder along riparian areas. The upper right of the photo is the grassland prairies, shrubs, and woodlands dominated by Oregon white oak (*Quercus garryana* Hook.) and California black oak (*Quercus kelloggii* Hook.) with California hazel (*Corylus cornuta* Marsh. var. *califorinica*), wild lilac/Deer brush (*Ceanothus integerrimus* Hook.& Arn.), poison oak (*Toxicodendron diversilobum* Torrey & A. Gray), as shrub cover in the understory. Hazel was commonly burned near Weitchpec, and on the slopes of Deerhorn Mountain (upper right photo) heading up the Trinity River towards Hoopa Valley (Six Rivers National Forest Interview-286, D. McCovey pers. com. 2002, Moore pers. com. 2005), and this practice continues today by local tribal people and Hoopa Tribal Forestry. A trail also traverses the main ridge system in the upper right of the photograph. Prairies were, and still are, composed of post-contact native and non-native grasses, and dominant forbs were tarweed, iris (*Iris* spp.), wild strawberry (*Rubus* spp.), Indian potatoes (*Brodiaea* spp., *Chlorogalum* spp., *Dichelostemma* spp., *Triteleia* spp., and *Lilium* spp.), and trailing blackberry (*Rubus ursinus* Cham. & Schldl) (Lake pers. obs. of prairie remnants). The change in aspect in the upper right section of the photograph is a transition from Oregon white oak/prairie to California

black oak/hazel dominated habitat. Shrubs and young Douglas-fir are the remainder of the cover. Roads parallel the Trinity River on both sides.

The same area in 1990 shows the effect of timber harvesting and the re-vegetation of *Ceanothus*, poison oak, and young conifers. A rapid decline in the amount of hardwood woodlands and prairies from the cessation of Native American burning practices with fire suppression is evident (M. McCovey 2002, Six Rivers National Forest Interviews: I-286, I-292, I-293, I-301, I-307, and I-309). Generally, habitat diversity has decreased and densification of vegetation, mostly shrubs and young conifers, have homogenized the habitats and increased the continuity of fuels susceptibility to a higher severity level. Physical factors such as slope, aspect and steepness, and soil types, degree of moisture retention are major factors in determining the potential vegetation for wildlife habitat or eco-cultural goods and services.

Orleans Valley

Figure 3.16a is an aerial photograph by US Forest Service, Six Rivers National Forest, from a formerly restricted version from US Department of Defense taken in 1944 of the Orleans Valley is compared to Figure 3.16b photographed 2003 by USFS. Photographs courtesy of Mid Klamath Watershed Council. Dunklin and Lake enhanced and modified photographs. Changes observed in photographs are related to Native American burning practices and American settlement of the area. Orleans was established on the Karuk village of *Panamnik*. Tribal and non-Native elders described the burning of Bacon Flat (Gifford 1939, Kroeber and Gifford 1949, Ora Smith pers. com. 2007) and Whitey's Gulch for wildlife forage and winter range habitat (Hillman pers. com. 2002, M. McCovey pers. com. 2002, Six Rivers National Forest Interviews: I-209, I-210, I-281, I-349, I-351). Densification of forest composition and structure is attributed to fire suppression following the establishment of the USFS ranger district in Orleans. Changes observed in the photographs are correlated with LMKWA 2003 Fire starts and Fire Regime Condition Class, and Fire Extent maps. The results of the Dance fire at *Tishunick* are visible in the 2003 photograph along the river bar extending north to the adjacent conifer-hardwood forest.

Short Ranch and Rattlesnake Ridge southeast of Orleans

Figure 3.17 is a 1944 photograph from the USFS, Six Rivers National Forest originally from a formerly restricted version from US Department of Defense compares vegetative landscape patterns of the area to Figure 3.17 photographed by USFS in 2003 of the Short Ranch/Rattlesnake Ridge area. Photographs courtesy of Mid Klamath Watershed Council. Dunklin and Lake enhanced and modified photographs. Fewer changes in vegetation are observed that are related to Native American burning. Tribal elders interviewed (Glaze pers. com. 2002, Hillman pers. com. 2002, Ferris pers. com. 2007) and those from the Six Rivers National Forest interviews (I-209, I-281) discussed pre-historic and historic burning of southern ridges and grasslands such as LePerron Flat to improve forage quality. Densification of forest composition and structure began around American settlement, and became more pronounced after USFS fire suppression efforts during the early 1900s. Changes observed in the photographs can be correlated with analysis results presented in the Six Rivers National Forest LMKWA 2003 for fire starts and Fire Regime Condition Class, and Fire Extent maps.

Vicinity of Somes Bar near the confluence of the Salmon and Klamath Rivers

Figure 3.18a photograph is from a formerly restricted version from US Department of Defense from USFS is used to compare vegetative landscape changes that occurred from 1944 to 2003 shown with Figure 3.18b aerial photograph by USFS of Somes Bar near the confluence of Salmon-Klamath Rivers. Photographs courtesy of Mid Klamath Watershed Council. Dunklin and Lake enhanced and modified photographs.Vegetation changes observed in photographs relate to Native American burning practices and American settlement of the area. Quotes from tribal and non-Native elders discuss the burning of Offield Mountain and other surrounding prairies and forests for wildlife forage, winter range habitat, acorn production, basketry material enhancement, and Karuk religious practices (Kroeber and Gifford 1949, Six Rivers National Forest Interview: I-308, Moore pers. com. 2005, Peters pers. com. 2005). Densification of forest composition and structure by 2005 can be attributed to establishment of the USFS and subsequent government policies to suppress fires, and the prohibition of Karuk ceremonial burning.

Maps and early accounts

Figure 3.19 shows an excerpt for Somes Bar to Weitchpec from Klamath National Forest map 1928 (Original map property of Ora Smith of Orleans, CA was digitally scanned) used as one of the base data layers for documenting the extent of the early historic area (1850 to 1920) land use patterns of Native Americans and Euro-Americans. The trail systems are shown as small dashed lines. The trails systems and camp locations from this map were used for comparison to ethnographic information, oral history interviews, and repeat photographs. Trails demonstrate formerly establishment Indian travel routes. Trails represent the potential extent of ignition zones, e.g. upper slopes near or along ridges, or areas, e.g., basketry material or acorn grounds, of Native American, and early American miner and settler burning practices (Hotelling 1978, Six Rivers National Forest Interviews: I-209, I-210, Anderson 2005). These same trail systems were utilized after the establishment of the US Forest Service to enforce fire suppression and exclusion efforts, construct roads, timber management, and for public recreation (Six Rivers National Forest Interviews: I-297, I-305, I-322).

<u>The extent of Native American burning and land use practices in northwestern California: Case study example of the lower mid-Klamath region</u>

The topographic map indicates potential fire ignition sources and likely locations for forest, shrub and grassland habitats and along riparian zones that were developed into a GIS map. The map includes tribal villages, documented or probable trails called here as traversable ridge systems, adjoining resources areas, and specificity of habitats managed with fire (Figure 3.20).

The case study area of the lower mid-Klamath region with ignitions and traversable ridge systems utilized for burning and accessing culturally significant resource areas is presented in Appendix A and B and Figure 3.22.

Discussion: Implications of TEK and CEMP, and historical landscape change since Euro-American settlement on biodiversity

Regional fire history, ecology, and fire regimes

Natural and anthropogenic fires, varying in rates and intensities, formed the historical forests, shrublands, grasslands and riparian areas of the Klamath-Siskiyou Mountains of southwestern Oregon and northwestern California (Skinner et al. 2006). However, the detrimental effects of cessation of Native American burning and fire suppression policies on these habitats were not acknowledged until recently (Taylor and Skinner 2003, Bisson et al. 2003, Skinner et al. 2006). Many scholars and land managers contend that the region has a historical "natural fire regime" predominantly driven by non-anthropogenic ignitions (Frost and Sweeney 2000, Vale 2002, Odion et al. 2004). Proponents of "natural fire regimes" for the Klamath-Siskiyou region generally support the premise that Native American burning and associated land management practices had little effect or were not very extensive given the total percentage of area for the region (Agee 1993, Frost and Sweeney 2000, Vale 2002). Other scholars contend that the so called "wildlands" of the region were in large part generally influenced and in specific areas greatly affected by "cultural fire regimes" and non-fire land use practices (Pullen 1996, Karuk Tribe and Cultural Solutions 1999, LaLande and Pullen 1999, Martinez 2004, Anderson 2005).

Fire severity is sometimes used interchangeably with fire intensity. "Fire intensity is influenced by the amount of fuel available for burning, local weather conditions before and at the time of the fire, and the topography of the burning site" (DeBano et al. 1998:57). Fire intensity is the rate at which a fire produces thermal energy. It is described in several ways, and is often more aptly termed fire line intensity (DeBano et al. 1998:56). Agee (1993) describes the relationship between fire line intensity, flame length, and the type of fire (Table 3.6).

Table 3.6: Fire intensity, flame length, and types of fire

Intensity type:	Flame length:	Type of fire:
Low intensity	0-1 meters (0 to 3 feet)	Surface/ground fire
Intermediate/Moderate	1-3 meters (3 to 9 feet)	Understory fire

High	>3 meters (Greater than 9 feet)	Crown fire

Fire intensity is generally classified as low, moderate, and high, and describes how the heat or energy of the fire is released rather than the physical or biological effects of the fire. Fire suppression initial attack criteria are also related to fire intensity of given flame heights, spread, and fuel types (Pyne et al. 1996). Characterization of types of fire is also useful in describing fire regimes, fire behavior, and subsequent fire effects on vegetation. Descriptions of types of fire allow characterization of the types of fires Native Americans desired in specific forest, shrubland, grassland, and riparian habitats. Agee (1993:386-387) states:

> "We know that a variety of fire regimes existed on the pre-European landscapes of the Pacific Northwest, and we know in general terms how we have changed species composition and structure by our management practices. Consensus, on fire management, however, requires the incorporation of human values, and most past fire management policies have been derived from the view of fire only as a threat, rather than from a broader perspective of values evident in today's society."

The continuity of values held by Native Americans are addressed in this chapter and presented in chapter 8. Natural resources, primarily habitat conditions, modified by anthropogenic and lightning ignited fires are culturally significant resources which assist in the survival and perpetuation of Native American culture (Hillman and Salter 1997, USDA Forest Service Klamath National Forest Ishi-Pishi/Ukonom 1998, Salter 2003). The various forms of data collected for this research indicate that there was a historical effect of indigenous people that resulted from their land management practices (Anderson 2006). The determination of actual versus relative extent of Native American burning is difficult to discern (Figure 3.21). Although if all the collective information presented here and in Appendix A and B were mapped to their locations or culturally significant habitats a more accurate understanding of the extent would be revealed (Busam 2006). Fire specifically was used for numerous reasons and affected the environment at the organism, population, community, and landscape level (Lewis 1993, Anderson 2005). TEK along with

Indian burning practices will likely have higher levels of success in restoring and maintaining biodiversity, which in turn can support cultural diversity (Anderson and Barbour 2003, Anderson 2005, Karuk Tribe Draft 2007). This premise holds true especially with Native cultures that were/are dependant on particular aspects of fire and the resulting effects of fire for the majority of their sustenance (Heffner 1984, Anderson 2005, Colegrove 2005). As well, Native people who rely on traditional subsistence resources to maintain their families in an economically depressed area or who want to restore the relative abundance of traditional lifeways (diet, ceremonies, arts) (Norgaard 2006) to transition away from unhealthy detrimental aspects of a semi-assimilated lifestyle (government commodities, alcoholism/drug abuse, depression/grief, physical and sexual abuse) (Stercho 2006). Tribal community health reflects ecosystem health, integrative restoration practices will help restore "balance" with community and environment (Seventh Generation Fund 2006).

The compilation of various information sources that integrate a multi-disciplinary approach has been used elsewhere to define reference ecosystems and historical range of variability regarding the anthropogenic and natural factors that affect biodiversity (Egan and Howell 2001). It has been argued that the reference condition is limited in its usefulness (Whitlock and Knox 2002). However, reference conditions that help define the interplay of historical anthropogenic and natural disturbance processes are useful when environmental attributes of the past are desired for conditions for the present or future (Egan and Howell 2001, Karjala et al. 2004).

There are historical and contemporary differences between lightning and anthropogenic ignitions that affect the composition, structure and assemblage of species found in those habitats (Figure 3.21). The ecological significance of historical locations and seasons of ignition are important to understand when and how specific habitats would burn. Indian-type fire is defined by Williams (2000:40) as:

> "... intensive land management, where not every area is treated at the same time in the same way. The idea is to create a mosaic of forests and grasslands, not monocultures. The result is a combination of open prairie or savanna, shrubland, young trees, mature stands, and old-growth forest."

Historical, Indian-type fire regimes in the coastal Pacific Northwest and Klamath-Siskiyou bioregion differ from current catastrophic wildland fire regimes (Fire Regime Condition Class assessment in Hann and Strohm 2003, Six Rivers National Forest-LMKWA 2003). Lightning is commonly assumed to be the source of historical fires in the Pacific Northwest and northern California (Agee 1993, Skinner et al. 2006). In the Klamath-Siskiyou mountains lightning is believed to have a higher influence on forests, shrublands, grasslands, and riparian zones than Native American burning practices before 1850 (Frost and Sweeney 2000, Skinner et al. 2006). However, the role of lightning versus Indian burning in shaping fire regimes and varying vegetation patterns in coastal Oregon and Northwestern California has been minimally described (Lewis and Fergonson 1999, LaLande and Pullen 1999, Boyd 1999, Six Rivers National Forest LMKWA 2003, Bricknell et al. 1992, Zybach 2005, Busam 2006). The role of Indian burning is commonly attributed to valleys and lowland areas, with little evidence put forward about when, why, or how Native Americans used fire in mid or higher elevation areas (Clar 1954, Agee 1993, Vale 2002). Table 3.7 compares patterns of pre-Euro-American contact Indian burning with post-Euro-American settlement patterns of catastrophic forest wildfires in the coastal Pacific Northwest and Klamath-Siskiyou mountains (Lake and Zybach unpublished).

Table 3.7 Comparison of Indian burning and catastrophic fire patterns in the coastal Pacific Northwest and Klamath-Siskiyou mountains (modified from Zybach 2005).

Fire Characteristics	**Indian Burning**	**Catastrophic Fires**
Causes	People (gender and age differences)	People and Lighting
Location of Ignitions	Travel corridors and specific destinations. Ridge tops. Low to mid elevation at specific intervals	Travel corridors and destinations, Ridge tops, higher elevations
Wind directions	Variable	East (Chinook winds)
Seasons	All year when fuels and weather conditions permit. Mostly, Late summer/early fall and late winter/early spring	Late summer/early fall
Frequency	Daily, and seasonally.	Years or centuries
Extent	1,000s of acres annually from smaller sized events.	1,000s of acres per event
Boundaries	Trails, ridgelines, riparian areas, forested areas/north aspects, bodies	Ridgelines, riparian areas, unforested areas, fog belt forests,

	of water, and ocean	north aspects, bodies of water and ocean.
Wildlife Habitat	Stable, sunny, high protein mosaic of grasslands and forests	Sudden changes in wildlife demographics and habitat patterns

The lack of understanding of the specific applications of fire by Indians in particular ecosystems has contributed to a dismissal of Indian burning as an important factor in shaping the composition, structure, diversity, and productivity of coastal forests and prairies (Vale 2002). Recent fire history reconstruction supports more frequent burning in redwood forests than formerly documented (Steve Norman pers. com.). In local areas, lightning is less likely to strike and ignite fuels in prairies, riparian zones, wetlands, and other mid- to low-elevation habitats usually burned by Native people (Bonnicksen et al. 1999, Six Rivers National Forest LMKWA 2003, Busam 2006). Indian burning practices, which considered climate, season, and daily influences of weather conditions on fire behavior that would affect resource quality have been overlooked as a significant driver in shaping ecosystems and habitats related to the rate of forest secession (Elford and McDonough 1964, Whitlock and Knox 2002, Whitlock et al. 2004). Indian burning practices were selective and specific to habitats, capable of temporarily arresting forest succession that affected vegetation at time scales of decades to centuries, and resulted in altered fire regimes (Bonnicksen et al. 1999, Lewis 2002, Anderson and Barbour 2003).

Indian burning practices reduced negative effects of catastrophic wildland fire (Williams 2000, Salter 2003). The specific application of fire by indigenous people to achieve various cultural and ecological goals created mosaics of vegetation differing in composition, structure, and fuel loading (Kimmerer and Lake 2001). This use of fire affected the potential intensity of wildfires and the resulting impact on vegetation, wildlife, and soils (Bonnicksen et al. 1999).

The lower mid-Klamath River watershed analysis (Six Rivers National Forest LMKWA 2003) conducted by the USFS concludes that the typically dry summers, localized human fire activity, steep topography, and existing vegetation types and seral stages indicate that that fires has been a major component of this lower mid-Klamath ecosystem. Keter (1993, 1995) found north and south of the Lower Mid-Klamath

Analysis Area that Native American burning was a widespread component of the landscape. Burning by tribes has likely affected vegetation for millennia due to the long-term existence of Native American tribes and traditional uses of various vegetative materials (Fredrickson 2004, Chapter 2), although the extent of influence is debated (Vale 2002).

The landscape patterns of Indian burning are a cultural legacy (Kimmerer and Lake 2001). Changes resulting from the cessation of Indian land-use practices to that under the governance and management of Euro-Americans (Johnson 1999) have resulted in the modification of ecological processes (fire, nutrient cycling, and hydrology). For example, Kimmerer and Lake (2001) state:

> "Every ecosystem in North America has been affected in some way by a fire regime . . . manipulated by indigenous people. Much forest science, including ecological classifications of vegetation types, arose from observation of forest that were essentially in transition from conditions of indigenous fire management to post-colonial fire suppression. Our understanding of forest processes may thus be based on an anomalous, transitional landscape" (Kimmerer and Lake 2001:37).

The landscape has become more prone to catastrophic wildfire as a result of the change in the occurrence and frequency of burning (Kimmerer and Lake 2001, Taylor and Skinner 2003). Patterns of Native American burning and wildfire include similarities and differences in sources and locations of ignition; locations and extent of fire boundaries; timing, frequency, seasonality, intensity, and specificity of occurrence of fires; and effects of fire on local human and wildlife populations (Walstad et al. 1990, Agee 1993). Taylor and Skinner (2003) in their report about research on historical fire regimes and forest structure in the Klamath Mountains acknowledge the change from frequent low to moderate severity fires to increased high severity fires. These authors conclude after analysis of fire scars of the fire record of 1628-1995 that there was an average period of two years between fires. Characterization position of fire scars relative to growth rings indicates that 76.2% of the fires burned mainly between mid-summer through fall, thus nearly a fourth of the fires occurred during other seasons. Late winter-spring (dormant) season of burning is not characteristic of lightning ignition. Topography influenced the median Fire Return Interval (FRI), but was not significantly influenced by forest composition or elevation, rather fire occurrence was found to correlate with historical periods. "The average period of time between fires was similar ($P< 0.05$, t test) for the pre-Euro-American (1.6 yr) and settlement (1.5 yr) periods and longer (4.4 yr) during the fire suppression era. Only 12 fires burned during the fire suppression period and most (83%) burned between 1905 and 1920 a time of active Indian and American fire use (Taylor and Skinner 2003:709-710), but after 1920 only two fires were intense enough to scarred trees within their research area. The annual areas burned in the study of Taylor and Skinner (2003) were similar for the pre-Euro-American period and the settlement pre-suppression period, and both differed from the fire-suppression period which demonstrated larger amounts of areas burned but fewer fires. The length of years for fire rotation increased significantly during the 20th century and is currently 12-15 times longer than the previous 300 years of record despite similar climatic conditions. Southeast of the area studied by Taylor and Skinner (2003), Fry and Stephens (2006) found similar fire history periods for the Wintu tribal territory and American settlers. Fire frequency is related to fire rotation which is described by Taylor and Skinner (2003) for pre-settlement, settlement, and fire suppression periods.

Table 3.8: Time periods, fire rotation and explanations of fire occurrence

Time period	Fire Rotation: years	Explanation and interpretation of fires per time period
1628 to 1699	30 years	Little Ice Age requires more extensive use of fire to maintain open xeric plant fire tolerant species.
1700 to 1799	19	Little Ice Age require more extensive use of fire to maintain open xeric fire plant tolerant species. Introduction of disease from Spanish along trade routes to the upper Sacramento Valley which reduced populations of Native people (Cook 1943b:315, Boyd 1999).
1800 to 1899	15	Little Ice Age fading, lessening the former extensive use of fire to maintain open xeric fire plant tolerant species. Introduction of disease from Euro-Americans, settlement and genocide in the upper Sacramento Valley further decimated Native peoples (LaPena 1978)
1628 to 1849	20	At first the climate of 1628-1800 the Little Ice Age requires more extensive use of fire to maintain open

		xeric plant fire tolerant species. Introduction of disease from Spanish up trade routes to the upper Sacramento Valley reduced population levels of Native people (Cook 1943b). Then from 1800-1849 the climate of the Little ice age fading, lessening the former extent use of fire to maintain open xeric fire plant tolerant species. Introduction of disease from Euro-Americans, settlement and genocide up in the upper Sacramento Valley further decimated Native peoples (LaPena 1978)
1850 to 1904	18	Introduction of disease from Euro-Americans, settlement and genocide in the upper Sacramento Valley decimated Native peoples (LaPena 1978) contributing to the further cession of Indian burning. Mining operation increased fire frequency and seasonality of fires. Indian burning practices adopted by early homesteaders and ranchers of sheep and cattle.
1905 to 1995	238	Near complete cession of Indian burning and less burning by ranchers, hunters, and woodsmen. Fire suppression becoming effective as a result of National policy (Weeks Act of 1911), formation of the US Forest Services with ranger fire patrol, California Civilian Corps, then following 1945 increased sophistication of fire fighting technologies, equipment, and organizational infrastructure.

Fire research conducted by Agee (1991), Skinner (1995), Taylor and Skinner (1998), USFS Lower Mid-Klamath WA (2003), Taylor and Skinner (2003), Busam (2006), and Fry and Stephens (2006) were used to support information presented in Table 3.8.

Climate effects on cultural adaptations and development

Oral history and ethnographic data of tribal groups circa 1850 report use of fire by indigenous people from British Columbia through California (Blackburn and Anderson 1993, Turner 1999, Boyd 1999, Anderson 2005), while other scholars limit the extent or influence of such fires on landscape level vegetation patterns (Frost and Sweeney 2000, Vale 2002, Knox and Whitlock 2002). Topics which need further investigation are: 1. cross-referencing periods after 1100 B.P. with dendrochronology done in the region, and 2. match fire scar frequency (fire return intervals for before or at this time period) and match potential initial Algic or Athapascan settlement patterns for tree ring analysis < 700 years. Data for these studies could be drawn from redwood, Douglas-fir, or pines.

The majority of fire history and dendrochronological studies do not mention American Indian burning as a potential contributing factor to past fire frequency or events (Whitlock et al. 2004, Briles et al. 2005). The few articles which do acknowledge the contribution of Native American burning provide little analysis of the relationship between habitation sites (villages or seasonal camps), or transportation/trade routes (trails and low elevation river corridors between habitation sites) (Skinner et al. 2006, see Chapter 3). For example, redwood forests in northwest California show frequent burning of (10 to15 years/mean fire return interval) prior to 1850 (Norman pers. com 2006). Cross dating, or years in time, for fire scars at some study sites were compared to archaeological data for Native American habitation sites or nearest collection sites. Those trees which registered the most frequent mean fire return intervals were nearest villages or resources collecting areas near campsites (Norman unpublished 2007). Norman's fire scar/tree ring data for coastal redwood forest offers recent support of more frequent fire return intervals than previously documented (Veirs 1982, Stuart 1987, Sawyer et al. 2000).

Pine and oak fire scars analyzed in low elevation inland forest sites support more frequent burning when compared to natural ignitions (Fry and Stephens 2006, Six Rivers National Forest LMKWA 2003). Mid- to high-elevation fire scar studies vary in the proportion of natural versus anthropogenic ignitions (Stuart 1997, Stuart and Salazar 2000, Willis and Stuart 1994). Fry and Stephens (2006) for the southeast Klamath Mountains correlate fire frequency with Native American (Wintu) and American settlement periods. Few studies have correlated lake sediment pollen and charcoal with fire history and dendrochronology (Whitlock et al. 2004, Briles et al. 2005). Lake sediment pollen and charcoal records have not been examined for correlation to tribal settlement patterns. The majority of lake sediment studies occur at high elevation sites which may or may not have been used as pre-historic human camp sites (Hildebrandt and Hayes 1983, Fredrickson 2004).

Studies document the reduction of extensive frequent low to moderate severity fires after 1850, followed by a reduction in fire and increases in severity of fires from 1905 to 2005 (Stephens and Fry 2006, Skinner et al. 2006). Time periods for different locations vary because of Euro-American settlement patterns. Observations and recognition of fire behavior and effects associated with similar time periods have been documented in oral histories of tribal elders and practitioners (Six Rivers National Forest Interviews, Heffner 1984, Karuk Tribe and Cultural Solutions 1999).

Conclusion

The differences and similarities of traditional ecological knowledge and scientific ecological knowledge are important to consider. Knowledge systems or institutional training influences the way people view their environment. In the Klamath-Siskiyou bioregion documentation and understanding of the various ways or reasons why Native Americans used fire for specific and intended purposes is critical to evaluate how biodiversity and productivity for areas of the landscape are affected. Because of the general lack of familiarity with the implications of Native American fire use, and associated subsistence and ceremonial land use practices, multiple sources of evidence derived primarily from deductive methods are used to substantiate those accounts. Changes in vegetation through time, as observed in the repeat photography, are a valuable tool in understanding what and how fire affected, or lack of, and how habitats have changed. As to how much of that change can be attributed to the cessation of Native American land use practices is debated.

Forming a complete as possible record of historical Native American land management practices should increase awareness related to historic range of variation or what has been perceived as otherwise historically natural factors affecting biodiversity and productivity in the Klamath-Siskiyou bioregion. Acknowledging Native Americans as interacting with and having developed specific cultural dependencies on fire induced habitat quality, can provide opportunities for improving tribal trust responsibilities and conditions associated with ecosystem or forest health that correlate with tribal community welfare (Chapters 4, 5, 6, 7, and 8).

Figure 3.1: Hypothetical model of accumulation and change of knowledge of vegetation response to climate and fire

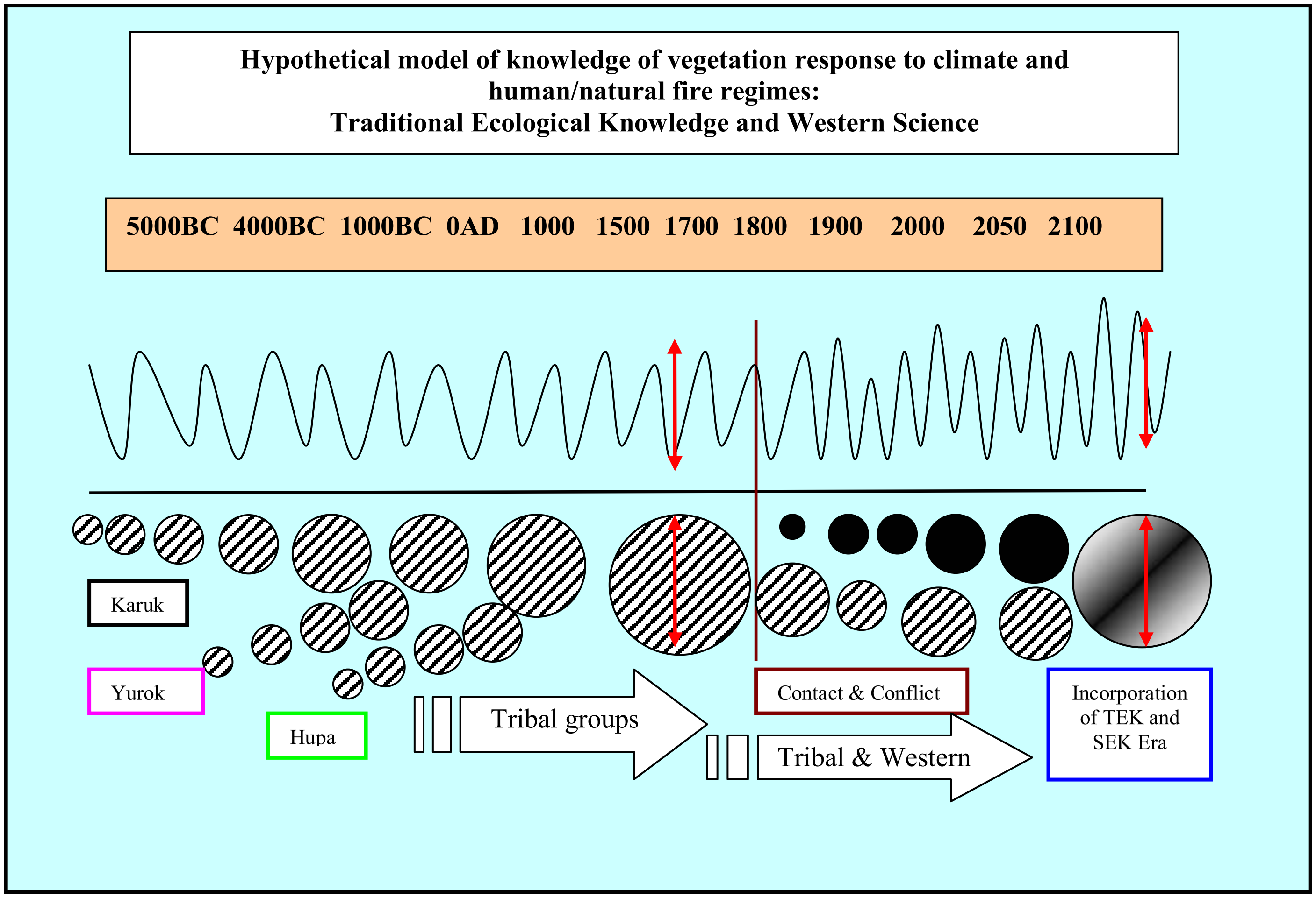


Figure 3.2a: Patrick's Point, Looking south: 1928 Photograph by T.T. Waterman, U.C. Regents, Contributing Institution: Phoebe Hearst Museum of Anthropology

Figure 3.2b: Patrick's Point, Looking south: 2006 Photograph by F. K. Lake

Figure 3.3a: Patrick’s Point, looking southeast 1928. Photographer T.T. Waterman. Title: View inshore from extreme outer end of Patrick's Point Creator/Contributor:U.C. Regents, Donor Contributing Institution: Phoebe Hearst Museum of Anthropology.

Figure 3.3b: Patrick’s Point, looking southeast September 2006 Photographer F. K. Lake

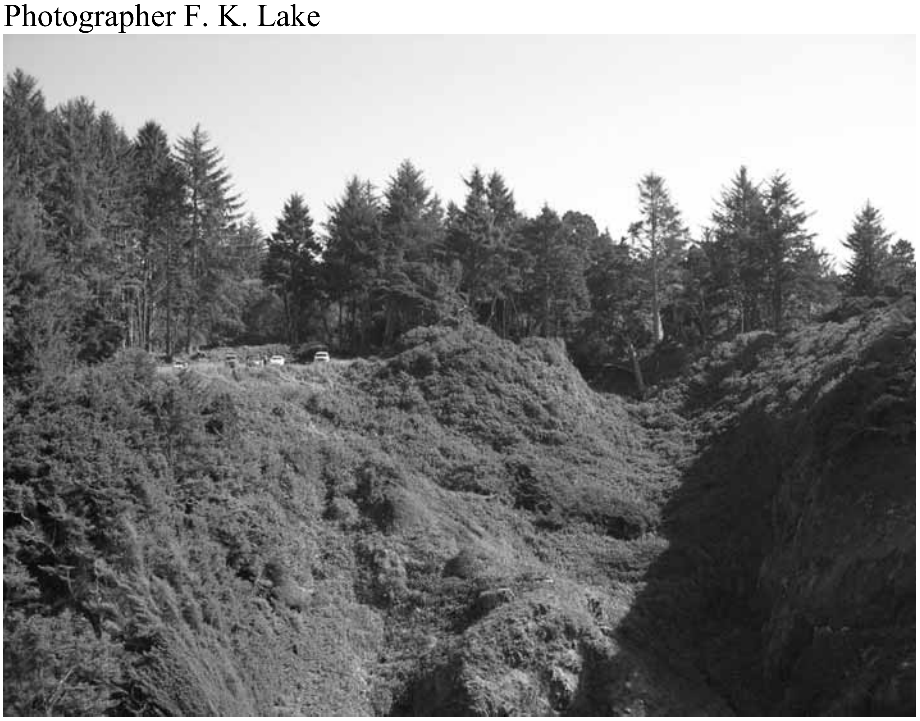


Figure 3.4a: Freshwater Lagoon. Circa 1920. Photograph by A.L. Kroeber. Looking northwest. Number: 34, Place: Humboldt County Identifier 15-1357, Ethnographic Photographs of California Indians and Sonora Indian Subjects by Alfred L. Kroeber, 1901-1930. Yurok

Figure 3.4b: Freshwater Lagoon September 2006 photograph by F. K. Lake

Figure 3.5a: Bald Hills, looking south 1934. Photograph by C. H. Merriam Title: Athapascan territory (Humboldt Co., Calif.) July 23, 1934 Identifier 3.

Figure 3.5b: Bald Hills, looking south. September 16, 2006 Photograph by F. K Lake

Figure 3.6a: Bald Hills, Dr. Rock and back side of Lyons ranch, looking south 1934. Photograph by C. H. Merriam. July 23, 1934. Title: Athapascan territory (Humboldt Co., Calif.) Identifier 2.

Figure 3.6b Bald Hills, Dr. Rock and back side of Lyons ranch, looking south Photograph by Frank K. Lake September 16, 2006

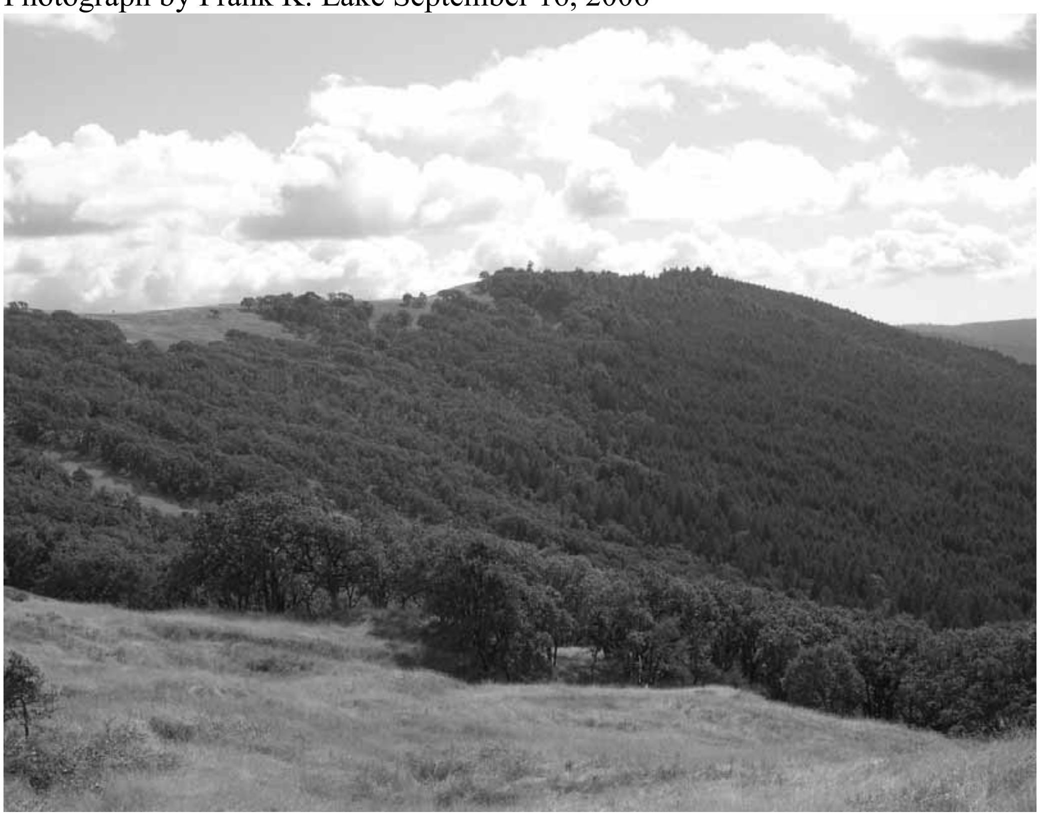


Figure 3.7a: Martin's Ferry, View down the Klamath River from the middle of the bridge. Circa 1926. RM 10. Photograph by Ruth Roberts. Humboldt State University.

Figure 3.7b: Martin's Ferry, looking down-river. August 2000 Photograph by J. Lipe

Figure 3.8a: Tish-Tang Ranch. Looking east. Circa 1890. Photograph by L. Thompson

Figure 3.8b: Tish-Tang Ranch/Village. Looking east. August 2000.
Photograph by J. Lipe

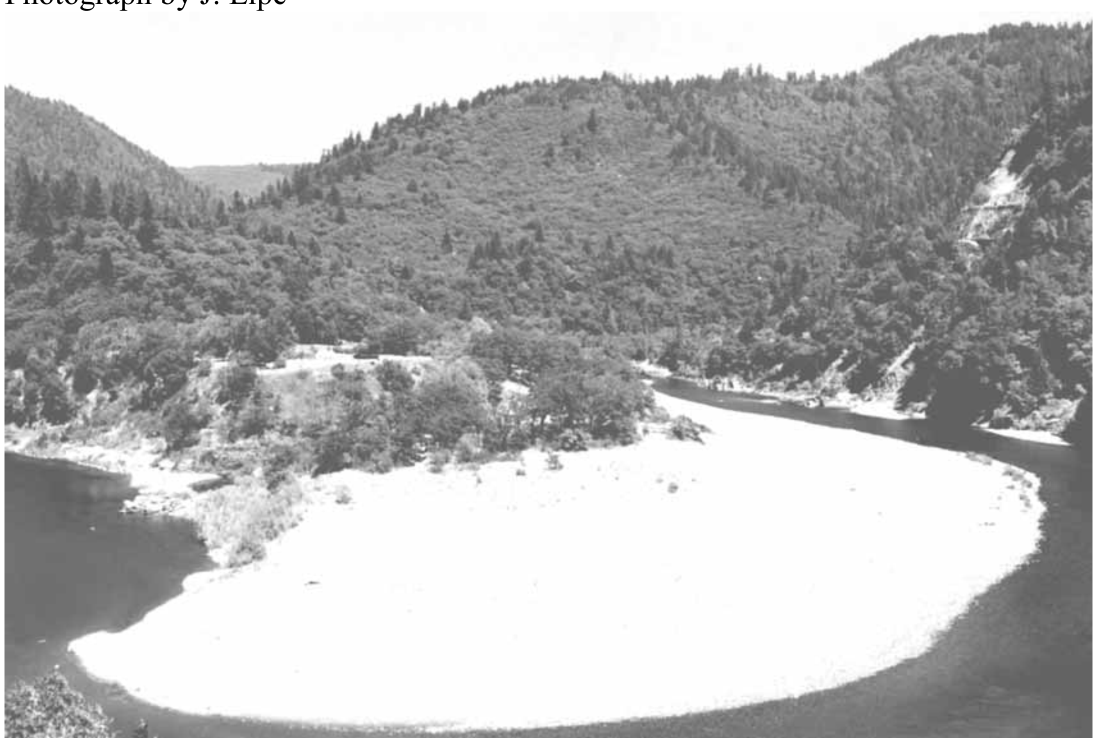


Figure 3.9a: Looking west from Big Rock to Orleans. Photographer A.W. Ericson circa 1894. "Birdseye View of Orleans/Scene in Humboldt. Co. No. 57"

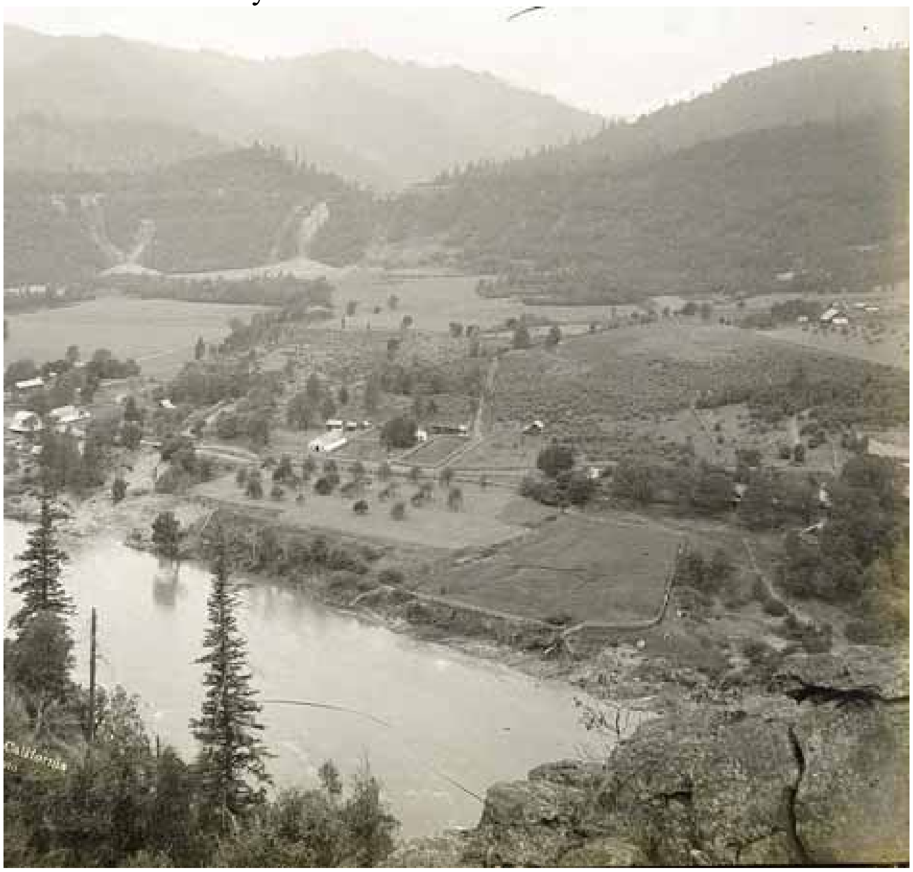


Figure 3.9b: Looking west from Big Rock to Orleans September 2006. Photograph by F.K. Lake

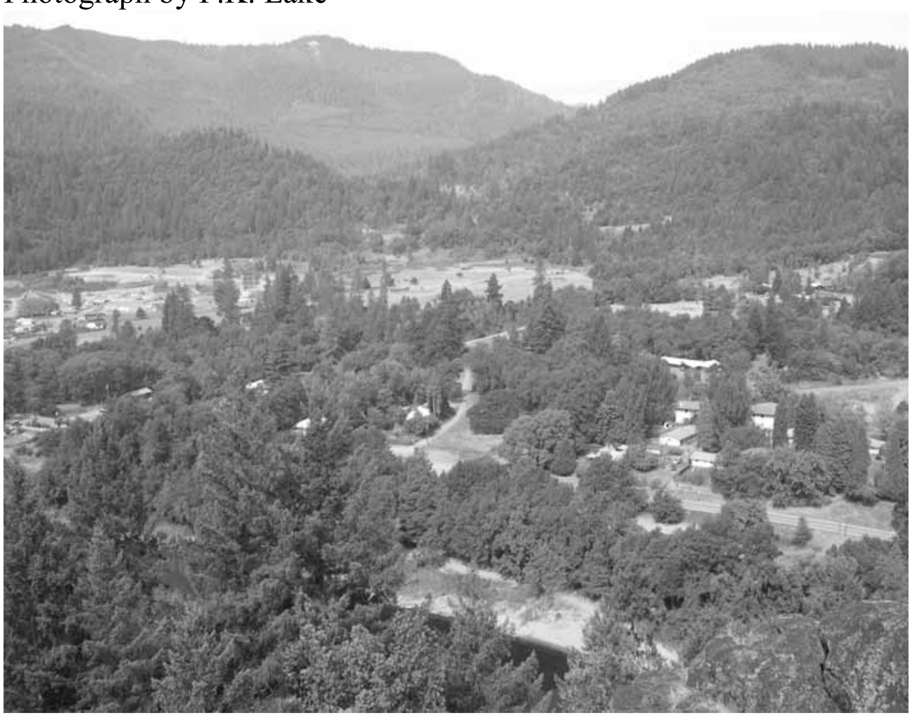


Figure 3.10a: Looking north, up-river from Big Rock, Orleans, CA. Circa 1894. Photographer A.W. Ericson. “View from Rattlesnake Rock, Orleans” No. 62

Figure 3.10b: Looking north up-river from Big Rock, Orleans, CA. in September 2006 Photograph by F. K. Lake

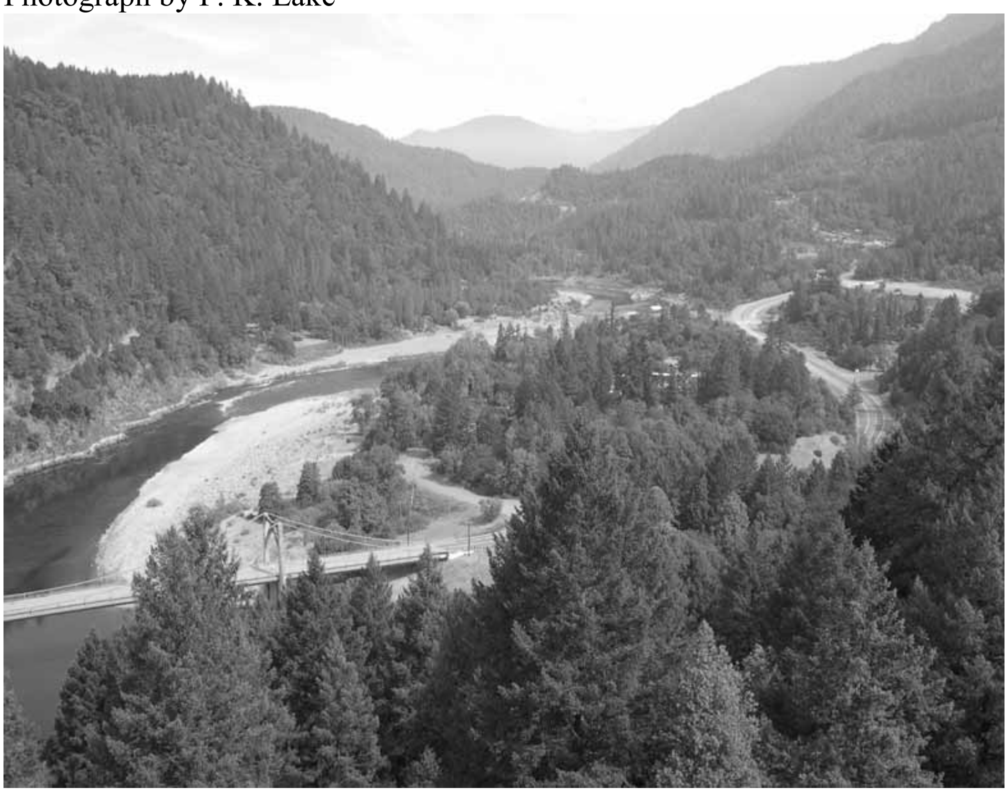


Figure 3.11a: Somes Bar: Sugar Loaf at the mouth of the Salmon River. Circa 1920s. Ruth K. Roberts Photograph Collection. RX23 Humboldt State University

Figure 3.11b: Sugar Loaf Mountain. August 2000 Photograph by J. Lipe

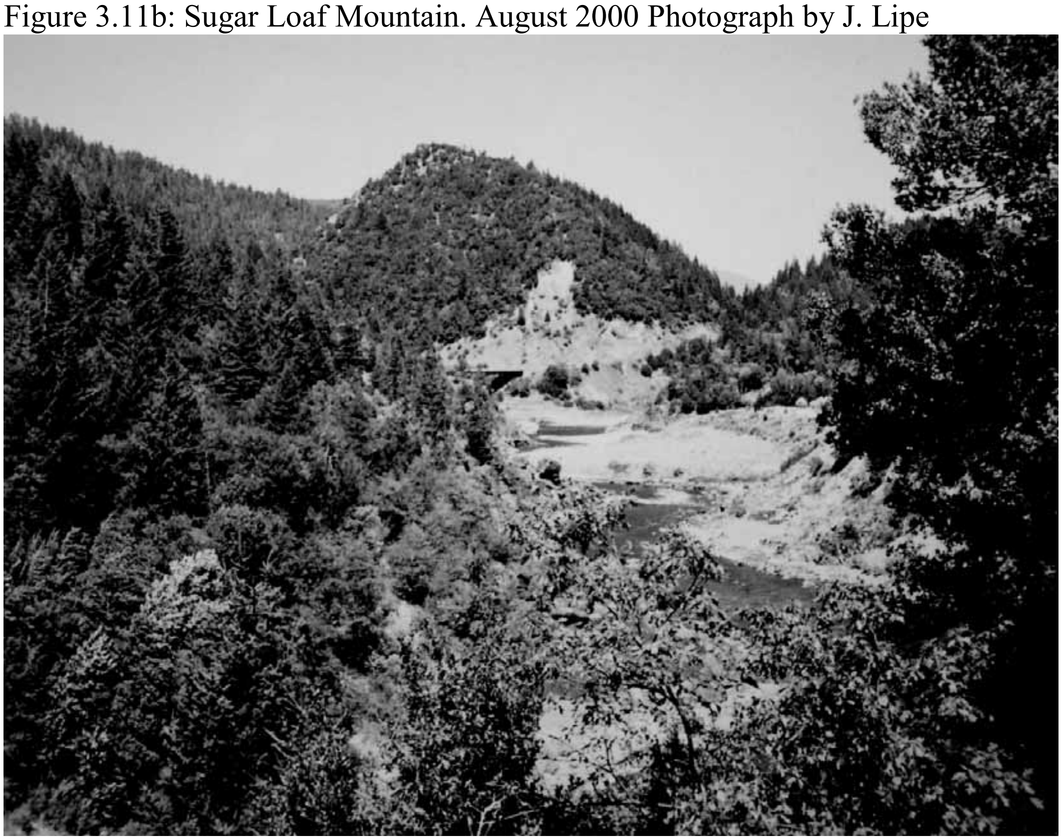


Figure 3.12a: Sugar Loaf Mt. Looking up-stream. 1907 Photograph by A. L. Kroeber No. 15-1396

Figure 3-12b: Sugar Loaf Mt. Looking up-stream. September 2006.
Photograph by F. K. Lake

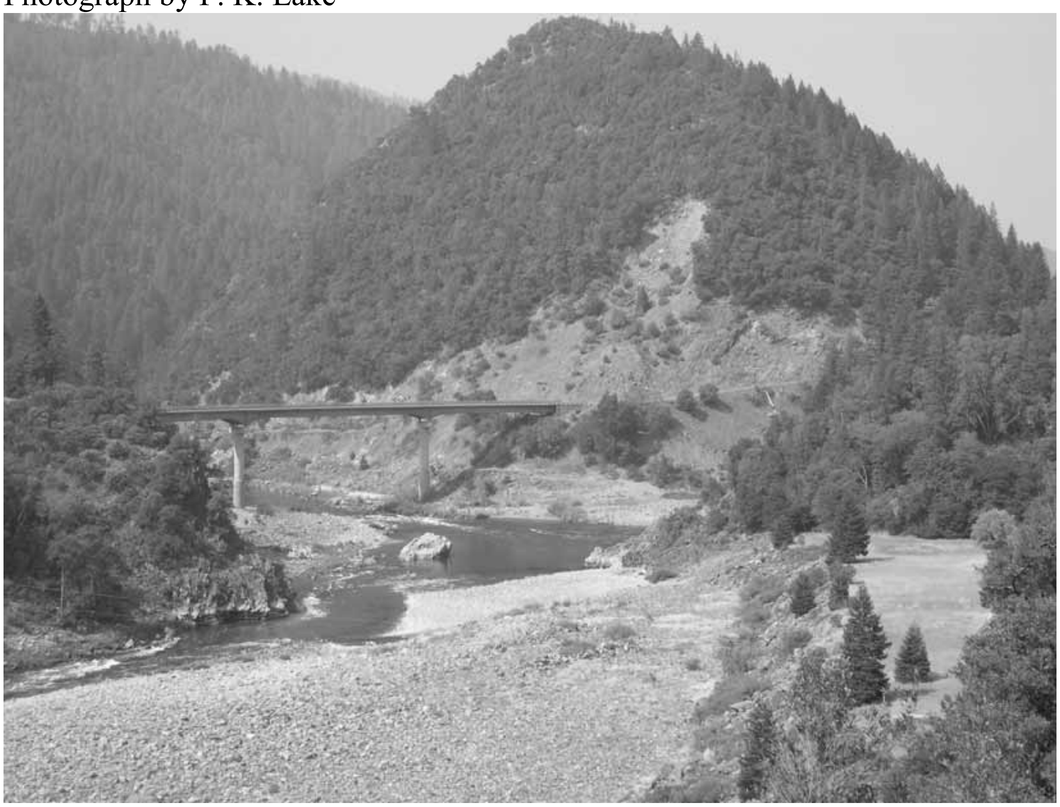


Figure 3.13a: Ike’s Falls. Looking up-river. Photograph by Ruth Roberts RX20 Somes Bar: Klamath River Scene. Humboldt State University. Circa 1920s.

Figure 3.13b: Ike’s Falls. Looking up-river. August 2000 Photograph by J. Lipe

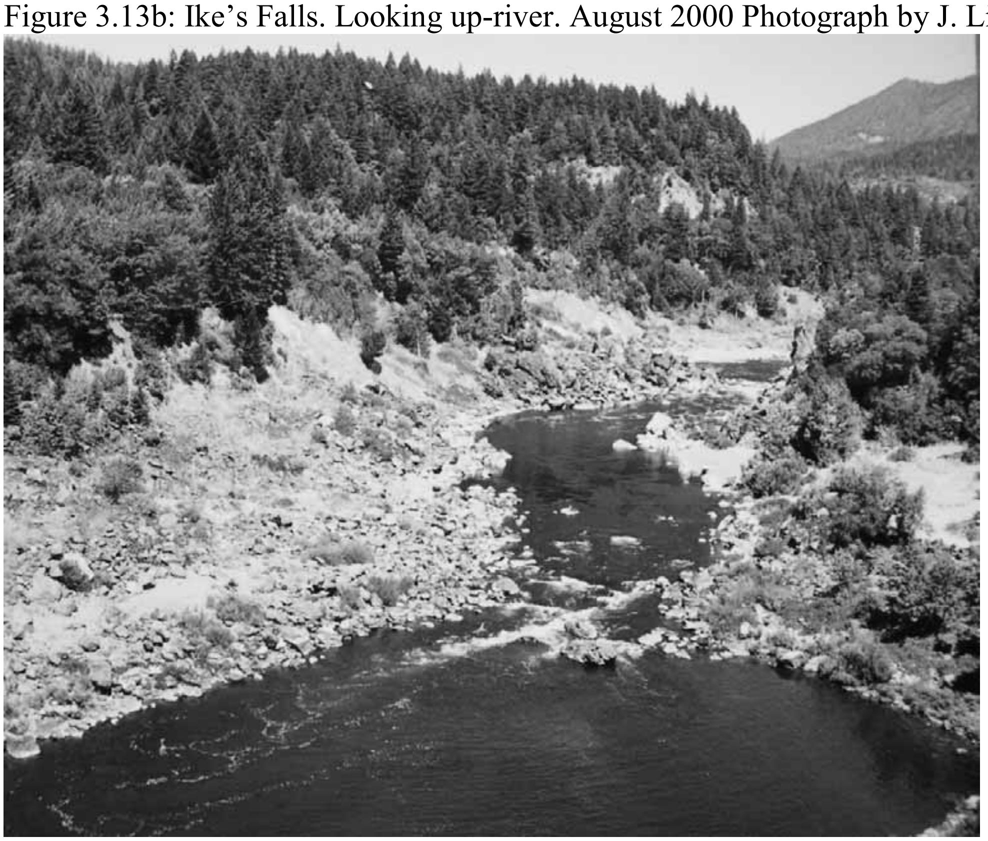


Figure 3.14a and b: Upper Ike's falls, looking down stream. 1920 versus 2000

Figure 3.14a: Ruth Roberts, Klamath River Scene, RX21. Circa 1920. Humboldt State University.

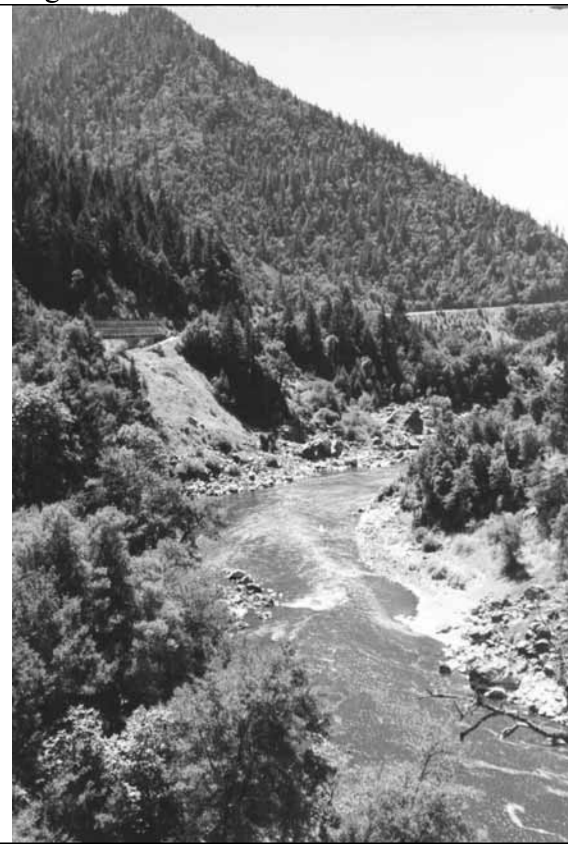


Figure 3.14b: Upper Ike's falls, looking down stream. August 2000 Photograph by J. Lipe

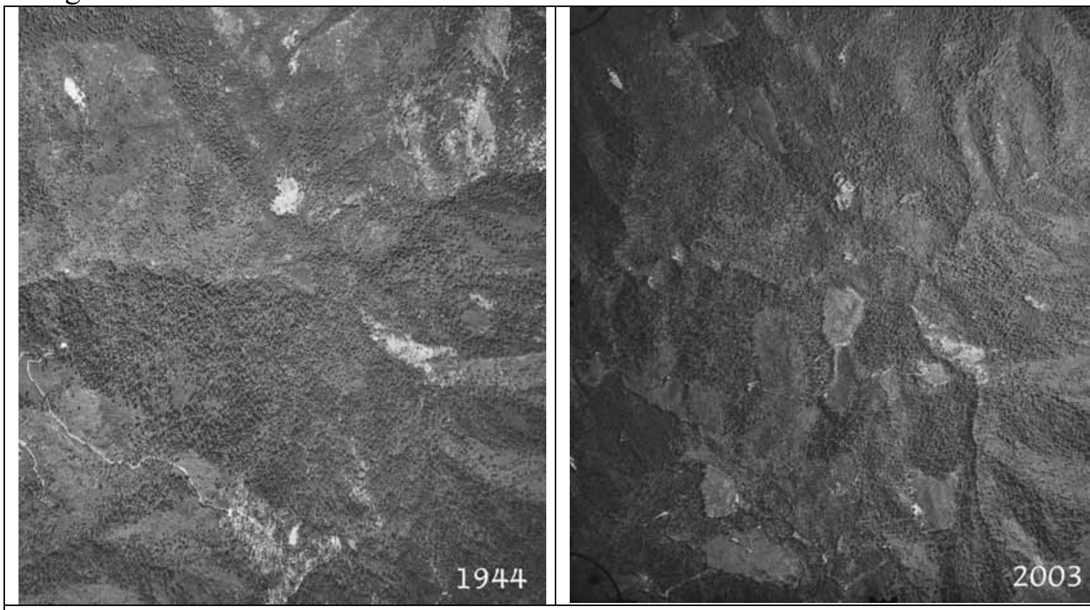
Figure 3.15: Deerhorn Mountain change over time between 1954 to 1990

Deerhorn Mountain-Lower Trinity River near Weitchpec 1954 (left) and 1990 (right), courtesy of California Indian Basketweavers Association

Figure 3.16: Orleans Valley, change over time 1944 to 2003

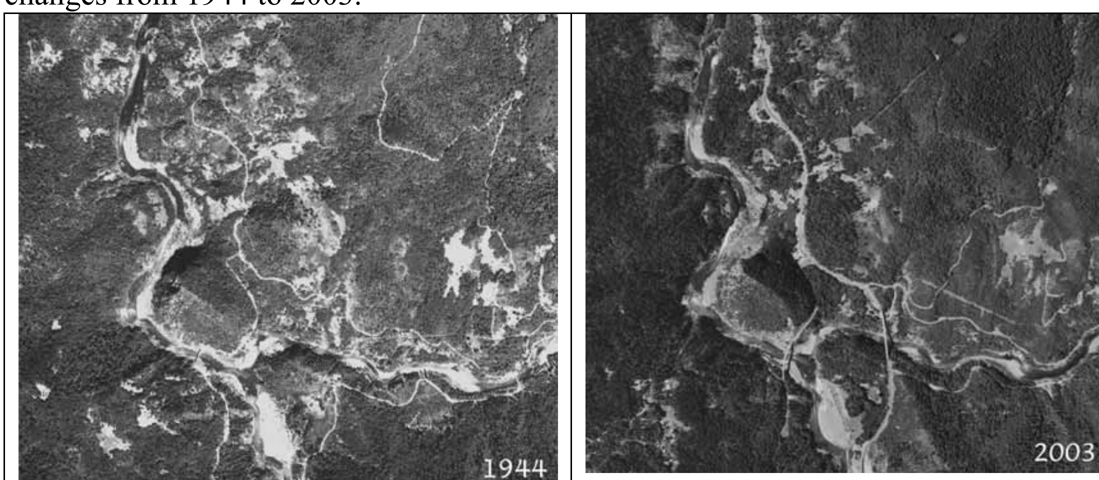
Orleans, Ca. Klamath River. Aerial photograph 1944 (left) compared to aerial photograph taken 2003 (right). T. Dunklin and F. Lake enhancement of USFS photographs courtesy of Mid Klamath Watershed Council.

Figure 3.17: Short Ranch and Rattlesnake ridge near Trail creek into Boise Creek change over time 1944 to 2003



1944 showing vegetation patterns (left) compared to 2003 showing vegetation patterns (right). T. Dunklin and F. Lake enhancement of USFS photographs courtesy of Mid Klamath Watershed Council.

Figure 3.18: Somes Bar near the Salmon-Klamath River confluence comparison of changes from 1944 to 2003.



1944 showing vegetation patterns (left) compared to 2003 showing vegetation patterns (right). T. Dunklin and F. Lake enhancement of USFS photographs courtesy of Mid-Klamath Watershed Council.

Figure 3.19: Klamath National Forest map 1928 (excerpt for Somes Bar to Weitchpec). Digital scan of original map courtesy of Ora Smith, Orleans, CA.

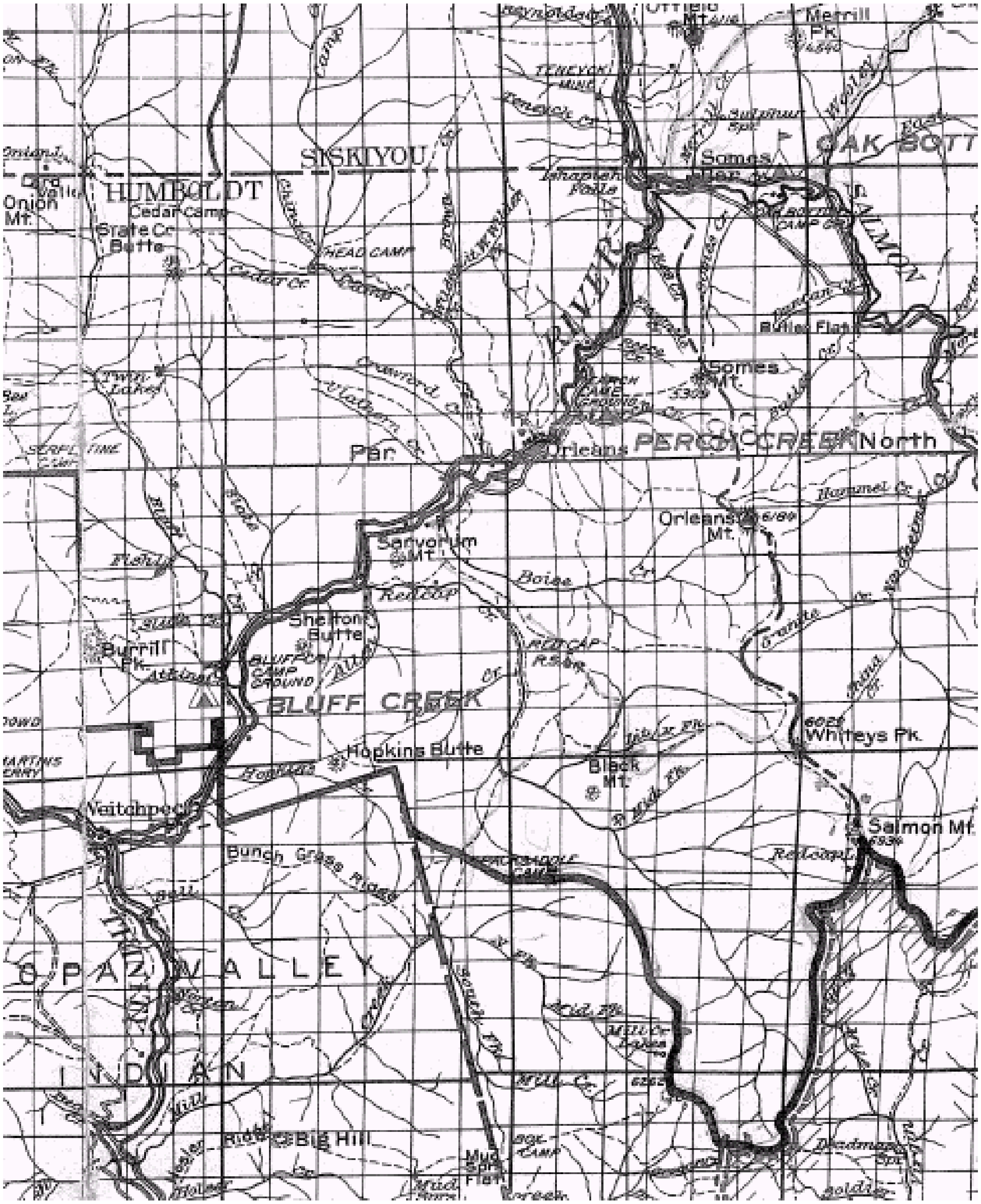


Figure 3.20**:** Lower-Mid Klamath Watershed Analysis Fire History by Cause 1910-2001

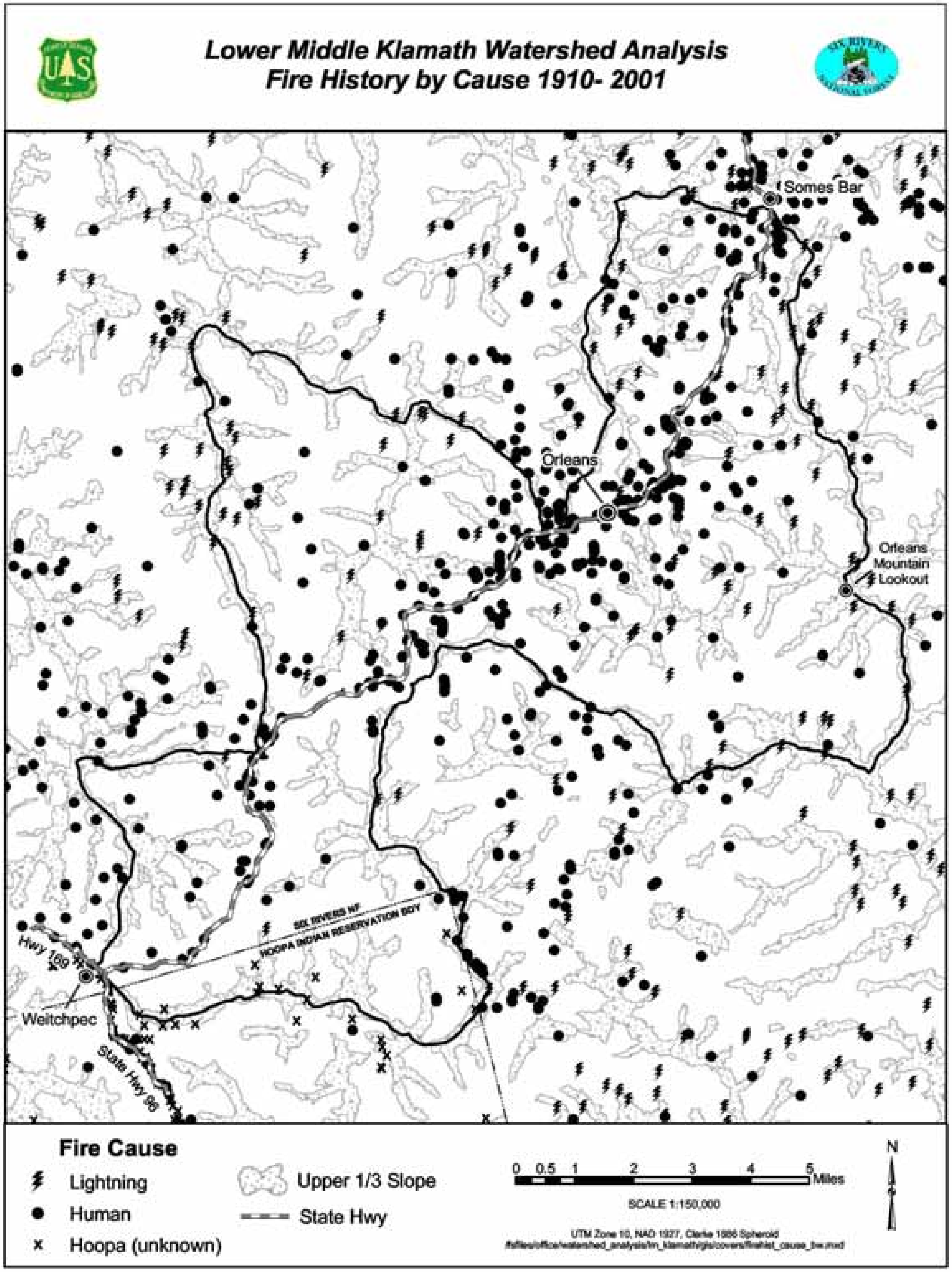
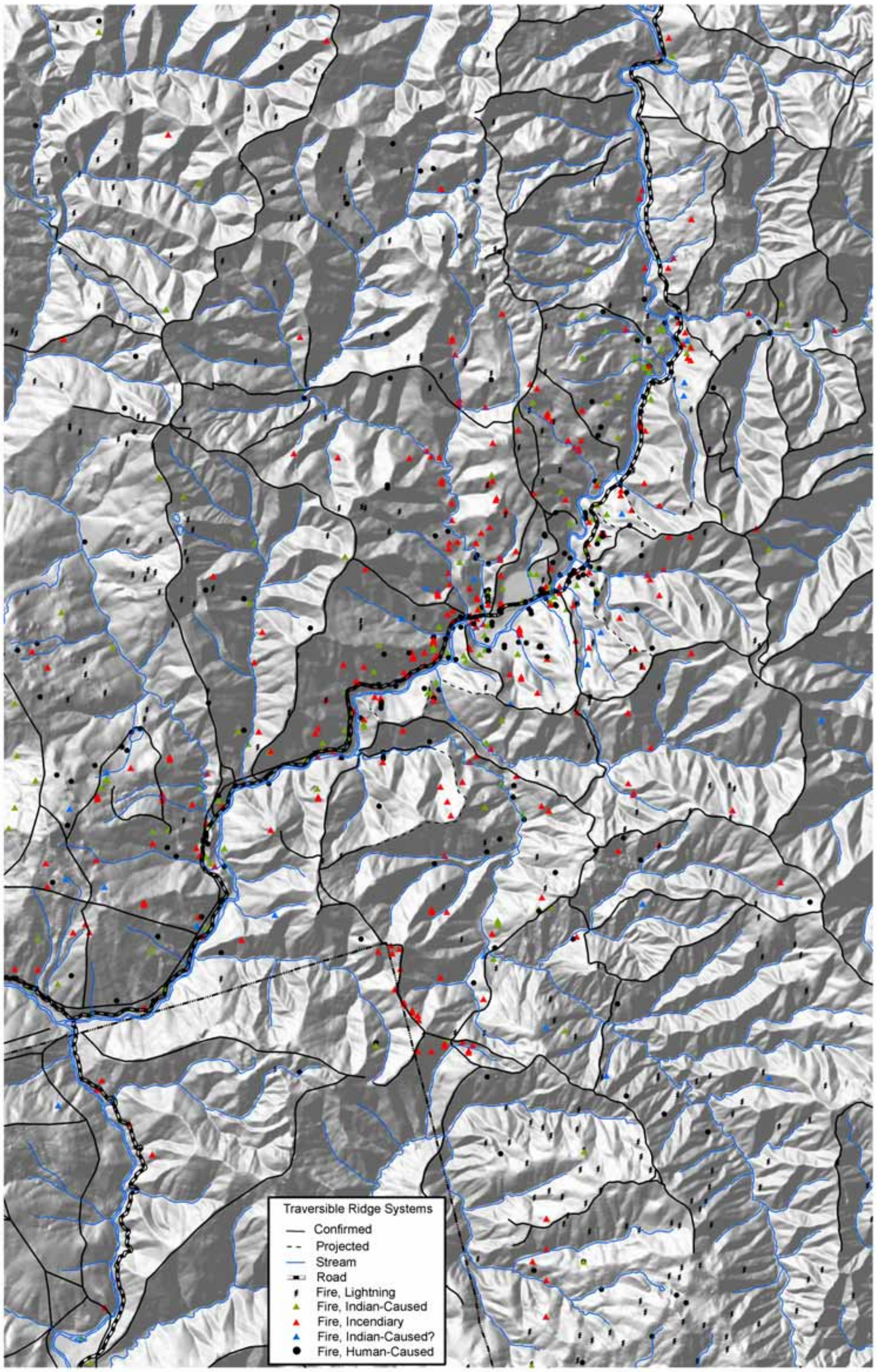


Figure 3.21: Case study area of mid-lower Klamath region with fires and traversable ridge systems utilized for burning and accessing culturally significant resource areas



Chapter 4: The effects of prescribed burning and flooding on vegetation characteristics, cultural, and ecological values of sandbar willow plant communities on the lower mid-Klamath River, northwestern California

Introduction

Sandbar willow (*Salix exigua* Nutt.) is an ecological and ethnobotanically important riparian plant species for Native Americans living along the lower mid-Klamath River in northwestern California. Sandbar willow is commonly used for basketry material, ceremonies, structures, and medicine (NRCS Web, Lake pers. obs.). Native American basket weavers historically managed sandbar willow with pruning or fire and continue these practices today (Heffner 1984, Anderson 1999, Glaze pers. com. 2002, M. McCovey pers. com. 2002, Reece pers. com. 2002). Although, the practices for rejuvenating *S. exigua* patches are culturally important, there has been little research of growth responses of sandbar willow to fire (USDA Forest Service-FEIS, Anderson 1999). Young willow stems that have sprouted from recent disturbance are preferred for basketry because of the straightness, length, pliability, and reduced insect damage to the shoots. Accessibility to potential stems is increased from sprouting at the ground level or lower branches. Sandbar willow is a vigorous and prolific shrub that responds well to moderate or periodic disturbance (Otternbreit and Staniforth 1992). This research focused on lowland valley outer-riparian terrace communities dominated by sandbar willow along the lower mid-Klamath River of northwestern California. Research demonstrated how prescribed burning and flooding changes the quantity and quality of sandbar willows for potential basket material and wildlife habitat. Of additional interest were the effects of disturbance on native and exotic plant species, changes in ground cover related to substrate composition pre- and post-fire and/or flooding. Research questions and analysis for this study were framed to address culturally and biologically relevant results.

This study was a collaborative effort between Oregon State University, Karuk Indigenous Basketweavers, and USDA Forest Service to understand the effects of prescribed fire on willows. However, the willow sites that received prescribed fire were subsequently flooded, which further modified the composition, structure, growth, and fuel types of the plant communities distributed along the lower mid-Klamath

River. The research is a case study involving three geographically separated sites. The study sites are similar in their topographic positioning and proximity to the main channel of the Klamath River, but varied in age. Vegetation was measured before and after prescribed burns and flooding at the three sites.

Background

Native Americans living along the lower mid-Klamath River utilized sandbar willow for various purposes, including: basketry, ceremonies, structures, and medicines (Heffner 1984, Davis and Hendryx 2004). Historically, permanent villages and seasonal camps were often up-slope and/or adjacent to sandbar willows patches (Bright 1978). Archaeological and ethnographic data document a long-term occupation and utilization of riparian resources by California native peoples (Mikkelsen and White 1981). Sandbar willow and black cottonwood (*Populus balsamifera* spp. *trichocarpa* Torrey & A .Gray) riparian communities were used for seasonal camping, fishing, gathering, trapping, personal, ceremonial, or other religious purposes (Davis and Hendryx 2004). Historical flooding also transported and deposited woody material along the riparian areas (Benda et al. 1998, Bilby and Bission 1998, Chapter 5). This wood was utilized as fuel by native people of nearby villages (Gifford 1939/1940, Kroeber 1976, Moore pers. com. 2007). In the years between floods, Native Americans used horticultural practices, such as pruning to foster the sprouting of willows (Anderson 1999, Anderson 2005).

<u>Mining and post-dam flows induced changes in the hydrological disturbance regime that affects willow community dynamics</u>

Hydraulic mining of river terraces from the 1850s to 1880s and in-river dredging from the 1920s to 1940s affected the configuration of the main-stem channel and edge habitats of the lower mid-Klamath River (Keir Associates 1991). Sandbar willow has been shown to be adapted to disturbance and can colonize areas affected by mining operations (Otternbreit and Staniforth 1992). Historical mining practices significantly increased the amount of sediment available for transport and deposition along the Klamath River and its tributaries, which likely contributed to geomorphic and vegetation conditions present today (Keir Associates 1991). Past mining impacts, compounded by flow management and water diversions of the Klamath River and many of its tributaries have further influenced the riparian geomorphic and vegetative condition (Higgins 1991).

Irrigation development and the establishment of flood control structures (dams) on the upper Klamath River and its tributaries affect river hydrology. The Klamath River has experienced fewer higher magnitude flooding events starting in 1918 with the construction of Copco I and II dams then followed by the construction of the Iron Gate dam in 1962 (Keir Associates 1991). Reductions in high magnitude flooding events, and moderation and regulation of the water flow fostered the expansion and establishment of sandbar willow along the main channel of the Klamath River (Glaze pers. com. 2002, M. McCovey pers. com. 2002, Salter 2003). It also allowed for the sandbar willow along outer terraces to mature, a process similarly documented on the Trinity River, a major tributary of the lower-Klamath River (DOI-BOR/USFWS Trinity River flow report 1999).

Riparian management and flow history

Prior to the construction of the dams in 1918 and other flow regulation structures on the upper-Klamath River, sandbar willow communities experienced disturbance from flooding, localized browsing by wildlife or livestock, and various uses from humans. Flooding was the dominant disturbance that affected community composition and structure of valley riparian communities (Pollock 1998). Historically, large magnitude floods redistributed and arranged the sandbar willow communities along the outer boundaries of the Klamath River flood zone. The magnitude of flooding events was episodic and nearly unpredictable from year to year since they resulted from regional climate and weather (Elford and McDonough 1964, NOAA and USGS Web page) patterns. However, floods have persisted since the first major post-American settlement in the Klamath Basin.

Floods were recorded in 1861, 1881, 1890 to 1891, 1900, 1926, and 1934 (Keir Associates 1991). Floods in 1955 and 1964 caused substantial structural and compositional changes to the Klamath River forested riparian lands (Ray et al. 1981). Figure 4.1 shows the peak flow graph of the US Geological Survey hydrology gage station in Orleans, California. The water flows that affected the study sites from Dec. 29, 2005 to Jan. 3, 2006 were near 150,000 cubic feet per second (cfs) at the Orleans USGS gage. Based on observations of changes for sandbar willow communities from this time period and the 1996/97 winter flood event, 150,000 cfs is sufficient flow to rejuvenate sandbar willow between Happy Camp and Weitchpec along the lower mid-Klamath River. Table 4.1 shows peak flows above 150,000 cfs. for the Orleans, Ca. USGS Hydrological Peak flow data from 1927 to 2005 record. The gage is located at USGS station number: 11523000, Humboldt County, California**,** Latitude 41°18'13", Longitude 123°32'00", with a drainage area 8,475 square miles**,** and gage datum 355.98 feet above sea level.

Table 4.1: Peak flows above 150,000 cfs at the Orleans, CA. USGS Hydrological Peak flow data from 1927 to 2006 record

Water Year	Date	Gage height (feet)	Stream Flow maximum cubic feet per second
1956	Dec. 22, 1955	59.40	202,000
1965	Dec. 22, 1964	76.50	307,000
1971	Jan. 17, 1971	30.96	190,000
1972	Mar. 03, 1972	32.82	191,000
1974	Jan. 16, 1974	37.24	279,000
1982	Dec. 20, 1981	30.07	201,000
1983	Dec. 17, 1982	29.88	198,000
1986	Feb. 18, 1986	37.16	278,000
1997	Jan. 01, 1997	37.79	258,000
2006	Dec. 31, 2005	Not available	156,000

Ziemer and Lisle (1998:60) state, “Although the largest floods are most important from a flood hazard standpoint, the influence of smaller more frequent floods cannot be discounted from a channel condition or ecological standpoint.” An important distinction in the type of flooding should also be made. The magnitude and frequency of flooding influences the capacity of a river system to transport sediment and organic material (wood) within the main channel and out onto the floodplain. The association between floods (as potential sediment transport), and sediment transport/deposition amount (the history of erosion) influence the capacity of flood events to alter "channels and floodplains, and to create channel refuge habitats, such as wood jams and side channels" (Benda et al. 1998:266). The severity (magnitude and duration) of flooding, coupled with basin level land management impacts (logging, road building, farming, or wildfires) can directly affect the condition of riparian communities (Keir Associates 1991). Other studies of riparian communities with the occurrence of sandbar willow in the semi-arid southwest region of North America have shown that the incidence of wildfire can increase following the post-dam era (Baker et al. 2004).

Other temporal and spatial conditions of riparian forests change when water flows are regulated by dams and water diversions.

> "Rates of establishment of pioneer trees downstream from dams are often slowed because of reduced flood magnitude and frequency and associated reduction in channel migration, and because of changes in the timing of flood events or high water periods. Dams that are managed for water supply capture spring runoff flows and release sustained high flows during the summer, thereby inverting the natural climatic pattern of high and low flows and preventing ecological processes such as establishment of spring-seeding plant species" (Baker et al. 2004: section 6.3.1).

The complexity of interactions between hydrology, geomorphology, and vegetation responses to regulated river conditions contribute to significant spatial and temporal variability in species distributions and reactions of riparian communities (Auble et al. 1994). Dams and other water diversions affect "downstream flows of water and sediment almost immediately, while channel adjustments take from tens to hundreds of years" (Baker et al. 2004). Improved understanding of in-stream flow requirements, ecological dynamics, and subsequent linkages to riparian vegetation, wildlife-fisheries habitat, and socio-cultural uses is needed by natural resources managers and the public (Doppelt et al. 1993, Anderson et al. 2006). Widespread changes in river channel form caused by modern industrial regulated hydrology and willow establishment not only affected wildlife and fisheries habitat but also Native American subsistence and ceremonial use patterns (Karuk Tribe FERC testimony submitted for public record, Salter 2003, Stercho 2006). Following each flood (Figure 4.1 and Table 4.1), the growth and sprouting naturally generated a large source of accessible and useable basketry material from which basket weavers or tribal practitioners would harvest.

Older more mature willows patches can be plagued by infestations of stem and gall insects (Price 1989). Insects that were on or bored into sandbar willow stems were collected in June of 2006 near Orleans, and identified as belonging to Cecidomiyiidae family-Rabidophaga species (gall midges) and Agromyzidae family (leafminer flies) (UC Davis Bohart Entomology Museum). Flooding, freezing, and fire can reduce insect infestations (Price et al. 1987, Price 1989). When flooding is of lower magnitude for a number of years and the weather milder, insect infestations can became epidemically widespread (Elford and McDonough 1964, Price et al. 1987). Pruning and fire was used by native people to reduce insect populations and rejuvenate willow sprouting during such epidemics.

Interviews with local tribal elders M. McCovey and L. Glaze in 2002 point out the use of fire by Native American people to maintain of sandbar willow communities (MM, LG, and FL refer to M. McCovey pers. com. 2002, L. Glaze pers. com. 2002, and F. Lake August 2000).

> **Interview August 22, 2002, Orleans, Ca.”** “MM: But around here [Orleans], by the time I was growing up, they were complaining about the river bars being buggy and that they should be burned but they didn’t do it. FL: So could you tell me a little, that’s one of the things I’m looking at is the willows burning. MM: We used to pick sticks for my grandfather and my aunt and uncle, help to pick sticks. FL: The willows (sandbar), *Paarak*? MM: The willows. And we used to do it down there at *Savarum* Bar. We used to pick for her. And they kept talking they needed to be burned because they were getting awfully buggy. But they didn’t do it. FL: Back in the old days when they could burn, what time of year would they burn the willows? Those ones along the river bar for the basket sticks? MM: I have no idea. I don’t remember when.

> FL: Yeah? MM: You have to find that out from someone else. FL: I want to know because for my project I'm doing the burning of the willows."
>
> **Interview August 2, 2002** FL: What about willow? [You have] been involved with some of the stuff down there at the bridge haven't you? Orleans bridge? LG: Yeah. I never heard of [it], I just recently hear people burning it. I know when we first started weavin', we had a lot more water in the river and it would come up and wash all those willows out, under the bridge, all over. I mean the river bed would be clean from anything. But now that we don't have the water, don't have the high water, it comes up and those willows just keep growin' into big trees now. FL: And before they used to be washed out? LG: Yeah. FL: So do you think they started burning willows as more like a response to not flooding as much? LG: Yeah because down at the bridge what they did, they burned that, those were getting to be, all buggy. FL: So that's one of the reasons they burned the willows is to get rid of the bugs. And a flood did the same thing? LG: Well, we had better sticks then. FL: Younger stuff, what I think it is, the younger material. LG: Yeah. I remember when we were out at Sandy Bar (Orleans), we used to, the water would come way up and we'd go up and watch it and it would just be boiling, you know. Taking all that stuff out. We could even hear the rocks movin'. But you don't see that anymore, not very often. Like those willows down there, they got a good root system now. FL: Yeah, they're anchored in there. So they only have one option, to burn them out? LG: And when they did that at T-Bar, those are pretty good sticks. FL: Do you remember what time of year they burned that? LG: I don't remember. I don't remember what time of year they burned that. I know I went up a year or so afterwards to pick sticks.

<u>Era of conservation, preservation, and restoration</u>

Under federal government management and control, the main stem Klamath River was designated as a part of the National and California Wild and Scenic River system in 1968 and 1981, respectively. These Acts are meant to protect scenic, recreational, geologic, fish, wildlife, historic, cultural, and related values (Doppelt et al. 1993a). The Wild and Scenic Rivers Act in 1968 was enacted by Congress to offset the pro-development effects of the Federal Power Act of 1920.

Further protection ensued in 1994 under the Northwest Forest Plan Aquatic Conservation Strategy (Klamath National Forest-Plan 2001, Six Rivers National

Forest LMKWA 2003). Federal management and subsequent “protection” resulted in limited operations or activities which could degrade or modify the condition of riparian habitat quality (Doppelt et al. 1993a). Under federal management, uses of sandbar willows communities (fish bearing streams/rivers) along the Klamath River are limited primarily to minimal-disturbance recreational activities, mining, camping, and prohibit firewood harvesting. Due to the importance of large woody debris in riparian systems, federal and state regulations prohibit the cutting or removal of woody material for domestic or commercial firewood (Ray et al. 1981), which is recommended as a means of protecting biodiversity attributes (Doppelt et al. 1993a). These last and most recent federal management designations have potentially limited Native American traditional cultural practices associated with ceremonial, subsistence, and artistic uses of willows.

Adoption and adaptive use of prescribed fire to emulate flooding disturbance

The revival and renewed interest in basket weaving by local Native Americans has expanded interest in the active management and utilization of sandbar willow communities. Prior to prescribed burns for this study, only a few areas at river access locations on federal lands were prescribed burned (Ti-Bar USFS river access and under the Orleans Hwy. 96 bridge) as projects between the USDA Forest Service and Karuk Indigenous Basketweavers. Other locations between Happy Camp and Weitchpec on private and federal property have also burned by either intentional or accidental fires.

Outer riparian terrace willow community use by wildlife and people

The ecological importance of willow dominated riparian communities in the Pacific West has been documented by Gregory et al. (1991) and Kauffman et al. (1997). Locally, sandbar willow habitat is used by many resident and migratory wildlife, and fish species using the Klamath River for migration, feeding, breeding, rearing, and protection from predators or physical conditions (Shasta River Coordinated Resource Management Planning Council-Total Maximum Daily Load process). Riparian zones are dispersal corridors and critical for some life history phases of many plant and animal species (Doppelt et al. 1993b, Kelsey and West 1998).

Contemporary human activities around sandbar willow habitats include: recreational rafting/boating, fishing, camping, wildlife viewing, and mining, as well as personal, subsistence and ceremonial use by Native Americans. Concerns arising from potential impacts from the multiple uses of sandbar willow riparian communities include modification of wildlife and fisheries habitat, scenic beauty, and invasive/exotic species (DeWalt et al. 1994, DiTomaso et al. 2006). Riparian areas are ecologically and socio-culturally significant areas on the landscape (Doppelt et al. 1993a).

Very little fire effects data exists on low-land valley riparian areas for the Klamath Mountains (Skinner 1997, Skinner 2002, Skinner 2003). Most studies on riparian areas have been retrospective tree ring analysis (Skinner 2002, Skinner 2003b, Dwire and Kauffman 2003), and have occurred on mountainous forested riparian zones. Local tribes and tribal community members share how certain riparian areas along the Klamath River corridor should be culturally managed (Salter 2003, Salter 2004, Karuk Tribe FERC testimony 2006). Trying prescribed burning of riparian areas with sandbar willow for cultural use is one desired outcome for management, preventing the spread of exotic/invasive weeds is another (DiTomaso et al. 2006, US Forest Service-Mid-Klamath Watershed Council projects).

<u>Native vs. exotic-invasive plant species</u>

Invasive exotic plants can substantially reduce the ecological quality of riparian habitats by changing conditions chemically, physically, and biologically (DeWall 1994, California Exotic Pest Plant Council plant list 1999, DiTomaso et al. 2006). Himalayan blackberry (*Rubus discolor* Weihe & Nees; *R. ameriacus*) is an invasive exotic shrub that has invaded and established in many sandbar willow dominated riparian communities. Himalayan blackberry provide significant wildlife cover and food (berries and young shoots as browse) as an understory component of mature sandbar willows. Salt cedar (*Tamarix ramosissima* Ledeb) if it gets established is a potential future threat to sandbar willow communities along the Klamath River, present elsewhere in California and the southwest United States (Hickman 1993, Glenn and Nagler 2005). This species is a strong competitor and has dramatically altered the disturbance regimes of other riparian communities with histories of water diversions, management, or regulation (Glenn and Nagler 2005). Much of the current condition of sandbar willow communities along the Klamath River involves high levels of infestation from invasive exotic plant species (California Exotic Pest Plant Council plant list 1999 compared to project site species present). Rhizomatous exotic invasive forbs can quickly colonize disturbed sandbar substrates. Introduced exotic annual grasses, such as ripgut brome (*Bromus* (*ridglus*) *diandrus* Roth), can increase fire ignition and spread potential (DiTomaso et al. 2006). Due to the riparian management interest involving exotic or invasive plant species (weeds) (DiTomaso et al. 2006), this study documents the changes in the proportion, percent cover, and density of native to exotic forbs and grasses found along transects within the three study sites.

Adaptive characteristics of riparian vegetation to natural and human disturbances

Riparian zones are dynamic environments influenced by multiple disturbances occurring in various frequencies and magnitudes. Western riparian zones, under natural flood regimes, "can be considered low-stress, moderate disturbance environments" (Glenn and Nagler 2005:423). Disturbance types and vegetation responses to disturbance can be a driving factor in the diversity of sandbar willow dominated communities. The response of vegetation to disturbances affects the quality and quantity of habitat for socio-cultural and wildlife uses. Fires synergistically interact with biophysical processes across ecological scales (patch to landscape), to influence the conditions and dynamics of geomorphology, hydrology, aquatic, and riparian communities (Dwire and Kauffman 2003). Plants and animals have developed strategies to maintain their dominance in riparian zones.

The Fire Ecology-Adaptations and Postfire Regeneration Strategy sections of the USFS-Fire Effects Information System for *Salix exigua* states:

> "Sandbar willow sprouts from its roots after fire. Its numerous wind-dispersed seeds are also important in revegetating burned areas. The high soil and fuel moisture content characteristics of its streamside habitat reduces the chance of fire ignition and spread." "Survivor species; on-site surviving root crown or caudex. Off-site colonizer; seed carried by wind, water, or animal postfire years one and two."

Other willow species such as the Scouler's (*S. scouleriana* Hook) willow also co-occur with sandbar willow. The genus *Salix* has species that are particularly adapted to a wide range of disturbance types. Willows are well adapted for flooding and fire effects. Willow seeds can germinate and establish on exposed mineral soil. Willows also sprout after physical damage, such as floods, herbivory, or fire, that has not destroyed the root system. The adaptive characteristics of willows enable them to successfully function as invaders, endurers, or resisters across a range of local conditions (Grime 1979, Naiman et al. 1998). Other species of plants, besides willow, exhibit single or multiple functional adaptations described by Grime (1979) to survive or establish after disturbance. The four categories (Naiman et al. 1998) are presented in Table 4.2.

Table 4.2. Plant functional adaptation traits

Category of survival type:	**Functional adaptations:**
"Invader"	Germinates an abundance of wind and/or water disseminated seeds
"Endurer"	Initiates growth of stems or roots after tissue is damaged or severed
"Resister"	Endures disturbances
"Avoider"	Not evolutionary adapted to disturbances of severe frequency or magnitude

Cottonwood is similar to willows in life history traits and riparian association, and exhibited similar adaptations and responses to fire (Gom and Rood 1999). "Avoider" type species are typically not associated with riparian zones, but may become established in flow regulated river systems when flooding disturbance is moderated. Adaptations that facilitate survival and presence for the other dominant plant species associated with the study sites are listed in Table 4.3.

Table 4.3: Ecological adaptations that promote persistence and recovery of riparian vegetation following disturbances: Fire and Flooding (modified from Dwire and Kauffman 2003:68, Grime 1979 in Naiman et al. 1998).

Adaptation: Type	**Classification and Function**	**Example of plant species**
Adaptations that facilitate survival		
Epicormic sprouting: Endurer (sprouting)	Growth from dormant buds on branches and stems protected by bark	Cottonwoods (*Populus* sp.), Oregon ash (*Fraxinus latifolia* Benth), Wild grape (*Vitus californica* Benth), Willows (*Salix* sp.)
Basal sprouting: Endurer	Growth from subterranean buds on roots, bulbs, lingo-tubers, and rhizomes	Willows, forbs, sedges (*Carex* sp.), grasses, horse tail (*Equisetum* sp.), dogbane (*Apocynum cannabinum* L.), Bouncing bet (*Saponaria officinalis* L.)
Thick bark: Resister	Protection of cambial tissues from heat damage	Douglas-fir, Ponderosa pine (*P. ponderosa* Laws.), Older mature willows for low to moderate intensity fires.
Adaptations that facilitate recolonization		
Windborne seeds: Invader	Deposition and establishment on post-fire or flood mineral/sand/silt soils	Cottonwoods, willow, Coyote bush (*Baccharis pilularis* DC.), willow herb (*Epilobium* sp.), dogbane.
Water-dispersed propagules: Invader	Dispersal of seeds or vegetative propagules on burned or flooded locations	Cottonwoods, willows, alders (*Alnus* spp.), Himalayan blackberry, sedges, rushes (*Juncus* spp.), tobacco (*Nicotiana attenuate* Torrey), mugwort (*Artemisia douglasiana* Besser).
Fire-Pruning-Browsing: Invader/Endurer (enhanced flowering and fruit production)	Increased reproductive effort in the years following disturbances	Geophytes, shrubs-Himalayan blackberry, herbaceous dicots, and grasses
Refractory seeds buried in soils: Resister	Resistant seed coat required fire or scarification to germinate	Lupine (*Lupinus* spp.), manzanita (*Arctostaphylos* spp.), *Ceanothus* sp., vetch (*Vicia* spp.)

Many of the same adaptations that plants exhibit in response to flooding or fire also result from Native American harvesting and management practices (Chapter 6, Anderson 1999, Anderson 2005). An important component of suitable habitat for some plant species are “safe sites.” Safe sites are described as areas of refuge from detrimental effects of too frequent or high intensities of disturbance, similar to the concepts diversity-stability or intermediate hypothesis (McCann 2000). Safe sites are related to habitat suitability, leading to reproductive or vegetative success of various animal or plant species. Suitable sites should be evaluated relative to other ecological processes across multiple evolutionary-ecological scales: individual-population and/or habitat-ecosystem (Auble et al. 1994, Peterson 2002).

Conditions and responses of fire and flood in sandbar willow riparian communities

Fire and flood regimes are two interactive processes that can exist synergistically across the landscape for riparian communities (Benda et al. 1998, Skinner 2002, Skinner 2003, Dwire and Kauffman 2003). Lowland valley sandbar willow communities are less affected by fire and are more influenced by flood regimes. Fire occurrence in sandbar willow communities result primarily from purposeful or accidental human ignitions. Lightning ignitions which spread from adjacent upslope areas are rare, but the potential exists (Six Rivers National Forest LMKWA 2003). For example, the spread of the Somes Fire on Aug. 20th 2006 down onto Somes Bar at the lower Salmon River resulted from lightning ignition and backfiring operations. Physical and biological characteristics of sandbar willow communities, in particular those on the upper terraces, are a mix of upslope species transitioning to riparian zone species. The physical and biological composition and structure of upper terraces are a unique floodplain-upslope "fringe" type ecotone, making them distinctive in both distribution and occurrence. The physical and biological characteristics in lowland valley sandbar willow communities influence fire behavior. Sandbar willow communities may serve as natural fire breaks, due to their proximity to surface water or high water tables (USFS-FEIS). The characteristics introduced in Table 4.4 are revisited when the effects of prescribed fire and flood are described.

Table 4.4 Riparian zone related characteristics which influence fire behavior and spread in low-land valley river bottoms (modified from Dwire and Kauffman 2003:64)

Fire risk factor	Riparian characteristics	Fire effect
Fuel loads: Woody debris Litter and duff	High fuel loads due to high net primary productivity; accumulation of fuels due to low fire return intervals, flood debris accumulation/removal	High or low fuels loads can increase or decrease vulnerability to fire in drought or potential burning conditions, influence fire severity, intensity, and return intervals
Fuel moisture content: Live: vegetation Dead: 1, 10, 100, 1000 hour	High fuel moisture content due to proximity to water, shallow water tables and dense shade. Topographic position	Fuel loads may remain too moist for ignition success and/or sustained fire spread
Fuel continuity: Disturbance patterns Distribution arrangement	Active channels, gravel bars, and wetlands can function as natural fuel breaks and/or	Breaks in fuel continuity can prevent or hinder the spread of fire

	concentrate fuels (driftwood/wood rat nest)	
Topographic position Proximity to human settlements Water's edge vs. upper terraces	Canyon-valley bottoms, lowest points on the landscape, proximity to water	High fuel moisture, high relative humidity, and few lightning strikes may decrease fire frequency and severity; more human-caused ignitions may increase fire frequency
Microclimate: Valley floor position relative to solar interception Understory vs. open exposed site Increased soil/vegetation moisture	Topography, presence of water and dense shade can create cooler, moister conditions	High relative humidity and cool temperatures may lessen fire intensity and rate of spread. Seasonal variation may increase (summer-early fall) or decrease (late fall-winter-spring) susceptibility to ignition and fire spread

The interactions between vegetation adaptive traits (Table 4.3) and fire risk factors that influence riparian characteristics (Table 4.4) are affected by natural and human causes. Such interactions are not easily described. However, Figure 4.2 shows the potential influence of interactions among physical, biological, and socio-cultural factors on the dynamics of sandbar willow dominated lowland valley riparian zones in the mid-lower Klamath River (modified from Dwire and Kauffman 2003).

Rationale for the Research

Riparian willow communities along the lower mid-Klamath River have experienced a reduction in the intensity, duration, and frequency of disturbance as a result of water management (flood control) and fire suppression policies (Salter 2003, Salter 2004). Cultural burning of riparian willow communities is believed to reduce accumulated plant biomass (fuel), reduce insect infestation, and promote sprouting of young shoots preferred for basket weaving (Anderson 1999, Lake personal observations). Based on observations following accidental or arson fires, prescribed fire would likely modify the composition, structure, and growth of vegetation in riparian willow communities (USFS FEIS) to a condition more suitable for Native American basket weavers.

Studying the effects of fire on sandbar willow to enhance cultural uses is of value to tribal groups in the Pacific West who utilize the species for basketry (NRCS web site, Anderson 1999). The effects of prescribed fire, flooding, and the combination of the two disturbances on the composition, structure, and density of vegetation and fuel load is of interest because it relates to the ecological condition and socio-cultural uses for the species. Results of this and similar research can have policy management implications for the riparian communities throughout the region (Skinner 1997).

Experimental Goals and Objectives

Previous studies indicate that fire increases the number of young live willow stems while reducing the number of older decadent mature stems (USFS FEIS-*Salix exigua*). Burn plans were developed to implement the prescribed fire treatment for this research. The USFS management at the ranger districts established their own management goals and objectives for the prescribed burns. The results of research were used to evaluate attainment of those management targets. The goals of the USFS Klamath National Forest, Happy Camp Ranger District as stated in the approved Prescribed Burn Plan for the Independence Willow Burn, under Section 3. Resource Management Goals and Objectives were "Reduce competitive blackberries by 80%, Retain < 25% total soil cover, and willow root crown mortality less than 10% (Burn plan page 9 of 29). The goals of the USFS Six Rivers National Forest, Orleans Ranger District stated in the Prescribed Fire Burn Plan Willow Research Project, under section 3. Resource Management Goals and Objectives "As a research project, this project will examine effects of traditional Native American cultural management practices on growth of sand bar willow and the ecological effects of treatments on sand bar willow communities. The research will use fire to treat willow plants and then monitor the willows for response to treatments" (Burn Plan page 5 of 32).

The overall objectives of this research were to assess empirically the effects of prescribed fire on: (1) The number of sandbar willow stems by size class and live status at three study sites, (2) Changes in density or cover of native or exotic grasses and forbs, and substrate composition, (3) Differences between fire and flooding on the structure, composition, and use-values of sandbar willow communities.

Hypotheses

The hypotheses of interest and research questions for this study were:
H_1: Shrubs: Is there an effect of prescribed fire coupled with flooding on the number and relative frequency of sandbar willow and Himalayan blackberry by size class (small, low, medium, tall, and very tall) in relation to status (live/dead), before and after disturbance (prescribed fire and flooding).
H_2: Substrate, forbs, and grasses: Will prescribed burning/flooding affect the density of cover type expressed as a change in mean percent cover.
H_3: Native and exotic forb and grass species: Are there effects of native/exotic status (live/dead) and prescribed burning/flooding on the mean percent cover (class)?

For this study, composition is defined as the assemblage of native and exotic shrub, forb, and grass species by status. Status is defined as the (live or dead) condition of the vegetation before/after prescribed fire and flooding. Status was described primarily for shrubs, compared to grasses and forbs which were considered "seasonally alive" at time of sampling. Structure is defined as the number of stems per size class. Fire behavior, and fire effects on plant species are included in this study. A culturally meaningful response of the prescribed fire would kill or consume a significant portion ($P\text{-value} < 0.05$) of taller willow stems resulting in a reduction in the mature size classes (tall and very tall) of willow shoots emerging at ground level. Secondly, prescribed fire/flooding should induce sprouting of willows, increasing the number of young willow stems (size classes: small, low and medium) compared to before fire and flooding disturbance.

Methods

<u>Study site selection</u>

Three sites occupied with sandbar willow, and were selected to study fire effects. These sites; Independence, Ullathorne, and Big Bar, have river access for recreation and were chosen among other sandbar willow patches along the lower mid-Klamath River. Each site was well suited for a localized case study. Project areas were also where Native people in the local community were interested in having prescribed fire experiments conducted. Site selection was based on the following criteria: 1) Accessible location to Native basket weavers, 2) Bordered by roads that serve as fuel breaks/fire lines, and 3) Likelihood of being burned again by US Forest Service for future basket material enhancement.

All sites were on the outer river riparian terrace, were determined to be representative of sandbar willow communities in the local area. The sites are similar to other historical and contemporary stands utilized by local Native people (Heffner 1984). Each willow patch (site) is approximately 80 meters in length and 30 meters wide (2400 meters^2), with slight topographic variation. The sites varied in age, with mature taller willows ranging in age from 8 to 32 years old. All study sites are located in northwestern California, USA on the Klamath and Six Rivers National Forests.

Study sites

Independence Bar: T 15N, R 7E, Section 30, 41° 39'34.51" N, 123°27'03.87" W, elevation 872 feet. Ullathorne: T 10N, R 5E, Section 2. 41° 17'14.84" N, 123°34'18.08" W, elevation 348 feet. Big Bar: T 10N, R 5E, Section 17 41° 15'09.32" N, 123°38'09.67" W, elevation 318 feet . The areas receive between 101 centimeters and 152 cm (40-60 mean inches/year) of annual precipitation (RAWS Station: 048346 SOMES BAR 1 W, http://www.wrcc.dri.edu, note: records not complete, missing data for temperature and precipitation). Annual temperatures vary from winter 0ºC (32 F) min-15.5ºC (60 F) max, to summer 16ºC (60ºF) min-44ºC (110ºF) max (NOAA, RAWS station Somes Bar) (Figure 4.3, Data is smoothed using a 29 day running average). Soils are predominately sand-silt flood deposition overlying river cobble or bedrock. Figure 4.4 show project areas excerpted from the USFS Klamath National Forest recreation map

Vegetation Sampling

The methodology used in this study was modified from FIREMON fire effects monitoring protocol (FIREMON Draft v2.0.). Vegetation consisting of shrubs, forbs and grasses were surveyed pre- and post-disturbance by belt transects with quadrats sampling procedures according to FIREMON DENSITY (DE) methods. Data collection occurred during the early summer months of June-July, when foliage and flowering facilitated species identification and determination of living or dead status. Native and exotic shrubs, forb, and grass species were determined at the time of surveys or following sampling from dried samples (Hickman 1993, NRCS http://plants.usda.gov/plantguide/). Sampling transects were established through each willow stand with quadrats imbedded in a modified belt sampling method (FIREMON Draft v2.0.-DENSITY final draft). This sampling method can be used when fire and land managers need to monitor changes in density or cover of vegetation (FIREMON Draft v2.0.).

The FIREMON density method worked well for sampling grasses, forbs, shrubs, and small trees that could be easily separated into individual plants or stems as counting units (FIREMON Draft v2.0.). The FIREMON Density (DE) method was used to evaluate changes in plant species density and height. This method uses multiple quadrats and belt transects to sample within plot variation and quantifies valid changes in plant species density and height over time. Plant status, live or dead, is qualitative and susceptible to surveyor error, but provides a sufficient characterization of pre-burn plant health and post-burn plant survival.

Transects and quadrats were installed in September 2002, and had two years to recover from any disturbance associated with installation. Each site was systematically divided into seven transects spaced at 10 meter parallel intervals perpendicular to river access roads. Iron rebar was installed to establish the endpoints of transects which traversed the width of the willow patch. During transect installment, a compass bearing was used to maintain the straightest line possible between end points. Variation in the topography of the three sites required transects of variable length and number of quadrats per transect. Transects were between 16 and 30 meters long to accommodate site conditions related to distance between access road to break-in-slope. Vegetation data along each transect and within quadrats were collected four months before the prescribed fire treatment (pre-), and sampled again eight months after prescribed burning (post-). An increment measuring tape was stretched from each transect end and willow stems emerging at ground level within a 1-meter belt were surveyed. Along belt transects each shrub stem emerging within 5 cm of ground level was counted. Information regarding the number of willow stems, their corresponding height size classes, and growth status was recorded prior to the burn treatment in the summer of 2004 and summer 2005, then following prescribed fire in the summer of 2006. Sampling of shrubs stem/shoot heights were measured and examined for status.

Density was calculated as the number of individuals per unit area using the area of the sampling unit, quadrat or belt transect summed for the site. Herbaceous plant species were sampled using quadrats while shrubs and trees were sampled with belt transects. Plant species size classes represent the structure of the willow riparian community. Size classes for shrubs, grasses, and forbs were characterized by height. FIREMON uses a size class stratification based on the ECODATA sampling methods (Jensen et al. 1993). Shrub, forb, and grass, and size class codes were: SM=Small (<0.5 ft. height, <0.25 m height), LW=Low (0.5 - <1.5 ft., 0.25 - <0.5 m height), MD=Medium (1.5 – <4.5 ft., 0.5 – <1.5 m height), TL=Tall (4.5 – <8 ft., 1.5 – <2.5 m height), and VT=Very Tall (8+ ft., 2.5+ m height). Only the size classes of shrubs along belt transects were used for statistical analysis, while size classes assigned to herbaceous material (forbs, grasses, and mosses) were used for qualitative information. Since every shrub stem across the site was not sampled, the stems within transects were summed together to provide total frequencies. The shrub stems/shoots were determined to be dead or living (Status) at time of sampling, pre- and post-prescribe fire or flooding (Burn). Status was (D=dead, L=living). The main factors of interest for vegetation changes were the effects of fire and flooding disturbance on the mortality, structure, and growth of shrubs. The scope of inference for this study should be limited to a statistical population of three sandbar willow patches located on the lower mid-Klamath River between Happy Camp and Weitchpec (Figure 4.3).

Quadrats for sampling herbaceous plants were systematically spaced five meters apart along transects after an initial randomly selected starting point. At each quadrat, density of each species was determined and the percent cover visually estimated. Density and percent cover were used to examine which native or exotic plants were most abundant within the three sites. The main variables of interest for quadrats were "percent cover" of "cover type" being the species or type of substrate, and "cover class" as forb or grass being native or exotic, "counts" (used for density), and “treatment” as pre- and post- sampling events. The cover type of each quadrat was characterized by type of substrate, and species of forb or grass. Substrate primarily consisted of duff-litter, sand-silt, wood, and rock-gravel. Forbs and grasses were identified to species if possible. Species names were entered into the USDA-Natural Resources Conservation Service Plants database to classify as native or exotic for analysis (http://plants.usda.gov/index.html). Additionally, each forb and grass species, including unknowns (e.g., forb 1) was assigned an exotic cover class designation because the majority of identified species were exotic.

Percent cover was used to analyze changes in pre- and post-disturbance for forb, grass, and moss species, exotic or native species of forbs and grass and substrate type. The dependent variable was “percent cover” for “cover type.” Presence and relative abundance of the species (composition) was also determined.

Characteristics of sampling sites

Independence Bar had a total transect length of 203.6 meters. This value equates to an average transect length of 29.1 meters and 2036.3 m^2, or 10 percent of the total area. Area of quadrat plots for forbs, grasses, and substrates sampling was 38 m^2, about 2 percent of potential vegetation of the site. Ullathorne had a total transect length of 207.5 meters. This value equates to an average transect length of 29.6 meters and 2072 m^2, or 10 percent of the total area. Area of quadrat plots for forbs, grasses, and substrates sampling was 40 quadrats (40 meters^2), about 2 percent of potential vegetation of the site. Big Bar had a total transect length of 182.5 meters. This value equates to an average transect length of 26.1 meters and 1827.7 m^2 or 10 percent of the total area. Area of quadrat plots for forbs, grasses, and substrates sampling was 37 m^2 about 2 percent of potential vegetation of the site**.**

Experimental Design

Prescribed fire ignition patterns determine localized fire effects in willow patches

Figure 4.5 depicts the experimental design used to study community-level responses to prescribed fire: a) Pre- and b) Post-Burning at the Independence, Ullathorne, and Big

Bar project sites that include fuel breaks consisted of existing roads and hand constructed fire lines. The perimeter of each site had surface vegetation (fuels) removed along a one meter strip (fuel break/fire line) to prevent unintended fires from burning the plots and stands before treatment application, and to clearly mark the treatment area. Along the center of the fuel breaks a half-meter wide strip cleared completely of above and below ground vegetation (stems and roots) exposing bare mineral soil was constructed. Fire ignition involved the use of drip torch, "chuckers" (a type of hand thrown explosive), and propane torch. Technical ground support consisted of fire engines/pumpers and fire crews with hose lines and hand equipment from the USFS-Six Rivers and Klamath National Forests. Project locations were accessible for safe prescribed burning, and defensible against possible escape of fire off the project site. Fire severity as Low, Moderate, and High classification is based on percent of area charred and amounts of fuel/biomass consumed in a fire event was estimated (DeBano et al. 1998). Fire intensity was visually determined from observations and photographs taken during prescribed fires. Fire intensity across the sites is inferred using percent crown scorch, percent area of trunk scorched/burnt, flame height, residence times, and temperatures of locations at specific locations above and below the surface. The percent composition of fuels remaining or consumed was measured (Chapter 5) and used to calculate fire severity.

Burn treatment and flooding event effects

Independence

Independence was the oldest and most mature site. The structure and composition was a dominant overstory of willows that established after the 1974, 1983, and 1997 flooding events. Ten very tall mature willows were cut, cross-sectional slabs (less than 3 cm thick) were then air and oven dried (25 °C for 8 hours), sanded (220 grit), and growth rings counted (Table 4.5).

Table 4.5: Age classes of very tall mature willows at Independence

Sample #	Tree Rings (number of) /Age (years)	Average diameter (centimeters)
1	12	10.3
2	21	9.6
3	10	11.45
4	13	11.3
5	33	16.3
6	31	15.1
7	14	10.15
8	23	10.15
9	10	8.4
10	9	5.8
N = 10	Mean age: 17.6	Mean diameter: 10.86 cm

Fire description

The Independence site was burned on October 6, 2005 at 2:00 to 4:00pm. The burn was ignition pattern driven under mild local weather conditions resulting in variable consumption of fuels (Chapter 5). Local project site fire weather taken on a Kestrel 4000 at 2:00 pm in full sun on the river access road, northeastern corner of project area, at the beginning of ignition was: Temperature of 25.6 degrees C (78 degrees F), Winds of 0-1.5 miles per hour (mph), Relative Humidity of 37%, Wet Bulb of 17 degrees C (62.6 degrees F), and Dew Point of 7.3 degrees C (45.2 degrees F). Weather Observations for 10/06/05, which were provided by fire personnel, are shown in Table 4.6. See Appendix H for conversions or input numbers directly in English or metric in to http://www.uwsp.edu/geo/faculty/heywood/Util/ComfortCalculator.htm.

Table 4.6: Weather observations during the Independence prescribed burn

Time	Location	Wet bulb	Dry bulb (temperature F°)	RH	Aspect	Wind: miles per hour
1430	South end	60	72	50	NE shaded	0-1 up-canyon
1500	South end	60	71	53	NE shaded	0-2 westerly
1530	South end	62	74	58	NE shaded	1-2 up-canyon
1600	South end	62	72	58	NE shaded	0-1 up-canyon

Ignition pattern was started with drip torches at the southwest corner, nearest Hwy 96. Fire personnel ignited the study site at the slope edge, backing fire down the hill below the highway into the willow patch. This created an upper burned-out fuel break which burned grass, and blackberries then into the willows and sedges. Flame lengths were 0.5 to 2 meters (1 to 6 feet) tall with the higher flare-up occurring in the Himalayan blackberry clumps which had grass underneath. Sitka-Silver willow and Oregon ash (*Fraxinus latifolia* Benth.) dominated sites were hard to ignite due to dense canopies and high fuel moisture contents. Ignition moved to the up-river/northern end of the project boundary. Sedge (*Carex* sp.)/poison hemlock (*Conium maculatum* L.) micro-sites had "flashy" flame lengths 2-3.5 meters (7-10 feet) tall which then quickly dropped to less than 0.5 meters (< 1.5 feet). Drip torch ignitions in the grass/star thistle (*Centaurea solstitialis* L.) on the side closest to the river/eastern-southeastern carried fire faster and more intensely. Grass and star thistle ground cover with younger willows carried fire rapidly into the older mature willows near the center of the willow patch. Flame heights were 0.5-5 meter (1-15 feet) high consisting of rapid flare ups, then dying down after a few minutes is shown in Figure 4.6 of the Independence prescribed burn. The rate of spread was estimated at 5 meters/minute or less for 30 to 50 meters across the site. Older mature willows with broken down tops had flame lengths of 0.5-5 meter (1-15 feet) high, with an estimated rate of spread of 1 meter/30 seconds or less. The ignited edges pulled the flames into the center of the site creating more intense heat and fire behavior in that area. Approximately, fifteen percent of the area burned with high severity, 45% moderate, 30% low, while 10% was unburned as determined by post-fire estimations and photographs (DeBano et al. 1998). Of the total sampled area, 90% was influenced by fire in some way.

The burned area was inundated by flood waters from December 29, 2005 to January 3, 2006. The peak discharge for the nearest USGS gage approximately 37 miles at Seiad, CA. USGS #11520500, was 74,000 cubic feet per second on December 31, 2005 (http://nwis.waterdata.usgs.gov/nwis/peak?site_no=11520500&agency_cd=USGS&format=html, accessed June 26, 2007). Flooding waters washed away ash and charred surface debris and deposited sand/silt and smaller woody material. A river access/levee protected the project site from direct flooding velocity, making the site a backwater eddy during higher flow conditions.

<u>Ullathorne</u>

Ullathorne was the youngest site. The structure and composition of this site had dominant overstory willows which were established after the 1997 flooding events. Ten very tall mature willows were cut, (less than 3 cm thick) were then air and oven dried (25 °C for 8 hours), sanded (220 grit), and growth rings (Table 4.7). Figure 4.7 shows very tall mature Ullathorne willows stalk cut and polished with tree rings with the fire scars of the two prescribed fires.

Table 4.7: Age classes of very tall mature willows at Ullathorne

Sample #	**Tree Rings (number of) /Age (years)**	**Average diameter (centimeters)**
1	8	3.75
2	9	5.35
3	9	6.1
4	9	6.1
5	8	5.6
6	10	6.1
7	10	6.55
8	9	6.15
9	10	8.1
10	10	8.4
N = 10	Mean age: 9.2	Mean diameter: 6.22 cm

<u>Fire description</u>

Ullathorne experienced the effects of a 45% surface area partial test prescribed burn in October 2004. That fire was not extensive across the site due to high moisture levels. Ullathorne was burned again on October 11, 2005 from 1:00 to 3:30pm. Local project site fire weather taken on a Kestrel 4000 at 12:45pm at the beginning of ignition were: Temperature of 24.7 degrees C (76.5 degrees F), Winds of 2.5-3.5 mph, Relative Humidity of 39.9-40.3%, Wet Bulb of 14.3 degrees C (57.7 degrees F), and Dew Point of 8 degrees C (46.3 degrees F).

Ignition pattern started at the up-hill side of the willow patch along the river access road. Drip torch ignition was conducted in diagonal strips, 1-2 meters (3-6 feet) apart against the wind in the grass/star thistle with sparse young willows. Drip torch ignition was then applied towards the river side/eastern-southeastern portion of the project site creating a circular column flame front. The flames of the Ullathorne prescribed burn carried towards the center of the willow patch preheating and consuming areas of blackberries with an overstory of taller willows (Figure 4.8). Former pockets of fuels consisting of old flood debris and wood rat nests that were partially consumed in the October 2004 attempt of a prescribed burn were consumed in the 2005 prescribed fire. Ground surface areas with bouncing bet (*Saponaria officinalis* L.), a rhizomatous invasive weed, reduced fire behavior and slowed the rate of spread.

The burn was ignition pattern driven under mild local weather conditions resulting in variable consumption of fuels. Approximately five percent of the area experienced high severity, 40% moderate, 50% low, and 5% un-burnt as determined by post-fire ocular estimations and photographs (DeBano et al. 1998). Of the total sampled area (2400 meters^2) 95% was influenced by fire. The same area was inundated by flood waters from December 29, 2005 to January 3, 2006. The peak discharge for the nearest up-river USGS gage, approximately 1 to 2 miles upstream at Orleans, was estimated at 150,000 cfs. resulting in flood waters entering the formerly burnt willow patch. Flooding waters washed away charred surface debris and deposited sand/silt and smaller woody material.

<u>Big Bar</u>

Vegetation at Big Bar was younger than Independence, but older than Ullathorne. The structure and composition of this site as a result of floods has dominant overstory willows which were established after the 1997 and 1983 flooding events. Eleven very tall mature willows were cut, cross-sectional slabs (less than 3 cm thick) were then air and oven dried (25 °C for 8 hours), sanded (220 grit), and growth rings counted (Table 4.8).

Table 4.8: Age classes of very tall mature willows at Big Bar

Sample #	**Tree Rings (number of) /Age (years)**	**Average diameter (centimeters)**
1	23	12.1
2	23	10.45
3	22	8.75

4	21	4.7
5	11	5.2
6	22	7.4
7	19	6.7
8	17	5.7
9	17	4.15
10	10	4.7
12	10	4.7
N = 11	Mean age: 17.7	Mean diameter: 6.77

Fire description

Big Bar was burned on October 24, 2005 at 1:30pm-4:00pm. Local project site fire weather taken on a Kestrel 4000 at 2:00pm at the beginning of ignition were: Temperature of 23.6 degrees C (74.5 degrees F), Winds of 1.0-3.0 mph, Relative Humidity of 48.3%, Wet Bulb of 15.2 degrees C (59.3 degrees F), and Dew Point of 10.9 degrees C (51.6 degrees F). Conditions 3:15pm at the end of ignition were: Temperature of 26.4 degrees C (79.5 degrees F), Winds of 1.2 mph, Relative Humidity of 38.7%, Wet Bulb of 16.4 degrees C (61.5 degrees F), and Dew Point of 10.4 degrees C (50 .7 degrees F). A test fire along the up-river/northern side of the project site was conducted then extinguished. The burn was ignition pattern driven under mild local weather conditions resulting in variable consumption of fuels. Ignition patterns consisted of firing out a black line (burned out buffer) along the Hwy 96 road shoulder down the slope, backing into the willow patch. Then the upper river/northeast-northwest ends of the project site were ignited against the wind. The grass/star thistle flame lengths were 1-2 meters (3-6 feet) high with a rate of spread estimated at 1 meter/30 seconds or less. During the Big Bar prescribed burn the willow/Himalayan blackberry dominated areas had flame heights of 1-8 meters (3-25 ft.) during flare-ups, with the more intense areas being adjacent to the grass/star thistle and proximity to drip torch ignition (Figure 4.9).

Other internal areas of the willow patch with mature willow overstory and dense blackberry understory were ignited with "chuckers" and due to the higher fuel moisture barely burned. Some of these same internal areas were burned with propane torch to induce fire spread, but fuel consumption was minimal other than wood rat nests and drier surface litter. Fire behavior was less intense due to internal pockets of higher moisture. Drip torch ignition where blackberries could be penetrated was low intensity and very slow rate of spread, often extinguishing in shadier/damper areas. Approximately five percent of the area experienced high severity, 30% moderate, 40% low and 25% unburned as determined by post-fire visual estimates and photographs. Of the total sampled area (2400 meters^2) 75% was influenced by fire.

The same area was inundated by flood waters from December 29, 2005 to January 3, 2006. The peak discharge for the nearest up-river USGS gage at Orleans was estimated at 150,000 cfs. resulting in flood waters entering the formerly burnt willow patch. Flooding waters washed away charred surface debris and deposited sand/silt and significantly more woody debris than was at the site pre- or post-fire.

Statistical Analysis

The experimental units for this study were the sandbar willow patches (sites) with transects or quadrats as subsamples. Only one treatment was applied, which was the prescribed burn; and subsequent flooding was referred to as the variable "treatment." The experimental unit (site) was subjectively chosen from a range of possible sites along the lower mid-Klamath River in which the study could be reasonably conducted. Data consisted of "Counts" of shrub stems or shoots by "Size class" and "Status" for each "Transect" for "Location" and "Year." Values from each transect were then summed in order to obtain a single total value for each site, as well as individual transects per site. Transects were placed systematically and parallel to each other to provide a more uniform sampling of the sandbar willow patches (sites). A potential limitation in the analysis resulted from some individual willow shoots along the transects being repeated measures, pre- and post-prescribed fire-flooding, resulting in some level of positive correlation among individual counts causing a partial violation of the assumption of independence from which log-linear models were derived. Statistical software package (SAS 9.1). Proc Mixed was used to compare the pre- and post-burn/flooding observed differences of vegetation composition, cover, and structure. Proc Mixed was also used to analyze shrub stems counts for size class and status. Proc Mixed was used to compare fixed effects using analysis of covariance with repeated measures (with a compound symmetry covariance structure) was used to conduct an analysis of vegetation quadrat data to test for any changes in percent cover of species or cover types of native or exotic origin. Degrees of freedom were approximated using the Satterthwaite method. Density counts of individual forbs and grasses per quadrat were correlated with percent cover of each species. Percent cover was subsequently determined to be more indicative of change as a result of disturbance than density. Mean percent cover for each species of forb and grass for all quadrats within transects per site was used as the variable of analysis for detecting significant changes between pre- and post-fire/flood.

Additional analysis was conducted on changes in cover types separated by substrate type, forb, and grass. Proc Mixed (SAS 9.1) was used to test percent cover as a function of treatment (fire/flooding), with the variable transect as random with repeated measures on the individual quadrats within transect allowing for a simple serial correlation across the transect, and calculations for least square means (LSMEANS) for treatments. Differences of least squares means analyzed significance of "cover type" from the effect of treatment pre- and post-. For the three sites vegetation quadrat data was analyzed as the dependent variable "percent cover," covariance structure was first-order autoregressive for neighboring quadrats within the same transect., and estimation method was restricted maximum likelihood (REML) with degrees of freedom determined from the containment method.

Class level information for each of the sites was:

Independence had Class level information for analysis consisted of the variables; "transect" with seven levels, "quadrat" with "28 levels," "treatment" with two levels (post- and pre-), and "native or exotic status" with two levels (exotic or native).

Ullathorne had Class level information for analysis consisted of the variables; "transect" with seven levels, "quadrat" with "29 levels," "treatment" with two levels (post- and pre-), and "native or exotic status" with two levels (exotic or native).

Big Bar had Class level information for analysis consisted of the variables; "transect" with seven levels, "quadrat" with "29 levels," "treatment" with two levels (post- and pre-), and "native or exotic status" with two levels (exotic or native)

Native versus exotic species significance for changes in percent cover of forb and grasses was calculated using SAS version 9.1 Proc Sort by “cover class,” transect, quadrat, treatment, and native/exotic. Then SAS (version 9.1) Proc Means was used to summarize all data by cover class, transect, quadrat, treatment, native/exotic by the variable percent cover where output was totals as sums of percent cover. Proc Mixed (SAS 9.1) by “cover class” tested the models of interaction between treatment and native/exotic with Degrees of Freedom approximated using the Satterthwaite approximation, and transect as a random effect with repeated measurement taken at neighboring quadrats on the transect following a first-order autoregressive error structure. Least-squares means calculated for the variables treatment, native/exotic status, and interactions of treatment*native_exotic. The dependent variable was “percent cover”, with a first-order autoregressive covariance structure using the quadrat within transects as the repeated measurement along the transect, using the REML estimation method, and the Satterthwaite approximation for the degrees of freedom.

Standard F-tests tested the significance of the effect of native, exotic, and/or treatment for “cover class” forb or grass. Type 3 tests of fixed effects analyzed the interactions of Native, Exotic and Treatment for “cover class” of forb and grass. The SAS (version 9.1) Proc Mixed procedure tested the significance in the change in cover class type (forb or grass) and the difference in change between the two as a “cover class.” Change in percent exotic and native cover, and difference in changes were tested for significance at each of the three sites.

There are several limitations of the data used in analyses. The first is that the data was collected without complete randomization. The second limitation is that the data only reflect species within the sampling planes or area of transects and quadrats that do not completely make up the full range of substrates, tree, shrub, forb, or grass species present in the sandbar willow patches along the lower mid-Klamath River. The third limitation is that data analysis of the effects of prescribed fire and flooding on vegetation and substrate only pertain to these three sites. Although, these sites are reflective of the types of sandbar willow habitats and the scope of inference would apply to valley sandbar willow outer terrace communities along the lower mid-Klamath River between Happy Camp and Weitchpec, CA.

Age class variation among sites of (tall and very tall) sandbar willow indicated that Independence and Big Bar sites were similar in mean age, with the Ullathorne site being younger. The Independence site was more variable in the ranges of age classes present. Mean age and size of selected willows from the three sites are presented in Table 4.9.

Table 4.9: Comparison of sites using very mature, tall, willow ages and diameters

Site	Number of samples	Stand. Dev.	Mean Age:	Mean Diameter (cm):
Independence	10	8.90	17.6	10.86
Ullathorne	10	0.79	9.2	6.22
Big Bar	11	5.20	17.7	6.77

Results

Results of Independence pre-burn and post-burn for Willow Size and Status are shown by Figure 4.10a. Ullathorne Pre-burn and Post-burn for Willow Size and Status are shown in Figure 4.10b. Big Bar Pre-burn and Post-burn for Willow Size and Status are shown in Figure 4.10c. Independence Pre-burn and Post-burn for Himalayan blackberry stem surveyed along belt transects for Size & Status are shown in Figure 4.11a. Ullathorne Pre-burn and Post-burn for Himalayan blackberry by Size and Status of stems is shown in Figure 4.11b. Big Bar Pre-burn and Post-burn for Himalayan blackberry by Size and Status of stem is shown with Figure 4.11c.

<u>Counts totals of transects for sandbar willow by size class and status</u>

Table 4.10 sandbar willow shoots from 2004 and 2005 are compared to post-prescribed fire and flood in 2006. Combined counts by size class and status of young growth that could be potentially useable for basketry is shown.

Table 4.10: Size classes of small, low, medium willows that were dead or live sampled within belt transects.

Site: Size classes small, low and medium	Status: Dead	Status: Live	Year
Independence	8	2	2004
Independence	0	0	2005
Independence	0	34	2006
Ullathorne	44	99	2004
Ullathorne	71	332	2005
Ullathorne	32	334	2006
Big Bar	43	33	2004
Big Bar	46	39	2005
Big Bar	24	453	2006

The variables location (Independence, Ullathorne and Big Bar) and year (2004, 2005, and 2006) were analyzed and compare the effect of each variable and their interactions for sandbar willow and Himalayan blackberry (Table 4.11).

Table 4.11: ANOVA Significance of interactions for sandbar willow (*Salix exigua*) and Himalayan blackberry (*Rubus armeniacus*) by size class and status across all three sites

Species	Status	Size class	Effect	Degrees of Freedom: Numerator/ Denominator	F-Val.	P-Val.
Salix exigua	Dead	medium	Location	2/54	13.4	<0.000
Salix exigua	Dead	medium	Year	2/54	3.6	0.034
Salix exigua	Dead	tall	Location	2/54	14.7	<0.000
Salix exigua	Dead	tall	Location*Year	4/54	3.2	0.019
Salix exigua	Dead	very tall	Location*Year	4/54	3.6	0.010
Salix exigua	**Live**	**low**	**Location**	**2/54**	**26.6**	**<0.000**
Salix exigua	**Live**	**low**	**Year**	**2/54**	**17.9**	**<0.000**
Salix exigua	**Live**	**low**	**Location*Year**	**4/54**	**6.3**	**<0.000**
Salix exigua	**Live**	**medium**	**Location**	**2/54**	**11.7**	**<0.000**
Salix exigua	**Live**	**medium**	**Year**	**2/54**	**7.2**	**0.002**
Salix exigua	**Live**	**small**	**Location**	**2/54**	**11.5**	**<0.000**
Salix exigua	**Live**	**small**	**Year**	**2/54**	**7.8**	**0.001**

Salix exigua	**Live**	**small**	**Location*Year**	**4/54**	**4.9**	**0.002**
Salix exigua	Live	tall	Location	2/54	10.7	0.001
Salix exigua	Live	tall	Year	2/54	5.3	0.008
Salix exigua	Live	tall	Location*Year	4/54	3.9	0.007
Salix exigua	Live	very tall	Location	2/54	8.5	0.001
Salix exigua	Live	very tall	Year	2/54	16.2	<0.000
Rubus armeniacus	Dead	low	Year	2/54	3.4	0.039
Rubus armeniacus	Dead	tall	Location	2/54	3.1	0.052
Rubus armeniacus	Dead	tall	Location*Year	4/54	4.7	0.002
Rubus armeniacus	Live	small	Location*Year	4/54	6.3	<0.000
Rubus armeniacus	Live	tall	Location	2/54	5.0	0.010
Rubus armeniacus	Live	tall	Year	2/54	7.2	0.002
Rubus armeniacus	Live	very tall	Location	2/54	5.2	0.009

Examination of the significant interactions for location and years for all three sites is presented in table 4.11. Important values to address hypotheses are noted in bold for sandbar willow size classes. Location, year, and the interaction of location and year were found to all be similarly significant, making the distinction influential variables difficult.

Table 4.12: Least Square Means data for the interaction of location and year by size class (Attributes found to be significant p-value < 0.05).

Species	Status	Size class	Effect	Location	Year	Mu = back log transformed counts	Mu Standard Error
Salix exigua	Dead	low	Location	Big Bar		0.429	0.179
Salix exigua	Dead	low	Location	Independence		0.100	0.073
Salix exigua	Dead	low	Year		2004	0.323	0.156
Salix exigua	Dead	low	Year		2006	0.218	0.116
Salix exigua	Dead	medium	Location	Big Bar		4.236	0.842
Salix exigua	Dead	medium	Location	Ullathorne		5.604	1.066
Salix exigua	Dead	medium	Year		2004	3.047	0.551
Salix exigua	Dead	medium	Location*Year	Big Bar	2004	5.024	1.255
Salix exigua	Dead	medium	Location*Year	Big Bar	2005	5.657	1.377
Salix exigua	Dead	medium	Location*Year	Ullathorne	2004	5.512	1.352
Salix exigua	Dead	medium	Location*Year	Ullathorne	2005	7.786	1.787
Salix exigua	Dead	medium	Location*Year	Ullathorne	2006	4.100	1.078
Salix exigua	Dead	small	Location	Big Bar		0.100	0.069
Salix exigua	Dead	small	Location	Independence		0.132	0.082
Salix exigua	Dead	small	Location	Ullathorne		0.199	0.116
Salix exigua	Dead	small	Year		2004	0.132	0.082
Salix exigua	Dead	small	Year		2005	0.199	0.116
Salix exigua	Dead	small	Year		2006	0.100	0.069
Salix exigua	Dead	tall	Location	Big Bar		4.699	0.963
Salix exigua	Dead	tall	Location	Ullathorne		4.386	0.899
Salix exigua	Dead	tall	Year		2004	2.216	0.433

Salix exigua	Dead	tall	Year		2005	2.086	0.476
Salix exigua	Dead	tall	Year		2006	3.014	0.586
Salix exigua	Dead	**tall**	**Location*Year**	**Big Bar**	**2004**	**3.646**	**0.988**
Salix exigua	Dead	**tall**	**Location*Year**	**Big Bar**	**2005**	**3.380**	**0.931**
***Salix exigua**	Dead	**tall**	**Location*Year**	**Big Bar**	**2006**	**8.418**	**1.932**
Salix exigua	Dead	tall	Location*Year	Ullathorne	2004	3.409	0.944
Salix exigua	Dead	tall	Location*Year	Ullathorne	2005	5.742	1.408
Salix exigua	Dead	tall	Location*Year	Ullathorne	2006	4.311	1.127
Salix exigua	Dead	very tall	Year		2006	2.042	0.516
Salix exigua	Dead	very tall	Location*Year	Big Bar	2006	2.626	1.095
Salix exigua	Dead	very tall	Location*Year	Independence	2004	2.356	1.002
Salix exigua	Dead	very tall	Location*Year	Ullathorne	2005	2.852	1.168
Salix exigua	Dead	very tall	Location*Year	Ullathorne	2006	2.397	1.015
Salix exigua	Live	low	Location	Independence		0.204	0.121
Salix exigua	Live	low	Location	Ullathorne		7.445	1.066
Salix exigua	Live	low	Year		2006	6.167	1.341
Salix exigua	Live	**low**	**Location*Year**	**Big Bar**	**2006**	**21.233**	**6.489**
Salix exigua	Live	**low**	**Location*Year**	**Ullathorne**	**2004**	**2.861**	**1.057**
Salix exigua	Live	**low**	**Location*Year**	**Ullathorne**	**2005**	**12.483**	**3.896**
Salix exigua	Live	**low**	**Location*Year**	**Ullathorne**	**2006**	**11.555**	**3.641**
Salix exigua	Live	medium	Location	Big Bar		3.103	1.149
Salix exigua	Live	medium	Location	Ullathorne		8.720	3.058
Salix exigua	Live	medium	Year		2006	4.712	1.287
Salix exigua	Live	medium	Location*Year	Big Bar	2004	2.534	1.185
Salix exigua	Live	medium	Location*Year	Big Bar	2006	8.221	3.501
Salix exigua	Live	medium	Location*Year	Ullathorne	2004	8.507	3.579
Salix exigua	Live	medium	Location*Year	Ullathorne	2005	6.130	2.630
Salix exigua	Live	**medium**	**Location*Year**	**Ullathorne**	**2006**	**12.714**	**5.303**
Salix exigua	Live	**small**	**Location**	**Big Bar**		**3.179**	**1.008**
Salix exigua	Live	**small**	**Location**	**Independence**		**0.183**	**0.118**
Salix exigua	Live	**small**	**Location**	**Ullathorne**		**5.548**	**1.700**
***Salix exigua**	Live	**small**	**Location*Year**	**Big Bar**	**2006**	**17.947**	**7.859**
***Salix exigua**	Live	**small**	**Location*Year**	**Ullathorne**	**2005**	**28.885**	**12.517**
Salix exigua	Live	small	Location*Year	Ullathorne	2006	6.826	3.157
Salix exigua	Live	tall	Location	Big Bar		3.491	0.845
Salix exigua	Live	tall	Location	Ullathorne		3.491	0.803
Salix exigua	Live	tall	Year		2004	2.802	0.634
Salix exigua	Live	tall	Year		2005	2.153	0.476
Salix exigua	Live	tall	Location*Year	Big Bar	2004	6.524	1.680
Salix exigua	Live	tall	Location*Year	Big Bar	2005	6.793	1.738
Salix exigua	Live	tall	Location*Year	Ullathorne	2004	7.201	1.826
Salix exigua	Live	tall	Location*Year	Ullathorne	2005	2.501	0.793
Salix exigua	Live	tall	Location*Year	Ullathorne	2006	2.363	0.762
Salix exigua	Live	very tall	Location	Big Bar		6.920	2.180
Salix exigua	Live	very tall	Location	Ullathorne		3.989	1.294
Salix exigua	Live	very tall	Year		2004	5.262	1.069
Salix exigua	Live	very tall	Year		2005	3.638	0.803
Salix exigua	Live	very tall	Location*Year	Big Bar	2004	9.195	2.982
Salix exigua	Live	very tall	Location*Year	Big Bar	2005	8.678	2.823
Salix exigua	Live	very tall	Location*Year	Ullathorne	2004	7.925	2.598
Salix exigua	Live	very tall	Location*Year	Ullathorne	2005	5.415	1.838
Rubus armeniacus	Dead	low	Year		2006	0.247	0.134
Rubus armeniacus	Dead	small	Location	Big Bar		0.155	0.093
Rubus armeniacus	Dead	small	Location	Independence		0.100	0.069
Rubus armeniacus	Dead	small	Location	Ullathorne		0.100	0.069
Rubus armeniacus	Dead	small	Year		2004	0.100	0.069
Rubus armeniacus	Dead	small	Year		2005	0.155	0.093
Rubus armeniacus	Dead	small	Year		2006	0.100	0.069
Rubus armeniacus	Dead	tall	Location*Year	Big Bar	2006	4.350	2.890

Rubus armeniacus	Dead	tall	Location*Year	Ullathorne	2006	0.047	0.066
Rubus armeniacus	Dead	very tall	Location	Big Bar		0.132	0.082
Rubus armeniacus	Dead	very tall	Location	Independence		0.100	0.069
Rubus armeniacus	Dead	very tall	Location	Ullathorne		0.100	0.069
Rubus armeniacus	Dead	very tall	Year		2004	0.100	0.069
Rubus armeniacus	Dead	very tall	Year		2005	0.132	0.082
Rubus armeniacus	Dead	very tall	Year		2006	0.100	0.069
Rubus armeniacus	Live	low	Location	Independence		2.460	0.955
Rubus armeniacus	Live	low	Year		2006	1.961	0.563
Rubus armeniacus	Live	low	Location*Year	Independence	2006	4.015	1.808
Rubus armeniacus	Live	medium	Location	Big Bar		4.711	2.869
Rubus armeniacus	Live	medium	Location	Independence		11.367	6.763
Rubus armeniacus	Live	medium	Year		2004	5.527	2.048
Rubus armeniacus	Live	medium	Year		2005	4.785	1.772
Rubus armeniacus	Live	medium	Year		2006	2.935	1.114
Rubus armeniacus	Live	medium	Location*Year	Big Bar	2004	5.115	3.240
Rubus armeniacus	Live	medium	Location*Year	Big Bar	2005	4.160	2.640
Rubus armeniacus	Live	medium	Location*Year	Big Bar	2006	4.914	3.117
Rubus armeniacus	**Live**	**medium**	**Location*Year**	**Independence**	**2004**	**16.526**	**10.090**
Rubus armeniacus	**Live**	**medium**	**Location*Year**	**Independence**	**2005**	**12.620**	**7.728**
Rubus armeniacus	**Live**	**medium**	**Location*Year**	**Independence**	**2006**	**7.043**	**4.366**
Rubus armeniacus	Live	small	Location	Independence		0.130	0.085
Rubus armeniacus	Live	small	Year		2004	0.196	0.111
Rubus armeniacus	Live	small	Location*Year	Big Bar	2006	8.360	3.273
Rubus armeniacus	Live	small	Location*Year	Ullathorne	2005	4.243	1.787
Rubus armeniacus	Live	tall	Location	Big Bar		5.875	3.306
Rubus armeniacus	Live	tall	Year		2005	2.243	0.817
Rubus armeniacus	Live	tall	Location*Year	Big Bar	2004	7.132	4.161
Rubus armeniacus	Live	tall	Location*Year	Big Bar	2005	7.014	4.088
Rubus armeniacus	Live	tall	Location*Year	Big Bar	2006	4.053	2.408
Rubus armeniacus	Live	tall	Location*Year	Ullathorne	2006	0.109	0.112
Rubus armeniacus	Live	very tall	Location	Independence		0.100	0.076
Rubus armeniacus	Live	very tall	Location	Ullathorne		0.100	0.076
Rubus armeniacus	Live	very tall	Year		2004	0.249	0.150

Rubus armeniacus	Live	very tall	Year		2005	0.212	0.128
Rubus armeniacus	Live	very tall	Year		2006	0.166	0.102

The most important interactions for sandbar willow or Himalayan blackberry are noted in bold, and those of particular interest with bold and asterisk. For *Salix exigua*, Dead-tall, Location*Year from 2004 to 2006 shows the increase in dead tall willow attributed to prescribed fire. *Salix exigua*, Live-low, Location*Year, for Big Bar 2006 shows the high number of generated willow shoots. *Salix exigua*, Live-low, Location*Year, for Ullathorne show an increase from 2004 to 2005, but little difference from 2005 to 2006. *Salix exigua*, Live-small, Location*Year, for Ullathorne shows significant reduction from 2005 to 2006 attributed to the effect of the more extensive fall 2005 prescribed burn and flood. *Salix exigua*, Live-small, Location comparing all sites, shows that Ullathorne had a higher proportion of smaller willows. The changes for *Rubus armeniacus*, Live-medium, for Location*Year at Independence were gradually reduced from 2004 to 2006 which is attributed to freezing/ice damage in the winter of 2004-2005 and the prescribed burn from 2005-2006. For *Rubus armeniacus*, at Big Bar for 2004 to 2005, there was little change, but additional decrease from 2005 to 2006 which can be attributed to the prescribed burn in the blackberry.

Differences in LS Means for sandbar willow and Himalayan blackberry for Status and Size Class by Location and Year (Tukey-Kramer adjustment).

Table 4.13a: Differences in Least Square Means for sandbar willow for Status and Size Class by Location and Year

Status	**Size class**	**Effect**	**Loca-tion**	**Year**	***Loca-tion**	***Year**	**Difference Estimate**	**Standard Error**	**Adjust ed-P**
Dead	low	Location	Inde-pend.		Ulla-thorne		-1.922	0.81	0.054
Dead	medium	Location	Big Bar		Inde-pend.		2.981	0.63	0.000
Dead	medium	Location	Inde-pend.		Ulla-thorne		-3.261	0.63	0.000
Dead	medium	Year		2004		2006	1.087	0.45	0.047
Dead	tall	Location	Big Bar		Inde-pend.		1.939	0.38	0.000
Dead	tall	Location	Inde-pend		Ulla-thorne		-1.870	0.38	0.000
Live	low	Location	Big Bar		Inde-pend.		1.957	0.67	0.013
Live	low	Location	Big Bar		Ullatho rne		-1.638	0.34	0.000
Live	low	Location	Inde-pend		Ulla-thorne		-3.595	0.61	0.000
Live	low	Year		2004		2006	-2.521	0.50	0.000

Live	**low**	**Year**		**2005**		**2006**	**-2.147**	**0.56**	**0.001**
Live	medium	Location	Big Bar		Inde-pend.		1.906	0.62	0.009
Live	medium	Location	Inde-pend		Ulla-thorne		-2.940	0.61	0.000
Live	medium	Year		2004		2006	-1.035	0.38	0.023
Live	medium	Year		2005		2006	-1.092	0.30	0.002
Live	small	Location	Big Bar		Inde-pend.		2.853	0.72	0.001
Live	small	Location	Inde-pend		Ulla-thorne		-3.409	0.71	0.000
Live	small	Year		2004		2006	-2.307	0.59	0.001
Live	tall	Location	Big Bar		Inde-pend.		2.467	0.56	0.000
Live	tall	Location	Inde-pend		Ulla-thorne		-2.467	0.56	0.000
Live	tall	Year		2004		2006	1.544	0.48	0.006
Live	tall	Year		2005		2006	1.280	0.47	0.023
Live	very tall	Location	Big Bar		Inde-pend.		2.074	0.51	0.000
Live	very tall	Location	Inde-pend		Ulla-thorne		-1.523	0.52	0.013
Live	very tall	Year		2004		2005	0.369	0.17	0.075
Live	very tall	Year		2004		2006	1.434	0.26	0.000
Live	very tall	Year		2005		2006	1.065	0.27	0.001

The significant estimated differences (Table 4.13a) for sandbar willow and those that are culturally meaningful are in bold font. The difference estimate post- minus pre-, and for Live-low, Years 2005 to 2006 (-2.147) indicates an increase in Live-low willow shoots across all sites that relates to rejuvenation of shoots potentially usable for basket weaving. The interaction of project sites (location) and pre- and post-fire/flood (year) on sandbar willow and Himalayan blackberry was investigated and results are presented in Table 4.13b.

Table 4.13b: Differences in Least Square Means for Himalayan blackberry for Status and Size Class by Location and Year

Status	Size class	Effect	Loca-tion	Year	*Loca-tion	*Year	Difference Estimate	Standard Error	Adjusted-P
Dead	low	Year		2005		2006	1.481	0.576	0.034
Dead	tall	Location	Big Bar		Ulla-thorne		2.474	1.030	0.051
Live	medium	Location	Inde-pend.		Ulla-thorne		2.060	0.884	0.060
Live	medium	Year		2004		2006	0.633	0.216	0.013
Live	medium	Year		2005		2006	0.489	0.178	0.022
Live	tall	Location	Big Bar		Independ.		1.936	0.827	0.059
Live	tall	Location	Big Bar		Ulla-thorne		2.579	0.877	0.013
Live	tall	Year		2004		2006	1.175	0.403	0.014
Live	**tall**	**Year**		**2005**		**2006**	**1.401**	**0.371**	**0.001**
Live	very tall	Location	Big Bar		Independ.		2.171	0.864	0.039
Live	very tall	Location	Big Bar		Ulla-thorne		2.171	0.864	0.039

The estimated differences were found to be significant in Table 4.13a for Himalayan blackberry are listed in bold. The difference estimate is post minus pre, and for Live-tall, for Years 2005 to 2006 indicates a reduction in live-tall blackberry across all sites.

Vegetation Quadrats: Substrate, Forbs and Grasses

Independence

Significance results for species and substrate, and native/exotic percent cover were as follows;

Table 4.14 Part 1 of 2: Independence quadrat pre- and post-differences of Least Square Means

Cover type	**Type:**	**Pre: Estimate**	**Pre: Standard Error**	**Post: Estimate**	**Post: Standard Error**	**Difference**
Agrostis capiilis L.	Grass Exotic	0.000	0.178	0.242	0.171	0.242
Aira caryophyllea L.	Grass Exotic	0.948	0.761	0.990	0.744	0.042
Anthemis cotula L.	Forb Exotic	-0.003	0.149	0.238	0.144	0.241
Anthriscus caucalis M. Bieb.	**Forb Exotic**	**6.293**	**0.795**	**-1.235**	**1.150**	**-7.528**
Artemisia douglasiana Besser	Forb Native	1.359	1.374	2.176	1.292	0.817
Aruncus dioicus	Forb Native	0.000	0.178	0.242	0.171	0.2416
Brassica nigra	Forb Exotic	2.1675	0.8092	3.8979	0.6795	1.730
Bromus carinatus	**Grass Native**	**3.9377**	**1.5044**	**-0.871**	**1.628**	**-4.809**
Bromus mollis	**Grass Exotic**	**4.6032**	**0.9102**	**0.439**	**0.968**	**-4.164**
Bromus ridgulus	Grass Exotic	2.1257	0.6243	1.8055	0.5889	-0.320
Bromus tectorum	**Grass Exotic**	**7.6582**	**1.8692**	**1.631**	**2.064**	**-6.027**
Cardamine sp.	Forb Native	0.778	0.471	-0.058	0.473	-0.836
Carex spp 1	Grass Native	7.949	4.558	7.500	4.538	-0.448
Carex spp 2	**Grass Native**	**-0.001**	**0.158**	**0.348**	**0.150**	**0.348**
Centaurea solstitialis	Forb Exotic	8.4812	2.9103	2.557	2.785	-5.924
Chenopodium botrys	**Forb Exotic**	**0.004**	**0.340**	**0.9145**	**0.3160**	**0.910**
Cirsium arvense	Forb Exotic	0.001	0.181	0.243	0.175	0.242
Cirsium sp.	Forb Exotic	0.000	0.018	0.024	0.017	0.024
Clarkia sp.	Forb Native	0.395	0.263	-0.020	0.260	-0.415
Claytonia perfoliata	**Forb Native**	**3.4491**	**0.2494**	**-3.0878**	**0.3362**	**-6.537**
Collomia heterophylla	Forb Native	0.396	0.266	-0.020	0.263	-0.416
Conium maculatum	**Forb Exotic**	**3.4053**	**0.9551**	**10.7039**	**1.6292**	**-5.6575**
Conzya canadensis	Forb Native	3.405	0.955	1.239	0.977	-2.166
Crepis capillaris	**Forb**	**1.2808**	**0.421**	**-0.389**	**0.447**	**-1.6693**

	Exotic					
Cynodon dactylon	**Grass Exotic**	**0.057**	**0.636**	**2.2383**	**0.56133**	**2.1810**
Cynosurus echinatus	**Grass Exotic**	**1.8625**	**0.7822**	**-0.455**	**0.807**	**-2.3177**
Daucus carota	Forb Exotic	0.001	0.315	0.5983	0.2998	0.597
Descampsia cerpitosa	Grass Native	1.7389	0.7878	1.5748	0.6746	-0.164
Echinochloa crus-golli	Grass Exotic	0.001	0.196	0.3582	0.1863	0.357
Elymus glaucus	Grass Native	4.0464	1.4066	3.1502	1.4879	-0.896
Elytrigia repens	Grass Exotic	0.003	0.332	0.544	0.322	0.541
Epilobium ciliatum	**Forb Native**	**0.083**	**0.391**	**1.7431**	**0.3211**	**1.6598**
Erodium cicutarium	Forb Exotic	0.000	0.267	0.363	0.257	0.362
Festuca sp.	Grass Exotic	0.000	0.267	0.363	0.257	0.362
Forb ssp. 1	**Forb Exotic**			**0.92330**		**0.9158**
Galium aparine	Forb Native	1.341	0.529	1.187	0.525	-0.153
Galium trifidum	Forb Native	0.013	0.162	0.253	0.158	0.241
Galium triflorum	**Forb Native**	**3.962**	**0.763**	**-1.342**	**0.857**	**-5.3037**
Geranium molle	Forb Exotic	0.263	0.175	-0.014	0.173	-0.277
Gnaphalium purpureum L.	Forb Native	0.002	0.193	0.403	0.177	0.401
Hieracium albiflorum	Forb Native	1.440	0.470	0.074	0.489	-1.366
Holcus lantus	Grass Exotic	0.000	0.089	0.121	0.086	0.121
Hypericum perforatum	Forb Exotic	0.017	0.242	0.389	0.233	0.371
Hypochaeris radicata	Forb Exotic	0.001	0.091	0.122	0.087	0.121
Isatis tinctoria	Forb Exotic	7.879	1.665	7.018	1.615	-0.861
Juncus bufonius	Forb Native	-0.007	0.149	0.361	0.139	0.368
Lactuca serriola	**Forb Exotic**	**6.770**	**1.114**	**-1.713**	**1.321**	**-8.4829**
Lamium amplexicaule	**Forb Exotic**	**1.651**	**0.404**	**0.246**	**0.422**	**-1.4050**
Lolium multiflorum	Grass Exotic	-0.018	1.462	2.222	1.409	2.240
Lotus micranthus	Forb Native	0.387	0.310	0.578	0.299	0.191
Lupinus bicolor	**Forb Native**	**0.997**	**0.336**	**-0.184**	**0.346**	**-1.1807**
Madia elegans	Forb Native	0.263	0.176	0.012	0.171	-0.251
Matricaria discoidea	Forb Native	0.000	0.089	0.121	0.086	0.121
Medicago lupulina	Forb Exotic	0.621	0.276	0.332	0.277	-0.289
Melilotus alba	Forb Exotic	0.560	1.338	4.344	1.225	3.7839
Melilotus sp.	**Forb Exotic**	**0.001**	**0.091**	**0.122**	**0.087**	**0.121**
Mentha pulegium	Forb Exotic	0.000	0.018	0.024	0.017	0.024
Nicotiana attenuata	Forb Native	-0.002	0.162	0.352	0.154	0.353
Plantago lanceolata	Forb Exotic	0.001	0.091	0.122	0.087	0.121

Poa annua	**Grass Exotic**	**-0.001**	**0.390**	**0.912**	**0.367**	**0.913**
***Poa sp.**	**Grass Exotic**	**0.010**	**0.383**	**0.857**	**0.365**	**0.8472**
Polygonum lapathifolium	**Forb Native**	**0.068**	**0.651**	**2.342**	**0.565**	**2.2739**
Polypogon monspeliensis	**Grass Exotic**	**0.096**	**0.449**	**2.032**	**0.369**	**1.9358**
Rumex crispus	**Forb Exotic**	**0.014**	**0.336**	**0.824**	**0.316**	**0.810**
Senecio sylvaticus	Forb Exotic	0.132	0.088	-0.007	0.087	-0.139
Setaria sp.	Grass Exotic	-0.004	0.309	0.467	0.298	0.471
Sidalcea spp.	Forb Native	0.264	0.264	-0.014	0.175	-0.278
Silene sp.	Forb Exotic	0.001	0.091	0.122	0.087	0.121
Spergularia marina	Forb Native	0.000	0.089	0.121	0.086	0.121
Taraxacum officiale	Forb Exotic	0.001	0.091	0.122	0.087	0.121
Trifolium repens	Forb Native	0.000	0.178	0.242	0.171	0.242
Trisetum cernuum	Grass Native	0.000	0.178	0.242	0.171	0.242
Verbascum thapsus	Forb Exotic	0.388	0.376	0.468	0.363	0.080
Veronica arvensis	Forb Exotic	1.054	0.702	-0.054	0.694	-1.108
Veronica beccabunga	**Forb Exotic**	**0.035**	**0.439**	**1.619**	**0.385**	**1.5843**
Vicia cracca	Forb Exotic	0.395	0.263	-0.020	0.260	-0.416
Vicia gigantea	**Forb Native**	**2.089**	**0.487**	**-0.730**	**0.536**	**-2.8184**
Vulpia myuros	Grass Exotic	6.980	2.002	3.555	1.973	-3.425
Duff-Litter		**37.909**	**1.593**	**-3.024**	**1.589**	**-40.9329**
Sand		**8.543**	**1.991**	**46.571**	**1.986**	**38.0279**
Forb		**79.942**	**6.992**	**60.131**	**6.860**	**-19.8112**
Grass		48.861	6.030	43.100	5.930	-5.761
Wood		**6.154**	**0.764**	**1.975**	**0.754**	**-4.1792**

Table 4.14 Part 2 of 2: Independence quadrat pre- and post-differences of Least Square Means

Cover type	Type:	Difference	Standard Error	Degrees of Freedom	T-value	Pr > |t|
Agrostis capiilis L.	Grass Exotic	0.242	0.249	73	0.970	0.335
Aira caryophyllea L.	Grass Exotic	0.042	0.769	82	0.054	0.9574
Anthemis cotula L.	Forb Exotic	0.241	0.172	74	1.398	0.166
Anthriscus caucalis M. Bieb.	**Forb Exotic**	**-7.528**	**1.555**	**101**	**-4.84**	**<0.0001**
Artemisia douglasiana Besser	Forb Native	0.817	1.540	82	0.531	0.597
Aruncus dioicus	Forb Native	0.2416	0.249	73	0.970	0.335
Brassica nigra	Forb Exotic	1.730	1.142	98	1.515	0.133
Bromus carinatus	**Grass Native**	**-4.809**	**2.134**	**80**	**-2.25**	**0.027**
Bromus mollis	**Grass Exotic**	**-4.164**	**1.466**	**89**	**-2.84**	**0.006**
Bromus ridgulus	Grass	-0.320	0.920	91	-0.348	0.728

	Exotic					
Bromus tectorum	**Grass Exotic**	**-6.027**	**2.563**	**100**	**-2.35**	**0.021**
Cardamine sp.	Forb Native	-0.836	0.637	74	-1.312	0.194
Carex spp 1	Grass Native	-0.448	4.001	88	-0.112	0.911
Carex spp 2	**Grass Native**	**0.348**	**0.208**	**75**	**1.671**	**0.099**
Centaurea solstitialis	Forb Exotic	-5.924	3.607	87	-1.642	0.104
Chenopodium botrys	**Forb Exotic**	**0.910**	**0.434**	**77**	**2.09**	**0.039**
Cirsium arvense	Forb Exotic	0.242	0.249	73	0.972	0.334
Cirsium sp.	Forb Exotic	0.024	0.025	73	0.972	0.334
Clarkia sp.	Forb Native	-0.415	0.379	73	-1.095	0.277
Claytonia perfoliata	**Forb Native**	**-6.537**	**0.518**	**82**	**-12.61**	**<0.0001**
Collomia heterophylla	Forb Native	-0.416	0.380	73	-1.097	0.276
Conium maculatum	**Forb Exotic**	**-5.6575**	**2.540**	**109**	**-2.23**	**0.0280**
Conzya canadensis	Forb Native	-2.166	1.198	100	-1.808	0.074
Crepis capillaris	**Forb Exotic**	**-1.6693**	**0.5875**	**78**	**-2.84**	**0.0057**
Cynodon dactylon	**Grass Exotic**	**2.1810**	**0.8365**	**81**	**2.61**	**0.0109**
Cynosurus echinatus	**Grass Exotic**	**-2.3177**	**1.0597**	**76**	**-2.19**	**0.0318**
Daucus carota	Forb Exotic	0.597	0.441	74	1.352	0.180
Descampsia cerpitosa	Grass Native	-0.164	1.096	86	-0.150	0.881
Echinochloa crus-golli	Grass Exotic	0.357	0.274	74	1.305	0.196
Elymus glaucus	Grass Native	-0.896	1.926	93	-0.465	0.643
Elytrigia repens	Grass Exotic	0.541	0.360	75	1.502	0.137
Epilobium ciliatum	**Forb Native**	**1.6598**	**0.5281**	**85**	**3.14**	**0.0023**
Erodium cicutarium	Forb Exotic	0.362	0.374	73	0.970	0.335
Festuca sp.	Grass Exotic	0.362	0.374	73	0.970	0.335
Forb ssp. 1	**Forb Exotic**	**0.9158**	**0.4355**	**77**	**2.10**	**0.0388**
Galium aparine	Forb Native	-0.153	0.779	83	-0.196	0.845
Galium trifidum	Forb Native	0.241	0.172	74	1.398	0.166
Galium triflorum	**Forb Native**	**-5.3037**	**1.1994**	**82**	**-4.42**	**<0.0001**
Geranium molle	Forb Exotic	-0.277	0.253	73	-1.095	0.277
Gnaphalium purpureum L.	Forb Native	0.401	0.266	77	1.504	0.137
Hieracium albiflorum	Forb Native	-1.366	0.723	78	-1.889	0.063
Holcus lantus	Grass Exotic	0.121	0.125	73	0.970	0.335
Hypericum perforatum	Forb Exotic	0.371	0.270	75	1.377	0.172
Hypochaeris radicata	Forb Exotic	0.121	0.124	73	0.972	0.334
Isatis tinctoria	Forb Exotic	-0.861	1.979	113	-0.435	0.664
Juncus bufonius	Forb Native	0.368	0.210	75	1.754	0.083

Lactuca serriola	**Forb Exotic**	**-8.4829**	**1.5915**	**95**	**-5.33**	**<0.0001**
Lamium amplexicaule	**Forb Exotic**	**-1.4050**	**0.6353**	**82**	**-2.21**	**0.0298**
Lolium multiflorum	Grass Exotic	2.240	1.819	74	1.232	0.222
Lotus micranthus	Forb Native	0.191	0.442	77	0.432	0.667
Lupinus bicolor	**Forb Native**	**-1.1807**	**0.5235**	**75**	**-2.26**	**0.0270**
Madia elegans	Forb Native	-0.251	0.251	74	-1.001	0.320
Matricaria discoidea	Forb Native	0.121	0.125	73	0.970	0.335
Medicago lupulina	Forb Exotic	-0.289	0.405	78	-0.715	0.477
Melilotus alba	Forb Exotic	3.7839	1.7048	87	2.22	0.0291
Melilotus sp.	**Forb Exotic**	**0.121**	**0.124**	**73**	**0.972**	**0.334**
Mentha pulegium	Forb Exotic	0.024	0.025	73	0.970	0.335
Nicotiana attenuata	Forb Native	0.353	0.208	75	1.698	0.094
Plantago lanceolata	Forb Exotic	0.121	0.124	73	0.972	0.334
Poa annua	**Grass Exotic**	**0.913**	**0.502**	**76**	**1.818**	**0.073**
***Poa sp.**	**Grass Exotic**	**0.8472**	**0.4331**	**77**	**1.96**	**0.0541**
Polygonum lapathifolium	**Forb Native**	**2.2739**	**0.8390**	**83**	**2.71**	**0.0082**
Polypogon monspeliensis	**Grass Exotic**	**1.9358**	**0.6084**	**85**	**3.18**	**0.0020**
Rumex crispus	**Forb Exotic**	**0.810**	**0.426**	**76**	**1.901**	**0.061**
Senecio sylvaticus	Forb Exotic	-0.139	0.127	73	-1.095	0.277
Setaria sp.	Grass Exotic	0.471	0.387	74	1.217	0.227
Sidalcea spp.	Forb Native	-0.278	0.253	73	-1.097	0.276
Silene sp.	Forb Exotic	0.121	0.124	73	0.972	0.334
Spergularia marina	Forb Native	0.121	0.125	73	0.970	0.335
Taraxacum officiale	Forb Exotic	0.121	0.124	73	0.972	0.334
Trifolium repens	Forb Native	0.242	0.249	73	0.970	0.335
Trisetum cernuum	Grass Native	0.242	0.249	73	0.970	0.335
Verbascum thapsus	Forb Exotic	0.080	0.531	75	0.151	0.881
Veronica arvensis	Forb Exotic	-1.108	1.012	73	-1.095	0.277
Veronica beccabunga	**Forb Exotic**	**1.5843**	**0.5848**	**81**	**2.71**	**0.008**
Vicia cracca	Forb Exotic	-0.416	0.380	73	-1.095	0.277
Vicia gigantea	**Forb Native**	**-2.8184**	**0.8062**	**78**	**-3.50**	**0.001**
Vulpia myuros	Grass Exotic	-3.425	2.153	105	-1.591	0.115
Duff-Litter		**-40.9329**	**2.4511**	**150**	**-16.70**	**<0.0001**
Sand		**38.0279**	**2.7786**	**150**	**13.69**	**<0.0001**
Forb		**-19.8112**	**8.2434**	**72**	**-2.40**	**0.0188**
Grass		-5.761	6.298	72	-0.915	0.363
Wood		**-4.1792**	**1.0714**	**149**	**-3.90**	**0.0001**

The species or substrate in bold had significant changes from pre- to post-fire/flooding disturbance. A negative value in the difference column indicates a reduction in percent cover from pre- to post-disturbance. Exotic grasses made up a prominent percentage of the species with significant change, but not as a substrate. This difference observed with Duff-Litter and Sand, being similar in absolute value is what should be expected since the Duff-Litter was consumed by fire, exposing bare mineral (sand) soil, or the flood waters washed away duff and litter, exposing or depositing sand (Post). The duff-litter decreased and sand increased percent cover following prescribed fire and flooding.

Independence Cover Class: Forb and Grass, Native versus Exotic

Table 4.15: Type 3 Tests of Fixed Effects: Independence Cover Class for Native versus Exotic

Cover Class	Effect	Numerator/ Denominator Degrees of Freedom	F-Value	Pr > F
Forb	Treatment	1/126	5.92	0.0164
Forb	Native_Exotic	1/67.3	199.87	<0.0001
*Forb	Treatment*Native_Exotic	1/127	3.55	0.0617
Grass	Treatment	1/131	0.83	0.3648
Grass	Native_Exotic	1/76	79.47	<0.0001
Grass	Treatment*Native_Exotic	1/132	0.21	0.6449

The effect of Treatment (fire and flooding) significantly influenced the proportion of forb cover, and resulted in a compositional shift between Native and Exotic species. The effect of Treatment had little influence on grass cover, but the cover that was present shifted in proportion between Native and Exotic.

Table 4.16: Estimates of change for Mixed Procedure, Exotic-Native for Pre- and Post-Differences

Cover Class	Label	Estimate	Standard Error	Degrees of Freedom	T-Value	Pr > |t|
Forb	Change in exotic cover	-36.80	11.30	150.4	-3.25	**0.001398**
Forb	Change in native cover	-3.43	11.30	150.4	-0.30	0.762279
Forb	Difference in changes	-33.37	15.50	125.7	-2.15	**0.033241**
Grass	Change in exotic cover	-9.39	9.62	151	-0.98	0.3305
Grass	Change in native cover	-3.244	9.62	150.7	-0.34	0.736482
Grass	Difference in changes	-6.15	13.31	132	-0.46	0.6449

The change in exotic cover for forbs was found to be significant, as well as the change between exotic and native plants.

Table 4.17: Least Squares Means: Independence Cover Class for Native versus Exotic

Cover Class	Effect	Treatment	Native_ Exotic	Estimate	Standard Error
Forb	treatment	Post	---	60.14	6.75
Forb	treatment	Pre	----	80.25	6.88
Forb	Native_Exotic		Exotic	123.70	6.61
Forb	Native_Exotic		Native	16.69	6.61
Forb	Treatment*Native_ Exotic	Post	Exotic	106.21	8.64
Forb	Treatment*Native_ Exotic	Post	Native	14.07	8.64
Forb	Treatment*Native_ Exotic	Pre	Exotic	141.19	8.83
Forb	Treatment*Native_ Exotic	Pre	Native	19.32	8.83
Grass	Treatment	Post		43.132	6.01
Grass	Treatment	Pre		49.45	6.10
Grass	Native_Exotic		Exotic	74.88	5.91
Grass	Native_Exotic		Native	17.70	5.91
Grass	Treatment*Native_ Exotic	Post	Exotic	70.18	7.54
Grass	Treatment*Native_ Exotic	Post	Native	16.08	7.54
Grass	Treatment*Native_ Exotic	Pre	Exotic	79.57	7.69
Grass	Treatment*Native_ Exotic	Pre	Native	19.33	7.69

Table 4.17 shows the cross comparison of treatment, native or exotic as well as the interaction of treatment with forb or grass species by pre- and post-treatment. The estimate values provide information about the amount of relative change. Figure 4.12 shows plant species Native/Exotic by Forb for the difference of post-treatment minus pre-treatment at the Independence site. Plant species Native/Exotic by Grasses for the difference of post-treatment minus pre-treatment at the Independence site (Figure 4.13). Intervals that do not contain zero are shown in bold.

<u>Ullathorne: Quadrat data results and significance for species and substrate, and native/exotic percent cover</u>

Table 4.18 Part 1 of 2: Ullathorne quadrat pre- and post-mean: Differences of Least Square Means

Cover type	Type:	Pre: Estimate	Pre: Standard Error	Post: Estimate	Post: Standard Error	Difference
Agrostis capiilis L.	Grass Exotic	1.818	0.7661	-0.212	0.783	-2.030
Aira caryophyllea L.	**Grass Exotic**	**5.936**	**0.675**	**-2.764**	**1.007**	**-8.699**
Artemisia douglasiana B.	Forb Native	4.868	1.779	5.111	1.762	0.243
Avena fatua	**Grass Exotic**	**1.374**	**0.576**	**-0.188**	**0.581**	**-1.561**
Brassica nigra	Forb Exotic	2.523	0.768	1.001	0.773	-1.522

Bromus mollis hordeaceus	**Grass Exotic**	**6.889**	**0.861**	**-2.446**	**1.091**	**-9.335**
Bromus ridglus diandrus	Grass Exotic	4.507	0.781	2.593	0.805	-1.914
Bromus tectorum	Grass Exotic	0.867	0.369	0.948	0.357	0.080
Cardamine sp.	Forb Native	0.128	0.086	-0.006	0.085	-0.135
Centaurea solstitialis	**Forb Exotic**	**5.959**	**1.099**	**-1.876**	**1.266**	**-7.835**
Centaurea sp.	Forb Exotic	0.000	0.087	0.118	0.084	0.118
Ceratodon purpureus	**Forb Exotic**	**4.008**	**0.509**	**-2.548**	**0.661**	**-6.557**
Cichorium intybus	Forb Exotic	-0.006	0.087	0.122	0.084	0.128
Cirsium arvense	Forb Exotic	0.257	0.171	-0.013	0.169	-0.270
Cirsium vulgare	Forb Exotic	0.001	0.121	0.234	0.115	0.234
Conzya canadensis	Forb Native	0.000	0.024	0.047	0.023	0.047
Crepis capillaris	Forb Exotic	-0.002	0.147	0.234	0.142	0.236
Cynodon dactylon	Grass Exotic	4.261	2.218	4.999	2.136	0.738
Cynosurus echinatus	**Grass Exotic**	**4.714**	**0.762**	**-0.350**	**0.851**	**-5.063**
Daucus carota	**Forb Exotic**	**0.934**	**0.275**	**-0.027**	**0.279**	**-0.961**
Elymus glaucus	Grass Native	0.257	0.171	-0.013	0.169	-0.270
Elytrigia repens	Grass Exotic	0.001	0.608	0.826	0.586	0.826
Epilobium minutum	Forb Native	0.026	0.017	-0.001	0.017	-0.027
Equisetum sp.	Forb Native	0.000	0.017	0.024	0.017	0.024
Eriogonum sp.	Forb Native	0.025	0.024	0.023	0.024	-0.002
Erodium cicutarium	Forb Exotic	0.000	0.017	0.024	0.017	0.024
Festuca arundinacea	Grass Exotic	0.005	0.951	1.826	0.895	1.821
Galium aparine	Forb Native	0.026	0.017	-0.001	0.017	-0.027
Galium trifidum	**Forb Native**	**-0.080**	**0.142**	**-0.080**	**0.142**	**-0.501**
Geranium molle	Forb Exotic	0.129	0.087	-0.006	0.086	-0.135
Heterotheca grandiflora	Forb Native	3.387	1.721	3.834	1.670	0.447
Hieracium albiflorum	**Forb Native**	**6.032**	**1.171**	**-3.184**	**1.348**	**-9.216**
Holcus lantus	**Grass Exotic**	**2.568**	**0.666**	**-0.707**	**0.716**	**-3.275**
Hypericum perforatum	Forb Exotic	0.128	0.087	0.019	0.085	-0.109
Hypochaeris radicata	Forb Exotic	0.000	0.088	0.139	0.083	0.139
Isatis tinctoria	Forb Exotic	0.248	0.216	0.360	0.209	0.111
Juncus bufonius	Forb Native	0.001	0.191	0.350	0.182	0.349
Lactuca serriola	Forb Exotic	0.000	0.174	0.236	0.167	0.236
Lolium multiflorum	Grass Exotic	0.000	0.017	0.024	0.017	0.024
Lotus micranthus	**Forb Native**	**3.589**	**0.608**	**-0.281**	**0.706**	**-3.870**
Lotus purshinanus	Forb Native	0.770	0.513	-0.039	0.508	-0.809
Lupinus polycarpus	Forb Native	0.505	0.287	-0.058	0.288	-0.563
Madia elegans	Forb Native	0.000	0.087	0.118	0.084	0.118
Medicago lupulina	Forb Exotic	0.250	0.143	0.111	0.142	-0.139
Melilotus alba	**Forb Exotic**	**7.623**	**1.463**	**4.799**	**1.412**	**-2.824**
Petasites palmatus	Forb Native	0.000	0.174	0.236	0.167	0.236
Petrorhagia dubia	Forb Exotic	0.377	0.358	0.196	0.352	-0.181
Plantago lanceolata	Forb Exotic	0.377	0.307	0.229	0.300	-0.148
Polygonum lapathifolium	Forb Native	0.000	0.174	0.236	0.167	0.236
Polypogon monspeliensis	Forb Exotic	0.001	0.308	0.584	0.293	0.583
Rumex acetosella	Forb Exotic	0.000	0.174	0.236	0.167	0.236
Rumex crispus	Forb Exotic	0.002	0.362	0.702	0.344	0.701
Saponaria officinalis	Forb Exotic	20.528	3.593	17.980	3.592	-2.548
Senecio sylvaticus	**Forb Exotic**	**0.030**	**0.623**	**1.616**	**0.575**	**1.586**
Sonchus asper	Forb Exotic	0.053	0.023	-0.006	0.024	-0.059
Taraxacum officiale	Forb Exotic	0.000	0.174	0.236	0.167	0.236
Thlaspi arvense	Forb Exotic	0.000	0.017	0.024	0.017	0.024
Trifolium arvense	**Forb Exotic**	**6.829**	**0.589**	**-5.838**	**0.762**	**-12.667**
Trifolium sp.	Forb Exotic	0.000	0.017	0.024	0.017	0.024
Vicia americana	Forb Native	0.128	0.086	-0.006	0.085	-0.135
Vicia cracca	**Forb Exotic**	**2.773**	**0.554**	**-0.240**	**0.696**	**-3.013**
Vicia gigantea	**Forb Native**	**4.341**	**0.650**	**-2.660**	**0.795**	**-7.001**

Vicia sativa	**Forb Exotic**	**1.294**	**0.643**	**-0.234**	**0.657**	**-1.527**
Vulpia myuros	**Grass Exotic**	**11.436**	**1.316**	**-3.205**	**1.765**	**-14.640**
Xanthium strumarium	Forb Exotic	-0.002	0.230	0.460	0.219	0.461
Duff-Litter		**31.086**	**1.593**	**-0.706**	**1.588**	**-31.792**
Sand		**17.996**	**1.476**	**44.605**	**1.474**	**26.608**
Forb		**84.686**	**5.654**	**61.000**	**5.521**	**-23.686**
Grass		**58.811**	**7.280**	**19.070**	**7.208**	**-39.740**
Wood		1.953	0.734	3.104	0.731	1.151

Table 4.18 Part 2 of 2: Ullathorne quadrat pre- and post-mean: Differences of Least Square Means

Cover type	Type:	Standard Error	Degrees of Freedom	T-value	Pr > |t|
Agrostis capiilis L.	Grass Exotic	1.1565	77	-1.756	0.083
Aira caryophyllea L.	**Grass Exotic**	**1.3873**	**99**	**-6.271**	**0.000**
Artemisia douglasiana Besser	Forb Native	2.0430	96	0.119	0.906
Avena fatua	**Grass Exotic**	**0.6554**	**81**	**-2.382**	**0.020**
Brassica nigra	Forb Exotic	1.0014	90	-1.520	0.132
Bromus mollis hordeaceus	**Grass Exotic**	**1.4996**	**98**	**-6.225**	**0.000**
Bromus ridglus diandrus	Grass Exotic	1.0341	117	-1.851	0.067
Bromus tectorum	Grass Exotic	0.5391	85	0.149	0.882
Cardamine sp.	Forb Native	0.1234	75	-1.092	0.278
Centaurea solstitialis	**Forb Exotic**	**1.9278**	**84**	**-4.064**	**0.000**
Centaurea sp.	Forb Exotic	0.1215	75	0.971	0.335
Ceratodon purpureus	**Forb Exotic**	**1.0032**	**85**	**-6.536**	**0.000**
Cichorium intybus	Forb Exotic	0.1234	75	1.039	0.302
Cirsium arvense	Forb Exotic	0.2468	75	-1.092	0.278
Cirsium vulgare	Forb Exotic	0.1690	76	1.382	0.171
Conzya canadensis	Forb Native	0.0338	76	1.382	0.171
Crepis capillaris	Forb Exotic	0.1685	76	1.399	0.166
Cynodon dactylon	Grass Exotic	2.3690	103	0.311	0.756
Cynosurus echinatus	**Grass Exotic**	**1.2758**	**96**	**-3.969**	**0.000**
Daucus carota	**Forb Exotic**	**0.3925**	**82**	**-2.448**	**0.016**
Elymus glaucus	Grass Native	0.2468	75	-1.092	0.278
Elytrigia repens	Grass Exotic	0.8504	75	0.971	0.335
Epilobium minutum	Forb Native	0.0247	75	-1.092	0.278
Equisetum sp.	Forb Native	0.0243	75	0.971	0.335
Eriogonum sp.	Forb Native	0.0340	76	-0.052	0.959
Erodium cicutarium	Forb Exotic	0.0243	75	0.971	0.335
Festuca arundinacea	Grass Exotic	1.3249	77	1.374	0.173
Galium aparine	Forb Native	0.0247	75	-1.092	0.278
Galium trifidum	**Forb Native**	**0.2152**	**77**	**-2.328**	**0.023**
Geranium molle	Forb Exotic	0.1234	75	-1.095	0.277
Heterotheca grandiflora	Forb Native	2.3743	83	0.188	0.851
Hieracium albiflorum	**Forb Native**	**1.7428**	**87**	**-5.288**	**0.000**
Holcus lantus	**Grass Exotic**	**1.0956**	**79**	**-2.989**	**0.004**
Hypericum perforatum	Forb Exotic	0.1240	76	-0.880	0.382
Hypochaeris radicata	Forb Exotic	0.1222	76	1.136	0.260
Isatis tinctoria	Forb Exotic	0.3062	79	0.364	0.717
Juncus bufonius	Forb Native	0.2674	76	1.306	0.196
Lactuca serriola	Forb Exotic	0.2430	75	0.971	0.335
Lolium multiflorum	Grass Exotic	0.0243	75	0.971	0.335
Lotus micranthus	**Forb Native**	**1.0424**	**90**	**-3.713**	**0.000**
Lotus purshinanus	Forb Native	0.7404	75	-1.092	0.278
Lupinus polycarpus	Forb Native	0.3869	76	-1.454	0.150
Madia elegans	Forb Native	0.1215	75	0.971	0.335
Medicago lupulina	Forb Exotic	0.2063	77	-0.674	0.503

Melilotus alba	**Forb Exotic**	**1.4999**	**125**	**-1.883**	**0.062**
Petasites palmatus	Forb Native	0.2430	75	0.971	0.335
Petrorhagia dubia	Forb Exotic	0.4349	76	-0.416	0.679
Plantago lanceolata	Forb Exotic	0.4352	76	-0.341	0.734
Polygonum lapathifolium	Forb Native	0.2430	75	0.971	0.335
Polypogon monspeliensis	Forb Exotic	0.4309	76	1.353	0.180
Rumex acetosella	Forb Exotic	0.2430	75	0.971	0.335
Rumex crispus	Forb Exotic	0.5069	76	1.382	0.171
Saponaria officinalis	Forb Exotic	3.9700	123	-0.642	0.522
Senecio sylvaticus	**Forb Exotic**	**0.7568**	**81**	**2.095**	**0.039**
Sonchus asper	Forb Exotic	0.0349	76	-1.692	0.095
Taraxacum officiale	Forb Exotic	0.2430	75	0.971	0.335
Thlaspi arvense	Forb Exotic	0.0243	75	0.971	0.335
Trifolium arvense	**Forb Exotic**	**1.2327**	**82**	**-10.276**	**0.000**
Trifolium sp.	Forb Exotic	0.0243	75	0.971	0.335
Vicia americana	Forb Native	0.1234	75	-1.092	0.278
Vicia cracca	**Forb Exotic**	**0.9504**	**96**	**-3.170**	**0.002**
Vicia gigantea	**Forb Native**	**1.1614**	**85**	**-6.028**	**0.000**
Vicia sativa	**Forb Exotic**	**0.8315**	**78**	**-1.837**	**0.070**
Vulpia myuros	**Grass Exotic**	**2.3539**	**106**	**-6.220**	**0.000**
Xanthium strumarium	Forb Exotic	0.2876	77	1.604	0.113
Duff-Litter		**2.4437**	**154**	**-13.010**	**0.000**
Sand		**2.2757**	**154**	**11.692**	**0.000**
Forb		**7.2081**	**74**	**-3.286**	**0.002**
Grass		**5.9238**	**74**	**-6.709**	**0.000**
Wood		0.7477	154	1.540	0.126

Ullathorne Cover Class: Forb and Grass, Native versus Exotic

Table 4.19: Type 3 Tests of Fixed Effects: Ullathorne Cover Class for Native versus Exotic

Cover Class	Effect	Numerator/ Denominator Degrees of Freedom	F-Value	Pr > F
Forb	Treatment	1/142	10.47	0.0015
Forb	Native_Exotic	1/68.5	270.96	<0.0001
Forb	Treatment*Native_Exotic	1/124	3.17	0.0776
Grass	Treatment	1/128	32.83	<0.0001
Grass	Native_Exotic	1/70.8	105.44	<0.0001
Grass	Treatment*Native_Exotic	1/143	29.53	<0.0001

Table 4.20: Ullathorne Estimates of change for Mixed Procedure, Exotic-Native for Pre- and Post-Differences

Cover Class	Label	Estimate	Standard Error	Degrees of Freedom	T-Value	Pr > |t|
Forb	Change in exotic cover	-36.43	10.17	159	-3.58	**0.0005**
Forb	Change in native cover	-11.72	10.18	159.51	-1.15	0.251
Forb	Difference in changes	-24.70	13.88	124.37	-1.78	0.0776
Grass	Change in exotic cover	-79.72	10.11	153	-7.89	**<0.0001**
Grass	Change in native cover	-0.416	10.11	153.20	-0.04	0.967
Grass	Difference in changes	-79.30	14.59	143	-5.43	<0.0001

Table 4.21: Least Squares Means: Ullathorne Cover Class for Native vs. Exotic

Cover Class	Effect	Treat-ment	Native_ Exotic	Estimate	Standard Error	Degrees of Freedom	T-Value	Pr > |t|
Forb	treatment	Post	---	61.00	5.40	84.8	11.29	**<0.0001**
Forb	treatment	Pre	----	85.07	5.53	85.4	15.37	**<0.0001**
Forb	Native_Exotic		Exotic	127.00	5.18	138	24.53	**<0.0001**
Forb	Native_Exotic		Native	19.07	5.18	138	3.68	**0.0003**
Forb	Treatment*Native_Exotic	Post	Exotic	108.79	7.17	155	15.17	**<0.0001**
*Forb	Treatment*Natvie_Exotic	Post	Native	13.21	7.17	155	1.84	0.0673
Forb	Treatment*Native_Exotic	Pre	Exotic	145.21	7.344	156	19.77	**<0.0001**
Forb	Treatment*Native_Exotic	Pre	Native	24.94	7.35	155	3.39	**0.0009**
Grass	Treatment	Post		18.99	7.54	9.49	2.52	**0.0316**
Grass	Treatment	Pre		59.06	7.62	9.87	7.76	**<0.0001**
Grass	Native_Exotic		Exotic	78.23	7.73	10.4	10.12	**<0.0001**
Grass	Treatment*Native_Exotic	Post	Exotic	38.37	9.17	20	4.18	**0.0005**
Grass	Treatment*Native_Exotic	Pre	Exotic	118.09	9.30	21.1	12.69	**<0.0001**

Analysis of native or exotic plant species composition of forbs and for grasses at Ullathorne for the difference of post-treatment minus pre-treatment are displayed in Figure 4.14 and 4.15 respectively. Intervals that do not contain zero are shown in bold.

Big Bar: Quadrat data results or significance for species and substrate, and native/exotic percent cover

Big Bar Willow Quadrat Species of significant change tables:

Table 4.22 Part 1 of 2: Differences of Least Square Means: Big Bar

Cover type	Type:	Pre-: Estimate	Pre-: Standard Error	Post-: Estimate	Post-: Standard Error	Difference
Agrostis capiilis L.	Grass Exotic	0.84	0.561	-0.05	0.57	-0.886
Aira caryophyllea L.	Grass Exotic	0.69	0.246	0.08	0.25	-0.609
Anthriscus caucalis M. Bieb.	Forb Exotic	0.57	0.386	-0.03	0.39	-0.597
Artemisia douglasiana Besser	Forb Native	4.08	2.274	7.08	2.22	2.997
Avena fatua	Grass Exotic	0.39	0.545	0.80	0.54	0.414
Brassica nigra	Forb Exotic	2.65	1.479	1.11	1.54	-1.544
Briza minor	Grass Exotic	1.38	0.531	-0.21	0.58	-1.588
Bromus carinatus	Grass Native	0.54	0.338	0.25	0.34	-0.286
Bromus catharticus	Grass Exotic	0.00	0.191	0.27	0.19	0.268
Bromus mollis hordeaceus	**Grass Exotic**	**5.72**	**0.961**	**-1.91**	**1.28**	**-7.626**
Bromus ridglus diandrus	**Grass Exotic**	**6.46**	**0.909**	**1.55**	**1.04**	**-4.910**

Bromus tectorum	Grass Exotic	0.03	0.019	-0.00	0.02	-0.030
Carex sp.	Forb Native	0.00	0.190	0.27	0.19	0.268
Ceratodon purpureus	**Moss**	0.86	0.317	0.02	0.33	-0.839
Cirsium vulgare	Forb Exotic	0.01	0.198	0.27	0.2	0.268
Claytonia perfoliata	Forb Native	0.03	0.026	0.03	0.03	-0.001
Conium maculatum	Forb Exotic	0.31	0.194	0.01	0.2	-0.302
Conzya canadensis	Forb Native	0.04	0.219	0.48	0.21	0.438
Crepis capillaris	Forb Exotic	0.00	0.096	0.16	0.09	0.157
Cynodon dactylon	Grass Exotic	5.55	3.162	4.12	3.21	-1.429
Cynosurus echinatus	Grass Exotic	0.28	0.217	0.28	0.22	-0.002
Cyperus rotundus	Grass Exotic	0.01	0.198	0.27	0.2	0.268
Daucus carota	Forb Exotic	0.01	0.198	0.27	0.2	0.268
Descampsia cerpitosa	Grass Native	0.01	0.298	0.41	0.29	0.401
Elymus glaucus	Grass Native	0.14	0.094	-0.008	0.095	-0.148
Epilobium ciliatum	Forb Native	0.00	0.019	0.027	0.019	0.027
Equisetum sp.	Forb Native	0.01	0.236	0.523	0.227	0.517
Galium aparine	**Forb Native**	**1.32**	**0.603**	**-0.244**	**0.620**	**-1.564**
Galium triflorum	Forb Native	0.29	0.127	-0.039	0.132	-0.331
Geranium molle	Forb Exotic	0.06	0.029	-0.012	0.029	-0.069
Holcus lantus	**Grass Exotic**	**2.95**	**0.184**	**-2.808**	**0.234**	**-5.763**
Hypericum perforatum	Forb Exotic	0.01	0.198	0.275	0.196	0.268
Isatis tinctoria	Forb Exotic	2.18	1.370	0.154	1.394	-2.028
Juncus bufonius	Forb Native	0.01	0.213	0.401	0.207	0.396
Lolium multiflorum	Grass Exotic	0.01	0.298	0.412	0.294	0.401
Lonicera ciliosa	Forb Native	0.02	0.100	0.155	0.099	0.131
Lotus micranthus	Forb Native	0.03	0.019	-0.002	0.019	-0.030
Medicago lupulina	Forb Exotic	0.14	0.094	-0.008	0.095	-0.148
Melilotus alba	**Forb Exotic**	**0.24**	**0.793**	**2.037**	**0.736**	**1.798**
Mimulus ssp.	Forb Native	0.00	0.099	0.137	0.098	0.134
Osmorhiza chilensis	Forb Native	0.17	0.094	-0.013	0.097	-0.181
Panicum acuminatum-occidentale	Grass Native	0.00	0.099	0.137	0.098	0.134
Poa sp.	Grass Exotic	0.01	0.298	0.412	0.294	0.401
Polypogon monspeliensis	Grass Exotic	0.01	0.213	0.401	0.207	0.396
Saponaria officinalis	Forb Exotic	1.79	2.753	3.229	2.673	1.443
Senecio sylvaticus	**Forb**	**0.07**	**0.464**	**1.383**	**0.431**	**1.313**

	Exotic					
Trifolium arvense	Forb Exotic	1.17	0.509	-0.156	0.527	-1.322
Veronica beccabunga	Forb Exotic	0.05	0.323	0.694	0.312	0.640
Vicia cracca	Forb Exotic	0.03	0.019	-0.002	0.019	-0.030
Vicia sativa	Forb Exotic	0.03	0.019	-0.002	0.019	-0.030
Vinca major	Forb Exotic	3.32	3.351	4.566	3.318	1.244
Vulpia myuros	**Grass Exotic**	**7.63**	**1.448**	**-0.858**	**1.650**	**-8.493**
Duff-Litter		**43.75**	**1.942**	**0.556**	**1.942**	**-43.190**
Sand		**6.90**	**2.096**	**36.323**	**2.096**	**29.420**
Forb		**21.62**	**9.083**	**29.564**	**9.083**	**7.946**
Grass		**40.30**	**6.250**	**17.251**	**6.250**	**-23.054**
Wood		**3.67**	**1.900**	**11.512**	**1.955**	**7.839**

Table 4.22 Part 2 of 2: Differences of Least Square Means: Big Bar

Cover type	**Type:**	**Standard Error**	**Degrees of Freedom**	**T-value**	**Pr > |t|**
Agrostis capiilis L.	Grass Exotic	0.823	67	-1.077	0.285
Aira caryophyllea L.	Grass Exotic	0.357	73	-1.706	0.092
Anthriscus caucalis M. Bieb.	Forb Exotic	0.548	67	-1.089	0.280
Artemisia douglasiana Besser	Forb Native	2.522	89	1.188	0.238
Avena fatua	Grass Exotic	0.601	70	0.689	0.493
Brassica nigra	Forb Exotic	1.766	76	-0.874	0.385
Briza minor	Grass Exotic			-1.887	0.063
Bromus carinatus	Grass Native	0.493	69	-0.579	0.564
Bromus catharticus	Grass Exotic	0.269	67	0.995	0.323
Bromus mollis hordeaceus	**Grass Exotic**	**1.778**	**84**	**-4.290**	**0.000**
Bromus ridglus diandrus	**Grass Exotic**	**1.342**	**107**	**-3.658**	**0.000**
Bromus tectorum	Grass Exotic	0.027	67	-1.077	0.285
Carex sp.	Forb Native	0.269	67	0.995	0.323
Ceratodon purpureus	**Moss**	0.478	70	-1.753	0.084
Cirsium vulgare	Forb Exotic	0.269	67	0.995	0.323
Claytonia perfoliata	Forb Native	0.038	68	-0.019	0.985
Conium maculatum	Forb Exotic	0.266	70	-1.137	0.260
Conzya canadensis	Forb Native	0.257	69	1.705	0.093
Crepis capillaris	Forb Exotic	0.135	68	1.164	0.249
Cynodon dactylon	Grass Exotic	3.002	85	-0.476	0.635
Cynosurus echinatus	Grass Exotic	0.314	71	-0.006	0.995
Cyperus rotundus	Grass Exotic	0.269	67	0.995	0.323
Daucus carota	Forb Exotic	0.269	67	0.995	0.323
Descampsia cerpitosa	Grass Native	0.403	67	0.995	0.323
Elymus glaucus	Grass Native	0.137	67	-1.077	0.285
Epilobium ciliatum	Forb Native	0.027	67	0.995	0.323
Equisetum sp.	Forb Native	0.318	69	1.628	0.108
Galium aparine	**Forb Native**	**0.688**	**71**	**-2.272**	**0.026**
Galium triflorum	Forb Native	0.195	68	-1.698	0.094
Geranium molle	Forb Exotic	0.039	68	-1.789	0.078
Holcus lantus	**Grass Exotic**	**0.390**	**72**	**-14.763**	**0.000**
Hypericum perforatum	Forb Exotic	0.269	67	0.995	0.323
Isatis tinctoria	Forb Exotic	1.611	72	-1.259	0.212
Juncus bufonius	Forb Native	0.295	68	1.340	0.185
Lolium multiflorum	Grass Exotic	0.403	67	0.995	0.323
Lonicera ciliosa	Forb Native	0.135	69	0.970	0.335
Lotus micranthus	Forb Native	0.027	67	-1.079	0.284
Medicago lupulina	Forb Exotic	0.137	67	-1.077	0.285
Melilotus alba	**Forb Exotic**	**0.824**	**78**	**2.182**	**0.032**
Mimulus ssp.	Forb Native	0.134	67	0.995	0.323
Osmorhiza chilensis	Forb Native	0.138	68	-1.306	0.196
Panicum acuminatum-occidentale	Grass Native	0.134	67	0.995	0.323
Poa sp.	Grass Exotic	0.403	67	0.995	0.323

Polypogon monspeliensis	Grass Exotic	0.295	68	1.340	0.185
Saponaria officinalis	Forb Exotic	3.202	71	0.451	0.654
Senecio sylvaticus	**Forb Exotic**	**0.549**	**73**	**2.392**	**0.019**
Trifolium arvense	Forb Exotic	0.779	68	-1.698	0.094
Veronica beccabunga	Forb Exotic	0.388	69	1.650	0.104
Vicia cracca	Forb Exotic	0.027	67	-1.077	0.285
Vicia sativa	Forb Exotic	0.027	67	-1.077	0.285
Vinca major	Forb Exotic	4.101	71	0.303	0.763
Vulpia myuros	**Grass Exotic**	**2.122**	**84**	**-4.002**	**0.000**
Duff-Litter		**2.992**	**140**	**-14.437**	**0.000**
Sand		**3.194**	**140**	**9.210**	**0.000**
Forb		**3.330**	**66**	**2.387**	**0.020**
Grass		**5.521**	**66**	**-4.175**	**0.000**
Wood		**2.127**	**133**	**3.685**	**0.000**

Big Bar Cover Class: Forb and Grass, Native versus Exotic

Table 4.23: Type 3 Tests of Fixed Effects: Big Bar Cover Class for Native vs. Exotic

Cover Class	Effect	Numerator Degrees of Freedom	Denominator Degrees of Freedom	F-Value	Pr > F
Forb	Native_Exotic	1	49.7	19.17	<0.0001
Grass	Treatment	1	118	10.72	0.0014
Grass	Native_Exotic	1	66.4	57.56	<0.0001
Grass	Treatment*Native_Exotic	1	127	11.21	0.0011

Table 4.24: Estimates of change for Mixed Procedure, Exotic-Native for Pre- and Post-Differences at the Big Bar site

Cover Class	Label	Estimate	Standard Error	Degrees of Freedom	T-Val	Pr > |t|
Forb	Change in exotic cover	10.703	8.543	136.245	1.253	0.212
Forb	Change in native cover	5.189	8.543	136.245	0.607	0.545
Forb	Difference in changes	5.514	12.476	127.885	0.442	0.659
Grass	**Change in exotic cover**	**-47.189**	**10.008**	**137.424**	**-4.715**	**0.000**
Grass	Change in native cover	1.081	10.008	137.424	0.108	0.914
Grass	**Difference in changes**	**-48.270**	**14.218**	**126.428**	**-3.395**	**0.001**

Table 4.25: Least Squares Means: Cover Class for Native vs. Exotic at the Big Bar site

Cover Class	Effect	Treat-ment	Native _ Exotic	Estimate	Standard Error	Degrees of Freedom	T-Value	Pr > |t|
Forb	**treatment**	**Post**	**---**	**29.909**	**9.497**	**7.16**	**3.15**	**0.0157**
***Forb**	**treatment**	**Pre**		**21.963**	**9.497**	**7.16**	**2.31**	**0.0532**
Forb	**Native_Exotic**		**Exotic**	**40.598**	**9.637**	**7.57**	**4.21**	**0.0033**
Forb	**Treatment*Native_ Exotic**	**Post**	**Exotic**	**46.287**	**10.541**	**10.8**	**4.39**	**0.0011**
Forb	**Treatment*Native_ Exotic**	**Pre**	**Exotic**	**34.91**	**10.54**	**10.8**	**3.31**	**0.0071**
Grass	**Treatment**	**Post**		**17.398**	**6.66**	**10.9**	**2.61**	**0.0243**
Grass	**Treatment**	**Pre**		**40.451**	**6.66**	**10.9**	**6.07**	**<0.0001**
Grass	**Native_Exotic**		**Exotic**	**56.316**	**6.71**	**11.2**	**8.40**	**<0.0001**
Grass	**Treatment*Native_ Exotic**	**Post**	**Exotic**	**32.857**	**8.37**	**25.9**	**3.92**	**0.0006**
Grass	**Treatment*Native_ Exotic**	**Pre**	**Exotic**	**79.776**	**8.37**	**25.7**	**9.53**	**<0.0001**

Figure 4.16 shows Big Bar plant species Native/Exotic by Forbs for the difference of post-treatment minus pre-treatment. Figure 4.17 shows Big Bar plant species Native/Exotic by Grasses for the difference of post-treatment minus pre-treatment

Intervals that do not contain zero are shown in bold.

Results common for all sites

Prescribed burning and flooding significantly (P value < 0.05) affected the density and cover type for species classified as a cover class of Native or Exotic. Significant change of Cover class was a change in mean percent cover for many of the dominate forb or grass species. Specifically at each site: Independence had significant changes for 17 out of 59 forb, and 6 out of 27 grass species. There were significant changes for 9 out of 53 forb, and 6 out of 17 grass species at the Ullathorne site. Big Bar had significant changes for 3 out of 32 forb, and 4 out of 25 grass species (Table 4.26).

Table 4.26: Significance of forb and grass species as Native or Exotic for all sites

Location	Cover class	Native Exotic	Number of species/site	Significance	Proportion significant
Independence	forb	exotic	35	9	25.7%
Independence	forb	native	24	6	25.0%
Independence	grass	exotic	21	5	23.8%
Independence	grass	native	6	1	16.7%
Ullathorne	forb	exotic	33	5	15.2%
Ullathorne	forb	native	20	4	20.0%
Ullathorne	grass	exotic	16	6	37.5%
Ullathorne	grass	native	1	0	0.0%
Big Bar	forb	exotic	21	2	9.5%
Big Bar	forb	native	11	1	9.1%
Big Bar	grass	exotic	19	4	21.1%
Big Bar	grass	native	6	0	0.0%

Table 4.27: Density (number of stems/meter^2 > 1) of pre- and post- of native-exotic forbs and grass species

Location	Species (Bold in all sites)	Forb-Grass	Native-Exotic	Counts/meter^2 Pre	Counts/meter^2 Post	Number % net change
Independence (Number of stems/38 m^2)	Aira caryophyllea L.	grass	exotic	7.82	2.47	5.34
Independence	Anthriscus caucalis M. Bieb.	forb	exotic	9.34	0.42	8.92
Independence	Artemisia douglasiana B.	forb	native	0.84	1.60	-0.76
Independence	Brassica nigra	forb	exotic	1.10	0.92	0.18
Independence	Bromus carinatus	grass	native	10.66	0	10.66
Independence	Bromus mollis hordeaceus	grass	exotic	25.58	0.84	24.74
Independence	Bromus ridglus diandrus	grass	exotic	3.76	0.76	3
Independence	Bromus tectorum	grass	exotic	50.92	3.55	47.37
Independence	Cardamine sp.	forb	native	1.26	0	1.26
Independence	Carex sp.	grass	native	5.68	6.71	-1.03
Independence	Centaurea solstitialis	forb	exotic	10.95	1.32	9.63

Independence	Conium maculatum	forb	exotic	6.87	2.37	4.5
Independence	Conzya canadensis	forb	native	2.34	0.79	1.55
Independence	Cynosurus echinatus	grass	exotic	5.26	0	5.26
Independence	Deschampsia caespitosa	grass	native	9.21	0.66	8.55
Independence	Elymus glaucus	grass	native	9.89	3.87	6.03
Independence	Epilobium ciliatum	forb	native	0	1.08	-1.08
Independence	Galium aparine	forb	native	0.84	0.97	-0.13
Independence	Galium triflorum	forb	native	2.656	0.21	2.45
Independence	Hieracium albiflorum	forb	native	1.74	0.32	1.42
Independence	Isatis tinctoria	forb	exotic	8.10	5.58	2.53
Independence	Lactuca serriola	forb	exotic	5.53	0.21	5.32
Independence	Lolium multiflorum	grass	exotic	1.55	0.18	1.37
Independence	Melilotus alba	forb	exotic	0.34	3.29	-2.95
Independence	Veronica arvensis	forb	exotic	2.63	0	2.63
Independence	Vulpia myuros	grass	exotic	47.68	17.10	30.58
Ullathorne (Number of stem/40 m^2)	Agrostis capillis L.	grass	exotic	4	0	4
Ullathorne	Aira caryophyllea L.	grass	exotic	49.96	0.05	49.93
Ullathorne	Artemisia douglasiana Bessesr	forb	native	3.67	3.72	-0.05
Ullathorne	Avena fatua	grass	exotic	3	0.05	2.95
Ullathorne	Brassica nigra	forb	exotic	3.1	0.47	2.62
Ullathorne	Bromus mollis hordeaceus	grass	exotic	54.3	0.3	54
Ullathorne	Bromus ridglus diandrus	grass	exotic	20	1.9	18.1
Ullathorne	Bromus tectorum	grass	exotic	1.5	0.32	1.17
Ullathorne	Centaurea solstitialis	forb	exotic	5.15	0.02	5.12
Ullathorne	Cynodon dactylon	grass	exotic	14.82	12.2	2.62
Ullathorne	Cynosurus echinatus	grass	exotic	19.8	0.4	19.4
Ullathorne	Festuca arundinacea	grass	exotic	0	4.37	-4.375
Ullathorne	Heterotheca grandiflora	forb	native	3.875	4.4	-0.525
Ullathorne	Hieracium albiflorum	forb	native	19.6	0.02	19.57
Ullathorne	Holcus lantus	grass	exotic	1.85	0	1.85
Ullathorne	Lotus micranthus	forb	native	4.62	0.1	4.525
Ullathorne	Melilotus alba	forb	exotic	9.02	3.7	5.325
Ullathorne	Saponaria officinalis	forb	exotic	39.92	45.5	-5.57
Ullathorne	Trifolium arvense	forb	exotic	3.92	0	3.92
Ullathorne	Vicia cracca	forb	exotic	1.775	0.12	1.65
Ullathorne	Vicia gigantea	forb	native	1.225	0	1.22
Ullathorne	**Vulpia myuros**	grass	exotic	125.5	0.82	124.67
Big Bar (Number of stem/37 m^2)	**Aira caryophyllea L.**	grass	exotic	2.3	0.19	2.11
Big Bar	**Artemisia douglasiana B.**	forb	native	2.92	3.38	-0.46
Big Bar	**Brassica nigra**	forb	exotic	7.62	0.19	7.432
Big Bar	Briza minor	grass	exotic	4.95	0	4.96
Big Bar	Bromus carinatus	grass	native	1.95	0.08	1.86
Big Bar	**Bromus mollis hordeaceus**	grass	exotic	33.38	0.11	33.27

Big Bar	**Bromus ridglus diandrus**	grass	exotic	27.24324	2.3	24.94
Big Bar	Cynodon dactylon	grass	exotic	24.6	6.86	17.73
Big Bar	Galium aparine	forb	native	2.73	0.023	2.70
Big Bar	Isatis tinctoria	forb	exotic	3.35	0.08	3.27
Big Bar	Melilotus alba	forb	exotic	0.05	1.97	-1.92
Big Bar	Saponaria officinalis	forb	exotic	1.70	2.51	-0.81
Big Bar	Trifolium arvense	forb	exotic	1.62	0	1.62
Big Bar	Vinca major	forb	exotic	4.27	4.54	-0.27
Big Bar	Vulpia myuros	grass	exotic	47.84	1.784	46.05

All other species of native and exotic forbs or grasses at the sites are not included because they had a density less than one meter^2 and were considered proportionately less important. These proportionately fewer species still contribute ecologically to overall riparian biodiversity.

Discussion

Research was originally planned to study fire effects of sandbar willow because of the Karuk tribal perspective regarding the lack of flooding to rejuvenate willow sprouts (Glaze pers. com. 2002, M. McCovey pers. com. 2002, Reece pers. com. 2002, Salter 2003). Flooding historically scoured and redistributed willows causing young growth which the Native American basket weavers relied upon. Part of the original theory prompting further investigation was that in the time periods between flooding disturbance, the Karuk basket weavers burned willows to induce sprouting for shoots and reduce insect pests. The timing of burns needed to lag in frequency behind flooding events. Cultural management involves the uncertainty of when the next flood of sufficient magnitude will occur. If a flood coincided with the winter following a burn it was of little concern because the disturbance-created environmental condition would be somewhat similar at the willow patch scale. In the case of this prescribed fire; flooding confounded the ability to discern fire effects. Qualitative data related to prescribed fire were photograph points from each end of the transect showing the condition of the willow patch for the two years (2004 and 2005) of pre-fire vegetation composition, structure, and cover and post disturbance during the transect/quadrat vegetation and substrate sampling (2006) (See Appendix C). This discussion focuses on effects of prescribed fire and/or flooding on sandbar willow patches. Fire severity, flooding disturbance, and growth response, changes in habitat, and whether there was accomplishment of the objectives and goals of the research.

Transect sandbar willow

The effects of the prescribed fire and flooding on the variables “size class” and “status” of sandbar willow are culturally significant because there was a change from the older mature willows that were inaccessible (too tall) and non-usable (stem morphology, branch structure, and insect damage) to accessible younger willow stems (Anderson 1999). The numbers of new stems in the smaller size classes within transects at the project sites were culturally significant. In relevant cultural terms, enough younger stems (shoots) were potentially available following prescribed fire and flooding for use to make a fish trap, which a master weaver could use to teach a younger apprentice, and then use for subsistence fishing to capture lamprey eels (*Lampetra tridentata*), an important food source (Figure 4.18). Willow shoots for the size range that could be used for fish traps or pack baskets were harvested at Ullathorne on March 26, 2007 within the burn area. These shoots were peeled and inspected for insects. A total of 309 out of 414 or 74.6% were insect free sticks, e.g., without visible stem holes or galls (Figure 6.3). Comparison of prior prescribed burned and flooded (Ullathorne March 26, 2007 shoots) versus flooded willow shoots and stems (River bar across from Orleans below Red Cap road) are shown in Figure 6.5. On left side of the one-meter ruler are willow shoots to be used for a lamprey eel trap with bark-on or peeled and used for open-work tray or pack basket (309 good of 414 total shoots).

Observations of sandbar willow communities in the last five years along the lower mid-Klamath River from Happy Camp to Weitchpec indicate that willow patches that were not burned, pruned, sheared, or browsed have less new useable shoot growth in proportion to overall stem growth (Chapter 6) (Reece pers. com. 2007, Glaze pers. com. 2007, Lake pers. obs.). High magnitude wide-scale flooding occurred along the mid-lower Klamath River in early January 1997 and then again December 29, 2005. Flooding disturbance fostered widespread sprouting. Burned sites along the lower mid-Klamath River are eco-cultural microsites with a higher proportion of young sandbar willow recruitment as compared to unburned or not pruned sites of "natural" stem growth.

Results of willow stems (shoots) by size class and status demonstrated that prescribed fire increased the accessibility of willow stems and increased their potential usability by increasing the number of willow stems in the small and low size classes-live at the sites. Older live very tall (VT) and tall (TL) willow stems have reduced potential to sprout following a disturbance, like prescribed fire or flooding abrasion or mechanical breakage, and may not foster the production of accessible young willow stems. Any mortality of willow stems observed during the post-fire survey was attributed to the effects of fire and flooding. However, potential confounding variables may have been freeze and flooding damage and/or ungulate browsing on willows following the burn treatment and flooding before the post-disturbance survey. The older age and maturity of the sandbar willow at the Independence river access site demonstrates the importance of managing willows before they become too old or deteriorated to respond favorably (higher amounts of sprouting) to disturbance. Comparison of the difference in mature live willow before the prescribed fire to young live willow after the fire highlights the potential of the sites to produce potentially useable sandbar willow stems for basketry. The significance of the observed results only applies to these sites, but demonstrated the importance of case studies that provide an initial understanding of potential fire and flooding effects on the size class distribution and status of sandbar willow stems for basketry use.

When compared to the same set of parameters, but for Dead-very tall, willows have less change likely because the low intensity of the prescribed burn did not kill willow stalks with thicker bark that are located in high moisture microsites. *Salix exigua*, Live-low, Location*Year, for Big Bar 2006 shows the high number of generated willow shoots. *Salix exigua*, Live-low, Location*Year, for Ullathorne showed an increase from 2004 to 2005, but little difference from 2005 to 2006. This is likely due to the effect of the partial (45% area) prescribed burn on the site in the fall of 2004. Related to the same effect is *Salix exigua*, Live-small, Location*Year for Ullathorne shows significant reduction from 2005 to 2006, attributed to the effect of the more extensive (85% area) fall 2005 prescribed burn and flood.

Quadrats for forbs, grass, and native or exotic plants

The most significant change observed in native vs. exotic forbs or grasses was the relationship between the percent cover and number of individual counting units of stems or clumps of species (density). The dominant forbs and grasses generally experienced a reduction in total percent cover and number of stems or clumps following prescribed fire and flooding as supported by the Density (number of stems/meter^2 > 1) of pre- and post-disturbance of native-exotic forbs and grass species (Table 4.27). The severity of prescribed fire or flooding effects varied between sites as well as within the sites. The within patch microsites that had heavier fuels burned hotter, potentially reducing the seed bank diversity or abundance of herbaceous plants (DeBano et al. 1998).

The microsites which experienced a higher velocity of flooding had rooted species and seed bank reserves washed away. New sand and silt deposited to variable depths also may have inhibited sprouting of those rooted plants or germination of residual seeds. Rhizomatous forbs, native (mugwort) and non-native (bouncing bet), expanded in areas of the soil profile fostering emergent shoots leading to a higher number of individual stems and percent cover than before the disturbances of fire or flooding. Deep-rooted perennial grasses were observed to maintain microsite dominance, compared to seedlings of annuals which generally had less percent cover and number of stems after prescribed fire and flooding disturbance. Figure 4.19 shows the difference between Post-fire and Post-flood ground cover.

Fire versus flood effects

Fire affects the vegetation of sandbar willow communities similarly to flooding but there are several important distinctions in how fire is different than flooding on the composition, structure, and density of shrubs, forbs, grasses, native/exotic species, and fuel load present. Fire affects the composition of riparian vegetation, similar to flooding, by reducing cover and/or density of shrub, forb, grass, and fuel. Fire can modify biological and physical conditions which facilitate changes in habitat microsites to the benefit or detriment of some species. With regard to sandbar willow, former research has shown that the immediate fire effects were that fires generally killed only aboveground plant parts. Fires of higher severity can remove organic soil layers exposing willow roots to heat and may reduce basal sprouting (USFS-FEIS). Pre- and post-repeat photographs of vegetation sampling show changes attributed to prescribed fire and flooding (Figure 4.20).

Fuel that was susceptible to combustion at time of prescribed fire was generally reduced, although live fuel killed or damaged by fire may have been modified to a more potentially combustible fuel condition (Agee 1993). Flooding can deposit whole, parts, or seeds of shrubs, forbs, grasses, and organics as fuel from upstream to new downstream locations modifying the future potential composition and structure if those migrants become established (Donaldson 1997, Naiman et al. 1998). Flooding, as observed in this study, reduced the composition (type) and amounts of different types of fuel present in a willow patch by flushing away, or by depositing fuel (Chapter 5). Fuel, which is discussed in chapter 5, is important because it was a type of substrate (e.g., duff/litter or wood) influencing the available ground cover area for vegetation. Fuel buildup can exclude vegetation from some locations, e.g., Big Bar flood material Post Fire/Flood (Figure 4.21).

Fire associated with high intensities affects the structure of vegetation by reducing the density of older mature larger willow and shrub species, and recruits the rejuvenation of younger vegetative growth or seedlings. Flooding affects the structure of vegetation by reducing the density of older mature larger willow and shrub species if scoured and exported, or pushes over mature, deeper-rooted, taller shrubs, and recruits the rejuvenation of younger vegetative growth from the roots, main trunks, or branches, e.g., Ullathorne willow clumps (Figure 4.22). The scale of consideration of riparian zones for this study was at the valley sandbar willow terrace plant communities. The effect of fire-related flooding at the landscape scale is described by Dwire and Kauffman (2003).

> “Characteristics of riparian areas result from numerous complex interactions among climatic, biotic, and geomorphic influences. Human activities that alter one or more of these components will be reflected in other components over various time scales through feedback responses, leading to changes in the riparian species composition, and affecting the structure and function of riparian ecosystems” (Dwire and Kauffman 2003:65).

Fire did little to modify the geomorphic condition of sandbar willow communities. In comparison, flooding can substantially redistribute and modify the geomorphic composition and arrangement of substrates and local surface topography (structure). The upriver side of willow patches experiencing more flooding energy also experienced a higher amount of scouring, pushing over of vegetation, and strained out flood organic debris (fuel). The leeward/downstream sides of willow patches were observed to have localized deposition of sand/silt which resulted in a topographic increase in elevation and slope gradient compared to adjacent portions of the willow patches that had higher flooding velocities, e.g., Ullathorne sand deposition (Figure 4.23). It was only after witnessing the geomorphic and vegetative changes in the sandbar willow communities resulting from flooding in the burned project areas, and unburned areas along the Klamath River, that an improved understanding of the evolution and formation of species present, substrates, and fuel loads resulting from former disturbances improved the characterization of sandbar willow community dynamics.

Species anomalies, such as the establishment of more terrestrial species (i.e., sword fern (*Polystichum californicum* D. Eaton) or service berry (*Amelanchier alnifoila* Nutt.) resulted from flooding events versus “natural” seed or spore dispersal. Many of these “flood carried and deposited” species have morphological and physiological adaptations to survive and establish following disturbance, which can increase diversity of riparian willow communities (Grime 1979, Donaldson 1997, Naiman et al. 1998). Geomorphic reconfiguration of sandbar willow patches after flooding with newly deposited sand/silt were colonized by willow or wild grape roots (*Vitus californica* Benth.). These areas are important localized sites where Native American basket weavers can harvest willow and wild grape roots for basketry or harvest willow sprouts emerging from rhizomes or roots in the several years after flooding.

Wide scale pruning of willows was likely hindered when miners displaced Native Americans (circa 1850s) and then with the creation of National Forest policies. The designation of the willow communities as part of the Riparian Reserve system under the Northwest Forest Plan Aquatic Conservation Strategy (1994) potentially restricted management options (Skinner 2003). The implication of this policy was addressed from the perspectives of Native Basketweavers in that the environmental condition of sandbar willow habitats are not able meet the demands or needs to sufficiently support the material cultural within the tribal community unless some form of management or “beneficial” disturbance is applied. Because of regulated river flows and federal land use policies, Native basket weavers have experienced significant hurdles to maintain weaving traditions due to the lack of quality material available for use (Heffner 1984, Six Rivers National Forest Interview: I-306, Glaze pers. com. 2002, M. McCovey pers. com. 2002, Reece pers. com. 2002, Peters pers. com. 2005, Spinks pers com. 2005). Multiple lines of evidence support the opinion that Native American management and use of sandbar willow communities for subsistence, ceremonial, and material needs can be compatible with the evolutionary and ecological disturbance traits exhibited by associated plant and animal species using the same habitat (DeWalt 1994, Anderson 1999, Anderson 2005).

The complexity of issues pertaining to the restoration of riparian zones or recommendations for managing flows for vegetation management is beyond the scope of this research (Auble et al. 1994, Donaldson 1997, Kauffman et al. 1997, Dibble and Rees 2005, DiTomaso et al. 2006). The data and information presented here regarding the effects of flooding, fire, and Native American uses provide another line of evidence in the complexity of managing the lower mid-Klamath River valley riparian communities for multiple values (DiTomaso et al. 2006). Invasive exotic weed containment and prevention of spread will continue to be a management concern (DeWall et al. 1994, Donaldson 1997). Potentially this data will be used to improve information available for developing fire behavior and effects models for sandbar willow communities or with increasing effectiveness of the management of these areas. This information can support additional adaptive management approaches through prescribed fire for basketry material enhancement, improving the relationship between USFS management and tribal basket weavers.

Attaining the management and research goals and objectives of the prescribed fires

The goals of the Prescribed Burn Plan for the Independence Willow Burn, under Section 3. Resource Management Goals and Objectives included: (1) "Reduce competitive blackberries by 40-80%," This was not achieved if the number of blackberry stems (counts) for all size classes and status (live or dead) surveyed within the transects are used as criteria in that the survey data results were: 2005 Pre Live stems: 141, Dead stems: 53, total 194 stems compared to post 2006 Live stems: 103, Dead stems: 35, total 138. A decline of only 28.9% in blackberry stems was found within transects. Actual area of crown cover was greatly reduced, based on observed changes, for blackberries but the survey methods used did not measure that attribute. (2) "Retain < 25% total soil cover" was not met. Post-Burn quadrat data averaged across all quadrats for the amount of duff/litter burnt were 80.54% and bare mineral soil exposed was 26.35% total surface area counted. (3) "Willow root crown mortality less than 10%" (Burn plan page 9 of 29) was not achieved based on observed conditions of Post-Burn mortality of older mature willows in the size classes tall and very tall-live. Stem counts from pooled transect data for tall and very tall willows were: Pre-2005 tall and very tall-live, 12 stems compared to post-2006 tall and very tall-live, 2 stems. There was 83.34% reduction in mature older willows within sampled transects across the site. A distinction between top versus root crown mortality should be made. The expectation that prescribed fire would top kill willows of the mature tall and very tall size classes, would recruit younger willows, small, low or medium, from the root crown. The mature tall and very tall willows at Independence were likely too old and root crown (basal or epicormic) sprouting was not prolific.

Section 4. Range of Acceptable Results Expected stated "Reduce competitive blackberries 40-80%" was not achieved; "Willow crown mortality less than 25%" was not achieved if the total live stems counts for tall and very tall size classes pre-2005 (12) compared to post-2006 (2) are used; "Retain 0 to 25% soil cover" was not accomplished in that 26.35% was the average amount of bare mineral soil across all quadrats, meaning that 73.65% of the area had covered soil.

The goals of the Ullathorne and Big Bar Prescribed Fire Burn Plan Willow Research Project, under section 3: The goal to "Burn hot enough to induce stump sprouting" was met for both the Ullathorne and Big Bar sites, as indicated by the increase in the number small, low, and medium-live size classes found within transects pre- compared to post-treatment. The ability to clearly distinguish that fire would "Maximize scorch or top kill of above-ground plants to 70 to 100% (page 6 of 32)" was compounded by flooding at both sites. Based on observation of fire behavior and the surface area burnt the Ullathorne site accomplished more of this goal than occurred at the Big Bar site.

Conclusion

Prescribed burning and flooding disturbance changed the quantity and quality of willows stems for potential basket material by increasing the number of younger willow stems. Burning of sufficient intensity over an extensive area had a rejuvenating ecological effect on the willow by decreasing the mature sizes and stimulating the recruitment of younger size classes of stems. The analysis of the number of willow stems for project sites along transects by size class and status before and after fire provided evidence to accept Hypothesis 1 (H_1). The second hypothesis of interest, H_2, for quadrats substrate, forbs, and grasses is accepted as well. Prescribed burning/flooding significantly affected the density of cover type (species and substrate) expressed as a change in mean percent cover for many of the dominate forb or grass species. The third hypothesis, H_3, for quadrats of native and exotic forb and grass species was accepted. Prescribed burning/flooding significantly affected the density of cover class expressed as a change in mean percent cover of the proportion of native to exotic species for several dominant forbs and grasses.

Culturally relevant results were observed and attained by prescribed fire at the three study sites, but to a lesser extent at Independence, the oldest site. There is a need to replicate the study at additional sites, so that the results found here can be further examined and assist the US Forest Service and Native American basket weavers. Of interest is the relationship between fire and/or flooding on sandbar willow responses in structure and growth (Anderson 2001, Anderson and Barbour 2003).

Figure 4.1: USGS gage Orleans, Ca. peak flow graph in cubic feet per second.

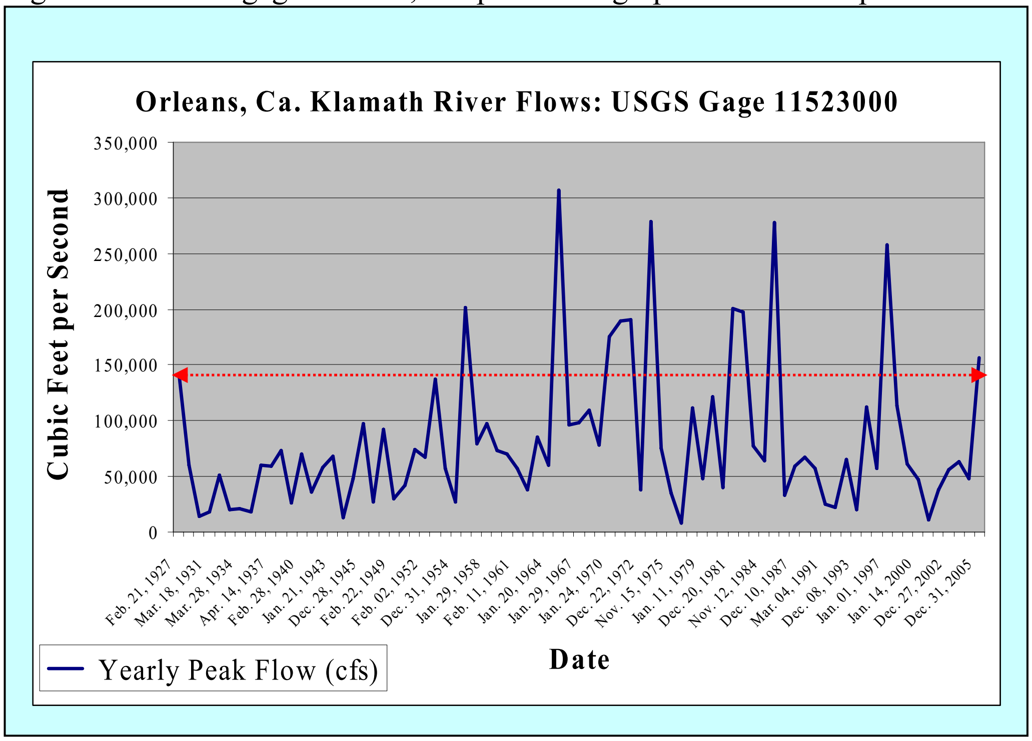


Figure 4.2: Riparian zone dynamics and interactions

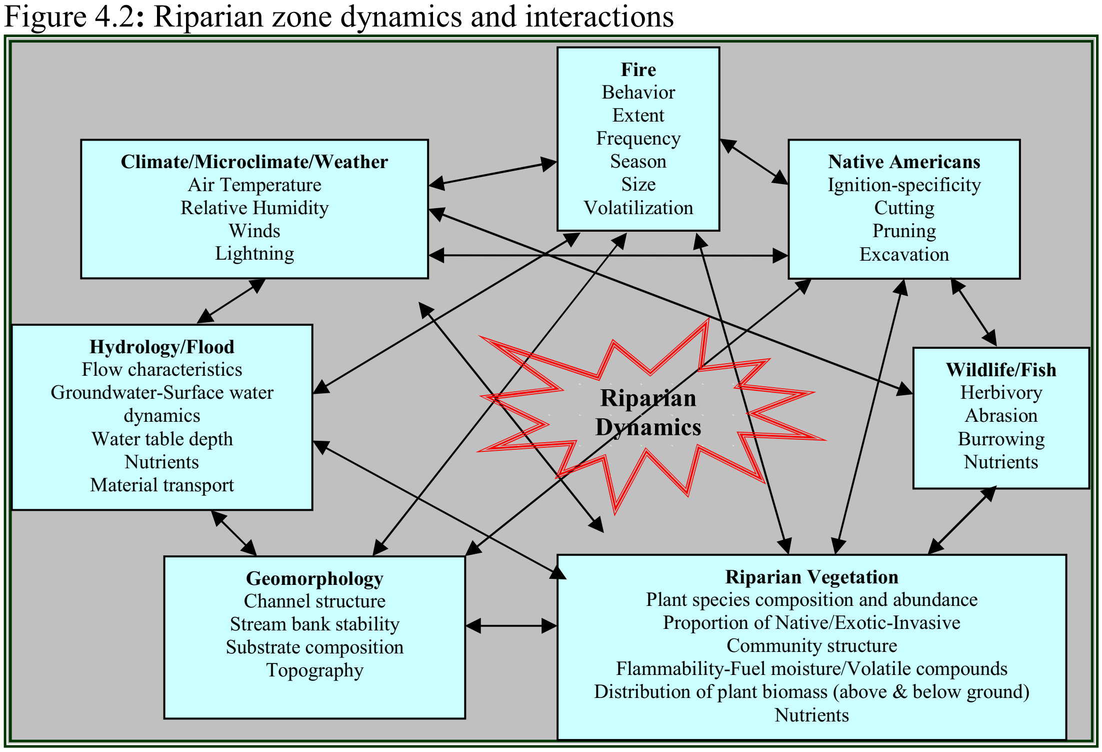


Figure 4.3: Somes Bar, CA. RAWS station: 048346 1961-1990 Year Average Temperature and Precipitation.

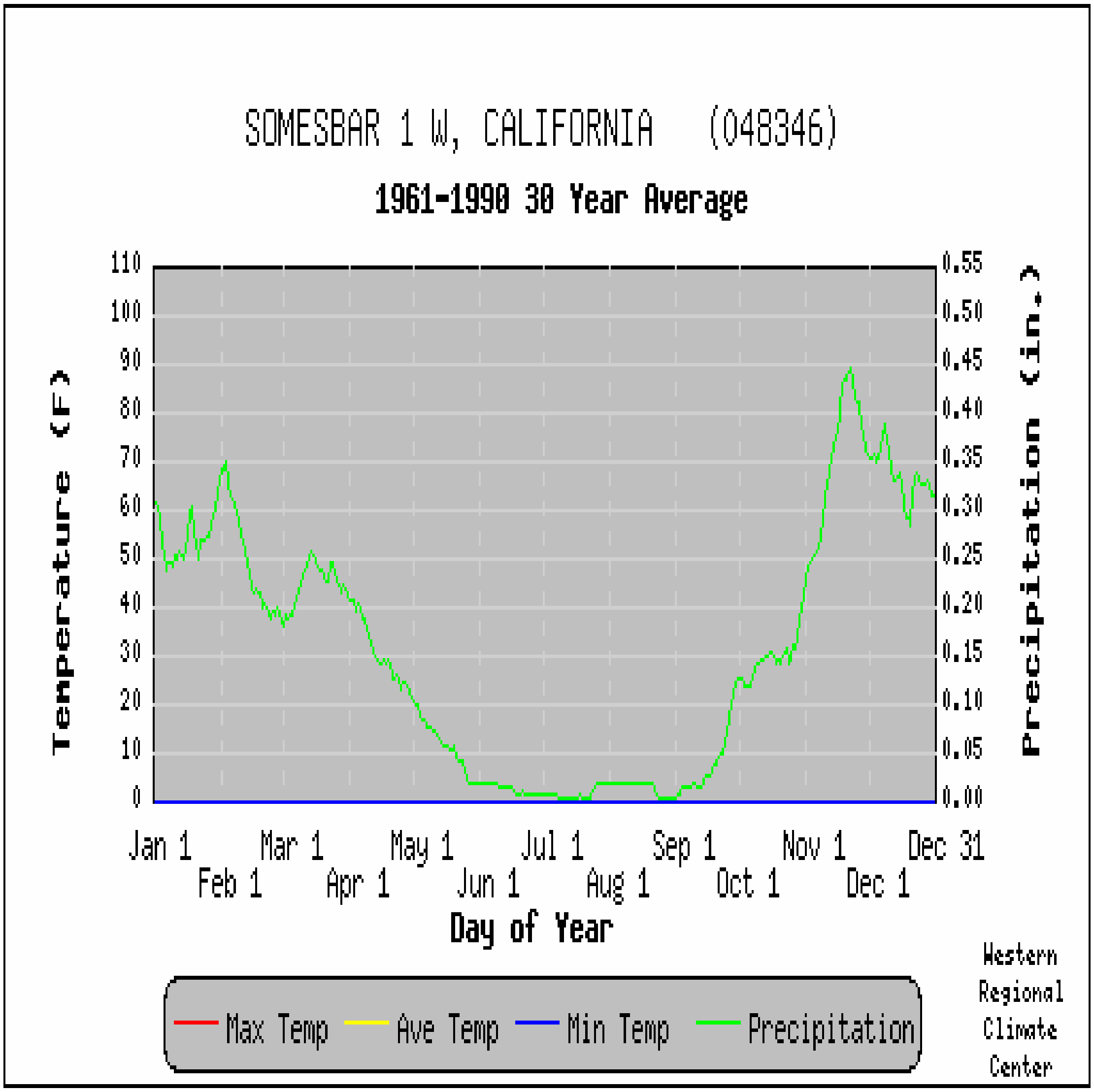


Figure 4.4: Project area map excerpted from USFS Six Rivers National Forest recreation map.

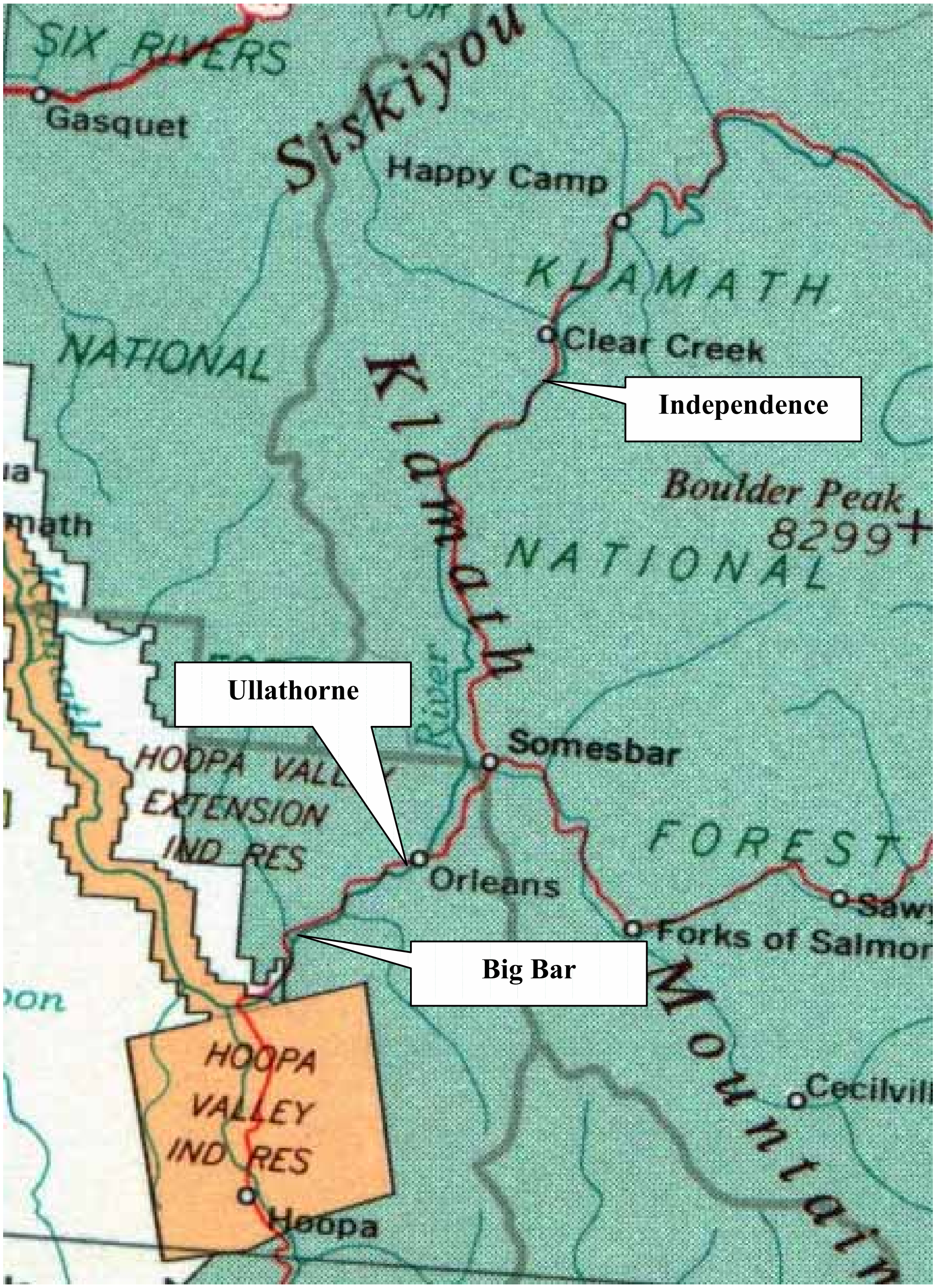


Figure 4.5: Experimental Design: Community-level responses to prescribed fire: Pre- and Post-Burning.

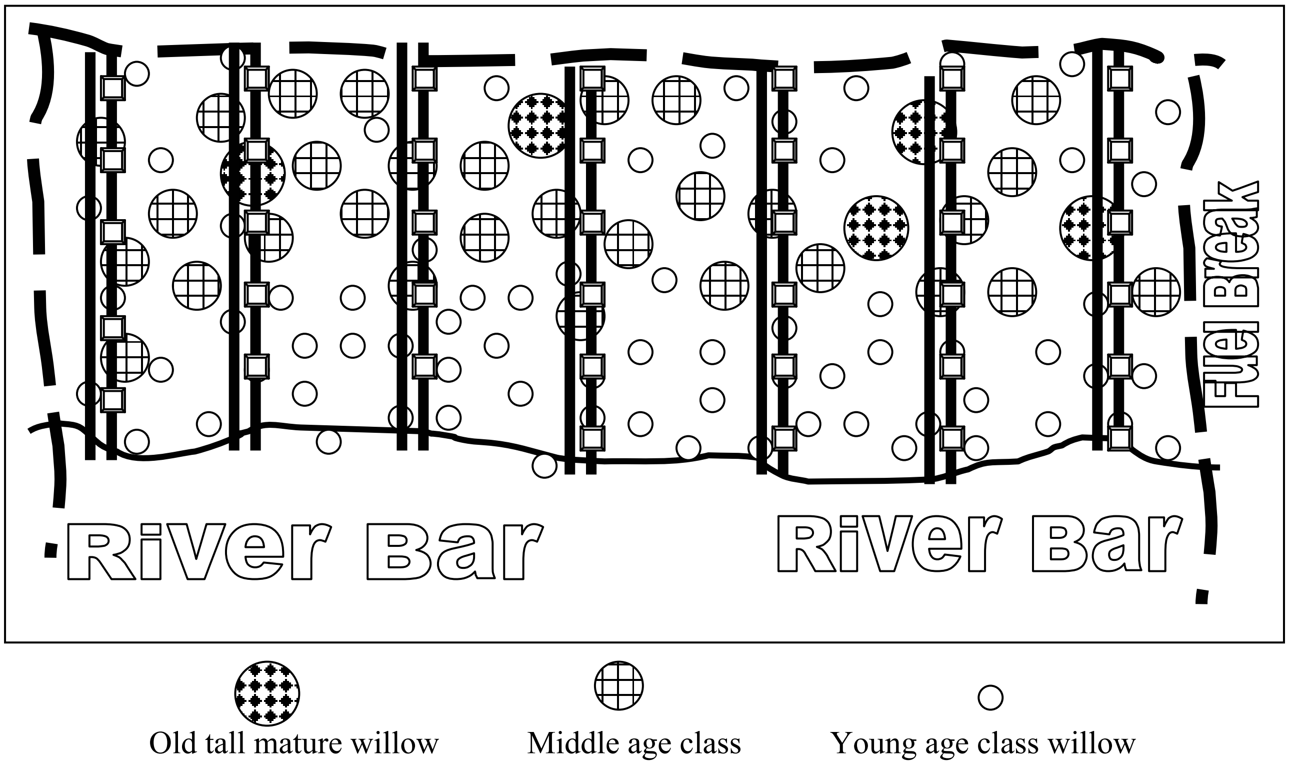


Figure 4.6: Independence prescribed burn

Figure 4.7: Ullathorne willow cut and polished stalk with tree rings and fire scars

Figure 4.8: Ullathorne prescribe burn (Same area shown in Figure 4.19 below)

Figure 4.9: Big Bar prescribed burn. (Compare to Figure 4.16 Post-Flood below)

Figure 4.10a: Independence Pre-burn and Post-burn for Willow Size and Status:

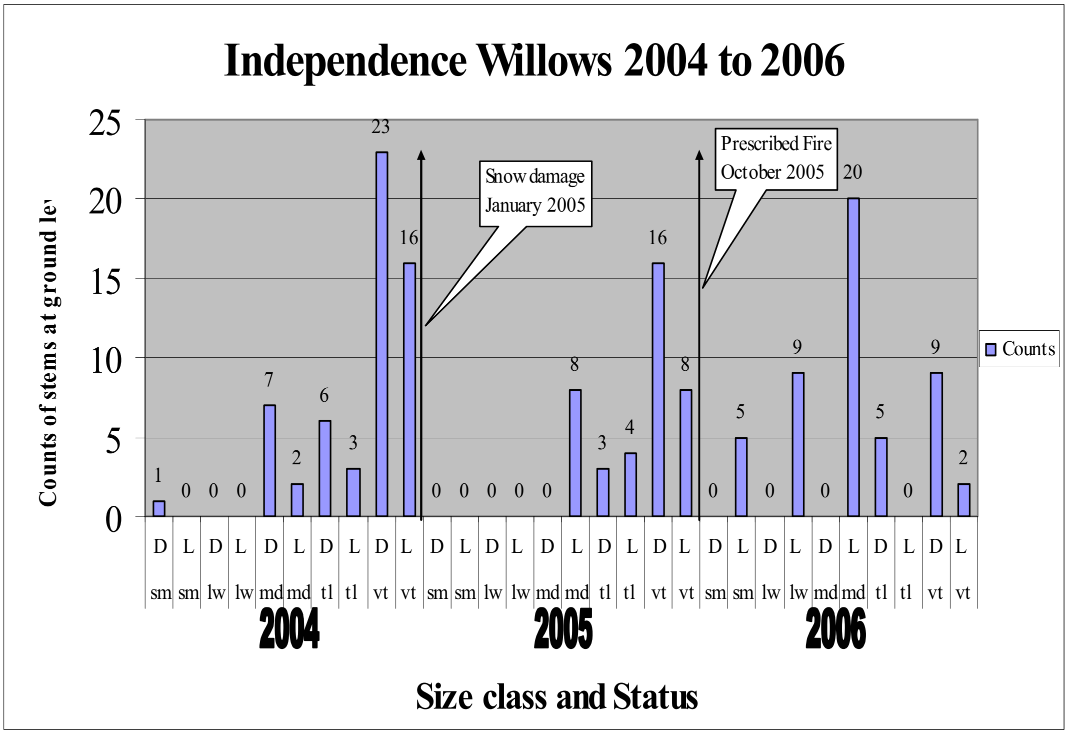


Figure 4.10b: Ullathorne Pre-burn and Post-burn for Willow Size and Status

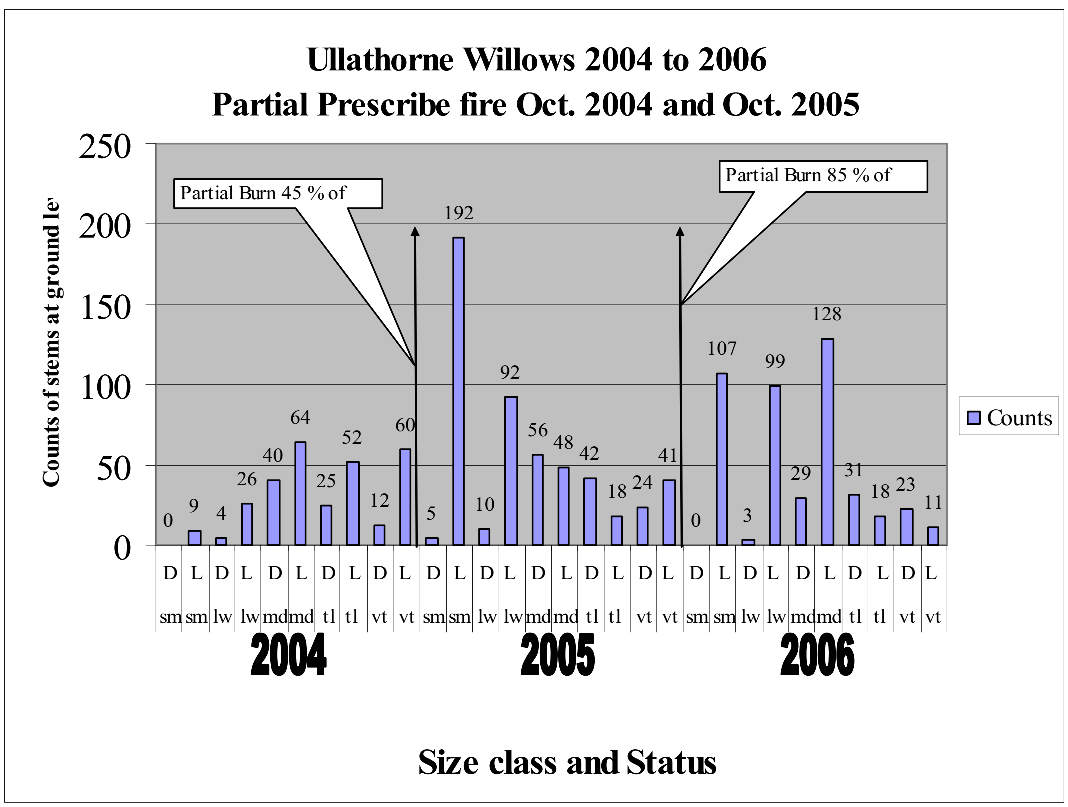


Figure 4.10c: Big Bar Pre-burn and Post-burn for Sandbar Willow Size and Status

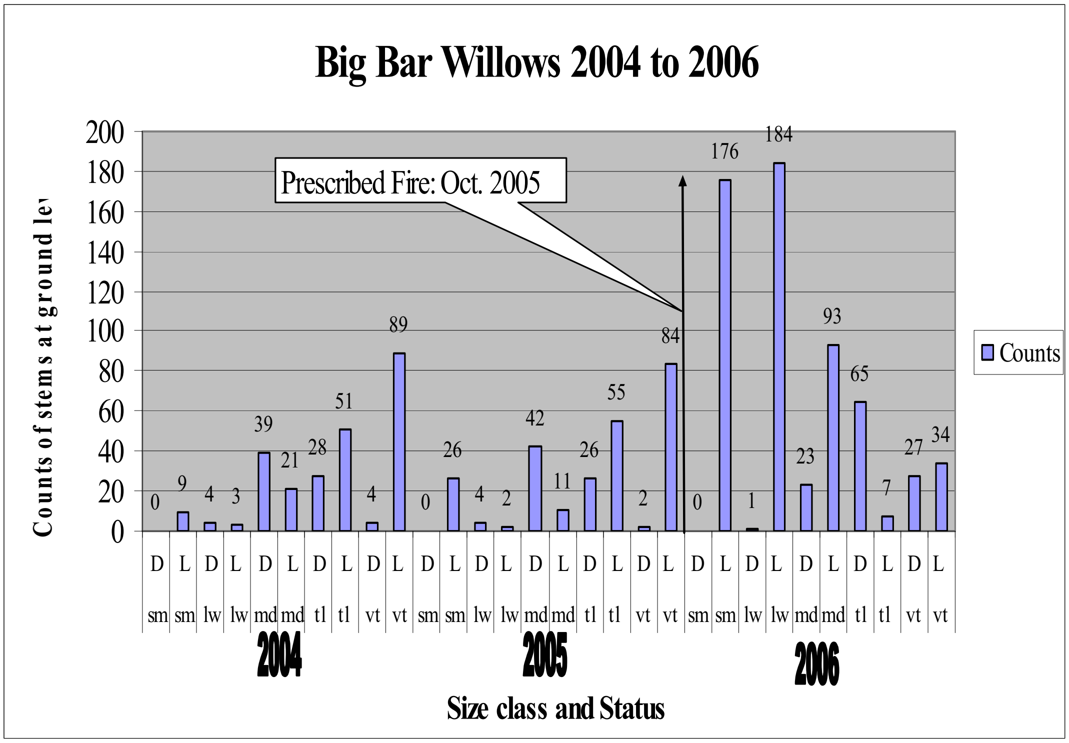


Figure 4.11a: Independence Pre-burn and Post-burn for Himalayan Blackberry Size and Status

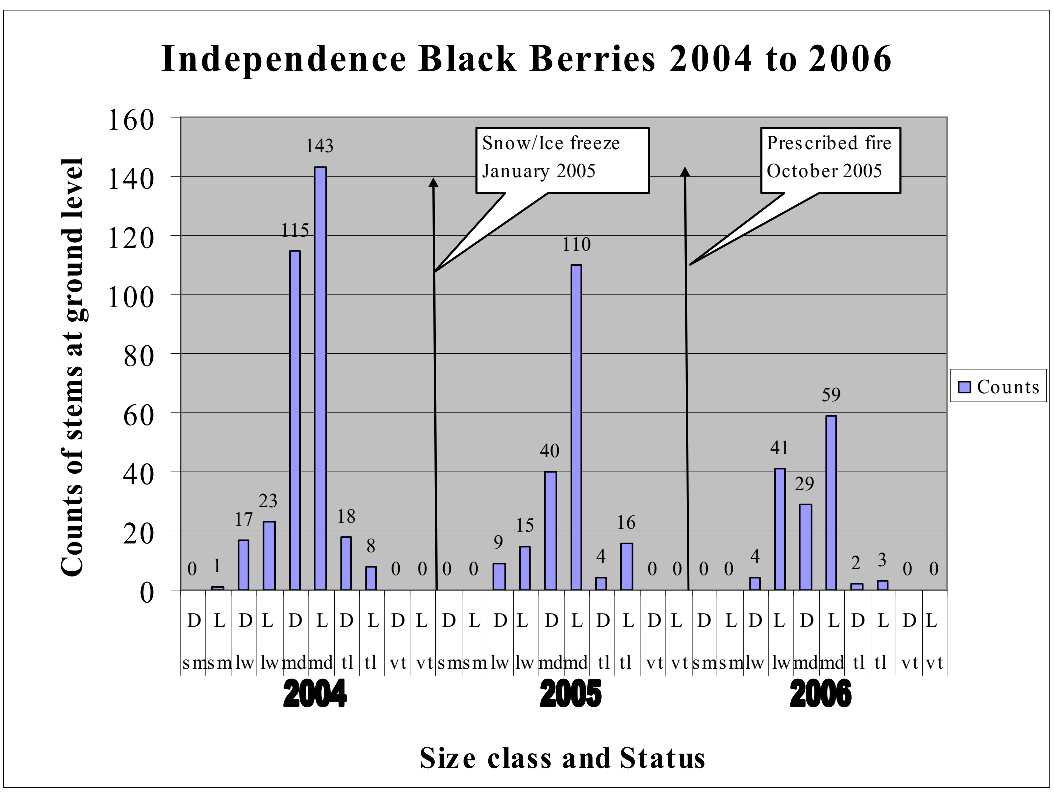


Figure 4.11b: Ullathorne Pre-burn and Post-burn for Himalayan Blackberry Size and Status

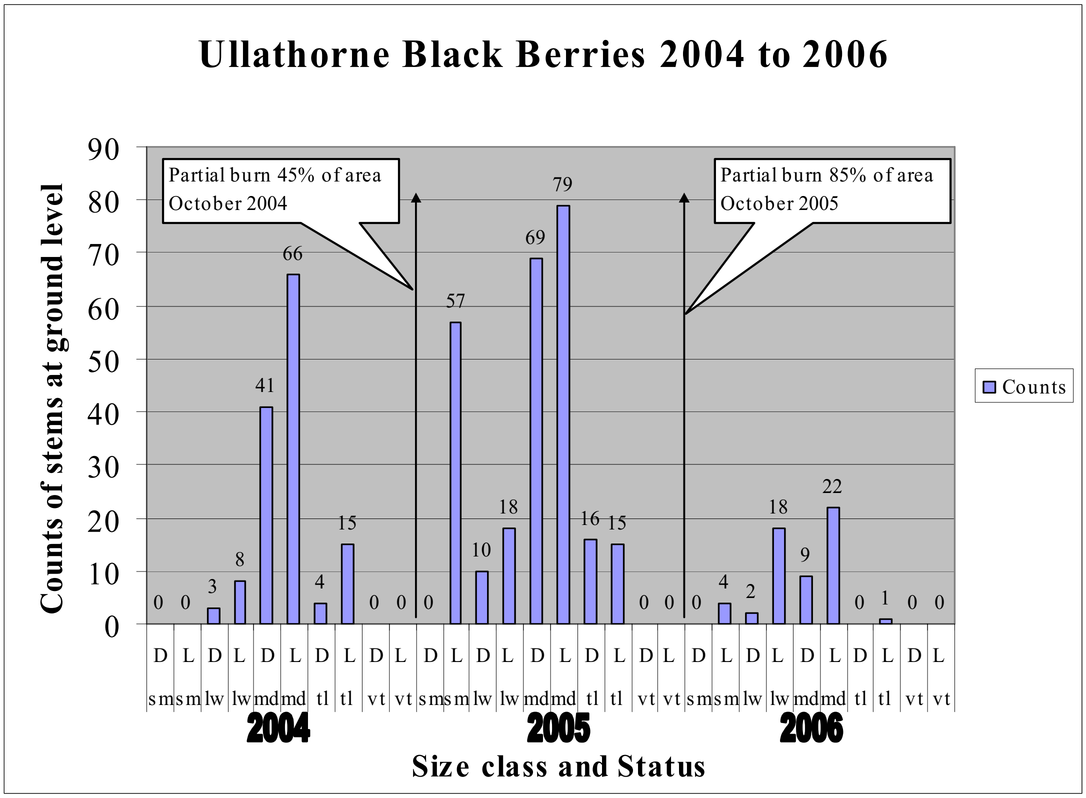


Figure 4.11c: Big Bar Pre-burn and Post-burn for Himalayan Blackberry Size and Status

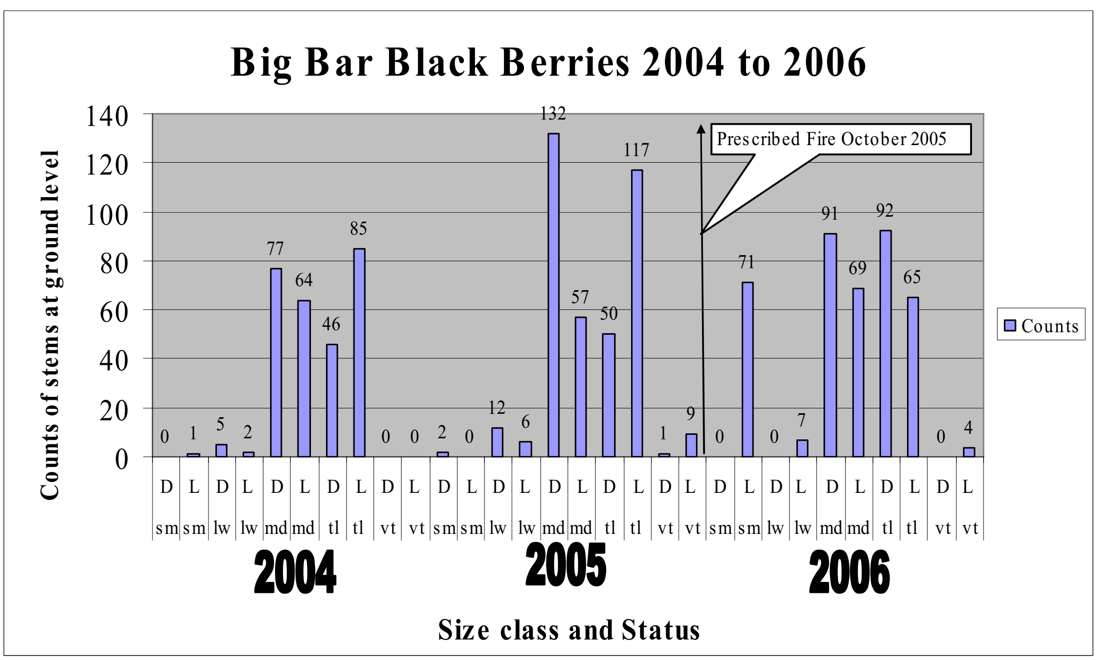


Figure 4.12: Independence plant species Native/Exotic by Forb for the difference of post-treatment minus pre-treatment.

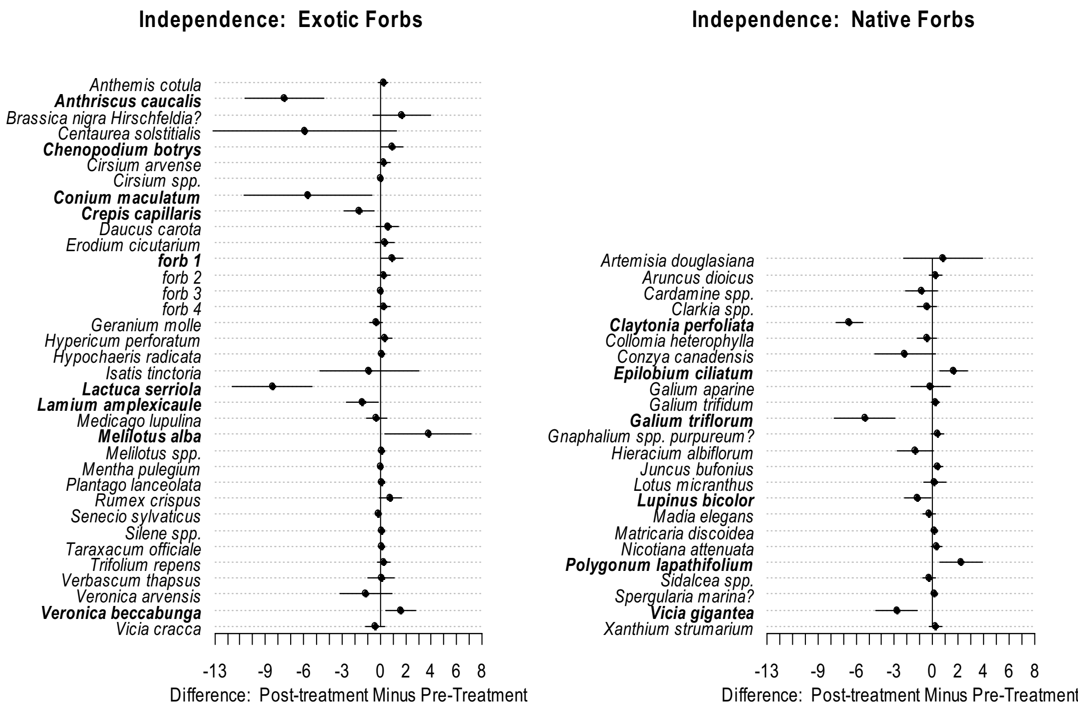


Figure 4.13: Independence plant species Native/Exotic by Grass for the difference of post-treatment minus pre-treatment.

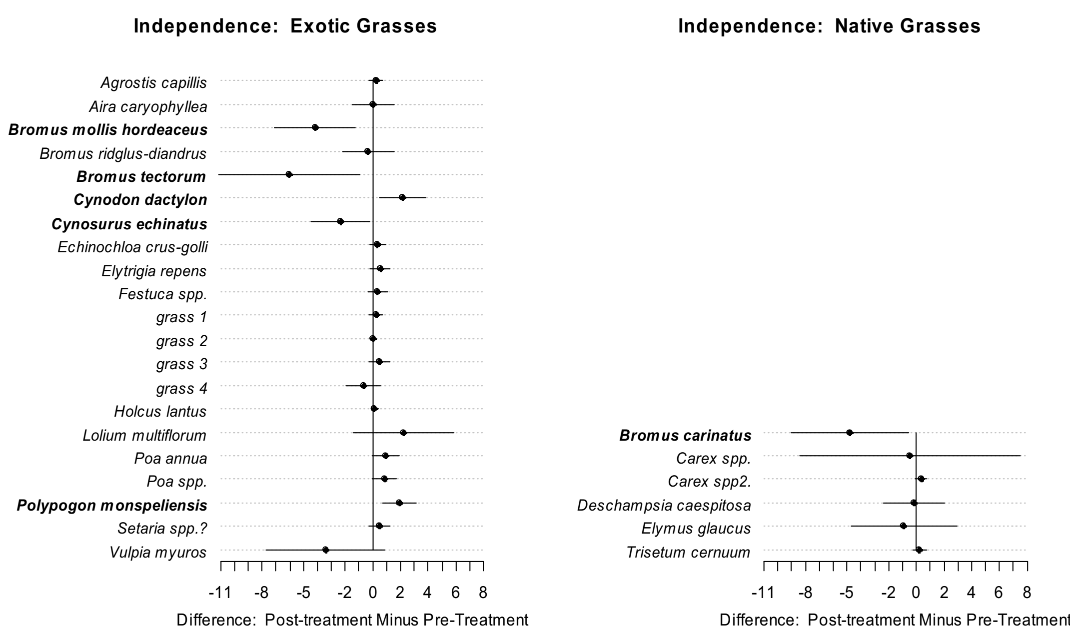


Figure 4.14: Ullathorne plant species Native/Exotic by Forbs for the difference of post-treatment minus pre-treatment

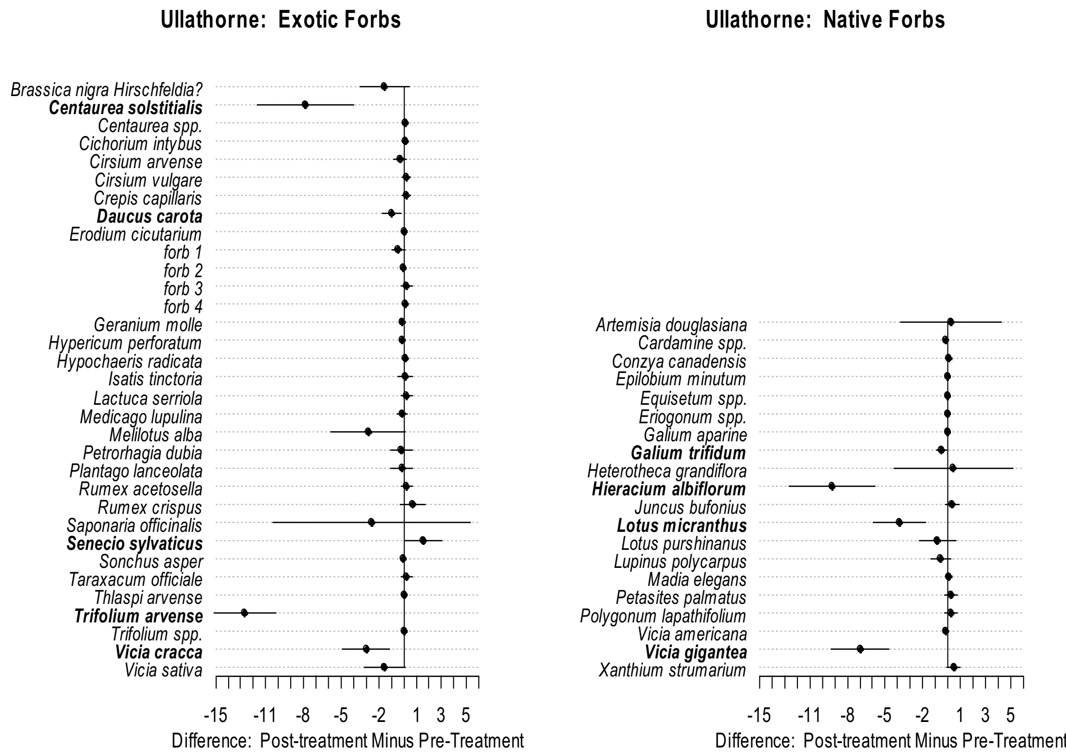


Figure 4.15: Ullathorne plant species Native/Exotic by Grasses for the difference of post-treatment minus pre-treatment

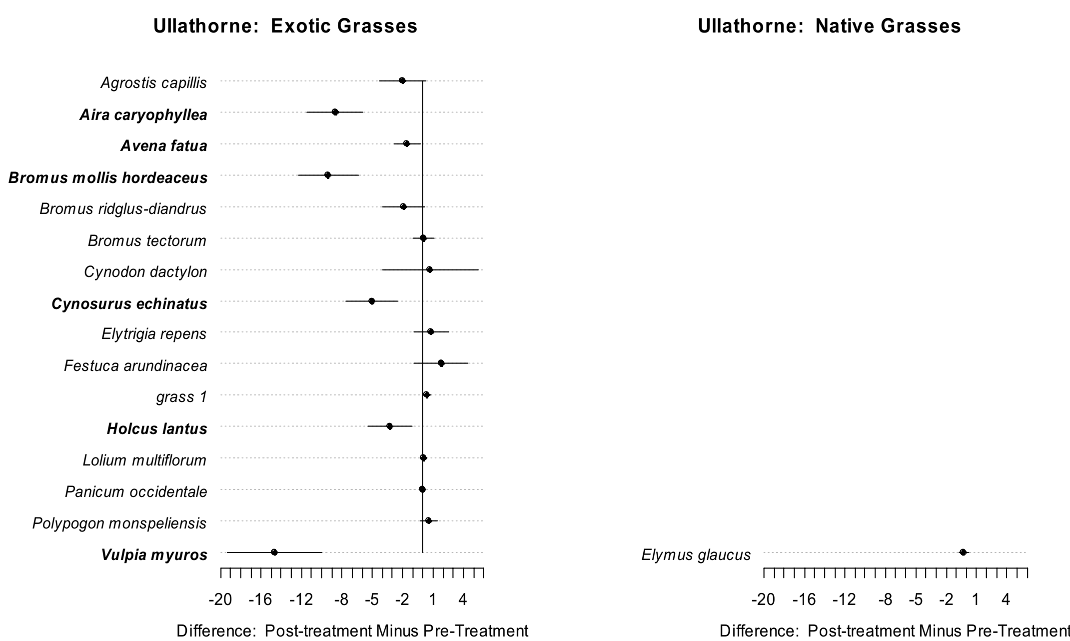


Figure 4.16: Big Bar plant species Native/Exotic by Forbs for the difference of post-treatment minus pre-treatment

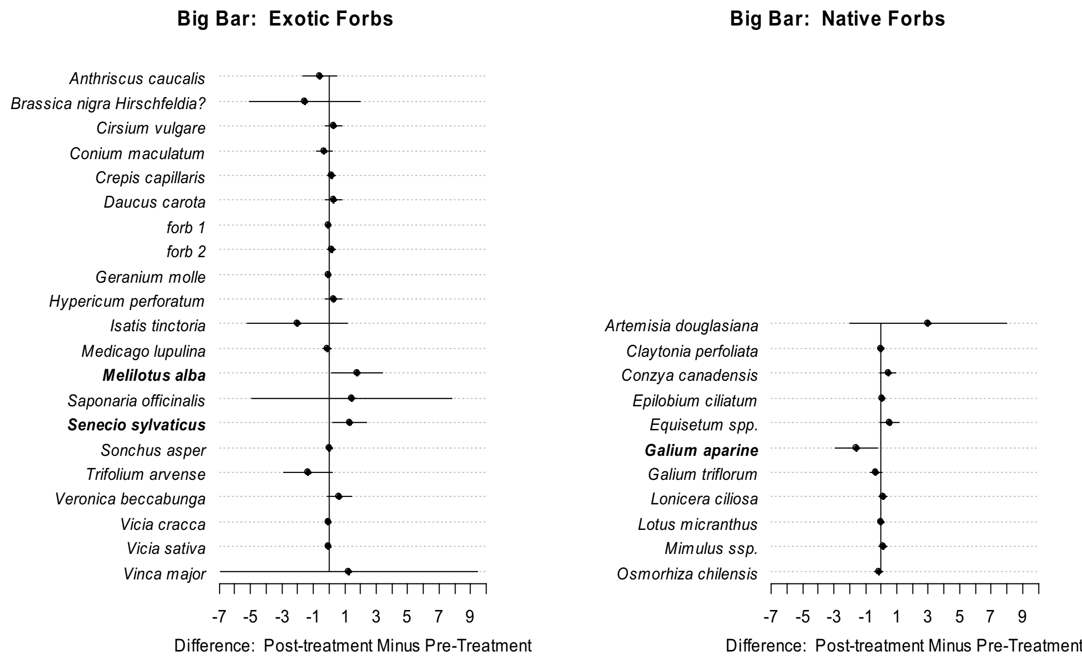


Figure 4.17: Big Bar plant species Native/Exotic by Grasses for the difference of post-treatment minus pre-treatment

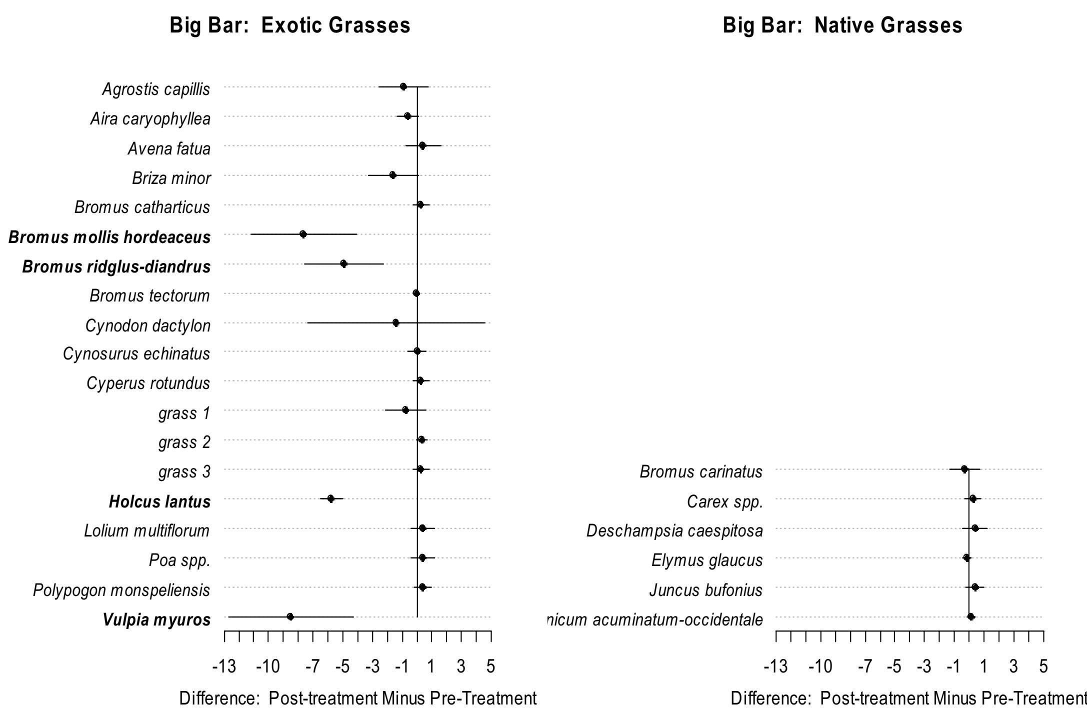


Figure 4.18: Fish trap and willow shoots

Figure 4.19: Pre- (6-24-2005) and Post- (6-24-2006) fire and flood ground cover

Ullathorne Transect 1: June 24, 2005

Ullathorne Transect 1: June 24, 2006

Figure 4.20 Big Bar flood material Post Fire/Flood

Figure 4.21: Ullathorne willow clumps

Figure 4.22: Ullathorne sand deposition

	
Ullathorne Transect 5 Pre-Burn June 25, 2006	Ullathorne Transect 5 Post-Burn/Flood June 26, 2006

Chapter 5: Assessment of Prescribed Fire and Flooding on Fuel Characteristics of Sandbar Willow Communities of the Klamath River, Northwestern California

Introduction

This research evaluated the effects of prescribed fire and flooding on fuel characteristics of valley sandbar willow (*Salix exigua* Nutt.) riparian zones along the lower mid-Klamath River, in northwestern California. Fire and flooding are processes which have been shown to affect the structure, composition, and function of riparian ecosystems (Lertzman et al. 1997, Naiman et al. 1998). They affect the quantity and quality of riparian wildlife and aquatic habitat over time across the network of stream courses. Research on flooding and fire in riparian areas has focused on renewal and rejuvenation of suitable riparian habitats for selected species (Naiman et al. 1998). Riparian vegetation, litter-duff, and organic material are types of fuel. Fuel is live and dead vegetative material, i.e., wood, foliage, etc., and other organics, susceptible to combustion. Fuel types present in riparian areas for this study are characterized as: 1, 10, 100, and 1000 hour sized woody material, duff, and litter; live and dead vegetation comprise the fuel load. Fuel loads have been described as the portion or “above ground biomass that is susceptible to consumption during a fire event” (Kauffman et al. 1994:521). These types of fuels, described more fully below, have differing ecological functions and influence fire behavior differently (Agee et al. 2002).

Fisheries and stream ecology research in the Pacific Northwest and Klamath-Siskiyou bioregions have examined the functional role of large woody material in tributary, riverine, estuarine, and marine ecology (Maser and Sedell 1994, Naiman et al. 1998). The functions of woody material on aquatic biology and channel geomorphology have been documented at the creek, river, and watershed levels (Maser and Sedell 1994, Naiman et al. 1998). There has been less attention from managers and researchers on how fire affects hydrology and the recruitment, retention, and consumption of woody material (Dwire and Kauffman 2003). Woody material in riparian areas is more susceptible to combustion under lower moisture conditions. Wood pulse theory characterizes and describes the creation, transport, retention, and export of woody material from headwater tributaries located high in watersheds to low-land valley riparian areas then out to the Pacific Ocean (Maser and Sedell 1994).

The river continuum concept (Vannote et al. 1980, Gregory et al. 1991, Naiman et al. 1998) examines the functional role of woody material as a significant component of stream ecosystems and riparian zones, however fire effects and historical tribal uses on woody material is virtually left out of such discussions.

Valley sandbar willow dominated riparian areas in the Klamath-Siskiyou mountains received little attention by fire managers or fire ecologists (Taylor and Skinner 1998, Skinner 2002, Skinner 2003, Dwire and Kauffman 2003, Shaffer and Laudenslayer 2006, Skinner et al. 2006). Fire history data suggest a variable role of fire in different types of riparian areas. Fire frequency or regime types have been found to vary between forested intermittent, forested perennial, and valley riparian forest types (Skinner 1997, Taylor and Skinner 2003, and Skinner et al. 2006). Shaffer and Laudenslayer (2006) reported that fire return intervals in riparian systems at low to mid-elevations are twice that of upslope areas in the Klamath Mountains. Those low elevation riparian systems are forested higher gradient channels, while those of the valley are the lowest found along rivers with less frequent lightning ignitions (Six Rivers National Forest LMKWA 2003, CDF Fire history data). Fites-Kaufman (1997) found frequent fire return intervals in intermittent riparian areas and adjacent uplands but longer fire return intervals along low gradient perennial streams, in the southern Cascades with similar forest vegetation as the eastern Klamath Mountains. The differences between intermittent and perennial streams were attributed to the presence of flowing surface water during the fire season which increased moisture content (humidity) of fuels (Agee et al. 2002). Table 5.1 describes the general relationships between riparian zone type and fire or flood.

Table 5.1: Comparison of riparian zone type to fires or floods

Type	Fire	Flood
Intermittent, mountainous	Frequent, more similar to adjacent uplands	Infrequent/variable, smaller magnitudes
Perennial, lowland	Infrequent, less similar to adjacent uplands	Frequent, with larger magnitudes

The effects of fire suppression may be twofold for mountain forested riparian zones. First, exclusion of fires increased vegetative biomass within riparian zones and adjacent upslope areas (Skinner 1995, Skinner 1997, Skinner 2003b). For example, brush and conifers become denser, which in turn may increase vegetative water consumption (Biswell 1999). This process may convert streams from perennial to intermittent during low precipitation years. Increasing the distance of the creek intermittence increases the susceptibility of the riparian areas to burning because conditions become more similar to the adjacent upslope. Under drought stress and extreme fire weather riparian zones may experience more intense and/or frequent fires than historically when compared to pre-fire suppression conditions (Elford and McDonough 1964, Skinner 1997). The proportion of intermittent to perennial riparian zones susceptible to fire changes with the density of vegetation and moisture levels (Agee et al. 2002).

Although comprehensive information is lacking, Anderson (2005) reports Native American burning of riparian areas in California (Lake unpublished 2004 cross-referencing of documented tribal burning of plant species found to be classified as riparian obligates). Valley riparian areas have been given considerable attention in regards to mining, water resource management, fisheries, and human settlement patterns (DOI-BOR/USFWS 1999, Doppelt et al. 1999, USFS Six Rivers National Forest LMKWA 2003). Fire and fuels management for valley sandbar willow riparian zones has been considered primarily for Native American cultural burns, arson, and ungulate winter range.

An important question arises: If tribal people have inhabited the Klamath-Siskiyou bioregion for over 9,000 years, what were the influence and interactions of Native American uses of riparian areas, coupled with flooding and fire (Connelly 1989, Fredrickson 2004)? The majority of permanent year-round Native American villages of the Shasta, Karuk, Yurok, and Hupa were located along the lowland riverine corridors (Kroeber 1976, Bright 1978, Silver 1978, Wallace 1978) of the Klamath River and its major tributaries. Annual flood deposition of woody material in riparian zones was utilized by Native people for fuel, food processing, subsistence, and construction (Moore pers. com. 2005 and 2007), e.g., Figure 5.1 of Hupa woman with driftwood in burden-pack basket. The transport and deposition of woody material was dependant on both the valley form and location of riparian vegetation (Maser and Sedell 1994). Native American villages and subsistence/fishery use sites were often near areas of woody material deposition in low-land valleys (Mikkelsen and White 1981). Any woody material left “high and dry” after flooding receded or retained in slack water side channels was available for fuel consumption or material utilization by Native people, especially near villages and camps (Moore pers. com. 2007).

Native people actively managed and utilized fuels in low elevation riparian areas prior to the 1850 gold rush and subsequent settlement of non-native peoples in the Klamath-Trinity and Rogue-Applegate river systems. Following non-native American immigrant settlement, the majority of areas not designated as mining claims, homesteads, or Indian allotments were placed under control of the federal government with the creation of the forest reserves (USFS Six Rivers National Forest LMKWA 2003). Shifts in cultures, demographics of settlement patterns, and land-use practices along river corridors influenced the amount of woody material present. After creation of the Siskiyou Forest Reserve in 1904, the Klamath and Six Rivers National Forests were established in 1905 and 1947 respectively (www.archives.gov/research/guide-fed-records/groups/095.html#95.11.23). Federal land-use policies and subsequent regulations limited the types of riparian management activities (Doppelt et al. 1999a). These regulations and development of dams along the upper Klamath and Trinity River systems have affected the quantity of woody material available in riparian willow dominated valley habitats (Doppelt et al. 1999a). The Northwest Forest Plan Aquatic Conservation Strategy (1994 Record of Decision) further restricted public and tribal utilization of woody material along the lower mid-Klamath River. Within 100 years of imposed federal land management, classification for a log caught on vegetation or rocks during winter flooding that once was utilized as fuel for heating or food preservation by Native people would then be reclassified as important “natural” riparian wildlife habitat. Some federal land managers, as well as academic and agency scientists have an incomplete understanding of the cultural role woody material had as a historically utilized fuel and construction products versus that material as functional wildlife/fisheries habitat (Doppelt et al. 1999a).

Background for the need of fuels and fire research in riparian areas

The abundance of wood in sandbar willow riparian habitat is currently perceived as a “natural” occurrence under federal policies and management regulations (USFS Six Rivers National Forest LMKWA 2003). Native American use of woody material in riparian zones prior to federal regulations reflected a condition of high resource extraction and utilization. Historical fuel loads of valley riparian zones have not been well studied, characterized, and documented. Fire suppression in the Klamath Mountains has decreased fire return intervals resulting in increased fuel loads and fire severities for many forested riparian zones (Skinner 1997, Skinner 2003b, Skinnner et al. 2006, see also Fire Regime Condition Class maps, Figures 7.3 and 7.4 in Chapter 7).

Fuel loads adjacent to forested riparian zones have increased in woody material as a result of fire suppression (Skinner 1997, Skinner 2002). Small trees, shrubs, and herbaceous vegetation influence fire behavior because their branches and foliage are suspended more closely to the surface allowing more efficient heating and burning. By estimating the cover and heights of woody and non-woody vegetation, fire managers can estimate the volume, density, and biomass of vegetation (FIREMON v.2), making the development of riparian fuels models possible. All three types of vegetation are strongly associated with fire behavior and potential fire effects (DeBano et al. 1998, Agee 1993). Live fuel moisture content of riparian vegetation can also greatly reduce fire behavior (Agee et al. 2002), but this characteristic of live vegetation was not measured.

Ecologists often refer to fine woody material (FWM) and course woody material (CWM) independently because they function differently in forest ecosystems as well as in their susceptibility to burning. FWM are pieces less than 8 cm in diameter and classified as 1-hour, 10-hour, and 100-hour fuels (described below). CWM includes pieces of wood 8 cm or greater in diameter and at least 1 m in length, also called 1000-hour and greater fuels. Criteria for down woody material retention requirements for the Northwest Forest Plan Riparian Reserves-Aquatic Conservation Strategy was based on fuel loads representative of the fire suppression era, and may misrepresent former fuel load conditions (Skinner 1997). Mixed severity fires (low, moderate, or high) adjacent to and within riparian zones can increase the potential of course woody material recruitment to aquatic systems (Skinner et al. 2006). Fuel loads of riparian areas created under fire suppression and exclusion are not historically representative (Skinner 1997). To gain a better understanding of current and historic patterns of fire-flooding processes on riparian fuels the following research study was conducted.

Pre-burn conditions, fuel models, and burn plan narratives

Fire ecology research in riparian zones can help with the development of specialized fuel models to conduct prescribed burns for Native American cultural purposes. These fuel models could assist with predictions for successfully emulating or simulating disturbance using prescribed fire in the absence of sufficient flooding. Reduction in the magnitude and duration of flooding is attributed to flow regulation and dam management (USGS gage records, Chapter 4). The BEHAVE plus (3.02) fire behavior model is one of the primary tools used by federal agencies to predict fire behavior. It is used to construct burn and fire management plans. Fuel model type is a key input to fire behavior models. However, there is a lack of fuel models applicable to many riparian settings. At best, the closest model describes low fuel loads of the dry climate grass-shrub vegetation type. Two different fuel models in BEHAVE plus were selected by fuels specialists for prescribed burn plans for the sites in this experiment.

Table 5.2: Comparison of burn plan and fuel model amounts between sites

Site	**Burn Plan**	**Fuel Model**	**Vegetation Type**	**Fuel Loading tons/acre**	**Fuel Distribution: tons/acre**		
					1 hour	10 hour	100 hour
Indepen-dence	Happy Camp	FBPS # 2	Timber w/ light Grass.	2-4, FOFEM SRM 921 Willow heavy	0-2	0-1	0.05
	Fuel Arrangement: Litter and grass ground fuel, willow vertical. Vegetation under 12’ tall was 20% Annual & perennial grasses and yellow star thistle, 10% Blackberries and 70% willow leaf litter, with vegetation over 12’ tall as: Sandbar willows (*Salix exigua*). **Surface fuel depth**: 6 inches (15.2 cm) with Duff depth 2 inches (5.1 cm).						
Ullathorne and Big Bar	Orleans	Int-122 -6	Overstory is mosaic of very continuous willows to areas of light willows with scattered openings.	3.2-8.7	0.7-1.7	1.0-1.5	1.0-5.5
	Fuel Arrangement: Surface fuels are loosely layered with live and dead grasses and limbwood with overstory of willow. Vegetation under 12’ tall was described as: Leaf						

	litter and grasses (70% live and 30% dead). Willow ranges from scattered 12-18 inch to 12 feet tall (90% live and 10% dead), with vegetation over 12' tall as: Scattered willow (90% live and 10% dead). **Surface fuel depth**: 0.2-2 inches (0.5 to 5.1cm) with Duff depth 0-0.2 inches (0.0 to 0.5 cm).

Fuels research and hypotheses

Changes in fuel load and type were examined before the prescribed burn, after prescribed burning but before flooding, and then after flooding. Flooding was an unexpected event that was incorporated into the initial study design. It was hypothesized that sandbar willow riparian areas experiencing prescribed burning, then flooding, would have a reduction in fuel, their composition and structure change compared to pre-burn and pre-flooding conditions.

Hypotheses

H_1: Prescribed burning will reduce the amount of fuel types present as:

a) 1, 10, 100 hours fuels sizes (1. counts versus 2. biomass)
b) 1000 hour sound and rotten fuels (1. counts versus 2. biomass)
c) Duff and litter (1. depth and 2. biomass)
d) Dead and live vegetation (1. woody and 2. herbaceous) biomass (percent cover and height used to estimate biomass)

H_2: Flooding will affect the amounts of the different fuel types at the sites.

a) 1, 10, 100 hours fuels sizes (1. counts versus 2. biomass)
b) 1000 hour sound and rotten fuels (1. counts versus 2. biomass)
c) Duff and litter (1. depth and 2. biomass)
d) Dead and live vegetation (1. woody and 2. herbaceous) biomass (percent cover and height used to estimate biomass)

Methods: Burn treatment and flooding event effects for each site

Study sites

The project sites were located in northwestern California, USA on the Klamath and Six Rivers National Forests on outer terraces of the lower mid-Klamath River.

Mature larger diameter willow stalks representing the dominant canopy were randomly selected and cut one year after the fire for each site, excluding the Ferry Point location. The age classes varied between the sites but shared similar plant species compositions (Chapter 4).

Independence Bar is located at T 15N, R 7E, Section 30, 41° 39’34.51” N, 123°27’03.87” W, elevation 872 feet. The Independence site was the oldest and most mature of the locations studied (mean age of samples, 17.6 years old based on stem growth ring counts). Independence was burned on October 6, 2005 from 2:00-4:00pm. The ignition and burn pattern was driven by mild local weather conditions that resulted in variable consumption of fuels. Approximately ten percent of the area experienced high severity fire, 50% moderate, 30% low, and 10% was unburned, as determined by post-fire visual estimates, post-fire quadrat vegetation plot estimates and photographs (DeBano et al. 1998). Of the total area sampled (2400 meters^2) using the transect method described above, 90% was influenced by the fire. The same area was inundated by flood waters from December 29, 2005 to January 3, 2006. The peak discharge for the nearest USGS gage located approximately 37 river miles (59.5 kilometers) upstream, Seiad #11520500, was 74,000 cubic feet per second on December 31, 2005 resulting in flood waters entering the formerly burned willow patch. Flooding waters washed away charred surface material and deposited sand/silt and smaller woody material. A river access gravel road on top of a partial levee protected the project site from direct flooding, making the site a back water eddy during higher flow conditions.

Ferry Point: T 15N, R 6W, Section 20 & 29. 41° 40’17.10” N, 123°26’03.57” W, elevation 894 feet. The Ferry Point site willow patch was not burned, and was less impacted by flooding effects. The area sampled post-flooding was barely above the flooding level. This sandbar willow dominated site was used for referencing fuel loads in that it did not receive a burn treatment or experience a flooding event. This site was sampled in the winter dormant season and live fuel estimates are likely lower than other times of the year when plants are in other phenological states.

Ullathorne: T 10N, R 5E, Section 2. 41° 17’14.84” N, 123°34’18.08” W, elevation 348 feet. Ullathorne was the youngest site (mean age of samples, 9.2 years old based on stem growth ring counts). It had experienced a 45% surface area partial test prescribed burn in October 2004. This site was burned again on October 11, 2005 from 1:00pm to 3:30pm. The burn was ignition pattern driven under mild local weather conditions resulting in variable consumption of fuels. Approximately five percent of the area experienced high severity, 40% moderate, 50% low, and 5% un-burned as determined by post-fire visual estimates and photographs (DeBano et al. 1998). Of the total sampled area (2400 meters^2) 95% was influenced directly by fire. The same area was inundated by flood waters from December 29, 2005 to January 3, 2006. The peak discharge for the nearest up-river USGS gage approximately 2 river miles (3.2 km) at Orleans was estimated at 150,000 cubic feet per second resulting in flood waters entering the formerly burnt willow patch. Flooding waters washed away charred surface material and deposited sand/silt and smaller woody material.

Big Bar: T 10N, R 5E, Section 17 41° 15’09.32” N, 123°38’09.67” W, elevation 318 feet. Big Bar (mean age of samples, 17.7 years old based on stem growth ring counts) was similar to Independence and Ferry Point, but older than Ullathorne. Big Bar was burned on October 24, 2005 from 1:30pm-4:00pm. The burn was ignition pattern driven under mild local weather conditions resulting in variable consumption of fuels. Approximately five percent of the area experienced high severity, 30% moderate, 40% low and 25% unburnt as determined by post-fire ocular estimations and photographs (DeBano et al. 1998). Of the total sampled area (2400 meters^2) 75% was influenced by fire. The same area was inundated by flood waters from December 29, 2005 to January 3, 2006. The peak discharge for the nearest upriver USGS gage approximately 12 river miles (19 km) at Orleans was estimated at 150,000 cfs. resulting in flood waters entering the formerly burned willow patch. Flooding waters washed away charred surface material and deposited sand/silt and significantly more woody material than was at the site pre- or post-fire.

Methods of experimental design and sampling

Sampling was conducted along transects before and after the prescribed burns, and after flooding. All living or dead vegetation or organic material in the proposed burn area was considered potential fuel. Sampling methods were adapted from the

FIREMON fire effects protocol, fuel load methodology (FIREMON V.2.1.1). Fuels data were collected along seven transects, with each transect consisting of two plots, systematically placed through each willow project site (Figure 5.2).

The average slope of each transect was estimated from one of the transect end points using a clinometer. Brown's (1974) planar intercepts were used to measure various fuel size classes (1, 10, 100, and 1000 hour). Additionally at each plot litter-duff depth, percent duff, percent cover and average height of live and dead vegetation were collected. A measuring tape laid close to the ground surface along pre-established vegetation survey belt transects defined the sampling plane (See vegetation research Chapter 4). The sampling plane extended from the top of the litter layer, duff, or mineral soil to a height of two meters along transects. Two specific components of dead woody fuel were measured using the Fuel Load methods: fine woody material (FWM) and coarse woody material (CWM) (FIREMON V.2.1.1). Diameter, length, and decay class were recorded for each piece of CWM. Dead woody material (DWM) biomass estimation was made using equations published in Brown (1974) in FIREMON. Fuels, duff/litter, and vegetation data are recorded at specific locations on or along each sampling plane. The 1-hour (woody material < 0.6 cm diameter) and 10-hour (0.6-2.5cm diameter) fuels were sampled from the 5-meter to the 7-meter marks along the plane, the 100-hour fuels (2.5-8.0 cm diameter) were sampled from the 5-meter to the 10-meter marks and pieces 8 cm and larger diameter were sampled between the 5-meter and 25-meter marks along the plane.

Woody, dead, and down material

"Woody" refers to a plant with stems, branches, or twigs that persist from year to year. These structural components (stems, branches, twigs) were tallied along the sampling plane. "Dead" woody material has no live foliage. Sampling deciduous species in the dormant (winter post-flood) season made discerning live, dormant, or dead material difficult. A scrape of the bark to view cambium tissue was used to properly identify the live condition of vegetation. The planar intercept technique assumes that DWM is randomly oriented directionally on the riparian forest floor. Because fuel transects were aligned along parallel vegetation sampling transects the systematic 10 meter apart parallel spacing of transects could reflect some orientation bias. DWM is variable in its distribution, but flooding can concentrate material nearest the up-stream end of willow patches, or on the back side where eddies have deposited material.

A portion of CWM was not sampled if the central axis of the piece was lying in or below the duff layer. Such pieces are considered to burn more like duff. Pieces of FWM that are "woody," "dead," and "down" fall into three general categories:

1) pieces that are not attached to the plant stems or tree boles where they grew and have fallen to the ground,

2) pieces that are not attached to the plant stems or tree boles where they grew but are supported above the ground by live or dead material, and

3) pieces attached to stems or boles of shrubs or trees that are themselves considered "dead" and "down."

It is possible for FWM to be considered "dead" even though it has green foliage attached because the model considers any piece severed from the plant where it grew to be both "dead" and "down" (FIREMON V.2.1.1-Fuel Load). In addition to surface fuels in riparian areas, flooding often deposits FWM and CWM in shrubs and trees which form a "suspended" or aerial dead woody material fuel component. Parts of plants and woody material strained out on vegetation during flooding are examples of potential green material that were considered "dead." Piece position of FWM was not critical in determining whether or not it is "down." Material such as needles, grass blades, pine cones, cone scales, bark pieces, etc., were not tallied as they are not "woody" in nature. This material is considered litter and was measured as part of the duff/litter profile (Figure 5.3).

Decay classification for CWM was determined at the point where diameter was measured. Decay classes 1 to 3 were considered sound, and 4 to 5 were rotten for fuel loading (tons/acre or kilograms/meter^2 determinations).

Table 5.3. Descriptions of decay class

Decay Class	Description
1	All bark is intact. All but the smallest twigs are present. Old needles probably still present. Hard when kicked
2	Some bark is missing, as are many of the smaller branches. No old needles still on branches. Hard when kicked
3	Most of the bark is missing and most of the branches less than 1 in. in diameter also missing. Still hard when kicked
4	Looks like a class 3 log but the sapwood is rotten. Sounds hollow when kicked and you can probably remove wood from the outside with your boot. Pronounced sagging if suspended for even moderate distances.
5	Entire log is in contact with the ground. Easy to kick apart but most of the piece is above the general level of the adjacent ground. If the central axis of the piece lies in or below the duff layer then it should not be included in the CWM sampling as these pieces act more like duff than wood when burned.

Duff, litter, and the duff/litter profile

At two points (usually 15 and 25 meters) along each sampling plane transect, measurements of duff/litter depth and estimation of the proportion of the duff/litter profile that was litter were made. Duff/litter measurements were made at each point within a 2-meter diameter circular area. A few transects had plots at the 10 and 20 meter marks to adjust for site conditions. “Litter” was determined as the loose layer made up of twigs, dead detached grass blades or seed heads or forb leaves or seed heads, recently fallen leaves, and needles where the individual parts are still identifiable and not decomposed. The “duff” lay below the litter layer and above the mineral soil. It was made up of litter material that has decomposed to the point that the individual parts are no longer identifiable, usually a dark brown stratum. The end of a metal ruler was used to lightly scrape the litter layer away then carefully removing the duff until mineral soil was found at the bottom of the profile. Depth of litter and duff was measured to the nearest 0.1 cm.

Woody and herbaceous vegetation

The cover of trees, shrubs, herbs, and grasses were the last fuel characteristics sampled along each sampling plane. These were divided into live or dead woody and non-woody vegetation. All herbs and grasses were considered non-woody plants because the aerial portions die back at the end of the growing season. Visual estimates for live and dead herbaceous plants and shrubs were made. The cover of live and dead woody and non-woody vegetation was estimated to the nearest 5 percent within a 2-meter diameter by 2-meter high circular sampling area (FIREMON V.2.1.1). Height estimates of woody and herbaceous (non-woody) material were made by noting the maximum height of all the plants in the class and then recording the average of all the maximum heights. Height was estimated to the nearest 0.1 meter.

Fuels data analysis

Data collected were entered into the FIRMON data base and calculations on mass per unit area were made. Additionally, summary statistics were calculated in Excel. The biomass equations in FIREMON are based on estimated formulas of standard oven-dry weights at the corresponding phenological stage. Summary statistics were complied for all fuel attributes with FIREMON (version 2.1.1). Additional analysis using SAS (Version 9.1) Proc Mixed was conducted to compare significance of the burn treatment and flooding event between sampling. Pre-burn, post-burn-pre-flood, and post-flood summary values were analyzed using SAS (9.1) Proc Mixed as a repeated measures ANOVA. The covariance structure was heterogeneous autoregressive, with the repeated measures over time on each transect using the restricted maximum likelihood (REML) estimation method, with degrees of freedom using the between-within method. Class level information included the variable Location at three levels (Independence, Ullathorne, and Big Bar), variable Treatment with three levels (Pre Burn, Post Burn, Post Flood), Transect at seven levels representing the number of transects per site, and the variable time reflecting treatment with three levels.

Fuel types (FIREMON FL) were individually counted as 1, 10, 100 hour fuels, and 1000 hour sound or rotten (logs), duff and litter depth, and sum totals for 1 to 100 hours., 1-1000 hours, and calculated duff/litter biomass per unit area (tons/ac or kg/m^2). Vegetative fuel, estimated at two locations per transect and averaged for the site, was characterized as percent live and dead shrub and herbaceous cover, and average height. Fuels loading summaries of fuels size classes were summarized using FIREMON Fuel Load summary report option (Table 5.4).

Results

Tables and charts for fuel loads calculated by FIREMON along transects presented in kg/m^2 (See Appendix D for Tons/acre). Table 5.4a addresses H_1 a) 1 and 2, b) 1 and 2 and H_2 a) 1 and 2, and b) 1 and 2.

Table 5.4a: 1 to 1000 hour fuel loads calculated by FIREMON

Location with sum of fuel type in kilogram/meters^2	Treatment Event	1 hour	10 hour	100 hour	1 to 100 hour	1000 hour Sound	1000 hour Rotten	1-1000 hour
Independence	Pre-Burn	0.16	0.84	0.77	1.77	0.59	0.3	2.6
Independence	Post-Burn	0.09	0.58	0.6	1.27	0.28	0.1	1.6
Independence	Post-Flood	0.07	0.42	0.4	0.89	0.3	0	1.2
Big Bar	Pre-Burn	0.13	0.27	0.11	0.51	0	0.1	0.6
Big Bar	Post-Burn	0.1	0.25	0.09	0.44	0	0.1	0.5
Big Bar	Post-Flood	2.26	2.83	1.73	6.82	0.11	0	7
Ullathorne	Pre-Burn	0.04	0.24	0.16	0.44	0	0.1	0.5
Ullathorne	Post-Burn	0.03	0.2	0.26	0.49	0	0.1	0.6
Ullathorne	Post-Flood	0.03	0.14	0.14	0.32	0.11	0	0.4
Ferry Pt.	Control	0.08	0.4	0.45	0.93	0.28	0.4	1.6

Hypotheses H_1 c) 1. and H_2 c) 1 are addressed by Table 5.4b address.

Table 5.4b: Duff and litter fuel loads calculated by FIREMON

Location with kilogram/meter^2	Treatment Event	Duff	Litter	Total	Duff (cm)	Litter (cm)	Total Depth
Independence	Pre-Burn	1.5	2	6.2	4.4	11.5	16
Independence	Post-Burn	0.5	0.2	2.3	1.4	1.3	2.7
Independence	Post-Flood	0	0	1.2	0	0	0
Big Bar	Pre-Burn	1.5	1.5	3.6	4.2	8.6	12.9
Big Bar	Post-Burn	1.4	0.9	2.8	4	5.2	9.2
Big Bar	Post-Flood	0	0	7	0.1	0.1	0.2
Ullathorne	Pre-Burn	0.3	1	1.8	1	5.6	6.5
Ullathorne	Post-Burn	0.5	0.2	1.3	1.6	1.4	3
Ullathorne	Post-Flood	0	0	0.5	0.1	0	0.1
Ferry Pt.	Control	1.1	1	3.6	3.2	5.4	8.6

Changes in fuel loading between sampling events was generally proportional to the extent and severity of disturbance type. Exceptions to this general rule exist over a smaller proportion of the affected area. Microsites which develop as a result of variable flood and fire induced change were comprised of physically, biologically, and culturally important components of valley sandbar willow riparian habitat. The changes observed in fuel types shown in Tables 5.4a and 5.4b, and Figure 5.4

reflect the duality of fire and flood disturbances across the project sites. Fire generally will reduce finer fuel types, but will also create courser fuels. For example, reductions in duff/litter and 1 to 100 hour fuel types, but increase 1000 hour fuel types proportional to the severity. Flooding was similar to fire at the patch level in the modification of fuels, but more influential in the extent of influence of valley sandbar willow communities along the Klamath River corridor. Flooding generally reduces, through downriver translocation, the biomass per unit area of fuel type, with localized areas within the patch that can substantially increase fuel biomass (deposition). These general trends of the duality and extent of flooding and fire effects contribute to changes in the amounts and types of fuel present.
Figure 5.4 addresses H_1 a) 1. Figure 5.4 shows fuel load changes between pre-and post-burn/pre-flood and post-flood for 1 to 1000 hour fuels.

Fuel loading cover vegetation plot summary

Changes in vegetation cover are important for inferring cultural and wildlife use quality. The amount of vegetation cover between sampling periods reflected disturbance type and season on the phenological stage of vegetation. Changes observed between sampling events are attributed to the prescribed fire treatment, subsequent flooding disturbance, and plant phenological state. Table 5.5 addresses H_1 d) 1 and H_2 d) 1.

Table 5.5: Changes in shrub cover and height by treatment event and location

Location	Date surveyed	Treatment Event	Shrub Cover % Live	Shrub Cover % Dead	Shrub Height (meters)	Shrub Height (feet)
Independence	9/13/2005	Pre-Burn	25.25	35.21	1.17	3.84
Independence	10/25/2005	Post-Burn	0	18.79	0.36	1.2
Independence	1/26/2006	Post-Flood	0	6	0.46	1.52
Big Bar	9/12/2005	Pre-Burn	45.75	18.64	1.93	6.33
Big Bar	11/17/2005	Post-Burn	31.43	26.46	1.89	6.21
Big Bar	1/24/2006	Post-Flood	19.5	17.57	1.5	4.92
Ullathorne	9/12/2005	Pre-Burn	22.14	13.04	0.93	3.05
Ullathorne	11/15/2005	Post-Burn	3.29	17.14	0.72	2.37
Ullathorne	1/24/2006	Post-Flood	9.5	6.46	0.56	1.83
Ferry Pt.	2/24/2006	Control	8.79	26.64	0.81	2.65

Changes in the percent of live shrub cover from pre-burn to post-burn reflect the amount of higher severity fire for each location. Flooding influence on percent live shrub cover is correlated with a reduction in foliage due to season (e.g., fall leaf drop). The increase in percent live shrub cover at Ullathorne from post-burn to post-flood is likely attributed to flood waters pushing shrub over and into the sampling plane. The changes in percent of dead shrub cover across location and between treatments are variable. The variables of treatment and location for percent live and dead shrub cover are analyzed below and results of strength of those interactions are presented. Table 5.6 addresses H_1 d) 2.

Table 5.6: Changes in herbaceous cover and height by treatment event by location

Location	Date surveyed	Treatment Event	Herb Cover % Live	Herb Cover % Dead	Herb Height (meters)	Herb Height (feet)
Independ	9/13/2005	Pre-Burn	42.86	52.86	0.61	1.99
Independ	10/25/2005	Post-Burn	8.29	1.93	0.11	0.37
Independ	1/26/2006	Post-Flood	13.75	0.43	0.12	0.38
Big Bar	9/12/2005	Pre-Burn	18	53.57	0.41	1.35
Big Bar	11/17/2005	Post-Burn	11.43	24.07	0.21	0.7
Big Bar	1/24/2006	Post-Flood	3.82	1.11	0.64	0.4
Ullathorne	9/12/2005	Pre-Burn	31.64	52.86	0.56	1.83
Ullathorne	11/15/2005	Post-Burn	25.14	7	0.19	0.61
Ullathorne	1/24/2006	Post-Flood	1.43	7.86	0.18	0.6
Ferry Pt.	2/24/2006	Control	60	21.43	0.13	0.42

Changes in percent cover for live and dead herbaceous from one event to another across location generally decrease. Exceptions are percent live herbaceous cover for Independence for post-burn to post-flood and percent dead herb cover for Ullathorne post-burn to post-flood. The exception observed at Independence can be likely attributed to “green up” or growth of forbs and grasses that were able to sprout through a shallower layer of flood deposit silt and sand. The minor increase observed with Ullathorne is likely caused by sampling estimation influenced by “dead” vegetative foliage strained out by flood waters present when surveyed. Other aspects of herbaceous fuel types are different than expected. For example the changes observed in herb height for Big Bar should potentially also reflect an increase percent live herb cover between treatments but it does not. Percent cover and height are two correlated attributes that were used to calculate biomass per unit area.

Table 5.7: Vegetation biomass (Kg/m^2) calculation generated from FIREMON

Location	Date surveyed	Treatment Event	Biomass (Kg/m^2) Shrub Live	Biomass (Kg/m^2) Shrub Dead	Biomass (Kg/m^2) Herb Live	Biomass (Kg/m^2) Herb Dead
Independ	9/13/2005	Pre-Burn	0.66	0.59	0.22	0.23
Independ	10/25/2005	Post-Burn	0	0.13	0.01	0
Independ	1/26/2006	Post-Flood	0	0.11	0.01	0
Big Bar	9/12/2005	Pre-Burn	1.62	0.52	0.08	0.17
Big Bar	11/17/2005	Post-Burn	1.21	0.74	0.04	0.05
Big Bar	1/24/2006	Post-Flood	0.64	0.42	0.03	0.01
Ullathorne	9/12/2005	Pre-Burn	0.47	0.25	0.15	0.19
Ullathorne	11/15/2005	Post-Burn	0.06	0.22	0.04	0.01
Ullathorne	1/24/2006	Post-Flood	0.21	0.08	0	0.01
Ferry Pt.	2/24/2006	Control	0.98	1.62	0.27	0.09

Changes for shrub and herbaceous live and dead biomass generally follow a decreasing trend. Exceptions are minor and have been addressed above. Analysis of variance was conducted to test the influences of treatment (fire and flooding) on fuel types across locations. Table 5.8 addresses components of H_1, but primarily H_2.

Table 5.8: ANOVA of fuel attributes across all sites testing the interactions of location and treatment

Variable	Effect	Degrees of Freedom (Numerator/ Denominator)	F-value	P-value < 0.5
1 hour	Location	2/18	Not available	No analysis; significant change from flood material
1 hour	Treatment	2/36	Not available	No analysis; significant change from flood material
1 hour	Location*Treatment	4/36	Not available	No analysis significant change from flood material
10 hour	Location	2/18	0.871	0.435
10 hour	Treatment	2/36	1.776	0.184
10 hour	Location*Treatment	4/36	1.110	0.367
100 hour	Location	2/18	0.331	0.722
100 hour	Treatment	2/36	1.013	0.373
100 hour	Location*Treatment	4/36	0.765	0.555
1000 hour Rotten	Location	2/18	1.410	0.270
1000 hour Rotten	**Treatment**	**2/36**	**3.309**	**0.048**
1000 hour Rotten	Location*Treatment	4/36	1.608	0.194
1000 hour Sound	**Location**	**2/18**	**6.899**	**0.006**
1000 hour Sound	Treatment	2/36	0.000	1.000
1000 hour Sound	Location*Treatment	4/36	1.162	0.344
Litter/Duff depth-plot 1	Location	2/18	Not available	No analysis; significant change from flood material
Litter/Duff depth-plot 1	Treatment	2/36	Not available	No analysis; significant change from flood material) flood debris
Litter/Duff depth-plot 1	Location*Treatment	4/36	Not available	No analysis; significant change from flood material
% Litter plot 1	Location	2/18	0.325	0.727

% Litter plot 1	**Treatment**	**2/36**	**665.149**	**0.000**
% Litter plot 1	**Location*Treatment**	**4/36**	**3.049**	**0.029**
Live shrub cover plot 1	Location	2/18	1.225	0.317
Live shrub cover plot 1	**Treatment**	**2/36**	**11.423**	**0.000**
Live shrub cover plot 1	Location*Treatment	4/36	1.880	0.135
Dead shrub cover plot 1	Location	2/18	0.618	0.550
Dead shrub cover plot 1	**Treatment**	**2/36**	**12.910**	**0.000**
Dead shrub cover plot 1	**Location*Treatment**	**4/36**	**5.326**	**0.002**
Shrub height plot 1	**Location**	**2/18**	**12.736**	**0.000**
Shrub height plot 1	**Treatment**	**2/36**	**5.111**	**0.011**
Shrub height plot 1	Location*Treatment	4/36	2.226	0.086
Live herb cover plot 1	Location	2/18	0.222	0.803
Live herb cover plot 1	**Treatment**	**2/36**	**24.577**	**0.000**
Live herb cover plot 1	Location*Treatment	4/36	1.446	0.239
Dead herb cover plot 1	**Location**	**2/18**	**3.861**	**0.040**
Dead herb cover plot 1	**Treatment**	**2/36**	**76.637**	**0.000**
Dead herb cover plot 1	**Location*Treatment**	**4/36**	**3.203**	**0.024**
Herb height plot 1	Location	2/18	0.107	0.899
Herb height plot 1	**Treatment**	**2/36**	**24.100**	**0.000**
Herb height plot 1	Location*Treatment	4/36	2.111	0.100
Litter/Duff depth-plot 2	**Location**	**2/18**	**14.004**	**0.000**
Litter/Duff depth-plot 2	**Treatment**	**2/36**	**81.782**	**0.000**
Litter/Duff depth-plot 2	**Location*Treatment**	**4/36**	**10.013**	**0.000**
% Litter plot 2	Location	2/18	0.982	0.394
% Litter plot 2	**Treatment**	**2/36**	**89.237**	**0.000**
% Litter plot 2	**Location*Treatment**	**4/36**	**8.015**	**0.000**
Live shrub cover plot 2	**Location**	**2/18**	**16.881**	**0.000**
Live shrub cover plot 2	**Treatment**	**2/36**	**17.571**	**0.000**
Live shrub cover plot 2	Location*Treatment	4/36	2.466	0.062
Dead shrub cover plot 2	Location	2/18	1.930	0.174
Dead shrub cover plot 2	**Treatment**	**2/36**	**4.068**	**0.026**
Dead shrub cover plot 2	Location*Treatment	4/36	1.468	0.232
Shrub height plot 2	**Location**	**2/18**	**5.220**	**0.016**
Shrub height plot 2	**Treatment**	**2/36**	**9.020**	**0.001**
Shrub height plot 2	**Location*Treatment**	**4/36**	**4.292**	**0.006**
Live herb cover plot 2	**Location**	**2/18**	**27.894**	**0.000**
Live herb cover plot 2	**Treatment**	**2/36**	**8.056**	**0.001**
Live herb cover plot 2	**Location*Treatment**	**4/36**	**9.934**	**0.000**
Dead herb cover plot 2	Location	2/18	0.623	0.547
Dead herb cover plot 2	**Treatment**	**2/36**	**34.367**	**0.000**
Dead herb cover plot 2	**Location*Treatment**	**4/36**	**4.362**	**0.006**
Herb height plot 2	Location	2/18	1.048	0.371
Herb height plot 2	**Treatment**	**2/36**	**34.631**	**0.000**
Herb height plot 2	**Location*Treatment**	**4/36**	**3.224**	**0.023**

One hour fuels and Litter/Duff depth-plot 1 experienced significant change (increase of) with fuels due to flood deposition. Transformation of these data attributes was determined be unnecessary due the large difference of changes. Variables listed in bold denote significance ($P < 0.05$). The variable "location" accounts for the change for all the sites: Independence, Ullathorne, and Big Bar. “Treatment” accounts for change of pre-burn, post-burn, to post-flood are combined. The grouping of individual components for each variable provides a course level analysis of the broader effect of the variables location or treatment used to characterize disturbance in valley sandbar willow habitats. Culturally meaningful results found to be significant were: Live shrub cover plot 1 and Live shrub cover plot 2 indicative of a reduction that either has reduced Himalayan blackberries allowing better access to willows and/or disturbance to sandbar willows that will likely result in sprouting that recruits potential basketry material. Changes in 1000 hour rotten fuel for Treatment likely correspond to fire. Changes in 1000 hour sound fuel for location were attributed to flood effects. Percent Litter plot 1 and 2 for Treatment is affected (decreased) by fire, but to a larger extent by flooding. Percent Litter plot 1 and 2 for the interaction of Location*Treatment indicate the strong influence of Treatment. Live shrub cover plot 1 for Treatment is likely caused by prescribed fire and phenological state. Dead shrub cover plot 1 and 2 for Treatment was affected mainly by prescribed fire, across all sites burning up dead drier thatch or leaves. Dead shrub cover plot 1 for Location*Treatment may be from more consumption by fire (treatment) at Independence. Shrub height plot 1 and 2 for Location and Treatment suggest the effects of disturbance varied by site potentially caused from more synergistic effects of variable intensities across the sites. Shrub height plot 2 attributes significant differences for the interaction of Location*Treatment. For example, fire behavior at Independence was of higher intensity, moderate at Ullathorne, and less at Big Bar coupled with more intense flooding at Big Bar and Ullathorne and less flooding at Independence in pushing over shrubs, thus lowering their height. Changes in Live Herb cover plot 1 and 2 for Treatment are likely from prescribed fire, seasonal phenology, and flooding deposition covering herbs. Live Herb cover for plot 1 is not significant whereas plot 2 is suggest variability across the site from disturbances. Dead Herb cover plot 1 for Location, Treatment, and Location*Treatment and plot 2 excluding Location having significant change suggest variation of disturbance or amount of dead herbaceous material being consumed by prescribed fire, flood deposition of sand/silt covering it, and interactions of fire and flood across all the sites. Herb height plot 1 and 2 for Treatment changed by fire burning those live and dead herbaceous fuels and flood deposition. Significance found for Herb height plot 2 for the interaction of Location*Treatment, suggest the strength of the influence by disturbances. Litter/Duff depth-plot 2 for Location, Treatment and Location*Treatment interactions of significant change are attributed to differences at sites and with disturbances. Differences for Live shrub cover plot 2 being significant but not plot 1 suggest important aspects for the variability of disturbance effects within the sites. Significant testing for 1 hour and Litter/Duff depth-plot 1 would have required transformation and modified analysis because of the large changes in those fuel characteristics increased by flood deposition of organic material at Big Bar.

More specific analysis and investigation of the interactions by location and treatment are presented in Table 5.9 below for LS Means addresses both hypotheses and fuel attribute types more closely.

Table 5.9: Least Square Means of meaningful interactions of effect, location, and treatment (Consolidated from Appendix D).

Variable	Effect	Location	Treatment	Estimate	Significant	Standard Error	Degrees of Freedom
% Litter plot 1	Treatment		Post-Burn	38.57	a	4.94	36
% Litter plot 1	Treatment		Post-Flood	0.43	b	0.06	36
% Litter plot 1	Treatment		Pre-Burn	76.19	c	2.31	36
% Litter plot 2	Treatment		Post-Burn	44.52	a	3.63	36
% Litter plot 2	Treatment		Post-Flood	9.14	b	5.37	36
% Litter plot 2	Treatment		Pre-Burn	77.62	c	2.00	36
Litter/Duff depth-plot 2	Treatment		Post-Burn	1.81	a	0.32	36
Litter/Duff depth-plot 2	Treatment		Post-Flood	0.07	b	0.03	36
Litter/Duff depth-plot 2	Treatment		Pre-Burn	4.43	c	0.38	36
Live Herb cover plot 1	Treatment		Post-Burn	16.60	a	4.45	36
Live Herb cover plot 1	Treatment		Post-Flood	3.95	b	2.04	36
Live Herb cover plot 1	Treatment		Pre-Burn	37.17	c	4.65	36
Live Herb cover plot 2	Location	Big Bar		2.60	a	2.28	18
Live Herb cover plot 2	Location	Independ		26.50	b	2.28	18
Live Herb cover plot 2	Location	Ullathorne		17.43	c	2.28	18
Shrub height plot	Treatment		Post-Burn	1.14	a	0.14	36

2							
Shrub height plot 2	**Treatment**		**Post-Flood**	**0.90**	**b**	**0.14**	**36**
Shrub height plot 2	**Treatment**		**Pre-Burn**	**1.46**	**c**	**0.15**	**36**
Significant difference is noted by a from b, from c or b from a, and c, etc.							

The determination of significance is shown by the letters a, b, and c in the column labeled "Significant." Significant difference is noted by a from b, from c or b from a, and c, etc. The effect of Treatment shows the relative estimates of unit change between disturbance events. Live Herb cover plot 2 is significantly different between Independence and Ullathorne.

<u>Independence site</u>

There were incremental changes observed among 1 to 100 hour and 1000 hour fuel load associated with pre-burn and prescribed fire to those of post-burn/pre-flooding and post-flooding. Table 5.4a, Table 5.9, and Appendix D). Each disturbance event removed proportionally some amount of 1 to 100 hour fuels, while the 1000 hour sound and rotten fuels decreased only slightly (Table 5.4a). The totals for 1 to 100 hour fuels decreased from 1.77 (pre-burn) to 1.27 (post-burn) to 0.89 kg/m^2 (post-flood). Duff /litter and substrate (soil) changes in fuel continuity were greater between pre-fire and post-flood events. The prescribed fire removed the greatest amount of duff/litter followed by flooding which removed or buried any that remained. Total duff/litter depth declined from 16 cm to 2.7 cm to 0 cm with each event (Table 5.4b). The live and dead shrub and herbaceous cover was reduced between each disturbance event. Live shrub pre-fire cover was 25.25%, and zero for post-fire and flooding. The amount of dead shrub cover was also greatly reduced by prescribed fire and subsequent flooding (Table 5.5). Shrub live and dead biomass changed more between the pre- and post- prescribed fire than post-fire and after flooding (Table 5.5).

<u>Ullathorne site</u>

The observed changes in 1-100 hour and 1000 hour fuel load associated with pre-prescribed fire to those of post-burn/pre-flooding and post-flooding were incremental (Table 5.4a). The prescribed fire disturbance event did not remove as much of the amount of 1 to 100 hour fuels as expected, while flooding removed less 1-100 hour fuel biomass (H_1 a and H_2a, Table 5.4a). The 1000 hour sound and rotten fuels decreased slightly following flooding (H_1 Table 5.4a). Very little fuel was present in the Ullathorne site compared to the other sites because of the young age of the willow patch and the partial prescribed fire in October 2004 which consumed concentrations of fuel. Areas of concentrated fuel were usually Dusky-footed wood rat (*Neotoma fuscipes*) nest built on previous flood material (Figure 5.5).

The kg/m^2 (biomass per unit area) totals for 1 to 100 hour. fuels changed from 0.44 to 0.49 then to 0.32 with pre- and post-fire and post-flooding respectively (Table 5.4a). Duff /Litter and substrate changes in fuel continuity were greater between each of the separate disturbance events. The prescribed fire removed the greatest amount of duff/litter followed by flooding which removed or buried any that remained. Total duff/litter depth dropped from 6.5 cm to 3.0 cm to 0.1 cm with each event (Table 5.4b). Changes in the relative depth of the duff/litter correspond with the amount or magnitude of disturbance on the ground surface with each event. Prescribed fire removed over half of the duff/litter mass in the cover plots sampled, followed by flood scouring and deposition. Duff or litter which was not consumed by prescribed fire, or washed away by flooding was buried under new silt/sand.

The Live and Dead shrub and herb cover was reduced between each disturbance event. Live shrub cover pre-burn was 22.14%, and 3.29% for post-burn and 9.5% post-flooding, but sampling time was also correlated with the seasonality of shrub phenology (Table 5.5). The increase in percent live shrub cover between post-burn/pre-flood to post-flood can be attributed to vegetation which was pushed into the sampling plots from the flood. The changes in the amount of dead shrub cover between sampling events corresponds with mortality following the fire and removal of dead shrub biomass by flooding.

There are similar changes in percent cover of substrate (litter) between the annual pre- and post-treatment for quadrats data (Chapter 4) to that of the fuel vegetation plot duff/litter data (see also repeat photographs taken at transect end points, Appendix E). Shrub live and dead biomass exhibited variable change between the pre- and post- prescribed fire and after flooding. Fire behavior and effects influenced the types and amount fuel at the Ullathorne site less than the effects of flooding.

Big Bar site

The observed changes in 1-100 hour and 1000 hour fuel load associated with pre-burn and prescribed fire to those of post-burn/pre-flooding and post-flooding were incremental (Table 5.4a). Each disturbance event changed proportionally some amount of 1 to 100 hour fuels, while the 1000 hour sound and rotten fuels decreased slightly after fire, but greatly increased after flooding with the deposition of driftwood (Table 5.4a). The kg/m^2 totals for 1-100 hour. fuels decreased from 0.51 to 0.44 pre- to post-burn, but increased to 6.82 after flooding (Table 5.4a). This increase was attributed to the deposition of flood material (see chapter 4, Figure 4.19). Duff/litter and substrate changed the quality of fuel continuity between disturbance events. The prescribed fire removed the greatest amount of duff/litter followed by flooding which removed or buried any that remained. Total duff/litter depth was reduced from 12.9 cm to 9.2 cm to 0.2 cm respectively with each event (Table 5.4b).

The Live and Dead shrub and herbs cover was reduced between each disturbance event. Live shrub cover pre-fire was 45.75% and 31.43% for post-fire and 19.5% post-flooding, but sampling time was also correlated with the seasonality of shrub phenology (Table 5.5). The amount of dead shrub % cover for sampling plots experienced little change from pre-fire to post-flooding, with a slight increase between those events. There were similar changes in percent cover between the annual pre- and post-treatment quadrat data to that of the fuel vegetation plot data (see also repeat photographs taken at transect end points in Appendix E). Shrub live biomass had a decreasing trend in change, while shrub dead biomass varied more between the pre and post prescribed fire and after flooding.

Discussion

The results of vegetation fuel load signify changes that vary in their spatial (location) and temporal (treatment) effects in valley sandbar willow riparian habitat diversity. Often, the standard deviation of DWM samples exceeds the mean resulting in the need of large numbers of samples for statistical tests (firemon.org). Shrub cover generally changed less compared to herbaceous cover. Percent cover and height of live and dead woody and herbaceous fuel combine to produce biomass. Examination of whether percent cover or height was significant provided evidence as to which component that contributed biomass was significant. Overall, flooding had the greatest effect on fuels. Flooding produces the greatest reduction in fuel, with the exception of a portion of Big Bar site where flood-deposited material increased the fuel load. Duff and litter were generally removed to the same degree across all three sites experiencing prescribed fire and flooding. Although, comparatively each site based on relative age had differences in beginning duff/litter depth, e.g., Independence had the oldest willows and deepest duff/litter depth. Some variation between pre-burn, post-burn/pre-flood, and post-flood can be attributed to sampling time which was correlated with the seasonality of shrub phenology.

Part of the variation between sampling events (pre- and post-fire/flood), were attributed to vegetation phenological stage. Fuels sampling was conducted pre-burn in September, post-burn sampling was conducted following the fire before significant surface green-up, and post-flood sampling within a month of the maximum flooding when waters receded. It was important to sample at the same phenological stage where vegetation as a potential fuel type is concerned.

Independence site

Fire influenced types and amount of fuel at the Independence site more than the effects of flooding, which could be attributed to the site being somewhat protected from direct flooding. There is a river access road between the site and the main river channel. Ecologically, fuels levels were reduced, affecting wildlife habitat quality and condition. The reduction in litter and duff probably reduced invertebrates (Smith et al. 2006), but the increase in herbaceous cover likely increased forage quality for herbivores (invertebrates and vertebrates). Elk (*Cervus canadensis*) were observed during the winter at the site browsing on herbaceous growth. Reduced fuels also affected cultural uses by reduction in insect pests (Price 1989) and improved access for management and harvesting (Anderson 1999). However, willows older than 20 years of age resulted in poor or low amounts of sprouting shoots potentially used for basketry. Statistically significant changes were only observed between the pre- and post-burn dead fuel load because of an earlier date of fall burning with higher intensity fire consuming a larger amount of fuels and inducing top mortality of vegetation.

Ullathorne site

Ecologically, fuel levels were reduced affecting potential wildlife habitat quality and condition. Reduced fuels can increase access for larger wildlife species, black-tail deer (*Odocoileus hemionus*) or black bear (*Ursus americanus*), but can reduce protective or nesting cover of smaller wildlife, like wood rats or birds. Culturally, fuels levels were reduced which likely reduced insect pest and improved access (Price 1992, Anderson 1999, Smith et al. 2006). The younger age of the willows (mean 9.2 years old) resulted in high amounts of sprouting of newer shoots potentially used for basketry. Historically, this site was downstream adjacent to an important Native American fish processing camp where driftwood material would have been used for heating or food preservation (M. McCovey 2002 pers. com., Six Rivers National Forest Interview: I-350) Statistically significant changes were observed in the pre- and post-burn fuel load were for live herb cover plot 2. Fire had little effect on the net change of the 1-100 hour fuel biomass compared to flooding. Flooding deposited 1000 hour sound fuels as driftwood. Changes in live shrub cover were more pronounced with prescribed fire than flooding, which may be attributed to phenological state of live shrub biomass. Changes in live herb cover were affected more by flooding than fire, which also corresponded to seasonal phenological state of live herb biomass.

Big Bar site

Fire behavior and effects had less influence on the types and amount of fuel at the Big Bar site compared to the effects of flooding. Ecologically, the 1 to 1000 hour fuels levels were increased, while the duff/litter and shrub/herb fuels were decreased, affecting wildlife habitat quality and condition. Increased woody material provides cover for wildlife species, whereas reduced litter can decrease invertebrate densities (Smith et al. 2006). The greater amount of area of unburned portions at Big Bar resulted in less changes attributed to fire. Culturally, total fuel levels were increased which reduced access to willow harvesting. Historically, this site was an important Native American fish processing camp where drift wood material would have been used for heating or food preservation (M. McCovey pers. com. 2002). The older age of the willows in unburned portions of the site resulted in poor or low amounts of sprouting of younger shoots, while the younger burned willows did sprout creating more shoots potentially usable for basketry (Vegetation response in Chapter 4). Statistically significant changes were only observed in Live Herb cover plot 2 attributes surveyed. Flooding resulted in changes in the fuel load in comparison to prescribed fire.

Discussion of fuel components issues for all sites

The continuity of riparian vegetation is clumpy, often consisting of mosaics of different plants and age classes that established from multiple fluvial disturbances (Naiman et al. 1993, Tabacchi et al. 1998). Fuel characteristics directly influence fire behavior. Under particular conditions fuel is susceptible to burning, and influences fire and flooding behavior which in turn affected vegetation or substrate condition, as observed with wood rat nests built upon 1997 flood material (Figure 5.5). Following prescribed fire, flooding washed away partially or unburned litter, duff, fuels, in addition to abrasively damaging live fuel, which created future dead vegetative fuel. Patchiness of burned and unburned willow crowns has been shown to increase insect pests that infect willows (Price et al. 1987b, Chapter 6). Flooding also deposited organic material of all compositions; needles, leaves, roots, branches, trunks, and whole plants, which recruited potential fuel for subsequent fire events.

Nutrient retention and cycling attributed to fire versus flooding effects is also important to consider. The results of this study on nutrient levels can only be inferred by comparing to other studies or synthesis of related information (McNabb and Cromack 1990, Naiman et al. 1998, DeBano et al. 1998). There were limited amounts of combusted fuels and organic matter resulting in the volatilization of essential nutrients as reported by the change in fuels classes and litter/duff pre- and post-fire and/or flooding. The amount of volatilization that occurs depends on the temperature and duration of heating reached (DeBano et al. 1998). With the exception of former flood debris and wood rat nest often associated with flood debris piles, smaller amounts of area for each project site experienced high temperatures and long durations of heat leading to combustion and volatilization of organic matter. In relation to the total riparian habitat area of the lower mid-Klamath River, the small amount of area for prescribed fires for maintenance and rejuvenation of sandbar willow basketry material is likely of little influence compared to the effect of flood control on the biodiversity and productivity of sandbar willow dominated communities.

> "In many systems, regular deposition of nutrient-rich sediment is necessary for [riparian] forest maintenance because the soils are poorly developed or because they experience rapid leaching associated with high water tables. A decreased nutrient supply, induced by flood controls, can result in decreased productivity as opposed to increased radial growth which may occur following alluvial sediment deposition by floods" (Naiman et al. 1998:314).

Examination of the cut and sanded sandbar willow growth rings support this conclusion (Figure 4.6). Increased growth ring width may be correlated with other variables such as competition for space which is indicative of other factors than nutrient availability. Furthermore, without removal of some or all of the dams on the upper-Klamath River and tributaries, restoration of the "natural" flow regime may not be possible. Any policy or management directives involving prescribed flow regimes will need to consider the balancing ecological, economic, and socio-cultural values (Baker et al. 2004).

Diversity in the composition, structure, and types of riparian vegetation and ignition patterns contributed to the variation in fire effects across the sites. These prescribed burns were of finer scale patchiness and varied from other wildfires observed in similar sandbar willow dominated riparian areas. The main factors responsible between these prescribed burns and other fires were attributed to the season of burn, fuel moisture levels/humidity, wind speeds, and ignition patterns. Arson wildfires usually occur under non-controlled conditions with greater intensities and extent of area burned (e.g., Dance Fire 2003 near Orleans, CA.).

Conclusion

Fuel loads of sandbar willow valley riparian zones along the lower mid-Klamath have changed since American settlement because of variety of management affects on socio-cultural, biophysical, and biogeochemical processes. Factors affecting the condition, distribution, and abundance of fuel types of sandbar willow communities have been past mining, changes in human use of woody material, upper Klamath River dam and irrigation projects, fire suppression and exclusion, and federal and state policies that regulate management or use of riparian zones along the Klamath River and its tributaries.

Prescribed fire used as an adaptive management practices to emulate flooding in rejuvenating young shoots in sandbar willow communities was found to be similar and yet very different in its affects on fuels. Prescribed burning treatments for this research demonstrated that the amount of fuel consumed is associated with localized site conditions of fuel moisture and type, temperature, wind speed, and ignition pattern. Higher magnitude flooding (greater than 75,000 cfs at Independence and 150,000 cfs at Ullathorne and Big Bar) that occurred after prescribed fire treatments had a much greater affect on the condition, distribution, and abundance of fuel types of sandbar willow communities.

In comparison, prescribed fire only affected the local project site, whereas flooding affected much a greater area along the mid-Klamath River corridor. Prescribed fire generally consumed smaller sized class fuels (1 to 100 hour), dead woody and cured herbaceous vegetation, and surface litter with some duff. Flooding was found to wash away and deposit litter and duff, modify the arrangement live and dead fuel or redistribute concentrations of woody material as flood debris.

Lastly, policies and management of sandbar willow communities along the lower mid-Klamath River affect tribal cultural use quality whether it's sandbar willow for basketry, or as critical wildlife and fisheries habitat. Consultation with tribes and tribal communities about management of sandbar willow dominated riparian zones is recommended. Federal, state, county, community, and tribal managers should attempt to incorporate tribal traditional ecological knowledge and scientific understanding of how fuels in riparian zones could be managed to achieve socio-cultural and ecological requirements.

Figure 5.1: Hupa woman with drift wood in burden basket. Photo A.W. Ericson circa 1890. Reference: HUMCO F868 H8 E7, Identifier: 1999.02.0142

Figure 5.2: FIREMON Fuel sampling layout.

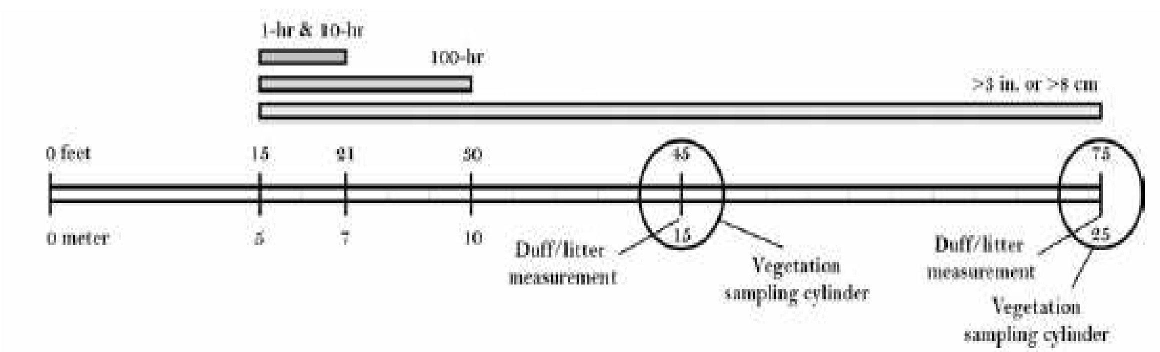


Figure 5.3: Sampling Duff/Litter Depth

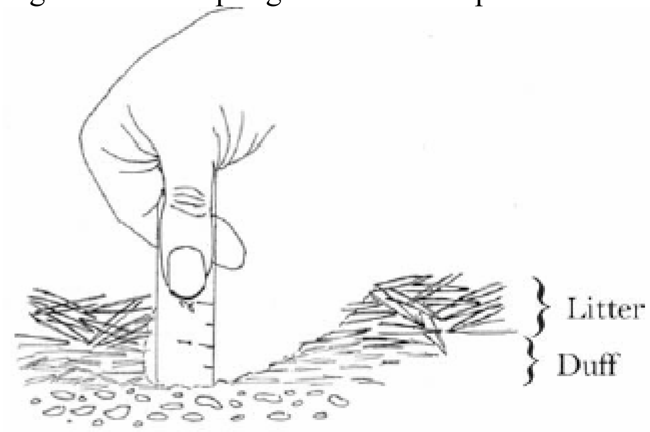


Figure 5.4: Fuel Load Changes Between Pre and Post-Burn/Pre Flood and Post-Flood.

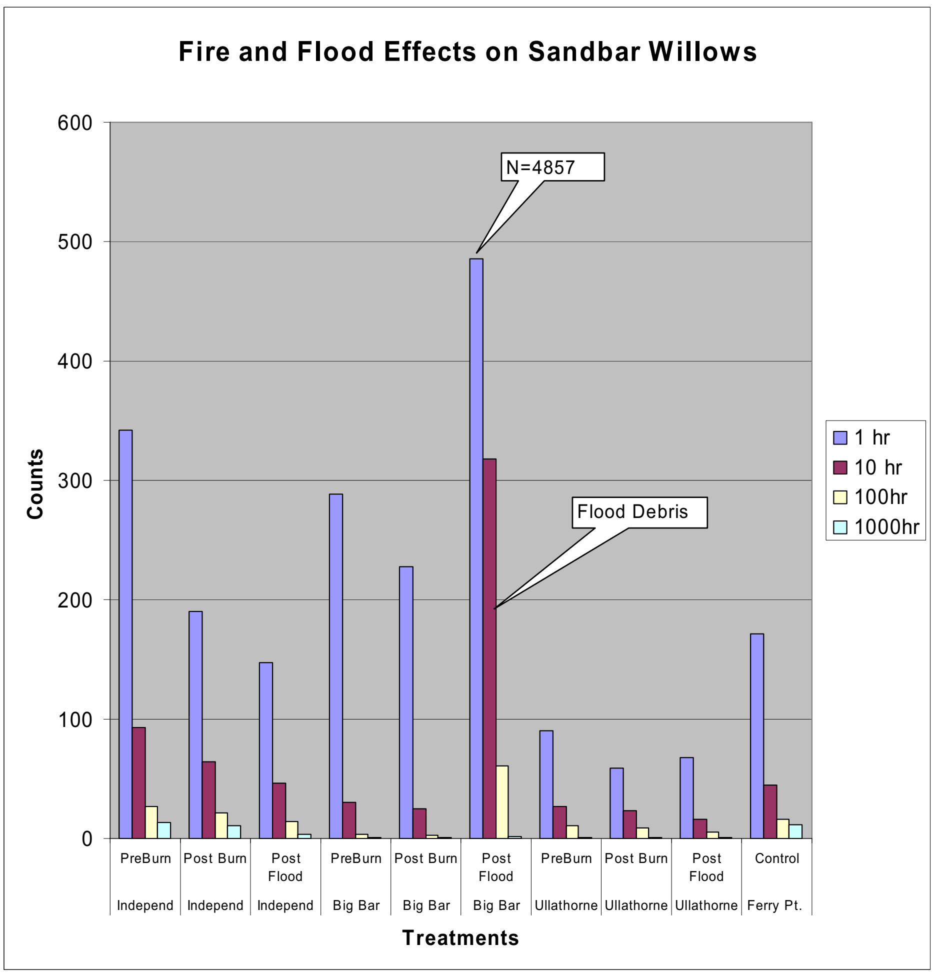


Figure 5.5: Wood rat nest built upon flood deposited material

Figure 5.6: Big Bar Fuels Transect 2 Pre-Burn, Post-Burn/Pre Flood, and Post-Flood

		
Pre-Burn September 12, 2005	Post-Burn/Pre flood November 15, 2006	Post-Flood January 6, 2006

Chapter 6: Ethnobotany of sandbar willow and other basket materials

Introduction

There is little published about of how Native people of the Klamath-Siskiyou bioregion used fire and other horticultural practices to manage sandbar willow (*Salix exigua* Nutt.). Most documents provide brief ethnobotanical descriptions of willow use for basketry (O'Neale 1995, Schenck and Gifford 1952, Heffner 1984, Davis and Hendryx 2004). Several publications describe how tribal people in other regions utilized willow for basketry and medicinal or structural uses (Heffner 1984, O'Neale 1995, Moerman 1998, Anderson 1999, Hankins 2005).

Common names for *Salix exigua* are coyote, sandbar, northwest sandbar, narrow-leaved, or locally gray or blue willow. It has also taxonomically been classified as *S. sessilifoia* var. *hindsiana*, *S. sessilifolia*, or *S. hindsiana* (Schenck and Gifford 1952, Baker 1981, Hickman 1993, Moerman 1998, Davis and Hendryx 2004). Narrow-leaved willow is variable in morphological traits and has been called *S. hindsiana*. Individuals of the species may be derived from *S. exigua* X *S. sessilifolia* hybrids (Hickman 1993). S. exigua has S. hindsiana recognized as a geographic entity from west of the Sierra in California and southwest Oregon, and S. sessilifolia as west of the Cascades in central Oregon to British Columbia, Canada (Brunsfeld et al. 1991). Individual variations in leaf shape and catkins have been observed for sandbar willow between Happy Camp and Weitchpec, CA. along the lower mid-Klamath River, indicating potential hybridization between *S. exigua X. S. sessilifolia* and/or *S. hindsiana*. Sandbar willow patches along rivers in northern California were found to be predominantly clonal with little genetic diversity (Douhovnikoff et al. 2005).

Willows serve important ecological functions for maintaining terrestrial and aquatic habitats as well as geomorphic stability along riparian zones (Kauffman et al. 1997). The vegetative growth of willow following flooding or fire is important wildlife browse (Stein et al. 1992). Less well known is how Native people manipulated willow and other vegetation along major rivers and creeks to produce suitable basketry materials, access to food and medicine resources, ceremonial use, and hunting and fishing (O'Neale 1932, Schenk and Gifford 1952, Kroeber and Barrett 1960, Baker 1981, Davis and Hendryx 2004, Benson et al. 2006). Sandbar willow was one of the most widely used willow species in the Pacific West by native people (NRCS Plant Guide). Native people used pruning techniques, along with fire, to manage willow patches, primarily for basket material (NRCS Plant Guide, Anderson 1999). Management techniques used by native people influenced the growth, morphology, and stand structure of willow and associated plant communities (Anderson 1999, Anderson 2005).

Sandbar willow shoots are harvested and used in local ceremonies, as "brush" to place in quivers or to accompany other dance regalia. The preferred morphological form for regalia is long vertical branching stems. These stems result from disturbance to sandbar willows which stimulate a sprouting response. Ceremonial uses of willow are an important part of Northern California Native cultures, especially among the Karuk. Local tribal medicinal uses of willow (*Salix* sp.) are only briefly documented (Schenk and Gifford 1952, Baker 1981, Davis and Hendryx 2004).

Floods historically scoured and redistributed willows causing growth which Native American basket weavers relied upon for basket material (Chapter 4). However, hydro-electric and irrigation system impoundments in the upper Klamath basin that regulate river discharge have resulted in diminished floods of sufficient magnitude and intensity to rejuvenate willows (Chapter 4). The ability for the US Forest Service, state agencies (California Department of Transportation), and private or tribal land owners to conduct prescribed burns on willows is limited by funding, management priorities, and environmental or social concerns. Due to the lack of flooding and opportunities for prescribed fire, Native American basket weavers have limited access to quality sandbar willow, unless the species is pruned or damaged (Reece pers. com 2007). Beavers (*Castor canadensis*), which were historically more abundant (Kindschy 1985, Breck et al. 2003), are also known to affect willows causing sprouting from severed or damaged stems that can form suitable shoots for basketry use. However, even though pruning promotes stems with suitable stem morphology, they are still susceptible to insect stem borer and gall infestations (DeClerck-Floate and Price 1994).

Willow patches can be plagued by stem, leaf, and gall forming insects that bore into or live on sandbar willow (Smith 1970, Price 1989, Price 1992, Stein et al. 1994, DeClerck-Floate and Price 1994). Insects collected near Orleans in June of 2006 were identified as belonging to Cecidomiyiidae family-*Rabdophaga* species (gall midges) (Figure 6.1) and Agromyzidae family (leafminer flies) (University of California, Davis, Bohart Entomology Museum). Gall forming insect specific to sandbar willow is the shoot-galling sawfly, *Euura exiguae* (Price 1989). Sawflies preferentially attack younger growth of willows rather than older willow growth (Price et al. 1987a, Price et al. 1987b, Price 1989) (Figure 6.2). A number of other insects also have herbivorous relationships with willow foliage, stems, or roots which in turn affect the condition or quality of stem growth (Smith 1970, Price et al. 1987a, Price 1989).

Flooding, freezing, and fire can reduce insect infestations (Price 1992). Reduced flood magnitude and mild weather can foster pandemic insect infestations. Native people used fire to reduce pest populations and rejuvenate willow sprouting (M. McCovey pers. com. 2002). In addition to natural disturbances, basket weavers manually prune willows to stimulate growth for shoots to be usable for weaving (O'Neale 1932, Heffner 1984, Anderson 1999, Glaze pers. com. 2002, M. McCovey pers. com. 2002, Reece pers. com. 2002, Anonymous woman pers. com. 2002). Cutting willows does not always reduce insect infestations in willow shoots (Price et al. 1987a, Price et al. 1987b, Price 1989, Glaze pers. com. 2002). The desired stem morphology for basketry use can be present following pruning, but some shoots may not be functionally useable if infested by insects. Insect infested stems will often not peel as easily (bark sticking at holes) (Figures 6.3 and 6.4) and/or break during weaving reducing weaving efficiency and/or and basket quality (O'Neale 1995, Fulkerson 1995). Willows in their natural state predominately have a crown structure and stem morphology unsuitable for basketry use, compared to when they have growth occurring from former recent disturbance as fire, flooding and pruning (Anderson 1999). For example, comparison of prior disturbed versus undisturbed willow shoots and stems from the Ullathorne site two spring seasons after prescribed fire and flooding (Figure 6.5).

Research indicates complex insect predator and prey relationships (Fritz et al. 1987, Price 1992, Woodman and Price 1992) on sandbar willow. Insects also differentially respond to types of willow growth (Fritz et al. 1987, Price et al. 1987a and 1987b).

> "Galling sawflies in the genus *Euura* (Hymenopter: Tenthredinidae) attack rare long shoots in a population of shoots within willow clones and among willow clones…Young plants grow rapidly, producing long shoots; old plants produce short shoots; in wet sites plants grow much better than in dry sites; and any damage to plant by snow, flooding, or herbivory causes rapid regrowth in juvenile shoots" (Price 1992:276).

The Coyote willow shoot galler, *Euura exigua* is a specialized ovipositor on young sandbar willow (*S. exigua*) shoots (Smith 1970, Price 1989). Price (1992) observed the natural rarity of long shoots, but did not mention fire as a disturbance agent of willows. Besides insect damage old willows accumulate lichens and mosses making them unsuitable for basketry (Anderson 1999).

Research goals and objectives

Goals

(1) To examine the effects of propane burning and pruning on growth and cultural use of sandbar willow and evaluate which management treatments produce the greatest quantity and quality of willow shoots for basket material. The number of "useable" willow stems (shoots) to "non useable" willow stems (Good:Bad proportion = good / good + bad) that resulted from each treatment after one year of growth were compared. Annual growth, shrub height, sprouting potential, useable stem production, stem condition, and presence of insect damage were assessed one year following treatment.

(2) To establish a cooperative relationship between the Karuk Indigenous Basketweavers, California Indian Basketweavers Association and USDA Forest Service biologists and resources managers, Orleans-Somes Bar Fire Safe Council, and individuals from the local communities. This collaborative effort was necessary to implement treatments and assess the quantity and quality of willow stems for basket

material that resulted. The USFS Orleans Ranger District conducted the National Environmental Policy Act requirements and implemented the propane burn treatment. A Karuk basketweaver served as the prune treatment (LaVerne Ferris Glaze of Orleans, CA.). This project involved additional community participation from individual Karuk Indigenous Basketweavers, Passport in Time-Follow the Smoke volunteers, and US Forest Service fire staff at the Orleans Ranger District, Six Rivers National Forest.

Objectives

Research objectives were to:
(1) Provide usable basket material for basket weavers from the experiment,
(2) To determine effective treatments to produce usable willow shoots compared to the number of usable shoots on willow shrubs prior to treatment, and
(3) To provide new information about ethnobotany and basketry management for the Karuk and other local tribes.

Project area and hypotheses

An experiment was conducted to test the effects of pruning and burning on sandbar willow shoot production and usability. Willow qualities were measured before and one year after treatments. The experiment built upon former theoretical models of Anderson (1999). The study was conducted along the Klamath River (Six Rivers National Forest, Orleans Ranger District) near Orleans, CA. at the confluence of Camp Creek adjacent to the Karuk village of *Tishunick* (T 10N, R 5E, Sec. 1, and 120 meters above sea-level). The site was selected after consulting the Karuk Tribe Department of Natural Resources, Karuk Indigenous Basketweavers and Karuk ceremonial leaders. The USFS Orleans Ranger District was the lead agency for government-to-government consultation with the Karuk Tribe of California for the project. The project site was approximately 0.4 hectares in size with the actual treatments (propane burning and pruning) affecting less than 0.25 hectare in area. Within the site, smaller individual treatments were applied to specific plant clumps located across the area. Based on the traditional knowledge and experiences of Native basket weavers of broadcast burning, it was expected that the propane burn (fire) treatment would produce a greater proportion of usable shoots than pruning or no treatment. Basketweavers consulted initially questioned the potential effectiveness of individual propane burning compared to pruning (Glaze pers. com. 2004, Houston pers. com. 2004, Polmateer pers. com. 2004). Willow shrubs that have propane burning or pruning treatments will likely experience changes in the proportion of usable stems and the amount of usable stems.

Hypotheses

H_1: Some treatments will produce greater numbers of usable willow stems (shoots) favored by Native basket weavers than others. (1. mean of Good between treatments versus 2. Proportion of Good:Bad stems 3. lower stem diameter:length ratio) [Burn < Prune < Control]

H_2: There will be no difference in ratios of stem diameter to stem length between 1. willow shoots in the experiment and others collected compared to hazel and Douglas-fir, which are also for basket material.

Methods

Field experiment

The research involved experimental manipulation of sandbar willow clumps and characterization of growth response. Experimental manipulations consisted of treating individual willow shrubs by pruning, burning, and no treatment (control). Characterizations of willow growth response to treatments were determined by the proportion of acceptable to unacceptable willow stems that were present pre- and post-treatment. Stem diameter to length ratio (D/L ratio) was used to examine change in stem morphology associated with each treatment.

Experimental design

Individual willow clumps were identified by their similarity in crown morphology and area occupied. However, above-ground stems may have been connected below-ground by rhizomes (Figure 6.6). Each above-ground willow clump, either single or multiple stems, was counted as an individual experimental unit. Individuals clumps that were similar in physical characteristics and were close (nearest neighbor < 3 meters away) to each other were organized into treatment blocks. A block consisted of three above-ground experimental units. Willows were either propane burned, pruned, or received no treatment (control). Above-ground individual willow clumps ranged from 0.5 meters to 2 meters in height, had variable crown volumes, and differing branching morphology. Willow variety offered a full range of former disturbance histories to study. Numbered tags were placed on individual willow clumps across the site according to block and treatment. Measurements were taken of growth, structure, and biomass of individual willows before and after treatment. The experiment was conducted as a complete randomized block with three treatments and 23 blocks. Each above-ground willow clump was randomly assigned a treatment. Thus, each block consists of the three different treatments. A hypothetical arrangement of individual willow clumps arranged according to size, age, and management treatments are shown in Figure 6.7.

Treatments and data collection

Prior to treatment each willow clump was measured for leader height and the number of stems emerging from the ground. The number of potentially usable willow shoots in each clump before and after treatment was counted. Approximately ten percent of these measurements were used to calculate a stem diameter/length ratio (Table 6.1). Digital calipers were used to measure the apical and lateral shoot diameter at the location approximately where Native American basket weavers would prune or harvest the stem (Figure 6.8). Pruning of stems usually occurs within 5 mm of the stem base, above the last lateral stem, or defect present on the lower portion of the stem. A straight ruler was used to measure stem length. Each stem was visually inspected for defects and stem quality was determined.

Based upon information from Native American basket weavers about shoots they used for weaving, a criterion was developed to determine desirable stems. A “good” usable willow shoot is a single straight stem greater than 1 mm in diameter and longer than 10 cm, without lateral branches, kinks, or signs of insect damage or bark defects.

Application of treatments

In November 2004, propane burners were used to burn willow clumps. The bases of each selected clump was scorched or burned. The use of propane burners provided a relatively uniform application of fire to the selected clumps (Figure 6.9). Native American basket weaver and author worked with USFS fire personnel with propane burners to implement treatments. The lowest 25 centimeters of each stem was burned for a minimum of 30 seconds on all sides or until bark blistering was observed. Bark blistering indicated sufficient cambium damage to cause crown mortality of the clump based on observations of wildfires in the area. For the pruning treatment, stems, branches, and twigs were removed from the clump. Pruning was done by a Native basket weaver to reflect culturally preferred stems and treatment to promote shoot growth (Figure 6.10). This procedure potentially allowed the best re-growth response for shoots that are ideal for basket weaving (Glaze pers. com. 2004). Untreated willow clumps were measured and left to grow for approximately one year.

All willows in the experiment grew for one year. During that time the other willows not included in the experiment were burned, pruned, weeded, and harvested for basketry material. Some of the willow stems harvested were used to calculate the stem diameter/length ratio relationships (Table 6.8).

In November 2005 a final survey of willow clump height, number of stems emerging from the ground, and “good” sticks were harvested and bundled. However, the timing of this harvest was not a common time for most basketweavers. Fall (following leaf drop) compared to spring (leaf emergence) or late-summer when stems are morphologically ready to harvest is most often done. The number of “bad” stems, notes on growth form, insect damage, and other information about willow condition was recorded.

“Good” stems were collected, bundled and stored. After several weeks in dry cool storage, stems were soaked in warm (approximately 85-90 °F) water for 5 minutes, removed, towel dried and visually inspected for traits suitable for basketry use. Each willow shoot also was tested for flexibility and defects (O'Neale 1995, Fulkerson 1995). Generally, a small portion of the bark was scraped near the butt end to examine the inner bark color. Light green inner bark indicated a live stem at time of harvest and brown inner bark indicated stem mortality prior to post-treatment collection. It was thought that shoots with useable morphology at time of collection, but were dead (brown inner bark) might still have been usable. Initially assumed "good" stems at time of harvest had visibly dead (brown inner bark). This was found to not be true during post-collection inspection (Figure 6.10). Assumed "good" stems at time of collection, that were dead (visible brown inner bark when just pruned as well as after being stored, soaked and inspected a second time), upon closer inspection that were found to be damaged or unsuitable were added to the "bad" category. The checking at time of harvesting, during storage, and again at soaking for use to weave is typical of the "quality control methods" basket weavers use have the best shoots possible for their baskets. The remaining shoots were re-bundled, stored, and dried. Later, these shoots were measured for stem diameter and length ratios.

Stem diameter and length ratio measurements of basketry material

Quantifiable measurement and documentation of Native basketweavers' willow stem and other plant species use has rarely been conducted (Anderson 1999). Morphological characteristics of shoots from sandbar willow and stems from other plant species commonly used for basketry material were measured. The stem diameter and length of these shoots were measured to compare sandbar willow, California hazel (*Corylus cornuta* Marsh. var. *califorinica*), and Douglas-fir (*Pseudotsuga menziesii* (Mirbel) Franco var. *menziesii*) stems. The size distribution derived from stem D:L ratios of usable shoots for different baskets was documented. A graph, depicting the relationship of stem diameter and length for baskets, was developed and a ratio of the "ideal" stem diameter to length for usable harvested shoots was determined (Figure 6.12).

Data analysis

Analysis of willow and other basketry material stems measurements

Data was imported from Excel into SAS v.9.1. SAS Proc Mixed was used to construct an analysis of variance model with repeated measures. The mean stem diameter/length ratios for each treatment were compared between and within the pre- and post-treatment periods. Analysis of variance was used to compare the mean ratio of stem diameter to length for the number of stems associated with each treatment**.** A Student's t-test was used to separate differences between pre- and post-treatment effects on willow shoot diameter:length ratios for individual within treatment type. SAS 9.1 Proc REG was also used for estimating slopes among treatments. Figure 6.13 shows a theoretical comparison of mean stem diameter/length ratio slopes among and between treatments and time that assisted with comparison of treatments or between different basket material types.

Results

Growth response and stem morphology

Propane burn, prune, and control willow experiment results for the treatment effects of propane burning, pruning and no treatment *did not match* what the research hypothesis as predicted. Results of the treatments and measuring the resultant one-year growth of shoots suitable for basket weaving are shown in Table 6.1.

Table 6.1: Summary of "good-usable" and "bad-not useable" willow stems pre- and post-Treatment

Willow # Treatment	Pre/Post	Mean Height (meters)	Mean # of stalks at ground level	Mean "Good" stems	Mean "Bad" stems	Mean Good/Bad Proportion
Pre-Burn	*Pre-Burning*	1.52 (5 feet)	4.09	41	67.4	0.38
Post-Burn	*12 months after burn*	1.34 (4.4feet)	7.17	19	49.9	**0.28**
Net change		-0.18	+3.08	-22	-17.6	-0.1
Pre-Prune	*Pre pruning*	1.47 (4.8 feet)	4.26	37	57	0.4
Post-Prune	*12 months after*	1.58 (5.2 feet)	3.83	23	113	**0.17**

	pruning					
Net change		+0.11	-0.43	-13.5	+56	-0.2
Pre-Control	*No treatment*	1.47m (4.8 feet)	5.30	35	68.91	0.340
Post Control -	*12 months later*	2.17 m (7.1 feet)	5.56	48	258.3	**0.15**
Net change		+0.7	+0.26	+12.6	+189.3	-0.18

Height, the annual change in growth after treatment, is indicative of productivity. In Table 6.1 propane burned willows grew on average 1.34 meters in one year, but were 0.18 meters shorter than the pre-treatment mean height. The average height of prune willows increased over the year since treatment. The mean control height grew only 0.7 meters. Although the difference in length of the stems, or the amount of shoot removal during pruning was not measured, growth of the pruned relative to the growth of the burned and control willows was inferred from the pre- and post- mean heights. The burn treatments grew from the ground to the height by the time of post-treatment measurement whereas willows in control grew from the tallest point at the time of pre-treatment to the time of post-treatment measurement. The actual growth of the pruned shrubs was between these two extreme measurements.

The numbers of stalks present at ground level indicated another type of growth response to treatment. Burning generally increased the total number of stalks at ground level, with an increase of mean good to bad from pre- (4.1) to post-treatment (7.2). In contrast, the number of stalks emerging at ground level in the prune and control treatments remained relatively constant (Table 6.1). The mean number of pruned basal stalks emerging from ground level resulting from this treatment was 4.26 pre- and 3.82 post-treatment. The decrease observed in the mean number of stems emerging from ground level for the pruning treatment was attributed to mortality of a few stalks. The willow stems in the control treatment averaged 5.30 pre- and 5.56 post-treatment. The increase in the mean number of stems emerging at ground level in the control treatment was minor.

The control, followed by the prune, then burn treatments produced the greatest number of mean usable "good" stems compared to pre-treatment (Table 6.1). The mean number of “good” versus “bad” stems changed because of annual growth and plant response to the type of treatment (Table 6.1). The proportion of good to bad stems also changed as a result of treatment (Table 6.1). Proportion of good:bad stems for burn, prune, and control were 0.28, 0.170, 0.16, respectively addressed Hypotheses 1.

The “Burn” treatment resulted in a reduction in the mean number of good stems and mean good:bad proportion from pre- versus post-treatment and also caused a reduction in the mean number of bad stems. The Prune treatment resulted in a reduction in mean proportion of good stems, increase in the mean proportion of bad stems, and a decrease in the mean good:bad proportion. The Control (no treatment) resulted in an overall increase in the mean number of good and bad stems. For all treatments the mean good:bad proportion was reduced from pre- to post-, but the amount of the change was less for the burn treatment. At the end of one year following treatment, the Burn treatment had the highest mean good:bad proportion, followed by the Control and lastly the Prune.

The analysis of the mean number of good stems required a square root transformation to normalize the distribution of the data set. The strength of the effect of blocking willows with treatment was found to be significant (Covariance Parameter Estimate for block, 2.0533, Standard Error 0.7710, Z-value 2.66, Probability of Z less than 0.05 was 0.0039).

Table 6.2: Type 3 Tests of Fixed Effects for mean number of good stems

Effect	**Numerator/Denominator Degrees of Freedom**	**F value**	**Pr > F**
Time	1/110	7.88	0.0059
Treatment	2/110	2.71	0.0713
Treatment*Time	2/110	8.23	0.0005

The interaction of the variables Treatment*Time was significant, and required examination of all treatment*variable combinations rather than with the main effects time and treatment.

The Least Squares means in terms of the “mean square root of the count,” showing the back transformed values for mean number of good stems by variables treatment, time, and their interaction (*compare values to Table 6.1 above).

Table 6.3: LS Means with Back transformed mean values for number of good stems

Effect	Treat-ment	Time	Estimate	Standard Error	Degrees of Freedom	Mean back transformed
Treatment	Burn		5.1077	0.3922	110	31.1
Treatment	Control		5.8508	0.3922	110	39.9
Treatment	Prune		5.1473	0.3922	110	31.5
Time		Post	4.9567	0.3637	110	29.6
Time		Pre	5.7804	0.3637	110	38.4
Treatment*Time	Burn	Post	4.1536	0.4674	110	22.3 *(19.04)
Treatment*Time	Burn	Pre	6.0618	0.4674	110	41.8 *(41.04)
Treatment*Time	Control	Post	6.2681	0.4674	110	44.3 *(48.09)
Treatment*Time	Control	Pre	5.4336	0.4674	110	34.5 *(35.48)
Treatment*Time	Prune	Post	4.4486	0.4674	110	24.8 *(23.43)
Treatment*Time	Prune	Pre	5.8460	0.4674	110	39.2 *(36.96)

Small amounts of variation exist between the untransformed (pre square root, then back transformed) values (Table 6.1) and the transformed values (Table 6.3 backed transformed values). Table 6.3 provides a more complex and more complete view of the strength to the effect attributed to the treatments and the change from pre to post. Comparison of the mean number of good stems for treatment without the influence of the variable time show similarity between Burn and Prune having slightly lower values than Control. Comparison of the mean number of good stems for time without the influence of the variable treatment shows a decrease from pre- to post-. Accounting for the interaction of Treatment and Time by treatment type showed a decline in the mean number of good stems for Burn, follow by Prune compared to an increase with Control from pre- to post-treatment.

Differences in Least Square Mean is used to make comparisons attributed to treatment and time with Tukey-Kramer adjusted of the values. Table 6.4 shows meaningful comparisons.

Table 6.4: Differences in Least Square Means with Tukey-Kramer adjusted values for mean number of good stems

Effect	Treatment	Time	Treatment	Time_	Estimate	Standard Error	Adjusted P < = > 0.05
Treatment	Burn		Control		-0.7432	0.3595	0.1014
Treatment	Burn		Prune		-0.0396	0.3595	0.9933
Treatment	Control		Prune		0.7036	0.3595	0.1278
Time		**Post**		**Pre**	**-0.8237**	**0.2935**	**0.0059**

Trtmnt*Time	**Burn**	**Post**	**Burn**	**Pre**	**-1.908**	**0.5083**	**0.0037**
Trtmnt*Time	Control	Post	Control	Pre	0.8346	0.5083	0.5730
Trtmnt*Time	Prune	Post	Prune	Pre	-1.3974	0.5083	0.739
Trtmnt*Time	**Burn**	**Post**	**Control**	**Post**	**-2.115**	**0.5083**	**0.0009**
Trtmnt*Time	Burn	Post	Prune	Post	-0.2950	0.5083	0.9921
Trtmnt*Time	**Control**	**Post**	**Prune**	**Post**	**1.8196**	**0.5083**	**0.0067**

The interactions found to be significant after Tukey-Kramer adjustment are listed in bold. Estimate values show amount of relative change. Changes in the mean number of good stems was significant for pre- to post- (Adjusted P =0.0059). The interaction of treatment and time for Burn pre- to post- was significant (Adjusted =0.0037). The interaction of treatment and time between Burn post- compared to Control post- was significant (Adjusted P =0.0009), as well for Control post- to Prune post- (Adjusted =0.0067), but not for Burn post- to Prune post- (Adjusted =0.9921). Data presented in Table 6.4 provide additional insights as to which interactions are meaningful to interpreting the effects among and between the treatments from pre- to post-.

Results for the proportion of good:bad stems

The covariance parameter estimates for the strength of blocking treatments was significant (Table. 6.5). It was meaningful to block the treatments.

Table 6.5: Covariance Parameter Estimates for proportion of good stems

Covariance Parameter Estimates for proportion of good stems			
Cov Parm	**Estimate**	**Standard Error**	**Z Value**
Block	0.003107	0.001452	2.14
Residual	0.009920	0.001338	7.42

Table 6.5 indicates that variation attributed to blocking clumps of willows was less than the variation resulting from treatment effects.

Tests of fixed effects show the interaction of Time and Treatment for proportion of good stems is significant and therefore the results should be described in terms of each Time and Treatment combination.

Table 6.6: Test of Fixed Effects to examine treatment, time, and interaction of treatment and time for proportion of good stems

Effect	Numerator/ Denominator Degrees of Freedom	F Value	Pr > F
Time	1/110	100.06	<0.0001
Treatment	2/110	9.53	0.0002
Treatment*Time	2/110	6.89	0.0015

The effect of the variable "time" (pre- versus post-treatment) was found to be significant, as was the variable "treatment" (Burn, Prune, and Control), and the interaction of treatment and time for the mean values of the proportion of good to bad stems. The differences observed in the Good:Bad stem (shoot) proportion was more correlated with the difference between pre- and post-, one year's growth than the difference attributed to the effects of the treatments. This was caused by the similarity of the willows pre-treatment, compared post-treatment which included the effect of one year's growth (Time) and the growth responses caused by treatment (Burn, Prune, Control).

Table 6.7: Least Square Means of the effect of treatment and time for proportion of good stems

Least Squares Means for proportion of good stems							
Effect	**Treat-ment**	**Time**	**Estimate**	**Standard Error**	**Degrees of Freedom**	**t - Value**	**Pr > |t|**
Treatment	Burn		0.3396	0.01873	110	18.13	<.0001
Treatment	Control		0.2500	0.01873	110	13.35	<.0001
Treatment	Prune		0.2828	0.01873	110	15.10	<.0001
Time		Post	0.2060	0.01670	110	12.34	<.0001
Time		Pre	0.3756	0.01670	110	22.49	<.0001
Treatment* Time	Burn	Post	0.2978	0.02380	110	12.51	<.0001
Treatment* Time	Burn	Pre	0.3814	0.02380	110	16.03	<.0001
Treatment* Time	Control	Post	0.1536	0.02380	110	6.46	<.0001
Treatment* Time	Control	Pre	0.3464	0.02380	110	14.56	<.0001
Treatment* Time	Prune	Post	0.1665	0.02380	110	7.00	<.0001
Treatment* Time	Prune	Pre	0.3990	0.02380	110	16.77	<.0001

The effect of treatment for time was tested and reported as Least Square Means in table 6.7. All pair wise comparisons for each variable were found to be statistically significant indicating that there were changes among all three treatments and time periods between treatments. Biologically and culturally, the willows that were burned experienced the greatest change in good/bad proportion of stems, the number of stems/shoots, number of basal stalks, and their height. Willows that experienced pruning were less changed in physical features compared to propane burning, and were varied in other characteristics (i.e., crown form) when compared to the controls. These results address hypothesis 1 and 2. The interactive effects of all variables were tested and reported in Table 6.8.

Table 6.8: Differences of Least Squares Means for proportion of good stems without Tukey-Kramer adjustment

Differences of Least Squares Means for proportion of good stems without Tukey-Kramer Adjustment									
Effect	**Treat-ment**	**Time**	**Treat-ment**	**Time**	**Estimate**	**Standard Error**	**Degrees of Freedom**	**t - Value**	**Pr > |t|**
Treat-ment	**Burn**		**Control**		**0.08960**	**0.02077**	**110**	**4.31**	**<.0001**
Treat-ment	**Burn**		**Prune**		**0.05685**	**0.02077**	**110**	**2.74**	**0.0072**
Treat-ment	Control		Prune		-0.03275	0.02077	110	-1.58	0.1176
Time		**Post**		**Pre**	**-0.1696**	**0.01696**	**110**	**-10.00**	**<.0001**
Treat-ment* Time	**Burn**	**Post**	**Control**	**Post**	**0.1442**	**0.02937**	**110**	**4.91**	**<.0001**
Treat-ment* Time	**Burn**	**Post**	**Prune**	**Post**	**0.1313**	**0.02937**	**110**	**4.47**	**<.0001**
Treat-ment* Time	Control	Post	Prune	Post	-0.01291	0.02937	110	-0.44	0.6611
Treat-ment* Time	Burn	Pre	Control	Pre	0.03501	0.02937	110	1.19	0.2359
Treat-ment* Time	Burn	Pre	Prune	Pre	-0.01759	0.02937	110	-0.60	0.5505
Treat-ment* Time	Control	Pre	Prune	Pre	-0.05259	0.02937	110	-1.79	0.0761

Table 6.9: Differences of Least Squares Means for proportion of good stems with Tukey-Kramer adjustment

Differences of Least Squares Means for proportion of good stems with Tukey-Kramer Adjustment									
Effect	**Treat-ment**	**Time**	**Treat-ment**	**Time**	**Estimate**	**Standard Error**	**Degrees of Freedom**	**Adjust -ment**	**Adjusted P**
Treat-ment	**Burn**		**Control**		**0.08960**	**0.02077**	**110**	**Tukey-Kramer**	**0.0001**
Treat-ment	**Burn**		**Prune**		**0.05685**	**0.02077**	**110**	**Tukey-Kramer**	**0.0196**
Treat-ment	Control		Prune		-0.03275	0.02077	110	Tukey-Kramer	0.2598
Time		**Post**		**Pre**	**-0.1696**	**0.01696**	**110**	**Tukey-**	**<.0001**

								Kramer	
Treat-ment* Time	**Burn**	**Post**	**Control**	**Post**	**0.1442**	**0.02937**	**110**	**Tukey-Kramer**	**<.0001**
Treat-ment* Time	**Burn**	**Post**	**Prune**	**Post**	**0.1313**	**0.02937**	**110**	**Tukey-Kramer**	**0.0003**
Treat-ment* Time	Control	Post	Prune	Post	-0.01291	0.02937	110	Tukey-Kramer	0.9979
Treat-ment* Time	Burn	Pre	Control	Pre	0.03501	0.02937	110	Tukey-Kramer	0.8399
Treat-ment* Time	Burn	Pre	Prune	Pre	-0.01759	0.02937	110	Tukey-Kramer	0.9909
Treat-ment* Time	Control	Pre	Prune	Pre	-0.05259	0.02937	110	Tukey-Kramer	0.4759

Important results of interest for the Differences of Least Square Means of the proportion of good stems were excerpted and present in Table 6. 9. The complete data are in Appendix F. Bold are statistically significant, after Tukey-Kramer adjustment for $P<0.05$ level. A significant difference in the proportion of good stems was found for testing the effect of Treatment between Burn and Control ($P = 0.0001$), and Burn and Prune ($P = 0.0196$), but not for Control and Prune ($P = 0.2598$). These differences suggest that the Burn treatment was effective at producing a difference in the proportion of good stems. Time, the growth of stems in response to the treatment that produces stems of which the proportion of good stems was calculated, was significant ($P = <0.0001$). This suggests that the change in the proportion of good stems across all treatments combined for pre- to post- was considerably different. Testing the effects of treatment which showed Burn was significant would imply that significant change observed with Time was attributed to propane burning. Significant differences were found for the interaction of Treatment and Time in comparing the Post-treatment proportion of good stems between Burn and Control ($P <0.0001$) and Burn and Prune ($P = 0.0003$) but not for Control and Prune ($P= 0.9979$). These results, suggest that the effect of propane burning treatment after accounting for interaction of Treatment and Time was considerably different than pruning and natural growth (Control). Comparison of interaction of Time*Treatment for the pre-treatment proportion of good stems was not significant, and it relevance suggest the amount of good stems present before treatment were statistically similar.

Measurements of willow and other basketry material stems

Analysis of variance of log of stem diameter/length ratios of the post-treatment good stems was conducted. Log transformation was needed to normalize the residuals. The Covariance Parameter Estimate (0.0068) was significant (Z-value 4.82, Pr-Z <0.0001). Similar to the mean number of good stems and the proportion of good stems, testing the stem diameter length ratios for pre- and post-treatment for the treatments were not significant. The test of fixed effects, Table 6.9, tested the variables time and treatment in comparing differences of stem diameter/length ratios.

Table 6.10: Type 3 Test of Fixed Effects for stem diameter/length ratios of "good" stems

Type 3 Test of Fixed Effects for stem diameter/length ratios of "good" stems				
Effect	**Numerator Degrees of Freedom**	**Denominator Degrees of Freedom**	**F Value**	**Pr > F**
Time	1	2739	121.40	<0.0001
Treatment	2	2739	2.12	0.1205
Treatment*Time	2	2739	18.19	<0.0001

The variable time was found to be the most significant influence on the stem diameter/length ratios for good stems across all treatments. There was a treatment*time interaction the results in terms of each combination of time and treatment should be to discussed.

Table 6.11: Differences of Least Squares Means for stem diameter/length ratios of "good" stems pre- and post-treatment

Differences of Least Squares Means for stem diameter/length ratios of "good" stems pre and post treatment without Tukey-Kramer Adjustment									
Effect	**Treat-ment**	**Time**	**Treat-ment**	**Time**	**Esti-mate**	**Stand. Error**	**Degrees of Freedom**	**t-Value**	**Pr > |t|**
Time		**Post treat-ment**		**Pre treat-ment**	-0.1015	0.0092	2739	-11.0	<0.0001
Treat-ment* Time	**Burn**	**Post treat-ment**	**Burn**	**Pre treat-ment**	-0.0299	0.0168	2739	-1.73	0.0831
Treat-ment* Time	**Burn**	**Post treat-ment**	**Control**	**Post treat-ment**	0.1225	0.0276	2739	4.43	<0.0001
Treat-ment* Time	**Burn**	**Post treat-ment**	**Prune**	**Post treat-ment**	0.0721	0.028	2739	2.55	0.0108
Treat-ment* Time	**Control**	**Post treat-ment**	**Control**	**Pre treat-ment**	-0.1637	0.0148	2739	-11.08	<0.0001
Treat-ment* Time	**Control**	**Post treat-ment**	**Prune**	**Post treat-ment**	-0.0504	0.0274	2739	-1.84	0.0655
Treat-ment* Time	**Prune**	**Post treat-ment**	**Prune**	**Pre treat-ment**	-0.1117	0.016	2739	-6.88	<0.0001

Table 6.12: Differences of Least Squares Means for stem diameter/length ratios of "good" stems pre- and post-treatment with Tukey-Kramer Adjustment

Differences of Least Squares Means for stem diameter/length ratios of "good" stems pre and post treatment with Tukey-Kramer Adjustment									
Effect	**Treat-ment**	**Time**	**Treat-ment**	**Time**	**Esti-mate**	**Standard Error**	**Degrees of Freedom**	**Adjust -ment**	**Adjusted P**
Time		**Post treat-ment**		**Pre treat-ment**	-0.1015	0.0092	2739	Tukey-Kramer	<0.0001
Treat-ment* Time	**Burn**	**Post treat-ment**	**Burn**	**Pre treat-ment**	-0.0299	0.0168	2739	Tukey-Kramer	0.5096
Treat-ment* Time	**Burn**	**Post treat-ment**	**Control**	**Post treat-ment**	0.1225	0.0276	2739	Tukey-Kramer	0.0001
Treat-ment* Time	**Burn**	**Post treat-ment**	**Prune**	**Post treat-ment**	0.0721	0.028	2739	Tukey-Kramer	0.1102
Treat-ment* Time	**Control**	**Post treat-ment**	**Control**	**Pre treat-ment**	-0.1637	0.0148	2739	Tukey-Kramer	<0.0001
Treat-ment* Time	**Control**	**Post trmnt**	**Prune**	**Post treat-ment**	-0.0504	0.0274	2739	Tukey-Kramer	0.4384
Treat-ment* Time	**Prune**	**Post treat-ment**	**Prune**	**Pre treat-ment**	-0.1117	0.016	2739	Tukey-Kramer	<0.0001

Similar to other methods of analysis for "good" stems the variable "Time" for the stem diameter/length ratio was found to be significant ($P < 0.0001$). This result indicates an important change in the stem diameter/length ratios for all treatments combined pre- compared to post-treatment. No change was statistically observed from pre- to post-Burn for stem diameter/length ratios, although there was for pre- to post-Control ($P < 0.0001$) and pre- to post-Prune ($P < 0.0001$). The post-Burn compared to post-Control was found to be significant ($P < 0.0001$). There was not a significant change found for post-Burn compared to post-Prune, nor for post-Control compared to post-Prune.

Table 6.13: Mean sandbar willow stem diameter:length ratios by treatment type pre- and post-treatment

Treatment type:	Pre: 10 % of "good" on shrub	Pre number of stems measured out of total good	Post: total good stems harvested	Post number of total stems harvested and measured
Burn	0.0704	227	0.0636	460
Prune	0.0678	234	0.0599	541
Control	0.0674	229	0.0576	1118

The stem diameter/length ratio was used to determine how the treatments resulted in "good" (usable) versus "bad" (non-usable) shoots. Table 6.14 results address Hypothesis 1-part 3 (same as Hypothesis 2-part 1) and shows that the number of stems measured, approximately 10% of total, on the willows pre-treatment were similar. The stem diameter:length ratios for pre % "good" on each willow shrub do not show much variation as well and when compared to the post: total good stem harvested there is very little change (Post-Pre values for each treatment type). This indicates the assumption that stems counted as "good" in the pre-treatment were morphologically similar to the stems counted as "good" in the post-treatment, with the Control showing the greatest variation. The pre 10% of "good" on willow shrubs are of a little higher ratio for the stem diameter/length ratios of other materials listed below in Table 6.8. The higher ratios with the pre-treatment stem D/L ratio could be attributed to the selection of "good" stems for measuring (being lower quality) versus those that are harvested and used which had more through examination before being determined a "good" stem/shoot. In regards to the stem diameter/length ratio numbers shown below, the smaller the ratio number the better the stem or shoot for basket weaving. For example, a stem 2.0 mm diameter thick and 30 cm long has a ratio of 0.066 compared to 2.0 mm diameter thick and longer length of 50 cm with a ratio of 0.040. Figure 6.14 shows plotted values for stem diameter/length ratios for different types of basketry material compared to all types combined. Figure 6.15 displays all points combined across types are labeled in gray and then overlaid in red for the points associated with willow bark on, willow peeled, Hazel peeled and Douglas-fir peeled, respectively.

Table 6.14: Comparison of mean stem diameter/length ratios for different basketry stem types

Plant used	Type	Descriptive history information	Number of stems	Diameter to Length ratio
Willow	Bark-on	Post Treatment-Burn (basal sprouts) Burnt Nov. 11, 2004 harvested Nov. 20, 2005	460	0.0636
Willow	Bark-on	Post Treatment-Prune	541	0.0599
Willow	Bark-on	Post Treatment-Control	1118	0.0576
Willow	Bark-on	Post Treatment-Wild	40	0.0476
Willow	Bark-on	Tishunick 6-25-03 scorched. Dance Fire	35	0.0577
Willow	Bark-on	Tishunick burnt 6-25-2003, harvested 2-23-2004	166	0.0487
Willow	Peeled	PIT 2003: 2, 3, 4, 5, 7, 8, & 17	376	0.0633
Willow	Peeled	PIT 2004: Harvested early July 2004. Used to show how to peel. For Orleans School.	823	0.0426
Willow	Peeled	Spring 2005-Wild harvested	74	0.0382

Willow	Peeled	LFG private supply in bundles	151	0.0417
Hazel	Peeled	LFG private supply in bundles	105	0.0496
Hazel	Peeled	Burnt Spring 2004-Harvested Spring 2006	314	0.0479
Douglas-fir	Peeled	Ukonom lookout road. Weepy tree lower branches.	123	0.0401
Douglas-fir	Peeled	Willow Creek. Weepy tree lower branches	26	0.0366

Stem diameter/length ratio of individual stems

Figure 6.16 shows plots the natural of density for stem clustering of each basket material stem type measured The stem diameter and length (n > 4350) of sandbar willow shoots (n = 3784) and other types of stems (Hazel n = 419, Douglas-fir n = 149) from the collections of basket weavers and this experiment were measured. These were examined to better describe the quality of shoots utilized by tribal basket weavers. Figure 6.17 indicates how stem diameter/length ratio and the size and type of baskets depend on the characteristics and quality of the stems. The differences observed in the bark-on compared to peeled willows are attributed to natural variation. Differences between hazel and Douglas-fir resulted from separate morphological growth characteristics. A lower stem/diameter length ratio corresponds with a longer-skinner stem that would likely be better for weaving, although it depends on what type of basket and potential functional use.

Potential variation in Native basket weaver preference and pruning style was mitigated and reduced by having LaVerne Glaze of the Karuk Indigenous Basketweavers be the only “prune” treatment (Figure 6.9). Visual comparison of those willows pruned for the experiment in the fall and those adjacent willows managed in the spring and summer by community members and volunteers showed minor differences in morphological traits and willow shoot usability quality (Table 6.10).

Discussion

H_1: The hypothesis that some treatment types will produce greater numbers of usable willow shoots favored by Native basket weavers (1. mean number of stems, 2. the mean [good/(good + bad)] proportion and 3. stem diameter:length ratio) was found to be burning < pruning < natural growth (control) for 1 and 3. but, burning > pruning

> natural growth for part 2. The number of stems that could be used for basket weaving was not increased with the burn and prune treatments over the non-treated control. The control resulted in more stems over the year than either the burn and prune treatments. Pruning was the next most effective because of lateral shoot growth. This was likely the result of pruning stimulating new shoot leader growth of longer lengths (Anderson 1999) (Figure 6.8). Harvesting of galls on stems from the shoot-galling sawfly (*Euura exiguae*) and how branching structure is modified has been shown to have a short term decrease in stem galling pests, with an increase in the second year (Smith 1970). The timing of pruning or crown disturbance is also an important determinate of insect survival (Smith 1970). Although the control produced more stems than either manipulation, experience and information from the Native basket weavers indicate that "good" shoots are either too high to access, take more effort to find, and generally have higher levels of insect pests (Smith 1970, Price 1989, DeClerck-Floate and Price 1994). Pruning is culturally important because it is the main basket weaver management technique to rejuvenate and stimulate the production of shoots (O'Neale 1995). Figure 6.18 shows the new bud shoots emerging the spring after the fall pruning treatment.

Beavers and natural flooding also rejuvenate shoot production not managed by Native basket weavers. Price (1989) reports pruning was shown to be greater than 95% effective in removing galls which harbor insects thus reducing future infestation. Burning or extensively pruning an area can reduce insect pests because some of the insects such as midges have short dispersal distances (Stein et al. 1994).

However, when these findings are put into perspective regarding Native basket weaver management, the propane burn treatment was least effective at providing usable or quality stems. Burning was believed to (hypothesized) address two aspects of nurturing "good stems." First, burning kills any insects hosted by unburned stems and foliage. Second, propane burning stimulated sprouting of basal and lateral shoots from dormant buds leading to the production of longer stems (raw data). The one year measurements of willow stems from the propane burning revealed this management practice was not very effective at producing higher quantities and quality "good" stems to satisfy all parts of Hypothesis 1. If the measurements of stems were able to be conducted for the second year, then results may have been different (Price 1989).

Willow used in these experiments were from a former mixed fire and pruning management history due to reoccurring wildfires and management of the sandbar willow by local Native American basket weavers and ceremonial practitioners. Based on professional judgment and that of LaVerne Glaze (basket weaver), the willow shoot growth harvested in spring 2004 that resulted from the late June 2003 wildfire (Dance Fire) were much better than other shoots harvested at other locations because of the morphological conditions, perceived lower stem diameter/length ratio (not included with measurements) and reduced level of insect infestation. The years following the late June 2003 wildfire (Dance Fire) bud-galling midge (*Rabdophaga* sp.) or shoot galling sawfly (*Euura exiguae*) were observed to increase in peeled willow shoots. These observations were similar to what Price (1989) observed in the time following other disturbances. Propane burning is a very specific and localized fire effect on individual plants. Broadcast burning as compared to spot by spot propane burning is energetically more efficient for willow management. Broadcast burns also reduce the population density of willow insect pests and increase the quantity of higher quality basketry material if conducted under conditions to promote higher fire intensities and flame speed (rate of spread).

The component of Hypothesis 1 for which type of treatment would produce different numbers of stem/shoots, supported the control treatment based on the mean [good/ (good + bad)] proportion and stem diameter/length ratios (Table 6.1 and 6.11). For two out of three parts of Hypothesis 1 and Hypothesis 2, it would appear that the control treatment is the best management alternative. Stems of untreated willows, e.g., Control stems, also can have higher levels of insect infestation that is not revealed until use for weaving. Pruning can be an effective management practice to reduce the localized individual clump level of insect infestation as well as to stimulate sprouting of lateral and apical shoots (Polmateer pers. com. 2005). Severe pruning also has similar shoot sprouting responses as top mortality from burning if conducted at an appropriate season or point in the growth cycle of willows.

Spring to early summer pruning and burning allows sandbar willows to have the growing season to respond to disturbance. Ideal management of sandbar willow for basket material would be spring river flows of high enough magnitude and duration (flooding) to scour and redistribute willows, followed by pruning during harvesting of post-flood sprouts until the next flood. If flooding is not sufficient, as is the case on many regulated rivers, prescribed broadcast burning could be used between flooding events. Severe pruning or propane burning of individual willow shrubs could be implemented as well, although this requires more labor and would need to be conducted late spring to early summer. Some Native American basket weavers suggest cutting at ground level older, taller willow shrubs followed by pile burning tops to reduce insect spread (Glaze pers. com. 2002, Houston pers. com. 2004). Some harvesters who collect, sort, and sell willow shoots believe that it would be more effective to treat willows in the early summer in the growing season than in the fall when willows are becoming dormant. Observations to wildfires and sheering (ground cutting) of willows lend support of the importance of the season of growth (Spinks pers. com. 2005).

H_2: The hypothesis proposed that, "There will be no difference in the stem diameter length ratio between willow bark-on and peeled shoots compared to other basket material used for warp (rods)" is rejected (Table 6.14). Willow peeled and bark-on shoots are similar to hazel, but willow and hazel are not as similar to Douglas-fir (Table 6.14). The difference observed with Douglas-fir stem Diameter/Length ratios is related to growth form, which is not as interchangeable with willow or hazel. Douglas-fir shoots are used to make certain types of baskets, usually open-twine without overlay.

Insect pest, sandbar willows, and basket weaver use

Studies on shoot galling sawflies indicated that once stems are cut the larva dies (Price 1989, author's personal observation of infected willows cut and dried). Table 6.9 displays the annual life histories of the two main insect pests and sandbar willow compared to the harvesting and management practices of Native American basket weavers.

Table 6.15: Annual calendar for insect pests, sandbar willow, and Native American management

Year-month:	Bud-galling midge: *Rabdophaga* sp.	Shoot galling sawfly: *Euura exiguae*	Sandbar willow: *Salix exigua*	Native American: Karuk basket weaver
Jan.		Diapause stage duration willow controlled.	Dormant	Harvest willow roots exposed by high water.
Feb.		Pupae form.	Dormant	Harvest willow roots exposed by high water.
Mar.	Pupation in galls just before emergence.	Adults emerge from galls. Mating when willow leaves emerge. Close range dispersal. Attack declines with ramet age, shorter stems, and distance from water. Females select longer younger shoots.	Bud break and leaf emergence. Flowering.	Harvest and prune for bark-on shoots before bud-leaf break from ground sprouts of former burning or coppicing. Harvest willow roots exposed by high water.
April	Adults emerge and mate. Swarming. Eggs laid and hatch on stems or leaves of shoots.	Death of eggs or very early first instars greater in older ramets.	New year's stem growth-rapid.	Harvest and prune shoots, peel. Harvest willow roots exposed by high water. Sort and dry willow shoots.
May	First instar larvae crawl to apical region of shoot, and individuals settle on meristems of apical or developing lateral buds.	Larva grow and feed in tissue from pith of stem. Larva occur more on lower to mid sections of stem.	New year's stem growth-rapid. Newly formed lateral buds on galled shoots.	Sort and dry willow shoots. Basket weaving.
June	Larva feeding produces galls on swollen buds near tips of stems-apical.	Larva grow and feed in tissue from pith of stem-lateral.	New year's stem growth-rapid.	Burn- higher intensity or Prune willow stems. Scorch of stems. Basket weaving
July	Development of cone shaped clumps from modified leaves. Galls forming	Larva grow and feed in tissue from pith of stem	New year's stem growth-rapid.	Dig to harvest willow roots in sandbar. Basket weaving
Aug.	Galls maturing. causes bud defects.	Larva grow and feed in tissue from pith of stem	New year's stem growth-moderate.	2nd harvest time of shoots. Peel. Dig to harvest willow roots in sandbar. Basket weaving
Sept.	Galls mature.	Larva grow and feed in tissue from pith of stem	New year's stem growth-slower.	Basket weaving
Oct.	Larva developed.	Larva cut exit hole in side of gall, then retreats down mine to pupate	New year's stem growth-slowing down.	Burn, or Prune willow stems. Basket weaving
Nov.	Penultimate stage larvae overwinter in galls.	Over-wintering pre-pupae	Senescence and leaf fall.	Midge gall tissues usually die during winter, and there is not subsequent tissue growth from that stem tip. Basket weaving
Dec.		Over-wintering pre-pupae	Dormant.	Basket weaving
Jan.		Diapause stage duration willow controlled.	Dormant	Harvest willow roots exposed by high water.
Feb.		Potential insect predation through exit hole. Pupae form.	Dormant	Harvest willow roots exposed by high water. Basket weaving.
Mar.	Pupation in galls just before emergence	Adults emerge from galls. Mating when willow bloom. Attack declines with ramet age, shorter stems, and distance from water.	Bud break, leaf emergence, and flowering.	Harvest and prune for bark-on shoots before bud-leaf break from ground sprouts of former burning or pruning. Harvest willow roots exposed by high water. Organize material.
April	Adults emerge and	Attack rare on 1-year old	New year's	Harvest and prune shoots,

	mate. Eggs laid and hatch on stems or leaves of shoot.	ramets/shoots which grow from the ground.	stem growth- rapid.	peel. Harvest willow roots exposed by high water. Sort and dry willow shoots.
Source:	DeClerck-Floate and Price 1994.	Smith 1970. Price 1989. Stein et al. 1994.	DeClerck-Floate and Price 1994. USFS web site data base.	O'Neale 1995, Heffner 1984. Anderson 1999, Lake this study.

A combination of management practices and harvesting times implemented with traditional knowledge and western scientific studies can likely improve the availability of usable quality and quantity of sandbar willow stems for basketry and ceremonial use.

Amount and quality of materials needed for basket weaving

Native American basket weavers encounter a common misperception that the common "wild" willow shrub or other basketry plant can provide enough quality material for weaving (William Van Pelt, Yurok, September 9, 1982),

> "…in the Springtime you gather hazel and PER-GERN. PER-GERN is the willow sticks, and you gather both of'em in the Spring. Of course, you have to scrape'em and dry'em and sort'em out' cause you don't take just any stick and expect to make a basket. You have to have them all even, same size, to make certain sized baskets…you have to pick your roots…in the Wintertime when the water washes the roots out from the trees and then when the river goes down you have to go down and scavenge around and see what roots you can find."

The results of study can be used to provide additional information about how much riparian area of sandbar willow is needed to support the material needs of basket weavers, for example, the number of "good" shoots per willow clumps per treatment by size (stem diameter and length). It also describes how a single managed (burned or pruned) or unmanaged (control) willow clump can produce a variety of shoots for different types of baskets (compare stem D/L ratios for individual willows per treatment). The question: "How many sticks does a basket weaver need for each type of basket or per year for basket making" is worth discussion. As observed by the growth potential following each treatment, not all of the shoots growing on an individual clump are usable for the same basket (Figure 6.10, and 6.12). Basket quality is a product of several components. The clumps must be properly managed to facilitate sprouting, which can be done by burning, pruning, or other disturbances that affect the above- and below-ground tissue (Anderson 1999, Anderson 2005). Second, shoots need to be similar in diameter, length, and taper (O'Neale 1995, Van Pelt 1982, Figure 6.19). Third, shoots of similar size need to have structural integrity and should be free of damage such as blemishes on the bark caused by abrasion and insect pests. Shoots also should be alive from the stem's butt to its tip (O'Neale 1995, Anderson 1999). Lastly, there must be an ample supply or accessible quantity of these nearly perfect shoots to construct high quality baskets.

Stem diameter/length ratios among basketry materials

The use of various basketry materials for the structural rib part of the baskets (warp), varies among basket weavers (O'Neale 1995). Differences in what is preferred versus what is actually used results from a weaver's ability to access "good" quality material. Before fire-suppression and exclusion and the cessation of Native American burning, hazel and willow were most commonly used among the Shasta and Karuk and some up-river Yurok or Hupa basketweavers (SRNF Interviews: I-304 and I-306, O'Neale 1995). Other Yurok, Wiyot, Hupa and Tolowa, basketweavers primarily had access to and preferred hazel (Kroeber 1976, Baker 1981, Heffner 1984, Clarke Memorial Museum 1985, SRNF Interviews: I-236, O'Neale 1995). Sandbar willow is more abundant in the aboriginal territories of the Shasta, Karuk, and Hupa tribes than Wiyot, Tolowa or Yurok tribes.

For the individual treatments of single willow clumps broadcast fire is the preferred method of burning. Other times, small amounts of fuel (twigs and leaves) are stacked at the base of each plant and burned. This is a similar contemporary method that is used for California hazel and another preferred basket materials such as beargrass (O'Neale 1995). The contemporary practice of spot burning may be an adaptive response to concealing fire-use. Hazel is a superior material for weaving, but contemporary access and the authority to properly burn hazel is limited for most basketweavers (Six River National Forest Interviews: I-236, I-304 and I-306, Glaze pers. com. 2002, Reece pers. com. 2002). Basket weavers consider hazel a more superior material to work with because of its durability, flexibility, and relative pest free qualities when compared to sandbar willow, *Ceanothus*, or Douglas-fir.

In the last decade prescribed burns for hazel enhancement have been conducted on the Hoopa Valley Indian and Yurok reservations, with fewer opportunities in Karuk ancestral territory. Wildfires have been predominantly the only way Karuk have had opportunity to get burned hazel (Glaze pers. com. 2002, Reece pers. com. 2002). Permission and rights to harvest the sprouts of formerly burned hazel is generally extended only to tribal members of those reservations, which limits access to non-Hoopa and non-Yurok tribal members.

Douglas-fir, "weepy fir", stems can be harvested where ever suitable branch growth fosters the production of this type of material. Wild lilac (*Cenanothus intergerrimus* Hook. & Arn.) shoots are generally collected and tended along rural county or National Forest roads or on the edges of timber harvest units. Fire can stimulate germination and the sprouting of *Cenanothus* shoots, but pruning or shearing is generally the preferred method to induce sprouting. Storage quality of basketry material varies among species.

Frequency and seasonality of material management and uses

It is reported that sandbar willow shoots and roots may only be stored for up to three years (O'Neale 1995). Willow material can become susceptible to insects which degrade the quality for use. "Willow sticks stored for more than two years may be infested with larvae which crumble portions of the sticks to dust. A basket in use stands no such danger" (O'Neale 1995:16). Some Karuk weavers and harvesters say willow shoots can be stored longer if kept clean and dry. Quality sandbar willow for basket weaving must be made available at a frequency that is equal or less than the longest available storage capability. Willow is also not as durable or "strong" as California hazel.

> "Down-river every basket maker uses hazel entirely or to a large degree; up-river, willow predominates. Willow is interchangeable with hazel as a foundation material. Because new growth of the latter is scarce [suppression of Wildland fires and cessation of Native people's burning it] and willow is everywhere abundant,

> Karok women have to be satisfied with it for most of their baskets. On the upper Klamath [River], above Katimin [Somes Bar], the quality is fine because of continual cutting down of shoots" (O'Neale 1995:16) [causes added].

In comparison to the experimental fall treatments of sandbar willow for this research, spring burning of hazel is culturally preferred by some Native basket weavers whereas other weavers prefer fall-burnt hazel (O'Neale 1995, Heffner 1984, Chapter 3, M. McCovey pers. com. 2002 and Appendix A and B). The difference in spring versus fall burning for hazel has been correlated with the types of shoots used for certain types of baskets (M. McCovey pers. com. 2005, Moore pers. com. 2005). Generally spring burning produces finer, smaller diameter and shorter length shoots. These are used for root over stick closed weave baskets. Shoots from fall burns which produced longer thicker shoots are more commonly used for stick and stick open weave trays, shifters, baby baskets, pack baskets or fish traps (D. McCovey pers. com. 2002). Prescribed fire research conducted on hazel in Minnesota has demonstrated that spring burning stimulates vigorous sprouting compared to summer burns which had less vigorous sprouting of shoots and higher levels of mortality (Buckman 1964).

Differences observed in the stem diameter/length ratios between shoots are attributed to variation in growth form coupled with prior treatment effects which induce growth. It is difficult to ascertain differences attributed to seasonal or time since disturbance (June-burn, November-burn, pruned, or un-treated) for sandbar willow. For example, Willow, peeled, Passport in Time volunteer harvested (PIT) 2004: Harvested early July 2004 stems (n=823) with the lowest stem diameter/length ratio of 0.0426 is the regrowth from the late June 2003 Dance wildfire (Figure 6.18). Although these stems were not harvested at the usual time preferred by Native basket weavers, they are similar in their overall stem diameter/length ratio as those collected by LaVerne Glaze (n=151, D/L ratio= 0.0417). A portion of Glaze's sticks were likely harvested from the same sandbar willow patch as the ones burned by the Dance Fire in June 2003 but in April (before the fire), not July of 2004. Slight differences were observed between Hazel peeled (LaVerne Glaze collection (n=105, D/L ratio = 0.0496) and Burnt Spring 2004-Harvested Spring 2006 (n=314, D/L ratio =0.0479 table). Differences are likely attributed to "Hazel peeled" having mix of unburned and burned shoots, differences in size (diameter and length) of stems observed for Burnt Spring 2004-Harvested Spring 2006 hazel shoots measured could be that they were from formerly burnt hazel clumps. There was a greater range of sizes sampled in the Burnt 2004-Harvested Spring 2006 peeled hazel shoots.

Graphs for individual type of material by description were not constructed, but likely would portray the range of samples used. The variation displayed in the dot graphs for each kind and type of basket material (sandbar willows, hazel, Douglas-fire of bark-on and peeled) compared to the overall combined diameter/length ratios demonstrates the variation among them (Figure 6.13 and 6.14).

<u>Observations and additional relationships between willow, insects, wildlife and humans</u>

Lupininus bicolor Lindley colonized the scorched surface at the base of the burnt willows. It was also more abundant after broadcast burns observed in other prescribed burn studies of sandbar willow (Chapter 4). Older mature taller willows retained in the project area functioned as important riparian bird habitat but also contributed to the insect infestation (Price 1989). Birds as functional insectivores target insects on the willows (author's observations). Undisturbed adjacent willows which host insect pest contribute to infestations. Insects were identified as best as possible (UC Davis Bohart museum/labs) and were likely *Rabdoghaga* species and *Eurra* species. Price et al. (1987a), Price et al. (1987b), and Price (1989) have reported shoot-galling sawflies and bud-galling midge as the most likely common pest of stem borers and gall forming masses in willows.

Below ground connections and the severity or intensity of disturbance types; flooding, fire and herbivory, affect the exchange of nutrients, water, and competition of resources along riparian zones (Dwire and Kauffman 2003). The clonal nature of willow allows them to survive and adapt to a variety of disturbances that other plants used for basketry are not (Douhovnikoff et al. 2005) (Figure 6.6). Valley sandbar willow riparian communities are susceptible to human and natural disturbances due to their geographic position and proximity to human habitation areas. Initially, variable severities of how fire effects the rejuvenation of sandbar willows were observed following an early fall (September 2001) wildfire and the early summer (June 2003) Dance Fire which occurred at *Tishunick*/Camp Creek confluence area, near Orleans, California.

Wildfire burned sandbar willows and the resultant growth are readily accessed and utilized for basketry or ceremonial uses (Figure 6.19). These fires are believed to occur in conjunction with Karuk ceremonial practices (anonymous USFS fire crew member, see also the legal case of the USFS Six Rivers National Forest charging the Karuk Tribe of California for the cost of fire suppression efforts of the Dance Fire June 2003). The terrace upon which this research project took place was formed from the January 1, 1997 flooding event. The subsequent regrowth following flooding was favorable to Native American basketweavers for material use. From December 29-31, 2005 flooding on the Klamath River washed into and through this site affecting access and potential future use of the site. As of May 2007, subsequent migration of the main river channel and the mouth of Camp Creek have eroded the project site.

Outside factors that influence willow growth include, cloning effects, proximity to water source, and Native basket weaver preference and pruning style. Cloning effects and the connection of willows below ground allow for the transfer of nutrients and water between individual above ground portions of willows that experience a range of different disturbance intensities (Price 1989, Douhovnikoff et al. 2005). The proximity to water, mainly rooting depth to water table is favored by larger older willows. Willows with larger more developed “root crowns” and roots accessing deeper portions of the soil profile with greater availability of water and nutrients are able to gain an above ground advantage and were observed to sprout more vigorously (Lake per. obs., Spinks pers. com. 2005, Douhovnikoff et al. 2005). Sandbar willows greater than 25 years old that experienced a fall burn had reduced sprouting and higher root crown mortality (Chapter 4). Price (1989) found similar but slightly different relationship between sandbar willow’s distances from wetted river channel.

Recommendations

Adequate supply of material between managed and unmanaged areas

This experiment was to potentially determine how many willow clumps a basket weaver needs to satisfy the demand for willow stems to produce various baskets. One basket tray requires between 250-300 willow sticks of similar morphological size and form. Larger baskets with a tighter weave require more individual sticks of nearly the same diameter, evenness of taper, and length. Weavers can be generalist or specialist in the types of baskets they make and the types and amount of materials they require to make baskets (Figure 6.15). Variation in styles or types of baskets made with different materials requires weavers to visit multiple habitats, at different seasons, over many years of management and harvesting materials. Additional problems arise between traditional use-areas by tribes or families versus contemporary access to suitably treated material. Contemporary weavers must develop interpersonal-tribal strategies to acquire adequate materials (Heffner 1984).

Land managers should prioritize an appropriate scale of prescribe fire to reduce pests, rejuvenate willow sprouting, and provide and ample supply of basket material for weavers. Many basketweavers commonly leave some shoots of useable size behind for other weavers, this requires a greater area than can be extrapolated from the number and size range of willows obtained from the experiment. Given current land management budget and priorities for fuels and fire management projects, few riparian areas are prescribed burned by the US Forest Service on the Klamath and Six Rivers National Forests (the three sites for this author's willow research project from fall 2004 to fall 2005). The majority of cultural burns conducted by the USFS since the late 1980s have been for beargrass (*Xerophilum tenax*) (USFS-Six Rivers National Forest Native American Program, Maps). Native Americans consider beargrass, a commonly used basket over-lay and regalia material, better after it is burned by moderate intensity fires and sprouts under partial canopy. Experimental trials between burned and unburned beargrass and hazel were conducted by Rentz (2003). She demonstrated at the plant cell level that the quality and related morphology of both beargrass and hazel is affected by burning.

Insect management and stimulation of quality willow weaving material

The scale of fire needed to reduce insect infections was an unexpected outcome of this study. Propane burning individual plants will top kill willow clumps and stimulates regrowth. When older unburned willow infested with insect pests are adjacent to burned individuals, also regrowth of the formerly burnt willow can also be infected. The same general finding applies to pruned willows (Price 1989, Price et al. 1987a and Price et al. 1987b).

Affects of research results to tribal community

Some aspects of the results of this study contradict the ethnobotanical knowledge of Native American basket weavers. Contradictions arise from differences regarding the effects of propane burning, pruning, or naturally growing sandbar willows to generate usable shoots. Karuk tribal basket weavers in the Orleans area who have witnessed the benefits of wildfire in reducing the presence of insect pest commented on the likely effectiveness of propane burning, and the season of that fire treatment. Not all fire events are equally effective at reducing insect pests and rejuvenating willow regrowth.

Benefits of research and economic value of basket material

The benefit of this research to tribal communities was primarily to the local Karuk Indigenous Basketweavers and Shasta, Yurok and Hupa basket weavers as members of the California Indian Basketweavers Association. Some basket weavers received willow shoots from this project and the useable willow shoots from the experiment were used in basketry classes held in Orleans. A few Native basket weavers have used some willow shoots to make baskets that were later sold. The economic value of a “good” useable willow stick is at a minimum of 10 cents, shoots from burned hazel are worth more (Spinks pers. com. 2005). Willow shoots can be worth 10 to 20 cents each, and hazel shoots worth 15 to 40 cents each. The implications of different types of management can be valued in another way. At the annual Karuk basket weavers gathering in Happy Camp Ca. on April 21, 2007, willow shoots of medium to larger sizes were being sold for $5.00 USD per bundle of 25 shoots, smaller shoots for $5.00 per bundle of 50 and hazel for $10.00 per bundle of 25. All willow shoots were individually inspected, and had the damaged or insect infested shoots removed prior to being sorted to bundles of similar size classes. The hazel was of from a mix of burned and unburned sites, with each shoot being peeled/scraped and inspected for defects prior to bundling (Emery pers. com. 2007). To make a high quality basket, a weaver needs at least 300 "good" shoots of similar diameter, taper and length. When the time it takes the weaver time to locate, manage, harvest or purchase, sort, prepare, and weave materials are considered, a basket's valued at about $350-400 dollars. The quality of material, skill and/or prestige of the weaver can increase the market value. Observations of basket weavers' prices for baskets sold indicate that they are not adequately operating under a successful market value in relative economic terms. The "value" of accessing and managing materials and weaving to maintain cultural ceremonial, subsistence, and artistry practices far exceed the typical American capital economic notion of value. The individual and collective traditional ecological knowledge of basket weavers related to cultural and ecological sustainability is incalculable.

Other ethnobotanical uses of plants

In addition to sandbar willow shoots for basketry and ceremonial regalia, roots are used for medicine and willow poles for structures. Willow roots also are commonly harvested and used in baskets. Willow roots are harvested along the rivers edge following high water events (mid-winter to spring), or excavated from sandbars in mid-late summer (Figure 6.20). Figure 6.20 shows Orleans elementary school students with mentor harvesting sandbar willow roots, near Orleans, CA. Willow roots are used whole or split to "ribbons" (similar to how pine and spruce root are used as weft) (O'Neale 1995). Willow roots may be used with or without overlay materials.

Willow poles with stalks from 3-10 centimeters in diameter and 3-5 meters tall are used to make structures for subsistence and ceremonial (funeral) activities. Similarly, preservation of fish and game meat was done in "huts" made from willow poles (Gifford 1939 and 1940). Meat is hung from the cross frame poles with a smoldering fire below. In the late summer fish were dried on the river bar in willow frame huts (M. McCovey pers. com. 2002). Sweat lodge frames and related structures also are constructed of willow poles. For purification and ritual cleansing, temporary sweat lodges are built along the river bar and ceremonially used. After the ceremony is conducted then the frame is torn down and used material burned in the fire that was used to heat the rocks (author's experience with tribal funeral ceremonies).

Willow is used medicinally by Karuk and other tribes (Davis and Hendryx 2004). Willow bark as medicine is harvested and used in a tea or poultice for various aliments, or as hair wash. A Hupa/Karuk man reported that the bark, leaves, and roots of willow are used in different medical ways. For example, a medicine for headache and fever is made from the bark. (Six Rivers National Forest Interviews: I-296).

Conclusion

Sandbar willow is a culturally and ecologically important plant species along the lower mid-Klamath River for tribal communities. Experimental testing of the effectiveness of propane burning, pruning and no treatment (control) revealed mixed results. Generally, natural growth (control) was found to produce a higher number of useable "good" shoots, followed by pruning and lastly propane burning. Pruning is the culturally preferred and historically practiced method of managing and harvesting sandbar willow. Insufficient intensity and duration of flooding has reduced the largest natural disturbance mechanism of creating abundantly available sandbar willow growth of desirable shoot morphology for basket weaving and ceremonial regalia use. Propane burning was used to see if it would be an effective method of generating useable "good" stems. Experiment results showed that the proportion of good to bad stems was better for propane burning compared to the control or pruning treatment, but there were fewer of them. Shoot growth from all treatments was infested by insects, mostly stem borers. Understanding the life histories and habitat preference of sandbar willow insect pests will likely assist in the development of adaptive management practices to promote "good" shoots and reduce insect pests (Table 6.15).

Observations of former wildfires at the project site strongly support the need for broadcast burning to reduce populations of insect pests and to rejuvenate abundant and accessible supplies of sandbar willow shoots for basket weaving. How wide spread the burning of sandbar willows among the Karuk was historically practiced is debated (M. McCovey pers. com. 2006, Burdick pers. com. 2006, Goodwin pers. com. 2006), but appears that it could be a viable tool if conducted over large enough areas and at the beginning of the growing season. Sandbar willow shoots compared to other basketry material, such as hazel or Douglas-fir, is generally more abundant and accessible for management under existing federal policies. Hazel shoots are superior material, but requires burning to promote the best and desire growth for basket weaving. With the exception of a few prescribed and wildfires, hazel shoots from burned areas has been greatly reduced because of land access, ownership, fire suppression and exclusion. Tribal basket weavers in northern California need many more areas on national forests, reservations, and private lands that can provide access to abundant good quality basket material to maintain cultural traditions. Providing opportunities and access for tribal basket weavers to the “good stuff” will likely require progressive and innovative fuels and fire management of terrestrial and riparian habitats. Cooperative research and management between agencies, tribes, tribal and community organizations, tribal practitioners, and other land managers will be needed (Everett 2002).

Figure 6.1: Insect larva in willow stem.

Figure 6.2: Insect larva in gall

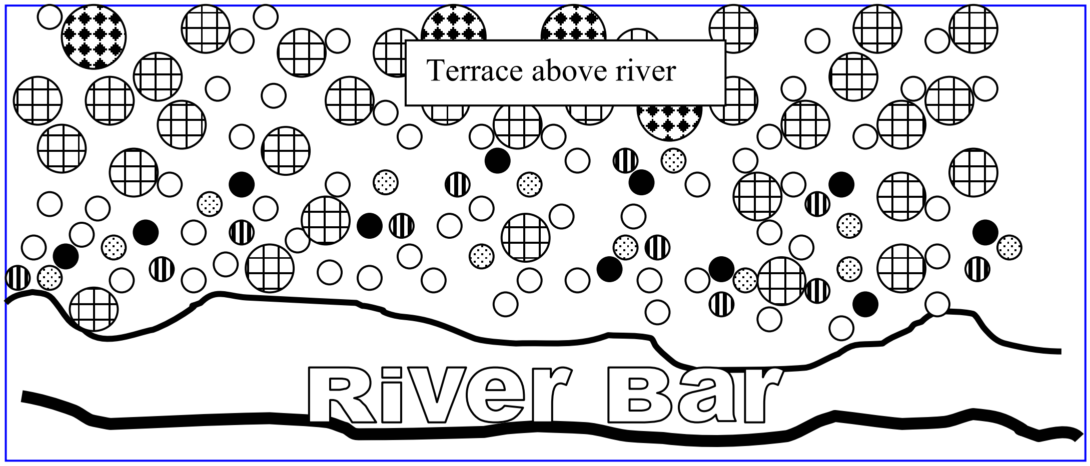
Figure 6.3: Bark adheres to stem caused by insect damage mine.

Figure 6.4: Bark adhering to edge of insect mine tunnel into stem.

Figure 6.5: Comparison of prior disturbed versus undisturbed willow shoots and stems. Left of meter ruler are willow shoots to be used for lamprey eel trap

Figure 6.6 Sandbar willow below ground connections

Figure 6.7: A Hypothetical arrangement of individual willow plant size/age structure and management treatments



Legend: Willow by age class

Old tall decadent   Middle age class   Young age class

Fire treatment   Pruning   Control: within Blocks

Figure 6.8 Conducting pretreatment measurements on willows with calipers

Figure 6.9: Native American basket weaver (LaVerne Glaze) and USFS fire personnel with propane burner

Figure 6.10: Pruning treatment implemented by Native American basket weaver

Figure 6.11: Assumed “good” stems at time of harvest with some visibly dead (brown inner bark)

Figure 6.12: Stem diameter/length ratios for different basket types.

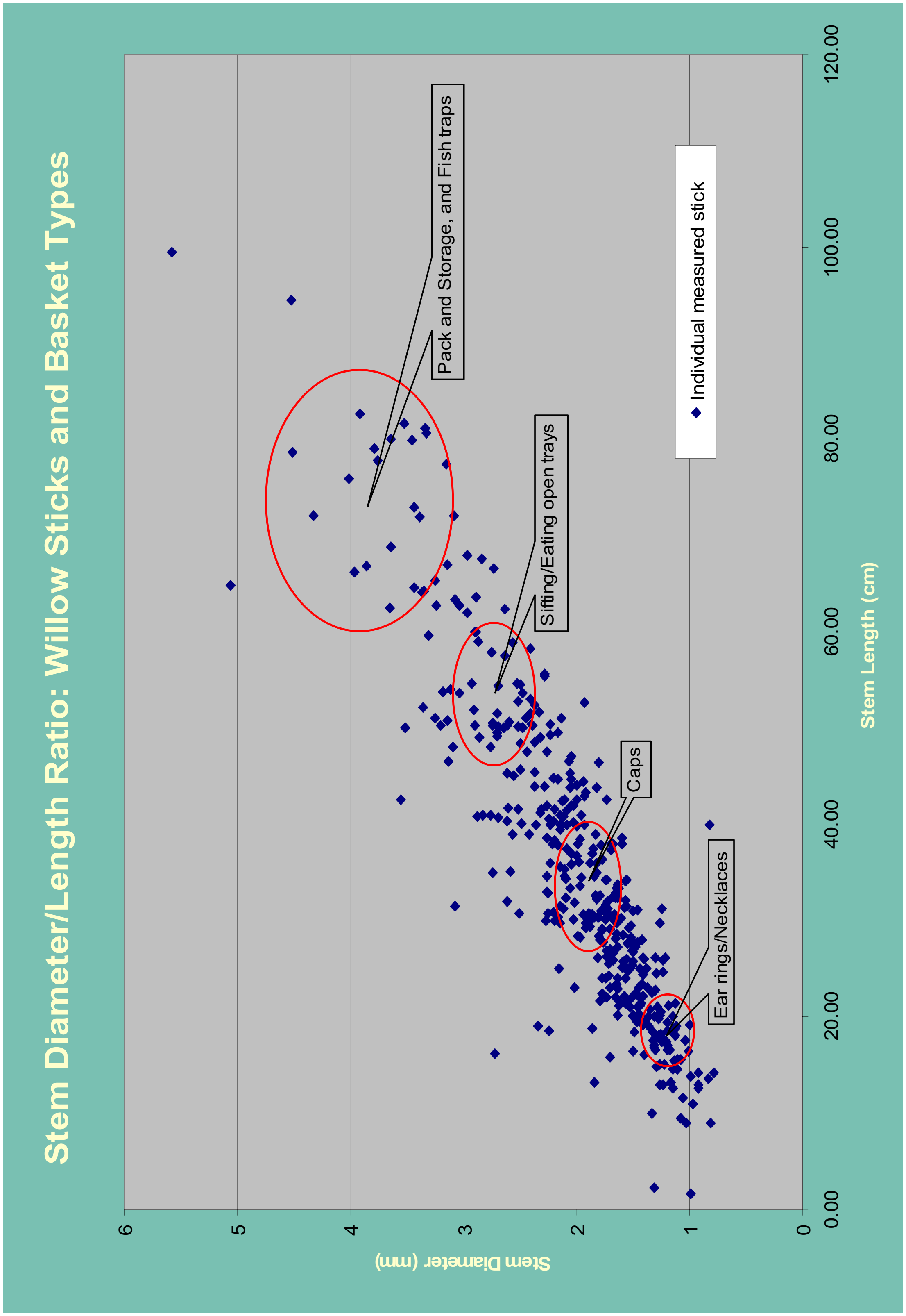


Figure 6.13: Experimental Design with Proportion of Good Stems

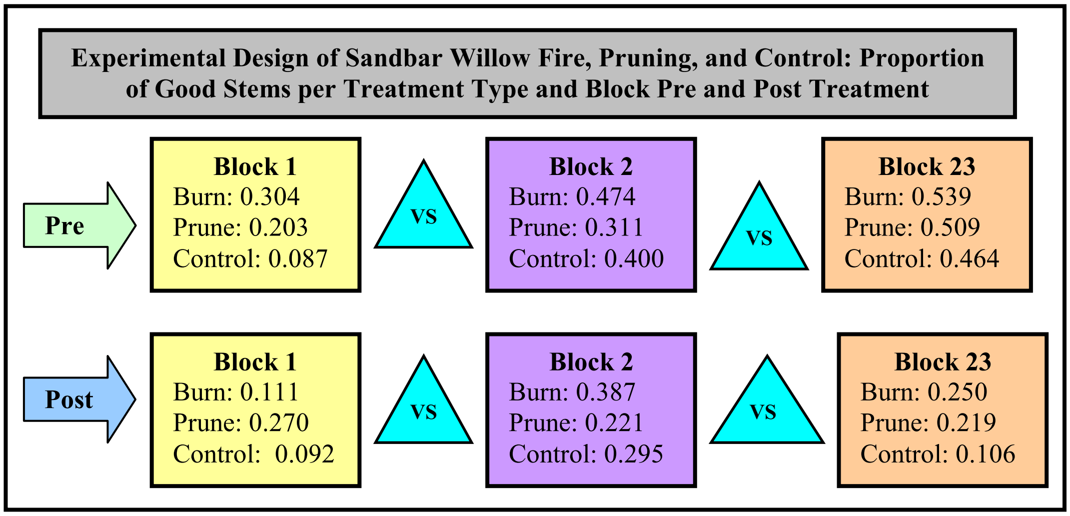


Figure 6.14: Theoretical comparison of mean stem diameter/length ratio slopes among and between treatments and time

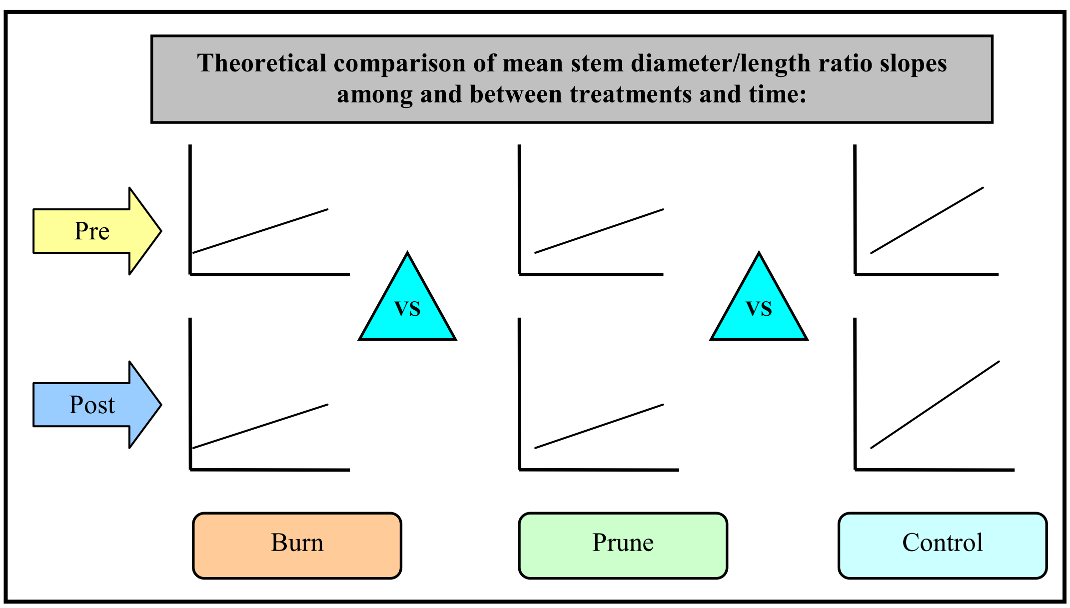


Figure 6.15: Plotted values for stem diameter/length ratios for different types of basketry material compared to all types combined.

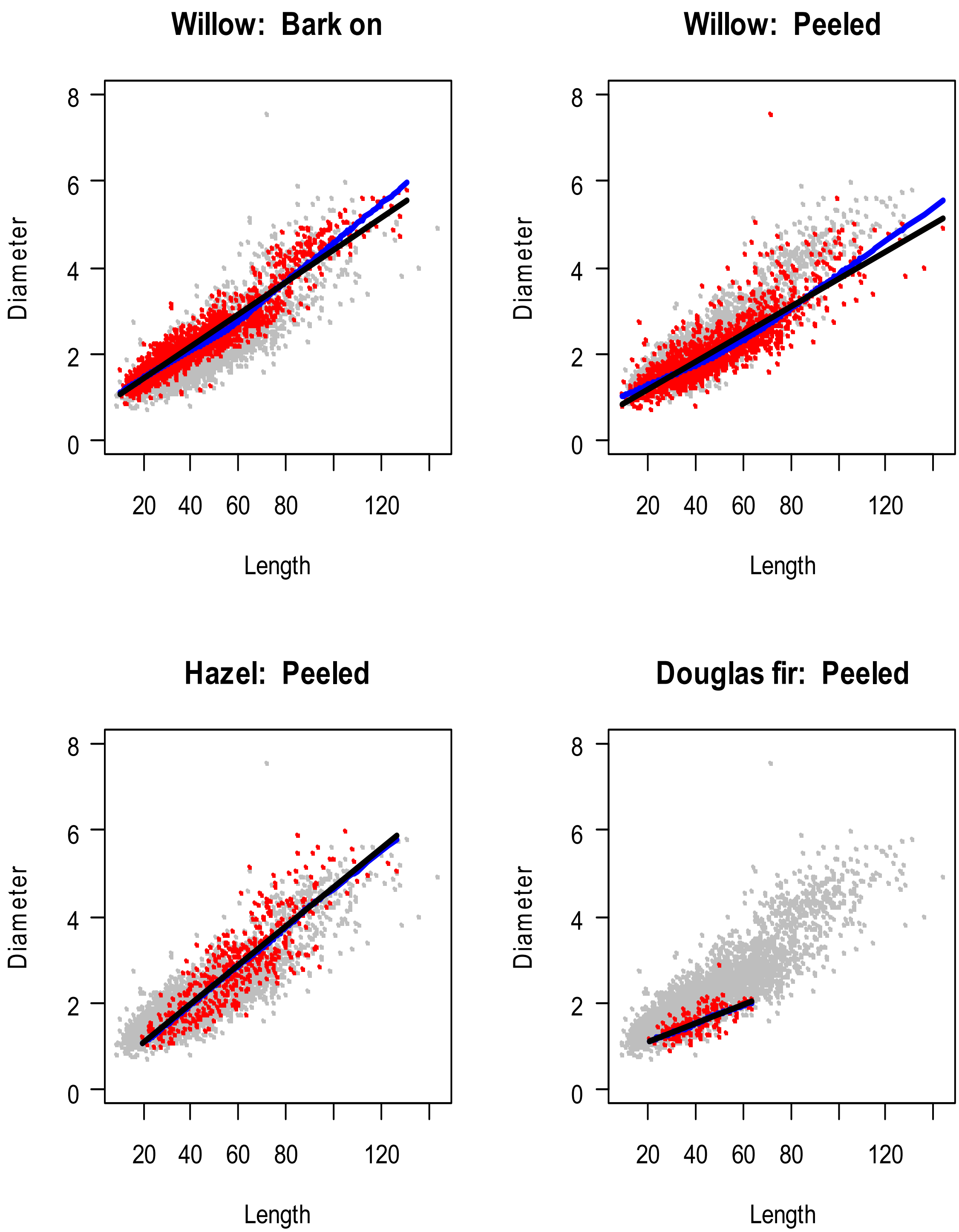


Figure 6.16: Plots of density clustering of each basket material stem type measured by diameter in millimeters, and length in centimeters

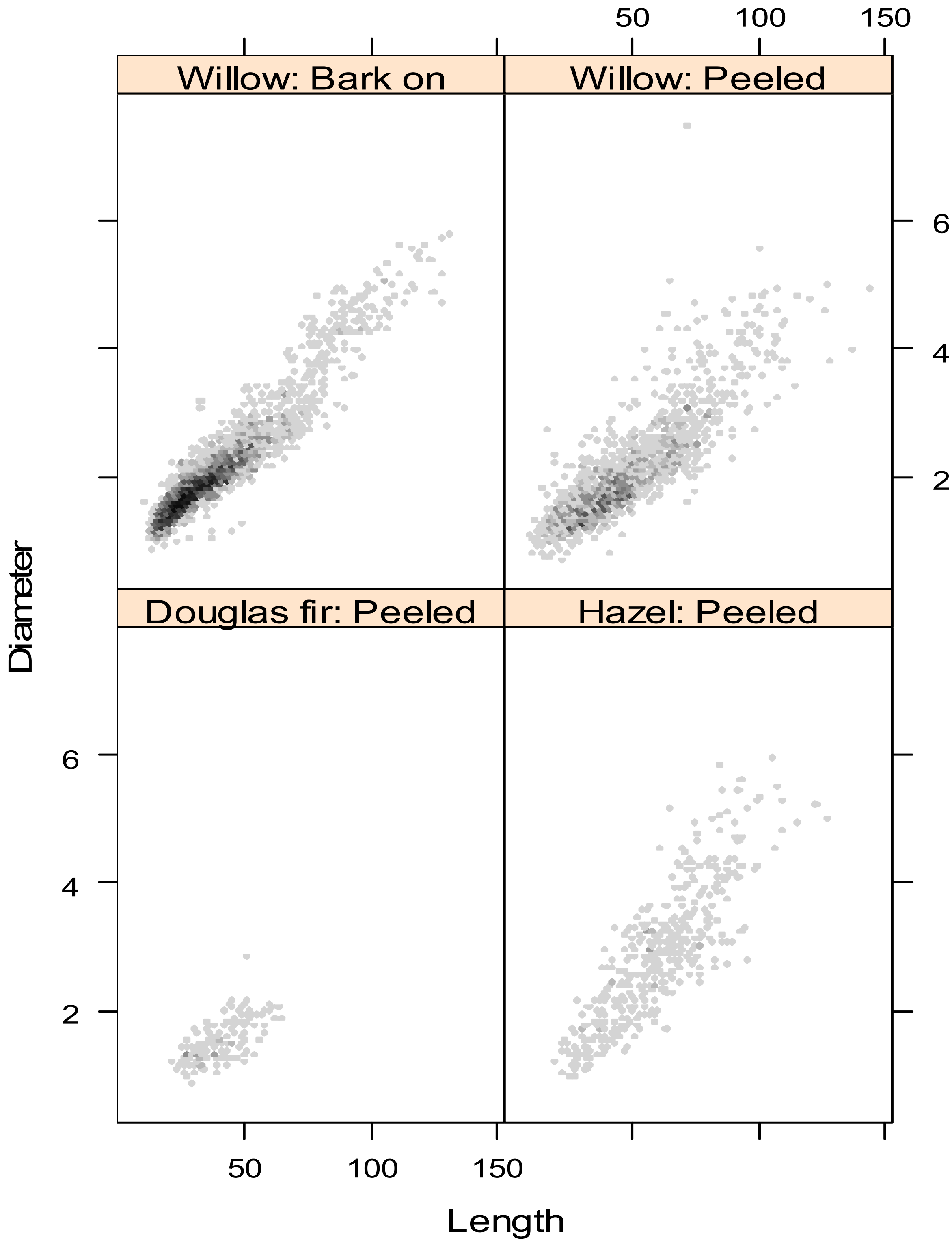


Figure 6.17: New bud shoots emerge the spring after the fall pruning treatment

Figure 6.18: Sandbar willow basket weave spacing

Figure 6.19: Formerly recent wildfire burned sandbar willows sprouting

Figure 6.20: Orleans elementary school students with mentor (LaVerne Glaze) harvesting sandbar willow roots

Chapter 7: Effects of fire suppression on tribes, tribal culture, and culturally significant habitats in Northwestern California, Klamath-Siskiyou Bioregion

Introduction

The following material is organized into two sections. The first section addresses ecological and socio-cultural effects of fire suppression on tribes or tribal groups in northwestern California with a focus on changes with vegetation seral stages and fire frequencies. The second section addresses the direct effects of wildfire suppression for tribal people, cultural resources, and culturally significant habitats.

> "The existing policy of the Forest Service in fire prevention and suppression has not been reached on the basis of guesswork. It represents continuous and critical study of forest fires. Fire exclusion is the only practical principle on which our forests can be handled, if we are to protect what we have and insure new and more fully stocked forests for the future" (Klamath National Forest 1928:17-18).

The implications of federal fire suppression policies and practices for tribes and tribal communities in northwestern California are described and discussed.

Case study area: Lower mid-Klamath River in a portion of Karuk, Yurok, and Hupa aboriginal territories

A portion of the lower mid-Klamath River area, as indicated by the boundaries of the US Forest Service (USFS) Lower-Mid Klamath Watershed Analysis (LMKWA 2003), was used as a case study example. This allowed the incorporation of more detailed analysis conducted by the USFS, Riley-Thron (2001), Kliejunas (2005), Busam (2006), Lake (this volume). The case study area includes a portion of the Orleans and Ukonom Ranger District on the Six Rivers and Klamath National Forest, portions of the Yurok and Hoopa Valley Indian Reservations, and private lands. Figure 7.1 shows the Lower Mid-Klamath Watershed Analysis boundary with Condition Classes at a courser level compared to other methods, e.g. LANDFIRE.

Background: Ecological and socio-cultural effects of fire suppression on tribes or tribal groups in northwestern California

There are several classification systems for describing the effects of fire suppression developed by researchers that land managers use. Fire Regime Condition Class describes the degree of departure from reference condition vegetation, fuels, and disturbance regimes. Another approach describes changes in habitat suitability for wildlife or plants based on the amount of fuels and condition of vegetation (Miller and Findley (n.d.), Anderson (n.d.): NWCG's Fire Effects Guide). A third approach describes departure from historical conditions as varying degrees of degradation of ecological integrity (Williams 2004, Noss et al. 2006). All three methods are appropriate, however this section primarily addresses the Fire Regime Condition Class because it serves as the basis in which the most evidence could support and being used by federal agencies. Where possible, this research identifies weaknesses in these approaches and, finally, discusses fire suppression's socio-cultural, religious/spiritual, and economic impacts tribal communities.

Fire Regime Condition Class: Reference conditions

Fire Regime Condition Class (FRCC), is "an interagency, standardized tool for determining the degree of departure from reference condition vegetation, fuels and disturbance regimes" (www.frcc/gov). FRCC is used because it serves as a basis from which evidence of various sources could support or be compared to. In order to determine the degree of departure from the reference conditions, one must first establish the reference condition (Frost and Sweeney 2000, Egan and Howell 2001, Skinner et al. 2006). Various methods are used to determine reference conditions, including: use of fire scars, tree ring data, documentation of past fires, species composition and structure, examination of vegetation survey records, repeat photography, and satellite imagery.

Past and present traditional ecological knowledge (TEK) can be used as evidence for FRCC determination of reference conditions. This includes use of ethnographic and oral history data related to past and current conditions and Native American land use patterns (e.g., trails, gathering sites) (Heffner 1984, Anderson

2005, Chapter 3). Collective tribal community knowledge and experiences can be incorporated as one of the lines of evidence (Berkes et al. 2000). This information can be used to define approximate boundaries, locations, and in some cases the transitional condition of vegetation for specific areas associated with modified fire frequencies (Kimmerer and Lake 2001).

Since vegetation, fuels, and disturbance regimes are not static, one must understand the reference condition's normal range of variability in order to assess significant departures from that reference condition. This normal variation is called the Historical Range of Variability (HRV). Hann and Bunnell (2001:394) define the HRV as the "variability of regional or landscape composition, structure, and disturbances, during a period of time of several cycles of the common disturbance intervals, and similar environmental gradients, referring, for the United States, to a period prior to extensive agricultural or industrial development." The HRV is used to characterize FRCC. FRCC is divided into three classes (Table 7.1). Areas characterized as Condition Class 1 have vegetation, fuels and disturbance regimes that are within their HRV. Condition Class 2 areas have moderate departure from the HRV. Condition Class 3 areas have extreme departure from the HRV. Departure from historic disturbance regimes may include changes in fire, flood, timber harvesting, road building, and introduction of exotic pathogens, plants, and animals (USFS Six Rivers National Forest LMKWA 2003, Skinner et al. 2006).

For the case study area fire, some of which can be attributed to Native American ignitions, was the most significant disturbance regime affecting FRCC. Flooding was also a significant disturbance regime along the river and stream corridors (Six Rivers National Forest LMKWA 2003). Changes in the fire disturbance regime included different wildfire extent, frequency, seasonality, intensity, and severity (Agee 1993, Skinner et al. 2006). Changes in vegetation included seral stage, composition, stand age, structural stage, and canopy closure (Hann and Strohm 2003, Graham et al. 2004) (Table 7.1).

The historic fire regime is a broad classification of fire's effects and functions across an area in the absence of modern human mechanical intervention. The FRCC process also includes influences of Native American fire use (Interagency Fire Regime

Condition Class Guidebook, V1.2). Figure 7.2 displays a map of lower mid-Klamath River with Karuk Villages, traversable ridge systems and fire ignitions from 1909-2005 period of record. The many villages were inhabited by Karuk until they were burned-out by miners or other non-Native settlers, or directly threatened by mining activities (Bright 1978, Salter 2003). Many Karuks were forced to flee to and across the mountains (SRNF Interviews: I-209 and I-354). They used primarily trails found along traversable ridge systems inter connecting watersheds, and subwatersheds as well as midslope benches near sources of water (springs or mineral/salt licks) or resources for subsistence and ceremonial use. These landscape level traveling routes were also ignition zones and served as shaded fuel breaks across strategic places across traditional use areas of families or tribal communities (SRNF Interviews: I-209, I-210, and I-299). Diseases, American invasion and subsequent resource extraction and development activities limited Native American settlement and life-way patterns (Cook 1955, Boyd 1992).

To what extent the multiple lines of evidence presented above are reflective of the data used to delineate the Fire Regime Condition Classes developed from vegetation series and seral stage within the Six Rivers National Forest Fire Management Plan (formerly at: http://www.r5.fs.fed.us/sixrivers, legal injunction has halted implementation of the Fire Plan) was not revealed (Salazar et al. 2002). The evaluation process does include ranking options for inclusion of Native American burning influence in reference condition fire frequency values. Fire Regime Condition Classes from LANDFIRE that display departure more prominent at lower elevations along the river corridor, and former ridge or higher elevation meadow complexes (Figure 7.4 and 7.5). Tribal elders have commented on how the majority of the change in vegetation has occurred at lower elevations below 3,500 feet affecting wildlife-vegetation habitat use quality as well (Aubrey pers. com. 2005, Colegrove pers. com. 2005).

Table 7.1: Fire Regime Condition Class (modified from Hann and Strohm 2003:399).

Condition Class	**Historic Range of Variation or Natural Range of Variation departure rank**	**Description developed by Hann and Strohm 2003**	**Comments in application to tribes in the Klamath-Siskiyou bioregion**
1	Low	Vegetation composition, structure, and fuels are similar to those of the natural regime and do not predispose the system to risk of loss of key ecosystem components. Wildland fires are characteristic of the natural fire regime behavior, severity, and patterns. Disturbance agents, native species habitats, and hydrologic functions are within the natural range of variability. Lightning and Indian ignitions.	Determining the reference condition at circa 1850, the condition of the landscape at all elevations was a product of natural and cultural fire regimes.
2	Moderate	Vegetation composition, structure, and fuels have moderate departure from the natural regime and predispose the system to risk of loss of key ecosystem components. Wildland fires are moderately uncharacteristic compared to the natural fire regime behaviors, severity, and patterns. Disturbance agents, native species habitats, and hydrologic functions are outside the natural range of variability. Lightning fires. Indian ignitions fewer and becoming limited to lower elevations nearest villages, and higher elevations limited to ridge system travel routes (trails).	Development of FRCC-2 began when outside Non-Indigenous factors began to limit the extent of Native American fire use and lightning fires. Changes concentrated at lower elevations 1850-1910.
3	High	Vegetation composition, structure, and fuels have high departure from the natural regime and predispose the system to high risk of loss of key ecosystem components. Wildland fires are highly uncharacteristic compared to the natural fire regime behaviors, severity, and patterns. Disturbance agents, native species habitats, and hydrologic functions are substantially outside the natural range of variability. Lightning fires. Indian ignitions fewer and isolated to specific areas at low elevation and travel routes (roads).	Development of FRCC-3 began after 1910, with most pronounced changes occurring after 1950 with technological advances in fire suppression efforts and industrial forest management at all elevations, but greater amounts of change below 3000 feet.

This classification includes fire frequency and severity as presented in Table 7.2 below. The next section establishes the historic fire regime for the case study area before modern fire exclusion and fire suppression efforts.

Table 7.2: Fire Regime Condition Class delineated historic fire regimes (Hann and Strohm 2003).

Class:	Description:
I	0-35 year frequency and low severity (most commonly associated with surface fires) to mixed severity (in which less than 75 percent of the dominant overstory vegetation is replaced)
II	0-35 year frequency and high severity (stand replacement: greater than 75 Percent of the dominant overstory vegetation is replaced)
III	35-200+ year frequency and mixed severity
IV	35-200+ year frequency and high severity
V	200+ year frequency and high severity

Historic fire regimes in the case study area

The spatial extents of past fires were the product of anthropogenic and lightning ignited fire patterns (USFS Six Rivers National Forest LMKWA 2003). Former research specific to the study area provide critical examination of anthropogenic versus lightning fire effects on forest communities, structure, composition, function, and ecological processes (USFS Six Rivers National Forest LMKWA 2003, Salter 2003, Busam 2006). According to ethnographic accounts, fire management records, and oral history interviews, a large percentage of the area has continuous Native American occupation and cultural burning practices (Heffner 1984, Karuk Tribe and Cultural Solutions 1999, Busam 2006). Lightning is a minor component of fire ignitions at low elevations but increases with elevation and ridge slope position (Six Rivers National Forest LMKWA 2003, Lake and Werren this research GIS-Chapter 3). USFS fire patrol records indicate that lightning storm events typically followed the ridges, have a higher ignition potential in the upper third of the slope, and generally occurred in the higher elevation headwater areas (Six Rivers National Forest LMKWA 2003, Busam 2006).

Biophysical conditions influenced the size of the area affected by fire events resulting in the development landscape patterns (Agee 1993, Graham et al. 2004, Skinner et al. 2006). Prior to fire suppression efforts, many mid- to high-elevation fires would burn until fall rains extinguished them (Klamath National Forest 1928, Agee 1993). Decadal climatic cycles, annual precipitation, and season precipitation influence the potential of fuels burning (Agee 1993, DeBano et al. 1998, Millar 2007).

1780-1909: Disruptions and modifications to historical fire regimes

Formal termination of Native American land tenure resulted from the removal of Native people from land management effectively excluded one type of fire from the landscape and continued with the creation of fire suppression policies. Introduced diseases, genocide, forced removal of indigenous people, and Spanish law all contributed to the exclusion of northern California Native American fire management between 1780 and 1855 (Clar 1954, Cook 1955, Cook 1977, Fredrickson 2004). From 1855 to 1910, American settlement, mostly American resource exploitation, unratified treaties or other unhonored federal government to tribe agreements resulted in limited Native fire use (Heizer 1973).

In the Siskiyou Mountains for the Rogue River and Siskiyou National Forests, Atzet and Wheeler (1982:4) found that: "In the mid 1880's miners and trappers were responsible for frequent and extensive fires. According to Lieberg (1900) and Haefner (1912) the settlers started 95% of the fires and the Indians and lightning were responsible for the remainder." From the mid-1850s to 1870s Rogue River Indians (Shasta, Takelma, Dakubetede, Taltuctunteda, Gusladada, Chasta Costa and Tututni) experienced genocide, internment at temporary holding areas (e.g., Table Rock Reservation), then forced removal to reservations further north in Oregon and elsewhere (Beckham 1996). Many miners and settlers coming from California and settling the Rogue Basin acquired, at times forcibly, Indian woman as wives settled along the Rogue River and its tributaries. Some of these Indian women tried to continue cultural traditions may have been the source, although greatly reduced in extent and number of ignitions, of the 1880's Indian fires (e.g., Karuk woman with White husband settled at Rogue River Ranch). In comparison, tribes in northwestern California along the Klamath River remained in their ancestral territory were able to continue cultural practices, although under restrained circumstances as well.

Across the Klamath-Siskiyou bioregion, American settlers and government attempted many ways to subdue and control Indian people. Early American-Indian conflicts were brutal (Heizer 1993). In cases where American citizens felt they were not adequately being protected against Indians or were allowed to conduct methods of dealing with the Indian problem, they took matters into their own hands. Volunteer militia in 1863, the First Battalion of Mountaineers, was composed of volunteers from Humboldt and surrounding counties joined the US Army (Alberts 1985, Tyler and McLaughlin n.d.). Volunteer militia coordinated efforts of dealing with the "Indian problem" between southern Oregon and northern California. These mountaineers were volunteer men familiar with mountainous terrain, Indian trail systems, villages and camps. Mountaineers were subsequently hired by the US Army to control Indians and protect American settlers in areas where non-local enlisted Army men were ineffective or were sent east for the US Civil War (Alberts 1985, Tyler and McLaughlin n.d.). These mountaineers were American settlers who had vested interest in maintaining access and control of natural resources that Indians struggled to defend and utilize. Some of these mountaineers became prominent US citizens influencing local politics, business, and natural resource management issues (Redwood Genealogical Society 1985).

The debate over the suppression of fires in California's forests often divided scientists, foresters, settlers, mountaineers, and Indians. An 1899 editorial to the *Forester*, journal of the American Forestry Association, captures the divisiveness of the debate. "The idea that the Indians were better foresters than the scientific experts of the present day seems a peculiar one, but it is seriously maintained by many intelligent people" (Anonymous 1899:241). Foresters, government officials, American settlers and Indian communities all weighed in the debate. In the late 1890s to early 1900s land tenure, designated status and authority of management in the Klamath-Siskiyou bioregion continued to be controversially debated by the American government, American settlers, miners, range and timber barons, and conservationists. The Native American perspective, as restrained people, was often ignored due to not having status as recognized citizens and other rights.

<u>1910-1945: Era of US Forest Service influence on cultural fire regimes</u>

The designation of lands in Karuk, Yurok and Hupa territories as National Forests or reservations, and whether those lands were being properly administered for the best local public interest generated local, regional, and national debate. A letter (October 5, 1912) from Gifford Pinchot, then president of the National Conservation Association to Mr. F.W. Gent, of Orleans, CA., stated the following (Appendix G):

> Every year since it was established, the Forest Service has been vigorously attacked by Congress. During the past session the attack was renewed, and definite statements were made that a strong effort will be made next winter to cripple the Service and break up the National Forests. In these attacks it is charged that the Forest Service does its work badly, that its regulations and methods are tyrannical and inefficient, and that the people of the West are overwhelmingly opposed to the whole National Forest system. Whether these charges are true, or whether they are merely part of an effort to open the National Forests to exploitation by the special interests, they are important. In either case, the actual facts ought to be known.

Pinchot goes on to list "Some of the charges against the National Forest" as:

1. That a National Forest is a detriment to the people who live in its neighborhood.
2. That all kinds of natural resources within the National Forests are withheld from use.
5. That the National Forests are run so as to favor the big man, and not help the homebuilder.
6. That homesteads are being taken away from settlers for ranger stations.
7. That the Forest officers are overbearing, opposed to the settler, and anxious to keep the country a wilderness by reporting against all claims, whether good or bad.
8. That the Forest officers are incompetent Eastern theorists, who know nothing about the West.
9. That timber sales are handled in the interest of monopoly for the lumber trust.
10. That cattle and sheep barons are given preference over settlers and small owners in range allotments."

Pinchot requested a reply that could provide "representative" citizen's opinion of the charges, and to include other Orleans residents' perspectives on the matter of how the National Forest was being managed. Mr. Gent, a citizen and merchant of Orleans, replied on November 15, 1912 to Pinchot. Pinchot in his response correspondence (December 16, 1912) acknowledged Gent had "approval in general of the work of the Forest Service upon the National Forests." Pinchot solicited Gent's assistance in keeping the National Forest under federal versus state control. These letters represent examples of how federal policies of the era, and societal expectations and desires of who should own and how the lands should be managed in northwestern California directly affected tribes and tribal communities' entitlement and ability to exercise usufruct rights, e.g., burning and subsistence activities (Anderson 2005).

Following the aftermath of American settlement, genocide, and forced removal, Native people still tried to carry out traditional subsistence and burning practices (Six Rivers National Forest Interviews: I-210, I-236, and I-288, D. McCovey pers. com. 2002, Aubrey pers. com. 2005, Colegrove pers. com. 2005, Moore pers. com. 2005). However, the creation of fire suppression policies from American government (1911 Weeks Act) were effective tools in limiting both Native fire use and non-anthropogenic wildland fires (Blackburn and Anderson 1993, Huntsinger and McCaffrey 1995, Stephens and Sugihara 2006). Following 1911, the US Forest Service increased its capacity for fire suppression at low elevations and limited locations in higher areas (Hotelling 1978, Pyne et al. 1996). Fire suppression was achieved through physical fire-fighting infrastructure as well as a public campaign to devalue Native fire use. Two primary sources of wildfires ignitions were recognized, lightning and human incendiarism (Jackson pers. com. 2002 recalls other ignition types). Lightning ignitions were an "act of nature" which could not be prevented or controlled like incendiarism, described as "selfish or malicious motives" (Klamath National Forest 1928:14).

In 1918, a letter from Harley, Orleans District ranger to a local missionary portrays the attitude and political position against Indian or other incendiarism: Harley in the 1918 memo outlining district fire problems:

> "There is also another source of fires, which I will call the renegade whites and Indians in the district, these I am glad to say are in the minority, but they do lots of damage considering their number. They set fires for pure cussedness or in a spirit of don't care damativeness, they have nothing at stake, and don't care whether the fire damages others or not."

The letter goes on to say: "In the 'Pure cussedness class', the only sure way to kill them off, every time you catch one sneaking around in the brush like a coyote, take a shot at him." Although, it was recognized by Harley (1918) that Indians were burning for cultural purposes. Harley (1918) did mention that:

> "In good acorn seasons the indians will sometimes try and burn off the leaves and humus under the oak trees, to facilitate the gathering of acorns. My past experience has proven that fires caused by 'Indians burning for basket material' are invariably small fires, as the location of the material needed is not productive of large fires."

A mixed impression regarding whether Indian fires were worse compared to other incendiarism was put forth. Arsonists, *per se*, were deemed a threat by Harley (1918). Other forms of incendiarism, besides Indians, were attributed to prospectors burning brush, and hunters and rangemen clearing out brush for access and to improve forage. Harley (1918) states:

> "In this district there is practically no open range, old residents will tell you that there used to be lots of open range and large numbers of stock had no trouble in getting fee(d), but the Forest Service has kept the fires out, and now cattle can-not live here on account of the thick brush. After convincing themselves of this fact, what more logical conclusion will they come to besides burning the area off, as they think, to increase the forage. It is hard to make people believe something that their own observation and experience leads them to believe otherwise."

Furthermore, in 1928 the US Forest Service's policy regarding incendiarism was still similar:

> "The incendiary problem, however, is not a fire hunt but a man hunt; not fire, but the owner of the hand that lights it, is the public's enemy… The hand of the incendiary is set against the public welfare and it is the duty of every citizen to help apprehend those who willfully set fires and to see that they are punished as they justly deserve." (Klamath National Forest 1928:14-15).

Under the section “The ‘Light-Burning’ Fallacy” in the Klamath National Forest (1928:16) map text the suppression of all fires was government mandate:

> “Because prior to the inauguration of systematic protection of California timberlands were repeatedly burned over without the complete destruction of the forest, many people have reached the untenable conclusion that the methods of Indian days are the best that can be devised for the present. It is commonly assumed in this argument that controlled burning of the forest, either in the spring or fall, is an easy practice which can be carried at slight expense, with negligible damage to the forest itself, and with complete or nearly complete removal of the accumulated debris which inevitably forms in any growing forest.”

The rest of the argument put forward in support of fire suppression was that prescribed burning was going to be an “exceedingly difficult and costly practice” (Klamath National Forest 1928:16). The fire suppression policies and practices were extended to the reservations as well, administered by the Bureau of Indian Affairs.

> “The BIA began mimicking the USFS and viewing all fires as bad, and extinguished them with a fury. Not only did they put out all fires, they made it a criminal offensive if Indians set fires. So now it became a crime for Indians to manage the forest the way that they were taught and were supposed to do” (Colegrove 2005:43).

Beginning in the 1920s, fire observation stations, e.g., lookouts, were constructed and fire personnel were placed there to detect and report fires (Jackson pers. com. 2002). Some of these lookouts were constructed on tribal sacred sites used as prayer seats (Alfred pers. com. 1996). Occupation and use of these lookouts or field camps modified tribal land use practices, especially traditional setting of fires near these areas that were culturally significant habitats. Ironically, the fire patrol and lookout data of historical fire incidents are now used for spatial and temporal lightning and anthropogenic fire ignition analysis (Chapter 3). Starting in 1935, the “10 a.m.” policy became popular federal practice such that a wildfire detected today, would be contained by 10 a.m. tomorrow (Stephens and Sugihara 2006). The “10 a.m.” policy was implemented by federal fire rangers, patrol officers, and Civilian Conservation Corps (CCC). Several CCC camps were established around the Orleans and Hoopa

Valley area to readily suppress any fire events (Hillman pers. com. 2002, Jackson pers. com. 2002, Moore pers. com. 2005). The CCC crews were composed of Indian and non-Indian firefighting personnel (Shaw 2005). Conflict over USFS efforts to control fires versus Indian burning continued into the 1930s. Russ Bower, a third generation Scott Valley resident and son of a local pack-train operator, was a Forest Service employee on the Klamath National Forest in 1932. Bower started work with an all Indian crew constructing the Wooley creek trail, and then later served as Orleans District Ranger from 1936 to 1939, shared his experience and approach in regards to the "Indian Incendiary Problem":

> The Indian fires weren't really incendiary, they were part of the cultural process. They had always burned off those fern prairies in the fall and the ones that we had to fight was the ones when we had no fall rain. They usually did burn the prairie off and it would go out when it hit the heavy fuels if the fall rains had already been there. These were classed as incendiary under the classification but they weren't really. I had two incendiary fires in the three years I was here and they were set by an outsider that came in looking for work… (Russ Bower interviewed by USDA Six Rivers National Forest 1983: I-346).

Bower stated that the Indians just needed to be treated like human beings, and that after he learned of the Indians' need for burned hazel (*Corylus cornuta* Marsh. var. *califorinica*) for basketry material, he helped them with getting 70 acres burned near Rattlesnake ridge, southeast of Orleans. The fact that Bower came from a local family and worked with Indians, his experience with the Indians was comparatively much less confrontational than other USFS rangers or foresters.

Continuity of tribal burning practices

The probability and extent of Native American ignition potential has been substantially reduced. The initial reduction in the extent and frequency of Native American ignitions occurred from 1855 to 1870 during American settlement, more so under government rangers starting in the early 1900s followed by the establishment of fire lookout in the 1920s. Subsequent enlistment of the Civilian Conservation Corps in the 1930s to suppress fires followed by new technology and strategies starting in late 1940s following World War II of militaristic suppression tactics were additional constraints on frequency and extent of landscape fires (Stephens and Sugihara 2006).

The frequency of Native American burning may have remained similar from 1870 to 1945, but the extent of those fires was likely limited for reasons mentioned.

Native Americans fires were reduced after 1911 around the Orleans area because of the proximity to the USFS rangers and then in the 1930s with Civilian Conservation Corps who hired and/or enlisted rangers and fire crews to extinguish fires (Klamath National Forest 1928, Six Rivers National Forest interview I-332, Hillman pers. com. 2002). The distance from fire suppression crew quarters at the main camp in Orleans and/or field camps scattered in various locations in the hills in relation to ignition locations was reduced. Native American ignition locations affected the likelihood of fires burning more of a given area. There existed a relationship between the size and intensity of the fire and the ability of the fire crews with primitive tools to suppress those fires (Jackson per. com. 2002). Fires burning in areas with light fuels were easier to contain and suppress compared to fires that burned in heavier fuels that likely burned until they were extinguished by natural topographic breaks and increased humidity. Formerly burned areas can also temporarily reduce fire spread because of the lower fuel content (Skinner et al. 2006).

Demographics of the local community also shifted from 1910 to 1945. Mining became less common, cattle grazing was reduced, and a reliance on timber increased. Native American burning and the potential extent of fire's influence were restricted. The once common frequent low-intensity fires had been easy to extinguish compared to changes in vegetation resulting from densification and timber harvesting which decreased potential frequency for a given area and increased fire intensity due to the accumulation of fuels (Skinner et al. 2006). Topographic locations, vegetation structure and composition, and seasonality affect fire behavior and can increase under severe fire weather conditions (DeBano et al. 1998).

<u>1945 to 2007: Era of militaristic fire suppression and industrial forest management</u>

After 1945, new roads or improvements to travel routes were constructed along former trails improving the government's ability to suppress fires and access timber (Gates 1995, Hillman pers. com. 2002, Allen pers. com. 2007, Ferris pers. com. 2007). More advanced mechanization associated with timber harvesting and fire suppression capabilities increased with technological advancements. From 1945 to the present, fire suppression became more effective and fires up to a certain size within a given time period were easier to contain (Pyne et al. 1996, Stephens and Sugihara 2006). In the mid-1950s basketweavers lamented at the lack of fires for creating useable basket material. Lavine (1958) reports issues facing Karuk basketweavers:

> "They used to burn the wildgrass where the chosen brush grows and they gathered the bush the second year after burning. They burned the brush so 'good things will grow up.' It is different now. The U.S. forest service has strict laws regarding brush fires in the rich timber country. The Indians have to apply for fire permits and this is something the old women do not understand. They manage without the brush fires but they say the baskets are not as good." (*Humboldt Times* Centennial Edition, Section 9, page 8, February 1954).

Tribal culture that was reliant on fire-induced vegetative changes in culturally significant habitats was slowly deteriorated by fire suppression and exclusion. The notion that Native Americans needed permits to burn was an additional cultural and institutional constraint. Tribal people having to ask the US Forest Service for permission to burn in their own traditional family-use areas was the equivalent of relinquishing tribal usufruct rights and tenure. Why should tribal people need to ask permission from the US Forest Service to do things they believed they retained the ancestral rights to do? The threat or actual danger of federal enforcement actions leading to potential death, injury, imprisonment, or fines for arson (incendiarism) was a considerable factor (M.McCovey pers. com. 2002, Peters pers. com. 2005). Risks for Indians to continue burning were often too great for tribal families to attempt (Aubrey pers. com. 2005).

Even up to the 1950s Indian burning was still perceived as a problem (Busam 2006). Portions of the Klamath National Forest were separated in 1946 to create the Six Rivers National Forest (Busam 2006), and a general inspection was conducted on the forest regarding the ongoing "Indian Incendiary Problem" (USDA, Six Rivers National Forest 1950:27-28 in Busam 2006). The report stated:

> "One problem area exists; the 'river strip'… There is a fairly large Indian population here and the area is still "west of the Pecos." The State has apparently not yet decided to take fire control laws across the river. Previous attempts brought a threat of bloodshed…. It looks as if we will

> have to live with this problem a while longer–until the area becomes more civilized, lending the State any assistance needed in developing an attitude toward protection among the local people. Perhaps the burning of basket grass areas and doe pastures would do the job (USDA, Six Rivers National Forest 1950:29)."

It was predominately attitudes from USFS leadership, interpretation of policies, and inability to work with local tribal communities about fuels and fire management that continued government-tribal confrontations. In the 1950s the beginning of extensive road building and timber harvesting continued to impact the welfare of tribal communities and culturally significant habitats. Employment with such activities benefited Indians "working in the woods", but at a recognized trade-off of degrading their culture (Hillman pers. com. 2002, Jackson pers. com. 2002, Colegrove pers. com. 2005).

The marked reduction in large fires after the 1960s is attributed to more technologically equipped aggressive fire suppression and prevention efforts (USFS Six Rivers National Forest LMKWA 2003). Historical narratives (e.g., oral histories and ethnographies) suggest that at the beginning of fire suppression efforts smaller fires were able to be contained and extinguished, while fires of larger extent and higher severities were often uncontrollable. Figure 7.5 shows the spatial pattern of wildfires, some of which burned across an entire watershed over ridges or down to the river. Progressive organizational and technical capacity of fire suppression forces, in addition to legal statutes, is correlated with the ability to contain and extinguish fires. Wildfires that exceed initial attack could become much more intense and "destructive," especially if there were insufficient firefighting forces. The so-called destructive effects of wildfires often differed between the USFS (Klamath National Forest 1928) and tribal communities. Classification of wildland fire "rate of spread" (ROS) and flame length (FL), affect wildland firefighter's ability to effectively suppress fires (Table 7.3). Fire suppression reports mention that increased sophistication of fire fighting techniques, personnel training, and equipment have resulted in a bi-mobile shift in the extent of severity of fires from small, and low-moderate severity (quickly contained), to those that rapidly grow large under extreme fire weather and fuel loads, with higher proportions of severity (Skinner et al. 2006).

Table 7.3: Fire behavior and fire suppression effectiveness (adapted from USFS Six Rivers National Forest LMKWA 2003)

Value	Rate of Spread (ft/min)	Flame Length (ft)	Suppression Effectiveness
Low	0-5	0-2	3-person hand crew or engine
Moderate	5.1-11	2.1-4	5-person hand crew or engine
High	11.1-22	4.1-6	engines/hand crews/water tender plus aerial attack
Very High	22.1-33	6.1-8	all above plus dozers/aerial support
Extreme	33.1+	8.1+	beyond initial attack, into extended attack

Data of recorded fire acreages from the case study area of Six Rivers National Forest can be used to infer the effect of successful fire suppression change after the 1950s (Table 7.4). These results suggest that fires are less frequent and vegetation requires a longer time to regenerate following fire. The natural fire rotation, the time between the fire events for a given area, was greatly increased with fire suppression and exclusion (Agee 1993). Table 7.4 shows that for the years 1960-2001, the expected chance an area will burn again was extended to 3268 years!

Table 7.4: Natural Fire Rotation for Specific Time Periods in the Analysis Area (data from Six Rivers National Forest LMKWA 2003)

Years	Area burned (acres)	Natural Fire Rotation (years)
1910-2001	19,411	227
1910-1959	18,796	127
1960-2001	615	3268

Six Rivers National Forest (Six Rivers National Forest) fire incident report data for the Lower-Mid Klamath Analysis Area that extend back to 1910. Approximately 457 fires (19,411 acres) were documented within the Six Rivers National Forest portion of the lower mid-Klamath analysis area between 1910 and 2001. Table 7.5 shows a segregation of wildfire acres and numbers for the Six Rivers National Forest portion of the Analysis Area. Table 7.5 also reveals the significant contribution of human ignitions and extent of those fires compared to lightning.

Table 7.5: History of Human and Lightning Caused Fires (1910-2001) (data from Six Rivers National Forest LMKWA 2003)

	Human		Lightning		Human		Lightning	
Years	**Acres**	**%**	**Acres**	**%**	**Count**	**%**	**Count**	**%**
1910-1919	4796	100%	21	0%	48	96%	2	4%
1920-1929	10665	97%	309	3%	57	88%	8	12%
1930-1939	29	100%	0	0%	6	60%	4	38%
1940-1949	1	100%	0	0%	10	77%	3	22%
1950-1959	2887	97%	88	3%	42	88%	6	12%
1960-1969	72	83%	15	17%	41	75%	14	25%
1970-1979	14	88%	2	13%	47	89%	6	11%
1980-1989	137	90%	15	10%	40	78%	11	21%
1990-2001	288	80%	72	20%	101	90%	11	10%
1997-2001	139	80%	35	20%	58	98%	1	2%
Totals	**18889**	**97%**	**522**	**3%**	**392**	**86%**	**65**	**14%**

Table 7.6: Summary of Fire History by Decade (data from Six Rivers National Forest LMKWA 2003)

Years	Acres	% Acres (1910 to 2001)	Average Acres/yr	Number	% Number (1910 to 2001)	Average Number/yr
1910-1919	4817	25%	482	50	11%	5
1920-1929	10974	57%	1097	65	14%	7
1930-1939	29	0%	3	10	2%	1
1940-1949	1	0%	0	13	3%	1
1950-1959	2975	15%	298	48	11%	5
1960-1969	87	0%	9	55	12%	6
1970-1979	16	0%	2	53	12%	5
1980-1989	152	1%	15	51	11%	5
1990-2001	360	2%	30	112	25%	9
1997-2001	174	1%	35	59	13%	12
1910-2001	19411		211	457		5

Table 7.7: History of Large Fires within the Analysis Area (data from Six Rivers National Forest LMKWA 2003)

	Fires ≥ 10 acres			Fires ≥ 100 acres		
Years	**Human-caused**	**Lightning-caused**	**Total**	**Human-caused**	**Lightning-caused**	**Total**
1910-1959	43	3	46	20	1	21
1960-2001	11	3	14	0	0	0
Total: 1910-2001	54	6	60	20	1	21

The extent and severity of historical fires have been correlated with drought and weather coupled with fuel conditions (Elford and McDonough 1964, Six Rivers National Forest LMKWA 2003). In view of the correlation between wildfire exclusion and suppression, the departure from historical conditions (Six Rivers National Forest Interviews), reflected in Fire Regime Condition Class (FRCC), places the communities of Orleans, Weitchpec, Somes Bar, and the Hoopa Valley Indian and Yurok Indian reservations at high risk from the threat of wildfire (Federal Register August 17, 2001, v.66, n.160) (Figure 7.1 Lower mid-Klamath River Fire Regime Condition Class). The LANDFIRE FRCC designation reflects even greater departure from the historic condition (Figure 7.4). In addition to changes in disturbance regimes, one of the greatest factors influencing FRCC is change in the historic vegetation composition and structure.

Historical vegetation

Historical vegetation refers to "those plant communities that existed during the reference period prior to Euro-American settlement" and that were "often affected by Native American burning" (Interagency Fire Regime Condition Class Guidebook 2005:2-6 of V1.2). The reference period circa 1850 designated to reflect historic range of variation for the composition, structure, function, and associated ecological processes representative of the historical vegetation. The vegetation contained within the reference condition reflects the interactive effects of climate-weather and Native

American land use practices (Six Rivers National Forest LMKWA 2003, Chapter 2 and 3). Historic conditions for forest, shrub, grassland, and riparian habitats, circa 1850 to the present are described below.

Vegetation composition

According to the USFS LMK watershed analysis (2003), the main disturbance factors affecting plant species composition are wildfires and floods. Nearly all stands in the area have been affected by fire at some time during their development. The vegetation types of the Lower Mid-Klamath Analysis (LMKWA) area, a subset of the larger Klamath-Siskiyou Mountains, are typical of the low to mid elevation portions of the region. Like the region, the watersheds within the case study area are dominated by the tanoak (*Lithocarpus densiflorus* Hook. & Arn.), Douglas-fir (*Pseudotsuga menziesii* (Mirbel) Franco var. *menziesii*), and white fir (*Abies concolor* (Gordon & Glend.) Lindley) series (Six Rivers National Forest LMKWA 2003). Included in these main series are subseries which include madrone (*Arbutus menziesii* Pursh.), live oak (*Quercus wislizeni* A.DC), black oak (*Quercus kelloggii* Hook.), California bay laurel (*Umbellularia californica* (Hook & Arn.) Nutt.), sugar pine (*Pinus lambertiana* Douglas) and ponderosa pine (*Pinus ponderosa* Laws.) as co- or sub-dominants. Oregon white oak (*Quercus garryana* Hook.) dominated grasslands were historically a more prominent vegetation type for low to mid elevations (Salazar et al. 2002). These vegetation series are generally distributed by elevation, parent soil material, and available soil moisture from precipitation. Red fir (*Abies magnifica* Andr. Murray) and white fir forest types characterize higher elevations in areas with low soil and air temperatures. The red fir and white fir forests also include mountain hemlock (*Tsuga mertensiana* (Bong.) Carr.), incense cedar (Cupressaceae *Calocedrus decurrens* (Torr.) Florin), and sugar pine as co- or sub-dominants. Jeffrey pine (*Pinus jeffreyi* Grev. & Balf.) is primarily located on ultramaphic serpentine soils (USFS Six Rivers National Forest LMKWA 2003).

Distribution of seral stages in the case study area

Seral stage is used to classify the age of the dominant vegetation, time since the last disturbance, or effects of multiple past disturbances. Vegetation composition and structure is characterized with seral stages described in the tanoak and Douglas-fir field guide (Jimerson et al. 1996). These seral stages are a course level approach that includes: shrub/forb, pole, early-mature, mid-mature, late-mature, and old-growth. The majority of the conifer and hardwood series in the case study area are composed of the early-mature and mid-mature seral stages as of the 2003 analysis (USFS Six Rivers National Forest LMKWA 2003). The composition and structure of early-mature and mid-mature seral stages are composed of tanoak and other hardwood regeneration following primarily logging or wildfire suppression activities. The majority of the white fir series is made up of the old-growth seral stage. Jeffrey pine series is composed of old-growth and mid-mature seral stages. Early-mature patches are common in the red fir series, and reflect in-growth of former open understory habitats.

Vegetation within the case study area

The USFS determined the vegetation condition within the case study area from ecology vegetation mapping data. The map was constructed from interpretation of comparative change from earlier aerial photos to 1990 aerial photos. Twenty-five percent of the interpretations were field verified. The characteristics of this map contain vegetative habitat composition with series, subseries, seral stage; and structure with overstory size class, and percent canopy closure by conifers and hardwoods. The vegetation series and subseries are based on the potential natural vegetation classification (map not shown, Six Rivers National Forest LMKWA 2003).

Table 7.8: Seral Stage Distribution by Vegetation Series in the Analysis Area 2001 (data from Six Rivers National Forest LMKWA 2003).

	SERAL STAGES (data presented in acres)						
Vegetation Series	**Shrub/Forb**	**Pole**	**Early-Mature**	**Mid-mature**	**Late-mature**	**Old-growth**	**Totals**
Tanoak	3,172	2,832	7,742	8,606	6,784	5,327	34,463
Douglas-fir	252	503	3,780	2,722	429	749	8,435
White Fir	268	99	821	696	379	951	3,214

Jeffrey Pine	147	65	205	352	182	322	1,273
Canyon Live Oak	36	39	908				983
Red Fir	13	11	349	49		155	577
Riparian	81	115	168				364
Black Oak			341				341
Grassland	142						142
Knobcone Pine		117	1				118
Port-Orford-cedar			8	13		82	104
White Oak			70				70
Alder	3	17	3				23
Serpentine Barrens	10						10
Grand Totals	**4,124**	**3,798**	**14,396**	**12,439**	**7,774**	**7,586**	**50,116**

Tanoak is the dominant hardwood tree cover type. Age and structure of tanoak are important to cultural use values. Two age classes and structural forms of tanoaks exist. Older, taller, co-dominant single stalk tanoaks with a high ground to crown ratio are usually indicative of a former low to moderate intensity fire regime such as from Native American burning and management. These older tanoaks are associated with mid-late mature Douglas-fir. The second structural and age type of tanoaks are multiple stalked less than 100 year-old trees with few or no signs of low intensity fire characterized as "early-mature and mid-mature." Multi-stalk tanoak likely established under two types of conditions. The first condition of establishment resulted from seedlings growing from the initial cessation of Indian burning which then experienced moderate severity fire that killed the top and then stimulated multiple stalks which have matured and persisted in the absence of fire. The second and most common cause of these dense multi-stalked middle-aged tanoaks was the result of industrial forest management. The tanoaks became established after timber harvesting and/or road building and have not experienced fire (Riggan pers. com 2007). These dense patches of tanoaks are commonly intermixed with mid-mature or younger Douglas-fir in plantations and have been shown to burn at higher fire severities than adjacent vegetation types (Skinner et al. 2006).

Table 7.9: Timber harvest of seral stages by vegetation series in the analysis area 1910 to 2001 (Data from the SRNF LMK-WA 2003)

Seral Stage	Tanoak	Douglas -fir	White fir	Jeffrey pine	Port-Orford cedar	Riparian	Totals
shrub/forb	3,156	230	195	6	1	0	3,589
Pole	1,927	166	77	9	0	0	2,180
early-mature	1,446	1,349	17	56	0	41	2,909
mid-mature	1,428	324	8	0	0	0	1,760
late-mature	701	19	7	0	0	0	727
old-growth	33	0	0	0	0	0	33
Total acres harvested	**8,690**	**2,088**	**305**	**72**	**1**	**41**	**11,197**
Percent harvested	**25**	**25**	**9**	**6**	**2**	**11**	**21**

Adjacent to the case study area on the Hoopa Valley Indian Reservation (HVIR), the BIA management of tribal forested lands is reported to have caused considerable damage to cultural use quality of natural resources from road building, timber harvesting and fire suppression activities. BIA timber harvest management and administration of the HVIR forest began in the 1950s to 1980s. During this period BIA harvested and converted almost 35,000 acres of Hupa and Yurok lands to commercial forest management with little regard for cultural resources (Colegrove 2005, see also Chapter 3 Figure 3.15 Deerhorn aerial photos).

Fire suppression effects on cultural resources

Departure from reference conditions, as reflected in the Fire Regime Condition Class (FRCC), does not sufficiently characterize fire suppression's impacts within the case study area. Fire suppression also had socio-cultural, religious/spiritual, and economic impacts. Fire suppression facilitated the termination Native American land tenure, changes in ecological processes and functions, and modification of fire intensities and frequencies, which have affected culturally significant vegetation associated with particular seral stages or conditions having cultural use values. Fire suppression's socio-cultural and economic effects have been studied by Huntsinger and McCaffrey (1995), Riley-Thron (2001), and Stercho (2006).

The authority of the federal government, under fire suppression policies, to exclude Native American fire management practices facilitated the termination of Native American land tenure (Harley 1918, Klamath NF 1928, Huntsinger and McCaffrey 1995, Hillman and Salter 1997, Salter 2003, Holmlund 2006). Indian fire use was the most dominant and visible sign of the extent of Native land tenure and, therefore, substantiated the legitimacy of Native land claims (Heizer 1973, Huntsinger and McCaffrey 1995, Anderson 2005).

Because many northwestern Californian tribes were dependant on fire-induced landscape level changes to adequately maintain cultural subsistence economies and religious functions, exclusion and suppression of burning shifted their dependence to other natural resources and income/capital sources, including government economies and (less nutritious) food support programs (Huntsinger and McCaffrey 1995, Stercho 2006). Effective fire suppression through both physical infrastructure and public campaigns, including fines, imprisonment, and threat of injury or death for arson convictions, facilitated the majority of changes in vegetation quality, which in turn has degraded formerly fire-induced conditions culturally valued by tribal people (Harley 1918, Six Rivers National Forest Interview: I-346, Huntsinger and McCaffrey 1995, Glaze pers. com. 2002, M. McCovey pers. com. 2002, Salter 2003, Kliejunas 2005, Busam 2006, Stercho 2006,). Fire suppression effects on vegetation are shown in Table 7.10.

Table 7.10: Major vegetation types and how fire suppression affected the cultural value or utility of those areas

Culturally Significant Habitat:	**Vegetation Type:**	**Factors responsible for changes from desired conditions:**	**Impacted cultural value or resources quality or quantity:**
Riparian river terrace	Sandbar willow	Dam construction, flow regulation, increased height and canopy growth. Increased insect pest infestations. Reduced up-slope fire interactions. Fire suppression.	Reduce natural disturbance factors to rejuvenate willow growth. Less quantity and quality of available basket material.
Riparian river terrace	Cottonwood, Oregon ash, wild grape	Dam construction, flow regulation. Fire suppression. Reduced up-slope fire interactions.	Less frequency of new sandbar areas for root colonization. Reduced availability of wild grape roots in sandbars.
Riparian creeks and spring	Alder, mock orange, Woodwardia fern,	Fire suppression. Increased density of vegetation. Reduced spring and surface water flow. Increased fire	Post-fire severities higher. Reduced surface and ground water availability. Reduce availability of shrub resprouts

		severity or more extensive areas.	for materials.
Coastal prairie	Bracken fern, forbs, grasses	Fire suppression. Increased shrub and tree cover/forest. Reduced ungulate/wildlife forage.	Reduced access and availability to traditional foods, materials, and medicines (bulbs, seeds, berries, and herbs). Reduced hunting and trapping opportunities.
Oak woodlands and prairie	Oregon white oak, hazel, forbs, iris, grass	Fire suppression. Increased shrub and conifer tree cover/forest. Reduced ungulate/wildlife forage.	Reduced access and availability to traditional foods, materials and medicines (bulbs, seeds, berries, and herbs). Reduced hunting and trapping opportunities.
Chaparral	Manzanita, buck brush-ceanothus	Fire suppression. Increased shrub and conifer tree cover/forest. Reduced ungulate/wildlife forage.	Reduced ungulate/wildlife forage. Reduced access and availability to traditional foods, materials, and medicines (bulbs, seeds, berries, and herbs). Reduced hunting and trapping opportunities.
Mixed conifer hardwood coastal forests	Redwood, Douglas-fir tanoak, huckleberry	Fire suppression. Increased shrub and understory conifer tree cover/forest and stem density.	Reduced access and availability to traditional foods, materials and medicines (bulbs, seeds, berries and herbs). Higher fire severities increase the recovery time of culturally significant vegetation or habitat quality.
Mixed conifer hardwood forest	Douglas-fir, Madrone, tanoak, thimbleberry, salal	Fire suppression. Increased shrub and understory conifer tree cover/forest and stem density.	Reduced access and availability to traditional foods, materials, and medicines (bulbs, seeds, berries, and herbs). Higher fire severities increase the recovery time of culturally significant vegetation or habitat quality.
Mixed conifer hardwood dominated forest	Douglas-fir, live oak, madrone, huckleberry transitional to denser stand	Fire suppression. Increased shrub and understory conifer tree cover/forest and stem density.	Reduced access and availability to traditional foods, materials and medicines (bulbs, seeds, berries and herbs). Higher fire severities increase the recovery time of culturally significant vegetation or habitat quality. Increased edible mushroom conditions (matsutake).
Mixed conifer oak dominated forests	Douglas-fir and black oak, hazel	Fire suppression. Increased shrub and understory conifer tree cover/forest and stem density.	Reduced access and availability to traditional foods, materials, and medicines (bulbs, seeds, berries, and herbs). Reduced hunting and trapping opportunities. Higher fire severities increase the recovery time of culturally significant vegetation or habitat quality.
Mixed hardwood	Live oak, madrone,	Fire suppression. Increased shrub and understory conifer	Reduced access and availability to traditional foods, materials,

live oak	gooseberry	tree cover/forest.	and medicines (bulbs, seeds, berries, and herbs). Higher fire severities increase the recovery time of culturally significant vegetation or habitat quality.
Mixed conifer Pine dominated	Sugar pine, ponderosa pine, bunch grass understory	Fire suppression. Increased shrub and understory conifer tree cover/forest and stem density. Increased competition for light, water, nutrients. Blister rust disease. Increased insect attack vulnerability.	Reduced access and availability to traditional foods, materials, and medicines (seeds, sap, roots). Higher fire severities increase the recovery time of culturally significant vegetation or habitat quality.
Mixed conifer Douglas-fir dominated	Douglas-fir, Ponderosa pine, Sugar pine, bear grass, Oregon grape.	Fire suppression. Increased shrub and understory true fir conifer tree cover/forest and stem density. Increased competition for light, water, nutrients. Blister rust disease. Increased duff and litter.	Reduced access and availability to traditional materials and medicines (forbs; leaves, roots, and stems). Higher fire severities increase the recovery time of culturally significant vegetation or habitat quality.
Mixed conifer, shrub, meadow	Incense cedar, Ponderosa pine, ceanothus, native grasses, Lomatium sp.	Fire suppression. Increased shrub and understory true fir conifer tree cover/forest and stem density. Increased competition for light, water, nutrients.	Reduced access and availability to traditional foods, materials, and medicines (seeds, sap, roots). Higher fire severities increase the recovery time of culturally significant vegetation or habitat quality. Reduced hunting and trapping opportunities.
High elevation meadows	Forbs (bulb foods), grasses	Fire suppression. Increased shrub and understory true fir conifer tree cover/forest and stem density. Reduced wildlife forage.	Reduced access and availability to traditional foods, materials, and medicines (bulb, roots, leaves). Reduced hunting and trapping opportunities.
High elevation riparian	Port Orford cedar, alder	Fire suppression. Increased shrub and understory conifer tree cover/forest and stem density.	Higher fire severities increase the recovery time of culturally significant vegetation or habitat quality. Greater pre to post fire changes in cultural use quality
High elevation mixed conifer	True firs, scrub hardwoods-oaks	Fire suppression. Increased shrub and understory conifer tree cover/forest and stem density. Reduced wildlife forage	Higher fire severities increase the recovery time of culturally significant vegetation or habitat quality. Reduced hunting and trapping opportunities.

Changes in Native American subsistence patterns and reliance on particular habitats also influenced the value for continuance of cultural burning practices in manners consistent to pre-American settlement.

> "When comparing habitation space between prehistoric Native Americans and contemporary populations, Vale (2000:12-13) fails to factor in that Native American's were reliant upon the nearby landscape for all of their daily needs. Baumhoff (1963:231), on the

> other hand, estimated food and subsistence material needs along the Middle Klamath River, and calculated that one person required 0.39 square miles to get enough subsistence resources. Baumhoff's estimate of subsistence area would have required 295 square miles, while Vale's habitation estimate requires only .003 square miles for all 755 people" (Busam 2006:126-127).

Perhaps by random circumstance, in 1930 seven hundred fifty five people were identified as Karuk, with 46 recognized as being full-blooded (Bright 1978). Using the population estimate of the Karuk of 1930 rather than pre-1850 would be misleading and erroneous (Cook 1956, Bright 1978). The population of the Karuk, as of A.D.1848, was estimated by Cook (1956) at approximately 2,700 (Bright 1978).

Disruption of Native American social structure caused by atrocities inflicted by miners, settlers, militia, and US government were compounded by policies affecting tribal land tenure and subsistence economies (Heizer 1993). Many Native people were forced to adopt agricultural land-use systems by federal programs and policies (Aubrey pers. com. 2005, Colegrove 2005). Currency changed from ecological wealth reflected in properly managed habitats of family use areas, regalia, and health to more American valued goods or monetary systems (Moore pers. com. 2005, Nixon pers com. 2005). The inability of Native people to exercise all aspects of their integrated land and water management systems led to simplification of their dependence on ecological goods and services derived from the environment. An example of a formerly dominant historical habitat type is provided for case and point reference.

Indian burning of oak woodlands and prairies fostered the production of foods (acorns and bulbs), increased hunting opportunities and wildlife forage, and provided additional food supplies to Native Californian people (Huntsinger and McCaffrey 1995, Anderson 2002, Salazar et al. 2002). Foods, medicines, and materials that were formerly harvested from frequently burned habitats shifted to goods acquired with American currency or bartered with baskets (O'Neale 1995). For example, prairies where Indian women dug bulbs, collected grass seeds, and men hunted deer or elk were modified into American farming and agricultural systems (Anderson 2002). Prairies were plowed and planted with hay for cattle or vegetable gardens, which replaced former traditional food products. Some subsistence practices and associated burning were conducted later than others. Indian men that took up grazing to supply local meat after the elk were extirpated, would run cattle up to higher elevations following the older Indian trails of their forefathers (Hillman pers. com. 2002, Colegrove pers. com. 2005, D. McCovey pers. com. 2002, Anonymous woman pers. com. 2002). When forage quality declined along routes and lightning ignitions were insufficient to maintain desired habitat quality, those areas were burned by Indian cattlemen (Hotelling 1978, Glaze pers. com. 2002, Hillman pers. com. 2002, M. McCovey pers. com. 2002, Colegrove pers. com. 2005 and Six Rivers National Forest interviews: I-309, I-346). "Ranchers routinely burned off brush to maintain forage for stock animals. Range burning was done by individuals with ties to Native American burning, and used range fires to serve both ranching and traditional purposes" (Hotelling 1978:12).

Indian men and families continued to make trips to former resource areas using pack horses or mules (SRNF Interviews: I-210 and I-287, Jackson pers. com. 2002, Ora Smith per. com. 2007). These late summer to fall trips were important times for camping, collecting, harvesting, and hunting as processes of maintaining continuity of TEK (Six Rivers National Forest Interviews) (Figure 7.6). Specific resource patches further away from the eyes and threats of non-Indians and USFS fire rangers could still be maintained by burning, although less in the extent and frequency of areas compared to former times.

The development and expansion of the forest road systems, often over the top of or along older Indian trails, provided an economic opportunity for many Native Americans to gain economic livelihoods from "working in the woods" (Gates 1995, Hillman pers. com. 2002). Indian men typically worked in the woods, and Indian women worked the home, garden, and other aspects of the homestead/ranch (Six Rivers National Forest Interviews, Glaze pers. com. 2002, Aubrey pers. com. 2005). When the majority of Indian children were forcibly sent away to boarding schools and Indian men went away to war, reliance on traditional foods and materials that required burning was further reduced (Six Rivers National Forest Interviews, Heffner 1984, Glaze pers. com. 2002, Aubrey pers. com. 2005). After 1945, "Mountain trips" for subsistence and religious purposes became infrequent, and ceremonial aspects of tribal culture were reduced (Aubrey pers. com. 2005). The threatened continuity of tribal culture and maintenance of TEK reflected the changing conditions of degrading formerly fire-maintained environments.

Tribes and tribal communities have unique relationships with their ancestral territory (Huntsinger and McCaffrey 1995, Martinez 2005). This is reflected in the work of Johnson (2000), based in interior British Columbia, Canada, that showed western ecologists' definition of "landscape" as ecological condition, compared to Indigenous people who describe the landscape in terms of utilitarian or spiritual conditions. Johnson (2000) provides an ethnoecological overview of how Indigenous peoples describe vegetation conditions and species-specific changes as a result of fire suppression. Indigenous place names were descriptive indicators of habitat condition. Place names not only provided information of prior ecological conditions but the place's significance to the Indigenous people of the area (Jackson pers. com. 2002, Foseide pers. com. 2005, Moore pers. com 2005). This is similar to the views held by tribal groups in northwestern California in regards to the effects of fire suppression (Huntsinger and McCaffrey 1995, Pace 2002, Chapter 3).

Fire suppression's socio-cultural impacts were of particular concern due to the United States' unique legal relationship with Indian tribal governments as set forth in the Constitution of the United States, treaties, statutes, executive orders, and court decisions (Heizer 1973, FSH 1509.13 - American Indian and Alaska Native relations handbook chapter 10, Dombeck et al. 2004). The United States government has a tribal trust responsibility to tribes that have ceded lands under recognized or unrecognized/un-ratified treaties or other agreements (Heizer 1972, Heizer 1973, Tamez and Johnson 2005). Tribal governments and communities are consulted and tribal concerns and desires are incorporated when and where feasible within the interest of the federal or state agencies who manage public trust resources (National Historic Preservation Act 1966-Section 106, National Environmental Policy Act 1969, Tribal Forest Protection Act 2004, Dombeck et al. 2004). Tribal trust resources are defined as: "those natural resources, either on or off Indian lands, retained by, or reserved by or for Indian tribes through treaties, statutes, judicial decisions, and executive orders, which are protected by a fiduciary obligation on the part of the United States" (Secretarial Order 3206).

In addition to the government's legal responsibility to tribal governments, co-management of natural resources is about achieving environmental justice and sustainability (Shepard et al. 2002, Dombeck et al. 2004). The incorporation of TEK with western scientific methodologies and approaches will likely benefit the majority of parties involved and natural resources (Dombeck et al. 2004). An interdisciplinary method which combines the various approaches described above with environmental, socio-cultural, and religious/spiritual impacts could be enhanced with traditional ecological knowledge (see KNF-Ishi-Pishi/Ukonom WA: Cultural Resources 1994, Holmlund 2006, FAO draft).

Effects on tribal people and culturally significant habitats during and after the suppression of wildfire events

This second section addresses the direct effects of wildfire suppression on tribal people, cultural resources, and culturally significant habitats. These effects include: smoke, fire retardant, fire lines (dozer and hand), safety and helicopter zones, fire camps, and increased vehicle and foot traffic.

The effects of a wildfire event and the associated fire suppression activities can be traumatic for any community (Everett 2002, Mendez et al. 2003, Kumagai et al. 2004, Lynn and Gerlitz 2006). However, a person or group with an extensive historical connection with a place is most impacted by the wildfire and fire suppression activities (Whitehouse 2000, Hardesty 2000). For example, if a new resident in a rural area has a home that is threatened by an advancing wildfire, the person will likely be concerned with physical property and life at the site of their residence. In comparison, a Native American with ancestral ties to the area may consider fire's threat to physical property and life across a larger geographic area as ecological, socio-cultural, and spiritual concerns (Raish et al. 2005). The catastrophic loss or degradation of natural resources in northwestern California by severe wildfire will likely impact Native people in greater proportion than the general non-Native population (Lynn and Gerlitz 2006, Huntsinger and McCaffrey 1995). Often the non-

Native public, for whom the US Forest Service manages natural resources for multiple benefits, has less fewer values directly affected by catastrophic wildfire (Dombeck et al. 2004).

Native Americans experienced a disproportionate share of impacts related to wildfire and fire suppression activities and these impacts are often not reported (McCool et al. 2006). McCool et al. (2006) does not contain any reference to tribes or Native Americans. It is unfortunate that tribes or tribal communities are assumed to be similar to the general public (Dombeck et al. 2004). Tribes and federally recognized tribal members or descendants have different rights regarding legal services and access to trust resources compared to the general public. The report “Managing the Impact of Wildfires on Communities and the Environment” only addresses tribes as part of the government structure (Fire Plan 2000:1). The report summarizes several key points:

1. Continue to make all necessary firefighter resources available,
2. Restore landscapes and rebuild communities,
3. Invest in projects to reduce fire risks,
4. Work directly with communities, and
5. Be accountable.

Although many of these recommendations have been implemented as parts of national agendas and policies (Dombeck et al. 2004), effective implementation of these points with tribal communities in northwestern California are still inadequate (National Fire Plan 10-year Comprehensive Strategy 2001, Tribal Forest Protection Act 2004, Tamez and Johnson 2005, Rains et al. n.d.).

The USFS report “Policy Implications of Large Fire Management: A Strategic Assessment of Factors Influencing Costs” stated that “Tribal relationships on the Big Bar Complex” (1999), which included Interagency Fire Suppression Incident Command and personnel that worked with the Karuk and Hoopa Tribes, figured as one of the “many factors [that] did contribute to the high costs” (Rains et al., n.d Executive Summary). One of the recommendations calls for tribal relations to be well managed, to utilize local liaisons, and have necessary agreements in place (e.g., memorandums of understanding) to facilitate coordination and collaboration. The

National Congress of American Indians (NCAI) policy issues of land and natural resources for Timber under Tribal Lands and Forestry states that:

> "Forest health issues related to insects, disease, and wildfire risk represent some of the largest continuing challenges on Indian forests. Indian forest managers have made significant strides to begin to address wildfire risk during the last decade. However, acreage treated for hazardous fuel reduction remains lower than needed. Funding for fire management has increased sharply over the last 10 years in recognition of the fuel buildup on Indian forests due to past management practices and forest health needs. In large part, restrictions on the use of fuels management funding limit the ability to integrate these monies into a comprehensive program that addresses wildland fire hazard and risk abatement with silvicultural treatments and fire prevention education. Protecting forest health will be an ongoing effort that is most efficiently addressed through integrated management" (http://www.ncai.org/Timber.66.0.html, as of June 26, 2007).

Integrated forms of research and management need to be inclusive of the broad tribal interpretation of what constitutes culturally significant resources and how wildfire impacts access and use quality of those resources (Graham et al. 2004, Lynn and Gerlitz 2006, Resource Innovations 2006).

The National Network of Forest (NNFP) Practitioners, working closely with tribes and tribal organizations, developed a technical note to address the potential capacity of tribal communities and other rural and underserved communities. This briefing states that many rural communities lack the resources to prepare for, respond to, and recover from severe wildfire events. The report continues: "incorporating social and economic information into planning processes at all levels (local, regional, and national) is a first step in identifying community capacity to address wildfire (Everett 2002). Further, this information needs to be systematically integrated into decision-making and agency monitoring" (Lynn and Gerlitz 2006:1). With respect to wildfire they characterize community capacity as the "collective ability of a community to mitigate wildfire threats, respond to active wildfire, and mitigate post-fire damage" (Lynn and Gerlitz 2006:1). They further describe capacity in relation to various factors including: income, cost of living, and other related economic indicators, as well as the potential of community organization and its fire suppression abilities. When tribal community members are able to have access and utilize "healthy and clean" forest resources maintained by fire they have reduced need for direct western economic monetary purchases of foods, medicines, or materials. For example, hunting and gathering in formerly burnt areas resulting from "good" fires (Glaze pers. com. 2002, Aubrey pers. com. 2005, Matilton pers. com. 2007).

Main key findings on community capacity to address wildfire were: insufficient information or related data to determine the most wildfire at-risk communities (See Federal Register August 17, 2001, V66:n160 for "communities at risk" from Somes Bar, Orleans, Weitchpec, and Hoopa as referenced in Six Rivers National Forest LMKWA 2003, Orleans Community Wildfire Protection Plan 2007 for the Karuk, Reed (pers. com 2007) for Yurok, Colegrove (pers. com 2007) 10-Year Fuels Management Plan for the Hoopa Valley Indian Reservation); flaws in designating Wildland Urban Interface zones in relation to (very) rural resident demographics (See Six Rivers Nation Forest WUI zones designation standards, Orleans Wildfire Protection Plan 2007); the relationship between low-income families and areas with little or no wild and structure fire response ability (Orleans is an example of an understaffed and under funded volunteer fire department compared to the Hoopa Valley Indian Reservation's upgraded newer wildland fire station and equipment); and lastly the proximity of low-income families living near federal lands.

Will Harling, of the Orleans-Somes Bar Fire Safe Council, often tells a story of a tribal elder who pruned the branch tips of encroaching shrubs as her only means of reducing fuels around her home. The shrubs grew over or near the eves of the house. The sentiment of many tribal elders is they have constantly voiced the need for cultural burning following traditional ways, primarily frequent low intensity burns (Heffner 1984, Six Rivers National Forest Interviews on file, Glaze pers. com. 2002, M. McCovey pers. com. 2002). Fire suppression policies, regional air quality restrictions, permits and fees, liability for escape fires or criminal charges for arson, and landowner social demographic changes are some of the reasons Native elders who knew how and could have managed their property and adjacent lands (National Forest or private) with fire, did not. Without some form of community assistance, many individuals or families may not have the means to adequately reduce fuels around their home and property (Everett 2002). The Fire Safe council was organized to assist private landowners reduce fuels around homes and structures. Additional treatments have been thinning and burning across portions of the private property to reduce the threat of fire coming from neighboring lands.

The capacity of the Orleans-Somes Bar Fire Safe Council has grown as a result of federal, state, tribal, and foundation funding to strategically prioritize treatments (Senos et al. 2006). Even with Fire Safe Council, tribal, USFS, and individual private landowner activities to reduce fuel around residence property, during the 2006 summer Orleans Complex fires, there was a need for fire suppression personnel to clear additional areas. During the Somes Fire (one of the Orleans Complex fires) fire suppression personnel and equipment mobilized around homes and clustered residential areas adjacent to or surrounded by forest, shrub, or grasslands. Many residents welcomed the precautionary measure to defend homes and property, but still were likely to have been adversely affected in different ways by suppression activities (Everett 2002, Kumagai et al. 2004, Mendez et al. 2003, Cohn et al. 2006).

<u>Arson: The continuance of tribal burning practices, opportunities for employment or mischief?</u>

Native people continuing cultural burning practices are often misinterpreted as arsonists. It is locally debated among fire suppression personnel and tribal community members whether fires being set are for cultural purposes, opportunities for employment (fighting fires), or maliciousness. Some tribal members may be charged with arson for setting fires not affiliated with official prescribed burnings or during fire restriction periods. For example, in 2002 more than 300 fires occurred on the Hoopa and Yurok reservations. One individual, age 30, was arrested and held at the Humboldt County Jail in connection with a June 2002 fire that burned 10 acres in Hoopa. That fire cost $9,000 to fight and caused more than $4,000 in damage. If convicted, that individual could serve up to six years in prison. Another man, age 33, could spend up to 20 years in prison if convicted for setting a fire near Big Hill Road on September 21, 2002 that burned 177 acres and cost at least $1.2 million to put out. Both men are from Hoopa (their tribal identity is unknown). Juveniles can be charged with arson as well. In August 2002 an arson fire burned more than 400 acres and cost at least $2 million to suppress and contain. Threats to life, property, and resources caused by arson are of concern for communities and fire managers. Unapproved “arson” fires set during extreme fire weather pose the greatest danger, where as fires set at other times may actually pose less social or ecological risks but are mandated to be suppressed and contained. Some tribal communities members may have good intentions of setting fires consistent with what they believe are similar to their traditional ways and purposes. Although, it has been brought up that the young people who set fires under dangerous conditions have not learned sufficient TEK about fire behavior and impacts to life, property or the environment (Marshall pers. com. 2007). Others tribal communities see it differently.

> “Now they’re making criminals out of people that’s trying to keep our ways. I see young people going up and down the road and some of them will throw a match out. I know what they’re doing, and where do you find a balance of telling them that they can’t do this yet they’re trying to hang onto something of who they are” (Lewis in Salter 2003).

On reservations and surrounding areas, federal programs have been developed to reduce arson fires. Reporting of arson fires to the Bureau of Indian Affairs WeTip Program that helps lead law enforcement to suspects is encouraged under local policies (*Northcoast Journal*: Weekly in the News December 5, 2002, Reed pers. com. 2007).

Steps taken to prepare against undesired fires

Proactive approaches to reducing the threat of wildfires is more a prevalent value among tribes and local communities in comparison to federal agencies who have the institutionalized foundation of fire suppression and are generally more reactive than proactive in addressing wildland fires (Everett 2002, Graham et al. 2004). The cost of “treatment per unit area” ($/acre) for fire suppression cost (reactive-emergency) are generally greater than cost compared to fuels reduction and prescribed fire treatments (proactive-scheduled). Discrepancy in treatment cost has often been a contentious point among agencies, tribes and community organization, e.g., Fire Safe Councils. Despite early US Forest Service recognition of a tribal and community supported "let burn" policy, branches of the federal government like the USDA Forest Service and DOI Bureau of Indian Affairs adopted and supported fire suppression as the dominant fire management tool. (Klamath National Forest 1928, W. Colegrove pers. com. 2005, see Appendix A, B and G: Cost of fire suppression versus other treatments).

Table7.11: Approaches to addressing wildfires. Modified from Danks (n.d.)

Emergency approach to wildland forest fires	**Community-based approach to wildfire management**	**Tribes or tribal approach to wildfire management and forest fires**
Fire as a catastrophe	Fire as a part of ecosystems	Fire as part of cultural survival and environment
Resources allocated on an emergency basis $$$$ suppression $ pre-suppression	Resources allocated on an on-going basis $ suppression $$$$ fuels and fire management	Resources allocated on an on-going basis $ suppression $$$$ fuels and fire management
Outside expertise	Local knowledge	Traditional/local knowledge
Centralized capacity to respond	Decentralized capacity to manage	Decentralized capacity to manage based on tribal needs
Mobile, specialized crews e.g. incident command crews, hotshot smoke jumpers, convict crews	Place-based, multi-purpose, fire/fuels crews e.g. brush disposal crews ecosystem management technicians	Place-based, multi-purpose, fire/fuels crews, family management areas e.g. thinning crews, families, ceremonial districts
Short-term, intense activity (capital intensive, high risk)	Long-term activities and objectives (good climate for private sector investment)	Long-term activities and objectives (natural capital, local economic self sufficiency)
Communities as victims	Communities as partners	Communities as partners and/or distracters to tribal applications.
Cultural resources as legal barriers to effective suppression efforts	Protection of recreational and scenic qualities, historical physical structures	Broad interpretation of cultural resources. Multiple concerns transcending physical, cultural, and psycho-spiritual values and uses.
Detachment or professional responsibility for environmental quality during or following wildfire event.	Concerns for water quality, fisheries, wildlife habitat, recreational use quality of fire affected area. Social and Economic values.	Concerns for water quality, fisheries, wildlife habitat, subsistence and ceremonial use quality of fire affected area. Socio-cultural and Religious values.

In the last fifteen years, various wildfires in Northwestern California have impacted the Karuk, Shasta, Yurok, Hupa, and other tribal or local communities more than others. These wildland fire events were determined to be the result of natural lightning ignitions and arson fires (USFS Klamath and Six Rivers National Forest fire history records). Table 7.12 gives general information about the wildfire and shows the extent of the area burned. Each of the fires listed affected the quality of cultural resources and had direct health effects during the events. Most of the areas experiencing higher severity were found to be correlated with former clearcuts/plantations and specifically fuel type (Key 2000, Six Rivers National Forest LMKWA 2003). Fuel type is the characterization of organic matter with live and dead vegetation susceptible to burn.

Table 7.12: Examples of Wildland fire

Wildfire:	**Year and/or dates of fire:**	**Extent and type of lands affected:**	**Burn Composite Index-vegetation Severity rating:**	**Tribal territory & Land designation**
Orleans Complex-Somes Fire	July 26-Sept. 25, 2006	15,624 acres total National Forest: Matrix, Late Successional Old Growth, Riparian Reserve, Wilderness	5697 unchanged (36.5%) 9192 low (58.8%) 565 moderate (3.6%) 170 high (1.1%)	Karuk Six Rivers and Klamath National Forests
Titus Complex-Fire	July 24-Sept. 24 2006	6272 acres total National Forest: Matrix, Late Successional Old Growth, Riparian Reserve, Wilderness	1176 unchanged (18.8%) 2934 low (46.8%) 1219 moderate (19.4%) 943 high (15%)	Karuk and Shasta Klamath National Forest
Dance Fire	2001	30 acres (12.14 hectares) Private, National Forest	70-80% High severity	Karuk, Six Rivers National Forest
Windy Fire	2000	70 acres (28.3 hectares) National Forest	Mixed severity	Karuk, Six Rivers National Forest
Megram-Big Bar complex	1999	National Forest, Reservation	Approximately 30% of the Megram Fire had greater than 70% stand mortality, as mapped 1 year after the fire. Several areas have 3-5 miles of continuous complete stand mortality within the burned perimeter	Hupa, Karuk, and Yurok. Shasta-Trinity and Six Rivers National Forest, Hoopa Indian Valley Reservation
Dillon	1994	> 11,000 hectares (> 28,160 acres) National Forest	76% low 18% moderate 6% high	Karuk, Klamath and Six Rivers National Forests
Hog/Off	1987	80,000 and 9,000 acres (32,375 and 3,642 hectares) National Forest	High to moderate severity, little area of low severity.	Karuk, Klamath National Forest

Figure 7.5 shows a variety of fuel, e.g., habitat, types that experienced differences in fire severity which burned under similar conditions. Plantations, over-stocked mixed-conifer/hardwood, and shrub-dominated areas burned more severely. Somes Fire-Orleans Complex 2006 – Six Rivers and Klamath National Forest, Severity Rating for Composite Burn Index.

Air quality and smoke effects on tribal community and firefighters

Smoke generated by wildfire events and fuels reduction projects usually differs in direct and indirect impacts to tribal community members and fire personnel (Motts study in Hoopa 1999). Wildfire and Wildland Use Fires may expand to include hundreds to thousands of hectares. Prescribed fires associated with broadcast burning for multiple objectives and/or mechanical or hand fuels treatments generally occur in smaller geographically limited areas. Most prescribed fire activities on public and private lands require adherence to regional Air Quality standards and permitting processes (Smoke Management Guidelines for Agricultural and Prescribed Burning guidelines at http://www.arb.ca.gov/smp/regs/regs.htm, accessed June 26, 2007).

Tribes are also required to develop smoke management plans (McKernan 2003, Reed pers. com. 2007). Many tribal smoke management plans explicitly mention the cultural and/or spiritual importance of using fire as a management tool and acknowledge the importance of "good" fire on the land for resource stewardship. For example, the Yurok Tribe's Smoke Management Plan adheres to the federal, state, and regional standard requirements for what are needed for mitigation and smoke impact evaluation procedures, but also acknowledges the cultural dependency on contemporary fire use (McKernan 2003). In addition the Yurok classification of fire types relates to: ecosystem maintenance, cultural, ceremonial, or religious purposes, and wildfires with limited management for health or safety are classified as Natural not Anthropogenic (McKernan 2003). These classifications were in line with FRCC which historically classified Native American fire use as part of the natural historic fires (www.frcc/gov).

Firefighter and other personnel have a higher incident of exposure to smoke compared to the general tribal community and public. Harmful effects of smoke are one of the many firefighter and public/community safety issues that have been researched (LaFee 2003 reference to Mott and other's research Hoopa Valley 1999). Native American fire personnel (fighters, supervisors, and support staff) disproportionately make up a higher percentage of the wildland firefighting workforce in the Pacific west (Shaw 2005). American Indians compose about one percent of the country's population, yet they represented about half the administratively determined (AD) firefighters of wildfires in the United States (Glenmore quoted in Harden 2004, Shaw 2005). For example, in 2004 almost 10,000 administratively determined Indian firefighters worked on wildland fires (Shaw 2005). Given this statistic, in addition to tribal residential proximity to wildlands where fires occur, American Indians as a demographic population are more likely to be exposed to wildfire smoke than others. Smoke emitted from a wildfire is similar to smoke emitted from prescribed fires (Sandberg et al. 2002). Given the tremendous need for fuels and fire management to reduce the threat of catastrophic wildland fires, the generation of smoke will be a prominent occurrence at some level during the year. Frequent yearly prescribed burns compared to infrequent large wildland fires' smoke emissions are classified differently by Air Quality Control policies (McKernan 2003). Prescribed fires are considered human management actions that can be regulated, compared to wildfires which are unregulated/unplanned activities (Sandberg et al. 2002).

Impacts to culturally significant resources

Large catastrophic fires burning across the landscape often cross multiple political and ownership boundaries (Skinner et al. 2006). In Northwestern California during the Big Bar Complex 1999, the fire moved from federal lands administered by the USFS National Forests on to tribal lands of the Hoopa Valley Indian Reservation. The Hoopa Valley tribal chairman at the time stated that the condition of the adjacent National Forest within traditional Hupa and Karuk ancestral territories threatened reservation resources and tribal members. The suppression efforts the Hoopa Tribe implemented on reservation lands to prevent the spread of the advancing Big Bar Complex-Megram fire damaged valued timber, cultural, spiritual, and other natural resources.

> "Our Reservation has also been substantially damaged by forest fires. The Megram fire of 1999 resulted in approximately 4,500 acres being destroyed through fire suppression efforts on the Reservation. About half of the damage was the result of "back burn" operations. The rest of the damage occurred through creation of a "contingency fire line." The fire line was up to 400 feet wide and approximately 11 miles long. The Hoopa Valley Tribe must not be subjected to the double hit of losing both the Hoopa escrow monies derived from timbering activities on our Reservation and having to finance the restoration and rehabilitation costs resulting from the BIA's poor timber harvest projects and forest fires. The potential application of Hoopa escrow funds to settlement costs never came to pass, instead we had to incur tremendous defense costs to protect our Reservation. The Hoopa escrow funds from our Reservation should be restored to meet the needs of our people" (Marshall 2002).

The Hoopa Tribe held the Federal government liable for those damages. The Hoopa tribe had to take proactive measures to prevent the advancing Megram fire on and across the reservation after learning the US Forest Service's contingency plan was stop the fire at the Trinity River, thus sacrificing those residences, property and resources on the east side of the river (W. Colegrove pers. com. 2005). Equity of employment wages for tribal members working on the fire was another issue (Rains n.d., L. Hillman pers. com. 2007). Tribal fire personnel working at the same capacity and skill level as federal or contract workers were being paid less. In addition to biophysical damage created by fire suppression efforts and burning, smoke carried by east winds substantially increase health risks to the adjacent Willow Creek, Hoopa Valley Indian Reservation, Weitchpec, and Orleans residents and wildlife (See smoke impacts above Motts and colleagues).

The protection of "cultural resources" versus culturally significant resources is determined by existing policies, knowledge of policy directives, interpretation and implementation of activities that affect such resources. The definition of "cultural resources" provided by Eidsness and Smith (n.d.) included with the California Indian Forest and Fire Management Council with Certified Archaeological Surveyor Training (see also the Section 106 and 110 of the National Historic Preservation Act 1966) are: "Those tangible and intangible aspects of cultural systems, both past and present, that are valued by or representative of a given culture, or that contain information about a culture; includes archaeological sites, historic structures and features, ethnographic sites, cultural landscapes, (and) collections." One researcher who examined fire effects on the Orleans Ranger District in California defines cultural resources as: "a wide variety of objects, buildings, structures, sites, districts, places, and values that were important to people in the past and often remain important today", and included "all things created and constructed by humans as well as culturally important natural resources" (Kliejunas 2005:31). Kliejunas (2005) found that the line officers and fire suppression personnel of the Six Rivers National Forest are more aware and knowledgeable of cultural resource protection issues during wildfire incidents than at other National Forests. As of the 2004 fire season, the daily Incident Action Plans for wildfire events on the Six Rivers National Forest-Orleans Ranger District included acknowledgement or management objectives related to cultural resource protection (Kliejunas 2005). During the 2006 fire season, cultural resource protection remained a prominent issue. For example: The "Benefits and Objectives" of the Orleans Complex-Somes fire reported on Inciweb on 9-1-2006 was: "Public and Firefighter safety. Hold fire in current locations on all sides. Cultural concerns remain of high importance within containment lines" (http://inciweb.org/incident/370, accessed February 14, 2007).

Destruction or degradation of physical, biological, and spiritual resources

The most commonly stated and reported effects of fire suppression on tribe and tribal communities are on cultural resources. Cultural resources are a management term that generally includes places, objects, and resource use quality or values assigned to those things important to people in the past and the present (Kliejunas 2005 and reference therein). Cultural resource management is the administration, monitoring, protection, and restoration of culturally significant resources. Many federal and state laws have been developed to protect cultural resources (Antiquities Act 1906, National Historic Preservation Act 1966-Section 106 and 110, National Environmental Policy Act 1969, Archaeological Resource Protection Act 1979), while others acknowledge the importance of American Indian access, use, protection and repatriation of those cultural resources (American Indian Religious Freedom Act 1978, Native American Graves Protection and Repatriation Act 1990). State laws govern cultural resource protection over forested industrial private timber lands. As a whole, private business or individual entities have been even less inclusive of tribal issues or concerns because of the lack of policy or law requirement to do so (Huntsinger and McCaffrey 1995, Jewett 2007).

Fire affects cultural resources in many ways; chemically, physically, biologically, socio-culturally, and economically. A report produced by Morton et al. (2003) primarily addressed impacts to tribes and tribal communities with a focus on cultural resources. Part of this study examines the relationship between acreage affected by wildfire severity and the number of cultural resources known to exist within the boundary. This approach could be useful for documentation of culturally significant sites impacted by wildfire events, but raises a number of additional issues about the completeness or definition of “cultural resources” (Morton et. al. 2003, see also Kliejunas 2005). Examples provided mention the restoration of cultural resource areas as focusing primarily on hazardous tree removal and site stabilization. Agency policies do not mandate gathering and publication of additional wildfire data in a consistent format. Additional information on specific wildfire impacts, such cultural use quality or condition of specific cultural resources, is more difficult to locate. Compiling these types of data likely requires contacting several departments within the agency (Morton et al. 2003:51). The use of wildfire severity mapping incorporating TEK and documenting impacts of wildfire on tribal members is one method of deriving more culturally appropriate data that aids in future improvement of fuels and wildfire management and can mitigate or lessen impacts to culturally significant resources in the future (Schmidt et al. 2002, Morton et al. 2003, Graham et al. 2004, Rollins et al. 2004, Agar 2006).

Cultural resources are often destroyed or damaged during fire suppression activities. For example, on the Somes Fire 2006, a large sugar pine considered a “Life” tree, important to spiritual uses of a ridge system, was cut for fire line safety and a “marker” river rock was revealed after back burning operations consumed litter and duff (Figure 7.8) shows the cut tree stump and river rock, two markers of the sacred site. The photograph also reveals the low intensity of burn the area experienced, which has caused additional questions of the actual versus real threat the Sugar pine Life tree contributed prior to back burning operations off the fire line. Great efforts were made on behalf of the Karuk heritage resources advisors to inform the Incident Command leadership, Division supervisors, sawyers, other firefighter personnel of the cultural importance and sensitivity of the area and large old-growth pines. Even though some resource and tribal heritage advisors are utilized to scout and search for cultural resources and/or develop mitigation strategies, some culturally significant resources were irreversibly damaged.

In some instances looting or vandalism has occurred by firefighters directly removing cultural objects from sites. In other instances culturally significant trees or wooden structures are felled or burned by the advancing wildfire or backfire application (author's experience on Somes Fire 2006). Unscouted or inadequately examined sites, features, or other culturally significant items have been damaged by fireline construction. The majority of entry level firefighters does not have experience in identifying cultural resource features, nor realize their duty to protect such features.

The severity, temperature and duration of burning have been shown to have varying levels of impact to various cultural resources. A greater degree of the mechanisms and effects are documented elsewhere (Kliejuna 2005, Halford 2001). Extreme shifts in temperature and moisture attributed to retardants or precipitation during the wildfire can be a factor in damaging particular types of lithic or clay items (Halford 2001, Kliejuna 2005).

Burn area emergency response (BAER) actions and activities

During wildfires, once areas are secured or burned over rehabilitation measures are initiated. Rehabilitation is conduct by a team of specialized resource specialists, agency crews, or contractors. Each federal agency or branch, USFS compared to BIA, has a Burn Area Emergency Response team for lands administered by them.

> "BAER Rehabilitation activities review of treatments and implications for culturally significant resources (vegetation, water, wildlife, and fisheries). The Burned Area Emergency Response (BAER) program address these situations with the goal of protecting life, property, water quality, and deteriorated ecosystems from further damage after the fire

> is out. Concern for possible post-fire effects on fish, wildlife, Archaeological sites and endangered species is often a primary consideration in the development of a BAER plan. BAER objectives are to: 1. Determine if an emergency condition exists after the fire. 2. Alleviate emergency conditions to help stabilize soil; control water, sediment and debris movement; prevent impairment of ecosystems; mitigate significant threats to health, safety, life property and downstream values at risk. 3. Monitor the implementation and effectiveness of emergency treatments. BAER is "first aid" – immediate stabilization that often begins before a fire is fully contained. BAER does not seek to replace what is damaged by fire, but to reduce further damage due to the land being temporarily exposed in a fragile condition." (www.nifc.gov/BAER/Page/NIFC_BAER.html).

Separate BAER teams are often convened for reservation lands under the DOI-BIA, and non-reservation federal lands under the USDA-USFS (Morton et al. 2003, and author's involvement with the Megram Fire 1999). Rehabilitation efforts across political boundaries in a rugged burnt-over forested landscape can be administratively challenging. Post-fire research has demonstrated that BAER seeding of grasses and erosion control measures may prevent natural establishment or rejuvenation of native vegetation (Kaufman pers. com 2001, Hunter et al. 2006, Noss et al. 2006). For example, many types of lilies (*Lilium* spp.) or other forbs and shrubs used as traditional foods, materials, or medicines and important wildlife forage can be suppressed by erosion control measures (personal observation). BAER work, e.g., laying slash across firelines, to rehabilitate fire lines which overlay tribal subsistence trails can disrupt future use and travel feasibility to post-fire resources (game, foods, and materials). The standards of rehabilitation may differ between federal agency personnel and tribes or tribal practitioners. For example, clearing of burned live or dead trees around sacred sites may enhance cultural use quality by providing line of sight to other sacred sites on distant ridges and peaks. Emergence of springs or increased flow of surface water bodies may increase soil moisture leading to erosion or landslides (DeBano et al. 1998, Meixer and Wohlgemuth 2003). Stabilization of sites could be contentious or may further disrupt cultural use quality if there is insufficient consultation with tribes and tribal practitioners. Tribal values related to post-fire condition and use quality may not likely be adequately addressed by criteria developed with the initial appraisal methodology of wildfire damages, benefits, and resource values to be protected (Crosby 1977).

Post fire salvage logging: Tribal views and values

Tribal communities are often more supportive of post-fire rehabilitation that incorporates salvage logging of fire-damaged trees than the general public (Mason 2005, Sessions 2005). Many tribal community members value quick and efficient utilization of fire affected resources, whether basketry shoots or saw logs. While Native Americans may mourn the loss of culturally significant natural resources and places damaged by wildfire, they also seek opportunity where it exists. Tribes with a reservation, such as the Hoopa Valley Indian Reservation and the Yurok reservation, have the potential for salvage logging of fire-damaged trees more promptly than the federal National Forests land due to reduced potential for environmental litigation. In addition to revenue from salvage logging, reservation tribal governments may be compensated or be eligible for federal financial assistance from Federal Emergency Management Agency. FEMA’s lack of familiarity with working with tribal governments and delays in payments that hamper tribe’s rehabilitation efforts are common problems (Pechuli 2003). Another issue may be difference in local tribal values compared to forestry reforestation guidelines regarding replanting. Some Yurok tribal members have expressed concerns about not replanting with conifers but instead with native grasses and forbs in areas following logging because those areas were formerly prairies or more open oak woodlands (Reed pers. com. 2007).

Litigation of federal fire and timber management plans and projects for National Forests reduces opportunities for fuels and fire management in comparison to Indian reservations (see *Evergreen* Winter 2005/2006 issue). The feasibility of project implementation for fuels management, prescribed fire, wildland fire use and fire suppression programs can be different between federal national forest lands compared to Indian reservation lands (*Evergreen* Winter 2005-2006, Intertribal Timber Council reports, Journal of Forestry issues on tribal forestry). Tribal community priorities for fuels and fire management can be similar for a geographic area, for example northwestern California, due to cultural affinity of resource uses. Necessary steps and the ability of the various fire management programs to develop fire and fuel management plans differ between federal USDA Forest Service National Forest and DOI Bureau of Indian Affairs/Tribal Governments. Differences have arisen from former federally mandated approaches to the development plans between the two branches of federal programs, as well as the implementation of plan goals and objectives (Resource Innovations 2006 and references therein). Recent national policies aimed at integration, coordination, and collaboration have improved some aspects of fuels and fire management, but mismanagement or misuse of mandates have potential to jeopardize ecosystems (National Fire Plan 2000, Healthy Forest Restoration Act 2003, Tribal Forest Protection Act 2004, Resource Innovations 2006).

Approaches needed to improve relationships with tribal communities

Lynn and Gerlitz (2006) make reference in the "Roles and Recommended Action" section of their report for the need of federal agencies to improve the understanding and implementation of socio-cultural and economic factors and increase resource allocation to rural low-income and low-capacity communities. Specific reference is made to: the identification and use of socio-cultural, economic and ecological indicators for assessment and evaluation processes which aid decision-making; inclusion of low-income residence in Wildland Urban Interface zones; development of performance measures which foster the ability of federal and state agencies, or tribal governments to evaluate the benefit of fire assistance programs for low-capacity communities; the overall engagement of rural low-capacity community members in the planning for wildfire preparedness; and call to action for low-capacity communities to engage and be proactive in identifying and defining their needs to improve capacity (Machlis et al. 2002, Lynn and Gerlitz 2006,). Research that assisted in the identification of the needs for tribes, tribal organizations, and tribal community should have additional developments of what their priorities or strategies are for addressing these fuels and fire manage issues (Resource Innovations 2006, Chapter 8).

Conclusion

The effects of fire suppression on tribes and culturally significant habitats have resulted from an accumulation of many different events and associated secondary circumstances. Direct and indirect impacts of fire suppression on tribes have resulted from social, policy, economic, and ecological factors. Each factor as an isolated event may be relatively small, but the gradual accumulation or synergistic effect of many events has taken its toll on tribal communities and culturally significant resources they depend on. Compared to the general American public tribal communities in northern California have been affected by fire suppression policies and actions, whether in changes in habitat use quality or negative impacts on subsistence and religious practices. Additional research cooperatively conducted with tribes or tribal organizations are needed to properly identify their issues on their terms, as well as having partners honor and respect tribal approaches to management (Machlis et al. 2002).

Figure 7.1: Lower Mid Klamath Watershed Analysis Fire Regime Condition Class

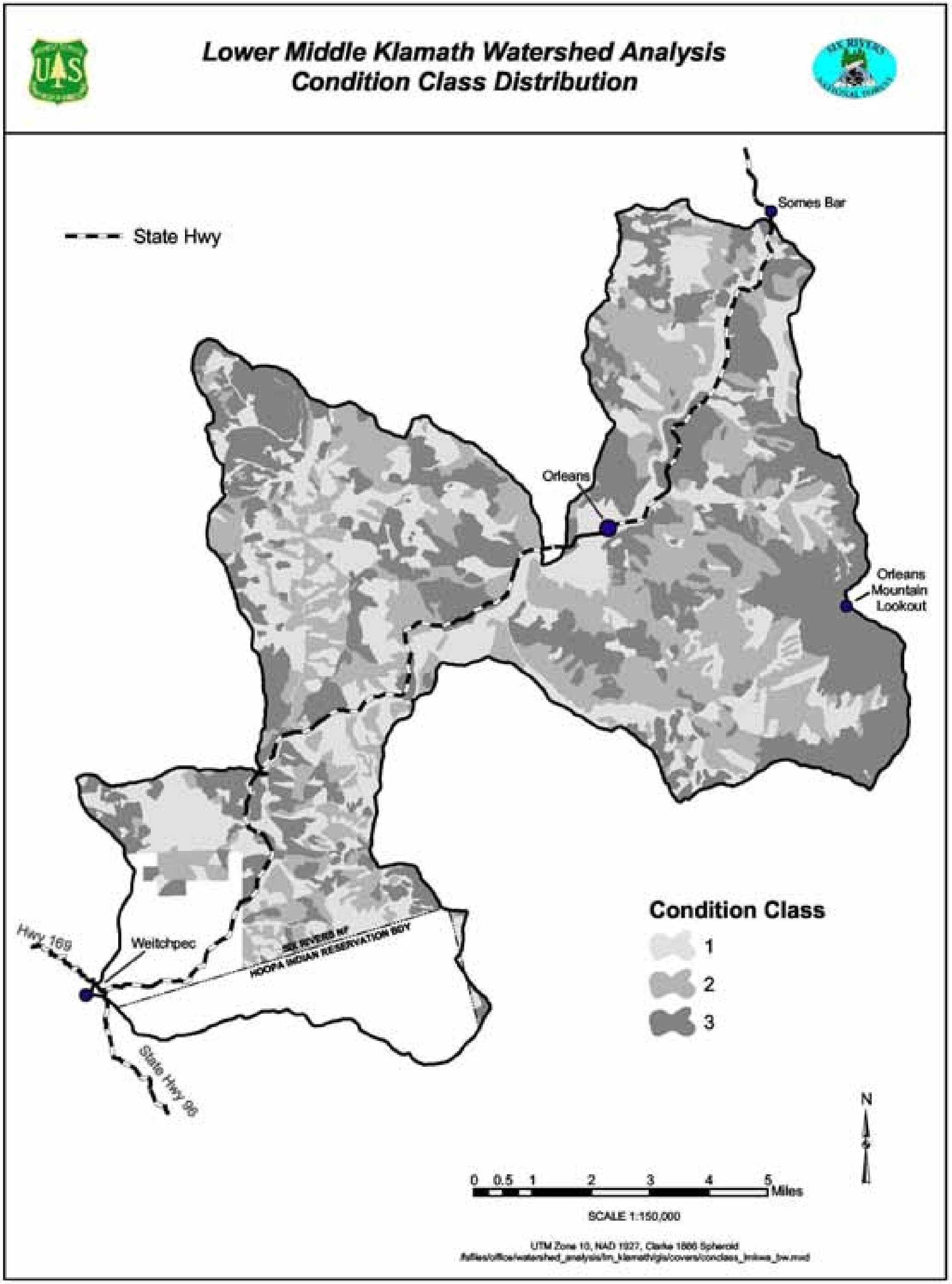


Figure 7.2: Map of lower mid-Klamath River with Karuk Villages, traversable ridge systems and fire ignitions.

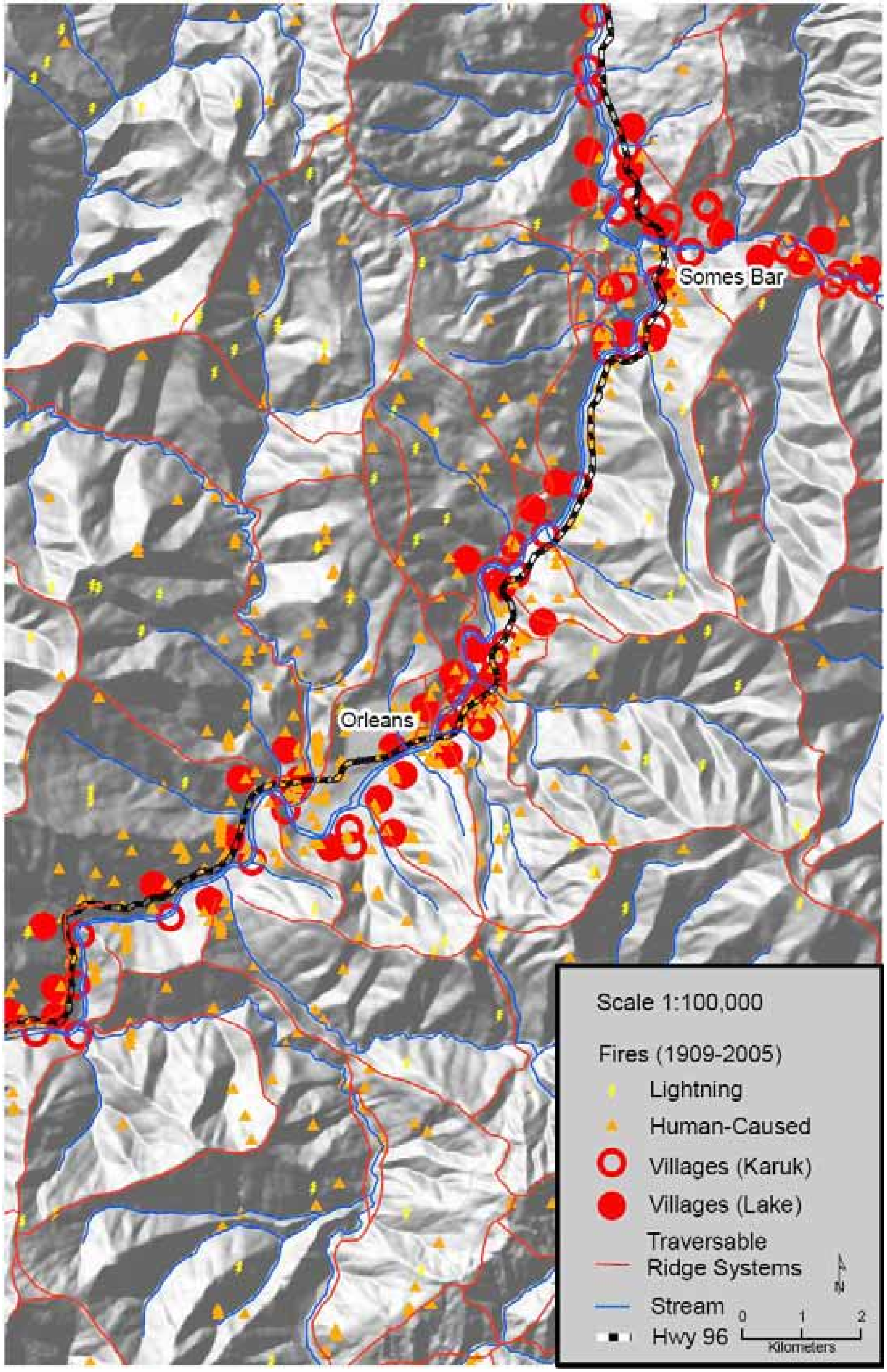


Figure 7.3: LANDFIRE FRCC for the Lower-Mid Klamath River for case study area

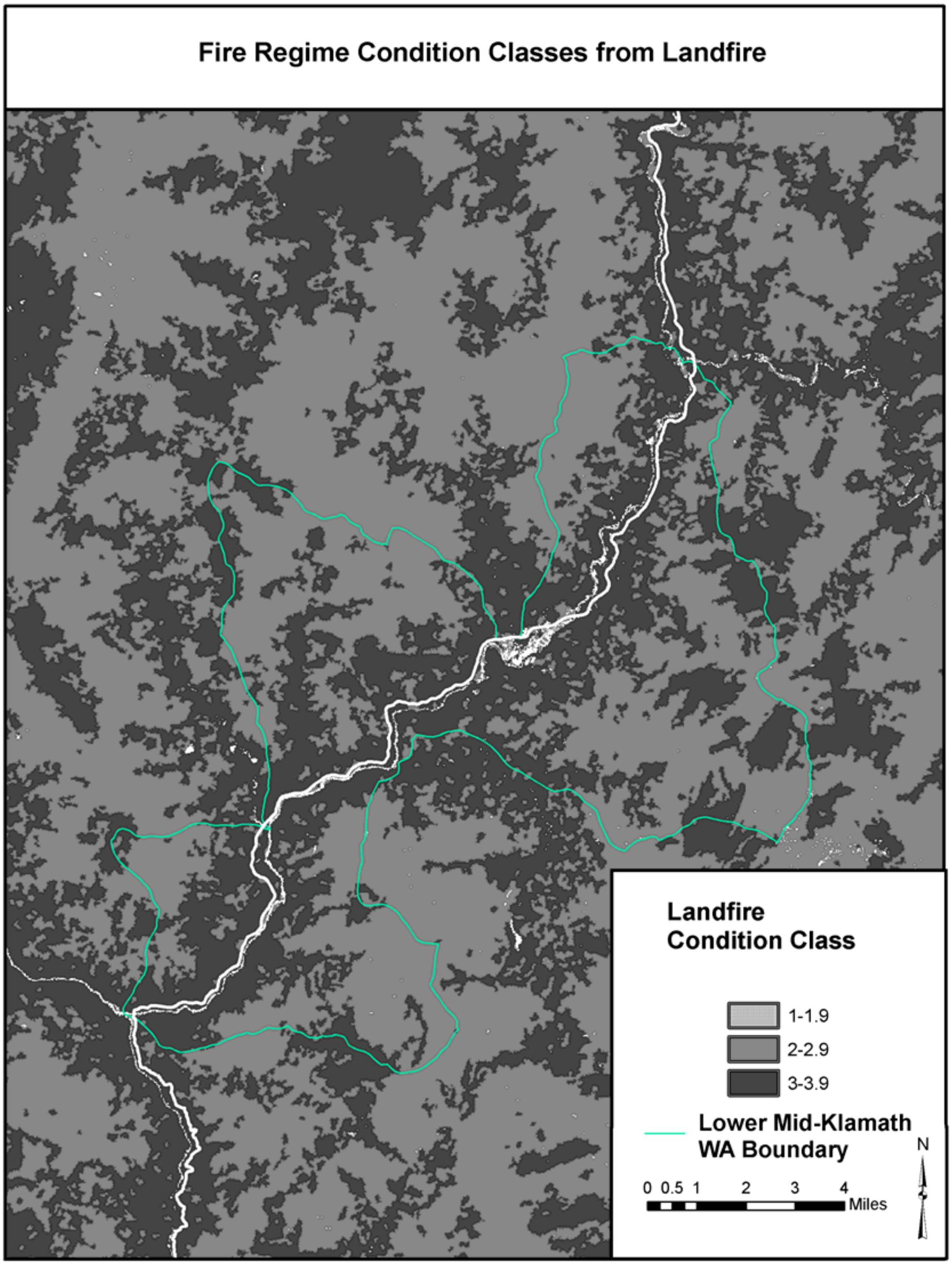


Figure 7.4: Fire Regime Condition Class by fire return interval for the Lower Mid-Klamath.

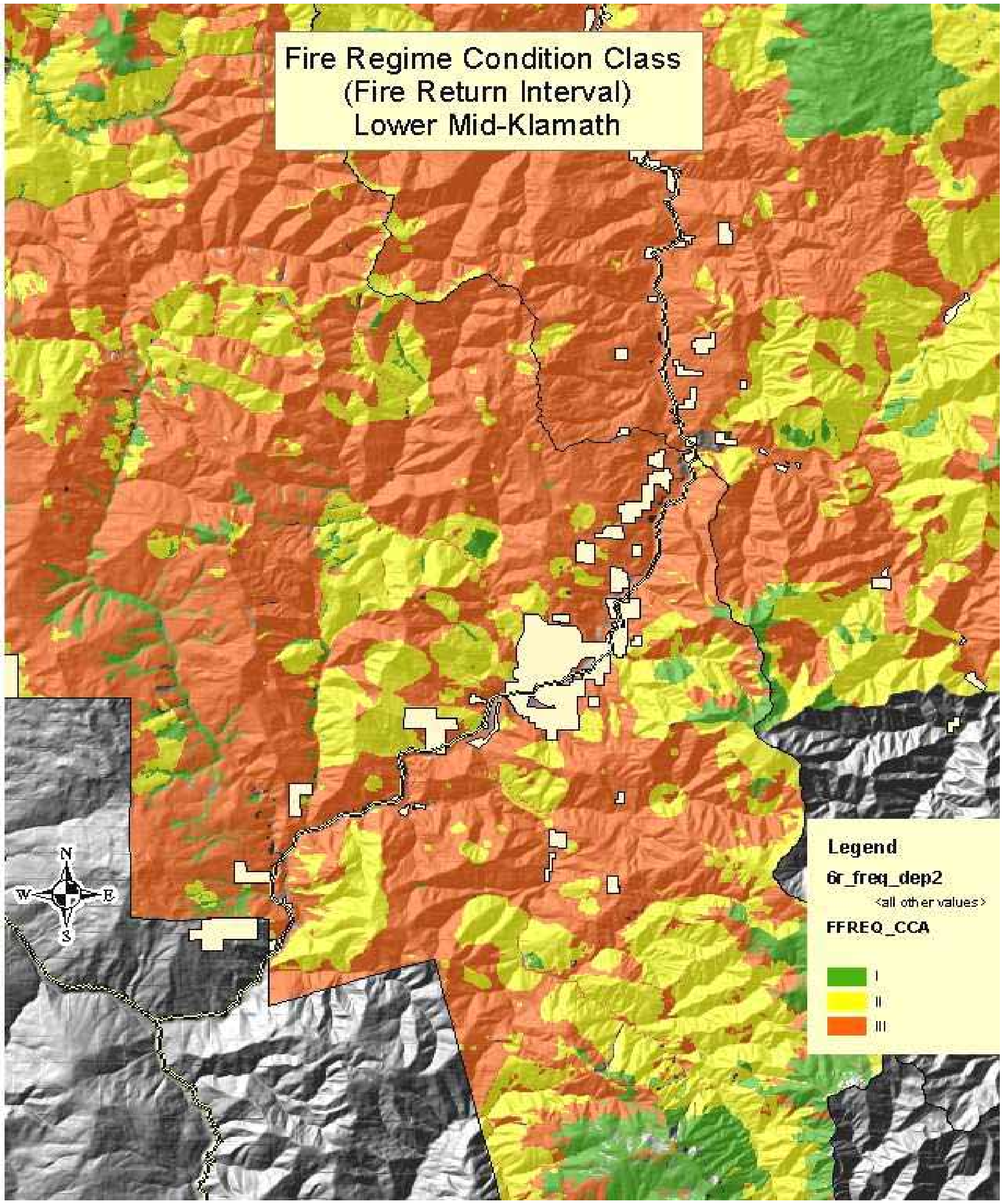


Figure 7.5: Spatial patterns of wildfires within the case study area

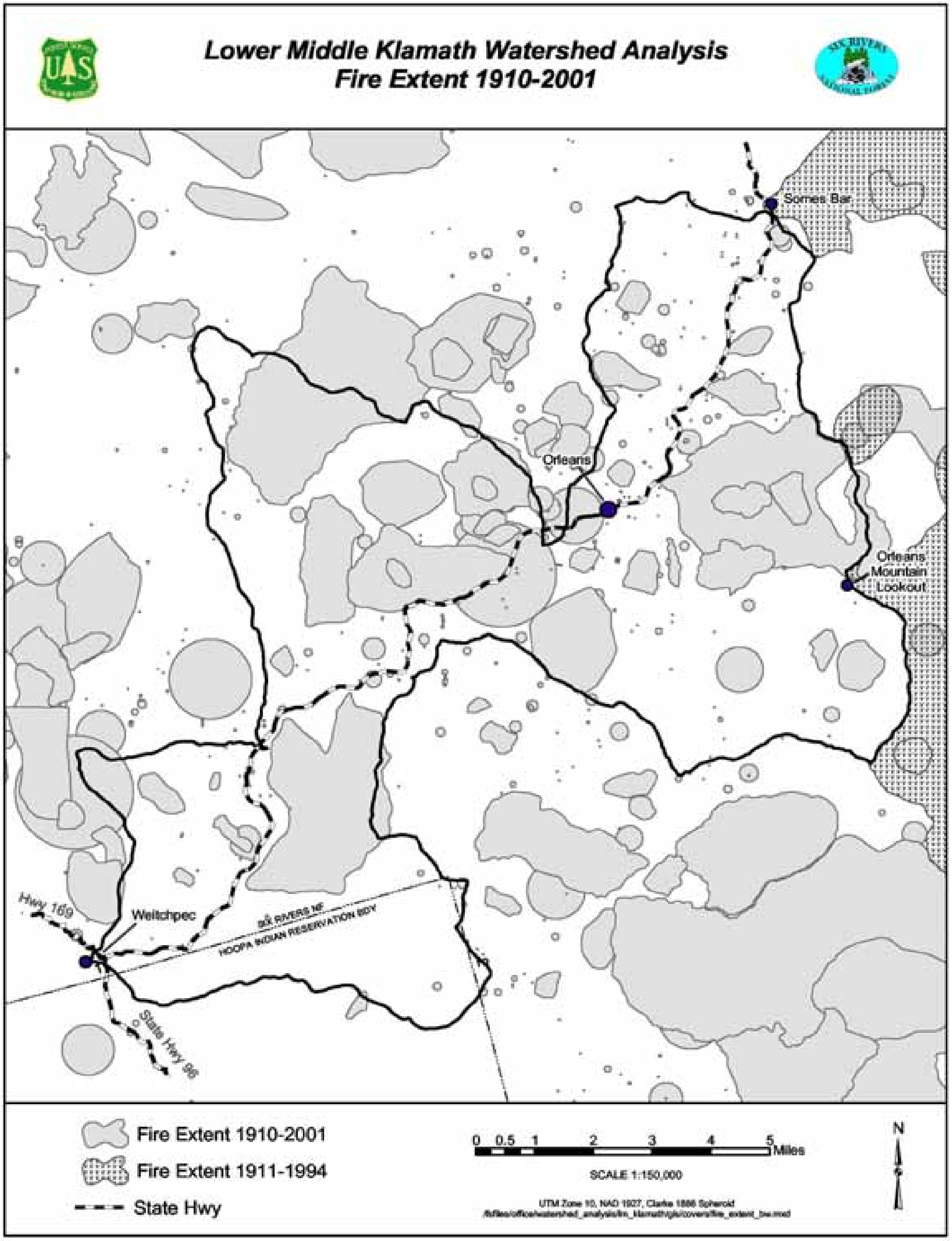


Figure 7.6: Marshalls breaking camp at Trinity Summit. Photograph by Pliny E. Goddard 1901. Contributing Institution: Phoebe Hearst Museum of Anthropology

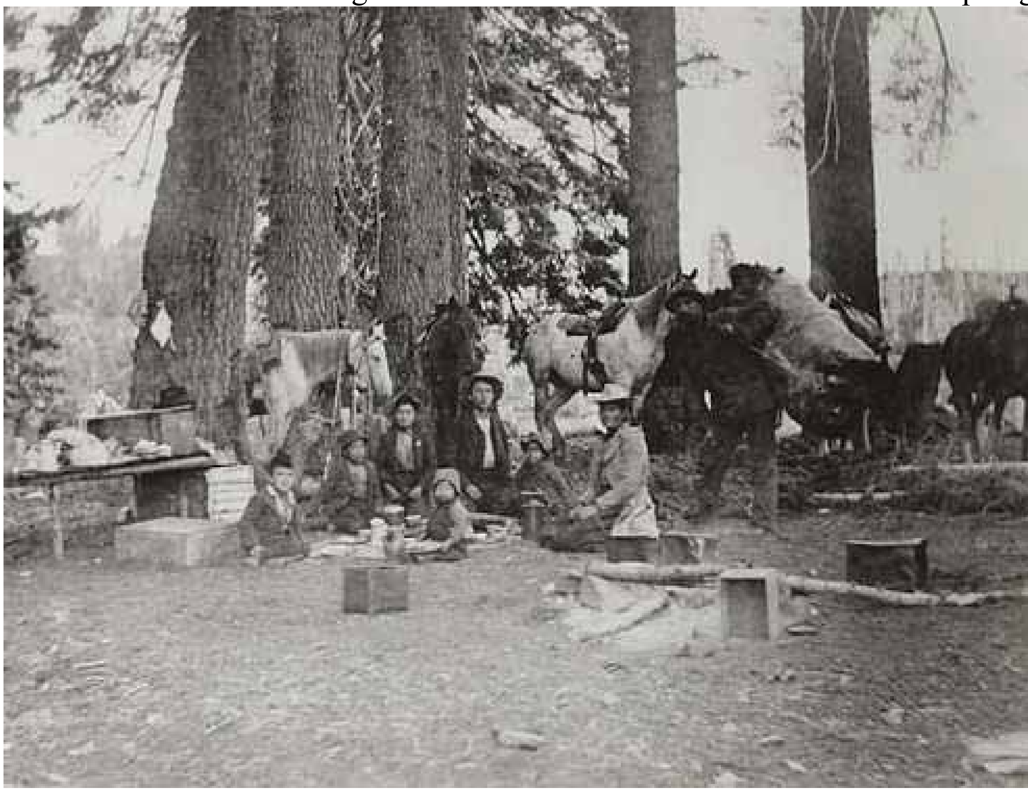


Figure 7.7: Somes Fire Severity Rating for Composite Burn Index

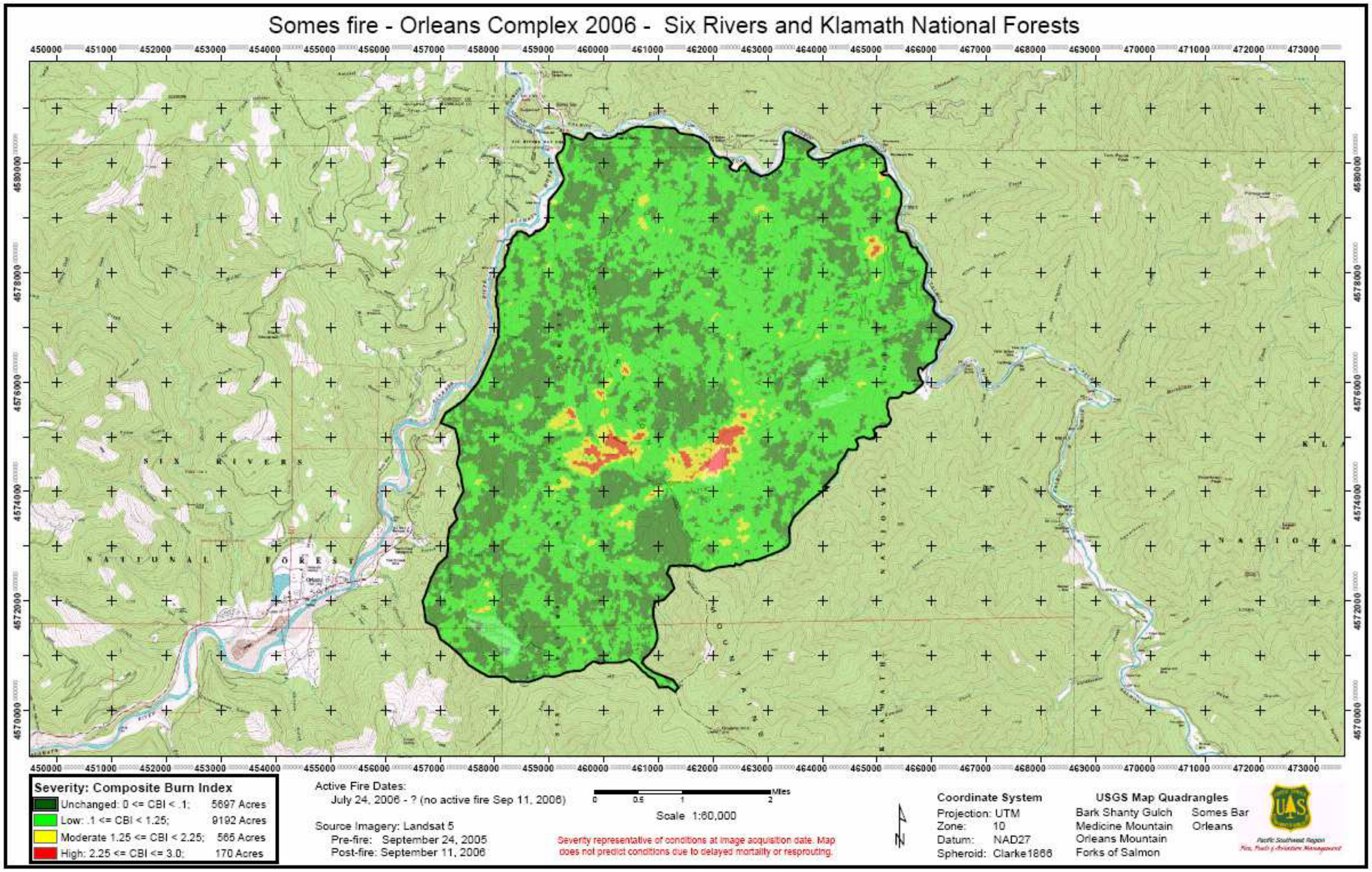


Figure 7.8: Somes Fire Karuk spiritual cut Life tree and marking rock

Chapter 8: Tribal priorities, recommendations, and applications to incorporate Traditional Ecological Knowledge

Introduction

This chapter discusses tribal priorities for fuels and fire management and suggests research needs or management recommendations that would benefit tribal people of the Klamath-Siskiyou bioregion. General considerations related to economics and ecosystem goods and services pertaining to sustainable management practices are addressed. General findings and recommendations associated with research topics are presented as closing remarks.

Tribal Priorities for Fuels and Fire Management

Tribal priorities for fuels and fire management vary from being similar to the general public depending on particular issues, to being very different (Dombeck et al. 2004, Colegrove 2005, Salberg 2005). Tribal priorities, as well as those of the public, are based on values (Dombeck et al. 2004, Graham et al. 2004, Colegrove 2005, Olsen and Shindler 2007). The ranking or importance of values corresponds to how fuels and fire management affect use of natural resources. Tribal priorities and values associated with fuels and fire management in northwestern California differ historically from those non-tribal perspectives and values. As stated by the Institute for Natural Resources (2004:30):

> "Recognition of Native Americans' role in shaping western landscapes is becoming more widespread, and managers are looking to traditional uses of fire for insight during development of management alternatives and recommendations aimed at cultural and resource preservation, as well as economic development opportunities."

Tribal priorities for fuels and fire management were drawn from ethnographies, oral histories, community-based organization information, government and tribal documents, and synthesized research (Six Rivers National Forest interviews, Karuk Salmon River Tribal Module 1996, Karuk Tribe/Cultural Solutions 1999, Klamath National Forest-Ukonom WA 1998, Hoopa Fuels Management Plan 2006). Methods of subject organization (fuels management, prescribed fire, wildland fire policies) and related issues (co-management, consultation and incorporation of TEK, tribal implementation responsibility, and capacity issues) are offered.

The ecological and socio-cultural scale of fuels treatments and fire affect tribal uses of culturally significant habitats. Federal land manager priorities of treatments may differ from that of tribal practitioners (Dombeck et al. 2004). Randomized landscape-level treatments proposed by modeling exercises are unlikely to reflect patterns on areas with historically less fuels or other site specific considerations (e.g., Strategically Placed Landscape Area Treatments [SPLAT] used with Fireshed modeling compared to historical village areas and traversable ridge systems) (McDaniels 2006, Bahro et al. 2007, Six Rivers National Forest Interviews, M. McCovey pers. com. 2002, and Hillman pers. com. 2002).

Differences in elevation and distance from river corridors are other important aspects in the gradient of lightning versus anthropogenic ignitions (Busam 2006, Chapter 3 and 7). A valuable tool for northwestern California would be to use methods that can more accurately map lightning/human-caused wildfires occurrence reducing uncertainty of ignitions (Amatulli et al. 2006). Prioritized treatment of specific areas will likely reflect policy mandates (National Indian Forest Resource Management Act 1990, National Fire Plan 2000, Healthy Forest Restoration Act 2003, Tribal Forest Protection Act 2004), public, and tribal values (Dombeck et al. 2004, Bright and Burtz 2006, Brunson and Shindler 2005, Colegrove 2005) that federal land managers must implement (Table 8.1; also Appendix A and B).

Table 8.1: Tribal priorities value ranked by type of activities

Resource	**Perceived-current condition(s)**	**Desired condition(s)**	**Tribal priority value rank**	**Feasibility of implementation due to capacity, funding or federal agency priorities.**
Reduce fuels along access/egress routes (roads)	Increased hazard to suppression and control effort and evacuation. Reduce quality of cultural resources and recreational functions.	Reduce canopy, ladder and surface fuels out to 300 feet along each side of road. Enhance access to culturally significant resources (gathering and hunting). Underburn	High	High: Increased safety. Ecologically, economically and socio-culturally more accepted and desired. Easier access and implementation for most areas. Multiple benefits.
Timber harvest and	Over dense stands of conifers and	Silvicultural systems which minimize	High	High: Stewardship contracting and

commercial thinning	hardwoods threatening desired culturally significant habitat access and use qualities.	impacts to other resource values.		agreements to remove economically profitable biomass, in which excess funding can be used to treat higher cost valued areas.
Reduce competing fuels around basketry plants: hazel and beargrass.	Conifer and shrub cover encroachment reduces use quality and increases hazardous fuels.	Mechanical and manual treatments to reduce canopy cover, ladder and surface fuels. Prescribe burn at required season and frequency (3 to 5 years).	High	High: Commercial logging and/or Stewardship agreements with tribes to implement. Small diameter utilization.
Large fire-resistant Black oaks, oak regeneration, and open understory	Degraded habitat quality, stands too dense, ladder fuels and conifer encroachment.	Restoration of Black oak dominated forest with open understory of herbs, grasses, and hazel for basketry.	High	High: Commercial logging with Stewardship contracting. Small diameter utilization. Firewood access.
Reduce conifer encroachment and ladder fuels around mature tanoaks.	Conifers out compete acorn trees, higher fuels increase severity and mortality. Acorns and foliage infested with pests.	Remove conifers around acorn trees, thinning of multiple stems, pile burning followed by broadcast burning.	High	High: Commercial logging with Stewardship contracting. Small diameter utilization. Firewood access.
Clear fuels and open understory along mainline ridges historically used as trails and travel routes.	Plantations, road vegetation barrier strips, and densification allow fire spread.	Reduce canopy and surface fuels on upper plantation margins, roads, and strategic ridges. Reconstruct trails for cultural and fire management.	High	High: Commercial logging with Stewardship contracting. Small diameter utilization.
Treat fuels around residence: Wildland Urban Interface	Overstocked suppressed conifers and brush increases fuel load.	Mechanical and manual treatments to reduce ladder and excess surface fuels. Pile and patch burn.	High	Moderate: Little value in thinning material generated. Equipment restrictions, increase labor cost. Safety concerns are of high importance.
Appropriate management response during wildfire events	Damage to culture resources and significant habitat quality by fireline and safety zone construction. Backburn ignition patterns.	Increase manual treatments of firelines. Ignition pattern backing from firelines. Utilizing natural and human barriers to reduce or control wildfire intensity.	High	Moderate: Federal agency institutionalized structure and operational procedures hinder site or area specific approaches under extreme wildfire conditions.

Restore White oak dominated prairies	Conifer and shrub encroachment reduces wildlife habitat and foods.	Expand extent of prairies and white oaks. Burn every 3-5 years.	High	Moderate: Commercial logging with Stewardship contracting. Small diameter utilization. Firewood access.
Treat conifer plantations to favor hardwood regeneration	Overstocked suppressed conifers and hardwoods increase fuel load.	Reduce conifer density, favor larger hardwoods, and reduce stems. Pile and patch burn.	High	Low: Little value in thinning material generated. Steep terrain, increased labor cost. Will lessen wildfire severity.
Reduce fuels in burned areas	Increased hazard with former fire killed or injured trees with dense growth.	Mechanical thinning if necessary. Periodic prescribed fire for cost effect treatments to reduce fuel accumulations.	High	Low: Areas have lower continuity of fuels, and are less in departure for fire return intervals according to western science.
Follow up treatments to maintain or correct actions associated with Burn Area Emergency Rehabilitation.	Damage to cultural resources or culturally significant habitats or use quality. Invasive exotic species control. Repatriation of cultural resources.	Trained tribal and federal agency hand crews working carefully in designated areas. Manual removal or control of invasive species.	High	Low: Funding for restoration and maintenance of formerly burnt areas low. Limited funding for locating and removal of invasive or exotic species.
Reduce fir encroachment in pine dominated stands.	Overstocked suppressed conifers and hardwoods increase fuel load.	Reduce true fir conifer density; favor larger sugar and Ponderosa pines, density. Pile and patch burn.	Mod.	High: Commercial logging with stewardship contracting. Small diameter utilization. Firewood access.
Reduce fuels and reintroduce fire around low elevation ceremonial – village sites.	Conifer and shrub cover encroachment reduces use quality and increases hazardous fuels.	Mechanical and manual treatments to reduce canopy cover, ladder and surface fuels. Prescribed burn at required season and frequency (3 to 5 years).	Mod.	Moderate: Mechanical and manual treatments. Cultural resource protection requires some equipment restrictions, increase labor cost.
Manually thin willow and/or broadcast burn river terraces.	Lack of peak flows to disturb and rejuvenate willows. Pest infestations.	Manually reduce older mature willows, pile or broadcast burn river terraces or patches. Control invasive weeds.	Mod.	Low: Manual treatments. Aquatic/riparian resource protection for equipment restrictions, increased labor cost.
Thin trees and vegetation around prayer sites to restore traditional	Conifer and shrub encroachment obscures access and view quality to distant places.	Tribal crews work with Federal/State agency specialists to implement treatments.	Mod.	Low: Manual treatments. Wilderness equipment restrictions and

view-sheds.		Reconstruct access trails, prayer alter.		associated increases with labor cost.
Reduce fuels on Offield Mt. and reinstate ceremonial burning.	Conifer and shrub encroachment obscures access and increases hazardous fuels.	Tribal crews work with Federal/State agency specialists to implement treatments. Reconstruct access trails, prayer alter, and fuel breaks.	High for Karuk, low for other tribes.	Low: Manual treatments. Cultural resource protection for equipment restrictions, increase labor cost.
Reduce fuels and burn outside of riparian zones with yew trees.	Degraded habitat quality, stands too dense, ladder fuels and conifer encroachment.	Mechanical and manual treatments to reduce canopy cover, ladder and surface fuels. Low intensity prescribed burn at required season and/or frequency.	Mod.	Low: Manual treatments. Aquatic/riparian resource protection for equipment restrictions, increase labor cost.
Reduce conifer encroachment and burn montane meadows.	Conifer and shrub encroachment reduces wildlife forage quality.	Tribal crews work with Federal/State agency specialists to implement treatments and burning. Reconstruct trails or camps around edge of meadows.	Mod.	Low: Manual treatments. Wilderness equipment restrictions increase labor cost. Burning difficult.
Allow torching in pockets of pitchy trees in brush fields.	Overstocked suppressed conifers and brush increases fuel load. Beetle infestations.	Reduce true fir conifer and brush cover density, favor early seral stages. Pile and patch burn.	Low	Low: Manual treatments. Wilderness equipment restrictions increase labor cost.
Reduce fuels and burn outside of mushroom collecting sites.	Overstocked suppressed conifers and hardwoods increase fuel load.	Mechanical and manual treatments to reduce ladder and excess surface fuels. Low intensity prescribe burn at required season and/or frequency to reduce litter but maintain duff.	Low	Low: Little value in thinning material generated. Steep terrain, increased labor cost.

Some US Forest Service personnel are concerned that tribes cannot effectively implement the management responsibility requested (Anonymous pers. com. 2006). Tribal representatives have acknowledged their need for increased professional capacity in some disciplines to fulfill desired land management implementation strategies (Resource Innovations 2006). Adequate funding, technical support, and authorization for the development and implementation of prioritized projects of tribal eco-cultural/forest management plans, and Integrated Resource Management Plans are needed (Moriarty et al. 2005, Tripp pers. com. 2006). Improved inclusion of tribal and tribal community members into fuels reduction, fire management, and wildfire activities can provide substantial opportunities for economic and educational capacity building (Rasmussen 2005, Colegrove 2005, Olsen and Shindler 2007).

The Fire Program Analysis (FPA) system is a method of providing opportunities for inclusion of tribal values and priorities for fuels treatment and fire management (Resource Innovations 2006). The FPA system is an interagency process for planning and budgeting fire management, and to assess the effectiveness of "alternate fire-management strategies" to achieve management goals and objectives (Resources Innovations 2006). Some aspects of the FPA process may be addressed by existing or draft tribal management plans. For example, the Hoopa Valley Indian Reservation's Forest Management Plan (Colegrove 2005), and the Karuk Tribe of California Eco-cultural Management Plan (Karuk Tribe Draft 2007) were guided by tribal values and western science. A new online decision-support model Comparative Risk Assessment Framework and Tools (CRAFT) has been proposed by USDA Forest Service-Pacific Southwest Research station as system to incorporate fire risks and communities values. The CRAFT model uses the Megram-Big Bar 1999 wildfire as a case study example (Lee et al. 2005), yet similar to other research findings or application tools it fails to reference utility for tribal community applications.

Priorities for fuels and fire management differ between tribes and non-tribal entities can be similar at broad levels but often increase at more localized levels (Dombeck et al. 2004, Colegrove 2005, Salberg 2005). Similarities exist with respect to reducing conifer encroachment, ladder and surface fuels, as well as treatments within the Wildland Urban Interface (WUI) for residences but different in favoring hardwoods, wilderness/roadless area management for subsistence or recreational use or sacred site protection. The differences relate to socio-cultural utilization of natural resources for tribes versus recreational or scenic quality for the non-Indian public. Table 8.2 depicts some of the similarities and differences between "tribal" and the "public." These comparisons are a generalized presentation, and should be evaluated across a continuum of similar to different values associated with use of natural resources.

Table 8.2: Relative ranking systems of issues for prioritization of treatment areas

Issues	**Non-tribal prioritization**	**Tribal prioritization**	**Explanation of differences**
Wildland Urban Interface (WUI) treatments.	High: Protection of life and property values.	Moderate: Protection of life and property vs. subsistence or religious uses.	Public and tribal values for protection of life and property vs. tribal values of management of adjacent environment for all species.
Conifer encroachment.	Moderate: Increased benefits.	High: Increased benefits.	Public views conifers as a timber economic resource vs. tribes as timber degrading valued hardwood and grassland habitats.
Ladder and surface fuels.	Moderate: Increased carbon storage and soil productivity.	High: Increased valued wildlife habitat and cultural uses.	Public views for regional/global carbon emissions vs. tribal local value of fire nutrient cycles and hydrology.
Wilderness-roadless areas.	Moderate: Protection of wildlife habitat.	High: Active management of wildlife habitat.	Public views for bioregion conservation vs. tribal values for total landscape management
Post-fire salvage logging.	Moderate: Differences in values of need for ecological vs. economic.	Moderate: Differences in value of need for cultural use quality vs. economic.	Public and tribal views vary with values ascribed to protection of ecological condition or economic gain compared to potential future use of salvage logged areas.

Comparison made in Table 8.2 are for discussion and do not reflect statistically valid sampling of the general public and tribal populations of northern California. However, in Montana, a comparison of the general population to a tribal community that participated in a "willingness to pay" for fuels reduction found no statistical difference between the two groups (Gonzalez-Caban et al. 2006--in press).

Similarities can be easier to address than differences because of their broadly defined goals. Differences, however, arise when the degree of various values pertaining to the habitat or condition of vegetation to satisfy cultural uses is considered (Colegrove 2005). Tribal values and priorities for restoration have remained fairly consistent over the last decade. In 1996, the Karuk Tribe stated their Restoration priorities as:

1. Ridges and Riparian zones,
2. Late Successional Resources, Special Cultural Resource Areas/Sacred Sites and Other Special Habitats,

3. Matrix or General Forest Stands Prioritized by Slope, Aspect, Elevation, and Soil Type.

Each of these priorities has "Restoration Prescriptions" that detailed more specifically the culturally significant features or associated values (Karuk Tribe 1996).

The Karuk Tribe's Cultural Environmental Management Practices "should be whenever possible, combined, interconnected, or systematically prioritized at the watershed scale in order to achieve landscape-level restoration of natural disturbance regimes" (Karuk Tribe Draft Eco-cultural Management Plan May 14, 2007:64). Management practices are prioritized below for the reduction of fuel loading for:

1. Tan Oak Stands,
2. Previously Managed Stands (Plantations),
3. Along Key Ridge Systems Interconnecting Reasonable Control Features,
4. Riparian Areas and Drainage Headwalls,
5. Burned Areas,
6. Adjacent to Homes (Wildland Urban Interface),
7. Along Forest Roads (access/egress and ridge system routes)
8. Fire Suppression Preparedness Work/Rest and Mobilization,
9. Post Fire Suppression Rehabilitation Activities (former Burn Area Emergency Rehabilitation areas),
10. Timber Harvest as a Means of Reducing Fuel Loading and Ensuring Ecological Diversity, and
11. Appropriate Management Response during wildland fire events, with others to be added (Karuk Tribe May 14, 2007: 64-84).

Each management practice includes resource objectives and management indicators that provide specifics about the importance of why a practice should be implemented to restore or maintain culturally significant species or habitats.

Additional research needs and recommended management direction within existing laws and policies are needed to fully include tribal concerns related to fuels and fire management. Many of the practices addressed by Cultural Environmental Management Practices are and can be supported by science. With other components of those practices, TEK can be cooperatively incorporated with western science to model, experimentally test, and evaluate their effectiveness in achieving desired resource objectives. Potential future applications for the incorporation of TEK may exist for mapping fuels and fire regimes of culturally significant habitats (Rollins et al. 2004, Karjala et al. 2004).

Sustainable fuels and fire management practices of the Karuk, as with other tribes, are achievable by restoration of human-interacted natural fire regimes (Chapter 2 and 3). Tribal approaches to restore the structure, composition and functions of culturally significant habitats affected by fire suppression consider multidimensional approaches to incorporating traditional and contemporary values (Baker 1994). Restoration involves facilitating the maintenance of ecological processes, and also the human relationship with those processes (Senos et al. 2006). Similar to historical tribal family use areas and cultural-spiritual management responsibilities, contemporary tribal people would be authorized to burn areas at certain times of the year when conditions are favorable to desired fire behavior and effects. This tribal community-based approach to fuels and fire management has been resisted by federal land and fire managers who predominately control or oversee landscape-level fire uses.

Incorporation of tribal community-based fire management systems (e.g., tribal practitioners burning where and how they wish) has encountered resistance from federal fire managers and fire-qualified personnel. Currently, on National Forest Lands, National and State Park lands and Native American reservations, some forms of cultural burning by tribal community members that is not permitted (having an approved burn plan or Regional Air Quality Board and California Forest and Fire Departments permits within particular seasonal restrictions) is considered arson under federal law. In addition, many fire managers and firefighters have a pro-fire suppression mentality instilled in them during their training. Aspects of their responsibilities also separate them philosophically from many tribal community members regarding fire uses. Exceptions may exist with tribal or local community members, who hold personally cultural values in support of one philosophy, but professionally or societally have to adhere to another policy's philosophy.

<u>Economic considerations and tradeoffs</u>

Although prescribed fire is interaction with fire *per se*, it does not have the economic incentive or urgency of wildland fire suppression. In addition, prescribed fires usually do not require overtime or hazard duty pay as well (National Finance Office). Another factor related to cost is the effectiveness of treatments for the amount of money spent on prioritized areas. Several studies have examined the cost of fuels treatment and report that Wildland-Urban Interface (WUI) treatments generally cost more per area treated (Amacher et al. 2005). WUI treatments in response to urban sprawl also have other impacts to biodiversity and attainment of larger landscape fire-biodiversity objectives (Noss et al. 2006).

> "A major complication to science-based forest and fire management is the rapid increase of the wildland-urban interface (WUI), a result of urban sprawl…WUI areas may require fuel reduction and fire management policies that are inconsistent with maintaining the biodiversity of those sites, even though carefully tailored treatments can maintain some aspects of biodiversity. An expanding WUI fragments landscapes, introduces invasive species, and may be a source of uncharacteristic fires; all of these lead to ecological impacts that extend well outside the WUI itself." (Noss et al. 2006:48).

Differences in "project implementation effectiveness per unit area cost" vary between government crews and contractors (Donovan 2005). Biophysical factors such as location, distance to access roads, slope and terrain, and vegetation type all affect treatment cost (Berry et al. 2006). Similar factors affect the cost of fire suppression and wildland fire use (Donovan 2005). Incorporation of tribal values and practices may initially increase cost per treatment area, but will likely foster self-regulation and maintenance of ecological processes (Karuk Tribe Draft 2007). Table 8.3 shows the relative cost between fire suppression, fuels reduction and prescribed burn for the 1920s to 2000s.

Table 8.3: Cost comparison of treatment per area

Treatment type	Time period	Cost per area estimate	Source of information
"Controlled" Prescribed fire	1928	$0.35 to $1/acre.	Klamath National Forest 1928
Thinning and	2005	$850/acre, $500/acre for manual	Salberg 2005

prescribed fire for hazel improvement		thinning and piling. $250/acre for handline construction, burning and project administration.	
Maintenance prescribed fire	2005	$150/acre every 3 to 5 years at the site.	Salberg 2005
Fire suppression	1999 Big Bar complex fire	$880/acre ($110 million/125,000 ac.) (50,587 hectares)	USFS 2000 in Everett 2002.
Fire suppression	Hoopa: Big Hill Road on September 21, 2002	Burned 177 acres and cost at least $1.2 million to contain	Northcoast Journal: December 5, 2002
Fire suppression	Hoopa: August 2002 an arson fire	Burned more than 400 acres and cost at least $2 million to suppress and contain.	Northcoast Journal: December 5, 2002

Prior to effective fire suppression and exclusion, the use of prescribed or "controlled" fire was viewed as being cost prohibitive and damaging to resources (Klamath National Forest 1928).

> "It has been found, however, that actually to carry out controlled burning in our diversified mountain topography is an exceedingly difficult and costly practice… and since this must be done every few years, the cost over a period of years soon becomes prohibitive for any but the holder of a very small parcel of land" (Klamath National Forest 1928:16).

The USFS then, circa 1920s, proclaimed just about any justifiable reason to limit fire on the landscape, which resulted in impacts to tribal communities (Chapter 7).

In Humboldt and Trinity Counties the 1999 Big Bar Complex-Megram fire burned 125,000 acres (50,587 ha) of National Forest, Hoopa Valley Indian Reservation and private lands. The costs of fire suppression were estimated at US$110 million (U.S. Forest Service data in Everett 2002). These cost resulted in substantial impacts to culturally significant resources and habitats (Chapter 7) that were valued beyond any monetarily calculated per unit area value.

Crisis fire hazard management creates increased economic opportunities for some Native American firefighters (Shaw 2005). Seasonal work on fires in and out of the area by Native American firefighters, as well as independent tribal contractors can make profitable returns for seasonal work (Harden 2004, Shaw 2005). It is locally perceived by some tribal community members that the Forest Services exercises an unofficial policy of not hiring locals on local fires (Hillman pers. com. 2002, and Quinn pers. com. 2007). Whether these claims can be substantiated is debated, but examples spanning decades of different wildfire incidents where the USFS did not hire locals and selected outside contractors were provided. The income for employment to conduct fuels reduction and prescribed fires should be compared to the safety and income level of an Indian firefighter who can earn between $5,000 to $25,000 in a few months (Shaw 2005).

A common statement encountered among tribal community members is the need to have well-educated, trained and physically fit tribal members who work year-round on implementing fuels reduction and prescribed fire projects, or working as interagency or interdisciplinary personnel on other natural resource projects related to fire management issues (Hillman pers. com. 2002, Jackson pers. com. 2002, Karuk Tribe Draft Eco-cultural Management Plan). Cost factors associated with increasing skills, knowledge, and safety of forest works and fire fighters may not be accounted for with reported cost for various treatments. Ecological workforce training can increase effectiveness of treatment implementation with achieving the project objectives, gaining community approval, and adequately addressing values (Lomakatsi Restoration Project, Senos et al. 2006).

Technical, legal, political, socio-cultural and economic issues today appear to be causing similar outcomes. For example, litigation of the USFS Six Rivers National Forest Fire Management Plan prohibits or hinders implementation of wildland fire use fires, and amount of areas receiving fuels treatments and prescribed fire compared to the adjacent Klamath National Forest, Happy Camp Ranger District who operates under an approved Fire Management Plan. Review of the Lower Middle-Klamath Watershed Analysis (USFS Six Rivers National Forest 2003) for information about Six Rivers National Forest Fire Management Plan (FMP) implementation strategies compared to the Klamath National Forest FMP reveals similarities in approaches that would have and are being implemented by the respective National Forest (USFS Klamath National Forest FMP).

Discussion about cost per unit area of various treatments and who administers, plans, and implements wildland fire suppression, fuels reduction and prescribed fire, e.g., agencies, fire safe councils, or tribes was cautioned as “comparing apples and oranges” (Salazar pers. com. 2007). Research to gather information about costs associated with fuels and fire management for projects in northwestern California revealed that accounting methods used with projected, reported, and actual cost can differ substantially (Latimer pers. com. 2007, Salazar pers. com. 2007). Request for specific information about associated cost to make comparisons for various treatments between the tribes, fire safe councils, and USFS was: met with some resistance; is technically difficult based on accounting systems used; or was not feasibly able to be provided due administrative, workload, and time constraints fuels and fire managers and planner operate under on a day to day basis (Colegrove pers. com. 2007, Daniels pers. com. 2007, Latimer pers. com. 2007, Reed pers. com. 2007, Salazar pers. com. 2007, Tripp pers. com. 2007). Managers consulted related that examples provided in Table 8.3 should be viewed with caution and are not likely accurate representations of cost per unit area for fuels and fire management. How then do land managers working with tribal and local communities effectively consider economic tradeoffs associated with culturally considerate treatments compared to those which may be justified by the USFS as meeting the broader prioritized objectives and accomplishing tribal needs, when tribal practitioners or community members express dissatisfaction they are not adequately meeting these needs?

For example, community discussions about the USFS Orleans Ranger District’s recent performance on some projects raises doubt about future accomplishment of the Orleans Community Fuels Reduction and Forest Health (OCFR) project. Hazel timber sale on the Orleans Ranger District, WUI fuels reduction, and prescribed burn treatments conducted by the USFS contract crews, compared to the Karuk Tribe fuels crew and Orleans-Somes Bar Fire Safe Council (Orleans Community Fuels Reduction roundtable meeting minute notes on-file with the USFS-Six Rivers National Forest-Orleans Ranger District, Karuk Eco-Cultural

Management Plan-Draft, King 2007). Other members of the community point to the capacity and accomplishments of the adjacent Klamath National Forest-Happy Camp Ranger District being able to effectively conduct extensive prescribed burns (greater than 500 acres) inclusive of WUI, cultural basketry material, and wildlife priorities and values within the last year (B. Colegrove pers. com. 2007, Harling pers. com. 2007, Reece pers. com. 2007). Differences between the two ranger district fuels and fire management programs have been attributed to leadership's or manager's ability to work inclusively and truly cooperatively with community. The manager's willingness to take risk regarding smoke impacts to community, fire behavior and duration of burning caused by implementation is another. In northern California on National Forest lands, consultation and support from local tribes and community members associated with overall "trust" of the USFS leadership, e.g., Forest Supervisors or District Rangers to do what they say they will in considering local values or mitigation of concerns will enhance the agency's ability to implement projects without litigation or political confrontation.

Principles of Fuels and Fire Restoration

Adoption and use of fire management principles can reduce the threat of catastrophic wildfire to areas if effectively treated (Agee and Skinner 2003).

Table 8.4: Factors that increase fire resilience (adapted from Agee and Skinner 2005)

Principle	Effect	Advantage	Concerns
Reduce surface fuels	Reduce potential flame length	Control easier, less torching.	Surface disturbance less with fire than other techniques.
Increase height to live crown	Requires longer flame length to begin torching	Less torching and surface to crown fire initiation.	Opens understory, may allow surface wind to increase
Decrease crown density for dominant or co-dominant trees or shrubs	Makes tree-to-tree crown fire less probable	Reduces potential for crown fire	Surface wind may increase and surface fuels may be drier.
Retain larger trees of fire resistant species	Less mortality under similar fire intensities	Likely restores historic structure	Less economical; may keep trees at risk for insects
Season or ignition pattern of burn	Reduces potential fire intensities and severities	Reduces mortality to desire species, or increases consumption of targeted fuels	May not represent historical natural season of burn, species may have greater physiological risks

Traditional ecological knowledge can be incorporated with scientific ecological knowledge and principles reported by Agee and Skinner (2003). The integration of knowledge to improve the ability of culturally significant habitats to resist wildfires can occur when the principles (Table 8.4) are applied at a specific scale to meet tribal needs. Similarity of cultural uses and values for forest species and conditions provide methods to take localized values and incorporate them into larger regional applications, e.g., Tolowa, Yurok, Karuk, and Hupa ancestral territories within the US Forest Service Six Rivers and Klamath National Forests or on Indian reservations (Colegrove 2005). Forest species and size classes of those tree and shrub species retained with initial fuels treatments may be of less importance to federal land managers, but could be substantially important to tribal communities (Colegrove 2005, Salberg 2005). For example, with the principle of retaining larger fire resistant trees tribal preference will likely be given to sugar pine (*Pinus lambertiana* Douglas), Ponderosa pine (*Pinus ponderosa* Laws.), and oaks over Douglas-fir (*Pseudotsuga menziesii* (Mirbel) Franco var. *menziesii*), other conifers, and hardwoods. In addition the priority for the maintenance of basketry material over generalized fuels reduction would be better recognized (Salberg 2005, Senos et al. 2006, Karuk Tribe Draft 2007).

When culturally significant species are incorporated into fire management prescriptions, higher levels of biodiversity can result. Many federal land managers, (Resource Innovations 2006) could inadvertently reduce or eliminate species of value that were perceived as hazardous fuels, e.g., California bay laurel (*Umbellularia californica* (Hook & Arn.) Nutt.), dogwood (*Cornus nuttallii* Audubon), or hazel (*Corylus cornuta* Marsh. var. *califorinica*) (Salberg 2005, Senos et al. 2006) unless consultations are made with tribal practitioners. Many plant species perceived as fuel likely have specific cultural uses or are associated with cultural use quality of the habitat (Karuk Tribe 1996). Reduction (thinning of individuals) or modification (limbing to increase ground to crown ratio) of such species may be acceptable, but elimination from the site is not (Karuk Tribe Draft 2007). The composition and abundance of understory shrubs, forbs, grasses, and fungi may be of greater value than the overstory trees for some cultural uses, but all components are needed for the habitat to function (Heffner 1984, Karuk Tribe 1996, Karuk Tribe Draft 2007). Cross referencing which plant species are found at fuels treatment areas with tribal ethnobotany can provide additional insights on how these plant populations or cultural use availability will be impacted (USFS-FEIS and NRCS plant data bases, Baker 1981, Karen Thesis and Associates 1991, Karuk Tribe 1996, Davis and Hendryx 2004, Salberg 2005). For example, Prince's pine (*Chimaphila umbellata* (L.) Bartram) and Oregon grape (*Berberis aquifolium* Pursh) are used medicinally. Prince's pine was identified as a Karuk culturally valued secondary management indicator species associated with the prioritization of fuels reduction and fire restoration along ridges (Karuk Tribe Draft 2007). These understory plants often occupy forested areas where their rhizomes and roots colonize duff-soil layers. Low to moderate surface fires that reduce litter and above ground foliage and stems, but retain the majority of below ground biomass allows sprouting of the species. Tribal elders comment on the abundance of medicine plants in areas where "good" fires cause new growth, make available water and sunlight, promote berries or seed production, recycle nutrients, and reduce competition from other less desired vegetation (Glaze pers. com. 2002, Peters pers. com. 2005, M.McCovey pers. com. 2002, Six Rivers National Forest-Interviews).

Fuels reduction treatments and fire induced changes for various culturally significant plant species and habitats directly and indirectly affect habitat quality and the distribution of wildlife species (Aubrey pers. com. 2005, W. Colegrove pers. com. 2005). Habitat quality and function can potentially be inferred from the presence of cultural indicator species. Cultural indicator species, e.g., porcupine (*Erethizon dorsatum couesi*) or Pileated Woodpecker (*Dryocopus pileatus*), are a collection of species that indicate functional and productive habitat quality for cultural needs. Karuk valued indicator species are referenced in the draft Karuk Eco-Cultural Management Plan (May 14, 2007, http://karuk.us). These species will likely vary between tribes as the result of value and habitat differences.

Ecological and cultural context of the resource value of fire-resistant hardwoods and conifers during fire suppression, wildland fire use, and prescribed burning activities in Northern California

The following actions for fuels reduction, prescribed fire, and wildland fire are based on community forestry field research, review of cultural resources concerns about wildfires, and working with tribal heritage resources advisors. Similar information is presented in more detail by the Karuk Tribe Department of Natural Resources (Karuk Tribe Draft 2007) as Cultural Environmental Management Practices.

1. Retain larger diameter, older fire-resistant hardwoods and conifers along fire/control lines and roads/trails serving as fire control boundaries and access travel routes when and where possible.

2. Protect and retain on-site hardwoods consisting of greater than 16 inch diameter at breast height (dbh): Tanoaks (*Lithocarpus densiflorus* Hook. & Arn.), California Black Oaks, Oregon White Oaks (*Quercus garryana* Hook.), madrone (*Arbutus menziesii* Pursh.), Canyon Live Oak (*Quercus wislizeni* A.DC), and Golden Chinquapins (*Chrysolepis chrysophylla* Hjelmq.) as well as conifers consisting of > 24 inch dbh: sugar pines, Ponderosa pine, Port Orford cedar (*Chamaecyparis lawsoniana* A. Murray), Douglas-fir, Incense cedar (*Calocedrus decurrens* (Torrey) Florin), and true firs that have the ability to resist and survive low to moderate severity fires. These types of trees are of great resource importance, having high ecological and cultural value.

To meet *ecological* objectives protect and retain trees having fire-resistant characteristics (high ground to crown distance and thicker bark) with the ability to withstand low to moderate intensity fire. They may have fire scars and cavities in the trunk, the physical signs of surviving former fire events, which serve as important den and roosting sites for wildlife. These trees, due to their site and canopy dominance, provide nutritionally valuable nuts or seed crops and connections with fungi (mushrooms-mycelium) which contribute to sustaining vital forest, shrub, and grassland food webs and the exchange of nutrients. These trees are biological legacies containing not only important diverse genetic material and functions/services but also have structure or growth forms and additional characteristics which make them more fire-resilient features of the landscape. For cultural purposes these trees serve as sources of traditional foods, medicines, and materials or have religious functions important to local Native Americans. Often the physical location of trees constitutes a feature within the sacred geography of place for Native Americans connected to subsistence, ceremonial, funereal or other religious activities.

A suggested course of action to retain fire resistant hardwoods and conifers is

- Inform and educate fire personnel and fire management staff of the importance and value of fire-resistant larger sized hardwoods and conifers.
- Retain when and where possible on site fire-resistant trees by assessing the actual threat to fire behavior to escape, fire/control lines, fire personnel safety, and access/travel routes or safety zones.
- Mitigate when and where possible fire suppression or fire-use management actions to foster the protection and retention of fire-resistant trees, and modify fuel type around them.

Mitigation actions to cutting/felling potentially hazardous trees includes

- Thinning adjacent and/or understory vegetation or fuel from around tree bole and extending up to the drip line to increase the distance from the ground to the base of the live crown.
- Remove adjacent smaller diameter trees and shrubs of less fire-resistant quality to increase retention of desired hardwoods and conifers.
- Limb or remove dead/sick sub-dominant stalks or branches without healthy live green foliage to reduce ladder fuels.
- Reduce fuel (dead organic material) logs and limbs in close proximity to favored trees.
- Scrape or remove moss or lichens adhering to the bark surfaces of tree trunks to lessen the chance of surface to crown fire initiations.
- Clear and/or rake litter in front of and from fire scar-cat face and/or if needed around base of individual trees near fire control lines.
- Protect surface roots from disturbance of fireline construction, or the potential of ground-duff fires.

- Wet down insides cavities or fire scars along fireline prior to back burning to prevent fire from becoming established which can further pose risk to tree and firefighter if the inside burns out.
- Extinguish fires burning in fire scars-cavities (cat faces) if a hazard to fire suppression or management operations or mop-up.

Mitigation measures lessen hazards of fireline conditions

Treatment and retention can result in conditions that reduce threat from undesired fire spread and the ability to control fire. Retaining trees eliminates the creation of additional fuel needing to be cut, handled, and moved along control lines or fire treatment unit boundaries. The adoption and implementation of these mitigation methods during prescribed fire, wildland fire use, or with minimum impact suppression techniques (M.I.S.T. Guidelines) can be accomplished without jeopardizing the effectiveness of control, fire personnel safety, or impeding safe and efficient use of travel or escape routes.

According to Brown et al. (2004) the most credible restoration efforts will:

1. Place highest priority on historically low-severity fire regimes, with secondary priority on mixed-severity fire regimes, and lowest priority on high-severity fire regimes,
2. Be based on the ecology of the species and site, with pre-American settlement conditions, circa 1850, as a sustainable reference, recognizing different goals for a wide variety of landowners,
3. Be site-specific and consider the landscape context, including watershed conditions and fish and wildlife habitat,
4. Consider a range of restoration steps, rather than attempt complete restoration with a single treatment everywhere,
5. Consider mechanical thinning and prescribed fire as acceptable tools, but in all cases apply fire-safe principles and best available science,
6. Where thinning is used, apply minimal-impact harvesting techniques, and focus first on areas where road systems are largely complete, and

7. Make a commitment to long-term monitoring and adaptive management so that we "learn by doing" (Brown et al. 2004:909), and consider the implications of future climate change and exotic species affecting fuels or fire regimes (Millar 2007, Seneos et al. 2006, Karuk Tribe Draft 2007).

Ecosystem goods and services related to fire in the Pacific Northwest and northern California

In 1992, the Chief of the Forest Service directed National Forests to apply ecosystem management, defining it as the skillful integrated use of ecological knowledge at various scales to produce desired resource values, products (goods), services, and conditions in ways that sustain the diversity and productivity of ecosystems (Robertson 1992). The paradigm shift to ecosystem management mandated to federal agencies to consider broader and more comprehensive aspects of the management in forest, grassland, and aquatic ecosystems than before (Robertson 1992). The federal government has a trust responsibility to manage public lands for tribal nations that ceded territories under treaties or executive orders (USDA 1997) or lands that have otherwise been removed from tribal control. There has been a long history of conflict between the tribes and federal government as to how the lands and waters being held in trust have been and are being managed. This difference of opinion is in regard to both the needs of national interest and those of local tribal communities (Newton et al. 2005, Tamez and Johnson 2005, Resource Innovations 2006). The conflict is about the value placed on natural resources and the ecological goods and services various habitats provide (Heal 2000, Costanza 2000, Farber et al. 2002). Religious and/or other related values often complicate natural resources management objectives (Karjala et al. 2004, Colegrove pers. com. 2005). Tribal members assert that it is their responsibility to help nature by judicious respectable forms of sustainable management (Hillman and Salter 1999, Colegrove 2005, Karuk Tribe Draft 2007). If lands can not be directly owned and managed by American Indians, then tribes want land managers to administer natural resources while considering Native American uses (Tamez and Johnson 2005). Justifiably, tribes are also reluctant to have federal, state or private land managers simulate indigenous land management practices without tribal collaboration, involvement, and implementation with such activities (Anderson and Barbour 2003, Resource Innovations 2006, Tripp pers. com. 2006).

Comparison of the public's environmental and economic value type with tribal socio-cultural value types is a course-scale method of seeing how goods and services may have similar or competing values (Costanza 2000). Issues correspond to goods and services.

Table 8.5: Comparison among value types for issues associated with goods and services

Public Value type:	**Issues:**	**Goods and services:**	**Tribal Value type:**
Environmental	Vegetation	Material- Basket, etc.	Socio-cultural
		Foods-Acorns, Berries, etc.	Cultural
		Medicine-herbs	Cultural
Environmental	Soil	Mushroom harvesting subsistence and commercial	Socio-cultural
		Nutrient cycling	Cultural
Environmental -Economic	Water	Springs/Surface water flow	Cultural
		Drinking	Socio-cultural
		Food preparation	Cultural
		Bathing	Socio-cultural
Environmental	Wildlife	Subsistence-Hunting and trapping	Cultural
		Regalia material	Cultural
		Artisan material	Socio-cultural
Environmental -Economic	Fish- Salmonid populations	Subsistence, commercial and ceremonial fishing	Socio-cultural
Environmental -Economic	Cultural resources	Places, sites, artifacts, and use quality of environment or natural resources	Socio-cultural
Environmental -Economic	Air	Health Risk Dispersed-yearly versus concentrated-per decade	Socio-cultural
Economic-Environmental	Fire suppression	Limited seasonal and periodic job opportunities: fire fighters, resource advisors, and support services.	Social
Economic-Environmental	Fuels and Fire Reduction-Restoration	Sustained yearly job opportunities: Planning, implementation, and monitoring.	Socio-cultural
Economic-Environmental	Salvage logging	Limited seasonal and periodic job opportunities: Private industry.	Social
Economic-Environmental	Cattle grazing	Sustained yearly job opportunities	Socio-cultural
Economic	Tourism-Guide services	Limited seasonal and periodic job opportunities	Socio-cultural

Management practices that foster ecosystem processes and functions are important for maintaining the integrity of goods and services provided by ecosystems.

Ecosystem processes include: hydrologic flux and storage, productivity, biogeochemical cycling and storage, decomposition, and maintenance of biological diversity (Christensen et al. 1996). Similarly, geologic processes, material (nutrient) cycling, energy transfer, and succession are identified as ecological processes with high susceptibility to alteration as a result of natural resource management activities. Furthermore, each category of ecosystem process has associated functions. Geologic processes include fluvial erosion, sedimentation, mass wasting, and physical weathering; material cycling includes the water cycle, carbon cycle, nutrient cycling, and chemical weathering; energy transfer includes radiation transfer, heat transfer, photosynthesis, and consumption; succession includes disturbances such as fire, flooding, wind, insects, diseases, and effects of exotic species (Paustian et al. 1999). Ecosystem functions are characterized by general boundaries of influence or interactions. Boundaries can occur at the patch-, stand-, habitat-, watershed-, or landscape-scale and includes inputs, outputs, and cycling of materials and energy, as well as the interactions or influences of organisms. Defining an appropriate scale assists management of natural resources. Ecosystem functions have been classified differently. Paustian et al. (1999) described functions (above) whereas de Groot et al. (2002) expand the characterization of functions to be more comprehensive. Such categorization of ecosystem processes and functions may seem abstract, but is important to describe in order to characterize what services and goods are derived and how they are valued by various cultures in society (Norberg 1999).

Ecosystem services are described as the maintained of hydrologic cycles, regulating climate, cleansing water and air, maintaining the gaseous composition of the atmosphere, pollinating crops and other important plants, generating and maintaining soils, storing and cycling essential nutrients, absorbing and detoxifying pollutants, and providing beauty, inspiration, and the acquisition of knowledge/research. Ecosystem goods are described as food, construction materials, medicinal plants, wild genes for domestic plants and animals, and tourism and recreation (Christensen et al. 1996). In many instances goods and services have been lumped together as a general category (de Groot et al. 2002).

The dominant explanation, definition, and characterization of ecosystem processes, functions, services, and goods by western culture have been related to how such classifications serve (or do not) the needs of native/tribal communities. The higher the value placed on a particular function, the greater the tendency for the services and goods to meet the needs of the local northwestern California tribal community (Colegrove 2005). Description of historical versus contemporary values has been attempted with a primary focus of traditional resources management practices with cultural burning/prescribed fire.

In the Pacific Northwest and California, many indigenous cultures utilized fire for millennia as a management tool to facilitate the production of goods and services (Anderson 2005, Gottesfeld 1994). Natural and cultural fire regimes have influenced many ecosystems (Bonnicksen et al. 1999). Cultural fire regimes which historically affected the composition and characteristics of particular habitats have distinguishing features which include: seasonality, frequency, intensity/severity, specificity, topography/fuels (Bonnicksen et al. 2002), and ignitions (Chapter 2).

All these interrelated factors discussed above influence each other resulting in the creation of fire induced ecological goods and services (Christensen et al. 1996) that are mediated by the effects of fire on ecosystem processes and functions. As Campos et al. (2005) stated, “Based on available scientific evidence, it is clear that humanity is highly dependent on the flow of forest ecosystem services, yet this flow is dependent on the way in which ecosystems are affected by human activities.” Ecological goods and services that result from burning are of particular importance to Native Americans are:

<u>Goods-</u>

1. Enhancement and recruitment of basketry material,
2. Increased crop production,
3. Stimulated growth of medicine plants, and
4. Created salts/minerals
5. Increase flows for suitable aquatic habitat for resident and anadromous fisheries

<u>Services-</u>

1. To improve and facilitate hunting, improve forage quality/range,

2. Reduce threats of catastrophic undesired fire behavior and fuels reduction,
3. Rejuvenation of terrestrial and riparian vegetation,
4. Increased water yield resulting from reduced evapo-transpiration,
5. Clearing of understory vegetation which improves visibility and increases safety from threats of predators or enemies,
6. Fire proofing areas,
7. Clearing of sacred sites or ceremonial areas,
8. Increased nutrient cycling,
9. Reduced pest infestations,
10. Communication, and
11. Improved access to soil resources

Ecological and socio-cultural processes which influence the ecological integrity of ecosystems and provide different goods and services have been discussed in regards to carbon sequestration, biodiversity, and water quality in Resource Innovations (2006).

Tools and techniques to integrate traditional ecological knowledge and tribal values in to fuels and fire management

Tribal perspectives on how to incorporate traditional ecological knowledge (TEK) and cultural values into fuels and fire management have been related to both sources of information and mechanisms of ecosystem function (Karuk Tribe 1996, KNF-Ishipishi/Ukonom Ecosystem Analysis: Cultural Resources 1998, Bengston 2004, Tripp 2005, Colegrove 2005, Shaw 2005). Published literature specifically about northern California is scarce (Harris and Cox 1997, Lake 2005, Levy 2005, Tripp 2005, Senos et al. 2006). Most written works come from federal government, tribes, tribal organizations, or research institute/academic reports that are unpublished, but available electronically through internet links (KNF-Ishipishi/Ukonom Ecosystem Analysis: Cultural Resources 1998, Karuk Tribe Salmon River Module 1996, Karuk Tribe/Cultural Solutions 1999, Resource Innovations: Tribal Wildfire Resource Guide 2006, Six Rivers National Forest Lower Middle Klamath Watershed Analysis 2003, Salter 2003, Karuk Eco-cultural Management Plan Draft 2007). Additional tribal values or recommendations are found in academic research (Kliejunas 2005, Riley-Thron 2000, Stercho 2006). The most common method through which federal agencies learn of tribal perspectives and values is by the government to government consultation or project interview processes (Tamez and Johnson 2005, Heffner 1984, Karuk Tribe/Cultural Solutions 1999, Clinton 2000: Executive Order 13175) advisory councils (e.g., CIFFMC, ITC, NAAC-CDF), solicitation of tribal/ community based organizations (e.g., KIB, CIBA, NNFP), or group-/individually-based concerns at workshops or related meetings (Passport in Time-Follow the Smoke, basketweavers annual gatherings). Tribal natural resource, forestry, and fire programs are currently implementing successful land management programs that utilize local TEK. These make great strides in resource management (Shaw 2005). Unfortunately there has been few formal organized methods of collecting, organizing, or archiving information by the federal (Heffner 1984, Williams' 2007 on-line reference), state, and tribal governments (Cultural Solutions 1999), tribal organizations, or other institutions for specific geographic areas (e.g., northern California tribes for the Klamath Mountain province/bioregion), but has occurred to some degree at the individual tribal level. Results presented in this dissertation serve as a basic starting point in this effect.

Once documentation or preliminary data are assembled they need to be organized and retrievable for management planning and prioritization of projects. Spatial and temporal analysis programs, e.g., Geographic Information Systems, and modeling programs may assist display of tribal priorities and resource values (Graham et al. 2004, Karjala et al. 2004, Rollins et al. 2004, Agar 2006, McDaniel 2006, Richards et al. 2007). Sensitive locations may need to remain confidential (sacred sites under NHPA-Section 106 requirements, AIRFA 1990), but information can be made available to tribal and agency specialists working on interdisciplinary planning, implementation, and monitoring teams. ArcFire, a GIS based modeling program, incorporates vegetation growth simulations with fire behavior models. It could be used to examine fire effects on culturally significant habitats, treatment alternatives that reflect cultural values, or test tribal fire use practices at desired frequencies and intensities (Agar 2006). Part of these modeling systems is a classification system for fire effects (DeBano et al. 1999, FIREMON). Approaches to mapping of fuels and fire regimes for the Klamath-Siskiyou bioregion, specifically northern California, using remote sensing to perform models of potential ecosystem-fire interactions could assist prioritization, planning and implementation (Graham et al. 2004, Rollins et al. 2004). Historical and contemporary tribal ecological knowledge and land use practices (Chapter 3, Chapter 7) should be incorporated in to existing tools and models being used by agencies, organizations and tribes. Fire effects classification systems have not been inclusive of socio-cultural issues. Including a socio-cultural component to the classification system would assist in understanding how fire severity relates to changes in cultural uses and values.

First, Second, and Third Order Fire Effects

Sequential order of fire effects on environmental conditions is generally described as first order (physical), second order (biological), and newly developed here, third order (socio-cultural). First order fire effects refer to the degree to which biotic (individual organism or community) and abiotic components of a site are changed directly by a fire. Second order fire effects are those that are directly linked to the fire but are mediated by other ecological processes in the post fire environment (Ryan 2006 unpublished). Third order fire effects, a term developed from this research, are socio-cultural responses to environmental conditions that are modified by first and second order effects, e.g., the fire-induced habitat quality created by frequent burning in specific areas that foster the perpetuation of Native American cultures in the Klamath-Siskiyou Bioregion (Heffner 1984/Six Rivers National Forest interviews, Pullen 1996, Karuk Tribe-Cultural Solutions 1999). Tribal communities are affected by the reduced frequency and presence of low to moderate intensity fires in culturally desired locations which impact contemporary traditional uses of forests, shrub, grassland, and riparian environments (Chapter 7). Increased cooperation about fuels and fire management between federal, state, and private land managers with tribes and tribal organizations is needed (Resource Innovations 2006). Increased communication and trust building between federal agencies and communities affected by wildfire are important steps for moving forward with future fire planning (Olsen and Shindler 2005, Resource Innovations 2006).

Prescriptions and ignition patterns should be developed to create desired first order fire effects during a fire event. Second order and third order fire effects within a habitat type or across the landscape can result in the production of food, medicines, materials, water, or habitats necessary to sustain spiritual-cultural survival. For example, oak woodlands are utilized for food, medicines, or materials for several years after a burn. Lightning or prescribed fire, in Douglas-fir/pine forests with a beargrass understory, reduces understory vegetation, course fuels, litter and duff, consumes beargrass thatch and stimulates growth for material that is culturally preferred.

TEK and Restoration

When addressing management and restoration issues today and planning for the future, it is important to recognize tribal people as being influences that shaped the historical condition of different plant and animal communities (Senos et al. 2006, Resource Innovations 2006). Native American practices interacted with other ecological processes such as fire, hydrology, and nutrient cycling (Bonnicksen et al. 1999). For example:

> "The plant knowledge of living tribal elders and the (pre) historical reconstruction of indigenous-managed ecosystems will have to be combined with scientific knowledge of how interactions determine productivity and stability in biological systems" (Karuk Tribe 1996: III-19).

The historical and contemporary types of fire regimes in the Klamath-Siskiyou bioregion and if they include Native American burning practices, is being debated (Frost and Sweeny 2000, Vale 2002, Fry and Stephen 2005, Skinner et al. 2006). Differences of opinion result from the degree of exposure and examination of the ethnographic data, belief in authenticity or accuracy of TEK conveyed through oral histories of Native people, credibility of historical accounts (Vale 2002, Clar 1954), and ability to address future conditions in the same areas (Millar 2007). The effect of American Indian management should be considered part of the reference ecosystem, i.e. a set of reference conditions for restoration practices fostering future desired conditions (Senos et. al. 2006).

> "Traditional environmental knowledge is becoming a respected land management tool for enhancing and restoring modern ecosystems.

> Climate history shows that indigenous cultures adapted to several climate change events. Studies that disregard human impacts are as flawed as theories concerning prehistoric lifeways that fail to examine the individual's ability to increase fitness by manipulating their environment." (Busam 2006:137)

There should be opportunities for the application of TEK and cultural environmental management practices in contemporary fuels and fire management (Shaw 2005, Karuk Tribe Draft 2007). TEK can provide further information for areas where western science is lacking knowledge of ecosystem processes, or where species-habitat linkages are necessary to support culturally significant resources (Senos et al. 2006). Incorporation of TEK with western science can foster socio-cultural approval of management actions and working cooperatively with tribes or tribal communities (Kimmerer and Lake 2001, Anderson and Barbour 2003, Ruppert 2003, Senos et al. 2006).

<u>TEK incorporated with SEK to address future conditions</u>

Tribes, land managers, and the public benefit from the incorporation of Traditional Ecological Knowledge (TEK) with Scientific Ecological Knowledge (SEK) to address future conditions of the environment (Senos et al. 2006). Fuels and fire management associated with natural resource values will be affected by climate, exotic species, and socio-economic changes (Millar 2007). Factors likely to affect ecological communities should be understood to develop prescriptions that provide ecological goods and services of desired future conditions (DFC). For example:

> "The identified restoration model, trajectory of change, or DFC may represent a significant departure from the historical range of variability in some cases or even represent a unique condition. Restoring a fire regime that resembles the pre-European settlement regime may not be possible in densely settled regions or in the wildland-urban interface (Marzluff and Bradley 2003, Radeloff et al. 2005). Understory species composition or structure may have changed as a result of invasive species. The DFC may include elements that were not characteristic historically, such as higher populations of old-growth trees or abundant forage production for wildlife in the understory. The model for restoration in these cases may need to be built from considerations of how fire fits into the contemporary landscape and how it can be used to meet specific goals, such as satisfying the needs of imperiled

> native species (Engstrom et al. 2005, Purcell and Stephens 2005). Even in these cases, a review of historical conditions is an important starting point for restoration planning, as such conditions are broadly representative of the evolutionary environment of the species native to a forest type (Covington 2003). Of course, any DFC or restoration model needs to be sustainable under the fire regime that is characteristic for the site" (Noss et al. 2006:24).

Western scientific models now predict significant changes to ecosystems of western North America (Millar 2007). Exotic species, plants or other pathogens, will be influenced by climate and result in additional effects to ecosystems (Millar 2007). The physical, biological, and geochemical changes of ecosystems in the Klamath-Siskiyou bioregion will affect social, cultural, and economic values, and natural resource uses. Anticipation of how ecosystem fire regimes respond to climate and exotic species is, therefore, important (Graham et al. 2004, Karjala et al. 2004, McDaniel 2006).

The climate for western North America, including the Klamath-Siskiyou bioregion, is expected to have an increased length of the "fire season" and higher mean low winter temperature (Millar 2007). A longer fire season is associated with seasonally, i.e. earlier spring plant growth and dormancy, longer period of reduced live fuel moisture, reduced snow pack or moisture, and increases in the susceptibility of fuels to ignite and burn (Millar 2007). The average lowest winter temperature is predicted to increase (Millar 2007). Temperature directly affects the physiology of bacteria, fungi, plants, and animal species. Species that are capable of adapting to the predicted temperature changes have a stronger chance of persisting. Species not able to adapt or are weakened by climate or other ecosystem changes will be reduced. Fire regimes are an integral ecosystem process in the Klamath-Siskiyou bioregion and are thus likely vary in response to other natural and anthropogenic processes (Agee 1993, Skinner et al. 2006, Millar 2007, Chapter 2).

Climate change could affect tribal uses and quality of culturally significant habitats by altering the components of fire regimes (Agee 1993, Skinner et al. 2006, see Chapter 2). Plant and animal species of significant cultural value, e.g., Douglas-fir/tanoak/huckleberry (*Vaccinium* spp.) forest type and anadromous fish, will respond differentially to climate. Some plants and animals will be physiologically able to tolerate longer drier summers and warmer winters, while others will not. The competitive dominance of native and exotic species over limited resources for light, water, nutrients, and space will correspond to their abundance and distribution. As documented by studies of past climatic conditions (Chatters et al. 1995, Biles et al. 2005), some species may be able to shift distribution in elevation, aspect or suitable habitat, although the predicted change is expected to be more rapid and extreme than the past (Millar 2007). Fuels reduction and prescribed fire programs today should consider potential future climate scenarios and design prescriptions to meet those expected conditions (Millar 2007). TEK of how species respond to climate change, or how tribal uses related to values for those species, can be incorporated with SEK to develop and prioritize land management activities (Resource Innovations 2006). Species or habitats of cultural significance that include many species should be addressed by management prescriptions to increase the likelihood of their persistence in the future (Millar 2007). Future socio-cultural and economic values will be affected by land management practices implemented today (Secretariat of the Convention on Biological Diversity 2003, Millar 2007). Federal agencies must consider their ability to manage appropriately for tribal trust resources in the face of changes created by climate change and exotic species (Resource Innovations 2006, Brooks et al. 2004).

Exotic species mostly likely to affect fire regimes of the Klamath-Siskiyou bioregion are certain plants and pathogens (Brooks et al. 2004, DiTomaso et al. 2006). Tree, shrub, forb, or grass species that are adapted to survive under conditions of future climate scenarios and that are resistant and resilient to disturbance will likely persist and out-compete native species, thus potentially changing the fire regime (Lundquist and Klopefenstein 2001, Brooks et al. 2004, Dibble and Rees 2005, DiTomaso et al. 2006). Scotch broom (*Cytisus scoparius*) and Himalayan blackberry (*Rubus discolor* Weihe & Nees; *R. ameriacus*) are recognized locally as some of the most invasive exotic plants (Senos et al. 2006). These plants respond abundantly to disturbances, particularly those activities associated with fuels reduction and fire management (DiTomaso et al. 2006, O'Rourke pers. com. 2006, Creasy pers. com. 2007). Scotch broom and Himalayan blackberries also can intensify fire behavior

(USFS-FEIS data bases, personal observations). Scotch broom proliferates from dormant seeds after fire (USFS-FEIS data, personal observation). Himalayan blackberry seedlings or sprouts will quickly cover areas after fire (USFS-FEIS data, personal observation). Scotch broom and Himalayan blackberries because of their successful adaptive strategies (Grimes 1979), often out-compete culturally significant plant species or modify cultural uses of desired habitats. Prescribed fire followed by manual removal of subsequent growth of invasive exotics species is necessary, especially where tribal concerns with the use of herbicides exist (DiTomaso et al. 2006).

Pathogens, such as sudden oak death (SOD) (*Phytophthora ramorum*) will likely spread due to human facilitated dispersal and changing climate conditions (Moritz and Odion 2005). SOD has reached southern Humboldt County, California and southern Curry County, Oregon (Rizzo and Garbelotto 2003). Northern California areas south of the Klamath-Siskiyou bioregion that experienced fire over the last several decades were found to have lower incidences of sudden oak death (Moritz and Odion 2005). Education about prevention, spread, and containment of SOD is being implemented (Meentemeyer et. al. 2004). Containment and future preparations to prevent establishment of SOD can be addressed by fuels and fire management (Moritz and Odion 2005). Sudden oak death is a resource concern because many native plant species that are infected or function as vectors in the spread are culturally significant (Rizzo et al. 2002). Cross referencing tribal ethnobotany (Scheneck and Gifford 1952, Baker 1981, Karen 1991, Davis and Hendryx 2004) with SOD host vectors (Rizzo et. al. 2002) demonstrates the potential impact to tribal uses and culturally significant habitats should sudden oak death become established (Moritz and Odion 2005). SOD changes habitat conditions by increasing mortality or weakening trees and shrubs (Rizzo et al. 2002). These changes then affect the amount of available light, water, or nutrients, as well as increase the susceptibility of live and dead fuel to ignition (Rizzo et al. 2002, Rizzo and Garbelotto 2003). Other exotic species may take advantage of SOD modified habitats which can result in nearly complete changes of those habitats compared to pre-infection. Other invasive species may be managed with fire in addition to SOD (Rice 2004, DiTomaso et al. 2006).

Findings and Recommendations

Research questions initially asked in chapter 1 were:

1) What factors have influenced the development of tribal cultural fire regimes in the Klamath-Siskiyou bioregion?
2) Can traditional ecological knowledge of tribal elders and practitioners be used with other lines of evidence to better understand changes associated with non-tribal management of sandbar willow (*Salix exigua* Nutt.) dominated riparian zones and culturally valued terrestrial fire-adapted habitats?
3) What are there affects of prescribed fire and flooding on riparian sandbar willow communities along the lower mid-Klamath River?
4) What are the results of propane burning or pruning to produce sandbar willow shoots suitable for basketry use?
5) How have fire suppression policies and management affected tribal communities and culturally significant habitats?
6) What are tribal values and priorities for fuels and fire management?

Chapters 2 to 8 addressed these questions with various methodologies providing multiple lines of evidence. The following recommendations for additional research and suggestions were developed from this dissertation's research and are provided to improve riparian, fuels and fire management by working collaboratively with tribes, tribal organizations, and tribal communities of northwestern California. Recommendations are drawn from each of the chapters. *[The information presented represents the views and experiences of the author and is not necessarily inclusive of other research results, agencies, tribes, tribal organizations, or tribal and local community].

<u>Chapter 2: Development of cultural fire regimes and Archaeological evidence of cultural fire use</u>

1. Cooperatively design projects with tribes, archaeological organizations, and universities for the collection, analysis, and presentation of prehistoric tribal land use patterns. Additional archaeological surveys are needed within the

Karuk ancestral territory to characterize former land use patterns and cultural development.

2. Archaeological site surveys and documentation can be used to facilitate protection from land management activities.

Chapter 3: Incorporation of traditional ecological knowledge to restore and conserve riparian and terrestrial biodiversity

1. Cooperatively design projects for the collection, analysis, and presentation of contemporary tribal TEK relating to natural resource management with a focus on socio-cultural values, use quality, and linkages to ecosystem processes.
2. Use TEK in collaboration with tribal natural resource departments, programs, or organizations to project trends in the quality of culturally significant resources given current knowledge of climate change, economic opportunities, and changes in human population demographics.
3. Use TEK in collaboration with tribal natural resource departments, programs, or organizations to prioritize landscape-level treatments.
4. Expand, revise, or complete landscape-level analyses of vegetation conditions related to culturally significant habitats that are necessary to improve management of tribal trust resources.
5. Use TEK in collaboration with tribal natural resource departments, programs, or organizations to implement fuels reduction and prescribed fire treatments in tribally prioritized areas or districts, e.g., the Karuk Ti-Bar demonstration project or Yurok Tribal Blue Creek Park.
6. Cooperatively design projects, such as youth-elder programs, where areas on federal and tribal lands are designated as living cultural use models. Incorporate training of agency cultural and natural resources specialists.

Chapters 4 and 5: Management of sandbar willow dominated riparian zones

1. Federal land managers and tribes should work cooperatively with other Federal water regulation/management agencies (DOI Bureau of Reclamation, US Fish and Wildlife Service, and NOAA Fisheries) to restore Klamath River flow

regimes of ample frequency to rejuvenate willow stands and suitable fisheries habitat conditions.

2. In the absence of sufficient flooding, USFS and Bureau of Reclamation should coordinate with the Karuk Tribe and Karuk Indigenous Basketweavers to implement fuels reduction and prescribed fire of selected sandbar willow communities. Such programs will to reduce insect infestations and stimulate sprouting of willow. Prescribed fire should be conducted in the summer to promote spread and intensities adequate to induce crown mortality and biomass removal.
3. Federal land managers and Tribes should work cooperatively with the public or community organizations (e.g., Mid-Klamath Watershed Council) to contain, eradicate, and prevent of spread of invasive exotic weeds in riparian zones. Adjusted season and frequency of burns may be necessary to accomplish this recommendation.
4. Accumulations of flood debris in riparian areas may pose fuel load problems. Selective firewood harvesting or removal could be considered.

Chapter 6: Ethnobotanical classification, management, and use of basket materials

1. The USFS or tribes should provide opportunities to basket weavers to manage additional areas and promote basket material of high quantity and quality. This recommendation includes providing fire personnel to implement prescribed burns at tribally desired seasons and frequencies.
2. Localized treatment of smaller areas will likely be inadequate to supply basket material for cultural uses. Multiple areas of similar habitat quality should be treated in different years so as to foster predictable and accessible basket materials. These materials provide subsistence and economic opportunities to tribal community members.
3. Support fuels reduction and prescribed burning as pre-treatment steps to enhance tribal access to areas containing hazel and beargrass.
4. Facilitate with funding and cooperatively designed projects for additional ethnobotanical studies of basket material use and quality. For example, study

differences in biophysical setting (fuel load, percent canopy, etc.), fire behavior and severity, and frequency of treatments in relation to abundance, quality, and storage capability of basketry material.

Chapter 7: Effects of fire suppression on tribes, tribal communities and culturally significant resources

1. Cooperatively designed projects with tribes, tribal organizations, or tribal community members for collection, analysis, and presentation of contemporary tribal issues or values related to effects of fire suppression on culturally significant resources. This activity should focus on socio-cultural values, use quality, and linkages to ecosystem processes.
2. Facilitate cross-training opportunities among federal agencies, tribes, and tribal community members used as heritage resource advisors for identification and protection of cultural resources. Strive to improve future working relationships on wildfire incidents, wildland use fires, and prescribed fires.
3. Develop or strengthen existing agreements between federal and state agencies and tribes or tribal organizations to support integrated fuels and fire management within a tribal ancestral territory.
4. Federal agencies, tribes, and organizations should work with research scientists and economists to incorporate tribal values associated with cost of fuels treatments, prescribed fire, and fire suppression. Examine how these treatments, climate change, and exotics species affect access to and use of ecosystem goods and services, tribal trust resources, and culturally significant habitats.

Chapter 8: Tribal priorities, recommendations and applications to incorporate TEK

1. Utilize and improve government to government consultation, agreements, and policy mandates between government agency managers, researchers, and tribes to align priorities for fuels and fire management.
2. Improve effectiveness of interagency and tribal advisory councils to address natural resource management issues when and where possible.

3. Increase capacity among parties to facilitate sustainable stewardship and restoration of culturally significant habitats to maintain the quality and function of ecosystem goods and services.

Conclusion

The incorporation of tribal knowledge and practices with western science is possible across various ecological, economic, socio-cultural scales, if conducted carefully with the full and willing participation of tribes and tribal communities. Accountability for the acquisition and application of knowledge that affects human and biological communities resonates strongly with tribal communities. Contemporary tribal priorities and values for natural resource management and restoration practices today link to ancestral relationships formed over millennia: “The application of traditional indigenous land ethics requires personal responsibility for forest and ecosystem health” (Karuk Tribe 1996: III-20).

Research, resource management and policies should be developed and implemented cooperatively with tribes, tribal organizations, and tribal communities. Although public values and priorities for natural resource management are becoming similar to tribes or tribal communities, fundamental differences still exists. These will not likely be adequately addressed under current policies because of the lack of available research on tribal issues and concerns regarding environmental justice, ecosystem and tribal community health, and rights of indigenous people.

Lastly, this dissertation reflects the experiences and knowledge gained by me, the author, over my life time. It was conducted to fulfill what I felt was a responsibility to place, family and community with the hope that it improves the working relationship between land managers and community about natural resources in the Klamath-Siskiyou bioregion (Figures 8.1-Frank in Brush dance regalia and 8.2-Frank with his first willow basket tray).

Figure 8.1 Frank in Brush dance regalia

Figure 8.2 Frank with his first willow basket tray

Bibliography

Abbott, D.N. 1972. The utility of the concept of phase in the archaeology of the southern Northwest Coast. Syesis. Vol. 5 Pages: 267-278.

Adobe Photoshop, version CS1 at http://www.adobe.com/uk/

Agar, A. 2006. ArcFuels: Forest Planning Tools for Managing Wildland Fuels. US Forest Service, La Grande Forestry and Range Sciences Lab, La Grande Or.

Agee, J. K. 1991. Fire history along an elevational gradient in the Siskiyou Mountains, Oregon. Northwest Science Vol. 65 Pages: 188–199.

Agee, J. K. 1993. Fire Ecology of Pacific Northwest Forest, Island Press, Washington D.C.

Agee, J. K., Wright, C. S., Williamson, N., and Huff, M. H. 2002. Foliar moisture content of Pacific Northwest vegetation and its relation to wildland fire behavior. Forest Ecology and Management. Vol.167, Pages: 57-66

Agee, J.K. and Skinner, C.N. 2005. Basic principles of forest fuel reduction treatment. Forest Ecology and Management, Vol. 211, Pages: 83-96.

Agrawal, A. 1995. "Dismantling the Divide Between Indigenous and Scientific Knowledge." Development and Change. 26 (1995): 413-439.

Air Resources Board, State of California. Smoke Management Guidelines for Agricultural and Prescribed Burning guidelines at http://www.arb.ca.gov/smp/regs/regs.htm, accessed June 26, 2007.

Amacher, G.S., Malik, A.S., and Haight, R.G. 2005. Nonindustrial private landowners, fires, and the Wildland-urban interface. Forest Policy and Economics, Vol. 7, Pages: 796-805.

Amatulli, G., Perez-Cabello, F., de la Riva, J. 2006. Mapping lightning/human-caused wildfires occurrence under ignition point location uncertainty. Ecological Modelling. Vol. 200. Pages: 321-333.

American Indian Technical Services, Inc.: 1982. Anthropological Study of the Hupa, Yurok, and Karok Indians Tribes of Northwestern California. Final Report prepared for the U.S. Department of the Interior/Bureau of Indian Affairs. Contract No. J50C14205074. January 1982.

Ames, K.M. 1994. The Northwest Coast: Complex Hunter-Gathers, Ecology and Social Evolution. Annuals Review of Anthropology. Vol. 23, Pages: 209-229.

Ames, K.M. and Maschner, H.G. 1999. Peoples of the Northwest Coast: Their Archeology and Prehistory. Thames and Hudson Ltd., London, England. 288 Pages.

Anderson, L. (n.d.) Terrestrial Wildlife and Habitat. National Wildlife Coordinating Group. Fire Effects Guide, Chapter VII. (www.nifc.gov/preved/comm_guide/wildfire/fire_7.html)

Anderson, M. and Findley, J. (n.d.) Plants. National Wildlife Coordinating Group. Fire Effects Guide, Chapter VI. (www.nifc.gov/preved/comm_guide/wildfire/fire_7.html)

Anderson, K.E, Paul, A.J., McCauley, E., Jackson, L.J., Post, J.R., and Nisbet, R.M., 2006. Instream flow needs in streams and rivers: The importance of understanding ecological dynamics. Frontiers in Ecology and Environment Ecological Society of America. Issue 6, Vol. 4. August 2006. Pages: 309-318.

Anderson, M.K. 1997. From Burns to Baskets: California Indian Women's Influence on Ecosystems with the Use of Fire and Other Horticultural Techniques. In Morales, M., Morales, T., Safe Solutions Group (editors) and Sugihara, N.G. (program coordinator). Proceedings of the Symposium Fire in California Ecosystems: Integrating Ecology, Prevention and Management. November 17-20, 1997. San Diego, CA. The Association for Fire Ecology. Miscellaneous Publications No. 1. Pages: 1-9.

Anderson, M. K. 1999. The Fire, Pruning, and Coppice Management of Temperate Ecosystems for Basketry Materials by Californian Indian Tribes. Human Ecology, Vol. 27, No. 1: 79-113.

Anderson, M.K. 2001. The Contribution of Ethnobiology to the Reconstruction and Restoration of Historic Ecosystems. Pages 55-72 in The Historical Ecology Handbook: A restorationist's guide to reference ecosystems. Island Press.

Anderson, M.K. 2002. From Burns to Baskets: California Indian Women's Influence on Ecosystems with the Use of Fire and Other Horticultural Techniques. Association for Fire Ecology Misc. Pub. No. 1:1-9.

Anderson, M. K. 2005. Tending the Wild: Native American Knowledge and the Management of California's Natural Resources. University of California Press. Berkeley. Pp. 526

Anderson, M.K. and M.G. Barbour. 2003. Simulated indigenous management: A new model for ecological restoration in national parks. Ecological Restoration 21:4(269-277).

Anonymous 1899. Editorial from Oakland Enquirer quoted in The Forester Vol. V., No. 1., January1899 Page:241.

ArcView program by ERIS. www.esri.com/

Atzet, T. and Wheeler, D.L. 1982. Historical and Ecological Perspectives on Fire Activity in the Klamath Geological Province of the Rogue River and Siskiyou National Forest. USDA Forest Service, Pacific Northwest Region, Portland, OR. Rocky Mountain Forest & Range Experiment Station Report: R6-Range-102-1982.

Auble, G.T, Friedman, J.M., and Scott, M.L. 1994. Relating Riparian Vegetation to Present and Future Streamflows. Ecological Applications. Vol. 4, No. 3, pages: 544-554.

Aubrey, Earl "Scrub". 2005. Personal Communication. Elder interview project. December 17, 2005, Happy Camp, CA.

Bahro, B., Barber, K.H., Sherlock, J.W., Yasuda, D.A. 2007. Stewardship and fireshed assessment: a process for designing a landscape fuel treatment strategy. In Restoring fire-adapted ecosystems: Proceedings of the 2005 National Silviculture Workshop. General Technical Report. PSW-GTR-203 Pages: 41-54.

Baker, Jr. M.B., Ffolliot, P.F., DeBano, L.F., and Neary, D.G., (eds.) 2004. Riparian Areas of the Southwestern United States: Hydrology, Ecology and Management. Lewis Publishers, A CRC Press Company, Washington D.C.

Baker, M. 1981. Ethnobotany of the Tribes of Northwestern California. MS. Humboldt State University, Arcata, Ca.

Baker, W. L. 1994. Restoration of landscape structure altered by fire suppression. Conservation Biology Vol. 8 Pages:763–769.

Baumhoff, M.A. 1958. California Athabascan Groups. Anthropological Records, Vol. 16, No. 5, Pages: University of California Press, Berkeley, Ca.

Baumhoff, M.A. 1963. Ecological Determinants of Aboriginal California Populations. UCPAAE 49 (2): 155-236.

Barlow, S. (no date). OREQ-W: Orick Then and Now…Historical Committee of Orick Chamber of Commerce, Zuber, G., Hufford, T., Blankenship, B., and Barlow, S Newspaper Articles complied by S. Barlow Artwork. Pages: 342.

Beckham, S. D. 1996. Requiem for a People: The Rogue Indians and the Frontiersmen. Northwest Reprints. Oregon State University Press, Original publication 1971. 214 Pages.

Benda, L.E, Miller, D.J., Dunne, T., Reeves, G.H., and Agee, J.K. 1998. Dynamic Landscape Systems *in* River Ecology and Management: Lessons from the Pacific Coastal Ecoregion. Naiman and Bilby (eds.), Chapter 11, pages: 261-288

Bencze, L. and Elshof, L. 2004 Science teachers as metascientists: an inductive-deductive dialectic immersion in northern alpine field ecology. International Journal of Science Education. Vol. 26, No. 12, Pages: 1507-1526

Bengston, D.N. 2004. Listening to Neglected Voices: American Indian Perspectives on Natural Resource Management. Journal of Forestry, January/February 2004. Pages: 48-52.

Benson, L.V., Hattori, E.M., Taylor, H.E., Poulson, S.R., and Jolie, E.A. 2006. Isotope sourcing of prehistoric willow and tule textiles recovered from western Great Basin rock shelters and caves-proof of concept. Journal of Archaeological Sciences. Vol. 33: 1588-1599.

Berkes, F. 1999. Sacred Ecology: Traditional Ecological Knowledge and Resource Management. Taylor and Francis, Philadelphia, PA. pp. 209.

Berkes, F., J. Colding, and C. Folke 2000 Rediscovery of Traditional Ecological Knowledge as Adaptive Management. Ecological Applications. Vol. 10, No. 5 Pages: 1251-1262. Ecological Society of America.

Berkes, F., and C. Folke, editors. 1998. Linking sociological and ecological systems: management practices and social mechanisms for building resilience. Cambridge University Press, New York, New York, USA.

Berkes, F. and Turner, N.J. 2006. Knowledge, Learning, and the Evolution of Conservation Practice for Social-Ecological System Resilience. Human Ecology, Vol. 34, No. 4. Pages: 479-494

Berreman J. V. 1944. "Chetco Archaeology: A Report of the Lone Ranch." In Gould 1975.

Berry, A.H., Donovan, G., and Hesseln, H. 2006. Prescribed Burning Costs and the WUI: Economic Effects in the Pacific Northwest. Western Journal of Applied Forestry. Vol. 21, No. 2. Pages: 72-78.

Bilby, R. E., and Bission, P. A., 1998. Function and Distribution of Large Woody Debris *in* River Ecology and Management: Lessons from the Pacific Coastal Ecoregion, Naiman and Bilby (eds.), Chapter 13, pages: 324-346

Bisson, P.A., Rieman, B.E., Luce, C., Hessburg, P.F., Lee, D.C., Kershner, J.L., Reeves, G.H., and Gresswell, R.E. 2003. Fire and aquatic ecosystems of the western USA: current knowledge and key questions. Forest Ecology and Management, Vol. 178, Pages: 213-229

Biswell, H. 1999. Prescribed Burning in California Wildlands Vegetation Management. University of California Press. Berkeley, Ca. 255 Pages.

Bonnicksen, T.M, M. K. Anderson, H. T. Lewis, C. E. Kay, and R. Knudson 1999. Native American Influences on the Development of Forested Ecosystems in Ecological Stewardship: A Common Reference for Ecosystem Management. Vol. II. W. Sexton, A Malk, R. Szaro, and N. Johnson (eds). Elsevier Science Press, Netherlands. Pages: 439-469

Bonnicksen, T.M. 2000. American's Ancient Forest: From the Ice Age to the Age of Discovery. John Wiley & Sons, Inc. New York, NY. 594 Pages.

Borden, C.E. 1979. Peopling and Early Cultures of the Pacific Northwest: A view from British Columbia, Canada. Science. Vol. 203, No. 4384, Pages: 963-971

Boyd, R. 1992. Population decline from two epidemics on the Northwest Coast. In Disease and Demography in the Americas. Verano, J.W. and Ubelaker, D. (eds.). Pages: 249-255. Washington, D.C.: Smithsonian Institution Press.

Boyd, R. 1999a. Indians Fire and the Land in the Pacific Northwest. Oregon State University Press.

Boyd, R. 1999b. The Coming of the Spirit of Pestilence: Introduced Infectious Diseases and Population Decline among Northwest Coast Indians 1774-1874. Vancouver and Toronto: University of British Columbia Press; Seattle and London: University of Washington Press.

Breck, S.W., Wilson, K.R., and Andersen, D.C. 2003. Beaver Herbivory and its effect on Cottonwood Trees: Influence of Flooding along Matched Regulated and Unregulated Rivers. River Research and Applications. Vol. 19, Pages: 43-58.

Bricknell, S.H., Hansen, C.A., and MacKey, E.M. 1998. Patrick's Point State Park Presettlement Vegetation Mapping and Soils Classification. Final Report. Interagency Agreement Number 84-04-130, March, 28, 1986. Department of Parks and Recreation and Humboldt State University.

Bricknell, S.H., Austin, A.T., Bigg, D.J., and Godar, R.P. 1992. Late prehistoric vegetation patterns at six sites in coastal California. Report on file at Humboldt State University.

Bright, W. 1978 Karok. Smithsonian Vol. 8 California, Handbook of North American Indians, Sturtevant, W.C. (general editor). Smithsonian Institution, Washington D.C. Pages: 180-189.

Bright, A.D. and Burtz, R. 2006. Creating defensible space in the wildland-urban interface: the influence of values on perceptions and behavior. Environmental Management. Vol. 37, No. 2. Pages: 170-185.

Briles, C.E., Whitlock, C., and Bartlein, P.J. 2005. Postglacial vegetation, fire, and climate history of the Siskiyou Mountains, Oregon, USA. Quaternary Research, Vol. 64, Pages: 44-56.

Brooks, M.L., D'Antonio, C.M, Richarson, D.M, Grace, J.B., Keeley, J.E., DiTomaso, J.M, Hobbs, R.J., Pellant, M., and Pyke, D. 2004. Effects of Invasive Alien Plants on Fire Regimes. BioScience Vol. 54, No. 7 Pages: 677-688.

Brown, J.K. 1974. Handbook for inventorying downed woody material. USDA Forest Service General Technical Report, INT-16..

Brown, R.T., Agee, J.K., and Franklin, J.F. 2004. Forest Restoration and Fire: Principles in the Context of Place. Conservation Biology, Vol. 18, No. 4, Pages: 903-912.

Brunsfeld, S.J., Soltis, D.E., and Soltis, P.S. 1991. Patterns of Genetic Variation in Salix Section Longifoliae (Salicaceae). American Journal of Botany, Vol. 78, No. 6, Pages: 855-869.

Brunson, M. and Shindler, B. 2005. Geographic variation in social acceptability of wildand fuels management in the Western United States. Society and Natural Resources. Vol. 17. Pages: 1-18.

Buckman, R.E. 1964. Effects of Prescribed Burning on Hazel in Minnesota. Ecology, Vol. 45, No. 3. Pages: 626-629.

Burdick, S. 2006. Personal Communication. Yurok-Karuk basket weaver and teacher.

Burn Area Emergency Rehabilitation, National Interagency Fire Center Boise, ID. web site: www.nifc.gov/BAER/Page/NIFC_BAER.html, accessed June 26, 2007.

Busam, H. 2006. Characteristics and Implications of Traditional Native American Fire Management on the Orleans Ranger District, Six Rivers National Forest. M.A. California State University, Sacramento. Department of Anthropology.

Butler, V.L. and Campbell, S.K. 2004. Resource Intensification and Resource Depression in the Pacific Northwest of North America: A Zoooarchaeological Review. Journal of World Prehistory. Vol. 18, No. 4. Pages: 327-405

Byram, R.S.1998. Fishing Weirs in Oregon Coast Estuaries. In Hidden Dimensions, the Cultural Significance of Wetland Archaeology, edited by Kathryn Bernick, pp. 199-219. University of British Columbia Laboratory of Archaeology Occasional Papers 1, Vancouver, B.C.

California Exotic Pest Plant Council plant list. 1999 http://ucce.ucdavis.edu/files/filelibrary/5319/4898.pdf

Campos, J.J., Alpizar, F., Louman, B., and Parrotta, J.A. 2005. An Integrated Approach to Forest Ecosystem Services. *Pp* 97-116 *in* Mery, G., Alfaro, R., Kanninen, M. and Lovobikov, M. (Eds.) “Forests in the Global Balance – Changing Paradigms”. (IUFRO-WFSE); IUFRO World Series Volume 17. Vienna, Austria: International Union of Forest Research Organizations, 185 p.

Chamberlin, T. C. 1967. The Method of Multiple Working Hypotheses, accessed March 29, 2007 at http://www.accessexcellence.org/RC/AB/BC/chamberlin.html

Chatters, J.C, Bulter, V.L., Scott, M.J, Anderson, D.M., and Neitzel, D.A. 1995. A paleoscience approach to estimating the effects of climate warming on salmonid fisheries of the Columbia River basin. In Beamish, R.J. Climate change and northern fish populations. Canadian Special Publication of Fisheries and Aquatic Science Vol. 121, Pages: 489-496.

Christensen, N. L., A. M. Bartuska, J.H. Brown, S. Carpenter, C. D’Antonio, R. Francis, J. Franklin, J. A. MacMahon, R. Noss, D.J. Parsons, C.H. Peterson, M. G. Turner, and R.G. Woodmansee. 1996. The Report of the Ecological Society of America Committee on the Scientific Basis for Ecosystem Management. Ecological Applications 6 (3): 665-691.

Clar, C.R. 1954. California Government and Forestry from Spanish Days until the creation of the Department of Natural Resources in 1927. State of California, Department of Natural Resources, Division of Forestry, Sacramento, Ca.

Clarke Memorial Museum 1985. The Hover Collection of Karuk Baskets. Eureka, Ca. Compiled by V. M. Fields, J. D. Toms, P.E. Palmquist, A. R. Reynolds, and C. J. Kelley. Pages: 112

Clewett, Ed and E. Sundahl 1989. A View From the South: Connections Between Southwest Oregon and Northern California in Living With the Land: Indians of Southwest Oregon, Pages 37-45.

Clewett, E. 1977. CA-SHA-475: An interim report on Squaw Creek # 1, a complex stratified site in the southern Klamath Mountains. Paper presented at the symposium on the Archaeology of the North Coast Range, University of California, Davis.

Climate Impact Group: Web site accessed April 4, 2007: www.cses.washington.edu/cig/pnwc/pnwsalmon.shtml

Clinton, W. 2000. Executive Order 13175, Consultation and Coordination with Indian Tribal Governments. Federal Register Vol. 65, No. 218. Nov. 9, 2000. See also Presidential Memorandum for Heads of Executive Departments and Agencies-Government-to-Government Relationship with Tribal Governments (September 23, 2004)

Colegrove, B. 2007. Personal communication. Hupa-Karuk basketweaver/teacher

Colegrove, Sr., N. 2005. The Forest is in Your Hands. Evergreen, Special Issues on Forestry in Indian Country. Winter 2005-2006 Pages: 42-44.

Colegrove, Sr., N. 2007. Personal Communication, Hoopa Tribal Forestry, Hoopa Ca. June 2007.

Colegrove, W. 2005. Personal Communication. Elder interview project Interviewed August 31, 2005. Hoopa, Ca.

Cohn, P.J., Carroll, M.S., and Kumagai, Y. 2006. Evacuation Behavior during Wildfires: Results of Three Case Studies. Western Journal of Applied Forestry. Vol. 21, No. 1. Pages: 39-48

Connonlly, T.J. 1986. Cultural Stability and Change in the Prehistory of Southwest Oregon and Northwestern California. Dissertation, Department of Anthropology, University of Oregon.

Connonlly, T.J. 1988. A Culture-Historic Model for the Klamath Mountain Region of Southwest Oregon and Northern California. Journal of California and Great Basin Anthropology. Vol. 10, No. 2, Pages: 246-260.

Connonlly, T.J. 1989a. Cultural Stability and Change in Southwest Oregon and Northern California: An Approach to Identifying Diagnostic Assemblage Types in Living With the Land: Indians of Southwest Oregon, Pages 56-69.

Connolly, T. J. 1989b. Points, Patterns & Prehistory, in the Table Rock Sentinel, September/October. Southern Oregon Historical Society.

Cook, S.F. 1943a. The Conflict between California Indian and White Civilization. II: The Physical and Demographic Reaction of the non-mission Indians in Colonial and Provincial California. Ibero-Americana Vol. 22, Berkeley, CA.

Cook, S.F. 1943b. The Conflict between California Indian and White Civilization. III: The American Invasion 1848-1870. Ibero-Americana Vol. 23, Berkeley, CA.

Cook, S.F. 1955. The Epidemic of 1830-1833 in California and Oregon. University of California Publications in American Archaeology and Ethnology Vol. 43 Pages: 321-22. Berkeley: University of California Press.

Cook, S.F. 1956. The Aboriginal Population of the North Coast of California. University of California Anthropological Records. Vol. 16, No. 3. Pages: 81-130.

Cook, S.F. 1977. The Population of the California Indians 1769-1970 Ethnohistor*y*, Vol. 24, No. 1 (Winter, 1977), Pages: 76-77

Costanza, R. 2000. Social Goals and the Valuation of Ecosystem Services. Ecosystems 3: 4-10.

Creasy, M. 2007. Personal Communication and e-mail. USFS Ecologist. Klamath National Forest, Happy Camp, CA. Local resident of Ti-Bar.

Cressman, L.S. 1933. Contributions to the Archaeology of Oregon: Final Report on the Gold Hill Burial Site. University of Oregon Studies in Anthropology 1.

Crosby, J.S. 1977. A guide to the appraisal of wildfire damages, benefits, and resource values protected. USDA Forest Service, Research Paper NC-142.

Davis, B. and M. Hendryx. 2004. Plants and the People: The Ethnobotany of the Karuk Tribe. Museum Series No. 5. Klamath National Forest and Siskiyou county museum. Yreka, CA.

Davis, L.G., Punke, M.L., Hall, R.L., Fillmore, M., and Willis, S.C. 2002-2004. A Late Pleistocene Occupation on the Southern Coast of Oregon. Journal of Field Archeology. Vol. 29, Pages: 7-16

Daniels, M.L., Anderson, R.S., and Whitlock, C. 2005. Vegetation and fire history since the Late Pleistocene from the Trinity Mountains, northwestern California, USA. The Holocene, Vol. 15, No. 7. Pages: 1062-1071.

Daniels, S. 2007. Personal Communication and e-mail. USFS Fuels specialists, Klamath National Forest, Happy Camp, CA.

Dawning, D. Traditional Ecological Knowledge: Fire Ecology. Institute for Tribal Environmental Protection. http://jan.ucc.nau.edu/~man5/tek/fire.htm

DeBano, L.F, Neary, D.G., and Ffollitt, P.F., 1998. Fire's Effects on Ecosystems. Wiley Press. Pages 333.

DeClerck-Floate, R. and Price, P.W. 1994. Impact of bud-galling midge on bud populations of Salix exigua. Oikos, Vol. 70. Pages: 253-260.

de Groot, R. S, M. A. Wilson, and R. M. J. Boumans. 2002. A typology for the classification, description and valuation of ecosystem functions, goods, and services. Special Issues: The Dynamics and Value of Ecosystem Services: Integrating Economic and Ecological Perspectives. Ecological Economics 41: 393-408.

DeLancey, S. and Golla, V. 1997. The Penutian Hypothesis: Retrospect and Prospect International Journal of American Linguistics, Vol. 63, No. 1, Pages: 171-202

DellaSala, D.A., Reid, S.B., Frest, T.J., Strittholt, J.R., Olson, D.M.: 1999: A Global Perspective on the Biodiversity of the Klamath-Siskiyou Ecoregion in Natural Areas Journal, Vol. 19, No. 4. October 1999.

Department of the Interior, United States Department of Agriculture, and Association of Governors. 2002. A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment 10-Year Comprehensive Strategy Implementation Plan

DeWall, L.C., L. E. Child, M. Wade, and J. H. Brock (eds.) 1994 Ecology and Management of Invasive Riverside Plants, John Wiley & Sons Ltd. (May 1994) 232 pages.

DeWalt, Billie R. 1994. "Using Indigenous Knowledge to Improve Agriculture and Natural Resource Management." Human Organization 53 (2): 123-131.

Dibble, A.C. and Rees, C.A. 2005. Does the Lack of Reference Ecosystems Limit Our Science? A Case Study in Nonnative Invasive Plants as Forest Fuels. Journal of Forestry. October/November 2005. Pages: 329-338

DiTomaso, J.M, Brooks, M.L., Allen, E.B., Minnich, R., Rice, P.M, and Kyser, G.B. 2006. Control of Invasive Weeds with Prescribed Burning. Weed Technology. Vol. 20: 535-548.

Dombeck, M.P., Williams, J.E. and Wood, C.A. 2004. Wildfire policy and public lands: Integrating scientific understanding with social concerns across landscapes. Conservation Biology. Vol. 18, No. 4, Pages: 83-89.

Donovan, G.H. 2005. A Comparison of the Costs of Forest Service and Contract Fire Crews in the Pacific Northwest. Western Journal of Applied Forestry. Vol. 20, No. 4, Pages: 223-239.

Donaldson, S. 1997. Flood-borne Noxious Weeds: Impacts on Riparian Areas and Wetlands. California Exotic Pest Plant Council, 1997 Symposium Proceedings, 7 Pages

Doppelt, B, Scurlock, M., Frissell, C., and Karr, J. (editors). Entering the Watershed: A New Approach to Save America's River Ecosystems. The Pacific Rivers Council and Island Press, Washington, D.C. 462 Pages.

Doppelt, B., Karr, J., and Scurlock, M. 1993b. Riverine Systems: The Stepchild of Environmental Efforts, Chapter Two, Part I: Forgotten Waters. In Doppelt, B, Scurlock, M., Frissell, C., and Karr, J. (editors). Entering the Watershed: A New Approach to Save America's River Ecosystems. The Pacific Rivers Council and Island Press, Washington, D.C. Pages 7-32.

Douhovnikoff, Vladimir, McBride, J.R., and Dodd, R.S. 2005. Salix exigua Clonal growth and population dynamics in relation to disturbance regime variation. Ecology, Vol. 86, No. 2, Pages: 446-452.

Drucker, P. 1937. The Tolowa and their Southwest Oregon Kin. University of California Publications in American Archaeology and Ethnology Vol. 36, No. 4, Pages: 221-300.

Dunklin Photography 2007. Video and Multimedia Productions. www.thomasdunklin.com. Arcata, CA. 95521.

Dwire, K.A. and Kauffman, J.B. 2003. Fire and riparian ecosystems in landscapes of the western USA. Forest Ecology and Management. Vol. 178, Pages: 61-74.

Ecological Society of America 1999. Traditional Ecological Knowledge: Another way to create order out of chaos. Newsletter 68. 12/1999. Interview of Frank Kanawha Lake, Robin W. Kimmerer, and Dennis Martinez.

Edmonds, M. 2001. The Pleasures and Pitfalls of Written Records. In Egan, D. and Howell, E.A. (editors) The Historical Ecology Handbook: A Restorationist's Guide to Reference Ecosystems. Society of Ecological Restoration. Island Press, Washington DC. Pages: 73-100.

Egan, D. and Howell, E.A. (editors) 2001. The Historical Ecology Handbook: A Restorationist's Guide to Reference Ecosystems. Society of Ecological Restoration. Island Press, Washington DC. 457 Pages.

Egan, D. 2003. Defining Cultural and Ethnographic Landscapes. Ecological Restoration Vol. 21. No. 4 Pages: 258-260

Eidsness, J. and Smith, A.K. (n.d.). Glossary for Archaeology and Cultural Resource Management. In Certified Archaeological Surveyor Training Manual. Presented by California Indian Forest and Fire Management Council. Redding, Rancheria. May 14-18, 2007. Page: 2

Elasser, A.B. 1978. Mattole, Nongatl, Sinkyone, Lassik, and Wailaki. In: Heizer, R.F. (ed.) California Vol. 8, Smithsonian Institution, Washington DC. Pages: 190-204

Elford, R.C., and McDonough, M.R. 1964. The climate of Humboldt and Del Norte Counties. Agricultural Extension Service, University of California, Eureka.

Ericson, A.W. 1890s. Photography of Indians and Landscape of northern California accessed from the University of California-Berkeley.

Emery, T. 2007. Discussion and examination of hazel, willow and other material she gathered. Happy Camp, Ca. April 22, 2007. Karuk basket weavering annual event.

Everett, Y. 2002. Community participation in fire management planning: a case from California, USA. In Communities in flames: proceedings of an international conference on community involvement in fire management Edited by P. Moore, D. Ganz, L. Cheng Tan, T. Enters and P. B. Durst. Pages: 125-133.

Fagan, B. 2000. The Little Ice Age: How Climate Made History, 1300-1850. Basic Books, New York. 246 pages.

Farber, S.C., Costanza, R. and Wilson, M.A. 2002. Economic and ecological concepts for valuing ecosystem services. Special Issue: The Dynamics and Value of Ecosystem Services: Integrating Economic and Ecological Perspectives. Ecological Economics 4

Ferris, Wilfred "Sonny Buck". June 2007. Personal Communication Orleans, CA.

FIREMON Draft v2.0. Sampling Methods: http://fire.org/firemon/sampmeth.htm

Fire Plan 2000. Managing the Impact of Wildfires on Communities and the Environment: A Report to the President In Response to the Wildfires of 2000, September 8, 2000. (www.fireplan.gov/reports/8-20-en.pdf)

Fites-Kaufman, J. 1997. Historic landscape pattern and process: fire, vegetation, and environment interactions in the northern Sierra Nevada. Dissertation. University of Washington, Seattle, Washington, USA.

Fites-Kaufman, J., Bradely, A.F., and Merrill, A.G. 2006. Fire and Plant Interactions. In: Sugihara, N.G., Van Wagtendonk, J.W., Shaffer, K.E., Fites-Kaufman, J., and Thode, A.E. (eds.) Fire in California's Ecosystems. University of California Press, Berkeley, Ca. Chapter 6 Pages: 94-117.

Fladmark, K.R. 1979. Routes: Alternate Migration Corridors for Early Man in North America. American Antiquity, Vol. 44, No. 1. Pages: 55-69.

Food and Agriculture Organization, n.d.. Fire Management: Voluntary guidelines Principles and strategic actions. Fire Management Working Papers. United Nations, Working Paper FP/17/E, FAO, Rome, Italy. Forest Resources Development Services, Forest Management Division, Forestry Department.

Ford, D.E. 2000. Scientific Method for Ecological Research 564 pages, Cambridge University Press

Ford, J. and Martinez, D. 2000. Traditional ecological knowledge, ecosystem science, and environmental management. Ecological Applications. Vol. 10 Pages:1249–1340.

Fogerty, J.E. 2001. Oral History: A Guide to Its Creation and Use. In Egan and Howell (eds.). The Historical Ecology Handbook: A Restorationist's Guide to Reference Ecosystems. Pages: 101-120.

Foseide, Ollie. 2005. Personal Communication. Elder interview project. July 21, 2005. Johnsons, CA.

Fredrickson, D.A. 1984/2004. The North Coastal Region. Chapter 10. In. Morratto, M.J. California Archeology, Academic Press, Inc. Coyote Press, Salinas. Pages: 471-527.

Freeman, M.R. (n.d.) The Nature and Utility of Traditional Ecological Knowledge. http://www.carc.org/pubs/v20no1/utility.htm

Freeman, M.R. and Carbyn, L.N. (eds.) 1988. Traditional Knowledge and Renewable Resource Management in Northern Regions. Edmonton: Boreal Institute for Northern Studies.

Frost, E. and Sweeney, R. 2000. Fire Regimes, Fire History and Forest Conditions in the Klamath-Siskiyou Region: An Overview and Synthesis of Knowledge. Prepared for the World Wildlife Fund, Klamath-Siskiyou Ecoregion Program, Ashland OR. December 2000.

Fry, D.L. and Stephens, S.L. 2006. Influence of humans and climate on the fire history of a ponderosa pine-mixed conifer forest in the southeastern Klamath Mountains, California. Forest Ecology and Management, Vol. 223. Pages: 428-438.

Fritz, R.S., Gaud, W.S., Sacchi, C.F., and Price, P.W. 1987. Patterns of intra- and interspecific association of gall-forming sawflies in relation to shoot size on their willow host plant. Oecologia Vol. 73: 159-169.

Fulkerson, M.E. 1995. Weavers of Tradition and Beauty: Basketmakers of the Great Basin. Photos by K. Curtis, and forward by C.S. Folwer. University of Nevada Press, Reno, NV. Pp. 138.

Gates, T. 1995. Along the Ridge Lines: A History of Yurok Trail Systems. Dissertation University of Carolina, Chapel Hill. Doctor of Philosophy in the Department of Anthropology.

Gee, G.C. and Payne-Sturges, D.C. 2004. Environmental Health Disparities: A Framework Integrating Psychosocial and Environmental Concepts. Environmental Health Perspectives. Vol. 112, Number 17, Pages: 1645-1653

Gifford, E.W. 1939-1940. Karok Field Notes. California State Library Collections, Phobe Apperson Hearst Museum of Anthropology, University of California, Berkeley, Ca. revised from handwritten fieldnotes-typed edition. 1992.

Glaze, L. 2002. Personal Communication. Elder interview project August 27, and November 8, 2002. Orleans, CA.

Glenn, E.P. and Nagler, P.L. 2005. Comparative ecophysiology of Tamarix ramosissima and native trees in western U.S. riparian zones. Journal of Arid Environments. Vol. 61: 419-446.

Gom, L.A. and Rood, S.B. 1999. Fire Induces Clonal Sprouting of Riparian Cottonwoods. Canadian Journal of Botany Vol. 77: 1604-1616.

Gonzalez-Caban, A., Loomis, J.B., Rodriquez, A., and Hesseln, H. 2006. A comparison of CVM survey response rates, protests and willingness-to-pay of Native Americans and general population for fuels reduction policies. Journal of Forest Economics. Doi:10.1016/j.jfe.2006.10.001.

Goodman, E. 2000. Protecting Habitat for Off-Reservation Tribal Hunting and Fishing Rights: Tribal Co-management as a Reserved Right. Environmental Law, Vol. 30, No. 279. Lewis and Clark Law School.

Goodwin, N. 2006. Personal Communication. Karuk ceremonial leaders.

Gottesfeld, L.M J. 1994. Aboriginal Burning for Vegetation Management in Northwest British Columbia. Human Ecology 22 (2): 171-188.

Gould, R.A. 1975. Ecology of Adaptive Response Among the Tolowa Indians of Northwestern California. The Journal of California Anthropology Vol. 2: 148-170.

Graham, R.T, McCaffrey, S., Jain, T.B. (technical editors). 2004. Science basis for changing forest structure to modify wildfire behavior and severity. General Technical Report. RMRS-GTR-120. Fort Collins, Co. USDA, Forest Service, Rocky Mountain Research Station. 43 pages.

Gray, D.J. 1987. The Takelma and Their Athapascan Neighbors: A New Ethnographic Synthesis for the Upper Rogue River Area of Southwestern Oregon. University of Oregon Anthropological Papers, No. 37.

Gregory, S. V. Swanson, F., McKee, A., Cummins, K. 1991. An ecosystem perspective of riparian zones. BioScience 41, pages: 540-550.

Grenier, L. 1998. Working with Indigenous Knowledge: A Guide for Researchers. International Development Research Centre. Ottawa, Canada. 115 pages.

Gifford, E.W. 1939/1940. Karok Fieldnotes. Part 1. Ethnological Document No. 174 in Department and Museum of Anthropology, University of California; Manuscript in University Archives, Bancroft Library, Berkeley, CA. Unpublished

Grime, J. P. 1979. Plant Strategies and Vegetation Processes. John Wiley & Sons, New York, NY.

Halford, K. 2001. Fire Effects on Cultural Resources: A Bibliographic Survey of Specific and Related Literature. DOI-Bureau of Land Management, Bishop Field Office, Bishop Ca. 93514. Complied for the BLM Preservation Board.

Hanes, R.C. Cultural Resources. National Wildlife Coordinating Group. Fire Effects Guide, Chapter VIII. (www.nifc.gov/preved/comm_guide/wildfire/fire_7.html)

Hankins, D. 2005. Dissertation on file at University of California-Davis, Department of Geography, Cultural Geography. Personal Communication about research results

Hann, W.J. and Bunnell, D.L. 2001: Fire and land management planning and implementation across multiple scales. Journal of Wildland Fire, 2001. Vol. 10:389-403.

Hann, W.J. and Strohm, D.J. 2003. Fire Regime Condition Class and Associated Data for Fire and Fuels Planning: Methods and Applications. USDA Forest Service Proceedings RMRS-P-29.

Hardesty, D.L. 2000. Ethnographic Landscapes: Transforming Nature into Culture. In: Alane, A.R. and Melnick, R.Z. (editors). Preserving Cultural Landscapes in America. John Hopkins University Press, Baltimore. Pages: 169-185.

Harley, F.W. 1918. Letter to Forest Supervisor from Orleans District Ranger F.W. Harley. Manuscript on file at the Fire Program, Six Rivers National Forest, Eureka, CA.

Harling, W. 2007. Personal Communication. Orleans-Somes Bar Fire Safe Council. Orleans, CA.

Harrington 1932. Tobacco Use Among the Karuk Indians of California. Bureau of American Ethnology Bulletin 94. Washington, D.C.

Happynook, T. 2003. World Council of Whalers: Sustainability and Aboriginal Science of Marine Resource Management. Presentation. Ag 301, Oregon State University.

Happynook, Tom Mexsis. 2000. Indigenous Relationships with Their Environment. In Paper presented at a conference hosted by International Institute of Fisheries Economics and Trade. Corvallis, Oregon.

Hayden, B. and Schulting, R. 1997. The Plateau Interaction Sphere and Late Prehistoric Cultural Complexity. American Antiquity, Vol. 62, No. 1, Pages: 51-85.

Hayes, J.F. 1985. An Analysis of Redwood National Park Artifacts. With contributions from D.A. Fredrickson, and T.A. Origer. Prepared for Redwood National Park, Purchase Orders PX 8480-5-0169 and PX 8480-5-0302, Crescent City California.

Heal, G. 2000. Valuing Ecosystem Services. Ecosystem 3: 24-30.

Heffner, K. 1984. Following the Smoke: Contemporary plant procurement by the Indians of northwestern California. Unpublished report Six Rivers National Forest, Eureka. CA.

Heizer, R.F. (editor) 1972. George Gibbs' Journal of Redick McKee's Expedition Through Northwestern California in 1851. Archaeological Research Facility, Dept. of Anthropology, University of California, Berkeley.

Heizer, R.F. 1973. The Eighteen Unratified Treaties of 1851-1852 Between the Indians of California and the United States. Berkeley, CA: Archaeological Research Facility.

Heizer, R.F. and Mills, J.E. 1991. The Four Ages of Tsurai: A documentary history of the Indian village on Trinidad bay. Translations of Spanish Documents by Donald C. Cutter. With new introductory material by Trinidad Museum Society and Axel Lindgren. Originally published by University of Califorinia Press. Berkeley, Ca.

Heizer, R.F. 1993. The Destruction of California Indians. With introduction by A.L. Hurtado. University of Nebraska Press. 321 Pages.

Hickman, J.C., editor. 1993. The Jepson manual: higher plants of California. University of California Press, Berkeley, California, USA.

Higgins, P. 1991. Taking a Watershed Approach to Restoring Klamath River Fisheries. http://watershed.org/news/spr_91/klamath_fish.html

Hildebrant, W.R. 1981. Native Hunting Adaptations on the North Coast of California. Ph.D. dissertation, University of California, Davis.

Hildebrant, W.R. and Hayes, J.F. 1983. Archaeological Investigations on Pilot Ridge Six Rivers National Forest. US Forest Service, Six Rivers National Forest, Eureka, CA. July 1983, Contract No.: 53-9JHA-2-140.

Hildebrant, W.R. and McGuire, K.R. 2002. The Ascendance of Hunting During the California Middle Archaic: An Evolutionary Perspective. American Antiquity. Vol. 67, No. 2, Pages: 231-256.

Hillman, G. 2002. Personal Communication. Elder interview project August 19, 2002. Orleans, CA.

Hillman, L. 2007. Personal Communication. June, 2007. Orleans, CA.

Hillman, L. and Salter, J. 1997. Environmental Management: American Indian Knowledge & The Problem of Sustainability. Forest, Trees, and People Newsletter, No. 34, 1997. http://www.magickriver.net/karuk.htm. Accessed April 12, 2007.

Hipwell, Bill M.A. 3/31/1998. Integrating Local/Traditional Ecological Knowledge into Fisheries Management in Canada. Final Report submitted to Integrated Coastal Zone Management Marine Ecosystems Conservation Branch Department of Fisheries and Oceans. www.oceansconservation.com/iczm/hipwell.htm

Hobbs, N. T. 2003. Challenges and opportunities in integrating ecological knowledge across scales. Forest Ecology and Management. Vol. 181: 223-238.

Hogarth, W.T. 2002. Memorandum Alternative Approaches for Streamlining Section 7 Consultation on Hazardous Fuels Treatment Projects. Letter to Regional Directors, Regions 1-7 and California and Nevada Operations; Regional Administrators, NOAA Fisheries from the directors of US Fish and Wildlife Service, and NOAA-Fisheries.

Holling, C. S., F. Berkes, and C. Folke. 1998. Science, sustainability, and resource management. Pages 342–362 *in* F. Berkes and C. Folke, editors. Linking social and ecological systems: management practices and social mechanisms for building resilience. Cambridge University Press, Cambridge, UK.

Holmlund, R.C. 2006. Fish, Forests, Fire, and Freedom: Infringements of Karuk Religious Freedom Through Federal Natural Resource Management. MS Thesis n Social Science in Environment and Community. Humboldt State University, Arcata, Ca.

Hotelling, W.E. 1978. My Life with the Kar-ooks, Miners, and Forestry. [California: W.E. Hotelling].

Howes, Michael. 1980. “The Use of Indigenous Technical Knowledge in Development.” In David Brokensha, D.M. Warren and Oswald Werner, eds.

Indigenous Knowledge Systems and Development. Washington: University Press of America.

Huntington, H.P. 2000. Using Traditional Ecological Knowledge in Science: Methods and Applications. Ecological Applications. Vol. 10, No. 5, Pages: 1270-1274.

Houston, M. 2005. Discussion about alternative willow managements at family allotment. Ti-Bar, Ca.

Institute for Natural Resources 2004. Report of the Forest Fuels and Hazard Mitigation Committee to Oregon Department of Forestry, Oregon Fire Program Review. Submitted by the Forest Fuels and Hazard Mitigation Committee. Prepared by Institute of Natural Resources, Oregon State University, Corvallis, Or.

Jack, K.R. 1916. An Indian's View of Burning, and a Reply. California Fish and Game Journal. Vol. 2, No. 4, Pages: 194-196.

Jackson, J. 2002. Personal Communication. Elder interview project. September 24, 2002. Hoopa, CA.

Jensen, M. E., Hann, W. J., Keane, R. E., Caratti, J., and Bourgeron, P. S. 1993. ECODATA: a multiresource database and analysis system for ecosystem description and evaluation. Pages 249–265 *in* M. E. Jensen and P. S. Bourgeron, editors. Ecosystem management: principles and applications. Volume II. USDA Forest Service General Technical Report PNW-GTR-318. Pacific Northwest Research Station, Portland, Oregon, USA.

Jewett, C. 2007. To honor and defend: Indian artifacts are lost as forests are logged, critics say, because safeguards are inadequate. Sacramento Bee, edition: Metro Final, January 1, 2007, Page: A3.

Johnson, M. (editor) 1992. Lore: Capturing Traditional Environmental Knowledge. Dene Cultural Institute, International Development Research Centre. 190 Pages.

Jones, A. L. 2001. Logic, Inductive and Deductive: An Introduction to Scientific Method (Paperback). Facsimile reprint of a 1909 edition by Henry Holt Company, New York. 317 pages, Adamant Media Corp. May 18, 2001.

Jones, R.R. 2000. The Role of Traditional Ecological Knowledge in the Back to the Future Approach to Ecological Modeling. Presentation made at the International Institute of Fisheries Economics and Trade, Oregon State University.

Jones, T.L., Brown, G.M., Raab, M., McVickar, J.L., Spaulding, W.G., Kennett, D.J., York, A., and Walker, P.L. 1999. Environmental Imperatives Reconsidered: Demographic Crises in Western North America during the Medieval Climatic Anomaly. Current Anthropology, Vol. 40, No. 2, Pages: 137-170

Jorgensen, J. 1980. Western Indians. W.H. Freeman and Co., San Francisco, Ca. USA.

Karen Thesis and Associates 1991. A Discussion of the Ecology and Uses of Selected Traditional Hupa Species. December 1991. P.O. Box 3005, McKinleyville, CA. 95521.

Karjala, M.K., Sherry, E.E., and Dewhurts, S.M. 2004. Criteria and indicators for sustainable forest planning: a framework for recording Aboriginal resource and social values. Forest Policy and Economics 6: 95-110.

Karuk Tribe FERC testimony submitted for public record-on file at the Department of Natural Resources, Orleans, Ca.

Karuk Tribe 1996. Karuk Tribal Module for the Main Stem Salmon River Watershed Analysis: Scoping of Tribal Issues for Karuk Aboriginal Territory. Prepared for USDA Forest Service, Klamath National Forest. Yreka, Ca. P.O. 43-91W8-5-7017. Prepared by Karuk Tribe, Department of Natural Resources.

Karuk Tribe and Cultural Solutions 1999. Karuk Forest Management Perspectives: Interviews with Tribal Members, Vol. 2: Appendices. P.O. 43-91W8-5-7053, Prepared for USDA Forest Service, Klamath National Forest, Yreka, Ca. [Karuk Tribe of California, Orleans, Ca. 95556 and Cultural Solutions, Ashland Or. 97520].

Karuk Tribe. Eco-cultural Management Plan, Draft May 14, 2007. Department of Natural Resources, Orleans, Ca.

Kauffman, J.B. and Martin, R.E. 1987. Effects of Fire and Fire Suppression on Mortality and Mode of Reproduction of California Black Oak. (Quercus keloggii Newb.). In Proceedings of the Symposium on Multiple-Use Management of California's Harwood Resources, Novermber 12-14, 1986. San Luis Obispo, CA. Technical Coordinators T.R. Plumb and N.H. Pillsbury, 122-126. General Technical Report PSW-100. USDA, Forest Service, Pacific Southwest Forest and Range Experiment Station.

Kauffman, J.B., Beschta, R.L., Otting, N., and Lytjen, D. 1997. An Ecological Perspective of Riparian and Stream Restoration in the Western United States. Fisheries, Vol. 22, No. 5, Pages: 12-24.

Kauffmann, M.R., Graham, R.T., Boyce, D.A. Jr., Moir, W.H., Perry, L., Reynolds, R.T., Bassett, R.L., Mehlhop, P., Edminster, C.B., Block, W.M., and Corn, P.S. 1994. An Ecological Basis for Ecosystem Management. General Technical Report RM-246. Fort Collins, CO. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station.

Kay, Charles E. 2003. Long-Term Vegetation Change on Utah's Fishlake National Forest: A Study in Repeat Photography. Department of Political Science, Utah State University. Logan UT. 84322-0725August 2003. 175 Pages.

Keir Associates and Klamath River Basin Fisheries Task Force. 1991. Long Range Plan For The Klamath River Basin Conservation Area Fishery Restoration Program. http://www.krisweb.com/biblio/gen_usfws_kierassoc_1991_lrp.pdf

Kelsey, K. A. and S. D. West 1998. Riparian Wildlife *in* River Ecology and Management: Lessons from the Pacific Coastal Ecoregion. Naiman and Bilby (eds.) Chapter 10, pages: 235-260

Keter, T.S. (n.d.) Environmental and Cultural History of the Smith River Basin. Report on file. USDA Forest Service, Six Rivers National Forest, Eureka, Ca.

Keter, T.S. 1985 On the edge: Historic Settlement and Adaptation on the North Fork (Eel River). Paper Presented to The Society of California Archeology. March 29, 1985. On file at the USFS Six Rivers National Forest Unpublished report, Eureka, Ca.

Keter, T.S. 1986. Relationship Between Culture and Environmental Change Along the North Fork. Paper Presented to The Society of California Archaeology. March 28, 1986. Santa Rosa, Ca. Paper on file at USFS Six Rivers National Forest, Eureka, Ca.

Keter T.S. 1993. Territorial and Social Relationships of the Inland Southern Athapascan: Some New Perspectives. Center for Archaeological Research at Davis. Publication No. 11. Pages: 37-51

Keter, T.S. 1995. Environmental History and Cultural Ecology of the North Fork Eel River Basin, California. USDA Forest Service, Pacific Southwest Region, R5-EM-TP-002. Six Rivers National Forest. Eureka, Ca.

Keter, T.S. 1997. Growing the Forest Backwards: Virtual Prehistory on the North Fork of the Eel River. Paper Presented to: The Society for California

Archaeology. March 27, 1997. Rohnert Park, Ca. USDA Forest Service Six Rivers National Forest. Eureka, Ca

Keter, T. S. 2007. Personal Communication. Dissertation Reviewer. Eureka, CA.

Key, J.L. 2000. Effects of Clearcuts and Site Preparation on Fire Severity, Dillon Creek Fire 1994. MS Thesis, Humboldt State University. Natural Resources-Forestry

Kimmerer, R. and Lake, F.K. 2001. The Role of Indigenous Burning in Land Management. Journal of Forestry, Vol. 99, No. 11, Pages: 36-41

Kindschy, R.R. 1985. Response of Red Willow to Beaver use in southeastern Oregon. Journal of Wildlife Management. Vol. 49, No. 1 Pages: 26-28.

King, G. 2007. Orleans Fuels Plan: Protection Or Timber Sale? Econews, Vol. 37, No. 3, April 2007. Northcoast Environmental Center, Arcata, Ca. Page 3.

Kroeber, A.L. 1920. California Culture Provinces. University of California Publications in American Archaeology and Ethnology. Vol. 17, No. 2, Pages: 151-169. University of California Press, Berkeley Ca.

Kroeber, A.L.1976. Handbook of the Indians of California. Dover Publication, Inc., New York. Unabridged republication of 1925, Bulletin 78 of the Bureau of American Ethnology of the Smithsonian Institution.

Kroeber, A.L. and Barrett, S.A. 1960. Fishing Among the Indians of Northwestern California. University of California Anthropological Records, Vol. 21. No. 1, Pages: 1-210.

Kroeber, A.L, and Gifford, E.W. 1949. World Renewal: A cult system of Native Northwest California. Anthropological Records, Vol. 13, No. 1. University of California Press, Berkeley Ca. 155 Pages.

Kumagai, Y., Daniels, S.E., Carroll, M.S., Bliss, J.C., and Edwards, J.A. 2004. Causal Reasoning Processes of People Affected by Wildfire: Implications for Agency-Community Interactions and Communication Strategies. Western Journal of Applied Forestry. Vol. 19, No. 2, Pages: 184-194

LaFee, S. 2003. Where there's smoke, There's also likely to be an unhealthy miasma of particulates, poisons, and other airborne chemicals. San Diego Union-Tribune, October 29, 2003. Page F-1

LaLande, J. 1991 The Indians of Southwestern Oregon: An Ethnohistorical Review. Department of Anthropology, Anthropology #9 Oregon State University, Corvallis, OR. **Permission granted to use Map 1 and 2**.

LaLande, J. and Pullen, R. 1999. Burning for a "Fine and Beautiful Country": Native Uses of Fire in Southwestern Oregon. In Boyd, R. (ed.) Indians, Fire and the Land in the Pacific Northwest. Oregon State University Press, Corvallis, Or. Pages: 255-276

Lake, F. unpub/per.obs. Graduate dissertation research working with tribal basket weavers in Northwestern California. Preliminary oral history interviews with Native American basketweavers. Fall 2000-present. Oregon State University, Environmental Sciences Program

Lake, F.K. and Zybach, B. Unpublished draft manuscript. Indian Burning Practices in the Oregon Coast Range. Available from authors. See also course material in Lake 2007. Applied Fire Effects, Rx 510, II-D: Traditional Knowledge-The Forgotten Fire. National Advanced Fire and Resource Institute, Tucson, AZ.

Lake, F.K. 2005. How does tribal management work? The Black Oak: Environmental Justice Where California Meets Oregon. Issue 1. Page: 6.

Latimer, L. 2007. Personal Communication. Orleans-Somes Bar Fire Safe Council, Orleans, CA. Dissertation reviewer and project volunteer.

LaPena, F.R. 1978. Wintu. In Heizer, R.F. (ed.) Vol. 8 California, Handbook of North American Indians, Sturtevant, W.C. (general editor). Smithsonian Institution, Washington D.C. Pages: 324-340

Lee, D., Borchers, J.G., Norman, S.P., Jacobson, S.L., and Hass, T.C. 2005. Illuminating Choice in Sustainable Forest Management: A Comparative Risk Assessment Framework and Tools. Final report to the National Commission on Science for Sustainable Forestry (NCSSF). March, 21, 2005.

Lenihan, J.M., Drapek, R., Bachelet, D, Neilson, R. 2003. Climate Change Effects on Vegetation Distribution, Carbon, and Fire in California. Ecological Applications Vol. 13, No. 6, Pages: 1667-1681.

Lertman, K, Spies, T. and Swanson, F. 1998. From Ecosystem Dynamics to Ecosystem Management. In River Ecology and Management: Lessons from the Pacific Coastal Ecoregion. Naiman and Bilby (eds.) Chapter 14, pages: 361-382

Lewis, H.T., 1990. Reconstructing patterns of Indian burning in southwestern Oregon. In: Hannon, N., Olmo, R.K. (Eds.), Living with the Land: The Indians of Southwest Oregon. Proceedings of the 1989 Symposium on the Prehistory of Southwest Oregon, Southern Oregon Historical Society, Ashland, OR, Pages: 80–84.

Lewis, H.T. 1993. Patterns of Indian Burning in California: Ecology and Ethnohistory in Before the Wilderness, Blackburn and Anderson, Ballena Press. Pages: 55-116.

Lewis, H.T. and Anderson M.K. 2002 (editors), In Stewart, O.C. Forgotten Fires: Native Americans and the Transient Wilderness. University of Oklahoma Press, Norman, OK. 364.

Lomakatsi Restoration Project. Ecological Restoration Workforce Program, Ashland OR. http://www.lomakatsi.org/Home/tabid/36/Default.aspx, accessed June 26, 2007.

Long, C.J., Whitlock, P. J. Bartlein, and S. H. Millspaugh 1998, A 9000-Year Fire History from the Oregon Coast Range, Based on a High-Resolution Charcoal Study.
Canadian Journal of Forest Research 28(5): 774-787.

Losey, R.J. 2003. Sea-level History and the Archaeology of the Northern Oregon Coast: A Case Study From Netarts Bay. Journal of Northwest Anthroplogy, Vol. 37, No. 2. Pages: 239-259.

Loud, L.L. 1918. Ethnography and Archaeology of the Wiyot Territory. University of California; Publications in American Archaeology and Ethnology, Vol. 14, No. 3, Pages: 221-436.

Lundquist, J.E. and Klopfenstein, N.B. 2001. Integrating concepts of landscape ecology with molecular biology of forest pathogens. Forest Ecology and Management Vol. 150, Pages: 213-222.

Lynn, K. and Gerliz, W. 2006. Assisting Low Capacity Communities Reduce Wildfire Risk: A briefing for states, tribes, counties and communities. University of Oregon-Institute for Sustainable Environment and National Network of Forest Practitioners June/May 2006 (www.wflccenter.org/new_pdf/184.pdf)

Mack, J. M. 1989. Archaeology of the Upper Klamath River in Living with the Land: Indians of Southwest Oregon, Pages 10-25. Southern Oregon Historical Society

Mantua, N.J., S.R. Hare, Y. Zhang, J.M. Wallace, and R.C. Francis. 1997. A Pacific interdecadal climate oscillation with impacts on salmon production. *Bulletin of the American Meteorological Society* 78: 1069-1079.

Marlon, J., Bartlein, P.J., and Whitlock, C. 2006. Fire-fuel-climate linkages in the northwestern USA during the Holocene. The Holocene, Vol. 16, No. 8, Pages: 1059-1071.

Marshall, C.L. 2002 Testimony of Clifford Lyle Marshall, Chairman, Hoopa Valley Tribe of California before the Senate Indian Affairs Committee, August 1, 2002

Martinez, D. 2004. Restoring Indigenous History and Culture to Forest Ecosystems: Conservation, Restoration, and Wood Timber Production in the Forest Matrix. Report on file with author. Douglas City, CA. or Indigenous Peoples Restoration Networks, Society of Ecological Restoration International.

Maser, C. and J. R. Sedell. 1994. From the forest to the sea: the ecology of wood in streams, rivers, estuaries, and oceans. Delray Beach, FL: St. Lucie Press. 200 pp.

Mason, L. 2005. Sovereignty, Stewardship, and Sustainability. Evergreen Winter 2005/2006 Pages: 26-31

Maston, R.G and Coupland, G. 1995. The Prehistory of the Northwest Coast. Academic Press, San Diego, Ca. USA. 364 Pages.

Mater, C.M. 2005. The Montreal Process Criteria and Indicators and Tribal Views on Forest Health and Sustainability: Is There a Match? Evergreen, special issues: Forestry in Indian Country: Models of Sustainability for our Nation's Forest. Winter 2005-2006. Pages: 11-16.

Matilton, C. 2007. Personal communication. Hoopa, CA..

Mazzocchi, F. 2006. Western Science and traditional knowledge: Despite their variations, different forms of knowledge can learn from each other. View Point. European Molecular Biology Organization. Vol. 7, No. 5 Pages: 463-466.

McCann, K.S. 2000. The Diversity-Stability Debate. Nature, Vol. 405. May 11, 2000. Pages: 228-233

McCool, S.F., Burchfield, J.A., Williams, D.R., and Carroll, M.S. 2006. Environmental Management, Vol. 37, No. 4, Pages: 437-450.

McCovey, D. 2002. Personal Communication. Elder interview project August 28, 2002. Orleans, CA.

McCovey, M. 2002. Personal Communication. Elder interview project August 22, 2002. Orleans, CA.

McDaniel, J. 2006. Super Models. Wildfire. September/October 2006. Pages: 8-16

McKenzie, D., Z. M. Gedalof, D. L. Peterson, and P. W. Mote. 2004. Climatic change, wildfire, and conservation. Conservation Biology 18(4):890-902

McKernan, K. 2003. Smoke Management Plan, Yurok Tribe Environmental Department.

McNabb, D.H. and Cromack, Jr., K. 1990. Effects of Prescribed Fire on Nutrients and Soil Productivity in Natural and Prescribed Fire in Pacific Northwest Forests, Walstad, Radosevich, and Sandberg (eds.), Oregon State University Press. Pages: 125-142.

Meentemeyer, R., Rizzo, D.M., Mark, W., and Lotz, E. 2004. Mapping the risk of establishment and spread of sudden oak death in California. Forest Ecology and Management Vol. 200, Pages: 195-214.

Mendez, S.R., Carroll, M.S., Blanter, K.A., Findley, A.J., Walker, G.B., and Daniels, S.E. 2003. Smoke on the Hill: A Comparative Study of Wildfire and Two Communities. Western Journal of Applied Forestry. Vol. 18, No. 1, Pages: 60-67.

Meixner, T. and Wohlgemuth, P.M. 2003. Climate Variability, Fire, Vegetation Recovery and Watershed Hydrology. Pages: 651-656 First interagency conference on research in the watersheds; 2003 Oct. 27-30; Benson, AZ. Online at: *http://www. tucson.ars.ag.gov/icrw/Proceedings/Meixner2.pdf.*

Mikkelsen, P. and White, G. 1981. Management of Cultural Resources in Riparian Systems. Paper presented at the California Riparian Systems Conference. University of California-Davis. September 17-19, 1981. Pages: 773-779.

Millar, C.I. 2007. Climate Change in Western North America. Presentation made in Arcata, Ca. US Forest Service, Pacific Northwest Research Station web page. Accessed May 23, 2007.

Millar, C.I. and Wolfenden, W., 1999. The role of climate change in interpreting historic variability. Ecological Applications, Vol. 9 No. 4. Pages:1207–1216.

Miller, T.E. 1982. Notes and Comments: Community diversity and interactions between the size and frequency of disturbance. The American Naturalist. Vol. 120, No. 4. Pages: 533-536.

Miller, M. and Findley, J. (n.d.): Chapter VI-Plants. In Fire Effects National Wildlife Coordinating Group on-line guide,___ http://www.nwcg.gov/pms/pubs/catalog.htm.

Moerman, D.E. 1998. Native American Ethnobotany. Timber Press, Portland, OR. 927

Mohr, J. A., Whitlock, C. and Skinner, C. N. 2000. Postglacial vegetation and fire history, eastern Klamath Mountains, California, USA. Holocene Vol. 10 Pages:587–601.

Moore, G., Sr. 2005/2007. Personal Communication. Elder interview project. August 18, 2005. Hoopa, CA. Follow up visit and communication June 2007

Moratto, M.J. 1984/2004. California Archeology. Academic Press/Coyote Press. Salinas, Ca.

Morgan, P., Aplet, G.H., Haufler, J.B., Humphries, H.C., Moore, M.M.,Wilson, W.D., 1994. Historical range of variability: a useful tool for evaluating ecosystem change. Journal Sustainable Forestry Vol. 2, Pages: 87–111.

Moriarty, T.E., Wilson, D.W., and Bizal. R.P. 2005. Forest Management Planning and Integrated Resource Management Planning in Indian Country. Evergreen Winter 2005/2006. Pages: 54-57.

Moritz, M.A. and Odion, D.C. 2005. Examining the strength of and possible causes of the relationship between fire history and Sudden Oak Death. Oecologia. In press.

Moss, M.L. and Erlandson, J.M. 1998. Early Holocene Adaptations on the Southern Northwest Coast. Journal of California and Great Basin Anthropology. Vol. 20, No.1, Pages: 13-25.

Mote, P.W, Parson, E.A, Hamlet, A.F., Keeton, W.S., Lettenmaier, D., Mantua, N., Miles, E.L., Peterson, D.W., Peterson, D.L., Slaughter, R., and Snover, A.K. 2003. Preparing for Climate Change: The water, salmon, and forests of the Pacific Northwest. Climatic Change. Vol. 61, Pages: 45-88.

Moton, D.C, Roessing, M.E., Camp, A.E, and Tyrrell, M.L. 2003: Assessing the Environmental, Social, and Economic Impacts of Wildfire. GISF Research Paper 001, Forest Health Initiative, Yale University, School of Forestry and Environmental Studies, Global Institute of Sustainable Forestry, 360 Prospect Street, New Haven, Connecticut 06511 USA, www.yale.edu/gisf

Naiman, R.J., Fetherston, K. L., McKay, S.J., and Chen, J. 1998. Riparian Forest *in* River Ecology and Management: Lessons from the Pacific Coastal Ecoregion. Naiman and Bilby (eds.) Chapter 12, pages: 289-323

Naiman, R.J. 1998. Biotic Stream Classification *in* River Ecology and Management: Lessons from the Pacific Coastal Ecoregion. Naiman and Bilby (eds.) Chapter 5, pages: 97-119.

National Congress of American Indians http://www.ncai.org/Timber.66.0.html, as of June 26, 2007.

National Fire Plan 2000. Ten-year Comprehensive Strategy (2001). http://www.fireplan.gov/

National Oceanic Atmospheric Administration data available at: http://www.nws.noaa.gov/

Natural Resource Conservation Service: http://plants.usda.gov/plantguide/pdf/cs_saex.pdf

Natural Resource Conservation Service-Plant Guide, Coyote Willow: Salix exigua Nutt. web index USDA, NRCS, National Plant Data Center, New Mexico Plant Materials Center, and Idaho Plant Materials Center.

Newton, N.J., Anderson, R., Goldberg, C., LaVelle, J., Royster, J.V., Singer, J.W., and Strickland, R. (eds.) 2005. Cohen's Handbook Federal Indian Law 2005 Edition. Michie publishing.

Niemi, E. and Lee, K. 2001. Wildfire and poverty: An overview of the interactions among wildfires, fire-related programs, and poverty in the Western States. Center for Watershed and Community Health, Mark O. Hatfield School of Government, Portland State University

Nixon, M. 2005. Personal Communication. Elder interview project. August 17, 2005. Hoopa, CA.

Norberg, J. 1999. Linking Natures' services to ecosystems: some general ecological concepts. Ecological Economics 29: 183-202.

Norgaard, K. 2005. The Effects of Altered Diet on the Health of the Karuk People: A Preliminary Report. See Karuk Tribe of California for report. http://karuk.us/press/Health%20Effects%20of%20Altered%20Diet.pdf, accessed July 5, 2007

Norman, S. 2007. Personal communication and draft research results at USFS-Pacific Southwest Research Station, Arcata, Ca.

Northcoast Journal 2002. Weekly in the News article: Charged with Arson. December 5, 2002. Eureka, California.

Norton, H. H., Hunn, E. S., Martinsen, C. S. and Keely, P. B. 1984. Vegetable Food Products of the Foraging Economies of the Pacific Northwest. Ecology of Food and Nutrition. Vol. 14 Pages:219-228.

Noss, R. 2000. Maintaining the Ecological Integrity of Landscapes and Ecosystems in Ecological Integrity: Integrating Environment, Conservation, and Health, edited by Pimentel, Westra, and Noss. Island Press. Pages: 191-208

Noss, R.F., Franklin, J.F., Baker, W.L., Schoennagel, T., and Moyle, P.B. 2006. Ecology and Management of Fire-prone Forest of the Western United States. Society of Conservation Biology Scientific Panel on Fire in Western U.S. Forests.

Odion, D.C., Frost, E.J., Strittholt, J.R., Jiang, H., DellaSala, D.A., and Moritz, M.A. 2004. Patterns of Fire Severity and Forest Conditions in the Western Klamath Mountains, California. Conservation Biology, Vol. 18, No. 4, Pages: 927-936.

Oliver, C.D. and Larson, B.C. 1990. Forest Stand Dynamics. McGraw-Hill, New York, New York.

O'Neale, 1932 (1995). Yurok-Karok Basket Weavers with introduction by Schevill. Originally published as University of California Press publications in American Archeology and Ethnology, Vol. 32, No. 1.

O'Rourke, T. 2006. Personal Communication. Yurok Tribe GIS specialist and tribal member. Weitchpec, CA.

Osborne, D. 1958. Western American Prehistory An Hypothesis. American Antiquity, Vol. 24, No. 1, Pages: 47-52

Otternbreit, K. A. and Staniforth, R. J., 1992. Life cycle and age structure of ramets in an expanding population of Salix exigua (sandbar willow). Canadian Journal of Botany. 70:1141-1146.

Olsen, C.S. and Shindler, B.A. 2007. Citizen-Agency Interactions in Planning and Decisionmaking After Large Fires. USDA Forest Service, Pacific Northwest Research Station. General Technical Report, PNW-GTR-715. May 2007.

Pace, F. 2002. The Influence of Fire Suppression on Vegetation, Environmental Quality and Human Health In the Lower Klamath River Basin of Northwestern California. Presentation made May 22, 2001. Klamath Basin Fish & Water Management Symposium. Humboldt State University, Arcata, Cal. Proceedings complied by Trehey, G.H.

Paustian, S., M. Hemstrom, J. Dennis, P. Dittberner, and M. Brookes. 1999. Ecosystem Processes and Functions: Management Considerations Management in Ecological Stewardship: A Common Reference for Ecosystem Management, Vol. II. Biological and Ecological Dimensions (eds.) Sexton, Malk, Szaro, and Johnson. Pp. 255-279

Peacock, S.L. and Turner, N. 2000. Just like a garden: Traditional Resource Management and Biodiversity Conservation on the Interior Plateau of British Columbia. In Pages 133–179 in P. Minnis and W. Elisens, editors. Biodiversity and native North America. University of Oklahoma Press, Norman.

Pechuli, G. 2003. Wildfire disaster shakes Apache's economy. Indian Country Today. January 29, 2003.

Perry, D.A. 1998. The Scientific Basis of Forestry. Annual Review of Ecological Systems. Vol. 29: 435-466.

Peters, J. 2005. Personal Communication. Elder interview project. August 17, 2005. Hoopa, CA.

Peterson, G.D. 2002. Contagious Disturbance, Ecological Memory, and Emergence of Landscape Pattern. Ecosystems, Vol. 5, Pages: 329-338.

Photoshop, Adobe (CS1-Version). http://www.adobe.com/products/photoshop/index.html

Pierotti, R. and Wildcat, D. 2000. Traditional Ecological Knowledge: The Third Alternative (Commentary). Ecological Applications, Vol. 10, No. 5, pages: 1333-1340.

Pollock, M. M. 1998. Biodiversity *in* River Ecology and Management: Lessons from the Pacific Coastal Ecoregion. Naiman and Bilby (eds.) Chapter 17, pages: 430-454.

Polmateer, S. 2005. Personal communication about willow growth from and management practices. Ti-Bar, CA.

Prentiss, W.C, Chatters, J.C., Lenert, M., Clarke, D.S., and O'Boyle, R.C. 2006. The Archaeology of the Plateau of Northwestern North America During the

Late Prehistoric Period (3500-200 B.P.): Evolution of Hunting and Gathering Societies. Journal of World Prehistory, Vol. 19, No. 1, Pages: 47-118.

Price, P.W. Roininen, H., and Tahvanainen, J. 1987a. Why does the bud-galling sawfly, *Euura mucronata* attack long shoots? Oecologia Vol. 74: 1-6

Price, P.W. Roininen, H., and Tahvanainen, J. 1987b. Plant age and attack by the bud galler, *Euura mucronata*. Oecologia Vol. 74: 334-337.

Price, P.W. 1989. Clonal development of coyote willow, Salix exigua (Salicaceae), and attack by the shoot-galling sawfly, *Euura exiguae* (Hymenoptera: Tenthredinidae) Environmental Entonmology Vol. 18, pages: 61-68.

Price, P.W. 1992. The Resource-Based Organization of Communities. Biotropica. Vol. 24, No. 2b. Pages: 273-282.

Pullen, R. 1996. Overview of the Environment of Native Inhabitants of Southwestern Oregon, Late Prehistoric Era. Report prepared for the USDA Forest Service, and DOI Bureau of Land Management. Medford District. Pullen Consulting, Bandon, OR.

Pyne, S.J., Andrews, P.L., and Laven, R.D.1996:173 Introduction to Wildland Fire, second edition. John Wiley and Sons, Inc. New York, NY. 769 Pages.

Radosevich, S. 2003. Personal communication with major professor. Oregon State University. Forest Science Department course FS 599.

Rains, M.T., Apicello, M., Berg, J., Copenhagen, M., Currier, J., Harbour, T., Hirami, P., Latapie, B., Lockyer, J., O'Neal, S., and Quintanar, R. n.d. Policy Implications of Large Fire Management: A Strategic Assessment of Factors Influencing Costs, A Report by the Strategic Overview of Large Fire Costs Team. USDA Forest Service, State and Private Forestry.

Raish, C., Gonzalez-Caban, A., and Condie, C.J. 2005. The importance of traditional fire use and management practices for contemporary land management in the American Southwest. Environmental Hazards, Vol. 6: 115-122.

Rasmussen, K.F. 2005. The Promise of Wildland Fire Management: Creating Economic Opportunity for American Indian Tribes. Thesis. Department of Planning, Public Policy and Management. University of Oregon. June 2005.

Ralph, C.J. unpublished bird survey results. US Forest Service, Pacific Southwest Research Station, Redwood Sciences Lab, Bird monitoring group. Arcata, CA.

Ray, D, Woodroof, W., and Roberts, R.C. 1981. Management of Riparian Vegetation in the North Coast Region of California's Coastal Zone. Paper presented at the California Riparian Systems Conference. University of California-Davis. September 17-19, 1981. Pages: 660-671.

Redwood Genealogical Society 1985. There Really was a Klamath County! 1851~1874. P.O. Box 645, Fortuna, CA. 95540. 111 Pages.

Reece, W. 2002 and 2007. Personal Communication. Elder interview project. September 23, 2002. Happy Camp, CA.

Reed, R. 2006. Personal communication with the cultural biologist of the Karuk Tribe of Califironia, Orleans, CA. Working on the Eco-cultural Management Plan

Reed, R. 2007. Personal communication with the fuels management specialist of the Yurok Tribe. Weitchpec, CA.

Rentz, E.D. 2003. The Effects of Fire on Plant Anatomical Structure in native California Basketry Materials. Master's Thesis, San Francisco State University.

Resource Innovations, 2006. Tribal Wildfire Resource Guide 2006. Developed in Partnership with Intertribal Timber Council and Confederated Salish and Kootenai Tribes of the Flathead Nation. Resource Innovations, University of Oregon.

Rice, P.M. 2004. Fire as a tool for controlling nonnative invasive plants. www.weedcenter.org/management/tools.htm#burning. Bozeman, MT: Center for Invasive Plant Management. Report October 2004.

Richardson, P.J., Boyd, R., and Bettinger, R.L. 2001. Was Agriculture Impossible During the Pleistocene But Mandatory During the Holocene? A Climate Change Hypothesis. American Antiquity. Vol. 66, No. 3, Pages: 387-411.

Richards, T., Bloch, V., and Schlosser, B. 2007. Inventory Data Acquisition and GIS Analysis for Community Wildfire Protection Plans (CWPPs), Integrated Resource Management Plans (IRMPs), and Environmental Assessments (EAs). Session workshop at the 31st Annual National Indian Timber Symposium, June 4-7 2007. Polson, Mt.

Riley-Thron, K. 2001 Forest, Fire, Home: Experiences with Wildfire in the Klamath Mountains of Northern California. Unpublished M.A. thesis, Department of Interdisciplinary Studies, Humboldt State University, Arcata.

Rizzo, D.M., Garbelotto, M., Davidson, J.M., Slaughter, G.W., and Koike, S.T. 2002. Phytophthora ramorum as the cause of extensive mortality of *Quercus* sp. and *Lithocarpus densiflorus* in California. Plant Disease. Vol. 86, Pages: 205-214.

Rizzo, D.M. and Garbelotto, M. 2003. Sudden oak death: endangering California and Oregon forest ecosystems. Frontiers in Ecology and Environment Vol. 1, Pages: 197-204.

Robertson, D. 1992 Memorandum issued to regional foresters and research-station directors, June 4, 1992. USDA Forest Service, Washington D.C.

Rogers, R.A., Martin, L.D., and Nicklas, T.D.. 1990. Ice-Age geography and the distribution of native North American languages. Journal of Biogeography Vol.17 Pages:131-143.

Rollins, M.G., Keane, R.E., and Parsons, R.A. 2004. Mapping fuels and fire regimes using remote sensing, ecosystem simulation, and gradient modeling. Ecological Applications, Vol. 14, No. 1, Pages: 75-95.

Ryan, K.C. 2006 unpublished. First Order/Second Order Fire Effects. Rx 510 Applied Fire Effects, Lesson Plan I-A. National Advanced Fire and Resource Institute, Tucson, Az.

Rypins, S., Reneau, S.L., Byrne, R. and Montgomery, D.R. 1989: Palynologic and geomorphic evidence for environmental change during the Pleistocene-Holocene transition at Point Reyes Peninsula, central coastal California. Quaternary Research Vol. 32, Pages: 72-87.

Salazar, L.A, Hoover, L.D., McGee, E.A. and Flattley, M.S. 2002. Oak Woodland/Grassland Encroachment-Implications for Fuels Management. In Proceedings of the Symposium: Fire in California Ecosystems: Integrating Ecology, Prevention, and Management. Misc. Publication. No. 1, Association of Fire Ecology. Sugihara, N.G., Morales, M.E., and Morales, T.J. (editors). Pages: 372-375.

Salazar, L.A. 2007. Personal Communication. USFS Fire and Fuels manager. Six Rivers National Forest, Eureka, CA.

Salberg, T.A. 2005. Hazel Fuels Reduction Project: Integrating Cultural Resource Management and Hazardous Fuels Reduction. Evergreen Winter 2005/2006. Pages: 72-73

Salter, J.F. 2003. White Paper on Behalf of the Karuk Tribe of California: A Context Statement Concerning the Effect of the Klamath River Hydroelectric Project on Traditional Resource Uses and Cultural Patterns of the Karuk People within the Klamath River Corridor. Contract (No. 3000020357) with Pacific Corp in Connection with Federal Energy Relicensing Commission Proceedings concerning the relicensing of Iron Gate Dam. Nov. 2003.

Salter, J.F. 2004. Whites Papers: Perspectives of the impacts to the Klamath River and Karuk cultural from dams and river flow management. Unpublished Contracted from the Karuk Tribe, Department of Natural Resources, Orleans, Cal.

Salter. J. n.d. Fire and Forest Management: Casting Light on the Paradigms. Accessed April 12, 2007. http://users.sisqtel.net/tcreek/bsalterfirepg2.htm

Sandberg, D.V., Ottmar, R.D., Peterson, J.L., and Core, J. 2002. Wildland fire on ecosystems: Effects of fire on air. General Technical Report. RMRS-GTR-42, Vol. 5. Ogden, UT: USDA Forest Service Rocky Mountain Research Station. 79 Pages.

SAS 9.1 online Help, search topic: www.sas.com/

Sawyer, J.O. Gray, J., West, G.J., Thornburgh, D.A., Noss, R.F., Engbeck, J.H., Marcot, B.G., and Raymond, R. 2000. History of Redwood and Redwood Forest. In Noss, R.F. (editor), The Redwood Forest: History, Ecology, and Conservation of the Coast Redwoods. Island Press, Washington D.C. Page: 7-38.

Scanlon, H.S. 2003. Wildfire Risk Planning and Mitigation in Northwestern California. MS Thesis in Natural Resources-Forestry, Humboldt State University, Arcata, CA.

Schenck, S.M. and Gifford, E.W. 1952. Karok Ethnobotany. Anthropological Records Vol. 13, No. 6, Pages: 377-292.

Schmidt, K.M.; Menakis, J.P.; Hardy, C.C.; Hann, W.J.; Bunnell, D.L. 2002. Development of coarse-scale spatial data for wildland fire and fuel management. Gen. Tech. Rep., RMRS-GTR-87. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station

Schlingloff, Jeffrey. First Nations perspective in Mapping, Traditional Environmental Knowledge (TEK) and Geographic Information Systems (GIS). http://www.scn.org/~bg837/

Sea, D.S. and Whitlock, C. 1995. Postglacial vegetation history of the high Cascade Range, central Oregon. Quarternary Research Vol. 25, Pages: 150-162.

Secretarial Order 3206: American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act, and its accompanying Appendix June 5, 1997. Washington, D.C., by the Secretary of the Interior and the Secretary of Commerce.

Secretariate of the Convention on Biological Diversity 2003. Interlinkages between biological diversity and climate change. Advice on the integration of biodiversity considerations into the implementation of the United Nations Framework Convention on Climate Change and its Kyoto protocol. Montreal, SCBD, 154. CBD Technical Series no. 10).

Senos, R., Lake, F.K., Turner, N., and Martinez, D. 2006. Traditional Ecological Knowledge and Restoration Practice. In: Apostol, D. and Sinclair, M. (eds.). Restoring the Pacific Northwest: The Art and Science of Ecological Restoration in Cascadia. Island Press, Washington D.C. Pages: 393-426.

Sessions, J. 2005. Are Indian Forests and Forest Management Improving? A comparison of the 1991 and 2001 national assessment. Evergreen. Winter 2005/2006. Pages: 32-37

Seventh Generation Fund 2006. Traditional Knowledge and Environmental Stewardship – A Native American and Community Forestry Collaborative Discussion. Fortuna, CA. June 21-22: 2006

Shaffer, K.E. and Laudenslayer, Jr.W.F. 2006. Fire and Animal Interactions In: Sugihara, N.G., Van Wagtendonk, J.W., Shaffer, K.E., Fites-Kaufman, J., and Thode, A.E. (eds.) Fire in California's Ecosystems. University of California Press, Berkeley, Ca. Chapter 7, Pages: 116-144

Shasta River Coordinated Resource Management Planning Council- TMDL process Staff Report for the Action Plan for the Shasta River Watershed Introduction Dissolved Oxygen and Temperature Total Maximum Daily Loads Accessed by web. 31 May 2007: www.swrcb.ca.gov/rwqcb1/programs/tmdl/shasta/060707/01ShastaRiverTMDL.pdf

Shaw, B. 2005. Firefighting Forces in Indian Country: Yesterday and Today. Evergreen Winter 2005/206. Pages: 69-71.

Shepard, P.M., Northridge, M.E., Prakash, S. and Stover, G. 2002. Preface: Advancing Environmental Justice through Community-Based Participatory Research. Environmental Health Perspectives. Vol. 110, Supplement 2, Pages: 139-140.

Sherry, E. and Myers, H. 2002. Traditional Environmental Knowledge in Practice. Society and Natural Resources. Vol. 15: 345-358. Taylor and Francis Press.

Shipley, B. 2002. Cause and Correlation in Biology: A User's Guide to Path Analysis, Structural Equations and Causal Inference. Paperback with corrections. Cambridge University Press.

Silver, S. 1978. Shastan Peoples. In Heizer, R.F. (editor). California, Volume 8: Handbook of North American Indians, Smithsonian Institution. Washington, D.C. Pages: 211-224.

Six Rivers National Forest Interviews. USDA Forest Service. On-file Eureka, CA. See Also Appendix.

Skinner, C.N. 1995. Change in spatial characteristics of forest openings in the Klamath Mountains of northwestern California, USA. Landscape Ecology 10:219–228.

Skinner, C. N. 1997. Fire history in riparian reserves of the Klamath Mountains. In: Proceedings—Fire in California Ecosystems: Integrating Ecology, Prevention, and Management. San Diego, California, USA. [Online, URL:^http://www.ice.ucdavis.edu/cafe´/agenda97/FireEcology/History/4FE Skinner.html&.]

Skinner, C.N. 2002. Fire history in riparian reserves of the Klamath Mountains. Association for Fire Ecology Miscellaneous Publications No. 1: 164-169.

Skinner, C.N., 2003a. Fire regimes of upper montane and subalpine glacial basins in the Klamath Mountains of northern California. Tall Timbers Research Station Miscellaneous Publication 13, Pages: 145–151.

Skinner, C.N. 2003b. A tree-ring based fire history of riparian reserves in the Klamath Mountains. In: Faber, P.M. (editor) California Riparian Systems: Processes and Floodplains Management, Ecology, and Restoration. Riparian habitat and floodplains conference proceedings. March 12-15, 2001. Sacramento, Ca.. Riparian Habitat Joint Venture, Sacramento, Ca. pages: 116-119.

Skinner, C.N., Taylor, A.H., and Agee, J.K. 2006. Klamath Mountains Bioregion. In: Sugihara, N.G., Van Wagtendonk, J.W., Shaffer, K.E., Fites-Kaufman, J., and Thode, A.E. (eds.) Fire in California's Ecosystems. University of California Press, Berkeley, Ca. Chapter 9, Pages: 170-194

Skinner, D. 2005. Viva La Difference: How and why tribal forestlands are managed differently from federal forestlands. Evergreen: Pages: 21-24Stein, S.J., Price, P.W., Abrahamson, W.G., and Sacchi, C.F. 1992. The effect of fire on stimulating willow regrowth and subsequent attack by grasshoppers and elk. Oikos, Vol. 62, No. 2: 190-196.

Smith, E.L. 1970. Biosystematics and Morphology of Symphyta. II. Biology of Gall-Making Nematine Sawflies in the California Region. Annals of the Entomological Society of America. Vol. 63, No. 1, Pages: 36-51.

Smith, D.M., Kelly, J.F., Finch, D.M. 2006. Influences of Disturbance and Vegetation on Abundance of Native and Exotic Detritivores in a Southwestern Riparian Forest. Environmental Enotology. Vol. 35, No. 6 Pages: 1525-1531.

Spinks, C. 2005. Personal Communication. Elder interview project. December 17, 2005. Happy Camp, CA.

Stein, S.J., Price, P.W., Abrahamson, W.G., Sacchi, C.F. 1992. The effect of fire on stimulating willow regrowth and subsequent attack by grasshoppers and elk. Oikos, Vol. 65, No. 2, Pages: 190-196.

Stein, S.J., Price, P.W., Craig, T.P., and Itami, J.K. 1994. Dispersal of a galling sawfly: implications for studies of insect population dynamics. Journal of Animal Ecology. Vol. 63, Pages: 666-676.

Stephens, S.L. and Sugihara, N.G. 2006. Fire Management and Policy Since European Settlement, Chapter 18 In: Sugihara, N.G., Van Wagtendonk, J.W., Shaffer, K.E., Fites-Kaufman, J., and Thode, A.E. (eds.) Fire in California's Ecosystems. University of California Press, Berkeley, Ca. Pages: 431-443

Stercho, A.M. 2006. The Importance of Place-Based Fisheries to the Karuk Tribe of California: A Socioeconomic Study. M.A. Thesis. Environment and Community. Humboldt State University, Arcata, Ca.

Stewart, O. C., 2002. Forgotten Fires: Native American and the Transient Wilderness. Edited by Lewis, H. and Anderson, M.K. Oklahoma Press

Strike, S.S. 1994. Ethnobotany of California Indians: Aboriginal Uses of California's Indigenous Plants. Vol. 2, Champaign, IL.: Koeltz Scientific Books.

Stuart, C. and Martinez, K. (tech. eds.) 2005. Northwest Forest Plan—the first 10 years(1994-2003): effectiveness of the federal-tribal relationship. Tech. Paper R6-RPM-TP-02-2006. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region

Stuart, J.D. 1987. Fire History of an Old-Growth Forest of Sequoia semperviern s (Taxodiacae) in Humboldt Redwoods State Park, California. Madrono 34: 128-141.

Stuart, J.D. 1997. Fire History of California White Fir (*Abies concolor* var. *lowiana*) Forests on the Six Rivers National Forest. Final Report Submitted to Six River National Forest, Participating Agreement #PA-5-94-10-027. March 31, 1997.

Stuart J.D. and Salazar L.A. 2000. Fire history of white fir forests in the coastal mountains of northwestern California. Northwest Science 74(4):280-285

Stuart, J.D. and Stephens, S.L. 2006. North Coast Bioregion. In: Sugihara, N.G., Van Wagtendonk, J.W., Shaffer, K.E., Fites-Kaufman, J., and Thode, A.E. (eds.) Fire in California's Ecosystems. University of California Press, Berkeley, Ca. Pages: 147-169.

Sundahl, E. and Henn, W. 1993. Borax Lake Pattern Assemblages on the Shasta-Trinity National Forests, North-Central California. Journal of California and Great Basin Anthropology. Vol. 15, No.1, Pages: 73-90.

Sundahl, E. 1981. Shasta Complex: The Jefferson Connection. State of Jefferson Newsletter, Vol. 1, No. 2: Pages: 2-3. In Connolly 1986.

Swezey, S. L. and Heizer, R. F. 1993. Ritual Management of Salmonid Fish Resources in California. In Before the Wilderness: Environmental Management by Native Californians, edited by Blackburn, T.C. and Anderson, M.K., Ballena Press. Melo Park, CA. Pages: 299-327

Synder, J.O. 1931. Salmon of the Klamath River. Fish Bulletin No. 34. Division of Fish and Game of California. 130 Pages.

Tabacchi E, Correll, D.L., Hauer, R., Pinay, G., Planty-Tabacchi, A.M, Wissmar, R.C. 1998 Development, maintenance and role of riparian vegetation in the river landscape. Freshwater Biology Vol. 40 Pages: 497–516

Tamez, S. and Johnson, S. 2005. Sustaining Communities and Sustaining our Forests: The Forest Service and American Indian Tribes Working Together. Evergreen, Special Issues on Forestry in Indian Country. Winter 2005-2006 Pages: 46-49

Taylor, A.H. and Skinner, C.N. 1998. Fire History and landscape dynamics in a late-successional reserve, Klamath Mountains, California, USA. Forest Ecology and Management. Vol. 111, Pages: 285-301.

Taylor, A.H. and Skinner, C.N. 2003. Spatial Patterns and Controls on Historical Fire Regimes and Forest Structure in the Klamath Mountains. Ecological Applications, Vol. 13, No. 3, Pages: 704-719.

TEK Advisory Committee. Purpose and mission statement. http://www.mnr.gov.on.ca/mnr/eip/html/tek_information.html

Thom, C. Sr. 2002. Personal Communication. Elder interview project August 21, 2002. Orleans, CA.

Treganza, A.E. 1959. Salvage Archaeology in the Trinity Reservoir Area, Northern California Field Season 1958. Berkeley: University of California Archaeological Survey Reports No. 46, Pages: 1-32.

Tribal Forest Protection Act 2004. P.L. 108-278. http://www.fs.fed.us/forestmangement/projects/stewardship/tribal/index.shtml

Tripp, W. 2005. The Creator Put Fire on the Mountain. Wisdom, No. 2, Pages: 3-4

Tripp, W. 2006. Personal Communication. Karuk Tribe Department of Natural Resources. Orleans, CA..

Trouet, V., Taylor, A.H., Carleton, A.M., and Skinner, C.N. 2006. Fire-Climate interactions in forests of the American Pacific coast. Geophysical Research Letters. Vol. 33, L18704.

Turner, N. J. 1997. Traditional ecological knowledge. *In* P. K. Schoonmaker, B. Von Hagen, and E. C. Wolf, (editors). The rain forests of home: profile of a North American bioregion. Pages 275–298 Ecotrust. Island Press, Covelo, California, USA.

Turner, N.J. 1999. "Time to Burn": Traditional Use of Fire to Enhance Resource Production by Aboriginal Peoples in British Columbia. In Boyd, R. (ed.) Indians, Fire and the Land in the Pacific Northwest. Oregon State University Press, Corvallis, Or. Pages: 185-218.

Turner, N.J., Boelscher-Ignace, M., and Ignace, R. 2000. Traditional Ecological Knowledge and Wisdom of Aboriginal Peoples in British Columbia. Ecological Applications, Vol. 10, No. 5, Pages: 1275-1287.

Turner, N.J., Davidson-Hunt, I.J., and O'Flaherty, M. 2003. Living on the Edge: Ecological and Cultural Edges as Sources of Diversity for Social-Ecological Resilience. Human Ecology, Vol. 31, No. 3, Pages: 439-461

Underwood, S., Arguello, L., and Siefkin, N. 2003. Restoring Ethnographic Landscapes and Natural Elements in Redwood National Park. Ecological Restoration, Vol. 21, No. 4 Pages: 278-283.

USDA Forest Service, Klamath National Forest 1928. Map, descriptive text. Yreka, Ca. Digital copy of map on file at USFS Pacific Southwest Research Stations, Arcata and Redding Ca. Acquired from Ora Smith, Orleans, Ca.

USDA Forest Service, Klamath National Forest 1998. Ishi-Pishi/Ukonom Ecosystem Analysis, Cultural Resources, Step 5-Interpretation Pages 5-27. Yreka, CA. On-File.

USDA Forest Service 1997. National Resource Book on American Indians and Alaska Natives. April

USDA Forest Service Six Rivers National Forest, Heritage Program. Unpublished interviews on file. Eureka, Ca.

USDA Forest Service Six Rivers National Forest 2001. Fire Management Plan FY 2001. 1330 Bayshore Way Eureka, CA. 95501. 306 Pages.

USDA Forest Service Six Rivers National Forest, Lower Mid-Klamath Watershed Analysis 2003 version. On-file. Eureka, Ca.

USDA Forest Service: Record of Decision for the Northwest Forest Plan-Aquatic Conservation Strategy 1994. http://www.reo.gov/library/acs/

USDA Forest Service Fire Effects Information System (FEIS): www.fs.fed.us/database/feis/plants/tree/salexi/fire_effects.html

USDA Forest Service National Wild and Scenic River: http://www.fs.fed.us/r5/publications/water_resources/html/wild___scenic_rivers.html

United States Geological Survey data: Topographic maps acquired from: Sawyers 1923, Preston Peak 1923, Hoopa 1921

USDI National Park Service. 2003. Fire Monitoring Handbook. Boise (ID): Fire Management Program Center, National Interagency Fire Center. 274p.

Vale, T. 2002. Fire, Native People and The Natural Landscape. Island Press. Washington D.C.

Vannote, R.L., Minshall, G.W., Cummins, K.W., Sedell, J.R., and Cushing, C.E. 1980. The river continuum concept, Canadian Journal of Forest Research. Vol. 20, Pages: 1593-1610.

Van Pelt, W. 1996. Quoted in Baskets and Weavers. C. Israel. Clarke Memorial Museum, Eureka, Ca. Page 38

Veirs, S.D. Jr. 1982. Coast redwood forest: stand dynamics, successional status, and the role of fire. In: J.E. Means, Ed. Forest succession and stand development research in the Northwest: Proceedings of the symposium, March 26, 1981, Corvallis, OR. Oregon State University, Forest Research Laboratory, Corvallis, OR. pgs. 119-141.

Wallace, W.J. 1978. Hupa, Chilula, Whilut. In Heizer, R.F. (ed.) Volume 8 California, Handbook of North American Indians, Sturtevant, W.C. (general editor). Smithsonian Institution, Washington D.C. Pages:164-179.

Walstad, J.D., Radosevich, S.R., and Sandberg, D.V. (eds.) 1990. Natural and Prescribed Fire in Pacific Northwest Forests. Oregon State University Press, Corvallis, Oregon. 317 Pages.

Ward, R.H., Redd, A., Valencia, D., Frazier, B., and Paabo, S. 1993. Genetic and linguistic differentiation in the Americas. Proceedings of National Academy of Science. Vol. 90, Pages: 10663-10667.

Waterman, T.T 1920. Yurok Geography. Authorized facsimile with new introductory material published by Trinidad Museum Society, Trinidad Ca. 1993. Originally published by University of California; Publications in American Archeology and Ethnology, Vol. 16, No. 5, Pages: 177-315. Original copyright 1920, University of California Press, Berkeley, Cal.

West, G.J. 1985. Holocene Vegetation and Climatic Changes in California's North Coast Ranges. In: Archaeological Investigations on Pilot Ridge: Results of the 1984 Field Season, J.F. Hayes and W.R. Hildebrandt (eds.) Pages: 8-29. Report on file at the Six Rivers National Forest, Eureka.

West, G.J. 1988. Pollen profile from Cedar Lake, Siskiyou County, California: A >10,000 year record of a Disjunct Population of Chamaecyparis lawsoniana. American Quaternary Association (AMQUA), 10th biennial meeting. 6-8 June 1988, University of Massachusetts, Amherst. p. 161.

Whistler, K.W. 1977. Wintu Prehistory: An Interpretation Based on Linguistic Reconstruction of Plant and Animal Nomenclature. Paper presented at the Third Annual Meeting of the Berkeley Linguistic Society.

Whistler, K.W. 1979. Linguistic Prehistory in the Northwest California Culture Area. In: A Study of Cultural Resources in Redwood National Park, by P.M. Bickel, pp. 11-26. National Park Service. Report on file at the National Park Service, San Francisco.

Whitlock, C. 1992. Vegetational and Climatic History of the Pacific Northwest during the Last 20,000 Years: Implications for Understanding Present-Day Biodiversity. The Northwest Environmental Journal, Vol. 8. No. 1, Pages: 5-28

Whitlock, C. and Knox, M.A. 2002. Prehistoric Burning in the Pacific Northwest: Human versus Climatic Influences. In Fire, Native Peoples, and the Natural Landscape. T.R. Vale (ed.) Island Press. Washington D.C. pp. 195-23

Whitlock, C., Skinner, C.N., Bartlein, P.J., Minckley, T., and Mohr, J.A. 2004. Comparison of charcoal and tree-ring records of recent fires in the eastern Klamath Mountains, California, USA. Canadian Journal of Forest Research, Vol. 34 Pages: 2110-2121.

Whittaker, R.H. 1960. Vegetation of the Siskiyou Mountains, Oregon and California. Ecological Monographs Vol. 30, Pages: 279-338.

Whittaker, R.H. 1961. Vegetation history of the Pacific Coast States and the "central" significance of the Klamath region. Madrono Vol. 16 Pages: 5–23.

Wild and Scenic River Designation, Federal and California for Klamath River. USDA Forest Service. LMK-WA 2003.

Williams, G. 2000. Introduction to Aboriginal Fire Use in North America. Fire Management: Today. Vol. 60., No. 3. Summer 2000. USDA Forest Service. Pages: 8-12.

Williams, G. American Indian Uses of Fire: http://www.blm.gov/hertitage/docum/Fire/Bibliography%20-%20Indian%20Use%20of%20Fire.pdf

Willis, R.D, and Stuart, J.D. 1994. Fire History and Stand Development of a Douglas-fir/Hardwood Forest in Northern California. Northwest Science, Vol. 68, No. 3, Pages: 205-212

Wilson, Richard n.d. The Interim Air Quality Policy on Wildland and Prescribed Fires. Environmental Protection Agency Memorandum www.epa.gov/ttn/caaa/t1/memoranda/wilson.pdf

Woodman, R.L. and Price, P.W. 1992. Differential Larval Predation by Ants Can Influence Willow Sawfly Community Structure. Ecology Vol. 73, No. 3 pages: 1028-1037.

Wohlgemuth, P.M., Hubbert, K., Arbaugh, M.J. 2006. Fire and Physical Environmental Interactions: Soil, Water, and Air. In: Sugihara, N.G., Van Wagtendonk, J.W., Shaffer, K.E., Fites-Kaufman, J., and Thode, A.E. (eds.)

Fire in California's Ecosystems. University of California Press, Berkeley, Ca. Chapter 5 Pages: 75-93

Worona, M.A. and Whitlock, C. 1995. Late Quaternary Vegetation and Climate History near Little Lake, Central Coast Range, Oregon. Geological Society of America Bulletin 197, Pages: 867-876.

Yazzie-Durglo, V. 1998. The Right to Change Tribal Forest Management. Journal of Forestry, November 1998. Pages: 33-35

Ziemer, R. R. and Lisle, T. E., 1998. Hydrology *in* River Ecology and Management: Lessons from the Pacific Coastal Ecoregion. Naiman and Bilby (eds.) Chapter 3, pages: 43-68

Zybach, B. 2005 Indian burning of the Oregon Coast Range. Oregon State University, Ph.D Dissertation.

Zybach, B. 2007. Personal Communication. Albany, Or. and e-mails correspondence.

Appendices
Appendix A: Collection of ethnographic quotes and oral history Interviews

Informed Consent Document

Project: Indian Use of Fire for Natural Resource Management

Purpose of the Research Project:

The purpose of this research is to document the use of fire by native peoples. The information collected from this research will help in documentation of traditional ecological knowledge and historical cultural land use practices that may improve management of natural resources. Understanding burning practices by native people can assist watershed restoration and prescribed burn projects and increase tribal participation in natural resource management. These collaborative efforts ensure long-term sustainable use of the environment and help maintain the ecological integrity of place.

Procedures:

This research will involve interviews of native people whom are familiar with traditional burning practices. Prospective participants will be given a written list of the questions that will be asked during the interview. Interviews may be recorded while the questions are read/asked by Frank K. Lake. Native participants will answer the questions to the best of their knowledge and/or experience with the subject. Participants will be able to choose to what extent the information they share can be used and made available for others to use. The information collected during the interview may be restricted and available for use only by those parties designated by the interviewee (you). Participants can remain anonymous, should they feel the need to protect their identity for public or publication presentation purposes. At the end of survey participants will be paid one hundred dollars ($ 100) for their time and sharing of their knowledge. Participants will be paid with a personal check or cash by Frank K. Lake. Participants will be given a transcribed and audio copy of their interview for personal records at a later date, usually at the review edit session.

Participants are asked to review the survey questionnaire prior to the interview and sign the participation consent form. Participants may choose to complete the interview survey in one session or over multiple sessions. Multiple sessions may require a longer time commitment by the participants. Interviews are expected to be a minimum of two hours. Multiple sessions could allow for the expansion of information and knowledge shared in the survey.

Risks and Benefits:

Minimal risks involved with this survey/interview are the usual discomforts expected from sitting down or staying in one place for too long during the interview. The benefits associated with the interview are the sharing of cultural knowledge to be used for better natural resource management. Benefits also include the documentation of family or tribal cultural management practices that affirm continued ties to aboriginal rights and land use. Recorded information may and can be used to pass traditional ecological knowledge of burning practices on to future generations. A copy of the interview on an audio-cassette tape or mini-disc, as well as a transcribed copy of the interview, will be provided to the participant as well.

Confidentiality:

Interview participants may choose to protect their identity by asking not to be identified when their information is to be used for presentation or publication to the general public. Participants may also choose to have their information made available only to those parties identified by them. This provides protection for tribally or family sensitive information concerning cultural burning or environmental management practices that participants may wish not to be shared with non-native, non-tribal, or non-family members. Parts or details of participant's information may be omitted from public presentation or publication. Below is an example of how a participant's interview information may be modified to protect the identity of person, place or action.

Example: "My grandpa John Doe (1/2 Karuk and ¼ Yurok) (circa 1940) used to always start fires in the brush in September on his way down the trail from Doctor rock. This was done to keep the young trees and shrubs from growing over the medicine trail. Boy, this would keep those 'piss firs' (US Forest Service) fire crews busy as ever!".

This statement could be changed to:

"Native people (circa 1940) have been documented to light fires in the wilderness areas when returning from prayer sites in September along trials to prevent the encroachment of shrubs and young trees. US Forest Service fire crews would be dispatched to suppress the Indian set fires".

This type of editing for confidentiality protects the individual, the location of the sacred site used by that family, as well as for the act of arson. A classification system that would identify the individual by tribal and initials could be also be used for public presentation and publication purposes. Example: John Doe, 1/2 Karuk and ¼ Yurok would be: Informant JDKY.

Interviewees are asked to select the following options of indicating consent for participation with this study.

Please indicate consent by checking each statement below.

I agree to participate in this study by…

______ being interviewed.

______ being audio or video tape recorded.

______ being photographed.

Please circle the appropriate answer:

I would / would not like to be identified by name in publications or presentations.

I do / do not agree that a copy of my interview materials be given to the ____ tribe(s).

I would like my interview materials to be deposited at __________________ ____. (Please indicate where and with whom).

Please state any additional conditions under which your interview material could or could not be released to or used:

____

____

____

____

____

____

I agree to abide by your wishes as outlined and identified on this form above.

______________________________ Date: __________________

Frank Kanawha Lake

Voluntary Participation Statement

I affirm that my participation in this study on Indian use of Fire for Natural Resource Management is completely voluntary. I understand that I may either refuse to participate or withdraw from the interview at any time without penalty or loss of benefits to which I am otherwise entitled. I understand that if I withdraw from the interview before it is completed or fail to answer completely any questions, before the interview is completed, the amount of money or other compensation that I receive for participating will still be paid in the full amount.

I understand that any questions I have about the research, the information I share or specific questions about the interview procedure should be directed to Frank K. Lake at (530) 627-3109 or lakef@onid.orst.edu or Dr. Deanna Kingston at (541)

737- 4515, deanna.kingston@oregonstate.edu, 238 Waldo Hall, Department of Anthropology, Oregon State University, Corvallis Oregon 97331.

If I have questions about my rights as a research participant, I should contact the Oregon State University Institutional Review Board (IRB) Human Protections Administrator at (541) 737-3437 or IRB@oregonstate.edu.

My signature below indicates that I have read and that I understand the procedures described above and gives my informed and voluntary consent to participate in this study. I understand that I will receive a signed copy of this consent form.

______________________________ ______________________________

Signature of Participant **Name of Participant**

Date Signed _______________________________________

Interview Questionnaire

Dear Tribal Elder/Community Member:

My name is Frank Kanawha Lake (Karuk/Seneca/Cherokee-Mexican), I am currently going to college at Oregon State University in Corvallis, Oregon. I am a graduate student in the Environmental Sciences program and conducting my research in Northwestern California and Southwestern Oregon.

You have been recommended by members of your local community as “someone with knowledge” of cultural practices and/or natural resource management. I was hoping to get permission from you to have an interview at a later date. I would like to ask you questions about river and landscape changes in the area you live. Most of my questions will be about the historical use of fire by Indian people. I am interested in changes that have taken place with forests, prairies, creeks and areas down along rivers. I would like to know what you think would be the best way to restore the health of forests, grasslands, fisheries and water quality. If you agree to be interviewed, I will have a list of questions for you to look over, and you will be provided $100.00 for your time and knowledge. We can designate the informed consent form so that the information you share can only be kept for your family, local tribe(s) and/or what may or may not be used for publication to educate others. If you desire, your identity can be keep anonymous for any reason.

If you have any other questions, I can be reached at (530) 627-3109 (home), (541) 953-7181 cell, or my office address is: Department of Forest Science, Richardson Hall, Oregon State University, Corvallis Oregon, 97331. My home address is: P.O. Box 48, Orleans, Ca. 95556.

Thank you for your time and consideration of my request. fkl

Questions

1. Name, age and tribal affiliation. Village affiliation if known.
2. Were you raised learning traditional practices such as harvesting basket materials, collecting wild foods/herbs, fishing or hunting?
3. Where were some of the areas you learned these traditional practices?
4. Were you ever told/taught about the use of fire by Indian people?

5. Have you seen fire used for cultural practices to burn hazel, willows, bear grass, under oak trees, after ceremonies or for other reasons?
6. Do you remember what places Indian people burned? (Examples: Along coastal lagoons to clear old bulrush/tule. Along the river for willows at ________ gravel bar. In _________ meadow or ________ prairies to keep trees and shrubs from growing over. Under the oak trees above or below _______ road. Burned for bear grass on ________ ridge. After the ________ ceremony or __________ dance Indian people would burn _______ hill side or along _________ area.
7. What time of year and under what weather conditions would have Indian people burned the places you named above?
8. What were the main reasons why Indian people stopped using fire? (Examples: government policies, no access on private land, loss of knowledge/did not learn why or how fire was used for older generations, ceremony/dance stopped)
9. Are there times of year or certain places when burning was not used by Indian people?
10. Have forests, meadows/prairies, and areas along creeks and the rivers changed by Indian people not burning? If so, how?
11. Did Indians burn willows along the river? If so, for what purposes and how would have burning affected other plants and animals that live in and around the willows?
12. What connections do see between fire, plants, water, and fish?
13. How do you feel traditional uses of burning could be used to restore forests, prairies, or other places that would help the wildlife and fisheries?
14. How should the government agencies, like the National Park Service or US Forest Service, be using fire for better management of natural resources and cultural resources?
15. Could you share with me your understanding of why or why not Indians would have used fire to burn places in the sacred high country. (Example; Marble Mountains, Trinity Alps, or Chimney-Doctor Rock area)

16. Would Indians use fire to burn around sacred places? And if so, what were the reasons?
17. Are there any myths or stories about the use of fire or burning?
18. Are there any last things you would like to say about how, why and where Indian people used fire?

Oral history interviews collected by this dissertation research

Earl "Scrub"Aubrey, Jr. (Karuk) Age 66 Interview conducted by Frank K. Lake
Happy Camp, Indian Creek. December 17, 2005
Born at Clear Creek, **Born Nov. 14, 1939**
Consent for voluntary participation verbally given and signed on IRB form.

Frank: So tell me a little bit about the different traditional practices and things you learned, whether it was like gathering foods, or herbs, or fishing, hunting. Who were the people that [taught you]? How old were you when you were learning those things and what family members or what people were taking you out and teaching you.
Scurb: My family taught me everything I know from before I could remember, it was natural to our life, it was our bringing up I guess.
F: Yeah.
S: Because my grandmother was my main teacher, because that is who I stayed with most of the time.
F: Who was that?
S: Ah, Bessie Aubrey. My grandmother who, we stayed down at Aubrey creek. And she taught us everything, everything we had to know about survival or life. It was nice, nice. Ah, to get back to the fires in the forest, ah, back when I was little.
F: Ok, you said you would camp back up in the mountains, every summer when?
S: Every summer, after the main initial work in the gardens, when everything was done because thing was a self contained ranch, where everything had to be grown, harvested and taken care of for the winter. There was not stores anywhere, other than Happy Camp, which was three and half hours away. So, everything had to be done. Or our winter, we were going to suffer a bit. So, we had normal chores that had to be done, and then after our chores, then [things] where in full bloom then we had extra spare time. The whole family went camping. Went camping. You took different trails, to different places back in the mountain very good. It seemed like that was our whole summer, but you know it was just a short time but, it was something that we all enjoyed.
F: How far back would you guys go back off the river?
S: It depended just on how far along our chores was, and what had to be done. Sometimes we could not stay long because we was behind time, and something that we needed, had to be taken care of and not neglected, so that would cut our time short in the mountains, cut a little shorter than it would normally be.
F: Um-hun
S: But, we all worked hard trying to get it where we could stay longer out in the mountains. And we would go out in the mountains to me, it was a joyful trip of having fun. Going fishing, checking the country over. Being out there in the quite wild. You know-beautiful.
F: Up in the Marble Mts., what area?
S: Marble Mts., the Dillon Mt. range, the Swillip mountain range, the, all the mountain ranges right in this area [Clear Creek to Happy Camp]. Not necessarily the Marble mountains all the time. When we went to the Marbles, we always went up Ukonom creek. Hiked into Ukonom Lake, and then hit all the lakes from there.

F: Uh-huh [Yes]

S: But if we went back on the other side, up around this side of Pony peak then we went on to Red Mt. and on back to the headwaters of Clear Creek over to Youngs valley, or headed towards Huntington Ranch, out that direction. When we made that trip we made it in a big circle and we came out at Elk Valley or Flint Valley out by the ceremonial grounds. So when we went that way we, there was a lot of ceremonial scenes we that we had to see.
F: The sites the rock outcrops, prayer fires?
S: Yeah, place to sit and say prayers
F: Yeah, yep.
S: And do things in that category, which you know. We was taught all that. So either way we went it was nice. Fun, it was really a lot of fun.
F: So what do you remember the old people saying about how that land had changed or how they burned there or was that more lightning fire?
S: It would depend on what time of the year we went. Some times we could not go until after harvest was done. That means the garden and everything was put up and put away for the winter. And then we got a late start to go back into the mountains. When we went back in there after a late start, well then that was during hunting season and you could. There was a time for hunting big buck too. But it was more like we were hunting for big buck so it was more like a hunting trip. Ok, on the times we went hunting when it was late in the season we did a lot of burning, we did a lot of burning. It was natural for us to burn. Gramma told us we had to burn, to keep control of everything the way it was. You had to burn that underbrush, So the deer, uh, whatever was there to feed on it, so without burning it [fire] they did not have food. So we had to burn it and we did. We set our own fires. I don’t think any of them ever burned anything major that we noticed or seen.
F: Uh-huh
S: But it did make a log of smoke once in a while, we used to laugh because we would try to make it smoke, we was just kids. But uh,
F: How old were you then? When you remember lighting fire?
S: Pretty young, pretty young, it was back, had to be before the 50’ies before I graduated. I graduated in 1958. 1958.
F: Uh-huh.
S: I don’t remember starting any fires after that. But, it had to all be before 1958.
F: And when the old people would tell ya, your gramma, who ever it was that was with you to light fires was it to, areas that had, what was it like, was it south facing slopes, was it under oak forests, was it pines or fir? Was it?
S: No, it was brushy, And she told us that when ever we see trees that had a lot of pitch running down the sides of them, and it was really noticeable, she said then that area had to be burnt. So some reason she knew that.
F: Maybe it was bugs or something?
S: She said when it showed pitch, when you when by a bunch of trees. Till this day I still look at the time and I see it, I see where there is a lot of pitch running off the trees. But my grandmother told me when ever you see pitch running openly off the trees

then the Great Spirit is telling us it gots to be burnt. And it is setting the fuel so that it will burn.

F: Uh-huh.
S: And she said that is just how the Great Spirit taught us how to do it. So when ever we seen a lot of pitch, you get brushy spots, you know, and pitch, evidence. That's the spots we burnt. And she said that the Great Spirit was telling us that had to be taken care of there was a problem there. What the problem was, I don't know, but.
F: That's what needed to be done, ya?
S: That's what needed to be done because that's what the Great Spirit was saying had to be done, it was making the trees produce the material that burns. So that's were we built the fires and we. It was fun and games to us. I did not really know what was going on. Now I have been looking back at it, thinking about it and I could see her point. And I have watched the forest for a long time and I watch it when I go out there, And it gots to be taken care of. It's out of hand, right now, it's really hard for me to up, out there and start a fire right now. Because I would probably burnt it, burn everything right flat to the ground and.
F: Because it would be too hot, too much brush grown…trees
S: Yep, Yep. They [USFS] waited too long, they babied it. Saved it too long now it would be a be catastrophe. Unless, you need to set it [fire] at the right time. It would still burn alright if you could set it at the right time. You got to catch it before a storm, you know, it would only burn so much. It could only burn so much then go out. Instead of burning the whole damn forest down.
F: When you guys lit fires was it from the ridge to let it back down or was it from some place down at the bottom or?
S: It really didn't matter.
F: Yeah
S: There was no exact spot we had to, it was just all of a sudden there it would be obvious that there was a lot of trees around there that had pitch all over them. We would just touch them off there, not really great big fires, just start fires just have a little tiny piece of pitch, light a fire and just throw it out in the leaves at some place there is other pitch and something.
F: Yeah
S: And watch it for a while, and go on, we did not stay with it.
F: Did you use a little pitch stick as a.
S: Yeah we used little pitch sticks, Yeah we was taught since we was little babies to always look for pitch, so to this day whenever I go out to the woods and doing what ever, always looking around because there are pitch logs. Solid pitch logs they work. Everybody recognizes them you can see them. I was taught that you always go to know where the pitch is or have some pitch on you because, you never know when your going to need heat and you aint going to get no heat if it is raining, and snowing and storming, and it you aint got something it aint going to burn. So.
F: Yeah
S: You always go to know where pitch is and you have to understand pitch. People don't to this day. I watch them at my fire place here, [laughs], I watch then stacks of pitch. I get some people in here that burn it likes it oak.

F: Just regular kindling.
S: Throw it in the fire and think nothing of it.
F: What did you remember some of the elders, or family telling you about how fire helped the animals? Did they talk about that?
S: Oh, they were a food source you had to have it. You had to have it. Forest couldn't, I was told, our forests couldn't survive without some kind of an ash, some kind of ash to break down the food. They said you could have a foot of leaf mulch underneath your trees which rots away, which turns into food which feeds the trees, Ok.
F: Uh-huh.
S: But without ash to make it disintegrate into plant food, that tree will starve to death
F: Uh-hum.
S: Because it doesn't have anything to eat. It gots to have something to break it down. And that's where the ash comes in, you got to have ash to break, to break the food, the leaves and the other things so the trees can eat it. Other wise the tree can't eat it. It just lays there. And the garden is the same way.
F: Yeah
S: When you plant a garden, you put all that manure in there in on it, if you aint got something to break it down the way you have our seeds in it. It can't eat it, it aint going to do that plant no good.
F: And so besides deer hunting, did you harvest other food out there?
S: We harvested everything.
F: Could you talk about those areas. How far, you know?
S: Different areas all over, there was, [exhales]. Seems like you harvested something everywhere we went no matter what direction we went. If it wasn't edible foods for us kids, then it was vitamins or minerals, or some kind of a tea leaf, or medicine plant, or some kind of , to harvest keep and use for when we needed it, latter on when you got sick or what ever. So we harvested everything.
F: So when you went out to the mountains you went out there for a purpose? Yeah right?
S: Oh, the whole, life was a purpose. In our way of living life is a purpose, every bit of it and everybody gots has something they got to do. We are all different, some of us gotta do something the next person can't do. That is how I was taught. We can only do we can do. And so, I just went along because my gramma said it had to be harvested, or why it had to be harvested, what the reason was, a lot of it I did not understand, A lot of it I still don't understand. But we did it.
F: Did you guys collect huckleberries?
S: Ate um,
F: You guys ate them
S: I never brought anything back. If it was there then we ate them. We enjoyed them.
F: Did you ever notice areas that, uh, after a fire had been there, lightning or other Indians, or if your family had burned it before how it grow back better did they ever comment on that?
S: Oh yeah, it was open it was clear. Everything was so alive, everything was different, everything was much more alive. You could see growth, you could see, everything happening the way it was supposed to. Instead of some rocky ridge some place, that nothing happens on.

F: Uh-huh.

S: You could see that there was a reason why it was burnt. Now days I look at it and I can, all I can see is a big brush patch. There is a reason for it.
F: Uh-huh.
S: Yeah, there is a big difference. But when you get in the higher country it is different, it is different than down here lower. You get up in the 2000 foot mark and going up. You can see the whole forest chang. It is different. It is all different up there. It is just like, it is like it has not really been touched or damage too much by anything, it is pretty much the same way, pretty much the same, the trails, everything is still here, content, open and clear as it ever was.
F: So you have noticed in your life, you have noticed more changes in forest down lower than higher up?
S: Oh yes, definitely down lower. Down where there are more humans. Down, this area [Happy Camp] around, take a look at these mountains right here close to use, they are solid brush patches, trees won't even grow in them. They are just mismanaged. Completely out of hand.
F: Uh.
S: Now you have to have fire lines around town because they are scared that the damn place is going to burn down the town with all the people in it or something. You know it is crazy. It's crazy really. It's not like it used to be, it used to be like when you had a place, you not only took care of the place you have but everything around it. Everything around your place. Now you can't do that, I can't go up here and start cutting brush across [Grayback cut off /Indian Creek Rd.], the road over there and start cleaning it up. They will arrest me for destroying government property or something. But it needs it, Take look across the road up here, look at it. The brush is..
F: This is the road outside of Happy Camp going up headed towards Cave Junction way, or whatever [Grayback].
S: Just a mile and half out of town.
F: I have seen them do the fuels reduction, what do you think about that kind of fuels reduction their doing?
S: It's not going to work.
F: And why would you say it is not going to work?
S: Because of what they did, Ok, they got funding and they did it. Drive back and look at it now, the brush it this high.
F: So it has all resprouted back, like the madrones and...
S: It is already this high.
F: Yeah, four or five feet.
S: Next year it will be more than that, it will right back were it was, and all they did was help it. They helped it grow.
F: Uh.
S: They ought to come back this year and prune it. Is what they should have did. Stay with it. Then it would change, then it would be good, it would be a big change. Two years from now you would not even know they cut the brush in there. This year it will be no different, they are going to still have that big fire break around town. And the fire is going to rip through there fast and it is not going to stop it.

F: So it you had a crew, and you wanted them to do a treatment there how would you, what would you, what would you do differently I guess?
S: I would be experimenting on different ways of cutting it down and not having to worry about it growing back. I watched them do a lot of things in the forest, from sprays to what every have you, listen to the people argue about it. How chemicals are in the air how the sprays are going to kill everybody and all that. And the one I like the most out of all of them is “cut and dab” process. And the state outlawed it. They won’t let it happen anymore for some reason. Or the government did, but I thought that the cut and dab was the most successful juice of anything I have seen used or do.
F: What is a cut and dab?
S: I don’t know, they cut the bark on the tree and they dab some kind of stuff on it, that looks like paint but it is not. : No, they cut and then they take a little paint brush and they paint it.
F: Oh is it like “hatch and squirt”, They actually hatch it with this hammer and then it injects it with this juice and kills it? And that would kill the hardwood.
S: It would kill everything.
S: It didn’t wash off, it didn’t,
F: Oh, Ok.
S: it went into the roots.
F: Um-um
S: And not sprouts came back.
F: Ok, So that’s one way of controlling it.
S: No sprouts came back, and nothing else died around it. And I thought that was beautiful.
F: Right on.
S: They didn’t stay with it, they just did for a while then they outlawed it for some reason. It has something to do, um, I heard the university talking about it. The individual that did it [application of herbicide] was not protected from the.
F: Chemical exposure?
S: Stuff they were putting on the tree.
F: Um-huh.
S: It made unsafe for him to dab it so they quit it.
F: Ok.
S: But it worked, it worked, I could dab five of my trees out here. Five of them trees would die and none of the others would. It never came back, there would be no buds coming off the roots.
F: Yep.
S: I cut them down and burnt them up, um, it did not hurt nothing, it did not hurt noth’n.
F: So that takes a lot of labor though, there has to be some one going around almost every tree.
S: But,
F: Every tree you want.
S: But its permanent.
F: Yeah.

S: And being permanent, other than a fast job. Oh, years ago like that. That's no improvement to me, grew back bigger than it did before they cut it, so it made that much more brush.
F: Yeah
S: If they were trying to reduce it then it got's to be permanent solution.
F: So some trees, if you are going to select which one's stay and which one's go, some trees are more culturally valuable than others to the Karuk people.
S: Yep, all, all of them are.
F: Which, which trees are, do you favor, are there favors over others or how certain, what do favor?
S: It depends on where they are grown and what the environment is around them. Are they brushed in, are they open out. We pick acorns, all our lives.
F: Uh-um [Yes-acknowledgement].
S: We pick acorns, we still eat acorns, we eat acorns all the time.
F: Tanoak acorns?
S: Everything that gots acorns in it, ah, Cook sack.
F: Yeah
S: It got acorns in it, and I stick it in my mouth, and I eat them.
F: Yeah.
S: They are bitter if you chew them, If you don't bit them and throw them in your mouth. The saliva in your mouth softens them, you roll them around quick they fall apart. And you eat it. There is not bitterness, no nothing. I eat it all the time. But if you chew them, blah! You will spit them out! So, it is all in how you eat them and I eat them all the time. So, I notice though when we got our acorn trees, I am talking about the ranch down river [Aubrey Ranch or Swullip Creek], We have our spot where we generate our acorns, where we get our acorns from for the year. We had to go up there and dig up around those trees all the time, cut the brush. Keep that younger crops from coming back, so didn't have a brush patch.
F: Was that so you didn't have fir trees and.
S: Every thing, everything around our acorns trees we had to clear it.
F: Ok.
S: So when our acorns fell we could go up there and pick them up. No brush, no problem,
F: What about the leaves and the duff?
S: It don't hurt nothing, you got to have the leaves and the duff. That's what keeps the tree alive.
F: Hum.
S: Without that there is not food for the tree.
F: What about burning under those places?
S: Ashes, that just puts ashes on to make it deteriorate into plant food faster. Your back to ashes again.
F: Yep, so that was good too then.
S: Ashes, ashes help. You had to have it. Other wise you can get four years of leave mulch, under one oak tree, you can throw all kinds of fertilizer if you wanted to, it would just dry up and get hard, when it gets wet it will deteriorate a little bit, but not

very fast, but if it had ashes on it. It helps the process, critical the time, timing to make the tree grow get bigger.
F: Ok.
S: Make it stronger, because you have to have something to break it down, something to break it down, other wise you have piles and piles of leaf mulch out there and it’s not doing forest any good because it is just laying there. The only time it can do it if we have a really wet winter. Then lots of water on it will break it down.
F: Yeah, but, it was the fire and the.
S: Ash.
F: Ash?
S: Ash, it didn’t take much water, Ash.
F: Huh [nodding head yes].
S: Ash, that made it plant foods for the roots would grow the tree would get bigger. We had to go out and we had to clear around our acorn trees. We had special acorns trees we got our acorns from. And we had to clear around them all the time. Now, I aint’ cleared around them for quite a few years down there, you know, but I go up and see the just about every year.
F: That was below Clear Creek at Aubrey Ranch?
S: I go up to see them, pretty brushy, pretty brushy around there now. If I wanted to pick up acorns there, I know I could find a better spot to pick them up.
F: Yeah, yeah.
S: I am not going to pick them up there, there is too much brush there now. But when I was a kid, there was no brush there because we had to go up there and clean it. That was one of the jobs I did not understand, I didn’t understand it when we was doing it.
F: When you were little?
S: And you know when I applied for an Indian allotment there. They, and they wouldn’t give it to me, and that was our food, They [USFS] said it was more valuable for timber than, than it was agriculture.
F: So let’s talk about that difference in perspective. You wanted to have an allotment at the Aubrey ranch area and now it is National Forest Land?
S: Hum-uh, it was ours, our home anyway.
F: Yeah.
S: But they said it was more important for, ah, timber area than it was for agriculture. And yet, that was, ah, that was our food.
F: Uh-hum [Yes].
S: That was more important to us than their god damn potato or god damn tomato plant.
F: Acorns was life.
S: Yes! It still is.
F: Hum.
S: But they would not give it to me, Indian allotment, because they said it was more valuable for, the land was more valuable for the timber resource than it was for agriculture.
F: What other things did you notice that grew around there that were food for you, and your family?

S: Oh, everything grew around there. We had all the watercress you would ever needed. We kept the ponds where you could go for it. I said we had our leaching ponds for our acorns to make the, the acorns that stays in the water all year. You know we ate the acorn every way there was to eat it. We had our creeks that we, ah, kept open, to make sure the fish were plentiful. We had, all of the area was hunting area, deer, the deer come in there and live in the winter time, and go back up on the hill in the summer time.
F: Uh-hum.
S: We had to keep it clean for them. The whole thing was our life. We had to have it. We just couldn't sit there and let it go to hell, and noth'n come around.
F: Did you remember them talking about other birds, woodpeckers, or little warblers.
S: All, all.
F: Little yellow birds or anything like that?
S: Oh yeah, Oh yeah, because I had to get the woodpecker all along my younger life there for the medicine lady, Daisy, and she would pay us. She would pay us a little bit of the American money, besides make us whatever kind of basket we wanted, what ever you know, I mean.
F: What was her name? Daisy?
S: Jacobs.
F: She was?
S: She was the medicine lady, yeah. And she was just part of the family. My grandmother did not know how to speak much English. She always spoke Indian.
F: Uh-hum.
S: Daisy only spoke Indian [Karuk].
F: So those woodpeckers, where did you find them, was there special habitat? Places for them?
S: Yeah, where ever there was the wild Indian grape.
F: Oh yeah.
S: Where ever that wild grape, it used to grow thick there around our place, down there, we had that wild Indian grape around there. It is still there. But that and the madrone berries. He like the madrone berry that woodpecker.
F: Uh-hum [Yes].
S: Any way where ever there was a lot of that, that's where we go hunting. And they would come in there every year they would come in. They would come in to get the grape, and they would come in to get that madrone berry.
F: Is that like late fall?
S: Yeah, yeah it was after harvest time.
F: Right now almost?
S: Nooooo?
F: A little too late now?
S: They are too late now.
F: Yeah.
S: They are on there way out, I don't know if they hibernate or what, move on or what.
F: Hide out, yeah?

S: You don't see much of them. This time of year. You hear'em. I go, yeah, I go out in the woods, I hear them. But there is not very many of them. Not like, not like it is during all around lick season time. You know? When the food is starting to get ripe.
F: Uh-huh.
S: It seems like they are down on the river, lower then.
F: Yep.
S: Before you have to go kind'a up high to find them.
F: Did you hunt other animals besides deer?
S: Oh yeah, we hunted a lot of things, when in the mountains. We hunted, ah, just about everything out there for some reason or another it seems like. We hunted the fur bear'n animals for pelts, usually for the ceremonies.
F: Like the fishers?
S: Oh yeah, but the fishers wasn't here until not just lately in our life. He wasn't here when I was a kid. We had martins, we have always had the martin here.
F: Is he the small one with the yellow [chest].
S: Yes, he was just a little iddy-biddy guy, like a little squirrel. But, ah, there wasn't too many fishers. There was a few, but not too many. They were hard to get. But, but, no-like the mink, like the otter.
F: Uh-huh.
S: The coon. The fox, matter of fact we made the American dollar for trapping them.
F: Uh-huh.
S: Which, you know, made a little extra money in our pockets as kids you see, and it was fun to do.
F: How was, did you ever find those animals around areas that had burnt earlier, where there as fire? How did fire affect some of those fur-bearers?
S: Where ever there was a fire, there was a lot of animals. When ever the deer moved in, the deer moved in the year after the fire. The will move in right after a fire to just, ah, get rid of their fleas and ticks. That ash got ride of their fleas and ticks so they would move into a fire, right after it burnt, and roll in the ash.
F: Uh-huh.
S: Role in the ash to make themselves comfortable, but not to feed. Give that fire two summers.
F: Uh-huh.
S: And then it is a feed plot. It's a feed plot. Then you got more deer in there than you can, think of. Because it is an open food plot. And they will stay there for at least four years. Before they will move on to another burn. By that time another burn will kick in and the feed will be better there.
F: So it's better from the second year to the sixth year.
S: Yeah. Um-hun [Yes].
F: Then after that it would be good to burn some place next to it again?
S: Un-hun, because all animals move in there, once deer move in there then every other animal moves in there. Every animal moves in there. It becomes a big food plot. I am going to shut the door.
F: Ok.
S: Sulfur lick, they come into eat the sulfur. [You had to turn it back on?-recorder].
F: [Yeah it's find, go ahead].

S: We always had to have our sulfur licks. Our lick time. When it came time, when it came time for the deer to have salt. We had special salt licks that we went to watch. Go out there and build a blind, and ah, and bring our sleeping bags out there and lay out there at night and wait for the deer to come in and take our pick of what buck we wanted.
F: Yeah.
S: We could take our pick of which buck we wanted, because we lived off the land we had to kill at least three deer a week, to keep the ranch going.
F: How many people would that feed.
S: Oh, I would say, Fifteen to Twenty.
F: Ok.
S: That's counting the grown ups and most of the kids. You see my grandmother took in every kid on the river that did not have a place to stay, or something happen to their family, or what ever, she took them in. To just raise them with us, you know, to keep the ranch going. Because she lost her husband before my time.
F: Uh-huh.
S: And she was keeping the ranch going and she had a big family but most of them, were ah.
F: Adopted kids?
S: Married, she adopted them. She just took them in. Took care of them. When their parents gotta hold of themselves they would come to get them [their kids], or they get big enough and go off on their own. Married or what ever. She took care of them.
F: Ok, let's take a break and bring some wood in.
S: Alright.
F: So, you there, uh, uh, got to get my ear phone in, there you are now I'm going. Hah.
S: Um.
F: So, yeah I think that high country stuff was important, then.
S: It still is.
F: And that is one of the things that, and in at least trying to talk to, ah, its. When you talk about land management, and even using that fire, everything at least when I was taught when I was little, all had prayers.
S: Prayers all the time.
F: And.
S: You have to talk to the Great Spirit all the time in your life. That is the way I was told. No matter what you go out there, right down to the creek. I gotta walk, ah, go out there, and I gotta thank him for every thing. And then thank all the spirits around me.
F: Uh-huh.
S: All the spirits around me, thank them for letting me be there with them. Yeah. And then I talk to the Great Spirit and tell him what I see. Not's what's right or wrong, what I see. Talk to him. Don't tell him anything is wrong, just tell him hey. There gots to be a reason, it would not be happen unless there is a reason for it. The Great Spirit would not let it be happen unless there is a reason for it. And I think if we are the managers of the forest, supposed to be the people taking care of it. Then we should be able to feel something is wrong there and at least start trying to do something about it. Because he would not let it be happen that way if it wasn't for a reason.
F: Uh-huh.

S: Right or wrong, there is a reason why it is right, and a reason why it is wrong. And if we can't see it and take care of it, my gramma used to say, then we aren't managing the forest the way we are supposed to be. Then we aren't trying to take care of our future. Because, that's what we are talking about. If we don't take care of it then problem is, that it is only going to get worse. And it is not only going to get affect the forests or the land here, its going to affect our lives. Our lives too. Because our lives are in jeopardy too.
F: So those things out there.
S: So that's what you call managing the forest. That's what you say, hey, some things wrong here. And if we was the nominated ones who was supposed to help out in that point of the system, and we neglect it, then it will only get worse. And it is going to affect us. It is going to hurt us. You know, ah, every thing is done way in the future. Way a head of time. Not just right now because it is really bad, but it should have been being taken care of when it firs started. And we kinda get signs and signal saying some things wrong. We all know it.
F: How do we learn to pay attention to it, because I think a lot of people are not being taught how to watch and study nature so they know when it is wrong.
S: It just gotta be taught, you have to get out there and walk around. And don't think you are going to be the only one out there, because pretty soon you are going to run into somebody else. Someone else, pretty soon, you start learning, you start listen. You start saying hey, I go out anywhere in these woods, I get around. I, I, never feel I am the only one out there because pretty soon I bump into somebody. Somebody else is out there.
F: Another human being or somebody like an animal.
S: Anything. In any way you want to look at it. Over abundance of knowledge to let me know, that, hey, I am not the only one out there that sees things are wrong. Everything is alive. I was taught everything was alive. Even the rocks, everything is alive my grandmother told me. I said, it all shows you what's going on.
[Break to take care of miss chicken].
F: So we were talking about how everything is alive, your grandmother was saying, even the rocks, so you have to listen to them.
S: Everything is alive, and you got to watch them, and when you go out there you have to listen to them. Their telling you. So when you talk to the Great Spirit you have to always talk for them too. Because you know they are talking for you. [talking to chicken?]
F: So you were talking about fires were burnt up until 1958, around when you graduated from high school.
S: Yeah, yeah. When I was in high school the last part of high school we did it.
F: What were some of the main reasons why Indian people stopped lighting fires?
S: Ah, the law. All of a sudden we had law. We did not have any law before that. Are deer hunting and all that it [the presence of law to prevent arson and poaching] was taking effect back when I was a little kid, but it wasn't enforced. It was just something that was natural, I mean to go out and get our food. Not having to got out and buy a god damn license to be able to do. We just did and no body bothered us, but it was outlawed. To go out some place from the home place. Then I respected their laws and stuff you know.

F: Uh-huh.
S: And I'd buy a license. I would by that license to go out hunting in Modoc for mule deer. Different.
F: Different spots?
S: Different areas, different type of hunting. And I would buy license and do it. But when I was down on the ranch, I never did feel, I still feel that I should have to worry about their law, but they seem to be pushing it, they are pushing it to the max now. It makes us, it makes us an outlaw of some kind. When all we are doing is feeding ourselves. Not depleting or hurting anything you know. But the law says they tell me, yeah well, so much for the law when I am hungry. [Laughing] I don't care what anybody says. That's the way it is.
F: Yep.
S: If I have to be that much more sneakier, then I have to be that much more sneakier. But so much for the law. The law got's to bend too, and it don't. So, it hurts us, it makes us enemies, it makes us outlaws, it makes us criminals, it makes us…I can understand why they sent us away from that school.
F: Boarding school?
S: Yep.
F: Tell me about [it].
S: Just for being an Indian, you know just because I was an Indian.
F: What did that do to you when you were a boy taken away from your family and sent to boarding school, what did you miss out on as far as the training and being trained, being taught and going out with your family?
S: I missed out on everything. Because I refused to learn. I refused to learn what they [boarding schools] were trying to tell me.
F: The white man's school. Yeah?
S: I refused to learn it, if I said I wanted to go to school because my gramma told me. That is the only way we can do it, we have to go to school, get an education. And we are all smart enough to do what ever the hell we got to do, it's no problem that we are ignorant or dumb. But we gotta want to do it. But they made it to the point that I did not want to do it. And I wanted to do it so bad to please my grandmother and let her know that, hey, I understand what she was saying. The education is what we need.
F: So those elders also encouraged you to get, ah, ah, an American education, a white man's education?
S: Yep, because we needed it. Because we was in their world, not in our own anymore. And without it we are nothing. Darn right, it still is. I am proud of it right now because at least my daughters have a chance to get an education.
F: Uh-huh [Yes-acknowledgement of what's being said].
S: I didn't have that chance, they didn't give it to me. What they gave me was something to pacify their own selves. They said, oh, it's under control, you guys don't have to go to school with the savage, we got a place for them.
F: So when you came back from school how old were you? When went away to boarding school.
S: We came back every summer, for a month, a month and a half.
F: So.

S: They let us come home for a month and a half every summer. I tried to enjoy everything I could enjoy back, most of the time we went camping, we went out in the mountains, we went and did something I wanted to do. I didn't get to do when I was in there [boarding school]. And I could see why my family all turned into alcoholics.
F: Because of the boarding schools being broken up? The families, or?
S: Uh-huh [Yes-head nodding], because they had to got through it too. I did not realize it when I first got sent there, that, my dad told us stories about how they shipped his ass away too. He went to Sherman, they all got shipped to Sherman. Where ever that's at.
F: And your generation got shipped to Chemawwa, up in Oregon?
S: Yep. And they used to talk about it. They didn't really understand what life was all really about either. Just little Indians on this river too. Then the war came along [WWII].
F: WWII or Vietnam?
S: No, WWII, When that war came along they all joined the service. They went in there and fought their ass off, you know, because it got them off of the river and put them out there into the world they never even knew existed. And if was from off of the battleship into the god damn bar, and they stayed there until they packed them to their god damn room drunk on the ship and shipped them back out to sea, and as soon as they got leave they were right back in the bar again, so it was a world they had never seen in their life. Can you imagine what it was like? I think about it now I didn't realize it when I was young, they were telling me the stories, I didn't really realize that until I got older what they went through. So they went through it harder than I did. Didn't have to go through it as long.
F: Yeah.
S: That was a short one, mine was seven and a half years. Seven and a half years.
F: So when they came back from boarding school or being sent off to war how did they pick up the pieces to maintain the culture?
S: They didn't. They didn't, it died. They didn't want to have anything to do with it anymore. They didn't even talk about it.
F: No more ceremonies, no more.
S: No more nothing. Everything died. We didn't even have any ceremonies to go to here, until way late here.
F: Just recently, right?
S: Yeah. Then it took off again.
F: So do you think, this is kind of a deeper question. Do you think that because Indians were sent off to boarding school or sent off away internationally to war, who was taking care of the place, who was taking care of the land, who was making medicine? Those ceremonies weren't being done.
S: Family, my grandmother. All we had was my grandmother.
F: Just a few of the old people did it?
S: And the medicine lady, and it was all home visits. She would always come down to the house and sit down there and weave baskets with my grandmother and talk, in Indian, all in Indian. And she had us kids in there, and would talk to us in Indian. We all could, I can understand Indian, perfect, I used to speak it perfectly. That's all I

knew how to do was to speak Indian. Until I got sent to that school. And I never spoke it since. It was horrible.
F: You talked about…you talk about baskets, what did you learn, even though it was mainly woman's stuff. What did you learn about using fire for basketry material from those older women?
S: I know, I know all of it, I know everything there is about baskets.
F: Could you tell me a little about that right now. If you would share? Like what did they tell you about burning for basket material?
S: We had to do it. It was part of, it was part of our job. We had to go down an cut it. We had to burn the hazel nut patches, we had to cut it, burn it. Wait till the shoots came back. We had to go down and cut our willows. We had to go down and pick the roots of the willows. We had to go out and cut the roots of the pine, bring it in, dig a pit, wrap it in old quilts or canvas of some kind, bury it back up and build a fire on top of it, and cook it to make water proof baskets, so no water can run through it. I can every do it, I had to do it. Every year I had to do it.
F: What time of year were the willow burned?
S: The willows we didn't burn.
F: Hum [Ok].
S: We had to cut them, we had to prune them. We had to go down and prune them so the shoots would grow. We had to make so the shoots would grow. Hazel, the hazel sticks we had to burn the hazel stick, and we had to burn the wire [bear] grass.
F: What's the wire grass, bear grass?
S: Hum-huh [Yes].
F: Ok.
S: We had to burn the bear grass, we had to burn the willows, ah, not the willows the hazel.
F: The hazel.
S: We had to burn the hazel. The willow, we just had to go down, we had to go down and cut it. We had to go down and prune it in order to make the long shoots. The little one, and the big ones and what ever grew.
F: Uh-huh.
S: You had to cut it. You just can't go down to the willow bush and expect to get perfect basket sticks, you pruned it the year before. It gots to be pruned, pruned when the leaves are all off it and it is just a stalb, at the first of the year [Karuk new year Oct?].
F: Some elders talk about, I have talked to, say that they burned the willows after they got too buggy in places.
S: No, you just had to prune it, if you just kept pruning it, it wouldn't get buggy.
F: Hum [thoughts].
S: If you let it grow wild then the bugs move in. There was certain kind of moth or fly that came around there that would affect the willows. But we just had to move to a different spot that they weren't. We had four or five different spots. We had four or five different spots we had to prune the willows, the ones along the river.

F: Oh.

S: We had to prune them. We did that for our fishing holes anyway. So, it didn't bother us too much because we had to cut out our fishing holes. To keep our fishing holes we would go down and brush it out and.
F: Yeah.
S: When we were doing that we also pruned for the basketry material, yeah, but the basketry material was a big issue in my family. I would hike down and pick the black fern and the whole works.
F: Uh-huh.
S: Ah, we did it all. We had to do it year after year after year for my Grandmother, was a very good basket maker. All, she made beautiful baskets. That's all she did, sit in there and sing Indian songs and do baskets every night?
F: Did she use that ceanothus too?
S: She used every bush there was. She was a basket maker. She had everything. I used to get a kick out of making the old sugar pine root, and we had to go cut it, to make the water proof baskets.
F: Sugar pine root? Or Ponderosa or bull pine root?
S: No, it had to be Sugar pine.
F: Ok.
S: It had to be Sugar pine.
F: Did you also see areas where the sugar pines were burned?
S: Oh yeah. A lot of it, you just had certain spots you could pick the root. Because the root wasn't good in all spots.
F: Yeah.
S: You had to find the tree that had the prefect root. It had to be a perfect grain. The grain was the root, ah.
F: Uh-huh.
S: We picked a lot of times and got it down there and cooked it and was too tough, too twisted.
F: Ok, it had to be long and straight, huh?
S: Uh-hun, if it was too tough, too twisted and everything to work with, you know, too rough. But then certain trees we went to, I still know the trees, I still go out there and go by them and think about it. I wonder if it is till the same I tell myself. I wonder if it still got the same, because it was so perfect.
F: Go talk to that old Sugar pine.
S: Yeah, it would be so perfect, we would get shoots that would be this long [motioned with hands 2-3 ft.]
F: Two feet tall, long.
S: Ah, root this big around.
F: Oh, they would be almost eight inches around [diameter].
S: Ah, you have look at them after you cook them, then you cut them into slabs, and then they just peel. They peel.
F: Ok. Big thick roots too, it just wasn't the skinny ones.
S: We had to dig them out to get them, dig'em out. We had to dig them out and cut them off. I always wonder if it has the same grain, if it does.
F: Yeah.

S: It does, like my grandmother said you have to look hard to find them, pretty soon you'll find it and you'll have the right one. You will have the right one you know. And we used to have to cook it. Dig a hole, then wrap it up, put them in the ground, put dirt over them, build a fire on top. Cook them for, what was it, two nights.
F: Two nights huh, steam them.
S: I am pretty sure it was two nights. We had to build a fire on them, before we dig'em out.
F: What about Sugar Pine cones? Did your family ever go gathert Sugar Pine cones?
S: Oh, We always did that.
F: Nuts. What time of year was that when you guys would go out?
S: We would go out when the squirrels would start cutting them off. It's early, it's early.
F: Ok.
S: You had to gather them early or, the longer you waited on them the better, but usually the squirrel, the chipmunks, the tree squirrels.
F: Yeah.
S: Ol'pine squirrel or what ever he is would get them. So you would see him. You would be walking around out in the mountains. You could see when that squirrel is busy. When he is getting the pine nuts that is the time to get it.
F: You too.
S: That's another one we had to bury under the ground. Had to take the cone and bury in the ground and make a fire on top of it. Cook it, then take it out and.
F: Shake it off.
S: Shake it, and all the nuts will fall out.
F: Huh, neat.
S: Or other wise you would be like that squirrel and take on leaf [cone scale] at a time.
F: Yep, scale, [laughing].
S: That way was a lot of god damn work. We would stem it, put it under the ground, and bring it out. When you get it out in the air those things [cones] would pop right open. All those.
F: Those little scales.
S: When they hit a temperature they pop open, and get the top of it with a glove on.
F: Shake it on something.
S: They all fall out, they all fall out right there.
F: Neat.
S: And they are cooked too.
F: Yep.
S: Ready, if you want to eat them, make jewelry, do what ever you want to do.
F: You mentioned trails earlier, these trails how important were these and what, did they go along, talk about the trails you remember the old people talking about or you remember traveling along.
S: Oh yeah, they went everywhere, they was our highway.
F: Where they along the ridges, side slope?
S: They were along the ridges.
F: Were they?
S: Side slope when ever you were going down.

F: Yeah.
S: When you got to where you were going down to then it was a ridge going down to, then you had to wind around too.
F: Uh-huh.
S: It got too steep to go straight down, then you had to wind around.
F: Yep.
S: But the ridge on top, the main ridge. Up a creek until you got to the ridge on top, then it was the top of the ridge until you go to where ever it was you got to where you wanted to go, then you had to wind down, then you had to wind down to where you was going. But yeah. My dad was a packer back then when there was no roads back in here.
F: Yeah.
S: So, he had a lot of tails to tell about trails, the main trails, like I said, right there where we lived is Swillup Creek, which is all our land, that was ours, that was our village. Called "*Kat-sah-hawn-ick*" [Karuk village name sounding like]. And that's where the ford was, what they called it. We had a cable car bridge that went across the river. Across the river. Now there is people there who don't belong there but, nothing you can do about it. And above there was a ford. The only place in the Klamath river in this area where you could walk your horse across the river.
F: Hum.
S: And the old Kelsey trail used to come to there, right down to the river. From the coast, over to there and then up the hill there and come out at Kitter Creek in Ft. Jones.
F: Yep.
S: I know the trail quite well. I have been over it a lot of times.
F: Even those trails, far back away, that's where those Indians would burn too? Not just down low but?
S: Ah yeah. Old trails burnt all across there was burnt, been burnt there.
F: But back in the back country?
S: Yeah all those areas were burnt.
F: Now you look at some of those places now where you drive on the Forest Service road, what do you think about those places, how have those places changed?
S: It did not change much.
F: Ah, Ok.
S: It is pretty much the same. Very little improvement the trail would be back in shape to how it was. Because it has all been taken care of earlier. It had all been burn out.
F: By lightning? Yeah?
S: No, by humans.
F: Ok.
S: It has all been taken care of because it was the main trails. So everybody, a lot of people used them. A lot of different Indians used them. Everyone had the right idea to take care of them, so when it needed burnt, it got burnt.
F: Yep.
S: See, it was more maintained than any other spots where there weren't trails or anything.
F: Uh-huh.

S: People were using them so they maintained them more, their still, their still in good shape. Nothing wrong with them. Nothing wrong with Ukonom trail. Nothing wrong with the ol' trail, that Kelsey creek trail that comes over the hill. Nothing wrong with it. It just a little brushy.
F: Yeah.
S: But it is not big brushed in or what ever you think. Most of it has low bush acorn. Growning all over it.
F: Ok. Yep.
S: It's just a bush, not a big view (?) sitting. The deer live on.
F: I've seen it up along the ridges in the High country in Elk Valley, tan oak scrub bush.
S: It's not tanoak, it call low bush acorn [Saddler?]. We call it sweet acorn.
F: Ok, Ok It's different than tanoak.
S: It's totally different. It only gets bushes. It's only a bush that grows acorns.
F: Ok.
S: It is the first acorn that comes on in the year.
F: Hun.
S: That's what the deer fatten on. That's what makes the deer fat. That's, that is their main acorn, their main food.
F: Ok.
S: The Forest Service and Non-Indians don't like it. They do everything they can to burn it. And really it's the most important bush there is in the woods.
F: High up?
S: High up it is the first acorn that comes one. The deer wait for that to come on. Where you find a big bunch of low bush acorns and the acorns are on that's where you go hunting the first day of hunting season.
F: Uh-huh.
S: There will be big bucks standing around all over looking at you. Because that's where they are at feeding on that. That's their food. It's their main food. The tanoak is later.
F: Yeah.
S: You know, its their last bit of food to get is the tanoak.
F: Down lower.
S: Yeah. It comes on later, its on thick and heavy.
F: What about Black oaks, could you talk about how important Black oak forests are?
S: Black oaks are alright for certain animals, certain birds and certain animals. The Black oak, I don't know maybe, other deer feed off of it, but more around here other things eat it most birds and squirrels.
F: Yeah. I mean all the other plants that are found with Black oaks type of forests.
S: Yeah.
F: That has the Black oak forest?
S: Mostly squirrels and the birds survive on that acorn.
F: What about things that grow around the Black oak trees that are they important?
S: Yeah, there is a lot of things that live on it. But, like I said mostly birds and squirrels.
F: Uh-hum.

S: The smaller ones. Ok. Now the little iddity biddy oak bush grows where it is bluffy and it is rock and it is not the wide leaf sweet acorn I am talking about. But its got littler tinnier leaves. Chipmunks live off in that.
F: Ok.
S: That's their food. Ok, Ok. The tanoak, not the tanoak, the Live Oak.
F: Yep, Yep.
S: The Live oak now that's the toughest oak bush there is in the woods, while its green. When it is dry it's like bluh [hands motion falling apart, broken easily].
F: Yeah.
S: It just pops, no good. But I mean when it is green you can't bust it. It is the toughest wood there is out there. The acorn that comes off on that, the Bear love it. That's what the bear eat. They don't eat the tanoak, as much. They'll eat it but not as much. They do like that Live Oak. That's all, where you find Live oak you'll going to find that Bear.
F: Uh-huh.
S: Tanoak, tanoak [meant to say Live Oak] grows where ever the bluff is, it will grow on a flat rock. It will find a way to fuck'n root and grow [laughing]. Not tanoak, I mean Live oak.
F: Live oak, yeah, the rocky areas.
S: It will grow where nothing else will grow. You will find that damn Live Oak.
F: Did you, or did you ever hear of your family going out to dig Indian potatoes? Those flowers, you know, the?
S: Oh, I know what you are talking about.
F: They dig them with a digging stick.
S: Yeah, but that was before my time.
F: Didn't mess with those?
S: No [exhaling], by that time agriculture was set in we had own gardens, we had our own.
F: Like, white man gardens?
S: Yeah. White man gardens. We had a big ranch to raise down river every summer.
F: Did you ever hear the old times talk about how they used to dig those?
S: Oh yeah, They, They taught us what it was all about. They showed us, they even dug'em and ate'em. Ah, to see if we liked them or not.
F: Yeah, "*tay-ish*" [Karuk-Indian potato].
S: We dug them, it wasn't like the regular potato but we got used to them. They had a different taste, more bitter, bitter, but it was survival when you didn't have the other potato. You see.
F: What do you, What do you think about the relationship between fire and fish? How does fire help or hurt or. When you have to think about the linkage of how burning was across the land and how that went down to the creeks, how that affected the water flow, how that was with the fish?
S: It did help the fish, it.
F: Could you talk about that a little bit?
S: It did help the fish, it [fire] threw a lot more debris into the creeks which caused the, kind of acid like tone, you know.
F: Huh.

S: To the creeks because of the sap of the trees and different things you know that fall into the creek, because fire causes a lot of debris, you know.
F: Uh-huh.
S: It burns down trees and sends stuff down into the watershed. You see what I am saying. And it clogs it up for a little while, but then the fish start benefiting off of it. It puts more food in the creeks for them. It puts more food in the creeks for them. It brings more of other things back to the water to where the fish can get it. So it doesn't hurt them they benefit off, from it. The fish, maybe not the first year, I mean you are going to have a lot of stuff, that burnt stuff getting in the water too, like I said, but then after that then the fish benefit. They benefit off of it. So it doesn't hurt them. It doesn't hurt them at all. It sets them back a little bit, but then they regain it right back because it brings a lot of nourishment. Like I said, right now they are starving to death. They aint got that. They aint got what I was just talking about. The floods wiped it out. I can take you down to the creek and show you what I am talking about. Every time you go to the creek, go to the Salmon River and look at what I am talking about. Go to any creek, stop and take a look at it. It doesn't got, no ponds.
F: That was the 1955 flood, the 1964?
S: The 55 flood tore it up, the '64 washed it out. Yeah.
F: Ok, it took away all the wood side channels where the large wood had the back pools?
S: Everything. It took everything. All you have is gravel, a ditch with gravel in it. No dirt, no sediment, no nothing. I see where it is building up a little bit making a few changes here in the last few years. The damage is done for a few years to the fish, it hurt, it hurt them bad. They aint got no food, they still aint got no food.
F: So how do we change that, how do we?
S: Help them, feed them, we got to do something.
F: And feed then would be by doing what, more of the fires?
S: No.
F: Or?
S: If we could do anything else we could buy the god damn food and throw it in there. They got to have food. Every time I am done with my fish I throw all the scraps, I got to go feed my fish.
F: In the creek.
S: I got to go feed my fish. So I go take all the scraps and go throw them in the creek. Nobody else does it they go throw it out on the ground for the coons and everything else to eat it. The fish need it.
F: So back in the past when you were a kid was there a lot more spawning fish.
S: Oh yeah.
F: Salmon dying. Eels spawning out and dying.
S: There is no more eels. In fact at one time in the year the eel were so thick you, didn't want to go close to the water because of the smell of rotten god damn eels.
F: Oh yeah, Do you remember what time of the year that used to be? When you were a kid what time it was?
S: About the time every one was getting done swimming. About the time the eels start coming in.
F: Ok, about late summer?

S: Uh-hum [Yes].
F: They would all be floating back dead?
S: Uh-hum.
F: There used to be a lot of them, huh?
S: Oh you did not even want to go swimming in the god damn creek. Too many god damn dead eels laying around in there. Now you can't even see one.
F: Yeah.
S: And what that was, was the fishes' food. That was a big, big part of what I am talking about.
F: The cycle?
S: The fish are staving to death right now, they aint got it. That was the majority of their whole life style really. Because without them [eels], aint got the fish either. See. That was their food. It would break down to microscopic scent, she knows where it would turn into a milky white mush. It would float along the edges of the shore where this baby fishes are.
F: Baby salmon eat those?
S: They could eat it. We could, ah, it's not there. There is nothing there for them to eat now. So their predators are heavy on them, you know, then when they head out of the creek and move down, it is like they are moving down into a big septic pond of some kind. Shit, then their doomed. Because there are so many enemies out there. Because the fish is a big majority of a lot of, a lot of things' life on this river. Without that fish, a lot of other things are not going to make it either.
F: Uh-huh.
S: That depend on it. That really depend on it. I don't hear that king fisher like I used to hear him anymore.
F: Uh-huh.
S: Just once in a while I will hear one. Not very often. He used to be holler'n all the time.
F: Uh-huh.
S: [stops to talk to kids].
F: One of the last questions I ask is do you know any old time stories or like legends or myths that talk about fire or something else that would be important.
S: Ah, I'm not a story teller. Yeah, I heard a lot of them, and I try to think of them, and I am going to talk about them, I can't put them together. But when I am sitting around by myself , then I will think about it. Oh no, but when I want to talk about them, then I can't remember them. Yeah, I heard every story you could name. Indians life was always like riddles, they always told stories to where, you know it was telling you something. The stories was telling you something. And why it was happening, why it took place, you know, like, when I go to tell them, I can't I am not a story teller. I should have been recording them, writing them down or something, because some of them were pretty nice. Some were pretty damn nice. And they all make sense. You know.
F: So for like this generation, the girls age [teenagers], what should they know, what should they learn about fire now? I mean, if they are going to be the basket weavers, and the people who are going to go out there to collect acorns.

S: I think they ought to play in it. They say if they [kids] play in fire all the time then they will pee the beds.
F: That's what the old story was?
S: If you play in fire you, will pee the bed. I think they ought to play in it, play in the fire. The boys do it, you know how they are. [girls laughing in background].
F: How do they learn to look at?
S: They laugh, they won't listen to me, they think it aint true. [Laughs] But, ah fires kind of weird because I lost a brother in fire. Our house burnt down. And he got burnt up in the fire on Christmas eve. I was in Chemawa Indian school, I didn't get to come down to go to his funeral or anything. They wouldn't let me.
F: Sorry. Alrighty, well, *Yootva* [Thanks]. We'll finish it up.

Wilfred Colegrove (Hupa) Age 69. Interview conducted by
Frank K. Lake Hoopa Cal. Aug. 31, 2005. Verbal and written consent provided
Consent for voluntary participation verbally given and signed on IRB form

Frank: Ok, just for starters, could you state your name, age, and tribal affiliation.
Wilfred: Yeah, my name is Wilfred Colegrove, a member of the Hupa tribe. My age is 69 years old.
F: Were you raised learning traditional practices such as, collecting wild foods or herbs, hunting, fishing, or other things?
W: Yes, very much so. I grew up in traditional practices and traditional religion, and ah, in addition to being involved in live stock, I owned live stock, mainly cattle. I also spent a lot of time in the mountains. I started off in the woods, working in the woods, woods work and logging. And I spent a considerable amount of time in my younger life in the mountains.
F: What were some of those places, you were doing some of those practices. Here in Hoopa Valley or where were they?
W: Well some were in the Hoopa valley and the surrounding area. On the National Forest over there, we logged on the national forest. We built roads out to Orleans. And then we built the road that connected Orleans to Hoopa. On one point over there, then we built road that came across Trinity Summit, and came back over to Hoopa from Orleans, and connected up, the north, the south side of the river on the reservation to the National forest area.
F: So you saw a lot of places that did not even have roads yet, when you were younger, right? They were just trails and things?
W: They were trails and uh, I think most of the roads were built on along the original trails.
F: Ok. So when, did you ever hear, you were doing that, did you ever hear from your family or elders in your tribal community talk about where they used to do cultural burning along some of those trails, or some of places out where you were at?
W: Oh, certainly they burnt from right here where I live at my home here to the surrounding mountains every winter. Late in the year, before those heavy rains come in. Usually it would rain earlier, then a frost would come out which would dry the ground out then it actually was not severe reason for the fire to create damage, and burn out these brush patches on the valley here, so they these whole mountains would be completely burnt. In the fall of the year, the whole mountain would be on fire at one time.
F: So in the fall time this east side of Hoopa Valley would be burnt, especially where there is these big firs and oaks, some madrones in there. They would burn this whole area, huh? They would burn off these flats and hills?
W: They would burn out these areas, after the under brush is burned out, and after a while these trees would develop their own resistance to fire.
F: Yep.
W: And it didn’t affect them and of course it didn’t crown. Nothing like that they, you can look up the mountain right there, some of those trees are 50-60 years old, probably been burnt 20-30 times. [Fire rotation 2-3 yrs].

F: Ok. So there is quite a bit of frequent burning here in Hoopa?
W: Well, in the later 3-4 years we have had a problem with burning, because of the regulations. And the severity of the fires. We had a big fire four years ago, called the Megram fire which came on to us [HVIR], from approximately 30 miles south of us, south-east of us from the national forest reserve, it's not a exactly a national park but it is a wilderness area.
F: Yeah. Late Successional Old Growth.
W: Right, and it came on us and that was a very severe fire and we had to work right hard to stop it. And consequently, there has been a lot of internal, ah, internal conflict regarding burning because of the severity of that fire. And ah, but this has been going on for some time. And it seems like after we took the livestock off, and ah we got a good fuel build up. Build up then. Fires become uncontrollable. So that was one of the reasons.
F: So from your perspective and what you learn from your elders, did there used to be great big fires like the Megram fire? That happened or was there, I mean?
W: No, nothing of that consequences.
F: That you could remember in elder history?
W: No, no, and ah, even with the lack of roads and stuff and the fire fighting techniques were different at that time. They built a lot of fire trails, and stuff, hand fire trails where now they fight it with, ah, almost exclusively with engines and the water, and they do build fire trails too, but not at that time. They had fire trails and they back fired into the fire to stop it and that's how they controlled most of the fires. Now the fire fighting techniques have changed completely.
F: Yeah, and when did you see that type of change, you know, around what time did you think they changed from going more the heavy equipment and engines and all that?
W: In think in the mid-fifties [1950's], in the early sixty's they became more mechanized and fighting the fire.
F: And so in your opinion is that when started to see the greatest change in the forests, around here?
W: I think so. I think, when they, when, ah, the forests started changing when they stopped the burning, I think there was almost a pull, because we lived here, the Bureau of Indians Affairs, basically, it's not the Forest Service but it's ah, it's ah a government controlled situation.
F: Yeah. Still a branch of the federal government?
W: The federal government and their practices were similar, I think that, a similar parallel, ah, systems. And, and, they looked at, ah, and so when the Forest Service would do something the Bureau of Indian Affairs, wouldn't be long before they follow into the track. And, so when the BIA got to the point where they couldn't, didn't want to allow any more controlled burning out here. Because, we're according to them [BIA] were damaging the forest. Ah, but it looked, appears, although I don't have no statistical documentation on it that after the controlled burning was stopped. And then anytime we have a fire here we, it looks like it goes fairly fast up into the crown.
F: Yep
W: And one of the reasons is, ah, the prairies are starting to grow in, and, that prairie with the trees not very close, it goes out on the bottom and they call it a ground fire. I

guess they call it, and when, the fire starts even in the grass and when it gets on the first limb it goes up automatically.
F: Yeah, ladder fuels?
W: Yeah, right.
F: Then it goes right up in the canopy?
W: Very quickly, and then once it crowns, it almost uncontrollable.
F: So when you said these controlled fires, that the BIA tried to stop, those were being, not from the tribal government, those were basically Indians or families who would just go out and do their own type of controlled burning? Yes, or?
W: Well I think even with your own land on the reservation it was pretty strict on controlled burning even that. And it became a conflict, but ah, again the BIA is in full control of this trust land.
F: How far do you think back from your life time that Indian people would go out back into the mountains for resources use, harvesting, hunting, or running cattle. And, how far back away from the valley would they use fire back there? Do you have any idea about that?
W: My grandfather was born in 1850, and he was over 100 years old when he died. On my fathers side, and they have been running cattle since he was a young man back in the Trinity Summits. And there was almost a proven thing that the last guy out, bringing the cattle out light their territory. It would do two things, it would keep the ground clean, create more grass, and also get away the fuel, fuel build up. And I think it did other things too, I think they looked at other things too, like ah, they ah, some of the trees that were, ah, were dead or diseased. Something had a tendency to, ah, burn them also.
F: Yeah.
W: They were volatile because of their pitch deals, and stuff in there, there was certain areas, like ah, where might be high metal content in the ground or something and whole areas would be hit with lightning.
F: Ok.
W: Over and over again. And so in them areas anytime you had trees that were knocked down.
F: Yep.
W: And there was fires started in there all the time. Just not one place.
F :Yep.
W: This fire would come through and clean up the mess in there. So there wouldn't be, so the starting would be more isolated rather than take off up the mountain. During times like this [Aug.], in the summer like this. In the summer I don't think anybody considered burning in the summer.
F: Ok. So let's talk about lightning a bit. Because, I looked at a lightning frequency map, and there is places that where either because weather passes through or lightning strikes, there are places that are frequently struck by lightning then there are other places I would assume that Indian people would have burned. So where have you heard about places where Indians would burn vs. lightning? And how did people work with lightning?
W: Well what happened, what seemed to me these areas like were typical lightning struck areas. And they were, ah, like one ridge would keep getting hit, but I don't

know what caused it, the metal content or the soil or the physical, geographical area, nature or if but, ah, the ridge of it , like a boy'ed [?] ridge. And Indians long time ago had their trails, they would go around it. They used to tell me you don't go up around there and sit around because people would get sick up there sitting around in those areas, you know, because they said what comes up out of the ground, I'm not sure what it was but, radioactive or what the situation.
F: Different kind of soil, huh?
W: It was.
F: Is it that serpentine? Dry rocky green stuff?
W: Well, not exactly, most of them was just rocky.
F: Huh.
W: They would build a trail around, around that area because they, especially young kids or something, kids ages, they did not want them to be up there because they were susceptible to get sick and ah, [from that].
F: Yeah [Dogs barking in background].
W: And so they would, kinda of, stay away from those areas.
F: Ok.
W: Although, we looked for those areas for a lot of years, because when that lightning hit. What it did it created, it petrified the trees and gets this pitch.
F: Yep.
W: We have a hard time getting this pitch for ceremonial use, so we go back in there and look for these places. That's how come I know about this because, we go back in there and get that pitch.
F: Yep, that real dense, dense wood.
W: That dense, that petrifies it, it gets black, the pitch gets black, the whole tree get black. Pitch tree, is pretty highly sought after, these pitch deals, you know, because it is hard to find pitch now. But, that's how come I knew about this I used to go in there all the time with my father when I was younger. We would pack out pitch.
F: Ok. Did you ever hear of, ah, places people wanted to burn specifically. Or areas, like oak areas, oak forests, were there prairies or meadows, were there specific areas that people went to burn, or for a specific reason?
W: This area right here, like this area, the head of the village here. The village is right here.
F: What is the name of this [the village here]?
W: *Matilton*.
F: *Matiltion*? Ok.
W: This village here, this was burned here than when the snow comes, late in the winter time the deer would come down here.
F: Yep.
W: Because there would be acorns, and it would be clean and they even, go and, burnt for acorns and stuff like that, because it did two things. One of them was to smoke itself, ah, kill the bugs and stuff that were in the tree, and those acorns would be healthy. And then when they fell down, and then they could pick, find them easier, rather than dig through the leaves. And the third thing it would do is to keep away the snakes. And probably the last thing, it, ah, would be ticks and bugs.
F: Yeah.

W: And stuff things like that.
F: Pests?
W: Pest, and pests, and people with this threat of this, ah, tick disease.
F: Lyme disease.
W: Lyme disease and stuff now. Its become, be very critical when you can't walk through that brush up here. You walk through there you will be, ah, your coat, your clothes will be full of ticks and.
F: Yeah.
W: And get on you, just, ah, even if you walk in high grass in that area, ticks will jump off on you, it used to never be that way. But, I think that's the advantage of burning.
F: So they, in your mind, because of the fire suppression, more brush and more the grass, the duff and litter there are more ticks and pests? Because there has not been burning?
W: That's right, and snakes.
F: Rattle snakes?
W: I killed a rattle snake here the first time I saw one was when I was seven years old.
F: oh, huh.
W: I killed one here last week, and it's the first time I have seen a snake here on this whole flat. All the way down here to There is some down on the other side of the mountain, the Tish-Tang side, creek and on the other side, there are rattle snakes over there. They will coming this way for some reason.
F: Yeah.
W: Ah matter of fact it is shocking to see a snake here this close.
F: What are other different areas, I know some people burned for basket material, you talked about acorns?
W: My mother was a basket maker and my sisters are all basket makers. And we have a difficult time getting the material to do that, especially for, ah, hazel stick areas. There's one area, like Tish-Tang which is three miles from here, they used to burn, then they quit burning it. They got regulations that said you couldn't burn it any more. With the threat you'd actually get arrested and prosecuted for arson. And, ah, they used to burn, ah, a lot of the, ah, the Deerhorn area.
F: Deerhorn, yeah?
W: There was a few areas up in Deerhorn, where they get the sticks, and ah, hazel sticks and also for the bear grass.
F: Oh, ok. And did you know what time of year they would burn for the hazel, did that matter?
W: Yes it did, now they wait until it is late, to burn it, and ah, then they control burn it. But the sticks don't come up and because they don't have time to reproduce, so they don't really grow good sticks on that thing right there.
F: So it is important the time that you burn it to the time that you harvest it. They plant has enough time for shoot growth.

W: What they used to do was when they picked sticks in the spring, it was usually earlier enough, because when they start to leafing out they become too rough and you can't use them for the baskets. So what they usually do it is, as soon as they pick sticks

they burn them again. It has a full years cycle to grow through and comes back again, you know. It comes up again, so if they try to harvest it again it would be half cycle.
F: Yeah, ok.
W: So yeah, it was a consideration, The tribe is looking in now, but ah, It's only been since the tribe has started to take over that to look into.
F: Self governance, The BIA has less of a management role.
W: So even though they still legally control the trust lands, they still, ah, They go through the self governance process, Compact Public Law 93-638. Which is a contract mechanism, kinda deal, that gives the tribes alot a say in natural resources and so that's been very beneficial in meeting some of these things.
F: Good. Is there other places you want to talk about using fire in a different season or specific place you remember?
W: Well yeah, I think of things, a place back here they call it a Milo(?) prairie, there is no more prairie there because it filled in, they used to burn these prairies, in the late fall of the year, after, ah, after the first frost came in. What it did was create new vegetation for the deer, and in some cases they would even run cattle in there. I watch these cows, they, ah, they don't exactly eat these all dried out. It would seem logical they would have a meadow, There will be in a forest there now, they be picking the shoots from the prince's pine. That Oregon Grape, because their tender, Same from the summit.
F: Ok, huh.
W: They are eating them. There are the same things Indians used for healing process.
F: They used the things that grew back after its been burnt. The regrowth of the forbs, the forbs and plants. Good.
W: One thing about the Megram fire. They put a line, right about 30 ft. away from my cabin, to stopped the fire, and back fired from it. And although that was four years and those things are growing back about like that.
F: Uh-huh, about ten inches or a foot tall?
W: The plants grow back and they are very very healthy.
F: Huh.
W: And Prince's pine, ah, I was talking to some of the boys that picked some mushrooms commercially. I don't know that much about mushrooms, because, I know about the tanoak and stuff like that. Of course, I would be scared to eat some, but they know what they are doing. Then they went back out to the burn, and said "wow they really did well this year".
F: The year after the burn, was that the first or second year after the burn they got their mushrooms?
W: It was the forth, or third or fourth year after the burn.
F: What is the fall mushrooms, winter mushrooms or was it more like the spring mushroom , like the morels?
W: Could'a been, All different [types].
F: All different kinds of mushrooms, they got them?
W: I don't know about, ah, the only other thing, ah, that there is about fire. That came back across the reservation, across the, in the small creeks that killed the trout. Because the water got so hot, the oxygen.
F: Yeah.

W: The lack of oxygen, but now they are coming back, this year they are about this again. Because, the last few year I've been watching them.
F: Yeah, six inches. Watching them, They have been growing.
W: They have been growing. So this year they are back again. It took them four years to come back.
F: So in your are teachings, from your elders, family or community. What do you see in the relationship between fire and the forest and the plants, water and the fish? What were you taught or do you have your own understanding of that relationship, about the connection between the fire and the fish?
W: I think so, ah, there is, ah, we know that intial year after the fire, something that we can do, because after fire we know that stuff goes into the creeks and stuff, we know that. And we know those creeks it's hard for those little fish and, ah, they spawn in there. But, I think that, ah, one of the things it does is that when fire goes across them creeks it, ah, it eats up a lot of those log jams and stuff in the riparian, and, when they did the fish rehabilitation program, it cost a lot of money to go just up down those creeks and cut those logs away that are jammin those creeks up, natural barricade and stuff. And those logs burned and got cleaned out.
F: Was that from the more catastrophic fires, or more of the controlled human lit fires?
W: Uncontrolled fires.
F: Uncontrolled fires? So it was the catastrophic or wild fires that hurt the fish.
W: Yeah. But then, ah, our, ah, our system has to be 200 ft. from the creek. There can't be anything, that has to be a barrier. Two hundred feet from our major streams here.
F: In the forest management plan?
W: We have access to the forest management plan, as a matter of fact, they are going to redo the tenth here. And, ah, 200 ft. seems to be realistic in the sense that they don't burn in there they don't log in there. They try to keep a way as much as they can away from putting machinery in there. Although sometime you can't help it. You have to go through some of those areas to get to, ah, to get access to other areas. For safety purposes.
F: Do you ever remember seeing first hand or hear other people talking about how fire used to go along some of the creeks, or along the main river? And how that might have been good for it versus bad? Do you have a perspective on that?
W: I remember there being a perspective on that, or the river or anything, but I don't remember hearing that it hurting anything. Although, like I said with the smaller creeks up high when that fire went through there, the natural fires, they, it killed the fish in there, but it's a self rehabilitation process-system, so.
F: Yeah.
W: Evidently, for that system it kills the smaller fish, but not the larger fish. I don't know how that worked out, but anyhow I know they came back. And, so, overall I think their fire management is, ah, and forestry, and we have a hundred thousand acres here. And in areas they have done the fire management, I think they have done a lot better. You know, even though we do thinning and stuff. Foresters and I have a difference of opinion. To leave some of the waste there, because it creates much and.
F: Yeah.

W: So forth, but the fuel build up comes in. I have seen some pretty awful fires that went through areas that they had thinned and then a fire breaks out, these, a catastrophic fire.
F: Yeah.
W: When a fire breaks out, and then they are the ones to go up first.
F: Those old brush piles.
W: The brush piles underneath them. I talk with the foresters of course and I have been involved in the management of the tribe for a long time as a councilman and as a chairman, and just as a participating citizen. And, ah, I have been interested in it. And I have been in the mountains so much and stuff, I am interested in solutions. What I, so, I think that the fuel buildup is, ah, a killer, just sitting on a bomb.
F: Uh-huh.
W: I think as you look, ah, as we look north you can see bald hill, although it's almost not bald hill.
F: Yeah, it's grown in.
W: By taking the cattle off, and at the same time restricting the use of fire.What it has done, brushed in. And the people up there are scared to death that one of these years we are going to get a 30 mph. wind down here. The fire starts on the lowerr end and pretty soon it traps them.
F: Yeah, its going to burn them out. Burn over their homes burn over their property. So that's another good kind of question. Understanding how fire used to be use and how things have changed because of fire suppression and the lack of controlled burning. Now that we have this fire danger, risks and hazards. What would be your prioritization, what would be your priority where would you treat first? Where would you like to see fire, where would you like to see fuel reduction done first in your mind?
W: Well, I think, ah, I think, ah, that's a dual, ah, dual kind of question, but I guess, probably, ah, you have a silvicultural, kinda situation where you are raising trees, but the trees don't really have a commercial value. Say, ah, tree that has been raised, grown on other grounds and stuff like that. On prairies, like that, The volatile nature of these trees are right down to the ground and stuff like that and they crown immediately and create a big hazard. I think they need to be burned. I think you need to look at, it has not happened yet, but we are sitting right under the gun for it. I think if you don't do something then you are going to see loss property and even loss of life as a result of our management.
F: What about resources? Are there certain cultural that are natural resources, like medicine plants or food crop trees. What happens when the firs grow through the oaks, then a crown fire goes through and hurts the oaks. I mean, are those areas of concern for you too?
W: I would think so too, Like right now we are in the process of the dance right now and one of the things we are eating is the acorns. And, ah, the acorns have always been a staple here. Especially those tanoak acorns. I guess is, it probably works out better for acorns than say, the black oak there, or the white oak, ah, or even the live oak. I think what we have to do is some place, get ah, happy, I guess or some place. There must be a fine line in there where we can do both and still do our silvicultural programs and sometime maintain the natural safety and preservation of our other

species. We can't go over board on it. You are catching me at, ah. I don't know if it's a good time or a bad time, because this is what we are talking about now, is preserving the balance for the earth, the mind, our system, our people, and the environment and our people around us. And we are sitting around talking about that. And, so, so, it's ah, it's not something that is unrealized, ah, with the community, the Indian community. There is a lot of discussion on that issue right now, even on, I think that is the biggest value of this dance. You bring people together and I think this is what was supposed to be done in the beginning, and that's what you do. You talk these things out, what you see as a potential problem, you know, our existence and so on and so forth. We do know that in the last twenty years or so that our fisheries have been so depleted so much that we are doing a consorted effort to bring back the fisheries. From, and, ah, especially the migratory salmon. And we are kind, ah, the incubator nursery of a whole economy, not only here but on the coast. So on and so forth, because creeks are alive with the salmon.
F: Yeah, You guys have the spawning and the rearing grounds.
W: That's right. And we have these natural things like the falls on Tish-Tang where the salmon can't go beyond there. And so, we advocating to start taking our water above there. Because you can put a small dam there, it don't make a difference because it won't hurt the migratory salmon. At the same time there are other wild species there. The trout and other species and that waterfalls, watershed area. I think, ah, that fire is a tool. If it was used controlled and used wisely. That you know that it benefits the community, it benefits the, ah, it benefits the whole ecological system that we live in. Or the ground that we walk on.
F: Yeah. The ground that you are blessing right now, that your fixing right now when you do your White deer skin dance, and your Jump dance.
W: That's right, exactly.
F: For me that's the really jewel or real the gem of it. Is because, values, the way people have their world view and their values determine what they do for their land management. And on federal lands, they say holistic management, but they still put everything in a little box. It's not tied together.
[Stop then restart interview]
W: I am probably involved in it more with the cultural aspects, like, ah, we use the fire to get the material to get the regalia for the dances, we make, we use it for the basketry. Or even utensils, You'll see the waterproof basketry, they use, their eating with now, even the, you see their using to put their acorns in with their rocks. Hot rocks into the basket and then it cooks the acorns in there. It certainly has a different taste than if you put it on the gas stove or whatever to make it that way. And then that fire does so many things, like, we use birds, and we try not to take more than we need for the feathers for the regalia, and so you will see that in areas that burned and stuff like that you get an abundance of birds that come in there.
F: Are those woodpeckers?
W: Woodpeckers and even migratory birds stop longer in here then they usually do. A lot of things be happen in there, I see those geese in here now. They come migratory through here and a bunch stay here. I see a whole bunch down here now [along Trinity River in Hoopa] they just nested. They have little ones down here and they nested down over here. Because, it's quite below the cemetery, nobody gets there. So they are

nesting in there, Of course you see them roosting in trees. Now they are nesting on the bar. You can see a bunch of new geese coming up in there. A lot of things happen during certain times of the year a lot of birds come through here, those areas that are burnt like that and they come in and do that and birds that stop, you know, in here, that come through, they stay longer, and ah. It does a lot of things, ah, it keeps down the insects, without using insecticides and stuff like that, you know. Ah, we are concerned about that because we are concerned about what's down next door to us down here. Like down in Woodland, or Sacramento, they have that west nile virus with the mosquito coming in so badly. You see that infested insects and things like that can really be a health problem. We were very concerned in the Megram fire [1999] here because, it got so overcast of smoke here that our professional medical staff. They went, ah, of course the first thing they did was to evacuate people with respiratory problems. That was pretty apparent to them what they should do. But there was a point where they were, they got our EPA division to monitoring the air. And we found out then, that there was a real, a point we evacuate the whole population because of the heath risks.

F: Yeah.

W: The amazing thing about it was the National Health Center, was out of Georgia, was not help in the United States. They were doing this because there was not this type of catastrophe in the United States. So we went to Canada, they have a lot of fires and so they were in contact with us to tell us at what point we should evacuate the community. And I will tell you the scariest thing about that is when we looked at the National Forest Services' plan, the evacuation, I mean the back up position here was the Trinity river. For all us living on this side of the river they give us up.

F: Oh, I see you being on the east side of the river you would have been burned out?

W: Right.

F: The way they would of allowed it.

W: They wanted it to get over the hill. Yeah because of the population. They didn't consider our population. We was the one's to have to put it out.

F: Well, I have lots of more things to ask you, you are very knowledgeable. Especially, having the experiences that you do, and now, you're a ceremonial leader. So I thank you for your time Willy. I just, I could sit here a lot longer, especially your views about how the fire helps all the animals you use for regalia, I think that's an important one. Because, like you said, that's time you focus on the woodpeckers the deer, the acorns the basket material all the things you need to sponsor your ceremony.

W: And certainly the plants too, the grasses.

F: Yeah the medicines plants, the basket plants. So?

W: Even with those things, like I mentioned the prince's pine and, ah, Oregon grape. That's, that's used here a lot, in the, ah, and then when the vines get old and stuff like that, they seem to goes back into the system, on a thing. When, they are small plant, new plant, they have a lot more healing properties. And so I guess that helps too, and doing that. I used to pick that all the time for my mother, she used to have liver and diabetes problems. She would take that and go and pick it. Try to get it in the high country, because she would be cleaner. And then boil it and then strain it. Used to put in the refrigerator. She used to drink that. It kept alive about fifteen year longer than she would have ordinarily. The medical people gave her up because of her liver and

kidney dysfunction. And with her high diabetes rate. And we do, and we know it does affect the kidneys bad and heart.
F: Yeah.
W: And her liver too, I think in her case it was the liver too.
F: Well, is there anything last to add or say about fire that you think would be important to pass on to people, as it relates to ceremonies, or basketry or food plants or anything else?
W: Well I think, ah, when you look at, ah, you talk about creation and you know we don't have a written biblical language. And most of our stuff is, ah, passed down through, ah, from, from people to people in a verbal context. And the thing is, I guess, it remains very much so that when, as legend goes, and the teaching says. When the world was created, and it kinda follows the biblical sense in a way, and when you had the angles on the earth, and they were putting together the order of the animals. And the people and put together the dances. And to do that, and so it is a logical perspective to think, and if that's so, than all that is that is our church. As they say in a strict, purely modernistic sense. And all your regalia was, was a thread of the reminder of your devotion. And, ah, thank goodness of the creation, the Creator. And in a sense it is a survival type of thing. And, we are not the only ones who have this is the kind of belief. The whole world has a similar belief, in a similar situation. And sometimes it amazes me that how these things run a parallel track. Although, were not aggressive against other religions or anything, but other religions are very aggressive against us.
F: Uh-huh.
W: And you know, because, you worship the white deer and you worship this. But,I don't think it is that but it is the thread in creation. And if brings people together, then it's doing its job.
F: Like you said when you are together at the camps or the ceremonies you are thinking of what's going on in you environment, their exchanging knowledge to try solve those, find solutions.
W: Uh-huh.
F: Philosophically and even then physically in the act of the ceremony what you want to do for the next year.
W: That's what their talking about, and the reason why I was talking about it was when we are underneath Bald Hill. Because we are under Bald Hill right now. I heard somebody say, oh my god, there is no more Bald Hill. Our world is changing.
F: Because of that fire or lack of it?
W: Which is yeah, which is fire, and so we, and so like with the fire, not only comes the cattle and stuff, but then deer, and other animals, you know, that eat, that survive off that, those areas, the grasses and stuff. But, anyhow so. That things work out good and, ah, maybe I can contribute more later on.
F: Ok, yeah, thanks I appreciate it, I know you are busy. [Interview ends]

Ollie Foseide (Yurok), Age 84. interviewed by Frank Lake.
Johnsons, CA. August 2005
Consent for voluntary participation verbally given and signed on IRB form

Frank Lake: So, what's your name age and tribal affiliation?
Ollie Foseide: Ollie Foseide, and Yurok. I'm 84 years old.
F: OK. And uh were you, uh, what village, I mean you live here now on, in what, Pecwan Johnson's area. But did you have another village affiliation or anything like that that your family's from?
O: It's the *Watek* this is where I was born and raised in *Watek* here.
F: Oh, this right here is *Watek* OK.
O: Yeah in *Watek*.
F: OK
O: And then, mile from [down river of] Pecwan.
F: OK. Um, and what do you remember about, where you were raised, or what do remember about being raised with traditional practices like harvesting basket material or collecting wild foods, or berries or herbs?
O: Yeah, we. As children we collected all kinds of basket material. And we went out and picked up food like, uh, berries, huckleberries and acorns, acorns and my mom used to get wild onions. She went out and picked wild onions. I never did do that, though.
F: Yeah.
O: You know, like, she did. A lot of the things that she didn't have us, let us do. She wanted to be careful how it's done.
F: Oh yeah? Why, why do you think that was? Was there only certain ways in doing things?
O: Uh huh.
F: Did she ever gather, um, anything else like the Indian potatoes, those, uh, they're like a blue flower, they have a blue flower on 'em?
O: No, she didn't.
F: Huh.
O: She didn't.
F: So just the wild onions.
O: Just the wild onions and acorns and.
F: What about mushrooms? Did you guys ever…
O: Mushrooms, um we had mushrooms. She'd pick, they'd pick mushrooms, and, and those thimbleberries.
F: Uh huh, those are good yeah.
O: And um salmon, salmonberries, she'd pick, they'd pick that, we'd pick that. And wild blackberries.
F: Oh, the ones on the ground?
O: Those little ones.
F: Yeah.
O: Little wild blackberries. And we, we used to pick tea, there was, I think they call it yurber surber tea. ???
F: Yerba Buena ???

O: That it.
F: Yeah, yerba buena, the little vine tea.
O: Yeah. What d'you call it?
F: Yerba buena.
O: Yeah. We call it *Hergorakeet*.
F: *Hergorakeet*?
O: Yeah, *Hergorakeet*. Yerba
F: Yerba buena.
O: Guena.
F: Buena. It's a Spanish word, Yerba ??? for herb, and buena meaning good.
O: Oh yeah.
F: Good herb, is what the Spanish called it. That little trailing mint.
O: Yeah. Yeah we picked that. And drank that all the time.
F: Uh huh.
O: And then when they went out further in the mountains they'd pick the, uh, the sna, princess pine
F: Yeah, the herbs.
O: Yeah, for herbs. For, medicine for. The princess pine was for, uh, I guess it was good for everything 'cause my mom used to always cook herbs up all the time.
F: Yeah, do you remember other things that she used to cook up?
O: Yeah, she, she picked those, uh, I can't think of the name of 'em. Can't think of the name of, uh, those bushes that grows out in the, out higher in the mountains. There kind of have oil in them.
F: Is it the Yerba Santa , the mountain balm?
O: Mountain balm.
F: That little green
O: Yes.
F: and white on the under part, and a little sticky.
O: Yes.
F: Yeah.
O: They, she used to cook, have that as a tonic.
F: Uh huh.
O: We used to have to drink that all the time. She drank it up until she died.
F: Oh.
O: When she had it. I can't think of any. Oh yeah, uh, we had all kinds of, ah, things that we picked to eat. You know, we live in here where there was no, no, uh, car or we couldn't run to the store in a little while, so we pick things and we dry things and then when the jars came along, then, uh, my mom would can.
F: Oh.
O: So that, that's how we lived in here. So we lived really off the land.
F: So what were some of the areas, describe around here *Waltek* right?
O: Yeah.
F: And then, uh, what were other places, like the.
O: Just go round the mountains.
F: Like across the river? To the south?
O: Across the river, yeah, go, they go huntin' for deer over there.

F: On the south side?
O: On the other side, yeah. And that's where we get our acorns too.
F: Ok.
O: Acorns all through. That was our main food, acorns.
F: The tan oak acorn, or the other, uh, did you eat other acorns too?
O: Yeah, just acorns, mostly acorn soup.
F: Did you remember them gathering, like, there's a white oak that grows more the, the rocky area.
O: I never did see them pick the white oak. Just the acorns.
F: Just the tan oak acorn?
O: Yeah. That was the main, our main, uh.
F: Food?
O: Soup in here.
F: OK.
O: And, and we had to go, we had to go and pick the, pick that.
F: Do you ever remember them gathering other seeds, seeds, different types of plants or bushes?
O: Oh we used to gather, hum, manzanita berries.
F: Oh, OK.
O: Yeah, we'd eat 'em, that manzinita berries. And, um, hazel, wild hazelnuts.
F: Yep
O: We had lot of that out here. My son and his wife stayed here, and my son went out there, out behind the house, quite a ways up the hill. He found a tree that was just loaded with hazelnuts. So he came back and told his wife we'll wait little while longer while it gets ripe.
F: Uh huh.
O: And I guess, when you went back, I guess in the meantime the bear got away with it.
F: Uh oh!
O: There was nothing left.
F: A bear or a blue jay or a ground squirrel will get 'em too.
O: Yeah, something. What else grows around in here?
F: Any other grass seeds, or anything like that, that were in, uh, open prairie areas that you used to eat?
O: Uh.
F: Like, sometimes there's these little grass seeds that people used to collect, I guess. Did you ever?
O: No, uh, I didn't eat it. My mom, uh, she just gathered certain things.
F: So, um, were you ever taught or told about the use of fire?
O: Yeah, I, we were taught that we had, you know, to build a fire outside to roast eels and cook fish on the fire and. But we were taught to put the fire out.
F: Oh.
O: Because it'll set a forest fire. But, but I know two men, Jim __??? and Bill __??? they go out in the fall time and they set a fire when its not too dry. They set fire underneath, uh, underneath trees and this caused the grass to grow good for their cattle. They both had cattle.

F: Were they Indian men?
O: Yeah.
F: OK.
O: And they set fire and they watched it, they didn't just go out and, all the underbrush was cut. I mean with, set a fire. And it just grew. I saw at Wetichpec. I saw it. It just went. It went along underneath the trees.
F: Oh, you saw the fire before, too?
O: Yeah.
F: How high was the flames?
O: It wasn't too high.
F: Yeah, like a foot? Smaller?
O: Yeah, they, it just, then it went out behind you after it burned everything.
F: It'd go out on it's own. So it wouldn't spread very fast?
O: Yeah. It wasn't very real fast. And the man said I do this so my cows will have good crop.
F: Uh huh.
O: I saw that.
F: Neat.
O: And this other fella had land down here, Jim __, he had land down here and, and he did the same thing he.
F: What area was that? It was down the creek from here?
O: I, I see his fire, but, but he went out and stayed with the fire.
F: How many miles down from here was it?
O: About a mile.
F: Oh, about a mile? On this lower north bank of the river?
O: Uh huh.
F: OK.
O: But that was the belief to, uh, set fire. To, uh, keep the land clean.
F: And what did the other Indian people think about that?
O: What's that?
F: What did the other Indian people think about it? Like, what would your mom say, or what would the others say about that?
O: They, they thought it was a good thing, you know. Like, when they, uh, set fire for basket material, hazel sticks, they set fire for that. They had a certain place to set a fire for that. But they set the fire so at certain times, and they watched it. They didn't just go set fire and then let it go.
F: Uh huh.
O: They watched it. Because they needed the sticks, hazel sticks. And also they set fire, have certain places to set fire for beargrass to make the basket you know.
F: What time of year, uh, what time of year would they burn for the hazel versus the beargrass?
O: Uh, you may burn it in the fall, or certain time a year in the springtime.
F: The hazel?
O: Yeah.
F: So, both fall and spring?
O: Uh huh

F: Did it matter if it was out in an open area or if it was in the forest?
O: Beargrass it had to be kept under trees.
F: OK.
O: So they try to keep that under trees.
F: In the shade or something.
O: Shade.
F: Yeah. And what time of year would they burn the bear grass?
O: In the, in the fall time.
F: OK. And, um, how far back, 'cause the bear grass doesn't really grow low down here next to the villages and along the river. How far, how many miles back do you think people would go to burn bear grass or to burn hazel?
O: Uh, they go out, they would hike up to, uh, *Morek* And that's about ten miles of road, river, I guess. And they go up in the mountains there.
F: Oh, the mountains.
O: *Kepel* hill.
F: Oh, *Kepel* hill.
O: Uh huh. And they pick their bear grass. They, see, they couldn't go very far, because they have to walk. And there was hazel sticks around here, so they didn't have to hike very far for that.
F: Now, you talk about walking. How important were trails to Indian people, either for fire or for going to areas to get resources? The trails. So, they had trails?
O: Yeah. They had to have trail.
F: So, these permanent trails that people would use year after year?
O: Uh-huh.
F: And do you remember what those trails were like or could you share with me how the trails were?
O: How, how big or?
F: Yeah, I mean, what did they look like, or did they go along ridges or along the river? Where did the trails go?
O: Wherever they can get through.
F: Yeah.
O: That's. That's. And it wasn't real wide. Wide enough if, uh, they have to use a horse they have it a little bit wider.
F: OK. But they were walking trails?
O: Uh huh.
F: How far, how far back in the mountains you think those trails would go?
O: Way back, 'cause they used to go from here to Doctor Rock.
F: Uh huh.
O: So that's a long ways, I guess. I've never been back there.
F: And do you know if people would actually collect things and light fires that far back, towards Doctor Rock, or was it just more closer around the village?
O: Mostly around, around, closer to home.
F: Yeah.
O: Yeah. 'Cause they couldn't pack it.
F: 'Cause, uh, some of the question that comes from, like the other forestry management people, was that they say Indians only did stuff around the village areas.

But a lot of those farther back areas, like Doctor Rock or the high country, well that was kinda wilderness, and that was more natural, and there wasn't as much Indian use or Indian management, so that's why I'm asking those kind of questions, if you know that type of thing.
O: Well, the Indians used to go back there. They went back there and, I know they, yeah, that they swamp teas, someplace back up in there.
F: Hum.
O: And they, and I know they got those uh, pine nuts.
F: The sugar pine?
O: Yeah, long ones.
F: The long cones of the sugar pine?
O: Yeah. They'd get that, that back, around Doctor Rock.
F: Hmm. And they would collect those?
O: Uh huh.
F: Do you remember how people said how they would collect those, or?
O: No, no, I don't know, but I know they went back there. And I ate some, you know.
F: Oh, yeah?
O: Uh huh. And one time, I think was Forest Hill, down, east of Sacramento, my husband was working in the woods there and mom came down there and so we were right in through there and she said stop. So I stopped and she said see the, that tree right there, I said yeah. She said that's some kind of, uh, nuts I used to go get back, back way high in the mountains.
F: Uh huh. Now, people used to have their own family areas they would go to, or could people just come and go where they wanted to find stuff?
O: We kind of went to find stuff.
F: So, its like if I wanted to go over to this area to collect acorns, I wouldn't have to make payment to anybody?
O: No.
F: OK. 'Cause there was some, some talk from the early anthropologists that Indian had family owned areas. Like someone owns a fishery, did they, you know, like someone owns their own fishing place?
O: They do, down in the river. But I always tell my kids don't, don't fight over the fishin' place. Because it's all the Indians' river. That's what I always tell em. But some people, you know, they don't want, to me they're greedy. They should divide it.
F: And so, there really wasn't specific family places that you know of that only certain families or certain villages went, someone from this village could walk up to another place, go downriver and gather what they wanted.
O: Yeah.
F: OK. Um. Do you remember other places that Indian's might have burned?
O: No, the, not that I know of. They did all that, though. The Indian chiefs did, go out. And these, the men that I mentioned, I saw that, but there's people that took care of fires. They went out and set fires. And they made sure it didn't, wasn't going to cause no trouble.
F: Yeah, and that was because of like, watch the weather.
O: Yeah.

F: Do you remember if it was with the rain, or not, how they, or do you remember anybody saying what time they would burn? Again it was a fall time, but was it before the rains or after a few rains, do you remember?
O: Yeah. They were careful.
F: OK.
O: They were careful.
F: 'Cause they didn't want it to get too big, or go up into trees or anything?
O: Yeah.
F: OK. Um. What would, uh, lets see. What were some of the main reasons why Indian people stopped using fire?
O: What's that?
F: What were some of the main reasons why Indian People had to stop using fire? Like, do they burn just as much today as they did when you were younger? Or do people burn less today?
O: They burn less today. I think.
F: What do you think?
O: And they burn, they go down to the river. And some of those people now they, they just go along and burn. I guess throw a match and gas on the road going up to Weitchpec and Georgia [Troll?] and I said when they do things like that pretty soon they'll have no more sticks because, uh, the sticks are gonna burn down into the roots you know.
F: Oh. 'Cause it's too hot of a fire?
O: Yeah.
F: Too hot. So it was better for basket sticks to have cool fire.
O: Just the, just the easy fire.
F: Easy fire, just to kind of like burn the top back, but not down in their roots, huh?
O: What you burn it down for, is so when you go and pick, there, brush that's burned there, you know, its out of the way and you picked.
F: OK, so its easier picking?
O: Uh huh.
F: And it also makes the sticks grow better, you say?
O: Yeah. They're flexible. More flexible, same way with the grass [bear grass]. When they burn it makes 'em more flexible.
F: The beargrass?
O: Yeah. I bent that beargrass other day at Orleans, they're pretty stiff.
F: Oh, are they? Must have been some that weren't burnt. Um, you mentioned people burning along the river. About how many years ago was that, or do people still do it?
O: Oh, they just go and go have smoked salmon.
F: Oh, OK.
O: We never burn like they do around up Orleans, with the bugs.
F: Yeah.
O: 'Cause we don't have no bugs.
F: That willow.
O: We don't have willow very much. Willow sticks.
F: Down here?
O: Nun huh [Nope]

F: So the Yuroks didn't burn their willows as much as this one.
O: I've, I've never heard of them burning.
F: Yeah. That's what some of the Yurok people say too, is that they never used willow as much or burned down here like the Karuk do up there.
O: Yeah. Like they do in Orleans, Karuks.
F: Uh huh.
[Family history and information of Frank omitted]
F: Um. How have, like the forest or the prairie areas changed by not burning. Have you noticed change in like, the example, here is.
O: It's.
F: I got these pictures from like 1920s. This is taken from across the river, looking over here.
O: Yeah.
F: And there's um, there's that big rock.
O: Right behind the house.
F: Yeah. And so, your house is probably someplace, I don't know, there's that little square building It's kind of hard to see but.
O: All this. All this is all grown'ed in.
F: Yeah, that's prairie. So all down.
O: Yeah, they're all grown'ed in.
F: So, what's that called across the river where this picture's taken from?
O: This is the point out here, isn't it?
F: Yeah, that's the point right there.
O: Yeah, right there, there's big rocks right out there.
F: And up here behind, you said this was *Waltek*, right?
O: This is *Waltek*, yeah.
F: And so all these prairies up above *Waltek*, and then that next ridge over, you see even the upper ridge behind it?
O: Yeah.
F: There was prairie through there.
O: Yeah. *Mana-peer*, they call it, *mana-peer*. ???
F: *Mana-peer* was prairie?
O: *Mana-peer*. Down here.
F: *Mana-peer*.
O: And this was above our house.
F: Yeah. I can make you a copy of one of these, or I can give you this photo when I leave, if you want. I just, uh, I have these color photocopies I got from the old pictures I got from the archives. This is taken in 1920.
O: 1920, yeah.
F: Yep. And so, all those prairies you see it's grown over. How, how did they used to keep 'em so open, then?
O: Huh?
F: How were these kept open then, but now they're all grown up?
O: I imagine with fires.
F: Yeah?

O: 'Cause its all grown up now. Years ago, I was always sorry that I, this lady pulled in out here, and I was going someplace, I had my purse with me.
F: Uh huh.
O: I was going out the door. And she said uh, I'm from New York, and she said and my dad lived in here when he was, I guess, wasn't married yet. Her grandpa. And she said he built his house down at *Nana-peer*. She said *Nana-peer*. She said he built a house. Oh yeah I remember that house I said, but its not there no more, it fell down, it got old. And she said he lived there. But I don't remember the man. I don't remember seeing the man. But she said he lived there and uh, he, he wrote a story about in here. In here. And he didn't quite finish it. So she said, I'm going to finish his book. He wrote a book. And I'm going to finish it. And uh, but she said *Nana-peer*.
F: Was it Kroeber?
O: No, somebody from New York.
F: Oh, from New York, huh?
O: Yeah. And so she said that, uh, and I said I would go down there, show you, I said, but you go right on down here, and there's a little bridge right down here little ways, right there, and that's *Nana-peer* up there. That's this one right here.
F: That whole big prairie area.
O: Yeah, *Nana-peer*.
F: Would there be places, that you know of around this area, where they wouldn't burn? And would there be special reasons why they wouldn't want fire to go into someplace?
O: What did you just say?
F: Like, is there certain places that you remember where they wouldn't want fire to go?
O: No.
F: And was it bad for some places if it got burnt?
O: No.
F: No. So fire basically helped everything pretty good.
O: Yeah. So, I was, I was sorry that I didn't.
F: Yeah.
O: That I didn't, uh, stay with that lady or even took, got her address, you know.
F: Uh huh.
O: But somebody said, uh, you know, just keep an eye on that Internet. You might have a word in there about *Nana-peer*.
F: *Nana-peer*. OK.
O: And then you'd find out what kind of book she wrote.
F: Yeah?
O: But, he hewed the lumber himself.
F: Tough job, huh?
O: Yeah. He had a good size. Must be about this, from here to here. Good size building there.
F: Forty feet or something, or longer?
O: Uh huh. And then there, right beyond that, there was another place. Mom and I were down picking willow roots, in the springtime, when the roots was.
F: Yeah.

O: She said you see that, flower out there? That rose? I said yeah. It's just a steep hill. She said there's a white man buried there. He wanted to be buried there.
F: On the steep hill?
O: I don't know how they got up there! I don't how, how they had this grave or, how.
F: And that's where they put him, huh?
O: Yeah. And they put him there 'cause that's where he wanted to be buried.
F: Well, I guess each person wants to rest well, huh?
O: Oh, I thought that was funny.
F: Yeah.
O: But you know, they come in here, they like it round here, I guess. And, I guess he didn't want to take up the land, so he.
F: Threw himself on the rocks, huh?
O: Yeah. On the side hill, just steep.
F: Yeah.
O: There's another man. When I go up the senior citizen in Hoopa, I got acquainted with him, and, uh, I said where are you from? He said Los Angeles. And I said, you come up here, and he said yeah. And, uh, so not too long ago I said when are you going back home to Los Angeles? He said I'm not because I like it up here.
F: Well, there you have it. Good place to live.
O: I thought that was funny. He said I'm not 'cause I like it up here.
F: Well, I was gonna ask you one of these questions here that's more about a bigger thing. Do you see a connection between, like, fire and the trees and the plants and the water and the fish? Like, how does, is there any way that you can think of that the fire helps the fish? In any way?
O: No. Just smoking it.
F: Just smoking it? It tastes good?
O: That's the only thing I can think of.
F: OK.
O: That, fire do.
F: Yeah. How would you, um, how would you like to see fire used again? Like, if you were gonna, say, restore the forest or areas like this that used to be open, um, do you think that, do you feel that there's traditional uses of burning could be used to restore the forest or help the forest better or these prairie areas?
O: I think, ah, I think if it was controlled burn. You know, if the forest was controlled burn as far as they could go, it would be good. This way, if it all catches fire, zoom.
F: Yeah.
O: Its gonna go up, into flames. Because all that underbrush is burning.
F: Uh huh.
O: Lot of underbrush. Any place you go around here you see nothing but underbrush.
F: And you don't remember it being like that as much when you were a girl?
O: No.
F: Well, like you, when you used to look through that, what's brush now, what kind of trees used to be there, or other plants. Do you remember what, just if you were walking down a trail here.
O: Just, just mostly fir trees.

F: Yeah?
O: And.
F: Fir and your acorn trees?
O: Acorn trees.
F: Do you remember what were other plants in the understory that were, what was underneath? How it was open, but what was still there, do you remember any of that kind of stuff?
O: Those, um. What kind of berries. They were blue berries. Kind of like blueberry.
F: Like the huckleberries?
O: Um, no, not huckleberries. Yeah, that's what you see too, there's a lot of huckleberries round down this way.
F: Were they found in some places and not others? Were they closer to, up the hill farther, or near the creeks?
O: No, mostly, mostly where it's damp. They have lot of it down the coast.
F: Yeah.
O: And I think they use that for floral too.
F: Oh, ok, yeah, they pick it, brush pickers pick it for floral industry [Salal]?
O: Yeah.
F: I just wonder 'cause one of the things that I'm gonna try to talk about is in the elder's memory they say it used to be more open, but now its all brush. And so, I'm trying to like, if, if they can remember, if you can remember what kind of brush that is. It's like, was there less poison oak, was there less, um, less of the buckbrush growing up the ceanothus Um, if you, if you have any memory or if you can remember what the plants were, how things have changed, that's helpful too.
O: Well, right here, right, right in our yard here, we have hard time. ??? During the flood, I guess, they, uh, the Johnson grass came floating down the river. With the river. And somehow we brought some dirt out here and now its growing all over.
F: Oh, so now there's a different kind of grass growing out here?
O: Yeah, different kind of grass. And then what we used to have.
F: That's a good question too, is, um, what about the invasive plants or the exotic plants? Like, you see the scotch broom now, the yellow one?
O: Uh huh.
F: That's growing up in places, or there's different grasses. In your lifetime, have you seen new plants come in here, and what do you think about that? Is that bad, or what's been good?
O: That's bad, that scotch broom, it's just taken over the. Like this piece of property over here is just covered now.
F: Yeah.
O: Take, oh, take a peek out there.
F: Yeah, see, I've seen it before. We'll look out afterwards. But, it's just full of it, huh?
O: Yeah, that, that's from the city.
F: Mm.
O: ________ grandma brought that plant in
F: Oh yeah?
O: From town.

F: Geez.
O: And, they’re pretty, you know, when they’re in bloom. And Mrs. McKinnon asked her for a slip. And she wouldn’t give it to her.
F: Oh.
O: And now it all over.
F: So, so that’s who brought it in, huh?
O: That, that was brought in, yeah.
F: Brought in, ok. Do you notice other things, other plants that have come in that used to not be here? Do you know any of those ones?
O: I notice, uh, those chicory plants.
F: Yeah. The ones with the blue flowers?
O: Yeah. We never did, uh, I don’t remember seeing those, long time ago.
F: Yeah, ‘cause they’re all over the place now.
O: Uh huh.
F: What about, like, the star thistle, the greenish one with the yellow flowers and the pokey things on them?
O: Oh yeah. We had those, big thistles you know.
F: Yeah, the ones that are like purple-red?
O: Yeah, we had those, uh huh.
F: But the star thistle, you don’t remember that much, huh? Let’s see. I was gonna ask you about the high country. Now, some of these other questions are, uh.
O: The what?
F: The high country. Could you share with me your understanding of why are, uh, why wouldn’t Indians use fire in the high country? We talked about it, a little bit, but, do you remember your mom or other elders talking about them using fire up in Elk Valley, or Doctor Rock or Chimney Rock area?
O: No, I never did, but, but I know, I never did hear of a fire out there either.
F: Oh.
O: Because the Indians put their fire [medicine/prayer] out. They make sure they water it down, you know, so, so they won’t cause no forest fire.
F: Hm. OK. And then, um, what about lightning? You know, this, even you growing up, do you remember lightning starting fires around here much, and if so, where were those? Kind of, where was lightning more common at?
O: I don’t know. I aint seen no lightning.
F: So there’s not much lightning strikes around this part of the river?
O: No. Huh uh.
F: OK.
O: But they, they say once in a while when there’s fire it was started by lightning. I’ve heard that.
F: Yeah. Um. Any other places or any other things that you can kind of remember that people talked about where they used to burn? You talked about bear grass, we talked about hazel. Do you ever remember them burning off areas for huckleberries, to get better huckleberries?
O: No, unh uh. I didn’t hear. They kinda let that grow.

F: Yeah. What about, uh, when you collected huckleberries, how did, how did you guys do it? Did you pick each little berry, or did you prune back the branch and then take the berries off the branches?
O: Yeah. We used to, to pick it right off the branches.
F: OK.
O: When we first started picking berries, and later on people came in and they taught us different. To snip them, to snip them at the ends, and you just get, just a cluster of berries. Then we'd bring it home and take, clean it.
F: Who taught you that?
O: Oh, people come in. It wasn't the way of the Indians.
F: To prune like that?
O: They pruned. No not that just mostly at the ends.
F: Yeah, the tips, like when you, when you prune the tips, then like a year or two later when it grows out its one big cluster of berries. And then you come and you just prune that, and then you bring all those little pruned tips with all the berries on them back home and you could sit around the porch and clean the berries off. And then your left with all the little sticks with the leaves, right?
O: Yeah.
F: But, you're saying somebody taught the people how to do that?
O: Yeah, they never used it. I mean, mom and them never used to pick berries that way. We used to have to just pick berries off of the branch.
F: Oh. So they never pruned the tops?
O: Yeah.
F: Hum. OK. Interesting.
O: That's how we picked. We picked lot of berries. One year, I think I canned seventy-two quarts of berries.
F: Wow.
O: My mom and me and one of my sons, Cleo, four of us, picked berries. One day.
F: Do you remember what year that was?
O: I don't remember.
F: Was it 1950s or 60s or?
O: Let me see. We moved up here during that flood, I guess, sixty, fifty-five?
F: Well, there was one in fifty-five, and then another one in sixty-four.
O: I think it was fifty-five.
F: Oh, OK. And that was the year you got lots of berries?
O: Yeah. We had, we had lot of berries. I used to make lot of pies.
F: Oh, sounds good, huh? *Sku-yen*. [good]
O: I had five children. So we ate a lot.
F: Yeah?
O: Everybody liked dessert.
F: Uh huh. I like dessert. Um, lets see, other things.
O: Just like that too, my niece, Arleen's granddaughter. Down here. She's tall and slender. I said oh, you have, you have nice shape. I told her, I, she's going to school in Riverside, ninth grade.
F: Huh.
O: And, uh, I said, don't get fat.

F: Yeah.
O: And my son from Hoopa was here, he said tell mommy I can get fat if I want to!
F: Funny. So, do you know any stories, um, about fire or about burning, like Coyote stories or any of the other stories that are like that type of thing? About *Wah-gay* [spirits] using fire, or anything that you can remember? Was there ever any stories taught to you about burning, or just about fire in general? That you can remember from some of the older people?
O: No.
F: Oh, OK.
O: I never any, I never heard nothing.
F: All righty. Was there, um, some other things that you would like to talk about more, that you remember from your mom? Was it, sorry, that motorcycle went by and it was kinda loud. Was there, I guess we're pretty much gettin' close to being done. So, I just was wondering if there was any, any of the last things you'd want to say that you remember, or that you think might be helpful in talking about fire, and how the land's changed, you know, and especially about how Indians were using fire. If you can, you know, if there's anything like that you wanted to add. I can always come back and talk with you more again later on.
O: Well, I think, I think, uh, just like I said a while ago you know, it should the, uh, underbrush fire. That's would be a good idea, underbrush fire. Like now, around here, they come and, I don't know with President Bush using all the money we probably won't have any more. But they, uh, the tribe had them to come and, uh, cut the grass, brush around here.
F: Yeah.
O: Thirty foot from our house.
F: Yeah, field reduction.
O: Yeah, and next year we probably won't have it because they'll say there's no more money.
F: Uh huh.
O: And, and all over, I think my son, Marvin, came up there and, and Jeremiah, and he, couple weeks ago they cut all around.
F: So, you like that, field reduction?
O: Yeah.
F: When they can get paid or people do it, they cut back the brush away from the houses.
O: Uh huh.
F: Yeah.
O: Otherwise, you know, it could start up. Fire could start up.
F: Yeah.
O: I was telling Arleen [_______] the other day, yesterday I guess, I said my mom and dad lived in Klamath and I lived with them down there and when they came up here for the weekend, so I came with them. And, uh, I said, I think I'll, I'll stay up here.
F: Uh huh.
O: So I stayed home, and I was washing dishes. Woo, I smelled smoke! And I looked around, so I went out. Here I had a purse, and it was laying around in here, and I used to smoke. And that purse had matches inside.

F: Uh oh.
O: And the kids played with the purse, when they were here, and that's what ignite inside the purse.
F: Uh oh. Strike-all match, kind of thing?
O: Yeah, uh, if, uh, if I didn't stay home this house would've been burnt down.
F: Oh.
O: So I went out there and stomped it out.
F: Yeah. Lucky.
O: Yeah. And the grass was just, you know.
F: Starting to go, huh?
O: Yeah, dry.
F: Wow. You said you were down at Klamath, in Requa area? And there were fish?
O: I, I lived in, uh, out there. Right near there. I didn't. Excuse me. I lived near the school.
F: Uh huh.
O: Right by the highway.
F: Yep.
O: That's where I lived. We had someplace round here.
F: So, this is, like I say, called Tucker or?
O: Yeah, Tucker Rock.
F: Oregos How'd you say it, Oregos?
O: *Oregah*.
F: *Oregah*?
O: Yeah.
F: And so, that, even right there, that, that at the, at *Requroi* it's all more prairie and open area.
O: Not anymore though, huh?
F: No. So when, when you lived down there, did you ever hear of, uh, Indian people using fire down along the coast? On those, on those headlands around *Requroi*?
O: Huh uh. Just, just when they go down the river to fish for eels and, then they eat down there.
F: Yeah. They make a fire for eating, huh.
O: Yeah.
F: But not for burning back the brush or.
O: No.
F: Or keeping the grass or prairies open?
O: No. I never hear of them. I never hear of fires being down there.
F: Hm. What about in the Redwoods? Did you ever hear of Indian people using fire to burn in the Redwood areas at all?
O: No.
F: No? OK. Well, I think that's pretty much it, Ollie. Just wanted to get your, your thoughts on things, and I thought maybe the old pictures would help out with stuff.
O: Yeah, well, one thing is the prairies.
F: Yeah? Now, did those prairies used to, from what you remember, from Klamath to here, did there used to be a lot more prairies?
O: All over.

F: All over?
O: All over, yeah. Now you look around, there's hardly no, no prairies. Just all filled up.
F: With the young fir trees and brush?
O: Yeah. My dad used to go up here. He had two, three horses. He had three horses. And, uh, he'd go up and plant hay up in here someplace.
F: On the upper prairie?
O: Yeah. This is the, used to be old Shaker church right there. [looking at photo]
F: Uh huh. Just up above that. And what's the name of this big rock here?
O: I don't know what the name of that is, it's just a rock.
F: Just a rock here in town? OK. And that's just above the house right here?
O: Right up there.
F: OK, right up there.
O: Yeah.
F: OK.
O: And some of the, uh, couple of the, its a big rock.
[Discussion of people's names and actions omitted]
O: Yeah. And, not this last, end of the winter, it was still cold.
F: Uh huh.
O: Yeah, it was cold that night. These folks never slept all night. 'Cause the dogs would bark. And I was washing dishes there, and I had that window open, and I heard a man hollering. And I told Barbara, Barbara _____down here, I said, who is that hollerin'? I said, I heard a man hollerin' from, from the window. And I opened it up. She said he hollered all night. Up, she said, I think it was up the rock. And she said, uh, he, uh, he'd holler and the dogs would bark, and woke ever, them and her son up. And her son went out and shot up in the air to keep the dogs quiet.
F: Shot the, shot a shotgun or a gun?
O: Up in the air yeah, with a gun.
F: Huh.
O: And it was about ten o'clock 'cause I looked to see. Whenever something goes on I always look.
F: What the time is?
O: Yeah. And it was about ten o'clock when I heard that man holler again. I never did find, hear who was up in there. Someone probably on drugs.
F: Something. You know.
O: And it was cold, cold. 'Cause she said, she said he hollered all night long up there.
F: Huh. Don't know. Yeah, I, I have some other pictures here. You want to see these other ones? They're from, uh, the old Martin ferry bridge. You see that too, that Martin's Ferry area.
O: Oh, yeah.
F: That, uh, that had more prairies, down there.
O: Oh, that's an old house, there, huh?
F: Yeah.
O: Mrs. Ryerson's sister used to own that. I think they, it was a hotel. It wasn't a hotel when I started seeing it.

F: Uh huh. And then here's an old picture of Weitchpec. *Wes-pus*? And there's, um, the store.
O: Oh.
F: And here's where the Trinity comes in. Yeah?
O: Oh, yeah.
F: But uh, even that was a lot more open. Around there. And you can see trails on this picture, yeah? This is by Erickson. It says, uh, A. W. Erickson, number 67, but I think this was taken like in 1890s.
O: Oh.
F: But the, um, those old cameras?
O: Uh huh.
F: But you can see, kinda you can see prairies all around, how open it was.
O: Yeah.
F: Around Weitchpec. And so, those are the types of things, I was, I was curious, you know when I saw old pictures like this. And you look at today it's all grown in.
O: Yeah.
F: And I thought, well, was that because, is that because Indians stopped burning there, or is it.
O: They had to stop, you know.
F: Yeah.
O: They were, they put a stop to it. The *Wah-gays* [white man] do everything.
F: Did you ever hear of Indian people getting into trouble for lighting fires, by the government or anything?
O: No.
F: No. Little bit different now, this way. Some places, like around Orleans and other places, I guess the law used to get after some of the Indians.
O: Because they were close to the law.
F: Yeah. Down here no law, huh? There was no law.
O: There's lawless down here.
F: Good. All righty. Well, we'll turn it off, then. We're done.
O: OK.
F: *Wac-klow*. [thanks][Interview finished]

LaVerne Ferris Glaze (Karuk), Age 70. August 2, 2002 interviewed by Frank Lake **(FL) Orleans, CA.**
Consent for voluntary participation verbally given and signed on IRB form

FL: Your name, age, tribal affiliation and if you identify with a particular village?
LG: LaVerne Ferris Glaze, age 70, Karuk/Yurok tribes, I come from the village of *Tishunick* and *Tooyuk*.
FL: Were you raised learning some of the traditional practices and to what degree you were, you weren't is also important. Hunting, fishing, gathering basket materials or other wild foods or herbs.
LG: Didn't put basket materials but we did do a lot of collecting of mushrooms for the season, deer hunting, fishing. It wasn't until later years that I got into basket materials.
FL: What were some of the areas that you went out and did these things? Or learned about this stuff.
LG: Mostly in the Redcap area. Because that's where we went in the summertime or in the fall to go hunting and that's where we did most of the harvesting.
FL: Were you ever taught about the use of fire by older Indian people? In your family or in the area?
LG: Oh yeah, I do remember Dad talkin' about they did use fire a lot and when, when, ah, the Forest Service came in, it was like, you just couldn't go out and set a fire anymore, they used to have a guy that lived down Camp Creek that used to, they used to call him the "runner". And he would go out and set fires, and he was so fast he would be back home before they detected the fire.
FL: An Indian guy?
LG: Yeah.
FL: And so what did he run on, trails or pickup trucks or just however he could.
LG: Oh no, he was a fast runner. In those days they didn't have a lot of roads, and probably didn't have cars then.
FL: And that was enough for the Forest Service or was it before the Forest Service was
LG: No this is just after the Forest Service came into the country.
FL: And he was a young fella?
LG: He was in WWI, because I remember seein' him a lot in town and he didn't have any hair because he'd been gassed or something. And he was kinda lean.
FL: Yeah, but he could still run pretty fast?
LG: Yeah. Dad used to tell that story all the time that they never did catch him.
FL: Well that's good in some ways. Do you know what kind of places they sent him out to go burn for? Was it brush in general or…
LG: Just the brush and probably places to harvest, I would think.
FL: Harvest acorns?
LG: I don't know that because it was before my time. Well, when you see pictures of this place years and years ago, it was not, it wasn't as thick. There was openings. And I think maybe a lot of it was just natural. Where the lightning would strike and they couldn't put it out, they didn't have bombers, helicopters and stuff so a lot of it just had to burn.

FL: Just on its own. How frequent do you think the lightning fire, like versus Indian fire, that's one of the main questions I ask people too is, when you remember people talkin' about it, that was more lightning high up and burning down low or was it kind of a mix?
LG: I don't think they went high up, that was mostly lightning fires because, you know, I mean when you talk about high up, that's a long trip, course they did go a long ways too, but.
FL: On the trails?
LG: Yeah, And they did have trails across the ridges, so they could've set them off there too.FL: Which is interesting because you see that the same places lightning strikes could happen the same places where Indian people would burn. And so in today's argument, just like the article, and things, I'll give you a copy of, things we write about and go to conferences, is they say, well it was lightning fire because you could see where the ignition sources were. And so, well maybe not necessarily, there's a reason why those trails were there, and so, I've asked other people in interviews, if they had other importance for trails other than just for trading or for going to resource grounds, if they actually may have burnt of them.
LG: Well you'd think that they would. When you think about it. If they're going across the ridge, and it's getting' pretty bad.
FL: They wanted easy travel, that's what some people said.
LG: Because up there near Indian Rocks, now that's well off the beaten path but it's on a ridge and there's signs of obsidian, when I was a kid we used to find arrowheads and stuff up there. So what they did, they came across from over there in Modoc country comin' over. That's a long way to go.
FL: Yeah, following along the ridges.
LG: Probably carryin' the obsidian with 'em.
FL: Yeah, for your flints, other stuff, arrowheads.
LG: So they did go to the ridges and I'm sure they did keep it clean.
FL: Have you seen fire used for cultural practices like hazel burning or willows or for bear grass? It can be either historical stuff or it can be other things you been involved in more recently your self as a weaver.
LG: Oh yeah. Not a long time ago because I wasn't into the basket weavin' then, but I know, ah, where the gals get their hazel down river [Weitchpec or Yurok Reservation], they torch it themselves. And even some of the older women said that they sent some kid out to do it and they don't do a good job they have to go up and start it themselves.
FL: What time of year would they burn that? The hazel?
LG: The hazel, in the spring. And whenever it would burn.
FL: When ever it got a little bit dry enough. And how would they prepare that? How have you seen that prepared?
LG: What's that?
FL: The hazel, how they kinda like prep it or
LG: I haven't seen 'em. They would just tell me how they'd do it down there. They do have a lot of fires down there, I noticed that. No, I'm talkin' about pitch.
FL: Pitch.
LG: Pitch.

FL: Like pitch sticks and put them with your hazels? Well, that makes sense. Little fir branches and stuff.
LG: Cuz you know pitch'll really burn nice.
FL: It'll get real hot.
LG: Give it a good start.
FL: What about for bear grass?
LG: Bear grass, the only thing I know is fightin' to get our bear grass burned by the Forest Service. They're willin' to burn it but then they have to have all these studies on it, go through all the…
FL: NEPA.
LG: Yeah, NEPA. So, they did burn some this year. And we did go up and harvest it, but it wasn't a very good burn.
FL: What was the problem with it?
LG: High up when that fog comes in, it keeps everything pretty damp. And everything has to be just so, you know. Well, it didn't take a good burn at all.
FL: So the bear grass takes a hotter fire?
LG: Yeah.
FL: That's like one of the things I'm tried to help with by doin' interviews is get that, the finer level of understanding because if I can put this together and make recommendations to the Forest Service, then I can say, lookit, burning at high elevations, there's fog, if there's other weather patterns, you need a hotter fire. So you prep around it to be able to burn hotter. So those are the kind of things…
LG: You need a hotter fire for bear grass, that's for sure, because you want that bear grass not, burned down,
FL: Singed?
LG: Yeah, burned down to the plant on the ground.
FL: The root part.
LG: Yeah, and then in the spring when it comes up, it'll just start comin' up right to the center. But then you can get it too hot. Because on the Ukonom side they had it way hot and it was two years before we could even pick any of that.
FL: So generally if you burn, what time of year do you think they should burn it?
LG: They did it in the fall then. But I think they should burn in spring-no, early fall. Like September. End of August or September. Like right now if they had the fires going which they won't, this would be a good time of year to burn bear grass.
FL: So the end of August early September. And they burn higher up now, like if they're at mile post 23, but do you hear, any other elders or weavers that you've been with, have you ever hear them mention about people burnin' bear grass down lower sites? Or would actually people, do you think historically, would have burned that bear grass too?
LG: I don't know. You know, a lot of people, many, many years ago, that was a family thing just to take off and go camp. So I don't really know, but I would think they probably did it high up.
FL: What about anything else you want to add or say, any more about bear grass from a recommendation standpoint? If I was going to get this report out to the Forest Service, itemize each thing out or recommendations. I'm gonna try to include

historical information, and suggestions and recommendations and then, like more fire science behind it.
LG: When you burn a spot, you're cleanin' out the understory when you burn it. So it takes a while for that to build up again. So it's gonna get a burn. So what I think we should have is different areas, like five acres over here that's burned one year, and then move onto another area, five acres over here, burn the following year, and just rotate that.
FL: Between two to three years or somethin'.
LG: Uh huh, and then that way you're gonna get enough stuff falling and enough buildup under there where it's gonna get a good burn again.
FL: So you need enough leaf litter and needles and branches and stuff and maybe even grass. What other plants do you see. Some of the best bear grass places you have seen, what does it look like as far as? More open, lot a space in between the trees or
LG: To get good bear grass you have to have canopy.
FL: Oh, OK.
LG: It can't be right out in the sun. You have to have that canopy there.
FL: Like filtered light?
LG: Yeah. Filtered light.
FL: So …it's not gonna jump up into the crown. I think that was some of the same things we found with the huckleberries and bear grass at Warm Springs.
LG: And hazel's the same way. Yeah, you don't want to get that hazel right out in the sun because there was a spot at Redcap that I thought after that Megram fire would be a nice place to get a plantation going but it's an old landing and it's right out in the sun. That's when Jennifer [Kalt-CIBA] said something about getting hazel nuts planted. And I said, you're gonna have to be on it. Those squirrels are out there're getting their winter supply. There wasn't one, not one. She though we were just go pick hazel nuts. They're happening.
FL: With good luck you're gonna run into them. Either that, or see where ground squirrels cash them out. They'll rob him. Poor guy.
LG: We need different spots, even for the hazel. We did that out there at Redcap and then they're also clippin' up there at Cooper Ranch [near Fish Lake]. But we need the different spots. I don't know if I'll see all that in my lifetime, tryin' to get all this together. And it's been years, we been workin' on it for years.
FL: I guess that's one thing, I think it's still a bit ambitious, but thinkin' I can make some change but…
LG: Well, you gotta think that.
FL: You gotta try.
LG: And we're all makin' progress. But then you just feel like you want to go out and burn it yourself. Just go do it.
FL: The hell with the Forest Service waitin' for all the proper paper work and stuff. Well, what's the community attitude on that? How do you keep a working relationship with the Forest Service and understand that they can eventually help you but at the same time they're hindered and they have their own delays and stuff, to where hell, they might not even get anything done for you.
LG: Yeah, but you know we're workin' with Stan Pfister [USFS Six Rivers NF, Orleans RD] and we have been for the last 10 years or so, but he understands our

problem and he's got problems too. His own problems of tryin' to get it together and his hands are tied in a lot of ways of doin' it. He has to go through his process. So, but he is tryin'. He is willing to work with us. He and John [Larson-Orleans Ranger]when he was there, John is very good too. You know you talk to a lot of these other people, who say, We can't get the Forest Service to do anything, you know. But I think persistence pays off. You can't go once and they'll say no.
FL: Yeah, you gotta be a squeeky wheel.
LG: You do. And most of the time they're willing. Like when we went out to do the hazel out there. We clipped it and piled it on top of the plant for burning. And they loaned us all their big clippers and stuff.
FL: Yeah that was nice.
LG: They even sent a guy out.
FL: You didn't have to pay for that so at least it's someone. Some contribution. So do you think that's more upon the ranger, the resource staff that was there?
LG: It depends on the people, not to just give up, you know.
FL: You have to be on them, eventually they'll see, well, if we commit resources they're gonna still be there anyways, the tribe, the tribal people, and then also the government.
LG: I think, ah, I think most of those people down in Miwok country and stuff, they give up too easily. When they could just be on it. They can say, hey, we have to have this stuff. But I think things are kinda changin' too. I think now the Forest Service realizes that we have too much fuel, too much fuel on the ground. There's places out at Redcap that we used to hunt in and you can't even get through anymore. There's gotta be a way to get that stuff out.
FL: Now when people say brush, they're talkin' about what? Young fir trees, different ceanothus, manzanita, what do you think of?
LG: There's some little fir trees out there that are so, they'd make nice little poles but, they're about that big and they're not gonna get any, they just keep goin' "jink" because they have nowhere to…
FL: They're thick, just like dog hair thick.
LG: Really.
FL: What about willow? Been involved with some of the stuff down there at the bridge haven't you? Orleans bridge?
LG: Yeah. I'm never heard of, I just recently hear people burning it, it's a good drive, I know when we first started weavin', we had a lot more water in the river and it would come up and wash all those willows out, under the bridge, all over. I mean the river bed would be clean from anything. But now that we don't have the water, don't have the high water, it comes up and those willows just keep growin' into big trees now.
FL: And before they used to be washed out.
LG: Yeah.
FL: So do you think they started burning willows as more like a response to not flooding as much?
LG: Yeah because down at the bridge what they did, they burned that, those were getting to be, all buggy.

FL: So that's one of the reasons they burned the willows is to get rid of the bugs. And a flood did the same thing?
LG: Well, we had better sticks then.
FL: Younger stuff, what I think it is the younger material.
LG: Yeah. I remember when we were out at Sandy Bar, we used to, the water would come way up and we'd go up and watch it and it would just be boiling, you know. Takin all that stuff out. We could even hear the rocks movin'. But you don't see that anymore, not very often. Like those willows down there, they got a good root system now.
FL: Yeah, they're anchored in there. So they only have one option to burn them out.
LG: And when they did that at T-bar, those are pretty good sticks.
FL: Do you remember what time of year they burned that?
LG: I don't remember. I don't remember what time of year they burned that. I know I went up a year or so afterwards to pick sticks but I can't remember, Marge [Huston] would probably know.
FL: Well, on that whole thing of areas, what do you remember about people saying things about people's different management zones, places they have for their own things.
LG: They did have their own, they did. Because the Wilders and Ferris' out here on Redcap that was their mushroom area and everybody knows it, everybody still knows it. You know, that this is where they go and it's just like fishin' up the falls. I remember Grandma Sanderson said, her and Aunt Lucy said, something about it's our fish day, we have to get up there and get fish for everybody, for the whole family but that was their day and I guess years ago they had fish day for these people, fish day for this family, fish day for this family.
FL: Their own dip places too. And what about for basket material and places they would burn? Those same things? People in those places, acorn grounds?
LG: Yeah, acorns, mushrooms, even deer.
FL: Places they would burn off or deer hunting places they owned?
LG: Yeah. They had. I mean that was like their own place to go.
FL: So if you didn't take care of it, you lost out. That's what somebody asked me today, well Frank, what happened if somebody didn't take care of their resources like burn it back or prune it or harvest those things. I said I don't know, probably got taken away from them.
LG: Or somebody else would move in on them. Or do it. Because I know even yet, you know this is what 2002, the Redcap country out at Salmon Summit and all that area there was used by Ferris', Wilders and Sterrit's. And it was like, that was their country. That's why we still have a cabin out there. They [USFS] tried to take that away from us too. We finally had it turned into a historical site.
FL: Can you still use it though?
LG: Oh yeah.
FL: How far is that cabin back in there?
LG: It's back in there about, from the trailhead, about 3 miles from our, it's very very hard to find you know. If you don't know where it is, you wouldn't find it.
FL: And so people today are just going back to where their families had gone for years before?

LG: Yeah.

FL: That's why, I was curious, for burning or for collecting stuff that had to be burned, how far would they go back?
LG: Dad's area went clear out almost to Trinityy Summit.
FL: From the river.
LG: From here out.
FL: Gee I guess I could look on the map to find out how far that was. When did he have out there, was it huntin' grounds?
LG: Yeah, in fact Sonny [Buck Ferris] still goes out there. Every year.
FL: So was that more lightning fire or did you ever hear stories of those guys burnin stuff when they came back after they were done hunting or anything?
LG: I don't know. I never did hear him talk about that. But since they had that big fire, the Hog fire.
FL: Yeah the Hog fire, yeah.
LG: They opened a road up from, a cat road from Salmon River side so now a lot of those Salmon River people go up and use that for hunting up there too on out to Dome Rock and Eight Mile. But dad, and Grandpa Ferris started goin' out there when he was alive, and then Dad went out there and then Cliff and the boys went out there and now Sonny Buck's takin' his boys out there.
FL: So it's goin' on down the line.
LG: yeah.
FL: I guess my next question or thing is, do you remember people or in your conversations with other weavers about certain times or under certain conditions they would burn? Like what I'm trying to get at is like the fuels question, Stan, he's a fuels person, he knows relative humidity, he knows weather, that kind of things. Was there a small, not so much in those words, was there times like before the coming of a storm or at certain times they would burn certain places?
LG: I don't know….
FL: You don't know.
LG: I really don't know what to say cuz I really don't know.
FL: You touched upon this earlier but how have you noticed the landscape, like along the prairies, the forest or places along the river, how has that changed, even in your lifetime? Or from even when you were younger, how did people said how it looked?
LG: It looked a lot different. I mean, we're just getting' covered up with brush. We used to go out to, or even along the river down here, cuz Dad used to plant down on the river bar below our old house [Present day Woodman's Red Cap Road.] and he had potatoes down there, it was all clear. And then the upper field he had alfalfa and they just now cleared it but it was a forest, you know, since Dad died. . . Yeah, I just covered in, when Sonny Bucks, we'd a been camped out there too, that used to be a huge field, big meadow, we used to go out there and play baseball and have picnics, even shoot and trap out there and stuff, it was a big meadow. Now it's just all closed in. It's like, one of these days we should go out there and open it up. Have it like it used to be. Cuz it's not gonna be a meadow, soon.
FL: So we're losin' a lot of those grassy prairie, meadow areas.

LG: Yeah. I'm sure that's the way it is up higher too, it's all fillin' in with brush and stuff. On the river bars you see it. Down at Ullthorne there used to be homes along there.
FL: That's what Leaf [Hillman] was sayin'. He had a great aunt or grandma or somethin' who had a property there.
LG: No, you know, it's just all grown over.
FL: Yeah and a lot of people who don't know would think that tangly, grape vine, fir trees, manzanita, ceanothus, whatevers in there, that's just the way it's supposed to be, all thick like that, blackberries.
LG: Yeah, it was all cleared out it had homes. And this place, Sandy Bar, when I got some pictures of it, when the old Sandy Bar people who lived here, they had it cleared out from up the point clear down to the end. There was no brush.
FL: No undergrowth?
LG: No, huh.
FL: Was there big trees though?
LG: They had orchards.
FL: Yeah there was orchards.
LG: But they had it all clear. It was a beautiful place. And the old house was there in the picture. So they just kept it pretty darned cleaned off. No, see these people have brush growin', closer and closer.
FL: Closer and closer, yeah, well, they have to learn. They don't think about it.
LG: No, I think I showed them the pictures of how the place used to look too, I think they like the weeds and the, cuz she was prancing around the big oak, I was scared because right after they bought it, we had problems with the water line, and we had the tractor over there diggin' up line and she was just prancin' through the big tall weeds and I'm thinkin' those weeds are gonna get dry and there gonna be a fire hazard, you know.
FL: What about oak forests? You gathered some acorns in your time. How did people talk about the oaks that needed to be burnt but now they're not so what's happened in that last 50, 60 years because they haven't burned the oaks?
LG: Where I go, you know you go to the tan oaks to get tan oak mushrooms, I know down below on Rattlesnake [ridge] you can't get through it now because all the older oaks have fallen over, you know. We used to pick [mushrooms] clear down to the creek and walk the creek clear up, pickin' mushrooms but you can't get through anymore. So if any place needs to be burned, that needs to be burned too. But then you're right by the creek.
FL: Would fire hurt the creek?
LG: Probably not.
FL: I'm one of the few fisheries biologists that thinks, probably because of my cultural background but, low intensity or moderate, cool to medium or moderate fire, nothin' that's really crowin' out, you know, would probably be good in those places.
LG: Probably would. Wouldn't hurt it. But the only thing I say too, I know out at the old homestead, Mom and Dad had a homestead out at Redcap when they first got married, they had 80 acres out there, and Dad built, that's where the first three kids was out there and Dad built a log cabin out there and that's where they had the three and then, that's where they got their mushrooms right there was a nice oak patch and

that's where they got all their stuff there and then it was John [Larson] was a ranger [Orleans RD] they were going to log above the old forest service road up there and Jenny and I said no you can't do that because it'll ruin our mushroom patch down there. He said, it won't ruin it you know, and so then they had logged that …it did ruin it.
FL: How did it ruin it?
LG: Let all the light in. You know. Too much light for tanoaks [mushrooms]. Tan oaks have to have darkness and it ruined the place.
FL: But I've heard others say they need also ground that has been burnt too. Have you heard that, no?
LG: Well I'm sure they do too because it puts all the nutrients back in the ground but, that was why, we haven't let him forget it yet. He ruined our mushroom patch. I won't tell you what we call it, but, John's big booboo.
FL: So as a weaver, today and having access, and I guess the quality of access and also the quality of material, what do you feel, from traditional burning practices, what do you feel aspects of that could be used for restoration? And you know, well yeah, we want to burn places, but if you had a priority or if you had a list of suggestions, what do you think they should burn and which ones? I know we talked a little bit about it but, do you have specifics?
LG: Do you mean, which product?
FL: Yeah, which thing?
LG: Hazel, would be mine, because, and willow too, but I would like to see more hazel managed. Because it's a better stick, stronger.
FL: How big of an area, per hazel bush if they burned it, how many sticks you get off of it but, you talked about every couple of years, having a different place for different resources, how much ground would you need to support one weave, let alone 10 or 15 in the community?
LG: Well it depends on how many bushes you got. We did up there at Redcap where I found that patch we did, Stan estimated 10 acres of pruning. But there was a lot of hazel on that bit, you know. And that would supply quite a few weavers. I we got five more places like that we wouldn't need that many.
FL: What do you think your second priority would be? For burning.
LG: It would be probably willow.
FL: Willows?
LG: Being how the [Klamath] River doesn't come up any more like it used to. It would be nice to. If you have bad willow basket material it's hardly even worth it.
FL: I see sometimes the young stuff, it comes up, it might be two, three years old, it might be straight but it can have bugs in it too. Do you ever get a sense, an idea, from your own opinion or others, how big of an area you should burn? For that, knock back the bugs? For a nice stand, get it goin' again?
LG: I don't know. I really don't. You'd have to burn enough of it to keep the bugs from comin' in.
FL: Well I know that place that burned down there last year at *Tishunik*, not the one that went up in the trees, but the one there on the flats. From August to August, from last year to this year, some of those things grew from sprouts over six feet tall. And

they grow bigger that my thumb, maybe a centimeter and a half, two centimeters across.
LG: Because of the fire that went through?
FL: Yeah, well it's the same thing with starthistle. Starthistle went from three and a half feet, three feet unburned to over six foot tall the year after.
LG: Really?
FL: Exotic plants are gonna be the problem. Because if we burn in there, I take it from my research areas, we can burn a few places and you might be OK for the spring harvest but if you try to wait til August, that second spring, late summer harvest for willows you're gonna be fightin' through the damn starthistle. And no weavers gonna want to do that. There's good material there but you won't be able to access it. And then after the willows, what do you think another priority would be?
LG: Probably, you mean as far as resources go?
FL: Yeah, material that you need. We commonly think, OK you burn bear grass, you burn hazel, you burn willows. So you have bear grass that would be a priority that we talked about, is there other plants out there that were used of basket materials that we just don't have in good quality or enough of because it's not burned?
LG: Not that I know of.
FL: We talked before about that blue blossom, or the ceanothus, the wild lilac, those tops, you get the nice straight tops.
LG: They're nice little narrow ones, but you know what I found is best with those? Is trimmed.
FL: Just pruned.
LG: Just pruned. And then you got some nice stuff. Cuz I find, you know, you don't go very far to harvest that but you know where the blades go along the road and turn off, boy that's the place to get 'em.
FL: So the top wacked off and they come back nice and straight. Well, we covered that one, which was recommendations. Can you think of places or hear of reasons why Indians, there were places they didn't burn? Cuz also the extreme perspective can be, well Indians said we have to burn up every place but did you ever hear of…
LG: Let 'er rip, that's what I say.
FL: But could you think of places that probably shouldn't be burned? Or that they wouldn't have burned traditionally, they would have kept fire out of it or around it.
LG: Well I think all the prayer spots they wouldn't want that burned. You know like, you mean burn it or?
FL: Well, just places they would have kept fire out of or wouldn't have burned. I'll give you an example. Like some of these upper creek areas, you get yew wood that grows in there. If that place burns through there, that's one thing where it can damage the yew wood, because you get the heat checks in it, that's not very good for bow material. So those are places I think, well, if you can burn around each side of it, burning frequently on the sides of it, would keep fire from going in there too, so there's ways you can also protect the resource by burning around it. And preventing fire, not burning it. So I was wondering if you ever heard anything like that.
LG: No, but I think like when the medicine man went up the mountain, you know, like Leaf [Hillman] said, well I hope you can find all the prayer spots, because it's getting'

really brushy so you know, I'm sure years ago they probably trimmed it or cleared. Maybe not, I don't know.
FL: Fire, energetically, you can prune so much and wear yourself out or you can just light a damn match and let it go, it'll burn itself clear so, I think fire, energetically is a pretty efficient tool.
LG: It was because you get a lot of places, and the most damage that we have now with fire is back burning, these guys back burning [Fire suppression practices]. They just sterilize the earth. But you know if you have a regular forest fire, and it just kinda rolls along through the
FL: Creeps
LG: Yeah, unless it crowns, then you got a big problem but normally, you get a fire and pretty soon it'll just start creepin' on ya.
FL: Just in your experience, goin' out huntin and lookin' at other places and checkin' out fires, are there areas that you think were good quality burns versus poor quality burns?
LG: Oh yeah there is.
FL: Can you give me characteristics of when you think, pick a forest type or somethin', pick, what's, I guess, like for instance, how much duff should still be left there? Like the branches and the sticks and the things like that, there's different sizes of those things, if a light fire goes through it's gonna burn everything about your finger size or your wrist, a little smaller down, and leave some of the bigger logs and leave some topsoil there a little bit.
LG: An ideal fire would be that. But can't always predict that one. I've seen a fire out there at Redcap that went through during that Hog [fire] one and it just took everything out, now it's just this big brush patch.
FL: So it burned up the overstory? It crowned out?
LG: Yeah. Went on top of the ridges, just took over and burned everything and now it's just grown up with brush which needs to be cleaned out too. Cuz if another fire comes through it's gonna do the same thing.
FL: So how do we do that, how do we thin out the brush in places or these younger trees? You know, we can burn 'em but in some cases
LG: Take off
FL: Yeah, you might wanna burn at one time of year, yeah that's somethin' I still struggle with is how would I make recommendations? Right now it can be favorable and when you think about thinning, reducing fuels and prescribed burning behind, but the window in which they might want to burn, the government might want to burn after they thin it might be a completely different time of year or a different window that when culturally the preference might be for burning. And too, I've seen burning at different times affect the quality of the basket material. Bear grass burned too late comin' up too small and
LG: Or too hot, like that one time up there on the Ukonum [Ranger District] side, that burned way too hot. And there was only two weeks difference between the Ukonum, they were at the same place. Ukonum was on the right hand side and Orleans district on the left hand side. Ukonum burned two weeks ahead of Orleans. And it got too hot. When Orleans burned it was perfect. They talk about the window.
FL: I'll stop this. [Interview ends]

LaVerne Ferris Glaze: November 8, 2002. Near Orleans, Ca. driving along Red Cap Road, along Rattlesnake Ridge area to La Perron Flat.

Interviewed by Frank K. Lake and Dan Bubba Lipe from Oregon State University

LaVerne Glaze**:** Mostly the Ferris and the Wilders.
Frank Lake: Mostly Rattlesnake ridge area?
LG: Yeah.
FL: Or below it?
LG: The whole ridge.
Dan Lipe: So for your mushroom them I think it would have, does it have to be open to find them or is it better if it is a thick canopy cover?
LG: Ah, they seem to grow better when it is a little thick. Because you want all that duff , you know, for it to take off too. A lot of times you can't even see the mushroom, because there is so much duff on it. So if you see kind of ah, little hump in the duff, and you kinda, scrape it off a little bit then you would be surprised there would be a mushroom underneath there.
DL: Ok, so did they leave that then, did they leave that area thicker forest for that type of thing to gather mushroom?
LG: Yeah.
DL: No burn it or,
LG: I don't remember it ever being burned out here. You know for mushrooms. It could have been, but, I don't remember it.
FL: I heard other people say mushrooms come up after it has been lightly burnt or something.
LG: It probably does, you know every thing that is burned, something comes up.
FL: True.
LG: Nicer. Better. I know out there after that Megram fire. I took a ride out there and I could not believe all the mountain lilies [*Lilium washingtonia*] were out. I sure was, covered, beautiful.
FL: Yeah.
LG: Something with the fire must of have, popped the bulb you know, scattered it or something. Yeah, this was our old place to mushroom and when the commercial people came in, they just raped the whole land. They don't leave anything. Mom used to make us go in and cut it. We always had a knife, just cut the stem off. She thought that would make them come back, but I don't know if that is true or not.
FL: It does, it saves the fibrous root part of it, it saves ground part of it, and they can grow back again.
LG: So anyway, well, ah, then I talked with the Forest Service, then they put up signs. I don't know if there are any of them left along here, but, No Mushrooming, you know.
FL: That was Road 10NO1? Yeah, I was just trying to get it on a map.
LG: I don't know.

DL: The sign, he [Frank] was reading the sign.

LG: But any way, that kinda screw things up to because, when you get those Asians coming in to get mushroom for commercial. They are going to see the sign that says, NO Commercial Mushroom Picking. So, where are you going to go? If nobody is policing you? You know?
DL: It is almost pointing out where the best place is.
LG: Yeah, that's right. Now this is the old trail right here. See that old trail going along there? That's the trail that used to come from out Salmon Summit and come on down to Orleans. My mom rode that trail, Mom and Dad had a homestead out here. [currently Tina and Russel's]. She road that trail. She had all three kids when they lived out here. The older kids, but she rode that trail in the week before my brother Wilfred was born.
DL: On a horse?
LG: Can you imagine?
FL: What's your thoughts or perspectives about the quality of the forest around here. What qualities?
LG: Around here? For this area? I like it because of the oaks and its thick and its good mushrooming down here. It's getting thicker though isn't it?
FL: So there are patches where you do want it thick area for mushrooms and other areas you might more opened or burned?
LG: Uh-huh [Yes], because I like that duff. You see all that duff down there?
FL: The leaf litter?
LG: Yeah. This is one of the better areas for mushrooms.
DL: Still today?
LG: Uh-hum [Yes]. If you can beat the Asians.
DL: And what can of mushrooms are you talking about?
LG: Matsutake.
FL: Matsutake or [also called locally] Tanoaks.
LG: Matsutake. Yeah Tanoaks.
FL: And this is, the forest is a mix of…
LG: Yeah, its mixed.
FL: It an overstory of Tanoak, with a few big, Douglas firs, firs. And a few madrones coming in underneath.
LG: To me this is ideal mushroom habitat in this country here. You got the ridge, and the mushrooms go clear down to the creek.
FL: So you think the people came from the village up that ridge trail and the would access resources on the side, down slope of it.
LG: Oh I am sure, yeah. We did. I mean, we were out here every year getting our mushrooms. But back then we could fill a couple sacks, mom would can it. And, ah, there was still plenty. Now with these commercial people in you're lucky to get a couple frozen bags of it. I know Sunny [Buck Ferris] saw a person up here with a rake one time. Sonny Buck, and he got made and he grabbed that rake and he raked that guys back and said, "How does it feel"? This is how it feels to me when you are raking the land. That guy jumped in his rig and was gone. You know, they have no respect.

They have no respect for, ah, like they go up to Fish Lake and they get all the frogs out of there and they get all the crawl dads out of there. They don't leave anything.

DL: So they are mainly doing that as a money source?
LG: Yeah, it's commercial.
DL: Not necessarily food?
LG: Yeah.
DL: Do they sell them?
LG: Yeah, they have buyers [mushrooms] right here in town.
DL: So they sell them, themselves there're not working for somebody who tell them this is what you are looking for, go get this I will give you so much. Do you know what I mean, or are they making all the money, the profits themselves.
LG: Well, no, no. OK, you have a buyer come in, a mushroom buyer comes in and they set up stations, like in Somes Bar, a couple in Orleans, Willow Creek, Hoopa. And then so you go, if you are going to commercially pick your mushrooms take them in. They will give you the going price for that day. And then they immediately put them on a truck and ship them out the same day. Put them on a boat or plane or whatever and they go to Japan. Because I remember when they first started some guy from Oregon called me and wanted to know if I would pick [mushrooms] for him. I asked pick what, mushrooms, he said mushrooms. I said I don't think so. You know. He said I got your name from some place. I hear you know your mushrooms and stuff like that. So that was when John was working here before he went down to Calaveras. So I called John up and I said I don't know what's going on but this guy called me from Oregon and wanted me to pick mushrooms for him. I said it would be worth looking into. Well first of all they don't need a license to buy or sell. You know, and I think that's bunk. I think it should be, you know.
DL: I think they changed that in Oregon. You have to have a permit.
LG: Oh really? Well, yeah. They do have to buy a permit now but,
DL: Maybe.
LG: That's all it is. Now this is Rattlesnake ridge here. All through here.
FL: Still known for mushroom?
LG: Oh, yeah. If you can beat them, like I said. If you can be the Asians in here you could clean house. You wouldn't have to go anyplace else to look.
FL: Before the Asian competition. Just among the Indians, or even non-Indians, the locals in the area, how did they work out a system of, kinda, to know who's gathering area it was or not.
LG: Well this has always been known, this side of the river, this country over here has always been known as the Ferris' and the Wilder's. You know what I mean. I guess because that's who used it the most.
FL: Yeah, who cared for it. What's the creek over here down to our right? Is that Red Cap?
LG: That's Red Cap. This is Boise over here. We are on two different creeks. Boise creek here and Red Cap there.
FL: And Rattlesnake ridge runs in the middle.
LG: Yeah.
FL: Is there other resources up here other than mushrooms that are important?

LG: There are huckleberries.
FL: Huckleberries?

LG: Yeah, Acorns. And this used to be my acorn tree. But look there was a fire in here. And I looked the other day, and there is not many acorns there. I don't think there are many acorns this year.
FL: Yeah. When did this fire burn?
LG: Ah, I think last year.
FL: Last year.
LG: Uh-huh. [Yes].
FL: Didn't go very far did it?
LG: No, it didn't. It could'a went on up the ridge, it would have been alright too.
FL: So should we go on up here to La Perron Flat?
LG: Yeah, go on up here.
FL: So that's four miles from the junction of the 10N01 and the 10N02.
LG: I don't pay any attention to the signs.
FL: I am trying to, I am just saying that so when we look at a map latter on I know where we were at. [All laughing in the back ground]. You are all, "I don't give a shit about the road numbers!" That way we can find our selves latter on.
LG: And, oh, right there the trail goes on up.
FL: The medicine man trail?
LG: No the trail that mom and dad used to use. So there what several family used to live down here, that had homesteads. Dad had one, Shorts had another. Lee Short had one way out Boise. And lets see who else. They were far apart, you know. All they had was horses. I always asked mom, what did you guys do for entertainment? She said we played horse shoes and made pets out of chipmunks.
FL: Made babies. [All laughing together].
LG: Had kids! She said my two brothers and sister were kinda little wild Indians. Because they didn't see people a lot. She said they would run, somebody would always holler when somebody was coming to visit you know. The kids would run, crawl under the bed, look out from the bed spread. Yeah, they was little wild ones. See, well dad and I used to come out, we ran cattle out here, we ran cattle out here every since I could remember, out Salmon Summit way. But we had to usually ride the horse. You know we didn't, this road was barely there. But you could come up here to La Perron, then from there on it was just trails on back in there. But then they [USFS] came along and said, I don't know, this was after I grew up, they came along and told dad that, ah, he had to cut down on his heard. Because there wasn't enough grazing out there. But, dad was very upset because the ranger that went out there, flew over the country and he didn't see any really good pasture lands.
FL: Who lives out here? The potter [Dee Tolson [?], down hill, south]?
LG: But this was my land here [up hill north] all the way up. This was part of the old homestead. Dad and mom's homestead. And I sold it when I bought Sandy Bar.
DL: Has this changed much? From when you were young?
LG: Yeah, it's a lot thicker. Because, Dad, of course he burned all the time. It was a lot more open.
FL: So what's grown it what kind of trees.

LG: All different kinds.
FL: Just in general. I see there is, dog wood, madrones, young tanoaks.

LG: Little firs.
FL: Little firs.
LG: Little firs that aren't going to get any bigger if they don't get some air.
FL: I see some big ol fir stumps so its been cut over.
LG: It was logged over, yeah. My brother had it logged.
DL: How much acreage wise was this?
LG: Sixty.
DL: Sixty acres.
LG: Sixty acres, that's what most of the homestead were. They would give you more I guess if you could manage it. But when dad came out here it was pretty wild. You know. You had to take care of that sixty acres. Like brushing and burning.
DL: That was your entertainment. Yeah.
LG: Also he worked Forest Service. We worked at a guard station. They had guard stations all around, different places.
DL: So, now all this is back in Forest Service again. They don't, nobody is doing anything with it really right? Manage wise? Is it a hands off.
LG: They aren't doing anything with it. No. Because they have too much to deal with and they don't have any help. They have a skeleton crew anymore.
FL: So now we are going up the road, 10N47, towards La Perron flat.
LG: The people who bought it from me, this part built a home down here. But it is surrounded by Forest Service property. The original homestead was up the hill. And I guess years ago when they had a surveyor come in, they didn't take in for [consideration] the contour of the land, or something. So a lot of the survey was off quite a ways. So originally the homestead was on up here a ways. The old cabin there is still remnants of the old cabin up there.
DL: And, so then you sold this when you bought the place you live at now.
LG: I bought Sandy Bar the ranch.
FL: Which included the cabins right?
LG: Yeah.
DL: Was that difficult to sell this? From being your families place? Because it was like a homestead?
LG: No, no, it was deeded, deeded land. See here is dad's old fig tree and walnut tree yet. Right here, the walnut trees over there. I guess the barn was, I don't remember the barn, it used to be down over there. And this is what they call Ike's springs. I got the sign down by the patio. I took it.
FL: That was the source of water?
LG: Yeah.
DL: And there was a barn here?
LG: Yeah, there was a barn right down in there. But the cabin was on up the hill.
FL: I looks pretty think and grown over now.
LG: Oh, it's way grown over. I couldn't find it last time. Kathy McCovey and I went in there, she said, "I think I can find it", so I said, "Let's go". We went in there we couldn't find it. It's so thick. It's all those little tiny firs that, you know.

FL: I also see some young maple. At least along the spring there was young maples and mock orange.

LG: We haven't seen a buck yet.
FL: Look it all those little trees. It looks like oaks.
LG: Tiny oak, yeah.
FL: All shaded out now, skeletons.
LG: Uh-huh. See this was part of the old property. But now that they had to have it changed because of the survey. It's down below, like, down where the bare spot was.
FL: Now, were both your parents Indian?
LG: Uh-huh, half, both were half.
FL: Half? OK. And do you think that because they were both Indian that it influenced the way they took care of their land? Did they manage their land differently than, say other, non-Indians in the area, or?
LG: I couldn't say that. I wouldn't want to say. But grandpa was raised here down on the river. I think the way your are raised, is the way your kids are going to be. That's the way I think, most of the time it happens though. Grandpa always kept his place all nice and slick. Now, you guys don't have very good eyes. I haven't seen anything.
FL: I have been looking.
LG: Have yeah.
FL: I haven't just been asking questions and jabber'n. [laughing]
LG: Ok, see, ah, the cabin was right over in there some place. But I couldn't find it.
FL: Was there a flat?
LG: Yeah. There was a big flat and I have pictures of it at home when mom and dad lived there. It was all cleared out, with fences and stuff.
FL: How long would it take them to come on horse back from here to the river?
LG: I don't know. However long it takes to ride it. But they did not go to town very often.
FL: I am just looking out across there and thinking from a stand point of biodiversity you don't see many other forbs or herbs or anything much on the ground. You see a lot of young fir trees in this area, and brushy tanoaks, and, but nothing else really.
LG: Little firs that aren't going anywhere. Over around here we used to come get acorns and then, John Larson, Ok'd a timber sale above it. And we told him John it going to ruin our acorns spot [she meant tanoak mushroom], he said "no, it isn't going to ruin it". Jenny and I call it "John's big fuck up". It is, because now the mushroom aren't hardly there, you have to scrounge to find one now. Because it opened it up.
FL: Too sunny, too much?
LG: Too much light, see that right up on the ridge?
FL: Yeah.
LG: That's where they had their logging. And this is where we used to mushroom really. Get some good mushrooms out of here.
FL: Yeah, it is almost all tanoaks [trees] in here. Side by side by side. The edge, just kinda the edge effect of the timber sale huh?
LG: Uh-huh [Yes]. So it did let a lot of light down in there. Mushrooms kinda like it damp and dark, and. We saw a big buck up here the other day. He might be standing up there looking at us now. See all the tanoaks [trees] in there?

FL: Yeah, does it still look from quality wise how many stems there are in the area, does it still look ok? Or do you think it is too thick? Not thick enough?

LG: I think it looks just right.
DL: Would have it been like that before? As small of diameter trees, or bigger ones that shaded more?
LG: You know that's pretty shady in there when the leaves, and everything is on. That's pretty nice in there. Except, look up see where that light is coming in above?
DL/FL: Yeah.
LG: That's the only problem; John Larson.
FL: And, so, by logging the trees on the ridge, which were probably big Douglas fir, as the sun moves around east to south.
LG: Un-huh [yes].
FL: It crosses south to the west it lets the light all along the top of this part.
LG: Uh-hun. That's what we told him, you'll mess it up. And sure enough it messed up. But he won't be able to forget that forever. He get's reminded of it a lot. But, see he was just sure it wasn't going to have any effect on this. See down in there.
FL: Would there be anything different that you can recommend on this site right now?
LG: Right now just let that top site grow up. Oh, I don't know. It could be cleared up a little bit. At least enough where you could get your self around down in there.
FL: So taken out the stuff that's just smaller understory things?
LG: Yeah, like these little things here.
FL: Yeah. But leave all the overstory stuff.
LG: Yeah. You know that would be a good project for mushrooms. Is to take and, ah, take one part where you know there is mushrooms give it a burn and then compare the two.
FL: Well when I get my degree [Ph.D] that's the kinda things I hope to do.
LG: But, on down here, on down this other road.
FL: Yeah.
LG: They had a burn on up through there I was really upset over it because it was one good mushroom spot. Somebody, maybe it was Sunny Buck, threw out a cigarette and it burned along the ridge there. But, you know, a couple years latter I found mushrooms and they were good there. So.
FL: So, the firs couple year after that, you didn't think it was good.
LG: Yeah.
FL: But, it ended up being good later on.
LG: Yep. When you go around the turn there is going to be a big blue buck standing in the road. [going around turn in road] Not! [no buck there]. See how terrible this is now after that logging.
FL: So after they logged it all the brush came back.
LG: It just came back thick.
FL: Geez, I'll say. It's all ceanothus [snow brush].
LG: Yeah.
FL: Snow brush, young tanoak [trees], young firs, pretty thick.
LG: Way thick. I do see they [USFS] have been going in and doing a lot of brushing around here lately in different spots. And you would have to have crew after crew

after crew, you know to, ah, to get anything done even in this part of the country. And I know that the brush is every where.

DL: I know you said they [USFS} talked to you guys [Basket weavers] before, about what they are doing. Like you said they messed up by cutting that afterwards. Even though you told him. Have you any time where you told them that it would be bad..
LG: To do something?
DL: And that don't do it? Or do they still just, take your word, and then go in and do what they want?
LG: They pretty well listen.
DL: They do?
LG: Yeah. If you got a good, you know, excuse.
FL: Give yourself a good case a good argument against it
LG: Now, let's see this stuff in here was horse logged. Now all that needs to be, ah, it wouldn't hurt to have a slow little fire go through that. It's actually, it's pretty nice.
DL: That's what I was thinking.
LG: Uh-huh [yes].
DL: It looks fairly thinned out underneath of it, in there.
LG: Uh-huh.
DL: It is amazing to me they aren't going to just do anything with this now, after they take the effort to do the horse logging and stuff, and then let it go right back, thick build up of fuel.
LG: I know.
FL: There are a few big 'ol tanoaks in here, geez.
LG: Yeah, there is.
FL: Some nice ones. And, again as long as the young firs don't come around them then over topple them?
LG: Yeah. Ok from that point over there to
FL: Yeah.
LG: to on up here is where they trimmed all over back in there, on up through there, hazel.
FL: Ok, so this is "your hazel".
LG: This is "my hazel" [joking emphasis].
FL: Hazel trimming area. And when were they supposed to do this? Next spring?
LG: I wanted them to burn it last spring!
FL: Last spring [April 2002].
LG: But, I don't know, I am going to see if they will do it yearly this year. And get it. Because we did all kinds of it. We worked way back in there. Way back in there, down over here [other side of road, down slope] which there wasn't a whole bunch, well there is quite a bit here too.
DL: So it seems fairly thick, it that where hazel grows the best? In a thicker stand or does it grow better in a more open. Like in the horse logged area?
LG: Yeah, hazel will grow great there.
DL: Yeah?
LG: Yeah.
FL: So it needs partial light?

LG: Yeah.
FL: Not full sun as if it was on the edge of a prairie or something.
LG: Because we were wanting to plant some up there at, where they had the Megram fire burn and they had a great big place, cleared out for, ah, a helicopter landing. But then we got to looking at it and, like, it's too open. I doubt if the hazel would grow in there.
DL: Wow, it looks like there is a lot of little firs coming in.
FL: On both sides, look at these firs down here, they are all about 12 ft. tall or smaller. But they are thick. Fifteen feet or smaller. All in little light patches.
LG: Yeah.
DL: And so by burning that, that's how they would have kept those from doing that? From coming up like that, or do you think they just let them?
LG: They would have to get rid of some of that. I mean that's way too thick. Its no good for anything.
FL: So we kinda shifted from areas that were more important for mushrooms to now for more hazel?
LG: Uh-hum [yes]. Now we are in the hazel zone.
FL: Well that's the way you have to kinda look at it, you know.
DL: As far as, that deer and that. Do you see, do you think, do you see more or less.
LG: Deer?
DL: Deer when you were younger? When it was more taken care of?
LG: Probably less. Yeah, even though we have all these roads and everything, you know. But, gosh. I know just riding the horses out here, we would see deer, bob cat, mountain lion. All kinds of varmints. You know, which you don't see anymore.
FL: Fisher?
LG: Yeah, fisher. Fisher down there on Rattlesnake ridge. There is still a family of fisher that lives down there. But then there is a lot more people that run the country now than there used to be too. Just like those kids getting those four deer, or what ever spot lighting. You know.
FL: Higher pressures on them [deer]?
LG: Dad used to go down to the alfalfa field and pick one off every once in a while when we needed some meat. That was no big thing you know. Be it a doe, be it a buck.
FL: Yeah, meat's meat. Now you got me looking out this clear cut thinking there might be something out there. [all laughing].
LG: Oh, we saw a bunch of deer up here the other day. We really did. Oh buck I the road and Jeremiah screwed up flippen his doggain shells. I said well. Quite playing around with those things.
FL: What about, what about? LaVerne I am curious about, what's your thoughts or feelings about the clear cuts and forest management here? We have to use wood, to supply wood to the greater society. But, you know, as far as how we do it in Karuk territory. What's your view on that?
LG: Oh, I think they should select. I don't think they should clear cut. I think they should just select log. You know, and not tear up the country. I mean, why just wipe it clean? When you could have a good look'in vista with trees still on it. And still get some lumber out of it. You know what I am talking about? I don't care for that clear

cut stuff. Select logging. Now they are going to log out Red Cap, towards Salmon Summit, out towards Whitey's peak.

FL: And we are headed more east and south of that?
LG: We are going almost straight for it. They are supposed to be doing that soon. But they are going to use, what do you call those things where you just used from the road and skid them down.
DL: Skidder.
FL: A skidder.
LG: Skidder. That's all they are going to use.
DL: Cables?
LG: They aren't going to take cats in there or anything.
FL: Skyline, they are going to try to use skyline. Where they just yard it in, rather than on the ground operation? Yeah, there are less impacts to soils and things that way.
LG: Now these are some good acorns trees here, but, I used to just come along this ditch and fill up the sacks.
FL: I have been looking as we have been going along.
LG: Yeah, huh.
FL: I hadn't seen anything.
LG: No, I haven't either.
DL: There is a deer!
LG: Oh yeah, I did see it.
DL: [It was] Along the road.
FL: Oh geez, there goes a yearling.
LG: Where is your papa? [as if talking to the deer].
DL: There, there.
FL: Was that a little buck, I didn't see it.
DL: No? It was a doe.
LG: If there a buck here, if there is a doe here, there is a buck here.
DL: She sure didn't seem to be looking anywhere, she just move up in. That's seems to be a pretty thick area too.
LG: Good eye Bubba, I just saw a flick of it. I was too busy flabbing my jaws together [talking]. It even see the leaves are going and stuff. You can still hardly see in there. That's how thick it is around here. No wonder we have a tender box when we have a fire. You know. Can't help it.
FL: All different sized fuels. Mainly smaller sized fuels, and ladders too.
DL: Look it, you can't even see twenty yards in there.
LG: That's just one little place. And it's like that a lot of different places, you know. God, you can't even see any place. So thick.
FL: So this is an old homestead, what's this?
LG: This is La Perron.
FL: Oh, ok. So La Perron flat. So this was referenced in that one book we had talked about before, right?
LG: Yeah.
FL: So what used to be going on here? Homestead too?

LG: No, this was just a, um. I think somebody did leave here year ago. I think you are right. I don't know who it was. But there is an old trail down from the flat that goes down into where I told you Short's had a homestead over there across from Boise creek.
FL: Ok. Headed north?
LG: Yeah. But this flat down hear I am talking about was where we used to always come for family doings. We used to come out here shoot targets, and have picnics, and stuff like that. Sunny Buck and I were out here and we said, you know, its just closing in on us. We need to get out here and start, build a fire or something. Open it up again.
FL: Do you think the forest service would ever turn over certain areas for individual management?
LG: I don't know, I don't know.
FL: Is that something you would be open too?
LG: Oh, yeah. Especially this spot. We had "Following the Smoke" a couple years up here.
DL: "No campfires, no charcoal" [USFS posted sign on tree]. Horses. White horse.
LG: That's Sunny Buck's, that's Cloud.
DL: There is our sign, Horse, huh?
LG: There should be two horses here. Oh, yeah there they are. See this used to be way big. Clear way over there. Now its like.
FL: Losing more and more of it. Incense cedar is coming in, more young firs.
LG: [rolls down window of truck and yells to horse] Cloudy. Sunny better get them down the mountain. Sunny brought them some hay I bet. Jasmine [the other horse].
FL: The horses know ya?
LG: Cloudy, come here Cloudy. [We get out of truck]
LG: I remember that, because. It seemed like it was right over here. There was just parts of it when I was a kid, so it must be pretty darn old.
FL: How far away from Salmon Summit, or Salmon Mountain?
LG: How far?
FL: Are we still a ways yet?
LG: Yeah.
FL: Oh, ok. I have never been up this way so I was kinda trying to orientate myself.
LG: Ah, we can go across this road that goes over to Black Mountain and then I will show you the way to Salmon Summit and the way down to Black Mountain.
FL: The main thing is just getting your prospective on what areas have changed and what values you think have been lost or gained because of the changes there?
LG: Well, this, I don't know. Who all uses this, La Perron flat, but. It would be like, nice if my kids or my grand kids used it like we used to use it. But they really don't. It's not like they want to come out, they don't want to get away from the damn TV, or what ever I guess. We need somebody to take interest and keep it open. To keep things open like it used to would be really nice.
DL: So how much bigger would you think this was when you were younger?
LG: Oh, a lot bigger.
DL: Twice the size or?
LG: About twice the size, yeah.
FL: So this is about five acres here, right now?

LG: It's about two and half acres of open.
FL: So, open. So it was probably 5-10, seven to ten acres?

LG: Yeah.
FL: So over to the edges of those big firs?
LG: Yeah. Way back in here.
FL: How do you think this used to be open?
DL: How was it kept that way?
FL: Yeah?
LG: Probably fire. Because, see dad used to pasture his horses out here too. You know when he would bring them out in the spring, when he got ready to out to the hills. And on up the road here is where we had, there was a trail on over to Black Mountain we used to take when we rode that way. And at the top of the hill is the trail to go out to Salmon Summit then. Now you can drive quite a ways out before you have to walk.
DL: So most of those trails then had to be fairly large, open if you were riding a horse on them.
LG: Oh yeah. They had to be kept open. They did trail work all the time.
DL: So are those trails. Can you still ride horse back if you want too on those trails or are they gone?
LG: Their still there, some of them are still there but it takes local riders and stuff to keep them open, you know.
DL: So there are some people still keeping them open then for the most part?
LG: Oh yeah. Those out that way anyway.
FL: And the main value for you guys [Ferris family] was horse pasture and picnicking? And also hunting?
LG: Hunting, camping.
FL: So you would go do other things around here then to do.
LG: Yeah. Gathering. We did, well my family did a lot of camping.
DL: This road goes?
LG: Yeah, but let's just turn around I think that road is kind of bumpy.
FL: What about these young cedars that have come in?
LG: What about them?
FL: Did you remember them being as many cedars when you were little?
LG: Don't remember.
FL: No?
LG: No. I probably did not pay that much attention. You know.
FL: You never really do. You just kinda, you just notice the gradual changes.
LG: Yeah, and every year when I came in [to La Perron flat] I would think, geez, this is getting smaller and smaller. You know how sometimes when you are littler you think something is big.
FL: Yeah.
LG: I was thinking that was the way this was but Sonny said no it is getting smaller. Closing in. See it wouldn't be bad to take all this stuff out. All those little trees.
DL: That's funny that this was probably made by fire, and there is a [USFS] sign there saying no fires.
LG: Let's take the side road that goes across.

DL: This one?

LG: Yeah, this goes over to the main road.
FL: So, 10N71 [laughs]. When we go back and get the Forest Service map we can look. Nobody ever planted fruit trees up here?
LG: Yeah, there are a couple of apple trees down on the flat. Where ever you go in the wilds you will find apple trees. Johnny Apple Seed was here I guess. Some times a peach tree.
FL: I think it is interesting because we are trying to talk to people about exotic species, and stuff. “I think we should take out all exotics; trees and plants...” and I said, well, if you talk to Indian people they are going to determine the cultural and ecological value of these things. They plant apples in places because it is good for bears, good for deer, good for them.
LG: Yeah [laughing].
FL: You know, it actually increases the diversity and productivity of a place. But some other thing may not. So, you know, take it out of there.
LG: Now, where ever you go, like going up to frog pond, I counted about five apple trees, a couple peach trees. Just right along the side of the road, you know. And even up the GO road. Ok, now this was all open by fire.
FL: On top of the ridge or we on, kinda, a saddle? Oh, not a saddle but a flat?
LG: On a flat [mid slope bench].
FL: Flat. Pretty much south, south-east facing.
LG: Ok, if you drive out here a ways to the point. I might point out a big buck. First, unlock the doors [to the truck].
DL: I thought you were saying there it is the buck. Huh?
LG: Boy is she good, huh? [laughing, as if that’s what Bubba was thinking].
DL: You want to go down by that stump and look?
LG: You might see something. [Looking at a recent burn area] It makes a good little wildlife spot. A good hunting spot.
DL: That’s what I was thinking. I was wondering. I have heard that them [elders] talk about that before that they burned to some what make the animals come into that area because of the new growth.
LG: Uh-huh [Yes].
DL: Keeping it open to where you could see them and hunt them easier.
FL: The thing too is, look it there is some oak here. A few big sugar pines up over along that far edge. Look’s like some sugar pine or bigger pine over there. This would have been nice open like that.
LG: Uh-huh [Yes].
FL: You know, you have to have that balance between areas that are closed, more dark you know, versus more open. Even the spacing of the stumps that you look at, doesn’t look like it was too thick in here. Do you know when they logged this?
LG: It really doesn’t, huh. It doesn’t look like it was way thick in here to start with. But it’s going to be.
FL: Feels like buck hunting temperature to me. Nice brisk fall air.
LG: [Back in the truck driving. LaVerne is telling a story]. Sonny says, “ok, are you sure you want it, it’s little”. Yeah. Ok. So he got it. He was up the hill. He says,

"aunty, it still has milk on its lips!" [joke about how young or little of a buck/deer]. [Laughing]. Of course he was lying, but. If you want to see some thick stuff [forests] I will show you some thick stuff. God!
FL: Ok, like we said, we are more interested in your perception of it [forest condition] and how it's changed.
LG: Well did you bring the pitch? We'll try it. [old term about setting fires to the land].
FL: So out of all the areas, the general Orleans vicinity, you came through this one more often than other? Through this territory, because your more familiar with it growing up?
LG: Yeah. It was just like I was raised in this part, side of the hill. My dad and grandpa built a cabin down here. I don't know if you ever heard of it? Copper cabin?
FL: I think you I have heard you talk about it.
LG: Yeah. And it was just right down, right down over, to the right down here.
FL: And what's this area still called? Upper La Perrons or just still?
LG: No, just Copper cabin. Right down that road. There is no sign of the cabin left. Just a few things around there. I found an arrow head down there.
FL: Some one thought the areas was good for a long time then?
LG: Yeah. And then there is private property on up here. Billy Delaney owns, his dad owned it, he inherited it. They logged it off. This is the old copper mines up here. See up this road. You can look up and see the logged off area.
FL: Yeah, the openness on the ridge.
LG: I think the copper mines are off on this side. And years ago there were many many miners in here digging holes. Trying to get rich.
FL: Now is that more of the tunnel type mining or the hydraulic type mining, hose style?
LG: Yeah. No there was no hydraulic clear out here. They were digging holes. No big bucks standing out in that timber?
DL: They are all out in that clearing eating.
FL: "Here comes LaVerne, hide!" [Joke-What the bucks/deer say].
DL: That's right.
FL: "Hide your ass now". She has young guys with her.
LG: "Run and duck down" [what the deer say]. But, look at this now. Isn't that terrible?
FL: Yeah. Dark. Just thick tanoak and fir all the way through. Huh, there is a big elder berry.
LG: Yeah. But I know I used to take Ed up to the top of La Perron peak and drop him off. He used to hunt threw. And look at it. Now that's been what, 25-30 years ago.
FL: This looks like…
LG: Look at it now.
FL: an old clear cut. All this dead snag stuff underneath. That's old snow brush ceanothus.
LG: Yeah. But you couldn't even get through there now. Ridiculous.
FL: So culturally, very little values? [the brushy thick clear cut]
LG: Yeah. Nil, nothing. Except maybe, over here being so how this is so thick. You see the poles in here?

FL: Yeah.

LG: They are kinda straight and about the same size. So if someone wanted to build something out of poles. This would be the place to get them. Because they are just reaching for the sky.
DL: Oh, there is a varied thrush.
FL: *Achkuun,* [Karuk-varied thrush]
LG: *Achkuun*,
FL: May be his is looking for acorns for us?
LG: Yeah, so follow him.
FL: You got me looking in the ditch now [of the road for acorns]. You know it take quite a few years. Like 30-35 year before an acorn tree will produce acorns.
LG: Is that how long it takes. I have often wondered.
FL: So even after they grow up that thick next to each other its going to be a while. You know, the smaller the crow because they are competing for light and space.
LG: Yeah.
FL: The less acorns they are going to have chance to produce.
LG: I think that's probably where the deer are hiding out, is in the acorns now too. And the bear because bear doesn't have much left up on top. See this right here. That's what I asked you, if you want to see thick?
FL: Oh yeah. Huh. Maybe some dip net poles?
LG: They are all ready bent, see that. That might be a good place to come get them.
FL: Yeah, it is really thick with the firs, and intermixed tanoaks. You see some big old stumps in there, so when they clear cut it, it all grew back really thick.
LG: Yeah. Too thick. There is still some really tiny stuff in there trying to grow. See that?
FL: Uh-huh. So you would recommend the Forest Service to come in here and thin some of these out?
LG: Oh, yeah. Give it some air. This is just one of the few places that needs it too.
FL: There are more areas like this across the land?
LG: And you know it is not even good for the deer or any wildlife. It's so thick. You're lucky to get through it.
DL: It doesn't look like there is even anything growing underneath it.
LG: No.
DL: A couple ferns and that's about it.
FL: LaVerne do you or other basket weavers, or other native women, ever talk about or have much concerns about medicinal plants and the quality of the plants on the forest floor?
LG: Yeah.
FL: And, ah,
LG: That's why we are so against having any herbicides sprayed. Having, you know. Well they say, "No it doesn't hurt, it doesn't hurt. You know, and when they spray it doesn't have any drift". But it has to have. It has to have, drift you know, when you spray something. It's going to over shoot. And who want to have something in their mouth or take something [for medicine] that's been sprayed with poison? Ok, this is a

cross roads. This one goes off towards Salmon Summit, the trail that takes off to Salmon Summit.

FL: Ok.
LG: This one goes down and goes back home, but it also forks down here at the Y and goes out to Black Mountain.
FL: Which way would you like to go?
LG: I don't care.
FL: We probably have about an hour worth of day light.
LG: What do you want to do.
FL: Which ever places you think are the most important ones.
LG: I can take you up and show you where the trail used to take off to Salmon Summit. And then we can probably go on out to the trail head but its about. How many miles are we up here?
DL: Frank can read these signs we should be able to know where we are at.
LG: Yeah, he has been reading all of his signs. [laughing]. We should know where we are.
FL: Oh, look at the dusting of snow on the peaks.
LG: Yes, there sure is, huh? Ok, one year I saw two great big, after season, two great big bucks walking across this little ridge right here. I have looked for them ever since. They haven't been there. Quail [running along the road]. See we are at mile 12. Camp is about 20 miles out, so its about 8 more miles. That's a big'ol mountain quail there.
FL: Not like the pets in the yard we can eat those.
LG: You can have those [laughing]. I am waiting to see those big bucks. But see this road was not in when I grew up. This was put in after for logging. So this has all really changed. You know when we were down at La Perron flat, that old road that came, we took the one going across and the other one went on up.
FL: Yeah.
LG: OK, that was it own and then on up here is where the trail took off. And so that was the end of the road. You couldn't go any more.
DL: That's where if you wanted back in here there were trails you could ride?
LG: Yeah, you pack in. That's the only way you could get in there was to pack in. But, you know, I was telling somebody, all we ever had to do was, oh I was telling Jeremiah. All you had to do was, the cows would get ancy. There was not enough feed. In the spring the feed was running out [down in the valley]. They would come around the corral balling and stuff. Dad would put the bells on the bell cows. And then we would get the horse out and take them up to rattlesnake ridge and start them out this way. They knew exactly where to go. They would just keep working themselves up the mountain. It's a smart cow. When you think about it. Yeah, they would just come on up. Ok, right up here. Right up here is where the La Perron flat road comes in, 10N01. And right there is where the trail took off. Right there in that brush patch. And this road wasn't here. And we headed on up the ridge. So, its twelve miles out to Salmon Summit. So that was quit a was to go. You know.
DL: So do we want to keep going on this? Or turn around?
LG: I don't care, whatever you guy want to do.
FL: Was there places you wanted to go see? That we could talk about?

LG: Ah,
DL: It's four o'clock now so. It's going to be dark pretty soon.
LG: It will be dark. We better go back. This goes clear on out to 23 mile I think. Twenty one or 23 mile. And then that's the end of the road there, and then the trail starts.
FL: There is a lot of land between here and the river, Orleans at Whitey's.
LG: Yes sir, there is. A lot of land. Did you realize? Did you think it was that far? Or no?
FL: I always, every time I kinda, drive with my own scale when I drive back, from Orleans, to Elk valley, I think, geez there is a lot of land. Creeks and things that keep going back and back and back. I don't know, one of the debates among academics and the colleges and stuff, is, and, well out of that whole land area, how much of these places, pre-Euro American contact or settlement, did the Native Americans really manage and care for, and have concerns about? Because we often just hear that, you know, oh, they try to tell us, they [Native Americans] were just concerned more with just the like the first couple of miles along the river and that was it, and that this part of the country [present back country] wasn't as important.
LG: No!, Nun-huh. You see that big mountain over there.
FL: What's it called?
LG: Salmon Summit. The one with the snow on it. That is where dad ranged his cattle out there. I think that's Salmon Summit, with all this fog and stuff, it looks like the highest mountain. There is a lake over there.
FL: And with Grant Hillman, and in the interview I did with him he talks about how important it was for families to come up here and hunt and get meat in the fall and come back down before acorns and stuff are ready.
LG: Well yeah, that's what dad did all the time. And he hunted when he started the cattle back down too you know. From up in the high country [Salmon Summit]. He would round them up and start them back down. We used to have a cabin out there. Its, ah. Ok the trail head, the trail head is back over in here that goes back there now. And then you go up about two miles on the trail. No body really knows where it is, except, hum, family. Because we don't keep the trail really open. I mean, it open after you get over the hill and down in to it, but. Dad built it, Cliff built it in '46 [1946]. And Sunny Buck said the other day, or the last couple years ago that roof needed repair, so when they were in there with the Megram fire. He went and cut down a cedar and, ah, cut it up for cedar bolts.
FL: Shakes?
LG: Yeah. But, ah, other than the roof, I guess the cabin is in pretty good shape. I haven't been out there in a pretty long time. But we turned into a historical site. Which was hard to do. They [USFS] wanted to go burn it down like everything else. But, Wilfred, my brother Wilfred, was still alive, and Cliff, and Grant [Hillman], and myself and we had help with John [Larson] too. So I am glad we got that done before John…
FL: Yeah it took him being ranger. To help see it through.
LG: Yeah. But that needs to be cleared out too. Up around the cabin. Because it was kinda like a park around in there, you know. When dad was using it all the time. But I know a lot of these hippies say, " where is it, where is it. We want to go out there"?

DL: So that’s 13 miles in on this road? Plus however many miles into your cabin. That’s a long way from the river.

LG: Yeah. Dad spent an awful lot of time out this way in the mountains. Of course with the cattle that was his excuse. “Oh, I got to go out and salt the cattle”. Sonny [Buck] has his camp out there at the end of the trail head.
FL: So when he says he is going to deer hunting camp, that’s what he had out there.
LG: Yeah. And then he has, that’s the base camp and then he has a camp out at High Springs, which is over on the Summit. And then he has another camp over at 8 mile, which is, starting over on Devil’s Backbone.
FL: Now you think your daughters, ah, Deanna and Renee, the values for them, coming out here. They did some of that stuff? I used to take her fishing. She’d catch a fish, and she would say: “Oh I caught a fish”, you know. [laughing]. _____ is a little bit different. But time is not on their side. You know. You work at the time, you just. It doesn’t seem to be there unless you want it to be.
FL: Well it’s tough, from the perspective of our research and the classes Bubba is taking in a class right now. Is as you go through different generations, their occupations, their familiarity and involvement with the place also changes their values.
LG: Yeah. Now this is Black Mountain right here. And that’s really been burnt over. There is an old homestead down in the creek down there. See if you can see the cabin down there, now. Nope. It’s around the bend. But, that road goes out to the saddle over there, Black Mountain. And dad and I used to ride from La Perron flat over. There was a trail that went down and went along the creek, and went up and started to Salmon Summit. I hated it, I hated it because that ride was so hot and dry… through there.
FL: Hot and dry through there?
LG: Yeah.
FL: It looks like its maybe some serpentine or other type soil that’s harsher.
LG: I really didn’t like it when he [dad] said, “We’re going to go Black Mountain way” I was like, I don’t want to go that way though.
FL: Now he did more things with you? Or he did it with all the kids and take them along.
LG: All of them [kids].
FL: Yeah.
LG: But, you see I was. I came along way late in life, after all the kids were. My sister was in high school when I was born. So, I got to be the boy and girl.
FL: The baby who got drug along with everything else.
LG: Yeah. I didn’t get drug along because I wanted to go.
FL: Ok, yeah.
DL: Ok, like Frank is talking now, your kids. Do they know this area like you? Where your cabin is, and all of that stuff? Have they been out to it?
LG: Clifford has, my son. The girls haven’t been out. We are going to take uncle [Clifford Ferris] out there this spring. Because that’s where we wanted his ashes out there. So they [LaVerne’s kids] have been out to Indian rocks and out that way. But they just haven’t been out to the cabin. They pretty well know this country.
DL: They all do, too?

LG: Yeah.
FL: Do you see more promise in, say, oh, I forget [her name], the one who helped feed the medicine man.
LG: Dorrie?
FL: Dorrie, yeah. With her versus, say Renee's daughters?
LG: Yeah.
FL: Because of her interest in it. More of one you could bring along here and value what you would share with here.
LG: Oh yeah. She won't miss camp when it is anywhere.
[Interview interrupted, resumed]:
LG: He [Dad Ferris] was a hell of a hunter too. He would, ah. He wouldn't carry very much stuff with him. He would go hunting he would have a few pieces of jerky in his pack and he would get way down in those canyons. And he couldn't get it [big buck] out, you know by himself. So he would just stay down there with it. Cut it up and smoke it. And carry it out in his pack sack.
FL: Geez.
LG: Because you can. Cars park along this ridge. [To go mushrooming]
FL: Indian, non-Indian?
LG: Yeah, every kind. A little of both.
FL: A little mix of every body.
LG: Yeah, Asians, Indians, Whites.
FL: And again this is Rattlesnake Ridge?
LG: Yeah.
FL: How did they find out about it, by just learn by watching? Taking a back road and? I always wonder how. I mean, it took you years to find good mushroom grounds. How did these people learn so quick?
LG: Well when you got it posted down here.
DL: Her signs, she said her signs [No commercial mushroom harvesting].
LG: I said why, I just gave the Forest Service hell. I said, "What are you doing putting up 'No commercial mushroom picking signs', when you can't monitor it. They don't come out here to see who's out here. You know, how much they got, or whatever. And who they are, if they are locals, or what? I said, if you want to monitor, I will monitor for you. And I did go out one year. Man, I was turning in license plats in right and left. But then they can't follow up anyway, so. They don't have man power. So why even put the signs up, is what I am saying, you know.
[Interview ended when the recording time ended, resume having driven down the road a ways further].
LG: You know one thing I wish the Forest Service and the Tribe [Karuk] could work something out to get some of this stuff [brush] cleaned up. Because I think it could be done. I don't know what its going to take, but you know the tribe could help a lot too. The tribe working with the Forest Service.
FL: Getting grant money.
LG: Yeah,
FL: For prescribe burning and things. What about the role of community groups like the fire safe council or watershed council?

LG: Well they are helping a lot. You know, I think they are doing well, what they are doing. But when they get a lot of their projects done they would be a big help too. Either they can expand this far [Rattlesnake Ridge], I am not sure if they can? With their grants or whatever.
DL: You were talking earlier about the younger kids.
LG: Uh, huh. [Yes]
DL: Are they starting to get more involved? Do you see them sitting in front of the TV and not caring much?
LG: There is a few, just a few that are really aware of what's happening. They got those darn TV and video games its__________. Can't get them off the couch.
FL: It's hard to get them concerned about forest stuff and land issues.
LG: Yeah. Well I am sure glad Jess [Jessica ______, her granddaughter] is getting into it. She is very vocal you know. She is kinda bull headed too, then. When she has something in her head it is going to be hard to change that little girl. But which it good, that's her belief. You know. She is sharp, she is very sharp. You know, it was like I was telling the basket weavers when they want to come to Orleans to gather this, gather that because, this is where they burn this, you know. Every time I try to go some place I try to tell them, actually it is up to you guys to try to work with your agency where you are to get it going. So you won't have to travel so far. Everybody thinks they have to come to Orleans to gather their plant materials. Mary [____] over there in Hayfork, she has a burn going this year. Over in Hayfork which is good.
FL: When we go by here [__________] you have mentioned tobacco before___. Did you plant those tobacco seeds yourself or were they volunteers?
LG: Volunteers.
FL: I was always wondering about that I you learned to grow tobacco, or if there was something special about the place.
LG: Right here [across street from Woodmans's house on Red Cap Rd.], right back there is tobacco. Wild tobacco, I didn't harvest it this year. I have so many seeds, but I didn't plant this year. I was always going to go over to *Tishunick* and sow it out, you know, where the burn was?
FL: Yeah.
LG: But I haven't.
FL: That's the old kinda style of tobacco?
LG: Uh-huh. [Yes]. You read in the, Georgia Henery, she over there used to go down to the river and burn out old log, burn out old logs, drift wood, she would burn it. And then she would plant the seed in it.
FL: Who got you started in that LaVerne? Who did you learn from?
LG: Myself, I just found it and harvested some and it actually, you know what. The first time we found it a burnt spot where they burnt berries. So actually, fire and tobacco go together. Because that was a burn spot where the first patch of tobacco came, and then the other over there where I just showed you had a burn pile too. That's why I wanted to take it down to *Tishunick* where it had been burned and just scatter the seeds. And see what we could come up with .
FL: Yeah, I didn't know if you were actually gathering it and drying the leaves and stuff too? And giving those to the medicine man, to be used for ceremonies or something?

LG: I have dried tobacco,
FL: I used to go with my dad [Bobby Lake-Thom] over to Duza Rock [near Fort Jones] and gather it, over outside of Fort Jones. But I haven't done that in a long time. I have just a little bit left, and you know those guys at *Pickyawish*, said you are only supposed to some that Indian tobacco in your pipe at very special, certain times. I was like that's true, I guess, but depends on how you were raised. I was raised you could use it to pray for even your own stuff.
LG: I suppose why not.
FL: You weren't supposed to use it to just get high or stuff, like smoking weed or something.
LG: Ok go on down by the store [Orleans Market] I will show you some tobacco. It is growing right in front of the store. You probably could get some seed off of right now, huh?
FL: We can look, I don't know if you wanted to go by Renee or Deanna's [her daughters] place or something?
LG: Yeah,
DL: That's what I was going to ask you.
LG: Ok slow down. Keep going right down here where this cement thing is. Pull over right there. What'd I say, what'd I say. See it?
FL: Oh, yeah, that's it huh?
LG: Do you want me to pick some?
FL: Yeah, would you.
LG: Oh, I guess I locked myself [Truck door]
FL: Do you see the seed heads on it? Could you grab me a leaf too? I want to look at the leaf?
[End of interview, road trip]

Grant Hillman (Karuk), Age 75. interviewed by Frank Lake (FL),
August 19, 2002. Orleans, CA.
Consent for voluntary participation verbally given and signed on IRB form

Grant Hillman: Progress, rules over everything else. When they changed the course of the river, Peter Thom, James Thom, they were the eel fisheries, guys over on the other sides of the river.
Frank Lake: OK, are these, I seen some past *Tishunick* off the bank, there were some steel, iron basket traps there. They still have old-time traps there too?
GH: Right. So that old highway used to come out around the point, and back into town. And that's where the river ran, and once they changed the course of the river, that did away with the fisheries over there. Before, that's always was where our fishing was.
FL: Salmon fishing too?
GH: Salmon fishing, eels, sturgeon, everything.
FL: Oh, it was below the falls [Ikes and Ishi-pish, upstream 9-10 river miles]
GH: So once this dredge changed this course of the river, they were supposed to move the dredge to this side and move the river back.
FL: They never did it.
GH: Then the WWII started. So the government confiscated all their electric motors, you see. This was goin' 24 hours a day, bang, bang, bang, rocks. This was in the late '30s [1930]. Well, once the war started, they just sat. So that's where the river stayed. You can't tell these people that the river belonged over there.
FL: Because the people who came in that were new thought it was always that way.
GH: Yes, thought it had always been that way. But this is what created all these slides where the big one is here [Red Cap Road, 2.5 miles down from Hwy 96], that was our gathering grounds for the acorns and the mushrooms, and at that time you could walk any place in there. And the deer, everything was in there.
FL: So is that the base of Whiteys Creek, where does Whiteys Creek come through?
GH: Whitey's Creek comes through right up here out of this draw. And this is Whitey's Gulch over here, that came down over here. Whitey's Creek came down this way, see. This was a CCC [Civilian Conservation Corps.] camp over in here, I was born and raised down here in 1927, down in that flat. So the old Indian women, would go up, you can see 'em packin' their old burden baskets, and some would be packin' these small baskets with handles, would go to the draws to pick huckleberries.
FL: Now, you said they would burn up to the draws. Would they burn through those huckleberries? The huckleberries do better when they're burned or not?
GH: No. You start a fire in the fall, and let that burn by itself and it'll go into the draws and that's where it'll stop. It creates a draft up the hill and your fire don't go into them where your water is at in the draws, and that's where your huckleberries stay. Is in them draws. This flat was all gooseberries, gooseberries and hazel nuts.
FL: Yep.
GH: So, once your suppression was started, the suppression, what it didn't destroy, the mining did. But the CCCs, once they moved in 1934, built these roads. We used to take our cattle over the hill on out to the Salmon Summit in that country, Indian Rocks, out in there, and it was all trails then.

FL: Those were all old Indian trails?
GH: All old Indian trails.
FL: Is that so they could trade with people back over in that area?
GH: Right, the Salmon River people came over from Salmon River, that was their main trail at Indian Rocks to the coast. They'd go through Hoopa over Bald Hills to the coast. That was the Salmon River trail.
FL: Where was that ridge system?
GH: Out, ah, Trinity, well that's Salmon summit, then you got Indian Rocks, the ridge system before you drop into Hoopa,
FL: The Mill Creek area?
GH: That the head of Mill Creek, I forget the name of that ridge, Pack Saddle ridge, goes over to Box Camp.
FL: Yep. OK.
GH: Then you, like my mother, when she went, see the kids were sent to Indian school, the first Indian school was Chemawa, or…Carlyle, this was way back before Sherman,
FL: Oh, Alright.
GH: I had sisters and brothers go to Riverside, Sherman, I had sisters go to Chemawa in Oregon, and some of the kids here went to Stewart in Nevada. So, but before these Indian schools, my mother she would tell me stories about when she had to go to school, they went to high school, took three days to get to the coast.
FL: By old Indian trail?
GH: Right. Crossed the river four times, rivers, in order to get to Eureka, [then] on steam boat, clear around the horn to Carlyle and then they would keep you there for four years. And then you'd come home and go to work.
FL: So at the time, a lot of those kids, when those kids got sent away, they didn't have a chance to see the cultural practices, or help do much of the cultural stuff did they?
GH: No, they lost out on that see. But our culture was lost here on Whitey's flat and you take up at Somes Bar, off Offield Mountain, that was their gathering area. They had a big fight off Offield Mountain a few years back. The Forest Service wanted to take all the old oak trees down, the acorn trees, now they have it restored pretty good.
FL: Yeah, they were cutting back the brush.
GH: Right. And restoring their original gathering area. Well all the little bands of Indians along the river had their own cultural gathering areas. They took care.
FL: Like districts almost, huh?
GH: Right. No body went into anyone else's. We didn't go up there and gather, and they didn't come down here and gather. But it was that way all along the river and they all took care of their own gathering area because this was life and death to them. This was their culture.
FL: So could you help me as far as you said around the village areas, the backs of these trails, how far people were going back, how far would they use fire in there for different things? For bear grass or for burning off meadows and things?
GH: Long ways. You never knew where these fires would end. Like ah, how far they went for gathering, there was a gathering area this ridge, the top ridge you see up here? [Looking towards Orleans Mt. south to Deer lick springs].

FL: Yep, the farthest one back or the first one?
GH: The farthest one back. The old road that the CCCs built up to like Orleans Lookout, going up that road, there was gathering areas, that far up [Antenna Ridge].
FL: What kind of stuff were they gathering?
GH: Acorns. They would go a long ways to gather acorns. You wouldn't think that they would travel that far. When your life depends on a certain thing to gather, say you got a poor crop here, not every year is going to be a bumper crop,
FL: Yep,
GH: and when you burn, your acorns are huge, no bugs.
FL: Yeah, it burns 'em out.
GH: Right. So your deer come in there too. They don't want no buggy acorns, not if they can get good ones. So I was workin' way up there on the other side, goin' up Orleans Mountain.
FL: How many miles back from the river is that?
GH: Probably not too many by river but by trail it's a long, long way up there. Orleans mountain trail goes, to go by road now, to get to Orleans mountain.
FL: I was thinkin' to pack trail, like if you had to walk out there you know, back in the old days.
GH: You would walk up Chemnickenee Creek, was the shortest, that's right at the end of the [Orleans Hwy 96] bridge, that's Chemnickenee Creek, that was where the trail went up to that gathering area up there and there was *Suvarom* Bar, that's the ridge of the other side of this, and you drop over this and you go into Boise Creek. Then you hit Suvarom mountain, that was a gathering area for the *Suvarom* Indians, that's the Indians that lived like the Redcap,
FL: Yeah, ok.
GH: Down in the mouth of Redcap. That was their gathering area, Suvarom mountain. So every little band of Indians had their own [areas].
FL: Like almost like a watershed?
GH: Yeah. So it started from, like our Indians, Karuk, that's where they started with *Suvarom*, The Rislings, that's where they come from and lots of sacred sites on Suvarom mountain, on the backside, was all cleaned out [burnt] for gathering, hunting.
FL: So it was cleaned off, they burned through there.
GH: Burnt. Yeah. All burnt, regularly.
FL: So you said on the flat, every three years.
GH: Right, every three years they burned this. We would burn this part. OK, then you had, old man's, Harry Ferris, that's Laverne's [Glaze-relation], that would be, Mavis' McCovey, that was her grandpa, they burnt that in there. And it was Ike Ferris, and then it was a Hotelling ranch. But everybody, we took turns, when to burn.
FL: Was it the men or the women who would burn those?
GH: The men. The women did all the gathering. No men gathered. All we did was, the huntin' and the fishin', that was. The men had the easy part. The women worked hard, they carried the biggest part of the burden, and now, like, where it was open you could go up here and gather your mushrooms in the fall by gunny sacks full,
FL: Tan oak mushrooms?

GH: Tan oaks. And now, now you can't find nothin' because you can't even get through there.
FL: So the brush has come in plus its too thick.
GH: The understory.
FL: Yeah, it's too thick. Also, did the mushrooms like the fire?
GH: Yeah, you bet they liked it. You can go out, I built a lot of roads, ruined a lot of our culture, but I had to make a livin'.
FL: Yeah.
GH: And we would be like out, goin' out towards Elk Valley, what they call Maple Springs, I remember we was workin' in there in the snow. And we had a big fire goin'. To keep warm. Come back in the morning and there would be nothin but mushrooms around. The heat would bring them right out of the ground overnight. So your fire really brings 'em. But it's, ah, like I say, the young people can't visualize what the country really looked like. But our cultural change has changed all over from startin' in the 30s, early 40s. [1930-140's]
FL: You said the early '30s. CCC crews, those first trail/roads, that allowed the suppression right?
GH: That allowed the suppression, that's when they started.
FL: Then after WWII they came back.
GH: You take, when I was a kid, there was probably, three-four, Forest Service people here. And they were local. There was old Albert Wilder, Hotelling, he died here a few years ago in Willow Creek
FL: Yeah, I read a little bit about him.

GH: Right. And about four locals were in the Forest Service. They called 'em Forest Service Rangers then. Once the CC camps got goin' and they built these little roads, way out in, like ah, Elk Valley our sacred ground up there,
FL: Yeah, so they built one way up to Elk Valley? That's a place I'm familiar with so I'm interested in about that too.
GH: That was a CC road. It started down here at four miles,
FL: At Cedar Camp, was it?
GH: Right. It went clear up, and went across and you used to be able to see the cut up there, way up on top of the mountain, clear to Cedar Camp, see. Then the Forest Service began to expand and take over the CC crews to suppress these fires. And another thing that changed a lot of our weather patterns. We used to have a lot more lightning.
FL: There used to be a lot more lighting?
GH: And the reason for this, I can remember an electric storm, you could see the smoke all over Somes Peak, all around.
FL: So, there was Indian burning plus lightning fires that helped keep the trails open.
GH: Right, right. But what changed our weather patterns is when they built these big lakes, like Shasta Dam, Trinity Dam, changed our weather here. These big bodies of water, man-made, changes your weather.
FL: Right, I don't know if the scientists know that or even thought about it.

GH: Water, changes your weather, so this is what brought a lot of our brush too. Because of our big man-made lakes that changed our weather.
FL: Those were made in the 60s [1960] right?
GH: Yeah. No, Shasta Dam was built way back. Like before WWII, because I had a brother-in-law that worked on it, he's still alive, and he was workin' around this part of the country then. So, all of those things had an effect on our culture. Pretty near everything the white man did had an effect on how we lived. Through weather, through their suppression, and if you don't have them electric storms, you don't get the amount of fires. I can remember when I was a young fella, you had Cal Sterrett, you had Herb Orcutt, these old timers, the Forest Service would lock 'em up in fire season.
FL: Lock up the Indians? Why?
GH: To keep 'em from burning. Then they got to the point…
FL: So they were incarcerated. Actually imprisoned the Indian men they knew would go out and set fires?
GH: Right. So then they changed their policy to where they started building these lookouts. You got Shelton Butte, you got Orleans Mountain, Ukonom Mountain. They begin to hire these guys, put 'em as lookouts instead of lockin' 'em up, they gave them a job on the lookouts.
FL: But they were still able to keep an eye on them.
GH: Yeah. This was their policy, and it's their policy still to this day not to hire local people on a fire.
FL: Because they, non-Indians would be diggin' a fire line here and Indians would be throwing the coals on the other side of the fire line?
GH: Right. This is still Forest Service policy. Their thoughts are so far back, what they perceived of us, and it still goes on today. Like the Gasquet fire over there. One of my sons lives over in Gasquet. He has a daughter workin' for the Forest Service right there at Gasquet. She isn't allowed to go on that fire.
FL: Cuz she's Indian do you think?
GH: Because she's local.
FL: Oh, ok.
GH: So their policy has never changed. I don't know if it ever will. It's sad but it's true. And until, it's like, we have a fire crew here now on Hoopa, I was talkin' with my grandson the other day, the say I was comin from Eureka, Leaf and I, there up at Oak Knoll station, it's an Indian fire crew, they had a memorial for that girl that was killed in that pumper [truck crash], you know, well they put her ashes over here at Terry's. So they had an Indian burial over there for her and then they had like a Forest Service.
FL: Yeah, memorial type thing.
GH: I'd never seen their uniforms before, it must have been some kind of an honor guard for the Forest Service. All in black uniforms, Smokey the Bear hat was even black, all standin' at attention over there, and they had the, the prayer site for the Indian prayer site belonged there. And Jeanerette, she sang the songs, it was pretty nice. But the Forest Service is so involved with suppression, I don't think it'll ever get out of this mode. Because they been in it for so long. That I don't know if they can ever change it.

FL: They're slowly changin' though. Even for me as a young fella, in their big fire magazine last fall, they had a thing on Indian burning and, you know, they're slowly, but to talk about it is one thing, but to actually have it on the ground is another.
GH: Like our ancestral territory. Leaf took me two times now up to Steinacher Creek, where they're workin' up there, puttin' that road [to rest-decommission],
FL: Restoration, yeah.
GH: Really a good job. And it makes habitat, deer elk, lots a good habitat. But the main thing is, they should use that as a fire break and begin to open our country back up. And lighten it, let it go up there and let it stop, creatin' more habitat. This is a good start. If they can just see it and visualize what it's gonna do, eventually, and this is our ancestral territory. It should be takin' care of like that. But this is a perfect start. Their restoration, have you been up there?
FL: Yeah, I been up to Steinacher a few times.
GH: They're doin' real good work, there's a good training, and I think it's good for our young people, I was really impressed with it. So to me, that's probably an ideal chance to really do something.
FL: You were saying something about the fire crew there.
GH: Now, I don't think they're, it's like they had 'em on the Happy Camp fire, they had 'em on the Hoopa fire, but they're kinda getting' away from the way they treated Indians before, don't let 'em them fight local fires, and I think this is a start.
FL: Yeah.
GH: Because our young people, they got to visualize what our country is supposed to represent in cultural ways and how the country is supposed to be takin' care of.
FL: How do you think these young people should burn and how we used to burn and how it should be. I'm curious about your ideas on that. We can go sit down if you want?
GH: I think our young people have got to be taught by elders how it was. And there's not too many elders left. And this is the hard part. If there was more elders that were old enough that seen what took place, when, and how this all came about to tie into the situation we're in today, and that live through this and could explain to them, you know it's pretty hard to explain to young people unless you can take 'em right there and show 'em.
FL: Yeah. That's the advantage of having it in person vs. something in a book. You can learn some things in a book, but it's always better to be shown right there.
GH: Right. So, this is some of my regalia here, I made this cabinet…
FL: That's a beautiful, that's a nice cabinet.
GH: Most of my kids have made something or other of what's in here. Here's a picture of white deerskin dance over at *Tishanick*, that's Leaf here, that's a son of his, this is a son of his down here. This guy [*fatawanun*-Ceremonial medicine man] come down that trail, that, I was tellin' you about up on the ridge, across the river.
FL: So those trails too, did they used to burn those, I know *fatawanun*, like up at Offield Mountain up where they rolled a log down, did they have other practices down this way where they would burn and keep the trails open?

GH: Yep. This basket here was made by Netty Ruben, I know it's over a hundred years old,
FL: Is that made out a hazel sticks?
FL: Do you think she burned it on this flat or how far back do you think she had to go to get her sticks for her baskets?
GH: Most of this stuff was done right here. Right here. And she was getting' kind a old when she made that for me, that was the first baseball cap,
FL: Oh neat.
GH: And a dog got a hold of it and chewed the visor off. But she made that for me when I was just a little fella. That was her first baseball hat, the first around cap with a visor. And then my brother made this dugout, and my niece made this little baby doll, and, ah, my grandsons, no my son made the acorn paddle.
FL: Yeah, nice.
GH: And I think this is the first elk horn drum stick, I made that.
FL: I like working with elk antler too.
GH: Then I made this here, and pretty near every one of my kids has made somethin'. This here is an old, this was Lou Wilder's hammer for makin' drums, solid rawhide. And that was Lou Wilder's dance bow up there. I made the sticks and the tossle.
FL: Was that out a hazel, the sticks?
GH: Yeah. And I also made…
FL Those sticks, I know they burned for basketry, but would you let some of the sticks grow older so that you could make the…
GH: Sticks used to be a big thing here. Years ago, every place had their own stick team. Well one guy was all he did was make the sticks. Each guy, hand were a little bit longer. They were all custom made. The games really meant somethin' then. Well, Moe's brother and Herb Cays [?], I don't know if you knew him, he was in, you probably read about the old race from San Francisco to Grant's Pass, Flying Cloud won that race, he was from Happy Camp, that's Basketball Bob's relations.
FL: OK,
GH: Well Herb Cayes [?], he ran in that same race, if you can imagine, that's quite a…
FL: Long ways.
GH: He lived across the river, see, over there on the point, where *Tishunick* is, that's where he lived. He used to be the stick maker. My oldest brother would go out to what they call Sardine Camp, and they would gather their sticks and bring 'em in on a horse. They would put 'em water and soak 'em for three months. Then they had for each guy, they had a whole [mold] frame for each guy on the team, How he wanted it. so they would soak 'em and they would be just like spaghetti, and put 'em in the [frame]… and when they dried, that's the way they were. That's the way I make my bows too. You soak 'em, put 'em in the water, soak 'em maybe three days. Put 'em in the deal, put the curve where you want, how you want it made.
FL: Now I was curious, with yew wood. I have a theory, right. In a lot of these upper draws, they wouldn't burn 'em because that's where you find your yew wood.
GH: That's where you find your yew wood. Absolutely.
FL: Fire wouldn't be a good thing to happen to yew trees would it?

GH: No. Nope.
FL: So was I right in thinkin' that? Because I was thinkin' you would keep fire out of there…
GH: Keep fire out.
FL: Because you want nice straight grain, if it got burnt, it would make a scar on it.
GH: If you get fire in anything, when you cut it, it will have what they call fire checks. Little bitty checks all through in this wood from overheat. That's what they call fire checks. It's the same thing in lumber. Like when they go to log these burns, this lumber will all have fire checks. They'd be small checks. But you couldn't use it for bows, you see, but it's good for lumber. But bows, I don't know if we had the last brush dance up here, at *Katimin* here awhile back, and I seen medicine man and medicine boy and there was one other in the dance, had a,
FL: Ringtail cats?
GH: Ringtail cats sash. And it was really really neat. This, ah, I think ah, like for basket sticks, for hazel, to make good ones, you gotta cut 'em down and burn 'em right there.
FL: Ok
GH: Your sprouts will come out the next year and it'll be like that, nice and straight.
FL: Three to four feet tall?
GH: Right. And Trudy, Mollier, the last ones I gathered down by her place, right along the bank there before you drive down to her place there was a patch of hazel there, every year she'd cut it down and burn all that trash, you see. So I'd go down there and …
FL: So she had to burn hers in the springtime too, huh? They always do better in the spring?
GH: Yeah. But boy, you talk about beautiful shoots. Just as straight and long, year after year. Same place. Nobody takes care of this kind of stuff anymore.
FL: Yeah.
GH: The Forest Service will think, Oh, they're doin' a big deal by takin' 'em out and lettin' 'em burn a little patch here for bear grass and stuff. Bullshit.
FL: You need more areas, huh?
GH: Yeah. They're [USFS] pickin' the area. Lot a things I don't like about the white man way. He thinks he's a, instead of the Indians teachin' them, they're teachin' the Indians.
FL: Yeah. And they should be learnin' from the Indians because they're local people that have a history.
GH: I seen it right up here at our fisheries, we have a biologist comin' out a college, teachin' the Indians. Got the shoe on the wrong foot here. My way of thinkin'.
FL: Yeah.
GH: Should be the other way around. These biologists, there's a lot they can learn.
FL: Well, I tell people I was Indian first, and then I became a biologist.
GH: Right. This is there. You can't learn it all in school. Ain't no way. Because it ain't all there. They don't have it all down. If they did, then maybe you could. But you still gotta learn from experience. And I see this up here and I go up. I see their biologists and I see our young fellas workin' in there, they're learnin' from these guys. They're learnin' their way.

FL: Yeah.
GH: Not learnin' from us. They may pick up a little from us. Not enough. Same with our culture. I think we should have someone in our natural resource department that is really over our cultural background. And I think this is what we have to do in order to hand this on down.
FL: Because so many parts of the managing, the water, the fish, the forest, the trees, so much of managing that goes right back to the culture and the knowledge.
GH: It all ties in as one. But they're too much of just on one thing. Managing the forest for the water's fine. That's part of it. But how the rest of our culture tied into it we don't have, we don't have in our Indian departments up here that I can see. No one teachin' the culture part, where we lost it, how we lost it, we gotta get it back. How are we gonna do that? But I think this Steinacher Creek job, this is a startin' point of getting' it back If it's handled right by our tribe, I don't know if it will be.
FL: Yeah. For the management, for the burning, is there times when, I'm really interested in lightning because a lot of times the Forest Service people, and some of the environmentalists, they'll say, well, the lightning fires struck enough around here that the Indians really didn't have to burn. And so, I argue that if we had to wait for a fire from lightning to come burn our acorns, our baskets, or other areas, we would go unclothed and unfooded [meaning no clothing or food]. So I'm interested in your perspective. The lightning versus Indian fire, how much of it, from the river, say Elk Valley, how much of that was lightning versus how much of that was Indian burning. What were the key areas the Indians burned?
GH: I think it depended on the high elevations a lot. I think your lower down habitat, where your gathering areas was done mostly by Indians. We did have lightning down low but not that amount. I would say the majority was done by Indians. Your higher up elevations, not too high, say 2500 feet and above. Then I think your lightning took care of a lot of it. The biggest part of it.
FL: Would there be reasons why Indians wouldn't want to burn up high?
GH: Any reasons why not?
FL: Why they would?
GH: Well I think our territory ran a long ways. You take like out at Indian Rocks out there, that was like a training ground.
FL: For power?
GH: For the women, the kids, and the men.
FL: Training, like education training. OK.
GH: Right. That was our huntin' grounds high up. Up at Indian Rocks, why, you would see after a big storm, arrowheads layin' around where they probably made arrowheads out there because they didn't use arrowheads for huntin. Then you find in the cracks of the rocks, these little, oh they were, square beads, they're kinda round but they have corners on them. So the bead work had to be taught there by women. I think that everybody at one time had went there. During the huntin' they would make their jerky.
FL: What time of year was that?
GH: I would think it was in later fall, and your kids would go along and learn to make your arrowheads. The girls to learn to make their beads, to learn to skin out the deer.

Everything was done at a certain area. Up there at Indian Rocks, why a lot of rocks stacked up on top, you'd always stack a rock up when you'd go huntin' out there, you'd stand it up. Going out on the left hand side was Waterdog Lake, when you throw a rock in there it was just orange with waterdogs. And the old thing, if you swim across there and come out on the other side, better luck.
FL: Yeah.
GH: A lot of different superstitions. But this is where your good meat was at. Your fatter bucks was up higher. So it only stood to reason that you'd have a school up there because once you hunted, you had to preserve this meat. Everybody had to go. The old huntin' arrows were, your obsidian arrowheads were not for huntin', they were more ceremonial.
FL: What did they use for huntin' deer then?
GH: Well you have a regular arrow with a wooden point.
FL: Oh, Ok. Your shaft is hollowed out, and you put it in there.
FL: You get that mock orange and then you have harder wood or bone on it.
GH: Right. You just pulled it out, put another one in. You could always remake these wooden ones really easy. I think Leaf has one over there. Cuz that was our huntin' arrows. You couldn't be chippin these arrowheads and losin' them inside. You pull your arrow out and put another one in. That was our way of huntin', arrows. So like I say, I think the only way to ever get our deal back would be, we have this, to have some kind of cultural training program that will educate our young to how things are supposed to be, how everything ties in. Not just one, concentrate on somethin over here, leave this other all out. It's all together. And I think our young people aren't getting' that. Do you think so?
FL: No. I guess I was lucky when I was little because my father took me around people like Charlie [Thom], down there at *Wasek* with Calvin Rube, be around people like Dewey George, I was too little but, this is when there, when Rudolph Socktish was still alive, and I was lucky because they took us out and showed us how to make medicine and pray at different places.
GH: Right, right.
FL: And what got me thinkin' as I got older and became a biologist, about the link between the fire, the trees, the water, and fish, was a lot of places we went up to in the High Country in Elk Valley, those back places behind Weitchpec and on down the river at Blue Creek was you have to go pray at springs or go bathe in a pond, you'd go up on a mountain and come down and go bathe in a pond or before you go, you go bathe, and these places they were talkin' about, they remember when they were younger, they said you could bathe there or leach your acorns out there. Then you'd fast from food, then you'd go up on the mountain, had these trails and pray at these peaks. Well those places we went to, in the late 70s and early 80s, [1978-1986] were all brushed up or they were dry. And then we'd go back and, we had a hard time, we found a little dry spot there, or this spring was dried up, there wasn't a pool of water, like say under the rocks, and it got me thinkin' years later, they would say that country was open or it used to be burned through and that wouldn't be in there with more water, so what got me thinkin' was there was a tie, something there between people going out and checking up on all these places, the fire, how burnt back the brush, reduced the transpiration, reduced how much the plants used the water, and how the

water would run that there was in a lot of places, more springs and more of these little ponds and bathing places, and we don't have those now.
GH: We don't have 'em.
FL: So, I'm a fisheries biologist and I work with streams and so it made me thinking about our cultural history and the land history. Which changed? And it was fire and so that's why I'm interested in the fire part. Because I know, I learned some of the stuff about burning down low but the question from the academic standpoint, with the scientist is well, just how far would Indians burn, how much did they do it, and so for me, my training was all based around the spiritual part of it. So when I became a biologist, I knew all these animals. When I went to my mamology class, I could tell you where a fox was, how he acted, how he barked, how he shit on a log,
GH: Right,
FL: I could tell a ring-tailed cat, what color eyes they were in the flashlights, how they acted, what they'd get into, what time of year. I was lucky I was raised with that, skinin' them out, seeing what they were eatin', seein' where they were poopin', knowing their barks, and the other thing for me too, being up in the mountains, was I had to learn, sat down and told, look, watch and be quiet. Sit still. Whether, I was near a pool of water, I'd watch that salamander and those little fish, watch those birds, be up on this rock, look out over here and watch those animals, I had to learn everything and how it acted, so that way if it acted differently, then I would be able to interpret that.
GH: Right,
FL: Because sometimes animals don't act the way they should and so you have to be, what's he tryin' to tell me.
GH: You know I think what we need is more Indian biologists.
FL: Yep.
GH: That have been brought up in the Indian ways. I think this is where we're really lackin'. But I think to become a biologist, I think you have to have a chance to have a good education.
FL: Yeah, you do.
GH: And I think this is where we're really in need. Like I was telling you about the biologists up here. We need to educate our young in the white man's ways that know our Indian ways before we can tie everything in.
FL: When I look at different things, like I see that water dipper [*Cinclus mexicanus*], the one along the creeks, I think of the greedy man in the fishin' story, you know, who didn't feed his family and then they turn into basket material. Everything that I see usually has a story or a lesson that reminds me of who I am and my responsibility. And I think for a lot of the young people, like with me at least, they willed down some of that knowledge to me, that knowledge is a responsibility.
GH: Right.
FL: So I feel like, what could I do in the white man's way, and also cultural? What's the highest level of training I can get to still be able to come back and fulfill that responsibility, passing on that knowledge. And so that's the work that I try to do now.
GH: My wife was white. Well, we had like, we were married for 40 some years. This is out at Indian Rocks. This is Salmon Summit, Redcap Lake down in this hole here,

and Devils Backbone goes on out and the old Indian trail from Salmon River over here went over to Pack Saddle Ridge into Hoopa.
FL: So, your lookin' south-south east?
GH: You're lookin' like south. [looking at Photo] But, ah, my wife, we had been married for so many years that, I don't know what you call it, brainwashin' or what, but they think they're Indian.
FL: Well yeah, if they are around everybody [that is Indians].
GH: You've changed their way of thinkin' so much that this is all they know. And I think this is what the white man have done to us. If you can change your own wife to thinkin' your way, like the drum up there, my grandson, that's the first drum he made. The first thing you make you have to give away.
FL: Yep.
GH: So he give it to me. To me the drum is special now. When I lost my wife, the last three songs that she heard when she was dyin' was off that drum. Leaf sang one, *Chuk-Chuk* sang one, we all sang one together. That made that drum special, because that's the last she ever heard was off that drum. I don't care what a person's color is. If they live within a culture so long, they become part of it. And this is where we had lost our culture and we had become part of the white man's culture so much that we overlooked our own. We know how it's supposed to be but it ain't. But when you can change your own wife's thinkin' ways. I put her ashes out at Indian Rocks right there where she's at. This is where she wanted to be. We went out there year after year for 40 some years. First time I met here that's where I took her. I wanted her to know this is the way I am, this is my country. So she felt the same way. But it takes a long time. You don't really see the change it don't come right then. It's slow. But over a matter of 40 some years.
FL: It becomes part of you, and you're part of it yourself.
GH: Yep, and I would like to see our young people change the same change. But it takes a long time. And our country has to change along with it, the way, in order to get it back. But everything the white man has done here, has attributed to ruining our culture. From the mining to the CCCs to the Forest Service near suppressions.
FL: How do you think these young people should learn about fire again
GH: Well, I think this has to be a separate department in set up in our tribal system where we can teach our young. Take 'em out and show 'em. This is not the way it's supposed to be. And we're really falling down on that end I think. I think that's the end that's really important.
FL: So you think they need a good history lesson?
GH: Just what it's all about.
FL: But then also, site examples.
GH: Right. You bet. And I think our time is runnin' out on this end of it because of elders. Like tomorrow, we're havin' a memorial service for Cliff, up here. He was born and raised on this flat too, you see. Him and I, I can't remember when I didn't know him. We been friends for 75 years. We'd been all over this country, year after year, when, we would go out in the spring, to hunt, make jerky, move the cattle higher and higher. We would salt logs, we would stay maybe week, 10 days, and we were young then, we were still in grade school. When you'd leave home, my mother would tell me where'd you'd get that rock in your pocket where to keep the rattlesnakes

away. They can hear that roarin' [sound of ocean waves]. That was the main thing. Keep them rattlesnakes away from you, you see.
FL: I grew up more on the coast and the belief was you always carry a piece of abalone with you to keep the snake away.
GH: Well, we had the same belief up here. You never left home without that.
FL: A rock from the ocean or from the falls?
GH: From down the coast. Lots of tradin' went on. Our culture's pretty much tied in. Closer than a person realizes. We had the same culture. There's no difference. And you'd go out and say maybe a week later you'd come home. Like Cliff and I, always went out together. Take the horses and put the salt on, of course you didn't have sleepin' bags then, just a blank roll, roll of blankets, head out. And can you imagine, now, in this day and age, say you're 11, 12 years old or 10 years old, can you imagine parents now lettin' their kids go for a week or 10 days and not knowin' where they're at?
FL: Kids don't have the training.
GH: No.
FL: They're not tough enough and they don't have the knowledge of how to, where to get good water, how they can hunt or even skin somethin' up.
GH: They'd probably throw your ass in jail for abuse or somethin. But this is the way it was. You'd, this is your country. You lived here. Don't worry about it. You get back, fine. But I've thought of that a lot, how the kids have changed, how our mind has changed about what are we scared of, lettin' our kids go out, and our whole world has really flip-flopped.
FL: Like Native people went from being very intimate and knowledgeable and knowing Nature and interacting with it to now almost being fearful of Nature.
GH: Right
FL: It's like it's supposed to be behind glass or behind protected areas. You just visit it but you come back. Rather than seeing. When people ask me who I am, I tell 'em about where I'm at, who I'm from. Not what I do as a job or whatever. Who I am is my family. When I go away places, I tell people this is who I am.
GH: I was talkin' to. This was taken, [looking at photo of boys in mountains] this is me, this is on top of Salmon Summit. The east slope. This is young Lou Wilder. This is Kurt my brother. But we would probably be out there a week, you know.
FL: How old were you boys then?
GH: I was probably
FL: Ten or 12, 13? Some wheres in there?
GH: Yeah, some wheres in there.
FL: And just by yourself, no adults? Geez
GH: No adults. But this is the way it was. So, this is the guy we're goin' to have a memorial for tomorrow.
FL: Yeah, Cliff. This country, again, lightning, or did you think Indian people burned it to keep it open? Lightning?
GH: Yeah. This is pretty close to 7000 feet elevation.
FL: Salmon summit you said.
GH: Yeah, I think it's 6900. But this is all from lightning.

FL: And so the lightning fires are the ones that made the forage good for the cattle and good for the deer. The big bucks would be from the burn areas, huh.
GH: Right. The Forest Service would tell you that, even the fish and game, until say, 10 years ago, that there's more deer, more game than there ever was. This is a bunch of propaganda on their part. Not so. Because we don't have the habitat, the winter habitat is what the Indians kept open, 2500 feet and below, where they come in the winter. They have to have winter feed. Otherwise you got no game. You can have all the summer range in the world. But if you ain't got.
FL: Winter habitat?
GH: Habitat for 'em, you're not gonna have no game. They have to live through the winter.
FL: So after they burn through the acorn areas, I don't know. [Are] there's things like the grass resprouts. Could you tell me more about what you seen, what you know about that.
GH: You got all your new shoots for them to feed on from fires. All kinds of shoots come up.
FL: Shrubs and grasses?
GH: Right. So, the Indian actually made, this is what I'm telling you about up at Steinacher. They're makin' perfect habitat to increase the deer, to increase the elk, but we gotta do more. They have to have our whole ancestral territory.
FL: Because of the lack of fire that have happened, what do you think they should do. Right now they're talkin' about fuels reduction, going in there and thinning. And then burning through. How do you think they should approach that? If you'd have recommendations to the Forest Service.
GH: If I had recommendations for the Forest Service, they have missed so many golden opportunities to open this country back up. I hear it on the TV like today, say Hoopa, I think I heard that this morning. Well, they're gonna demob down there and start, what do they call it, rehabin'.
FL: Rehab.
GH: OK, what do they mean by rehabin'? When the Forest Service rehabs, you had the Hog fire, you got the '87 [1987] what they call the incident, and thousand of acres burned, I was on cat, put in three different fire lines, they didn't even know where the fire was, you'd make one, come down the highway, haul it back up, make another one on another ridge come down. [Destroyed sacred sites?] Cuz you're crowdin' the fire. Once they get that fire, it came all the way from the wilderness, Stanshaw meadows clear to the, pretty near to Blue Nose, where there's Blue Nose ridge, on the other side of Blue Nose ridge at, what the heck's that campground up there, Dillon campground.
FL: OK, Yeap. What's the first thing they do when they get done with this is, I was on an eight, and another guy was on an eight, we was makin' fire lines like, 7500 foot wide.
FL: Geez, right on the ridge, huh?
GH: Right. And what did they do when they get this fire out? They hire another contractor come in, put the water bars in, pull all this slash back over to the fire lines. This is their rehab, instead of maintaining things as habitat and as fire break and continue to burn and use this as a fire break. You put all these millions of dollars into these fire lines here. They rehab'n the burn.

FL: They have to prevent erosion?
GH: They have to prevent erosion Right.
FL: But then once you have it burned, keep burning again.
GH: Right.
FL: That way it doesn't fuel up again.
GH: They've had so much opportunities on big fires and blew their chance.
FL: Cuz then the fires burn completely hot. There's low intensity, moderate intensity, and high intensity fires.
GH: Right. You've gotta maintain burning areas. You ain't gonna burn the whole country. But there is areas that need to be maintained and there is these big fire lines that they've spent millions of dollars and cover them back up and plant brush and trees so it can burn. This is ah, to me this is wrong. Where we used to burn, break over the ridge and probably creep down the other side a little ways, that was like a fire break. Burn it again, the same thing, you know.
FL: Every three years or it just depended?
GH: About every three years, don't give it a chance for your understory to grow.
FL: Just enough leaves to carry the fire.
GH: Right. But I'm strictly against the rehabing these fires. They throw. If they would take, I don't know what kind of budget the Forest Service gets.
FL: It's quite a bit. I worked on fire rehab at Hoopa. It was a lot of money.
GH: OK, if they would take 10 percent of their budget that they use for fighting fires, I forget how many millions they put on this Gasquet fire in the last few weeks, for prevention [Active prescribed fire]. Prevention is keepin' it burnt, they would be doin' somethin'. They would save an awful lot of money in the long run and bring the country back to the way it was.
FL: Is timing important? If they try to burn in November, should they burn other times?
GH: Did you see the Forest Service down there in Arizona and New Mexico, they burn up these countries. They're burning in the wrong time of the year. They're startin' their fires late spring. You got a hot country coming. You gotta let nature take care of these fires. We get our lightning, most of it, from now on, it'll build up, build up…
FL: So around mid-August on.
GH: Right. Then probably our biggest fire month is September, our driest month. You get them fires goin', latter part of September, forget 'em. Nature's gonna take care of this. For some places we're so built up anymore, we have to watch, anymore. But in our part of the country, we got nothing but wildernesses.
FL: Yeah.
GH: Let her go, there ain't nobody livin' up there. And it's gonna build everything together eventually. Let nature take care of it.
FL: Besides hunting up there for the meat, was there other things culturally that other people would get up there that did better after a fire? You can think of, was there berries or…

GH: I think all berries do better. Different elevations you have different gooseberries. Different colors. They don't grow up very high. They're down pretty low. It's the stuff that grow up in this, the understory.
FL: The brush that takes over.
GH: The brush that takes over. Our prairies are getting smaller, because the brush is creepin' in. But the understory, it kills everything, it kills our gathering stuff, and then where it grows up to your big timber, don't have no limbs for 30, 40, 50 feet. The understory'll grow up there. Then when the fire starts, it kills everything.
FL: Yeah, cuz it can jump like a ladder up.
GH: And this is the way our whole country is right now. Nothin' but understory. It kills our big trees, which we don't want [larger fire-resistant trees killed by ladder fires].
FL: What about sugar pines? They're sugar pines near the river, but also I see some sugar pines farther back. I know people use to have family owned areas, did they do burns for those too?
GH: I think a lot of sugar pine, a lot of the pine around here was planted by the Forest Service, lots. In fact, they brought more knob cone pines in from over along the Trinity, one big unit up here, at Frick [?]Hill, there's nothing but brush.
FL: Up at *Anshanamkarak*, [Ike's below Somes Bar].
GH: Terrible lookin' stuff. And when they built the highway down the river, down here at Big Bar, they planted a bunch of stuff in there. I forget, they had a big sign there, some guy workin' for the Forest Service, a tree farm, Max's tree farm I think it was. And it was, trees not local for that elevation. First few years looked pretty nice. Then pretty soon they begin to show their true nature and everything got ugly again. They took the sign down and cut 'em all down. Didn't look good for them, see.
FL: Yeah, geez.
GH: But when they were lookin' good, this is ours, this is what we're doin', see. As soon as it looks bad, take our sign down. But they have done so much of this. Bringin' nonnative stuff in, maybe it's because of their education, somebody came in, liked somethin' from someplace else, so we'll grow it here, don't work that way. It's just like years ago, there was, where you had fir trees, they grew. Where you had a prairie, it was open.
FL: My question on that is, and this is a real interesting point for me, I don't mean to cut you off, but you had patches of Douglas fir, the fir in one areas, and the other prairies and the oaks, and you had other prairies higher up, was it lightning fire? I have a tendency to think that the Indians helped manage with the lightning fire.
GH: We did.
FL: To create and make. Everything had it's own place. And so now it's kind of blended together. And so could you talk about that a little bit.
GH: High up, like I say, it was mostly lightning that took care of the whole country. I'm sure that we helped out. But down low, it was mostly us. Winter habitat, very important because this was our gathering areas, this was where they wintered, the game moved down to winter, in the late fall, we had to take care of that. But I can remember when lightning came down pretty low, but like I say, big bodies of water [man-made reservoirs].
FL: Those man-made lakes changed the weather?

GH: You bet. And then our lightning, we didn't get near as much. So, and we have to work with Nature, I think, especially in our gathering areas. There's no way of ever opening the country all up. You know. It wasn't always all open everyplace, but there was bad [catastrophic-crowning] fires years ago, but I know bad fires way out beyond Maple Springs, and out in that way, goin' out that way towards Elk Valley, old, old burns, that are now just nothin' but brush. Look at the old Redcap burn. I think it burned in 1935, the first big fire come through there, and it never did ever grow back trees.
FL: Too poor soil, too harsh a soil?
GH: I think it got so hot it killed the soil.
FL: Yeah, that's another problem with hot fires. Yeah.
GH: Then you have to have a certain type of brush that grows back to build this soil back up for anything to grow.
FL: Which is what? The buck brush, the ceanothus, or what other kind?
GH: The Ceanothus I think is a big turf builder.
FL: Yeah.
GH: Generally whenever you see a good hot fire, that always comes next.
FL: Is that alright, is that what it's supposed to be doin'?
GH: I think that's what it's supposed to be doin'.
FL: OK, cuz I know sometimes they use that for basket material and also I see the deer, they really like that. It's an important deer food.
GH: Anything that's tender, growin' fast here, deer eat. But, ah, hot fires, I was out, last year I went out to, this Megram fire on the back side, I come in to Mullen's camp, the other side of Salmon summit, I wanted to see. There's places there scorched pretty hard but nothin' that Nature can't take care of. The rest of it all really looks good.
FL: Yeah, light to moderate burns.
GH: Really looks good. But we've got to learn to work with the lightning. This burnin' is important for everything. For the game and for us. Nowadays it's more important for the game. Were not. We've lost our ways of gathering. And I don't think we'll ever get 'em back because I don't think that, sure we'll have a certain amount of gathering, our younger people are learnin' more about the baskets, you see, the basket deal [class] over here, it's pretty interesting to see our young people in there. But I don't think it won't be a livelihood the way it was. We made baskets for cookin', we made baskets for acorns, everything was for a purpose.
FL: Yeah, from cradle to grave, there was a basket for somethin'.
GH: Right. This'll never happen again. Everything they made was for a use. It wasn't just for looks.
FL: Yeah.
GH: Mostly what they're makin' now, being taught, is mostly just looks
FL: And when you get down to usin' it you have to understand how durable it's gonna be, not be afraid to, if I make somethin' nice, an acorn paddle, hey, burn it, that's what suppposed to get done. You use it for what it's for.
GH: Right. But it's pretty interesting, I know, like these, the basket makers, the Forest Service is regulating them down to, just do this here, do that there. And I notice our

river bar, water really low this year, lower than ever. You got willows growin' up there in the middle of the river.
FL: See, that's what I work on, I'm looking at, is the burning effects. Do you know much about the willows down here, did they used to burn willows? How did you care for those?
GH: The willows were burned,
FL: *Paarak*, the blue [grey, *Salix exigua*] willow, right?
GH: But now they burned them this side of the bridge there once in awhile, here, a few years ago they burned. This has to be done regularly.
FL: How frequent, every couple a years?
GH: Every couple a years if they're gonna gather sticks there. You can't just burn it once, and that's good enough, you know.
FL: How big of an areas? Did they, from when you were little? Like, Netty Ruben or other people talk about, how often would they burn the willows down by the river?
GH: Well, I think it all depended in once your willows start goin'
FL: Side branches, yeah?
GH: Right,
FL: Lateral side branches, then you burned again.
GH: Right, they want the long…
FL: Straight ones.
GH: I don't know, like I say, the women did all the gatherin'.
FL: OK.
GH: And it's funny that way cuz men seemed to have it, I don' know, it was easier. I think they had an easier life than the women. I think the women's responsibility was far greater than, what, todays. The women's responsibility nowadays is kinda takin' over the men's responsibility. And we have kinda fell into that same mode. I don't know if the men really know where they belong.
FL: Yeah?
GH: It's a, more and more women are head of households.
FL: Yeah.
GH: This is, I was up eatin' with the senior citizens here, you probably know Norman Goodwin,
FL Yep.
GH: Well he's Christy husband, and they have young kids, he's had three or four different families, well, I think she was kinda cookin' up there then and she was sittin, Merlin Tripp, I think you know him too.
FL: I think I recognize him.
GH: Well anyway, we're sittin there eatin' and Christy was tellin' us how helpful her husband was to her, he does everything. Norman comes over and sits down, she brings him a plate, brings his coffee to him. The coffee cup got emptied, he just pushed it across the table. He never had to say a word. This is old Indian ways you see. You clean the fish, the women cleaned the fish, they prepared everything. And I look at Merlin, he was lookin' at me, things haven't changed there. Cuz he was brought up the old ways.
FL: And so was she.

GH: But I would like to see a department where our young people can connect with the past, take 'em out, show 'em. This is what took place here, I don't know what your thoughts are on this.
FL: I think it's important. When I moved back when I finished school, I wanted to be able to work with the youth and the elders. Put them together for different projects.
GH: I think you're right there.
FL: You know, the transfer of that knowledge with that responsibility.
GH: We don't have this. It's really lacking.
FL: Cuz there are a lot of people like you that are retired, that have the time, there's young people that are younger, get them around, sit them down, get them to hear the stories, teach them patience and other things. I think that's important. And don't be afraid too, if there's a small fire, take those kids out after and let 'em look at that fire, and tell 'em, hey, you see how this madrone tree burned here, you see all these burned leaves, come back and look. If they see that growin' up with it, then they'll know.
GH: I go down over the coast quite often. Lot of time I'll go over to Bald Hills. And you hit the redwood park [Redwood National Park] down there and last couple of times I drove down through there and I'm lookin at this old-growth. Every one of them has got an old fire scar on it, or your goose pen where you can see it had been burned.
FL: Sometimes coming out the top.
GH: Yep, and then you look at what's comin', this understory, it's been so long since anything's been burnt, that if it burns now, it's gonna kill everything. It's gonna get so hot, they have poles in there thick, just thousands of 'em.

[End of interview on the mini-disc, time ran out]

Jimmy Jackson (Hupa), Age 92. Interviewed by Frank Lake (FL), Oregon State **University. Hoopa Valley, Ca. September 24, 2002.**
Consent for voluntary participation verbally given and signed on IRB form

Jimmy Jackson: They was here one time. The federal government. They showed us how all fires start. I said no they all don't start that way.
FL: What did the try to tell you that it was lightning fire that started?
JJ: No, They said that it was, ah, man made.
FL: Oh,
JJ: I said no. Not all the time. I said a lot of places I looked where there is forest fires. I said I fought forest fires from the San Bernidino Mountain through California, to Oregon boarder. I fought fires all the way. But what I said there is always something. Now you could go right out there to the what-a-call, Throw a bottle down along side, ah.
FL: The road?
JJ: When that sun gets to a certain place, you gonna to start a fire.
FL: Oh, kinda like a magnifying glass?
JJ: Magnifying glass, I said that will start it. It will start it every time. Because we lost a lot of timber up here in Hostler creek one time [because of that].
FL: OH, what year was that?
JJ: It was about '46, [1946].
FL: Yeah
JJ: We had it all bucked up, boy, [Lazy cat,]
FL: [Good story listen'er though-laughs]
JJ: [But, anyway] we lost two feet off of each log. We had all bucked up and we couldn't figure out how in the hell the fire could get start there.
FL: Yeah.
JJ: So later on, one of the boys falling timber said, hey-hey here we are. That was the days we used drag saws.
FL: Uh-hun.
JJ: He said there it is, I said what is it. I was bull-bucking then.
FL: Yeah.
JJ: That god-damn old gas jug sitting on the stump. And that's what, ah…
FL: It got too hot or something?
JJ: Well, the sun come through it you know.
FL: Oh,
JJ: And it burned, it was kinda, leaves.
FL: Yeah,
JJ: Dry leaves, and that thing caught on fire.
FL: Huh.
JJ: We lost two feet off each log. But they would not buy it because it was kinda of cracked.
FL: Yeah,
JJ: But they did say if we bucked off two feet off each end of it they would take them. So we had to cut some. We always, you got to watch out for it animals can do the same thing.

FL: Start fires?
JJ: Yeah,
FL: Really, start fires?
JJ: They can walk through this rocky bluff right here, and kick a rock off.
FL: Oh.
JJ: And then there is a lot of grass growing down here underneath.
FL: Yeah.
JJ: That rock will rock and throw sparks.
FL: Yep.
JJ: And the time it hits. That's what happen at Telescope one time.
FL: Hum.
JJ: And then, In Indian they call it "where rock falls off"
FL: Ok,
JJ: And, and every so often where like the roots and stuff grow, it pushes a rock off. That place over there has rocks about that size [8-10 inches]. Just piled up clear to the bottom.
FL: Hum.
JJ: From where it breaks loose from up above. And, that's what started that fire. Of course what we did was we, ah, throw a small rock down, about that size,
FL: A basket ball.
JJ: Yeah you could see the sparks go flying.
FL: Huh, it must be really high in iron or other metals or something.
JJ: Yeah, it was metal.
FL: Huh.
JJ: And we find out that will do it. And old man bear can walk across there and kick a rock loose, do it.
FL: Yeah, Yeah.
JJ: And that's the same damn thing again.
FL: Especially this time of year when it is hot and dry.
JJ: And you take a deer, deer have a, you know, an awful sharp toe.
FL: Huh-uh.
JJ: They dig for stuff.
FL: Yeah, I seen them paw around at places.
JJ: They dig out something, and some time they kick something loose and it rolls. Right up here, a fire started up here. We found out what it was when it went out.
FL: Supply creek fire?
JJ: No it was Beaver creek fire.
FL: Yeah, Beaver creek, that's right
JJ: And, ah, and the dog-gone thing went out.
FL: Huh.
JJ: And the rock was laying down at the foot of the hill. We figured that was the one that did it. And the guy who went up there said he saw where it had broke loose.
FL: Oh yeah.
JJ: That's all. He didn't say it did it, he just say he saw what it was like.
FL: Huh-uh.
JJ: There is so many ways to do it, a human being could do it too.

FL: Yeah, tell me about that, do you remember. Because you are Hupa and Chilula too right, Redwood creek Indian?
JJ: What's that?
FL: What tribes are you, your Hupa?
JJ: Yeah, Hupa.
FL: Are you Chilula, Redwood creek Indian too?
JJ: No, I am nothing. Part Yurok.
FL: Oh, part Yurok too.
JJ: Yeah, well any way.
FL: So tell me other ways too.
JJ: You could use candles.
FL: Candles? Tell me about that.
JJ: You make shaving.
FL: Huh-uh.
JJ: You can set it right out there. And you can, can take and pile these shavings up. And when you are ready to go home you can…
FL: Huh-uh.
JJ: You have a candle in your pocket.
FL: A long candle?
JJ: Yeah,
FL: Huh, a slow burner.
JJ: Two or three hours, You can be in Eureka by the time the fire starts. You light that, and it keeps a burning.
FL: Huh.
JJ: It runs down, the what'a you call runs down, to the bottom and that's what starts the fire.
FL: Oh yeah?
JJ: Yeah
FL: What other tricks [to do you know] like that?
JJ: Its been known to be, and then the Bureau of Indian Affairs they approved that, they said that would start a fire, that would do it, but that's done by the human being.
FL: Yeah
JJ: Which is true.
FL: Is that one way Indians started fires when they didn't want to get caught?
JJ: No, no, well they learned from that.
FL: Ok
JJ: They learned from it. They learned, ah, and I said at that time I was just a young man, and I said that's the first time I ever see the government try to tell the Indians something. We had fire one time from Tish-Tang creek.
FL: Ok, yeah.
JJ: Clear down here to Mill creek.
FL: Oh, that's pretty big, that's almost the whole side of the valley.
JJ: Clear on up there, it jumped, what'a ya call it.
FL: Hostler creek ridge?
JJ: Hostler creek ridge and jumped that, well it will do it because it creates its own draft

FL: Yeah.
JJ: It creates its own draft, and it blows the leaves and everything all over. And if you watch a fire at night time. You can see what'a call it, the embers fly a little.
FL: Oh the sparks carry a little
JJ: The leaves, and..ah.
FL: That's how it starts spot fires huh?
JJ: Yeah. But one thing I have learned never try to fight fire at night time
FL: To dangerous?
JJ: To dangerous. Because a tree could be standing here, just straight up in the air and maybe its burning down by the bottom.
FL: Yep.
JJ: And you don't know which way that tree is going to fall.
FL: Fall, that burnt cat face in it.
JJ: Because you can look at it and you can see the tree going. Because I did it and I seen it. Right down here on the Bluff [motions towards down-river towards Weitchpec]. I could see that tree just going like that. Geez and next thing I know I see the tree coming towards me.
FL: Oh, did it have some holding wood, and it kinda swung on it?
JJ: No. It just, it just was the way it looked.
FL: Oh I see.
JJ: It looked like it was going that way, then it was coming my way.
FL: Oh geez you were going to get squashed.
JJ: Yep. But I got a way because we was, ah, we always had when we were working night time, we always watched, we make, ah, kinda get-a-way place [safety/escape route].
FL: Yeah, an escape zone.
JJ: Some of the boys wanted to sleep, you know, you holler, then. We fought a lot of real hard fires. Then our, what'a called, now our department. Now what they are doing up, ah, my tribe [Hoopa VIR], they got what you call pick ups. It got a radio in it. Gotta TV in it. It got every God damn thing in it. But they anit got anything to put a fire out on it. But at one time, ah, right over there what they call Sugar mountain. We were there we set one up, a tower.
FL: A look out, a fire look out?
JJ: Uh-huh, it was fifty feet high. And ah, we found out then, that ah, what-a-call, we could see from there clear over to Trinity Summit country. But, then they got, oh, they was. So they set this one up, up here. At Big Hill. They put Big Hill up. They didn't have it, but they couldn't see it from this direction. So anyway, a fella named Randkey, Leonard Randkey, I remember the old fella. He as a World War I veteran. He was kinda shell shocked, the ol' bastard.
FL: Was he Indian?
JJ: No, a white man. He was a big fella. An I don't know how damn hot is it, he'll have a makanall coat on.
FL: Geez.
JJ: Because he used to come when we was working on trail or anything. He would come walking up there with this God damn coat on. Geez-ust, Christ, we told him one time. But all we had to do was holler. Because we wanted to get rid of him. Say well,

ah, Fire!, Fire in the hole, shit, he would go, ah, get going. He would get the hell out of the country. He was, he just couldn't take that. Banging, banging. So anyway, we finally convinced the old fella that if he bought a pickup with every thing in it. There is a pump in it. There is a water tank in it. And all kinds of ah, in those days they had, there was can, five gallon cans, you could pack it.
FL: Yeah.
JJ: You could pump it.
FL: Yep, yep, now they have soft bags.
JJ: Yeah, and you could take that and keep it in the car and have your picks and shovels. Or what ever you need in the, to fight the fire. And have one over there patrolling. Over there by Sugar Mountain. And the other one over here in Mill Creek. And if you see smoke you are there before it gets a going on you. Because that guy could see over here, he could see and he could call in a fire that started in a certain place. They get right up to it. If they could get it, they would, if not they would call back. But they could put that fire out every time. But these guys up here don't get off of their black ass. I give them hell all the time. I tell him, by God, you fellas. Like this last Sunday when that fire started.
FL: Yeah.
JJ: Stated over here. Where they at? I called them up there. I see smoke come up over there. I called, nobody there. I called every God damn place, and all I got was ah, "I am away from my desk…" and all that shit. I said, I don't give a damn how far away you are there is a fire over there. And that's how it got started. It burnt more, but it didn't hurt anything. It didn't hurt much.
FL: So do you thing fire, like, whether it's man set, like Indian fires or lightning, is bad for the forest? Or what's your thoughts about fires?
JJ: My, my, what-a-call it, my thing was as a young man I worked around my father and grandfather, and my grandmother. We always packed out up the hill. Up this. There was no roads then. Had to pack an old mule, with the cans and everything going up here at four mile
FL: Up towards Buckhorn?
JJ: No, right up this, four miles up. And there was nothing but tanoaks. Just nothing but tanoaks. We would go there and pick up, ah, acorns. And, ah, what-a-call them, there under the…
FL: Mushrooms?
JJ: Oh, what-a-call, ah, season.
FL: Pepper nut [Cal. Bay laurel].
JJ: No, ah, what the hell. Huckleberries.
FL: Huckleberries. Oh yeah, huckleberries are good.
JJ: So I always picked there. And they call it sacred ground. It's not sacred ground, it's a camp ground where everybody camped. Because there was a good place there. There was water there. There was rock wall where you made, like, a stove. And they cooked on it. And they picked acorns while they were there.
FL: Yeah. What time of year was that?
JJ: That's in, well, ah, oh, I see, it could be October, November. When ever…
FL: October'ish?

JJ: In October I think. And always, and then if any fire breaks out, well then we were right on top of it. See. But now they don't do that no more. They don't go out there, they. Like those two cars. They go back and forth, they drive from that end of the valley. From up on the hill. They didn't come down here. They went back and forth, like Pine Creek. And this one was over here, and ah, on the, what-ah one had the, this road, one going up Mill Creek. And that's the only one, then they patrol that on top, then Forest Service had one out there.
FL: Ok.
JJ: So they patrol that.
FL: I am curious about the acorns though. When you used to go up and collect acorns with your family. Because…[Phone rings, Jimmy stops to answer the phone].
JJ: We used to go up there and by that time two more come over there, two more dogs.
FL: After that bear. He was.
JJ: He was running on his way. There is a panther here too, and ah, two of them. And last year I had corn planted right there. And God damn-it, I was out there holding corn. Corn was about three feet high, I guess. God damn I see something move, coming along, God damn it was that cat with his tail.
FL: Oh, black tip you could see it?
JJ: Yeah. Boy, I tell you. All I had was a hoe, I never moved. He kept going, went right on up. He got over to my fence. I just see him go right…
FL: Jump on over?
JJ: Then there is another one, kinda smaller one. Well, this was a big one.
FL: Yeah.
JJ: But I have a lot of fun.
FL: So I was wondering if you could tell me more about the fire? I don't know, ah. The reason why I am interested in it is because for land management today, and the forestry part of it. At least I feel it is important to understand how lightning fire affected the land and also too, how Indians were using fire for basketry material, or for foods, or how, you know, they were using fire, in places to burn.
JJ: Well, they used hazel sticks, you know.
FL: Ok, tell me about that.
JJ: What they do, they burn it down to the ground. They burn it right clear down to the ground.
FL: Did they prune it back or any thing first? Or did they just burn it?
JJ: No, no, they just burned it. Then they got a road around it. It is right up here towards Tish-Tang Creek. It is a big flat up there and that's where they burned all the time. So we had a forester here. He name was, oh let's what the hell was his name? Oh, it don't make any difference. He said, I will show those God damn Indians how to, if you want forest fire. He went up there, hired a bull dozer and dug all them trees out. Brush out. From way up on the hill he just took them and geez, cut every thing out.
FL: Through everybody's hazel patch, huh?
JJ: Yeah.
FL: How the hell they supposed to make sticks for baskets?
JJ: Yeah, that's right. He didn't think that's what they were doing. But that's the way he did it. And that's, and now they are coming back up again in some [places].

FL: Ok.
JJ: So that's how they did it. They build a road around it. They never would just set a match to it. They would protect it first.
FL: Do you know what time of year they used to burn for hazel?
JJ: Just any time now, after…
FL: Oh, ok.
JJ: After they get knots on them. That's when they burned them. There was so many things that they did. And, so like killing deer. They made their own deer licks, and…
FL: Oh yeah, with fire?
JJ: No. With salt.
FL: With salt. Oh, ok.
JJ: They would dig a big hole near the water. Some place where it was damp. They would dig a big hole and then throw a whole, damn near a whole sack of salt down in the hole. And cover it all up again. A lot of times they would get made because the ol'deer would dig them out. They made, they had to do it. Because I had a grandfather that told me all about hunting elk. He said elk was the easiest thing to kill. He said, because you just arrow in the stomach and they will die. He said I killed a lot of them with a bow and arrow. And he died way back, I don't know whether he, I talked with him, he was alive when grow up.
FL: Yeah.
JJ: I was about 13 or 14 when he died. He died at the age of 113.
FL: Geez, he was an old timer.
JJ: Yeah.
FL: You are going to be like him, an old timer too.
JJ: And he was telling, and he was telling me all about, he told me all kinds of things. He said when they put this reservation they, together, he said, the white man come in here they wanted to shoot us. He said they wanted to kill us. But he said, I had, he said, I got away couple times. They couldn't shoot me.
FL: So they were hunting Indians?
JJ: Yeah, they were soldiers he said. They had mustache. And I ask him about old General Grant. He was supposed to have stayed here [Hoopa Indian Valley Reservation] one night. But he didn't know. He was a soldier. But he didn't say soldier, he said "Long Gun." He had a long gun. And he said they stayed up there around the agency, where the school is now. He said he stayed there one night. And ah, so one day I saw, an old fella named Scott. They [whites] gave him a name, Scott. And I asked him, he was an old man too.
FL: Indian?
JJ: Yeah. I asked him. Did you ever see that fella? That solider that stayed in that building? That house now which is, sits over there, where General Grant, lived, stayed one night. "Yeah, I talked to him", he said. "I talked to him." He said he was drunk. Yeah. He said he was drunk. I talked with him. He said, ah. But he said he didn't stay long. No, he only stayed one night. [Back to burning] Ah, but everything they did, they protected it, before they did it.
FL: So they were always safe about keeping the fire…
JJ: About keeping the fire. We never had fire like that [catastrophic].
FL: Not the types of fires we have now?

JJ: Yeah. Just as soon as it starts, what'a call it, Thunder and Lightning. They watched it. [Stop for utility truck PG & E].
FL:[start interview again]
JJ: This tribe several times. I said, "What happen the wheel break, or something?" What it not going to turn no more? He said no more shut up. I said that's what they supposed to have done. Every time we needed a little more water, "normal flow," it just turn the wheel. Shit they never. They never did those things. They just now days, they just, what they's doing now. I, I could be wrong. I could be wrong. But the more fires they burn around here. The more money they going to get next year. To fight that fire. That's what's happening. Too much money. The grant, the budget is going to be bigger. Because look at the big fire they had this year.
FL: Yeah. [Stop and resume interview]
JJ: I go up to Box Camp and get my water. Its ah, I never forget that, I came through there one day and I see, ah, I see a pipe sticking out of the rock, a bunch of rocks, with water shooting out. So any way, I never thought anything. You know, next time I went by there, by God, that pipe was gone. So I asked the question, I said. I asked somebody, what become of that pipe. They said, oh, they pulled it out and threw it away. I said, who do you think did it? They said Forest Service man did it. I said, I don't think he would do it. They said, ah he did. Ah, so anyway. I guess one of the cowboys or who ever it was, went up there, was up there, they found that pipe laying down over the hill. They went and drove the damn thing into the rock.
FL: Oh yeah, again so you could get your water.
JJ: It shoots right out. They couldn't pull it out. They drove it in.
FL: Did you ever notice after an area burns if there is more water. Like springs?
JJ: Well, yeah. A long as there is timber you know. A long as there is timber there is going to be water. They are the ones that hold the water. The timber.
FL: What about the brush and the smaller trees?
JJ: Oh they, yeah, they all have to have water so they hold that water. That's where your spring comes from.
FL: I thought they would use the water. They don't suck the water up.
JJ: No, oh, hell no. Yeah, they use some of it sure, but damp all the time see. Ah, you talk to some of these guys who know a lot about this. I talked to guys who went to Stanford [University].
FL: Yeah, school?
JJ: Yeah, and ah, They said that some of the water is used like that by the tree. But the majority. But if you cut all the trees then there is no trees to hold the water in there anymore. That's why the springs dry up. They must of studied that.
FL: A little bit different than they way I was thinking of it maybe. I thought, may be if you burned off some of the brush you'd burn up some of the young trees. They wouldn't be using so much water, they would have it coming out the springs That's why I was asking you.
JJ: They hold the water.
FL: Could you remember some of the reasons why Indian people stopped burning like the way they used to. And why we have so much stuff that grew back now?
JJ: Well, to me, they, kind'a don't give a damn any more. They don't care. [Visitor, stop interview]

FL: So they just don't care no more? They don't try to burn for acorns, or for…
JJ: No, no. They burn for sticks.
FL: Hazel sticks?
JJ: Yeah. And then that bunch grass. They burn for bunch grass.
FL: Oh, bear grass? Yeah the bear grass.
JJ: They burn for that but they watch it pretty close. They don't have a great big, like, fire. They just burn so much. Yeah, there used to be a lot at Mud Spring. What they call Mud Spring up here. Yeah, we used to burn, I mean, ah, along where ever they think it should be burnt. A little piece. But we watched it. We burned that whole ridge right there.
FL: Is that what they call, what's the name of that ridge?
JJ: That's ah, Noah's Ark.
FL: Noah's Ark huh?
JJ: They call it that in Indian.
FL: Oh, ok.
JJ: On day I was up there. And, ah, I see a spring over there. Right now there is a spring up there. Right above Paul Jackson's place there. And I told my grandmother. I was just a young kid, just a young fella. Not much older than 14 or 15. I came back, when I came back into the house. Grandma, I said we ought to tap that place up there for water. Oh, no, no, no she said. She said the water that is dripping off the end of that boat.
FL: You told me about this before, yep.
JJ: Yeah, she said that is a boat laying there. And she said if you walk on it, you are going to find out. So one day come along I walk up there. Curiosity, I get up there. Geez, "woomp-woomp' [hollow sounding thuds] when you are walking.
FL: Mushy?
JJ: Yeah, so any way. She told me, you watch when it rains this winter. She said, that water's dripping off those roots over there. I said, yeah. It's dripping off in to a little pond like underneath. She said when this winter comes, its going to really. She said you go up and look, you going to see what. I finally later in the years, it was raining. And I went up there to look. The water was dripping same as it was the day when I first looked at it.
FL: Oh yeah. It didn't matter if is was rain or shine, it still kept its [constant flow rate] same level.
JJ: She said, that's the, what'a call it, the boat. The water is running off, ah, dripping off the end of that boat. So that road that runs down from up on that little gap ahead of it down to the main highway. The BIA had that road going up that mountain. Then they said why don't we have a road that reach the highway, back down the hill. And some person, I forgot who he was. He name was Campbell, his last name was Campbell. He said, don't do that, don't bother that. That's kind of, ah, damp ground. And the Indians call that the boat. They don't do that [mess with that area] Oh hell the engineers, huh. Knew all about it. So what they did, they went up there. They had a bulldozer and they started that road. And they build a road alright. They build it. That rain, that weather. The whole damn hill side came down.
FL: Down.
JJ: Come down the highway.

FL: Try to tell them.
JJ: Yeah, tried to tell them. But no, they knew all about it.
FL: So you said they used to burn along that ridge?
JJ: Oh yeah.
FL: For what acorns, or burn it to keep it open?
JJ: Where ever there was more acorns, or what'a call it like, they try to keep it from burning. Acorns trees, the berries, the different things we eat.
FL: Oh, ok.
JJ: There used to be a lot of wild blackberries, right up along that fence line right there. Wild blackberries, blacker than hell. God damn, good eating though, pie.
FL: The little ground ones, the little tangly ones, or big bushes?
JJ: No, the one along what'a call it.
FL: Oh, bigger bushes.
JJ: Some were damn near an inch long.
FL: Yep.
JJ: We used to have a lot of strawberries. We don't have any more wild strawberries. God, if you want to eat something that is sweet.
FL: Tasty one, huh. Small ones.
JJ: We used to take a cup, get a cup full and come home put a little cow's cream on that. God damn boy. We enjoyed it. We never, we always had, ah, we never had anything decent to eat. We might raise string beans. Or something in the garden. And that's all we ate, like, I told them kids today. We got along with potatoes and beans. We got a long with it. We didn't have no problem. I said, I know because I was one of them. Ah, they wanted to know about Indian doctors how they, how did we get along. [Kids asked] "We had no doctors long time ago?" We had them, I said, we had doctors. Because I said, I was with one of them. I was sick. I said this old lady, not the old lady. I was down here fishing with a trigger net for salmon. Spring time. I said the damn fishing place was no good so I move two or three different places. It didn't do no good, I didn't catch any salmon, so came home, the next morning I woke up, I had the damn'edst headache I ever had. And I couldn't figure out what hell was wrong with me. And we lived right over there close to the hospital. So they took me over to the hospital and the doctors looked me over. And they examined me and everything. Well they said you have spinal meningitis. Well, that's things going to kill you. That's what they told me, these are the words they used. So anyway they gave me medicine and it didn't do no good for about two weeks. Finally then, my mother, my father, and my grandfather said then, "Let's try Injun doctor".
FL: Ah huh.
JJ: See what he has got to say. We had an old lady living next to us. So anyway they asked the old lady if she would come over. And she would try to help us out an account of me being sick. I think I was 12 or 13 years old. Oh, I forgot, but anyway. [talks to cats and drinks water]. The old lady came up one night. They hauled me down to my uncles place. So they put me on the floor there and they had a mattress on the floor. She came up and she sang a few Indian songs.
FL: Kick dance songs?
JJ: No, no, regular Indian doctor songs, they are special. For certain sickness. Just like giving you something for, like, belly ache, or what ever. And then she sang this song.

And after she got through singing. She had a lot of help. Oh, there was about 6 to 7 people there. Night time. Well she said, I can see you. What was you doing down in that gorge down there? I see you sitting on the rock right here. I see you over here on that other rock. I see you here on that rock. What were you doing? Oh, I said, the fishing place wasn't very good so I moved to that other one. So I said, that one was not good so I moved to the other one, then I went home. She said that's what is the matter with you. You, the rules that the old people set here, you can not do those things. When you go fishing you stay right there. You stay right there.
FL: You were jumping around too much.
JJ: Don't be jumping around. And those people in that gorge wants to kill you. They want to kill you. But she said, tonight when I go home. I am going to try to talk to them to save your life.
FL: Oh, she was going to talk to the spirits?
JJ: Huh?
FL: She was talking to the spirits or who?
JJ: Uh-huh. She said I want to talk to them. The people who takes care of that canyon down there. There is people down there she said. But they watch out for that area down there.
FL: Spirit people.
JJ: In other words, what it is, is "Brownies", is what she was talking about. We call them "Brownies." So anyway she went home and next night she came up and she sang a few songs for a while and then she told her old man give me the pipe. The pipe so. They had a pip there. Load it up and she took about three good drags and nothing came back. It just stayed right like it. I was wondering what kind of tobacco. There is no cancer in that tobacco.
FL: Was it Indian tobacco?
JJ: No it was just regular tobacco that I could see. It was in the can. So once she got done after singing she had a feather. I'd say, damn near two feet long, you know. Black feather.
FL: Condor?
JJ: It was from a bird, I don't know an eagle I guess. And so anyway, she took that feather and go up from the box she was sitting on, and she fanned all the people that was sitting there, and come to me. And she was talking Indian the whole time. Back and forth. Some of it I understood, and some I didn't. And finally she raised her hand like that. And told her husband that to relight that pipe. He relighted and she took two to three more drags. And she opened her eyes and started talking. Well she said you know. They told me they are going to let you go this time. Don't you ever do that again. Those rules were set up for you, so not to destroy. To keep those rules. And she said never do that again. And she said, ah, you going to be all right. But, what she say tomorrow morning what they going to do. She said I can see it. They are going to pick you up off of the floor and they are going to set a rocking chair out on the porch. You are going to see the prettiest bird you ever seen. She said you are going to see, and I could never figure it out what I did. So, anyway. That was the longest night I ever did put in. And she said on top of it, your head is going to be like a squash. That's the way your head is going to feel. No headache. But your head is going to be like a squash. She said nothing in your head, just hollow. So anyway that was a long night I tell you.

The next morning by God I woke up. By God it was, no headache, but my head felt like it was hollow. And ah, so anyway, they, my mother and my father, they come over and talked with me. They picked me up and walked me out on the rocking chair out on the porch. I set there, oh, ah, a good half hour. And oh, all of a sudden like a fire, right by. There was some cherries trees lined up by, water. And one of those limbs was sticking way out like that, and that bird lit upon it. It was an Oriole.
FL: Oriole huh?
JJ: An Oriole, every color in the rainbow that Oriole. That was the final thing. And how and the how did she see that?
FL: Was it like blues, and greens, and purple and reds, or?
JJ: Every kind of color in the rainbow. It was a pretty bird.
FL: I wonder if it was a bunting, they call it a Lazuri bunting.
JJ: It might be, I don't know, but to me, it was what you call it anyway, an Oriole.
FL: An Oriole.
JJ: And I am still here.
FL: Yep. Got through it huh?
JJ: Now, what could it be what is it. She didn't have to go to school. Didn't have to do a damn thing. How did she know? But I found out later. What they do after the close their eyes. They try to over power the area where they are looking. For what happen to you.
FL: Tracers, they try to track it down.
JJ: Yeah, they going to track it down, to what happen. And that's how they find out things like that happen. And then, then they can work it out of you. So they used to, I told that story some place. Ah, one guy said, "hell, they just a God damn, what'a call it."[phone rings].
FL: So do you know if there was any rules about fire like that, spiritual rules about burning in sacred places or the high country. Like up at Trinity Summit or Mill Creek Lake. Did they ever burn around sacred sites like that?
JJ: No, no. They were awful careful about fire. That was clear out of our [Hupa or his family?] jurisdiction. We had nothing to do with it. But they [?] did hire us to fight the fires.
FL: Out there?
JJ: I remember, when I was young I knew men that went out, clear way out, towards New River and that country. They had a big fire over there. You know I never been to that fire. Only one time. I wasn't fighting fire I was riding a horse over there.
FL: Oh, ok.
JJ: There was a trail to it. They called it, well, when I went they called it Sawtooth mountain. And later on I was talking with a fella named Wesley Hotelling. He was a Forest Service man.
FL: Yeah.
JJ: From up, ah, Willow Creek. I talked to him. I said how about this Sawtooth mountain. "Oh, we changed that", he said. "We changed the name for it. We call it Mary Blaine mountain." And he said when the miners were in there, I didn't know this you know. When the miners were in there, in that area, mining for, looking gold. He said there was a camp in there where all these miners were looking, checking for every thing. No wonder I said, I found pieces of old cook stoves. I said I didn't thing

anybody was ever in there. Oh no, he said they was in there. So anyway when I came home, when I came home from there, I told my grandfather, I said, they [USFS] changed what'a call it, the name of Sawtooth, they changed it to Blaine, ahhhh he said that's white man. He said that's white man. I said, what the hell, what's wrong? Oh they had to have a cook. So they took, hired this lady, her name was Mary Blaine.
FL: Ah, ok.
JJ: And he said she got all the gold. [Suggesting she had sexual relations with the miners and got paid in gold]. That's why they call it Mary Blaine mountain today.
FL: Ok.
JJ: She earned all that gold out there. She probably cook alright enough, but she was doing other things. Those old prospectors out there.
FL: Keeping them happy, huh?
JJ: That's what I learn, and told Wesley Hotelling about it. God damn, he said, it could be true.
FL: Yep, Yep.
JJ: I have been all over Trinity Summit. I was up there when I was eight years old. I rode a pack mule up there. I sit on the pack, what'a call it, all the way to Red Cap prairie. My aunt had TB [tuberculosis]
FL: Oh.
JJ: The thinner the air was the better she felt. So every summer, like June or something like that, she said, well let's pack up and go, after school. After school vacation. We used to go up there. Every year I went until I was fourteen years old.
FL: How about that prairie, you said, Red Cap prairie way up in there. Was that Indians burned to keep that open, or was that just part of lightning? Or kind of rock or soil? What was it?
JJ: It was a creek, creek, just steep.
FL: Oh, ok.
JJ: It was really something though. But now I understand, I don't know how true it is, but people were telling me that the President of the United States talked on the radio, and on TV that he was going to have the Forest Service cut all the dead trees down [Healthy Forest Restoration Act].
FL: They have this thing called Healthy Forest, they want to cut out the dead under brush and under growth. So like, that is one of my questions. So, how do you feel, traditional burning, like Indian burning, could be used to restore forest or prairies? Or other places that would help wildlife or the fisheries? If you had recommendations about how to take care of the forest.
JJ: It's going to help the deer.
FL: Yeah.
JJ: But I don't think it's going to help anything else. Because the deer is going to get that fresh grass.
FL: Ok.
JJ: They're going to get it.
FL: What about the shoots that grow back after burning?
JJ: Yeah. They go right after that stuff. And that's going to add, a lot of places where the fire hadn't burned you will find acorn trees about that high.
FL: Oh, about 3-4 feet.

JJ: And they eat those acorns and get fatter than a hog. Because I killed some bucks in there. I know. God damn, fat in them about that deep.
FL: Nice and big fat ribs. Good eating, huh?
JJ: Oh Christ, tender. So it, it will help. But leaving trees to rot. I don't know. There is a lot of good trees among the fire yet you know. They going to let them go, or cut them down. But the longer you leave them, they no good. They aint going to be any good.
FL: But you have to leave some trees out here, don't you? For like wildlife, woodpecker and stuff right?
JJ: No, ah, they. Woodpecker get any God damn thing they want any time.
FL: Oh, ok.
JJ: They can fly, they fly from this ol'ridge over here to clear over here into this place. It's right there you can hear them. "hearp, hearp…"
FL: Yeah.
JJ: You don't have to worry about them. You don't have to worry about them.
FL: Oh.
JJ: There's like a panther. Who don't stay in one place. He sleeps here, and tomorrow he sleeps way up on the hill. See. He just wander around. All those woodpecker they have a…
FL:[50:30] [Cat rubs against Jimmy's leg, then jumps on table on mic, tries to drink Jimmy's water out of glass] Do you think there is a way they could use fire to make a better forest? More wildlife, more acorn resources, more bear grass materials. And how would you suggest that?
JJ: Well I tell you, ah, as long as you don't log the country, your not going to have no trees. It's just like pruning. Trees, they rot, you know. And to me, I fell trees and I have seen trees felled. And they looked so good. Big old back Sugar Pine, its just a perfectly good tree. Because there are limbs when it goes up. When you cut all the trees there is no more, what'a call-it, for the trees go grow up. Break the limbs off, and they grow over it. When they are young they grow over it.
FL: They get kinda shade branches and they fall off.
JJ: You'll find knots inside of the tree.
FL: And it grow good clean grain on the out side.
JJ: You see, the outside it good. So that's what I find out about trees. There is no way. I had some people, some ah, environmentalist from, where in the hell were they from any way [question to self], well any ways, from out Los Angles. There was a bunch of women come up here one time. They wanted, they were looking for me, and they wanted me to take them, and they wanted to see why is it you people are cutting all the trees down.
FL: All ok.
JJ: Why are you people cutting them down for? Well I said you build a house don't you? [Them] Oh Yes! Well then I said, "may be we have to use lumber to build a house." [Them] Oh no, you don't have to do those things you have other things you can do. I said, "Well may be you believe it but I don't." There was a bunch, I think there was 5 or 6 of them. I forget. So any way. They said, "Could you take us out", they had a big van, "Take us out where we they, we will show you where it looks like they cut all the timber down." Ok. We end up in Bluff creek. There is a nice road

there. I know one place, they were, there was one tree, that was fell 50 years ago, there must be 100 to 200 trees coming up.
FL: Right in that patch.
JJ: Yeah. All from around that stump, one stump. [stop to talk about federal officer on hwy. 96] But anyway when I took these people up there. So I took them. I showed the where these trees were cut, and I said “you see the reason why we cut?” Look where they cut over there I said. Look at them old dead trees, what good are they? I said, what good are those trees over there? They are dying up high up on the limb. I said, you know what kill those trees? [Them] Ol’well, they just got old. I said, No. Bugs.
FL: Bark beetles, huh?
JJ: Yeah. They eat those things and then they kill those limbs. And they eventually kill the tree. I said that’s what happened. I said, you see what happened? Don’t you think that tree ought to come down and hit the ground? Before it spreads it. Before that beetle get enough, goes over to the other one? And start damaging that tree? Oh, oh, no. They could do a lot of other things. I said, well here are still quite a few trees. So I knew where there was some more, and I said we got to go on up. Now, I said. I am going to show you something. You saw that poor old stump down there. There was about hundred some, standing, trees coming up along side of it. I said, now we are coming up to this one. I said this old stump between the trees. Now what are you people talking about? I damned near had them changed. I damned near. [Them] Well, ah, we’ve been told. No, I said We live out here in the mountains and we know what it is all about. And you people are from the city. All you can see is flowers and stuff. But I said, I do believe in cleaning up the trees. The dead ones get them out of the way. Ether leave them laying there or log them out. And maybe make wood out of it. Do something with it. But, they agreed with me. They were agreeable when they left. I never did forget them. But, I knew who they were. I didn’t want to say anything. But, I don’t know. I never did hear anything from them any more.
FL: Yeah. I guess they went back to the city, huh?
JJ: Yeah. I get a kick out of it.
FL: Do you ever remember, any old time stories or legends? Indian stories about fire or burning, or anything like that? Coyote stories or something like that?
JJ: No, no. I never did. We never had too many fires. Because we put them out as fast as they burnt.
FL: Was that even before the government, before the white people came here? Indians used to put them out?
JJ: No, no, they didn’t have too many burns in the early days, according to my, ah. It looked like they had a lot of sheep in the area. It wasn’t as many trees and brush like it is now. In the last ten years is when you seen all this brush. And we, what I have been trying to do. They get a grant to cut all the brush around the home.
FL: Yeah, yeah. The call it fuel hazard reduction. Defensible space.
JJ: Yeah, so. They come here and cut the brush around the house. Then they go away. They cut brush way out there in the mountain. What the hell, we don’t want that. It’s going to burn anyway. If it’s going to catch’a fire, it’s going to go. Why not start cleaning-up here and go right on up in a swath. Clear all that out. Move over here, take another swath. Keep’a going, pretty soon you will have the brush cut. And all the dead what you call it. Pile them up. It makes jobs for the people. I said, it will make jobs.

And there's a lot of people looking for something to do. They wouldn't work for what we worked for. A dollar a day. I said they wouldn't work for that. I said, You guys are spoiling them. Like I told my own people over there. They are cutting timber. The guys falling timber getting $14/thousand [board feet] falling timber. I was in the council. And I told them you know what. If I was in your position, you guys, you foresters, I would pay those guys $5/thousand for falling timber. [Them] Well, why, why not pay them… I said, No. You guys got the habit of paying these men what ever price you set, sky high. I said you can't come down. You will have to come up. So it's going to cost you more. But if you had given him, ah, a small fee. Then you could see they could do this job. Then you give them a raise. But I said, if you are there on top, you aint, you can't come down. You gotta go up. I said you guys are just completely wrong. I said you guys better change your ways. But they never do that. And I said, another thing too, I said I fell timber in my days and would get up at five o'clock in the morning and go up there and may be cut myself be two or three big trees and make myself may be $200 dollars, tomorrow morning, and come on home before lunch. You see how much money I would make, you see what's happening. You guys are paying too damn much money. And I said, some of those guys. You have a bull-bucker, out there he is not even scaling those logs. He just let them scale it. They, I said. I have been a bull-buck. I know if I let those guys scale their own logs, they will add an inch to it. I said it's alright about a little log, but when you get a big, big log around 25-30 inches, I'd say, then you are gaining a lot of wood. I said, why did you guys hire, what-cha call it, one who doesn't even know what he is doing. I said, that man you got out there in the woods. I don't like to say this, but I worked in the woods.
FL: A young guy or older?
JJ: Younger. I said, you got bosses out there right now that aint worth a damn. Why are they bosses? See, like here the other day. I used to listen to them on my scanner. They would break something to just kill the day. Bring the machine, or something to be welded. They would bring it clear over here. Where there is a mechanic with a car with everything in it. Who could drive right out there and, ah.
FL: Yeah. Fix it on the site.
JJ: No, they would bring it back down here and kill the whole day. Sit around in the woods. And here this last one I heard. My grandson is a cat-skinner, you know. So I talked to him about it, I said. He said, I am going to quit. The hell with them fellas up there he said. I don't want to be mixed up with them, he said. What the hell, I said. Geez, you a cat-skinner, what the hell you don't have to. Yeah he said, You know the other day I was up there, and he said. I was getting logs, and he said. He got two choker-setters on the cat. I backed up to a bunch of logs. He said, two guys were setting on a log next to, a log away where he backed up to these logs. He said I set there and waited for them. I thought they would set the chocker, or… They set there. He said, I had to get off of my own cat and set my chokers. And those guys just sit there. He said, I'm going to quit. I said no, no, don't quit. He said well, if they fire all them guys, I don't want to be mixed up in it. I want to be away from it. Now that's the way they log, I know.
FL: They are loosing money then.
JJ: All the time. What they did now. I told them all about the logging too. I said you guys are logging. You got three machines. You got a yarder, you got on big D-8 cat,

you got a 7, D-7 cat, and I said, a three drum rig. And I said you guys are contracting it out. And I said that guy who is contracting out is making money. Where you should be making the money. You should be making the money. You log it out. And you make the money. No you have to pay them $250/thousand to log the timber out for you. And I said, you only getting $500/thousand for it. I said, what in the hell are you making? You have to fall the timber, you have to log the timber, you have to load the timber, haul the truck.
FL: Clear the roads.
JJ: Now what and the hell are you making? I says, tell me. Jesus Christ, ah. Them foresters. He just shook his head. I tell them. It don't take me long to tell them fellas. They know too, when I come to the council if they are going to talk on timber. Yeah, they know. Oh Lord, they all say. Here he come. Well, I said, Jesus Christ, you got to make money some way.
FL: Yeah.
JJ: I said, you guys ain't doing any good.
FL: Is there any last things you want to tell me, or you would like me to learn about Indians burning, or any last things you might remember about what you saw when you were little about people burning places.
JJ: They never burned anything. When they did burn, they just burned enough to save this tree, or pick up the acorns. They never set a hot fire. No.
FL: Always cool fires? A small area.
JJ: They were always careful about it. [**Company comes over, interview ends**]

Darrell McCovey (Yurok), Age 79 and Mavis McCovey (Karuk), Age 70.
Interviewed by Frank Lake (FL), August 29, 2002, Orleans, CA.
Consent for voluntary participation verbally given and signed on IRB form

FL: Would you tell me your name and your age and tell me what tribal background you are.
DM: My name is Darrell McCovey, I'll be 79 years old the 30th of this month.
FL: Geez, that's a couple of days, huh, tomorrow isn't it?
DM: Yeah.
FL: Geez, well happy birthday.
DM: And I'm a Yurok.
FL: Do you identify with any village?
DM: I was born down at the mouth of the Klamath River.
FL: Oh, Requa, huh?
DM: Right across the river from Requa.
FL: Was it, they call it *Welthwa.*
DM: It used to be commercial fishing in them days and my dad and all of them used to go fishing for six weeks, be somewhere.
FL: At Dad's camp? Where Dad's Camp used to be? [Place on south spit]
DM: No it was Sturgeon's camp. Up the river from Dad's camp.
FL:OK, Alright,
DM: Sturgeon camp they called it.
FL: What traditional, I guess, cultural practices and things did you grow up learning?
DM: Not too much. Just like now, like Yurok language, I talked more of that than I did when I was a kid.
FL: Oh, the language?
DM: Yeah. I can't talk it. I can understand it but I couldn't talk it. Not somebody to talk to nowadays, older people, I'm the oldest one around nowadays.
FL: Yeah, yeah. So did you ever go out and go collect other wild foods or anything? Or acorns or hazelnuts, or ever go and get other wild foods when you were younger or growin' up?
DM: Oh I got, I went with my mom, we used to pick acorns around. That's about all. I used to go huntin' with my dad but I never did kill anything, I just went along with him.
FL: What about fishin'? Did you do quite a bit of fishin'?
DM: No, I never did fish either, until just recently 'til we got our own. But I never did. Like in the summertime years ago they used to allow these Indians to guide tourists in the mouth of the river, but I never did. I was, I guess I was too young. So I never did, do any guiding or anything like that.
FL: So what where were some of the places you used to go out to get acorns? Did you ever go out with people and see basket material getting collected or anything?
DM: Oh yeah, I used to do that all the time. My mom, used to, down at *Notcho* we used to live. Like every fall, she'd burn, just you know so next spring, all these new shoots would come up and she'd go out pick her hazel sticks. She did that every fall.
FL: Huh, about what time of year?
DM: Oh, it was after the first rain or so.

FL: After the first rain, just kinda lay the dust down a little bit.
DM: Mostly just, there was no underbrush in them days. Mostly leaves that would be burning. I used to see it around Weitchpec too, above, over that road there from Pearsons and they used to burn there too every fall. They would just burn the leaves. They didn't burn the.
FL: It never got into the tops of trees.
DM: No it never did, yeah.
FL: Now would each people burn their little area, or how would they?
DM: They would just burn mostly, yeah. My mom just burned a certain place where she would burn. But this bear grass, that was way up in the mountains like. Lightning fires would start those. Then it would burn and afterwards she'd pick her bear grass up.
FL: So she pretty much let the lightning fire burn the bear grass.
DM: Yeah, because that bear grass would grow up high…didn't grow down here low.
FL: So how old were you when you first started seeing fire, or you can remember that, going out with your mom seeing her burn stuff?
DM: Oh, ten, 12 years old probably.
FL: So what was it like, was it exciting?
DM: Yeah, I used to like to go out. Not really, but I used to, what I really hated was when my dad used to set eel traps, and he used to go down there, sat there for hours while. He used to pound hazel sticks into the river bottom and hang the eel traps off of those. And that's what I used to hate, cold sittin' down there. But I did it. We used to always used to catch a lot a eels. God.
FL: About what time of year would those come through?
DM: That was in the winter time mostly. After the first river raising, after that, that's when we use start settin' out them, I call them baskets.
FL: Were they stick baskets?
DM: Yeah. My mom used to make 'em.
FL: What were they made out of? What material?
DM: Hazel.
FL: Oh, she had to burn her sticks also, huh?
DM: Yeah, uh huh.
FL: Was there any difference when she'd burn for her burnden baskets versus hazel sticks?
DM: My mom wasn't much of a, she was good at rough-like baby baskets, she made those and, she wasn't much good at this finer stuff. Like eel traps and baby baskets, she was good at that. She wasn't good at the finer Indian things.
FL: Like fine caps and trinket baskets.
DM: She could do it but they weren't as fine as the other ones.
FL: So you were about 10 or 12 when you first started seein' her lightin' fires?
DM: Uh huh.
FL: Would she just kinda take you along? Or would she actually show you how to do it?
DM: My dad used to go with her, most of the time. Well, they didn't go very far down, just above the road down there, at *Notchco*. Just above the road. We used to call it "Brushy prairie". That's where most of this hazel brush grew. Then we used to, they

used to burn between Weitchpec and Martin's Ferry, lot of them hazel sticks grew there. She used to pick sticks there, them hazel sticks.
FL: So she burned that in the fall?
DM: I don't know who burned that. I guess those people in Weitchpec did their own burning, [Mom] just by that one spot in *Notchko*, that' where we, she used to burn that that I know of.
FL: So how would they start the fires?
DM: Oh, just matches. Mom would, just kinda when they walk along. There were no trails up there at Brushy prairie. Just above the road there a little ways. And it would burn itself out, oh, maybe a mile or so up the hill from where she set the fires. But it never did get in the timber, way up high, it never did get that high.
FL: Would there still be wild grapes, or the buck brush, or the other kind of brush growin' up around there or would it all be burnt back down too?
DM: They would all be burnt down. Mostly the hazel then, there was no buck brush or anything like that.
FL: But that took over [Now since less burning]. So, were there other things that she might have burned?
DM: That was like the only thing, like I said, bear grass up at, that grew way up high, she never did burn that. But we used to go out, drive out there and get it.
FL: And like you saying the timing was important too. Because you didn't want to burn it, it was too dry.
DM: Yeah, when it was too dry.
FL: So was it usually after the first rain?
DM: After the first rain, yeah. Well everything was pretty dry yet. [the fire] But, nothing would crown. [It] would just burn the underbrush.
FL: And like you were saying, afterwards, they just let it go up the hill and no one [cared].
DM: Yeah, just let it burn itself out.
FL: Neighbors never got concerned?
DM: No. Well, Oh I guess everybody did it.
FL: Yeah so if all of your neighbors are burning it. It's different then how some of the white people might be, where they didn't want fire on their private property, whereas Indians, it sounds like, it's more like you could just burn some of area right around your place too. So did you ever see them burning anything for like acorns or anything like that?
DM: No. Acorns, ah, those acorns, were big tan oak trees. That's where them acorns, there's a bunch of acorns right back out here [behind his house up Ferris Ranch Road, Orleans]. Nobody picks acorns much here lately, that I know of. I remember down at Martin's Ferry there was, goin' up to Martin's Ferry hill, there was, you know, we used to go up there and pick acorns. We used to pick great size. Mom used to crack them and, up in the attic she used to dry them up there. Get ready to grind. She'd grind 'em up and put 'em in big jars and whenever she want to make acorns, she just made some. But she never did use it rock. She'd just boiled it.
FL: The whole thing, huh? Oh she didn't have to use a fire rock? She just boiled it in a pot?
DM: Yeah. Uh-huh.

FL: Some people, like, when you do the hot rock, and put it in and stir around, I just boil most of mine too.
DM: Them rocks, what they boil in, they used to tell. The boys couldn't [lick] them acorns, used to stick to them rocks, you know.
FL: Lick the rock.
DM: Yeah, yeah, they said the boys couldn't do that because they'd grow up being poor. That's what they used to tell us. So we didn't get to lick the rocks.
FL: That's too bad. [laughs] That's funny. Do you remember other places that Indian people would burn? Like maybe your family or other people talking about it? That's not burned now.
DM: Mom was about the only one who knew how to burn, for her basket stuff, she was about the only one I knew that burned. I guess other people burned in Weitchpec. But them days, we didn't go very far you know. No roads we had to go, by, I had to walk.
FL: How was the trails back then?
DM: There was good trails. Yeah, there were really good trails.
FL: How did they keep those open?
DM: I guess they kinda brushed them out. <u>I remember there was one trail between the forks of Pecwan Creek. There was a trail goes up to, what you call, *Acekool-nu* (?) camp they called it, oh, five, six miles from up the river up there. There was real good trails up there they keep, I don't know who kept it open but I remember when I used to go out there, and there was real good trails. Before this, the Indian people, they used to gather acorns up there too</u>.
FL: Oh, that far back, about 5 or 6 miles back?
DM: They didn't go that far out. I remember they used to make those chairs where they used to rest.
FL: Yeah. Oh, those little rock seats?
DM: Yeah. I remember every half a mile you run into one of those I guess.
FL: Do you ever remember them burning down along the willow, river for anything?
DM: Just for fun like it's grass used to burn.
FL: Yeah, who would do that?
DM: Just a bunch of us kids, you know. Just these old women would go bitchin' around about that. But the men they didn't care, because they could run. You know, they're cattle, they just let 'em run wild. They burn the grass if they burn it dry they did'nt hurt anything.
FL: Down along the river bars?
DM: Yeah down along the river bars. Didn't hurt nothing. But a lot of them old ladies.
FL: What time of year would you kids do that?
DM: Like in the fall time when everything was dry. Oh they didn't burn it, just burn the grass, didn't hurt nothing.
FL: How would it look when it came up in spring?
DM: Yeah, when it was spring it'd, ah, be all nice and green, you know.
FL: Yeah. You seen any wild flowers or anything?
DM: Yeah, That was down at Johnson, when we did that. Down along the river bar, burn that grass.

FL: What about prairies. There seemed like there used to be a lot more prairies in the open meadows and stuff.
DM: Yeah, seemed like there was. Well I remember there was one down there we called *Plox-sal* (?), I remember that, gee, it used to be. Then all these trees grew, about took over that. Just about now it's all covered with trees now.
FL: How did they keep it open and how did it used to be prairie?
DM: I don't know how they kept it open.
FL: Do you think they would burn it?
DM: No, I don't think they burned it. Maybe they did. I don't know.
FL: What about higher up when you used to go huntin' with your dad. Did he ever talk about how fire was important in the higher up mountain areas or anything?
DM: Not that I know of they never did burned. Or set fire just to burn. I never seen 'em do it. But mostly, they just let lightning fires up high like that.
FL: How far do you think the Indians actually would burn the forests and stuff for hazel or for whatever away from the river versus what may be, lightning?
DM: Hazel didn't grow too high. Just maybe a mile or so from the river. And that's as far as I know they burned. Unless there was a wild fire but, then the wildfire, they light that for their bear grass.
FL: Yeah. Were people not as afraid of wildfires as we are today?
DM: No, well, they weren't that thick you know, because most, well, the wildfires, they just let it burn, they didn't try to put it out. They just let it burn. It didn't really hurt anything. They didn't care anyway. They didn't log or anything so they didn't care if they burned the trees or not.
FL: Yeah. It probably wasn't as thick as the brush, right?
DM: Yeah, it wasn't as thick, everything was all, there wasn't hardly any underbrush in them days, you know. Not like out here you know.
FL: Now it's pretty thick in places. So when you think of brush, you know, that's grown up now versus wasn't there before, what is it? Like young fir trees or buck brush or what's.
DM: Just mostly poison oak brush like out here, poison oak and buck brush and all that.
FL: And before that, it would be burned off, huh? Cut back. Do you know if they ever burnt farther places down river, like at Requa or anything?
DM: I don't think so. Well I never did. Requa, everything was so damp around down there anyway.
FL: Because, Merky Oliver used talked about how it used to be more open down there and there was more of that big fern [Bracken] that they would dry the seaweed on. And in the old pictures of Requa they're lookin' towards *Oregos* [Tucker Rock], it was more open. So I wondered there or like, or just anything you might have remembered people talkin' about or heard other Indians saying, "Oh yeah, we burnt here or there", you know, that's the kind of stuff I'm interested in.
DM: Most of them, I know they burnt where they lived, you know, They didn't [burn other places] that I know of.
FL: So Johnson's
DM: Yeah, yeah, Johnson's and up, as far up as the *Kepel*, them days. Everybody burned along, above the road in the fall time just for …

FL: Do you remember anything about the old fish dam at *Kepel*?
DM: No, I don't.
FL: No, cuz there was one reference in an anthropologist book about how they would burn after the fish dam.
DM: I never seen one of them fish dam.
FL: What do you think the main reason why Indian people stopped using fire, or why they couldn't burn as much any more?
DM: Well most of them quit making baskets and stuff. They had no use of going to get sticks, of hazels or willows or anything. They didn't burn willow because most of that grew along the river anyway. But most of it they just burned for their basket material.
FL: So when they stopped needing to rely on baskets they also stopped having to burn?
DM: Yeah, they just quit burning. Yeah.
FL: Other people have talked about like government policies or things like that, was, do you think that was less of an effect?
DM: I don't know.
FL: Can you think of times or places, times of year or other places when Indian people wouldn't burn a place?
DM: I don't think so. They just burned where they liked their baskets, that's the only place where they burned. They didn't burn where they picked acorns, they didn't burn the, well. I guess if they burned around there they'd burned up all their acorns. They were on the ground already.
[Mavis enters the house]
Mavis McCovey: Well, what did you get out of him, anything?
FL: It was fun. Right now, we're still doin' it. You can sit down and join us if you want. You can add some more. We're just talkin' about burnin' hazel, how his mom used to do that, then, I was wonderin' about other things, that you burned, and I was wonderin' why they stopped, one of the reasons why they stopped burning. So.
MM: They'd pick you up and throw you in jail. I lived down there for almost, what 15 or 16 years and the first part of time I lived down there they just burned all along the road, different spots where there was hazel sticks and they just set it on fire anytime they felt like it.
FL: That's what he was just saying.
MM: And then pretty soon they started doin' it less because the police would look for them. I say probably about three, four years before we moved from down there. Probably about 1960, and then it tapered back and they still did it, and they're still doin' it.
FL: Yeah, you just have to be more sneaky and sly about it that way you don't get caught. Yeah.
MM: Pretty soon, Carol my daughter worked for the Forest Service over here and she said, you know they put funding into the Forest Service up here for where those fires down at Weitchpec the Indians are setting all the time. They're funded. They get special funding, just for that.
FL: I wonder if the Hoopa Fire Dept. does the same thing. Keep all those guys workin' all year round, huh?

MM: They burn all the time over at Hoopa too. They say there arson fires.
FL: They say there arson but they're probably for some cultural practices.
MM: But the other people over there, the older people say they're setting fires now and they set them with disregard to where houses and stuff are. And before they set fires, there was always, ah, you always notice they set fires at Martin's ferry and on the Hoopa bluffs and to one side of where you went up the hill, the Smokers, they never put it on this side, there's hazel in there, never did it in there, they always put it in the other side.
FL: The east side where it's sunnier?
MM: They went south.
FL: Oh, down Pine Creek way.
MM: No, south. Going towards Hoopa. And instead of burning right below where Smokers live, they go clear to where Pearson's old store was and then they burn down that towards Hoopa that way. But of course when the wind comes up, in the afternoon, they burn these fires in the afternoon or in the morning. And they put these fires out and of course the wind would blow them.
FL: Carry 'em up. Some of them would burn however many miles back up and then go out, huh?
DM: I remember above Pearson's and a'ways, they used to burn that at night it's just like a ribbon of fire.
FL: You could see the front part of it going up?
DM: Yeah.
FL: Was that Deerhorn Mountain? What's the name of that mountain?
DM: Yeah, at Deerhorn, yeah.
MM: They still burn a lot around Deerhorn Mountain. There's a house up there now. But they still burn a lot in that area. You see it all burned up.
FL: And there was hazel over there?
DM: Yeah, there was hazel above the road.
MM: And down Martin's Ferry they really did a lot of burning. They did different spots all the time.
DM: Clear down to Martin's Ferry bridge they used to burn there. Was nobody lived around there any way.
FL: So it was kinda in between houses or village areas that they burn.
DM: Yeah.
FL: I was just trying to think about other things about that. Because, I've looked at some old historical photographs and I should probably bring 'em by and show you sometime. There's some from 1890, I have some from 1920, and then we're trying to take pictures the same place today and show how much it's changed. I usually pack them around in my truck but I left them back up at the college this time. I'll bring them down and show you, I got pictures of Weitchpec and Martin's Ferry, and you can really see that. That's one reason why I started wondering, how has this all changed. You know. I guess that's why I'm asking the questions.
MM: But they were freer to do it down where he lived. He was tellin' me about the trees being little. Just little trees, all the places you'd think about by a certain lake up there, different places, there was just little trees, like, little Christmas trees coming up when he was young. And I told him so, my grandfather had that experience when he

was young up here [Orleans]. They were about a hundred years later, 60 years later that they had to quit burning down there.
FL: And that's when the fir trees came up? Ol' Douglas-fir?
MM: Start coming up in places that there weren't any before. They said like some little prairie up there some place with a little lake by it, he said little trees were just starting to come up, like I told you they burned those prairies.
FL: Do you remember your family talkin' about how the land was starting to change then? They were complainin' or growlin' around about fire not being able to go as much as it could?
DM: My folks never did growl about it. Probably my dad set fire way up high. I don't know. They probably did burn way up high for.
MM: Darrell was a sickly kid so he didn't go with his father. He stayed. From what I gather, just the way his uncles acted, that he was with his uncles a lot, younger uncles a lot, they were probably as old as his oldest brother. And he was with them an awful lot. And I think they were, that he couldn't get out there and play with the other kids because he had heart disease, rheumatic fever when he was a kid, and so he didn't go with his father like a boy normally would.
FL: You did say you were a lot with your mom and watched her a lot?
DM: Yeah, I used to go with her, I could keep up with her.
MM: His dad could walk his youngest brother into the dirt. That was 9, 10 years younger than him.
FL: Yeah, geez.
MM: And he could pack twice his weight. Daryl had a younger brother that was married to Julianne Sterrit, and he was that way. He only weighed about 160 pounds, 150 pounds, and he could lift at least his weight packin'. Just no problem.
FL: Bring a big ol' buck down the hill, huh.
DM: Yeah.
MM: Just get underneath it and come down. Daryl couldn't do that. He was bigger and had bigger muscles and everything. He never could lift like his younger brother could.
FL: Different bodies. So do you don't remember people talk about burnin' willows at all?
DM: Like I said, willows grew along the river. I remember we used to break 'em down. And like in wintertime, we break 'em down so new shoots would come up. I remember doing that.
FL: Was it the same kind of willow that grows up here?
DM: Yeah, yeah.
MM: The gray willows. They only used the pussy willow root.
FL: Ah really, I thought you could just use pussy willow for basket trap or something.
DM: No, they were brittle, they would break.
FL: Oh, ok. Well it's a good thing, I won't try to use them next spring.
MM: Use hazel for the eels. Like I told you, they burned a different time for them.
FL: But then the willows, what do you mean by break 'em down, you just knock 'em down?
DM: Just break 'em, whatever could break.
MM: Stomp on 'em, jump on 'em.

FL: That'd help, cause 'em to resprout, huh? Did the older people tell you to go do that?
DM: Yeah, they didn't tell us but they didn't care you know.
FL: Yeah, yeah, but they went and got the sticks afterwards?
MM: They told you not to do it.
FL: So that you would? [laughing]
DM: Yeah, if they told us not to we would. Yeah, if they told us to go ahead and break, we wouldn't do it. Not to, so we broke 'em. [laughing]
FL: Mischief, huh?
MM: He was telling me how they get in cherry trees, old seedling cherries, and they get up in these cherry trees and these old women get out and chase 'em out of these cherry trees. And he says, and they never picked the cherries that were in these cherry trees but they wouldn't let those kids get 'em.
DM: Yeah, God, the old ladies down at Johnson. There was a couple of old seedling cherries there. Get up there, god, they run us outa there. Then we picked them. Those cherries were about the size of redwood trees, too. They were big trees. That would make everyone pick them.
FL: [Just in your time growin' up, or maybe in stories from other people too, did they ever talk about connections between like fire and wildlife or like fire and water or anything like that?
DM: They didn't talk about fire chasin' all the wildlife away. They kinda want to see fire like to me. When they're hunting, they didn't like that brush. So they didn't seem…
FL: So the fire was actually good for the wildlife? Keep it open. Did you ever, even after burning through the hazel areas, those prairies, did you ever see it different times of the year and see more wildlife there or anything?
DM: No. Like the hazels, I seen where they'd burn and there'd be more of those. But on these prairies, grass would grow better, it'd seem like.
FL: Ever seen deer in there feedin' around?
DM: Oh yeah, you'd see a lot of them. They come out in the prairies a lot.
FL: Do you think there's ways today for management that we could use Indian burning, like you know, start bringin' some of it back?
DM: I think so, I'd like to see it, let 'em do that.
FL: What do you think would be the priority? Like what areas do you think we should start burnin' back in first?
DM: Well, like I said between Weitchpec and Martin's Ferry, they used to burn that every fall. That's about the only place I ever seen burned. Only except down, we used to live down at *Notchko* my mom used to burn, and that's about the only place where I seen where they burned for basket material.
FL: So you think that would be a priority to start burning those types of places again?
DM: Yeah. Did you ever drive between Weitchpec and Martin's Ferry? Well, it used to be just clear, no underbrush, nothing. Now it's all overgrown.
FL: What were the trees that were there then?
DM: Well just like they are now. The fire didn't get that far, it didn't get that hot. Well, it'd burn these bigger trees, it didn't bother them. It was just the underbrush and leaves was mostly what burned.

FL: Yeah, so when the fire would burn up through there when you watched it like your mom's fires, how high were the flames?
DM: Oh they didn't, as high as that window there, maybe.
FL: Five or six foot, not even that high?
DM: Like I said, it was mostly the leaves that burned.
FL: And how often would she burn that?
DM: Every fall she'd burn.
FL: The same place she could burn?
DM: Yeah, uh huh.
FL: Wow, OK.
DM: Then like in the springtime, that's when she'd go pick them sticks, when the sticks, when the sticks would peel.
FL: Yeah. The bark would slip off real good, yeah. Did you ever hear old people talk about diggin' roots or any other things in those prairies or meadows?
DM: I don't know if they did. My mom used to get hers along the river. The willow, you know. I remember when we were kids we used to change the streams, so they would wash this side and all the roots would stick out, we used to do that.
FL: Oh you would, at the creeks?
DM: Yeah, change the streams come down.
FL: How would you do that?
DM: Oh just go up there and dig little trench along there wash themselves out. Then pretty soon there would be nothing but sticks, the roots that we got. [They] going and get 'em.
FL: Was that up the creeks farther or at the mouth?
DM: It was just along the river, that's what we did, yeah. But I never did see 'em go up. I guess they picked the redwood. I never seen 'em do that, but I know them, they used to pick them redwood roots.
FL: Oh yeah, for baskets?
DM: Uh huh.
MM: Over town [Orleans] there in the pines they used to fix a cleared spot and they built a fire, kinda slow fire, over top where these roots went in the ground. And they built this fire and they'd keep this fire going for hours. And then they'd scrape it away and then later they'd go back there and they'd dig down and chop those roots off and take the bull pine roots and they'd be all cooked and everything. And shred them and make them for that, eating baskets because they were waterproof.
FL: So it swells up too like a spruce root would almost.
DM: Uh huh.
FL: They just would do that just right around town?
MM: Over town here [Orleans].
FL: Did they ever do it farther up in places where they had camps or anything?
MM: I don't know, I just knew that Netty Ruben did this in my lifetime. Cuz she made fine baskets and eating baskets, and stuff. But if you don't make fine baskets then you wouldn't be doing that.
FL: Yeah, that's true like he said his mom did more open work.
MM: Yeah, she did the eel baskets and that, she used grape root on her eel baskets. Hazel, and hazel, willow root on her other baskets.

FL: I guess I'm also interested too, if you heard 'em talkin' about, like again this wildlife, cuz, that's some of the things that now the Forest Service and a lot of the people interested with the environment, how does fire help wildlife or how does it harm the wildlife?
DM: I don't think it harms the wildlife, fire.
MM: They're too damn smart.
DM: They move away from it.
MM: As soon as they start smellin' smoke they're out a there.
FL: But then it's afterwards. The sprouts and everything.
DM: They'll come back to feed on that.
MM: They come back fast. They come back fast on Mount St. Helen's?
FL: Yeah.
MM: They came right back in there, there they were. Just as soon as things start comin' up, there they were. All the antelope and everything were back in there.
FL: How should the government, like the Park Service or Redwood National Park, or the Forest Service here, how do you think they should go about taking care of the forest today?
DM: I don't think they take care of the forest really.
MM: No. How should they?
FL: Yeah, how should they?
DM: Well, like I said, they should control burn like that, what I think. Lot of this underbrush. They have to control burn it, then these wildfires wouldn't get away like they do now.
MM: And when they trim the brush down, like the people go out there and trim it. In the spring time you do out there and trim it, in 3 weeks it's all back again. It just comes right back. So actually burnings more feasible than trimming.
FL: It takes less energy on your part. Burning clears everything out for you. Fire. I'm just worried about it now cuz there's so much fuel there and so much brush that the young trees, everything, even up into the bottom branches of the tall trees up into the canopy and so, I think a lot of times they just, they don't know what to do. I think part of it too is the government doesn't realize that it has changed unless you show them historical photographs. You know.
MM: Like I told you, when I was a kid you could go to Elk Valley and you could look clear up to the upper camp up there from the lower camp. You could see it. You could see where the upper camp was, what was it, more than a half mile away? And you could see right up the hill. And now there's brush all along the creek and new little fir trees in the creek and you can't see up there no more. There's brush around underneath the trees and before there wasn't any brush underneath those trees. It was just open.
FL: There's other little smaller plants and shrubs on the ground though, huh.
MM: The little gambling flowers and all that.
FL: We've even lost some of those though because the other things that take the sunlight from them, the nutrients in the soil, some of those get pushed out, the other flowers. Do you know, ever hear people using fire along medicine trails or like the high country or anything?

DM: No. I don't think they used them kind of fires, that I know of. They probably use it where they make their medicine [a little fire] and all that but I don't think they made it.
FL: A prayer fire?
DM: Yeah.
MM: They just probably took it, well everytime before the man goes out to the *Pickyauwish*, to do his *Pickyauwish*, they have to go and trim back all the plants along the trail. They have to clean out the trail, they got to dig little steps where it washed away. They have to put little steps up the bank and everything because you can't touch anything with his hands when he comes down. He comes down that trail and he can't touch anything. So they have to get all the little limbs and all that stuff out of the way where he couldn't trip and fall down. When he's running and none of the brush can touch him where he can put his hand up to push it away. So the little trail has to be that wide.
FL: About three feet or so?
MM: Probably be about 27 inches, like that TV, about 30, 32 inches.
FL: Just a narrow little trail?
DM: Yeah.
MM: The men used to be thin. They used to be this size. Little men, they weren't like Norman Godwin. They were little tiny men like Mike Davis and like Darrell, like you, small. Slender. I remember Joe Roberts a long time ago he used to dance down the river, and he was the biggest man, the fattest man in the pit. And he might have been 170 pounds, about 5'6", and he was the fat man in the Yurok tribe.
FL: Now you got guys like Walt Lara, big, big guys or bigger, Alberts. Now that Alberts guy is huge.
MM: Well you got Al Graham, Daryl's Uncle Ted would be, but what'd they weigh, about 180 or something, 190 pounds? About 6 feet tall. They were big men. So the trail wasn't very wide because you were supposed to be small. And they trimmed that because the medicine trail wasn't something they want noticeable.
FL: It's not the same kind of trail people would use to go to their family grounds higher up?
MM: No, they didn't want it to be wider and clearer and cut back more because you'd be packin' burden baskets and stuff.
DM: I can see why they didn't want to get real heavy. Like comin' up river in the boat. Less weight havin' a boat, the easier you can go. God, I can remember comin in the river in a boat.
MM: So I don't think they were burning the medicine trails. They wouldn't be using fire there. They might be using fire on the trails to go out farther to their hunting grounds.
FL: Hunting grounds, gathering grounds?
MM: And that kind of stuff where you're going to go out there and you're gonna camp out. Because a lot of times those men went out, way out and would hunt at Salmon Summit and dry meat and bring dry meat back. And go out there and grab a whole, they'd all go out there and get a whole bunch of meat, and dry it and jerk it and pack it back. Or make the women go out and get it. Daryl don't know anything about women going and doing that.

FL: That's the good thing about interviewing different people too, you get different, family roles.
MM: Well his mother and grandmother were medicine people in the Yurok tribe and his grandfather and that's on his mother's side was a medicine man, powerful medicine man, and so they didn't do that. They were busy getting medicine, praying and doing all this other stuff and they didn't have to go and pack deer meat. Somebody would pack it to you.
FL: Yeah, someone would bring it to him, yeah.
MM: And so you get a different row, because I remember Orville Allen telling, saying that about. And then the women would go out and pick up meat and my aunt would say, Oh no, she didn't know any women that did stuff like that. But she did complain about her mother being gone all the time. She said she's always taking care of her younger brothers and sisters. She and her mother was gone for weeks, a month, taking care of somebody.
FL: Doctoring someone, huh?
MM: Uh huh, be at their house and be gone for a month. She had a whole bunch of little kids at home, and grandma be gone. Her father'd be working in the mine, because that's what he did when he was younger. And there she was taking care of kids.
FL: A whole bunch of them probably too?
MM: Yeah they had 7, well she didn't. My mother was born like 20 years after her, but her and her older brother were always taking care. She said he took care of the ranch and she took care of the kids. And she said it was always raining, cuz they went to school in the summertime. It was always raining. You couldn't get across the river in the winter.
FL: Yeah, that makes sense.
MM: So they went to school from like April to November. And from November to April you were home. She said, and then she'd be watching kids. I guess people got sick more in the wintertime.
FL: Yeah, flus and stuff. Is there any stories, like myths or anything like that, you ever heard about fire? I mean there's stories people will tell but was there ever like stories that they would pass down and tell about fire at all?
DM: Don't think I ever hear a story about a fire.
FL: There's coyote stories or woodpecker stories, or deer stories?
MM: You got one with the buzzard.
DM: Oh yeah. You know this buzzard. You'd ever see him?
FL: *Ler-gert*, yeah.
DM: He's got no feathers on his head? Well there's an old story about it that. According the Indian story, everybody was a man or woman. But a deer, was a deer. Seems they were always hunting them … and this old buzzard, they went out there and they killed this deer and it was in the wintertime and so he thought he gutted all of it and he thought he'd eat the heart and liver, so he was going to build a fire, he's gonna roast it, they always packed, and the Indians, they always packed pitchy wood.
FL: Yeah, a little small pitch piece to get it going.
DM: So anyway they's goin down to roast the liver and heart, chow down for you, headed home, so he had a little fire going. The fire wasn't going too good, so he got

down and he was going blow on it, get it goin. And he got down too low and a big gust of wind came along, ignited the pitch, burnt all the hair off his head. So he made up his mind that he'd never eat cooked meat again. That's why you see buzzard eating all this road kill.
FL: This dead nasty stuff. Alright, I'll have to remember that one. That's a good on. Do you know any stories about lightning or thunder?
DM: No I don't know hear nobody, lightning or thunder.
MM: Yeah there is. That one, *Sler-gerth* [?] That's thunder. That guy with the bullhead grease on his head, from *Kennek*.
DM: Do you know where *Kennek* is down there?
FL: I know it's a fishin' place, yeah.
DM: That's in the center of the Yurok nation, the center of the earth for them. Down there. There's a lot of stories about that place. I forgot most of them. All of them in fact.
MM: Do you remember about *Kennek sler-gerth*…
DM: No.
FL: Oh well, he'll probably remember it later on.
MM: He would put the Mudhead, that bullhead greasy, always fished and fished. And his brothers kept disappearing and he followed em. Then the ladder come down and he went up in the center of the world. He got all cleaned up and went up in the center of the world and had black shiny hair, him and his dog. He found his brother and his brothers and his wife up there. Remember?
DM: Yeah.
MM: Well tell it because you tell it a lot better than I do.
DM: *Kenego Sler-gerth*, that was his Indian name. He had two brothers and they lived down at *Kennek* and that's all he did with his younger brother was fishin' bullheads, you know they're real slimy. And instead of washing, he'd just wipe it, wipe his head, his hair was all scraggly and he'd wipe his dog too, wipe his hands on his dog, so everyday his brothers and their wives would go somewhere. And so this one day he thought he would follow them and they came to this great big green grassy place and they were all running around in circles three times. I don't know why the Indian three cuz something, three times, jumpin' in the middle and the ladder come down and they'd go up. And so he thought, *Kenego Sler-gerth*, thought he'd try it. So he did that and sure enough, the ladder came down. So he picked up his dog and crawled up on this ladder, got up in the clouds. He was walking along the trail there and he could hear somebody talkin' to him. and he kept wondering. So he asked, who's talkin to me? Was a babbling brook there. That's me talkin to you this brook says. You better take a bath and wash you hair, wash your dog all up, and so was what he did, and he had nice shiny black hair and the dog was all prettied up and he followed this trail on down, and come down to this place where they were having a stick game there and his brothers were playing. I don't remember who they were playing there. They were playing a game. Anyway, they were losing everything. So he came up to where they were playing and these women said, Gee, there's old *Kenego Sler-gerth*, look at him, all cleaned up shiny. They asked him, his brothers were losing everything playing with these stick games, so they asked him, *Kenego Sler-gerth*, if he'd play and he won

everything back for them. I forget the rest of it now, how it went from there on. But anyway, he won everything back anyway.
MM: Then he was playing again and then they got all tied up [wrestling on the ground] and that's why there's thunder in the sky and lightning.
DM: Oh yeah. The thunder brothers, Big Thunder and Little Thunder. Oh *Kenego Sler-gerth,* he played little thunder first and beat him. So little thunder, the last round was played with Big Thunder, *Kenego Sler-gerth*, then they couldn't do it. Couldn't get away, just pretty nip and tuck, and that's why you hear that rumble and thunder. They're still playing up there. And that thunder.
MM: So that's when they were playing big thunder and little thunder.
FL: That's a good one.
DM: Yeah, they're still going at it yet.
FL: When you hear that thunder they're still playing stick games. Alright. Well, was there anything, I guess. to finish up, any last things you want to talk about fire, anything you think would be important for me to know or pass on to someone?
DM: About the fire, that's about the only thing I know. My mom's burning and what they burnt for the Indians.
MM: But he does know there were prairies down there that didn't have any fir trees on 'em when he was a kid.
DM: Yeah.
MM: So something, they must have been burning, that's the only conclusion you come to. That they were keeping open spaces open.
FL: Yeah.
MM: So that deer and stuff could eat. Keep all that little tender brush growin'.
FL: Nothin' else, huh? Well thank you. I appreciate you taking the time with you. It's been good. Like I say, I'll take back all the paper work and everything and then.
DM: Can you say that, *Kenego Sler-gerth*?
FL: *Kenego Sler-gerth*!
MM: You got it down.
DM: I don't know what it means.
FL: No, just through marriage. I was raised more down there. I learned Yurok first before the Karuk.
MM: That's like Lauren. She's Yurok and she learned Karuk.
FL: Yeah. And I think I learned some of my Yurok probably was like, from Dewey George, Calvin [Rube] and then Flora Shaugnessy down there. Those were older people I remember speakin'. Taught me the animals, names of the fish, then I pick other language up just being around.
MM: I have to laugh at Daryl. We went to language class down there and I didn't know anything about the Yurok language other than just hearing my mother-in-law and her sister talk and different people talking in her house and I kind of knew what they were talking about but I didn't know what they were saying. I just had a general impression of what they were talking about. And so we'd go down to this meeting and Carol O'Rourke asked Daryl about, I know a few words, he said. I know a little bit. I can't really talk but I know a little bit. And she says, Well, she started to say something, I don't do colors, Daryl said. I don't do colors. I do animals but I don't do colors.

FL: Are the colors harder to remember?
DM: Yeah.
MM: They got dead colors, live colors, religious colors.
FL: See, I don't even know that. I just know all the animals. Oh, A good part of the animals.
MM: Well, "*chezlomez*" is religious white. And then there's another one, "*chez*" something, that's dead white. Something that's white and dead. They have white, dead white, red dead, black dead. As far as I can remember. And then they have religious white red. I don't know if they got black on religious. But white and red.
DM: Black was bad word for Yurok. Black I know.
MM: Then they got regular colors. Colors are a lot easier up here. We only got just the colors. But the Karuks only have one color for blue and green and purple and lavender.
FL: It's all the same thing, *perid'ish*?
MM: Yeah, it's that whole spectrum of blues and greens clear to the lavenders, all one color. Be the color of the ocean. But they use that one color for the whole spectrum. And then they got red and yellow, and white. So it's easy in this [Karuk] language. Easy for the kids to learn. But the Yurok language gets complicated.
FL: Yeah. OK. [**End of interview**].

Mavis McCovey (Karuk) Age 70. Interviewed by Frank Lake,
August 22, 2002, Orleans, CA.
Consent for voluntary participation verbally given and signed on IRB form

FL: Just to start, could you tell me your name, age and tribal affiliation?
MM: I'm Mavis McCovey and I'm a Karuk Indian. Age ____.
FL: Was there any particular village area?
MM: My grandfather came from Chimkenee village?
FL: Right down the way here?
MM: Uh huh.
FL: So, what traditional practices were you raised with, growin' up that might relate to fire, it could also be fishin' and things like that.
MM: Mostly he [father] talked about how they burned before [fire suppression], because if you got caught burning, then you'd have a federal warrant because the Forest Service came in, in the 1920s and they stopped burning, as they had previously, from my understanding, what he talked about was that they didn't have any fir trees down here. They burned so frequently and so often that all these fir trees grew up around here after he was a boy.
FL: I have heard that from other people too.
MM: He said there was a whole bunch of little Christmas trees coming up when he was a boy. And so he was born in '68, so in the 1870s, their weren't, the fir trees were just startin' to grow around here because the Indians kept the villages and the sides of the hills so well burned. They were mostly just oak trees. He said over in *Panamick* [Orleans] there were just big old oak trees, and they burned underneath them all the time. There was no brush. You could see half a mile underneath the trees. And he said they just burned all the time, all their village sites and around up on the hillsides behind them. So that there was no danger of fire. And he said that was so that the elk and the deer would have something to eat.
FL: The green up?
MM: The grass lands he said. And up on the hillside they kept bald spots where the prairies were, he said they kept them burned back all the time.
FL: What time of year would they usually burn those?
MM: Spring and fall.
FL: Spring and fall, Ok.
MM: And he said they never burned in the summer of course. They'd burn right away in the spring as soon as things would start…
FL: Drying up?
MM: And just as soon as it kinda dampened down a little bit where it wouldn't get away from you then they'd start burning in the fall. He said they were always busy burning everything. And then all the sticks and all that kind of stuff, like anything that fell off of a tree or anything. He said they drug all that in and used it for firewood. So the forest was just clean.
FL: Did they ever pull down the limb branches or anything like that too?
MM: He didn't talk about that.
FL: Just they got whatever was down wood was down there, they burnt the rest of the leaves and stuff.

MM: Gathered all the little sticks and all that and pulled it in. He said their houses were made up here, the village houses, and a four foot wall on the outside of the inner wall,
FL: Terrace.
MM: Like you have the terrace and went out and had that little outer wall, where all your storage area was. He said outside of that they had another wall, about 4 feet more all roofed in. And he said he had two hides hanging down for the doorways, and you could come out of one doorway and just start pulling wood out of the sides all the way around your house.
FL: Ah, you had a little wood shed bin.
MM: And he said, they had it just stuffed with wood.
FL: Any particular wood or just any wood they could get that was, most of it, well then again we seem to think, most of the wood was hardwood, it wouldn't have been pitchy like the fir and everything. Now we see it laying around.
MM: Yeah, it was hardwood. And he said that's what they brought in, they pulled in driftwood, all the driftwood. He said, and then they filled up, up high [in the limbs of the trees] all the trees that were open, they'd fill them up with wood.
FL: So trees that had fire scars in them?
MM Uh huh.
FL: Had a little cavity, you could stuff it full of wood.
MM: And then when it rained, when there was a break in the weather, they come out and pulled that wood in and put it inside in their house.
FL: That's fascinating. That helps identify the fuels problem. You know, because that's often a debate, well, how much would the people gather versus what they would burn up. So we know the answer to that.
MM: He said they kept small fires. They didn't have to have very big fires in their houses because the houses in the ground four feet [deep], and so the ground isn't cold at 4 feet deep. He said so that the houses were always around 50 some degrees [F] inside your house, which seems cold to us, I guess. If you lived outside mostly, it wouldn't be.
FL: I'm curious more about the prairies, if you could talk a little about that. So they burnt off the prairies you said like in the fall time or the spring. Did they do that mainly for the feed for the elk and the deer or was there other roots or other things that was there because sometimes those wildflowers like the *tayish*, the potatoes grow in those areas too.
MM: Sometimes they're burning to enhance that grow certain things. Or too for the basket weaving, you know, what do they call them, bear grass, they were burning for bear grass and they'd burn those, hum, hazel sticks, and they'd burn those red willow, the swamp willow, they tried to get all that burned off, burned down too so they had nice little shoots.
FL: For like eel traps or other burden baskets or bigger stuff? What kind.
MM: In the fall, now this I learned from my mother-in-law [Yurok]. In the fall they burn for eel baskets, and in the spring they burn for burden baskets and for baby baskets and…
FL: Just the same plant they would burn at different times for different reasons. Huh.

MM: Yeah. She went at different times and she burned clear up until she couldn't get up the hill anymore. I guess she must have been around 60. And she'd go up there and set the whole place on fire. But that was down on the reservations [Yurok], so they got to burn a lot longer.
FL: Down in Yurok area?
MM: Uh huh. And they burned a lot longer.
FL: What was her property? What village was that area?
MM: It was at *Notchko*. And it was up the hill, it was on, part of it was on their own allotment. It was a nice little prairie up there that had a bunch of hazel growing on it that she burnt. And she'd go up and set it on fire. She set it on fire in the fall, she said she was doing it for eel sticks.
FL: Oh, I have to remember that then. I knew the women would prune it back and then sack it and burn it in the spring, and sometimes the fall fire just runs through it, and they'll just burn it with the sticks still on it. So.
MM: And that was. But around here [Orleans], by the time I was growing up, they were complaining about the river bars being buggy and that they should be burned but they didn't do it.
FL: So could you tell me a little, cuz that's one of the things I'm looking at is the willows burning.
MM: That would be Daisy Jones, Duanne Allen's step grandmother, that we used to pick sticks for, my grandfather and my aunt and uncle, help to pick sticks, she was on crutches.
FL: The willows, *Paarak*?
MM: The willows. And we used to do it down there at Savarum Bar. We used to pick for her. And they kept talking they needed to be burned because they were getting awfully buggy. But they didn't do it.
FL: Back in the old days when they could burn, what time of year would they burn the willows? Those ones along the river bar for the basket sticks?
MM: I have no idea. I don't remember when.
FL: Yeah.
MM: You have to find that out from someone else.
FL: I want to know because for my project I'm doing the burning of the willows, and a few things I've heard it was always in the fall time. I looked at some places that already burned, *Tishunick*, and way after one year, geez, they come up real nice and straight. From August to August, just in one year, after they were burned last year, they come up real nice. And they'll probably be ready to be picked definitely next spring, they'll be already to go. Or you could have even got them right now, the second spring, what do they call it, you could get them the second [time] in the summer. So I was tryin' to find out, you know, whatever anybody knows about the willows, that's one real interest of mine too because that's what I'm workin' at. Or my real focus area.
MM: There's all kinds of stuff at Le Perron Flat.
FL: Le Perron's?
MM: Yeah, the ironwood [*Holodiscus discolor*] and they got, the medicine plants and the, and those little iris [*Iris* sp.] plants that they burn.

FL: For string? They used to burn, they used to burn areas too, the same prairies where iris grew?
MM: And then the little tick brush [*Ceanothus intergerrimus*].
FL: Yeah, the blue lilac?
MM: The blue and white and pink, it doesn't matter.
FL: Oh, ok.
MM: The difference in the colors are the maturity of the plant.
FL: I didn't know that.
MM: I didn't know it for a long time neither. I kept wantin' to get a pink one, and at full maturity they're white. They start out blue and then they turn kinda lavender pink. Well then next they turn white.
FL: That's the ceanothus, the buck brush, that tick brush some people call it too.
MM: They used it for medicine, they used it for fine basket.
FL: The caps I've heard, right.
MM: Real fine baskets. Or little tiny ones.
FL: Cuz the sticks are small and straight. And so the ceanothus or that tick bush, whatever it is, that did really well after fire,
MM: They burn for that too so that makes little, when you pick it now you're picking little tiny one that come off about that long. But if you burn it then they come off real fine about that high.
FL: Yeah, LaVerne [Glaze] growled at me because I was over in the Illinois River valley and I seen that place that burned last year. I was there in June. I said, Oh geez, look at all this ceanothus has this nice little straight tops. And I just did a few and I peeled them and I kept a few. And I showed them, Oh look at this ceanothus. She said, You should have gathered all of those. There was a bunch of them around back but it was too late, they wouldn't have slip the bark.
MM: Yeah, they are good about that.
FL: And then you mentioned the iron wood. They'd burn that too? And then what would they use that for?
MM: They use that for your, ah, arrow shafts and things that you need tough wood for. You want something strong.
FL: Tough and straight?
MM: Uh huh. And then around here I got that arrow wood [Mock Orange, *Philadelphus lewisii*] everyplace here but you just cut it. You don't have to burn it, you just cut it.
FL: So it grows back the same way whether it's burned or pruned?
MM: It will grow big branches out and then will send out straight shoots off the branches.
FL: The mock orange, the one with smelly flower, the real pretty flower?
MM: Yeah. And they use those for arrow shafts. It didn't need to be burned. That was one you could just cut. Of course it's good if it burns every once in awhile so that'll come back from its roots and send out new clean wood.
FL: Is there certain plants that you would like to talk about that you think do better for [with] fire? That people told you about? Or you even seen yourself?
MM: Those, I don't know what you call them. Potatoes?
FL: The Indian potatoes, brodiaeas, camas, the lillies too?

MM: Yeah. They do better when they burn. I have a bunch of ‘em out here. And there was just a few of them, just kinda scattered. And then it caught on fire down here and burned up the fir tree, and it burnt through that little gulley where all the little lilles were growing, and they came back and they were like an onion, the bulbs were bigger.
FL: Bigger bulbs, huh?
MM: Uh-huh [yes], the bulbs were bigger and the plants were bigger after it burned through there.
FL: And so the older people used to burn through that same area for the potatoes or the bulbs.
MM: Yeah, to make them. I guess the fire gives ‘em some kinda minerals or something.
FL: Nutrients or somethin’.
MM: Yeah because they burn better, or maybe it gets rid of the competing grass. It does something that made them get bigger and better.
FL: Yeah, you don’t hardly hear people talk about eatin’ those anymore. Farther north they do.
MM: It’s a lot of work.
FL: But those were found in the prairies too.
MM: Yeah, they were in the prairies, they said that the Karuks had the best. Darrell’s grandmother used to tell me that. The Karuks had the best vegetables, she said.
FL: Is that mainly because of the fire, they would burn ‘em and take care of them?
MM: They were more redwoods down river so there wouldn’t be as many. Open spots. They’ll grow right amongst the oak trees. Those things will grow under the oak trees, in amongst the oaks, there’s no poison oak brush and all that stuff fightin’ with them. If they got it cleared out then, the vegetables will come up and the wild onions will come up.
FL: So they benefited also, too when burn under the oaks for the acorns. Could you talk a little about that? Can you remember people saying different things?
MM: They burned under the oaks to get rid of the competing brush and so that the elk and stuff could eat and plus they got rid of the bugs. Down here low, like where I’m at, I’ve got oak trees back here [Orleans, upper Ferris Ranch Road]. But they’re really buggy. And they’re not quite as bad if you go up there used to be a big oak field, goin up where Sonny’s [Sonny Buck Ferris] camp is out there [near Whitey’s Peak].
FL: Do you know the name of the mountain or place? I don’t know.
MM: What’s the name of it Darrell? You’re going out to Salmon Summit but you’re not that far out. You’re out on the road yet.
Darrell: I forgot the name.
FL: Oh, Sonny Buck’s camp? I’ll ask him.
MM: And there’s oak flats down there. The Forest Service take them out. But there’s these big oak flats and the acorns out there, although it hadn’t burned out there, the acorns were better I guess because it wasn’t so warm, it’s really cold in the winter and so it kills a lot of the bugs and down here if you don’t burn, it just gets so buggy. They have nothing but bugs in ‘em.
FL: Yeah, and so they’d also burn those places further back too.
MM: Yes.
FL: How did they get back there? They had trails or how was it?

MM: <u>There's trails everyplace. That was the main. You went from here and you went over Mill Creek Gap and you'd drop down into North Fork Redcap Creek, and you went around Black Mountain and you went over to Hoopa. It was the main trail</u>. But you owned your acorn flats. The villages had certain acorn flats that were theirs.
FL: Villages and families? How was it owned, or cared for?
MM: Families. Most villages were like Whitey's village down here was mostly Rubens, or people that married into Ruben's family like grandfather came from *Chimkenee*, mostly Ferris family, and each village was mostly family or relatives to that family. And then you owned certain acorn flats were yours and you picked acorns there. But that didn't mean that you hogged all the acorns there. Because some years you wouldn't have any, and some years other people would have them, and so you traded back and forth. Well then you'd say, come pick acorns with us because you don't have any at yours. Well then the next time they'd do that with you when you didn't have many at yours.
FL: Was there different kinds of acorns too? Do you recall. Or what was the best ones, or ones people preferred?
MM: The tan oak, up here the tan oak. My aunt said the Hoopas ate black acorns.
FL: The black oaks?
MM: Uh huh. She said that looked like chocolate pudding. When she first went to school over there she didn't like their acorns because it looked like chocolate pudding. She said it tasted OK but it was the color.
FL: I fixed some up, last weekend I had some, black acorns. It was alright.
MM: Well she said they taste alright. They just didn't like them because they looked like the wrong color. It'd be like eating blue butter I guess. You'd be surprised how things look make a difference. But up here they most ate tan oak. And, what you call it, or years, for almost 20 years, Victor Knight's grandma, Rachel would come up here. I had an acorn tree back here, it's getting kinda half rotten down there. They had great big acorns. And she'd come up and want to pick up acorns over there at my place. She just wanted to pick 'em up underneath that tree because it had big ones.
FL: One stop shopping, huh. One big acorn [tree] there?
MM: She'd always ask me, can I come up and pick up some acorns? I knew she just wanted to go to that tree.
FL: Could you remember or think of any other places that they might have burned? We talked about prairies, we talked about acorns. Would there be other places they might haved burned? We talked about the river bar some. Did you ever hear them burnin' around places for ceremonial purposes?
MM: They really didn't have to burn around the ceremonial sites so much. My ceremonial site over here has been, nobody's touched it for [over] 70 years. Almost 80 years. In 07 it'll be 80 years. And my uncle told me that when they fixes, cleaned around the site every so often, he said then they peed on it. And they stamped on the pee. And they peed on it and peed on it all the time and brush wouldn't even grow on it. To this day there's no brush or no trees growing on that thing. We've got grass. I think there's one little huckleberry bush, I think gooseberry bush. And that's it. And it's still kinda shaped like the world. Kinda diamond shape. Kinda rounded diamond shape. It's still shaped that way and the trees grow right up to it like that.
FL: Just to the edges huh?

MM: Uh huh, it just goes right around it. Not even oak trees grow on it.
FL: That's interesting.
MM: And he said that's what they did. My grandfather said that. They kept it clear but didn't say how. He was a Victorian man so he didn't talk about that. But my uncle said that's what they did and that's why things didn't grow on 'em. And that's why you can go back to those sits and find these prayer sites but they do burn and cut on the trails all the time.
FL: I'm interested in trails. Could you share with me more information about trails. What ever. Did they ever light fires off a trails or anything?
MM: They just burned along them. But then when they had, that was just in later years. You're talking like 1940, 50, 60s, and even now. They burn and they cut it, because they get in trouble if they set it on fire. But before they didn't have to [cut it clear and open]. They just burned the whole country and the whole country didn't have any brush on it. So where the trail went was open area underneath the trees, so there'd be a difference there. Quite a difference.
FL: Young people like me, other than lookin at old photographs wouldn't know any better. Wouldn't know that that used to be open in places, other than talkin to people or seein old photographs.
MM: Or like, they were talkin about the village of *Ammeekeadam* [west side of Klamath river at Ik'es fall below Somes Bar]. And they said well, it has to be out here in this clear spot and the guy said, well the fir trees wouldn't have been here so take out all of the fir trees out. And look at just the big pepperwood tree that's there and the big oak tree that's there. They'd be the only trees that would pre exist.
FL: Yeah, yeah.
MM: So all this fir spot could'a been open. So you don't know, you know they extended the village site. And then one of the places they thought was a village site ended up to be a burial site. They ran into a grave when they tried to dig down because they didn't realize that the fir trees were
FL: Were growing up every where?
MM: Just non existent at the time.
FL: You mentioned berries, huckleberries and goose berries. Did they burn those?
MM: Not per se. Not deliberately. They just burned them and they come back.
FL: So they didn't burn them [berries], like acorns for a specific reason?
MM: They did it for a specific reason for acorns, and willows, they're trying to get rid of the bugs. Cause down here they get buggy fast.
FL: Well for huckleberries, it just happened to be by chance that they might burn from just general fires and then they'd do better?
MM: And they do better once they burn. But all the gooseberries. I just used to have hundreds of gooseberry bushes around here. And they're just dying out. I don't know if it's the herbiciding of the 70s [1970's]. That's when they started disappearing. I don't know if it was from that or if the haven't been burned. You know. I don't know. But I know that they got burned all the time because they were keep'n the field open.
FL: Yeah, ok. Do you remember any specific information like what time of year or under certain weather conditions they would have burned? Like you said in the fall time. But would it, for example, some people talk about, would they've burned before the coming of a storm, do you remember anything like that?

MM: They burned in the afternoon.
FL: In the afternoon? Ok.
MM: I know they'd burn in the afternoon, I guess so the wind would pick it up. And spread it through fast. It would run out of fuel and quit. In those days,
FL: You didn't really have to worry about it getting in the tops of the trees really did you?
MM: There was no, my grandfather used to argue with his brother-in-law, he was a Forest Service guy. And he'd [say], ah, you're just making kindling, he said, just like piling kindling underneath those trees. You'd burned it all out, they'd be a lot better off. That was like 60 years ago he was arguing with him, tellin him how they were growin, and they'd only be doin' it for about 20 years then. Because it started up here in about the 1920s.
FL: Is when they stopped Indian burning really?
MM: Totally. But they stopped them earlier from the time my grandfather was young, they had already stopped it because the fir trees were growing.
FL: And you said that was in the 1880s right, or?
MM: 1870s. They [young fir trees] were start'n to come up all over. But I know my mother-in-law used to burn in the afternoon too. She would go out with a match and set and that wind would come up.
FL: Up-river wind to carry it through.
MM: Uh huh.
FL: So what were the main reasons why Indian people stopped burning? Was it government policies or was it just people not having access to resource grounds or, did you ever hear much of that from your family?
MM: When the white people started owning the land and they didn't burn it. And then they'd get after you if your fire got away and got onto their land. Like if Rubens were burning down here it came up on this piece here then they'd be in trouble. And you didn't want to get in trouble with the law.
FL: [29:28] The law was always after the Indians for something.
MM: You didn't want to deal with them.
FL: So on the fires then, farther back like in your grandfather's time, would it have been men and women that would have burned, different places in different times. Or would it have been just the women or just the men? Who?
MM: The men would be burning some things, like the medicine trail the men would be burning. And if it was up here, but I imagine if you were Yurok, the women were the head of the medicine people and the women would have been doing it.
FL: That's a different shift.
MM: And up here the men were the bosses of that. And the women would be tending. The men helped the women do everything though too. Cuz grandpa used to tell, my grandmother was Indian doctor for women and she would gather her medicine and he helped her gather medicine, take it and burn for it and prepare for it.
FL: So the medicine plants even needed to be burned to grow back better?
MM: You never cultivated anything. The only thing they cultivated was marijuana.
FL: Indian tobacco? Yeah.

MM: The other ones they didn't cultivate. They'd just grow, the other parts of the medicine grew wild. But they like to be plowed up or to be burned or something to make them come up better. Get rid of the completing.
FL: Competing brush, the things they didn't want, the nonfood or non-medicines. Were there certain times of the year or certain places when burning, the Indian people wouldn't burn? Like you said sometimes they wouldn't burn or in the summertime they didn't burn either?
MM: They didn't burn in the summer. Probably because it would get away from you.
FL: Yeah, it's almost too dangerous.
MM: They did most of their fish drying on the river bar. They made their little willow smokehouses.
FL: Oh really, tell me about that. I always thought they were out of planks, or driftwood kind of smokehouses.
MM: They put driftwood up and then they'd stick them in the ground and weave them. You know those sweat [house] ones, they made willow ones and they built a little fire in there, and they put 'em on the river bar in the fish camps and they stayed on the river bar. They didn't go home. They all lived on the river bar when it was fish time. They flayed the fish, they smoked the fish, when they went home they packed dried fish home with them. They wouldn't take none of that up to the village even if you're like 100 yards from your village,
FL: You just did it on the river bar huh?
MM: You just lived down there. All the people that were working with the fish were just livin' down there and the older people would help with the fires and keep the wood going, kids draggin wood and stuff and the adults fishing and flaying fish. And they put 'em there and didn't hardly put any fires in, they just smoked 'em a couple a days, the wind on the river bars helped dry the fish.
FL: The afternoon hot winds?
MM: Uh huh. And they could let the fire go out after that, couple of days of smoke, then that put a crispy crust on them, flies wouldn't get to them, and then the wind would just dry them and then they packed them home. The same with acorn camp. They'd go camp, whole family, kids, grandparents, everybody. And the younger people would pack the acorns in and the older people would crack 'em, and they'd crack 'em, they'd dry 'em and pack 'em in, in their baskets all those dried pieces of acorn. They'd take some in their shells, but mostly they'd have them all cracked up and all dried and ready to grind. At acorn camp and they'd stay a month, a month and a half.
FL: What time of year would that be?
MM: September, October. Getting late, November.
FL: So they'd finish up with fish camp and then go to the acorn grounds? And then when would they go farther up, like people, like Grant [Hillman] was talkin about huntin' grounds up, Salmon Mountain way and back there.
MM: The men did that all the time. This place here, is a, had a village down here just about where Pat Wilder and them are.
FL: So this is upper part of Whiteys (?)

MM: No this is considered the *Chimkenee* Slide Village. That was his name literally, because this whole mountain here came in, the whole thing slid down, that's why it comes up so steep. It's a big slide off a that mountain. That mountain slid in.
FL: Yeah, and created the flat down here?
MM: And there's a couple of benches up here, that's what come sliding off that mountain. It covered one village but it wasn't a year around village.
FL: Yeah a little camp?
MM: It's a hunting village, that's what was over here and down there at Ruben's was a full-time village, but this place over here still has lot a deer. There's a deer lick up in here some place. Up along this creek and so, that's why they lived here and when you dig real deep or use a cat [tractor type] around here, you'll come up with scrappers and all kinds of stuff that tend meat. That's what you find in the ground.
FL: Processing site.
MM: It's cooler in here. And so they'd hang their meat and stuff up here.
FL: Did you ever hear about them using fire to drive game or anything like that to run the deer any way? No? I know some of the tribes on the Oregon side, they used to, at least the old documents talk about seeing Indians burn along the ridges and then funnel deer down into big nets and stuff. I don't know if we had that same practice over here or not. Did you ever hear about it?
MM: Grandpa said the deer were so tame when he was a boy that Indians didn't even use their arrows on them. He said they threw rock.
FL: Geez,
MM: Drop it. Then just cut it's throat. He said they'd come, weren't afraid because, you know they'd come in pretty close because they weren't afraid of you, cuz you couldn't shoot a hundred yards so they were tame and if you could throw a rock real good you could drop one. And then you'd just drop one and kill it, and cut its throat. And so they didn't chase them, they were pretty tame. I know they'd come in here and they'd get close. They eat all my roses over here.
FL: Yeah, you gotta watch 'em on that one.
MM: They like rose bushes. No they didn't talk about that, talked about killin' them with a rock. But like I said, trees were open, you could see. There was elk over in Orleans. Big herds of elk walkin' around those big oak trees. Those big oak trees were like 10, 15 feet across. Big oak trees.
FL: Hum. Did you ever hear anybody talk about burning up along creeks or anything? For any reason, or near them, along creeks? No?
MM: I'm sure they did because like I said, it was clear.
FL: So even the creek areas, it wasn't like open on the sides of the hills and up to the ridges and all of a sudden you have the creeks and it wasn't brushy. And it was even cleaned up down by the creeks and burned through at times?
MM: Yeah, and alder of course were growing in the creek. You couldn't stop that. There'd be alder and willows along the creek like there's alder and willows down along the creek.
FL: Yeah.
MM: But I wouldn't put alder and willow back in after this creek funneled, and went and put sprigs all the way up the creek, slow the water down. So it wouldn't funnel when it come down.

FL: Filter out, help it go slower?
MM: Uh huh.
FL: How do you feel some of the old time knowledge and traditional uses of fire could maybe used today to restore the forest? If you'd have recommendations to make to the Forest Service or the Park Service.
MM: I think they should, you couldn't brush it all out. But it needs to be cleaned out, the canopy needs to be left above and the brush has to be taken out underneath, otherwise we'll keep getting these mega fires [catastrophic large acreages] and when you have big tree falls and stuff, like that big wind storm in 1995, they should go clean it up, they should clean up the brush and the wood and the downed trees out of there. And get 'em out. Instead of just leaving them laying there to rot and then when the fire came,
FL: It burned hot?
MM: It burned for 15 miles. It must have burned pretty good….
[After pause for visitors, interview resumes]
FL: Hanged 5 Indians in Orleans? Why was that?
MM: Because they something to some white man. The Indians did something to some white man up the river. And there was more Indians down here. Panamick was the biggest village.
FL: So they did that as an example or somethin'?
MM: Uh huh. And he said, It really upset the tribe, the people because it wouldn't even be the same family. If one family did something to you then you negotiate with the family. If that didn't work out then, you did something to that family. You didn't do something to somebody else.
FL: Yeah, exactly. The Indian was Indian to them so they rounded up whoever, huh.
MM: So that would be another reason why if the white people didn't like you burning, you'd quit.
FL: You'd be afraid you'd be hung or shot?
MM: It'd be dangerous, they'd beat you up. My grandfather said he got out of the school, he said, he was 5 or 6 and he said they went to school in the summertime across the river there, and he said, as he came home, he was going down to the boat landing down by Georgie Henry's there, where those rocks are down below the dance grounds, and there was all village, all the way.
FL: The whole flat, huh?
MM: No, along the river all the way, for about a mile clear over to the turn there, and the river was on this side, it didn't go down towards, it went towards Camp Creek.
FL: OK, closer toward *Tishunick*, towards the bluff. Grant was saying, that was before they brought the dredge in there right?
MM: Yeah. And so anyway, he said he was going down there near that boat landing to go across the river and his brother was 8, 9 years older then, he was already down there at the boat landing, and his brother was like in 7th, 8th grade, and he said he stood there for a long time because these miners were burning these Indian's houses and trying to holding them [Indian people] to hold in the house, and he said there were just these little kids, and he remembers they were just little kids like him. He said they even looked like him, cause he was a half-breed but he was a dark half-breed. And he stood there and he stood up there on the wagon road and he said, the school was

farther up then, it was up in the middle of the town, and he said he stood there for a long time and he didn't know what to do. And he said they had the houses on fire and the men and the women were gone, mid-age people, there were just these old people at home, probably in their 40s but they were old. And these little kids under 5, just little kids, 8, 7, 5, the ones that couldn't work. They were home with these old people in the village. And he said they burnt the whole village down that day. And he said finally he noticed they were just fighting with those, the Indians and he said so finally he thought they're not paying any attention to me, I guess it's OK, and he walked around down through the houses that were burning and stuff, right down to the boat landing near the river and they didn't pay any attention to him.
FL: Huh, What year was that?
MM: It was the summertime and if he was 5 or 6 it was 68, or about 73.
FL: 1873, 1874? Geez.
MM: Uh huh. And he said that's when they burned out the *Panamnick* village [site of Orleans] because the miners wanted to mine there. They wanted to mine on that river bar.
FL: Too much.
MM: So most of the Indian practices were curtailed by then. Like I said, he said they could walk, the fir trees were just startin to come up when he was a little boy, like a bunch of little Christmas trees because they weren't burning anymore.
FL: One of the other questions I ask of people is about lightning fires, how important was lightning fires versus Indian fires in maintaining the openness of the country? Also, how far would Indian people burn back away from villages?
MM: A mile or so.
FL: Only a mile or so? And so the rest of the country, like in the high country and places farther back would have been just lightning fires?
MM: Or if you had a certain spot, like I said, if it was a prairie, then they'd keep it open. They'd burn it, don't care where it was. They'd keep the prairies open.
FL: So a lot of the prairies were Indian fires then, even if it went way further back?
MM: If it was way further back they'd still burn it. And keep it open. They wouldn't let trees come up and take over like they're doin' now, you see we're losing all our prairies.
FL: Yeah, we're losin' all our prairies and there's a lot of good wildlife habitat in those prairies.
MM: Yeah, I think that's one of the main reasons they were keeping them open all the time. They wouldn't let the fir trees and the trees that come in real easy, grow real fast. They wouldn't let them in. They'd keep burning them all the time to keep them open all the time. Plus there probably things on the prairie that they wanted to burn. Because he always talked about the prairies were closing and that they always kept them open.
FL: Yeah because you'd have to wait for along time for the rare chance of lightning to hit there probably.
MM: But lightning fires, they'd just let go, they just let 'em burn out.
FL: Did they ever work with them too, maybe, back burn for any reason? Or, nothin? Just let 'em burn where they did?

MM: Just let 'em burn. From what I've heard, they just let them go. I guess it would be getting a little brushy, and then of course if you're burning if your burning a mile or two back from your villages, you'd be back quite a ways. Then you would keep all your trails open. They were mostly on top of the ridges.
FL: OK, along the ridges.
MM: They had ridge trails, but then they had trails where they went down to a certain.
FL: To a certain resource, root grounds or?
MM: Or another village,
FL: Another village ok.
MM: Other people they had villages. They always had villages wherever there was good fishing spot, good flat spot, good warm spot where there was a lot of game.
FL: Yeah, makes sense.
MM: And then sometimes they'd live in the rockiest, little coldest ugly look'n, little place like up there at up Ikes the one on Millie's
FL: *Anshanamkarak*, [Ike's] that side.
MM: Yeah, in *Ammeekearam* you could see why they'd have it, warm and flat, and it was a good fishing spot too. But right on that other little cliff, the little bench, it would be over there too, and it would be just windy and cold all the time, and they'd still be there because it was a good fishing spot.
FL: Huh.
MM: And then the Forest Service came back and said the Indians claim all the fishing places is rancherias, all the good fishing spots.
FL: Well, makes sense.
MM: And I thought, did they thinks we were idiots? We lived on fish and then we wouldn't be living where they're wasn't good fishing spots? [laughs] It wasn't by design, it was just that's the way things really were. And then I told, what you call it, Judith Morasco, I say, I see where you Yuroks had a village at a Big Bar, and she said, yeah. I said, nobody ever lived at Big Bar.
FL: Why is that?
MM: The sun don't shine for about 5 months out of the year. Both tribes fished there, it was good fishing spots, still is, but nobody lived there. There was no village there other than just camps. Cuz it was too cold. They just would not stay where it was that damn cold. Don't care how good the fishing was, they wouldn't stay there, they wouldn't live there. They always liked around the turn at base of, ah, Shelton Butte, all washed off now, there used to be a big high bench, that was a great big village because the sunshine's there all day long. In the wintertime the sun comes in and shines there. And over the hill here on the other side of Chimkenee there's three, four villages along there, cuz the sun's all along.
FL: Good sun. Well, it makes sense.
MM: There's Boise Creek, then there is *Chimkenee* and then there's *Saruvarom* on both sides, and there's *Tuyuck* on that, the other side.
FL: Farther down?
MM: Farther up. And then *Saruvarom* went around the turn, *Saruvarom* which is just before Boise Creek, Boise Creek was right there, and then two villages of *Chimkenee* up at this end.
FL: Lot a people lived in the area.

MM: Yeah because there's a lot of sunshine.
FL: So then how would they, as far as land goes behind the villages, how would they divide that up for each family area or village area for like the root grounds or the acorn grounds, or, iris or meadows. How did they work that out?
MM: I don't know. They all had their area. And like I said, they shared it. They shared back and forth, traded back and forth for different years. If something wasn't growing good in one place, then they'd share with someone in another place and then come back and share with you when you had a good year.
FL: We talked a little about bear grass. That was another one people have mentioned that they would burn for. I was wondering, you don't see bear grass growin down too low, I don't know places that's down too much lower, so how would people work that out? Did you hear anything about that when you were little or younger?
MM: They say, up here when I was younger, wherever they had burned, they'd all go out, the whole country would go to that burn area. And then in later years some burned up here and the whole country, like Hoopa, and *Pecwan* and Weitchpec and Orleans, and up at Happy Camp, they were all picking bear grass out there. When there was a big burn, they'd just pick lots of it.
FL: There's a little expression, follow the smoke. They literally did, huh? They'd burn and then come back a year or so later, huh?
MM: I know my mother-in-law, she must have had enough to last her 20 years. Even Myrtle McCovey came all the way from Klamath and picked some. So if there was a big burn, they, just all the basket makers went and picked it.
FL: Now was that lightning fire or Indian fire that would have burned that big of an area?
MM: That was lightning fire. That was a big lightning fire, burned for two, three miles up there, had a lot of bear grass in it. But then there'd be bear grass in these prairies that they'd be burning off too.
FL: Yeah, true.
MM: Because they're high up on the mountain and they always wanted, they always burned them. Cuz they didn't like them to close up.
FL: So would you say that Elk Valley, that little meadow and prairie that's in Elk Valley, more in the valleys versus the ridges, would you also say that's the type of prairie that people would burn? Cuz I could see them burning prairies on the ridges, or even on the flats, but sometimes you have these valleys farther back that were meadows. Would they burn those?
MM: They'd burn those.
FL: They'd burn those too, keep them open too?
MM: There was big ones down there. Some place over past Bluff Creek, south of Bluff Creek there's some big flats and meadows up in there somewhere. I don't know where, there's no road that goes to 'em. But they, Indians lived up there. They had villages up there.
FL: Oh so there were villages just not on the main river, there were villages sometimes farther back too? I never really knew that.
MM: Off of some big creek like that. Cuz we were supposed to have had villages there. Well, it's like being up at Quartz Valley. You're pretty high up there, pretty isolated.

FL: True, lot of people lived there, like at the mouth of Shackleford creek, where that comes into the Scott [River], villages through that area too, right?
MM: Uh huh. A lot of those were Shasta.
FL: Yeah.
MM: Actually they were Shasta pretty much down to Dillon Creek. In the beginning.
FL: Huh, really! And the Karuk were just down this way further? I always thought it was by that river up.
MM: That came after 1850s. The white people ran 'em up there. Shastas were more migratory, moved more, and followed deer herds. So they'd have these villages, they were kinda like the Navaho, they had village and moved to the higher villages down to the lower villages and we [Karuk] were a permanent village. And then when the whites came and started chasin' us, away from the gold mines, up in the Salmon, up in the Klamath, and Somes Bar there were so many gold mines, that the [Karuk] Indians moved up to Siead and the Shastas mixed with us and just came back and we kinda took over their territory because we'd just stay there and they'd go in and out.
FL: Yeah, ok.
MM: We didn't impact them that much because they weren't there all the time anyway. That's what I'd heard from my grandfather. Well they [Miners] were burning us [Karuk] out down here. What do you think we're going to do!
FL: Get out of the place with the most danger. I guess one question I was always wondering, and this kinda referred back to somethin we talked about, the high country there, Dr. Rock and Peak 8, Sawtooth Ridge, Chimney Rock, was, do you know if the people used to burn when they'd leave that area? Cuz I heard when I was little that after you make medicine, when you'd go back down a trail you'd burn off places. And so I was wondering if that was something I remembered wrong or if you heard other people talk about burning and coming back from places or after ceremonies?
MM: <u>They had areas that they kept kinda burnt out where you can face Dr. Rock, there might even be across the canyon and on the trail comin' down to ah, Camp creek</u>, I don't know if they deliberately burned them or if they just made their prayer fires and just left 'em, but they had prayer fires all along where they over where they faced there. And when they came back down they had these little prayer fires and when they goin' up they made 'em, and I think they'd just leave 'em. But in Elk Valley nothing seems to burn. It goes out. You make your prayer fire and when you go back the next time you see a little spot where there was fire, it's just right there. It don't seem to spread or anything.
FL: Although it could use it up there some places. You could burn around there, its getting pretty thick in places.
MM: Yeah, when I used to go up with my aunt, but I never got to leave the first camp. She went up but I didn't. I stayed in the first camp. And she'd go for the whole afternoon, she'd be gone up on the hill and then she'd come back down. She said she just went a little ways but I don't know where she went. She went up to bathe and a she came back down and I can remember sitting in that camp, you could see clear up to the glass camp, which is clear, now it's kinda brushy in little spots on the creek, and before I don't know if they cut it down or what they did, but there wasn't any evidence of burning. It would be like 70 years ago. 60 years ago. Because I was a little kid, and I can remember it was just clear, you could just look way up in the trees on that trail,

you could see way up there and now there's brush along that trail. There was always those little gambling flowers and that stuff you could see that going along the trail. But it wasn't, but I don't ever remember seeing anything that looked like it was burnt.
FL: Because I've seen Port Orford cedars up there on my way back over to Sawtooth Ridge, you come through the last pond and you drop down up by Dillon Creek, there's big Port Orford cedars in there that have scars on them, from fire and stuff.
MM: But would that be from lightning?
FL: I don't know. Well thanks, we'll end it up now because you got company. Thank you.
MM: So I don't know. But I know there was no evidence of burning right there. I don't know if they went in there and trimmed it all.
FL: I know over in Quartz Valley, Lester Alfred, when he was still alive, he would take me out with my dad and we would go places and pray there on Quartz Mountain and he would show us other mountains this way, toward [Mt.] Shasta, Dusza rock, back this way toward Salmon Mountain and he was saying, you always kept it open, they'd have to burn it open because you needed to make your fire. You needed to have that power, that line of sight, and then you'd make your medicine [rubs hands together] and you'd have that, you'd want to see that. If it was all brushed up you couldn't do it. And he used to go around there because they ended up putting that lookout station there, so they said they shouldn't a done that, and then they let all the brush come up around there and the young trees. And so I wondered if that was similar. Because I remember him saying about that. Like those prayer sites
MM: But then when you get up on top there where you look around and see for miles, you can see clear, there's nothing growing.
FL: Yeah it's just too rocky, too hard soils, just too rocky.
MM: And there's some kind of inversion system in Elk Valley. Things don't burn. They don't burn good. Like I said, the medicine fire goes right out. You build your medicine fire and you use it and then you and look and it just burned out a little space. So it's something to do with the way the air currents are.
FL: Do you remember any stories, like there's a story about how the animals stole fire but do you remember any stories or myths or what ever, anything like that about old-time stories that people might have taught about burning or any practices?
MM: Can't think of any right off the top of my head. If I think of any, I'll tell you. It's hard to remember things when you're 70 years old you know. You don't think like you used to.
FL: Like I said, I can come back and visit again.
MM: Your mind don't click like it used to.
FL: Was there any last thing you want to say or share with me? Like one of the most important things about burning? Times or certain things they would have burned but we don't burn now that would be important to pass on?
MM: Actually, I think the whole damn country should be burned out. For safety, for health, for health of the trees and animals, for the people who that are here. I think it should be all cleared and it should be all burned. I don't know how it's gonna happen or what but that's what needs to happen.
FL: Back the way it was maybe 150, 200 years ago, huh?
MM: Yeah. Revitalize the country.

FL: Did you ever hear people talk about, I guess the one last question which is interesting to me, I heard others talk about it, was in your relationship between fire and the water, did you ever hear people talk about fire and springs or fire and an amount of water, anything like that?
MM: The fire keep that small brush down and the trees and the grass then can get the water. But with the way they're mismanaging the water on the Scott River, it's having a detrimental effect on the Salmon River, because the water table is so low on the Scott River, a lot of the water comes down the mountain will shift to its lowest point and in the other direction and its robbing the Salmon River. People don't think about that.
FL: That's really interesting.
MM: It's like conversion, the conversion system of air and if the table's low here, and its' higher here in the Salmon, then that will shift over. And then this cycle will get…
FL: OK, well thank you.
[**Interview ends, company comes in the room**].

Glenn Moore, Sr. (Yurok), Age 86 and Dolly Moore (Hupa) interviewed by
Frank K. Lake. Hoopa Cal. March 30, 2005
Consent for voluntary participation verbally given and signed on IRB form

Glen: My name is Glen Moore Senior. I was born 1919, August 23. My tribal affiliation is Yurok tribe. I was raised in, on the Klamath River. It's a village called, ah, *Sheray-gon Pach-oo*. Or *Shrey-peech* for short. And, ah, at that time there was no roads, just trails, and the travel was either by **trail** or the river. And ah, my father's name was Ed Moore, they called him Big Ed. He was, ah, his father was *Pers-kus*, he was one of the signers of the ungratified treaty of Weitchpec in the 1850s. My mothers name was, maiden name was, ah, Nettie Johnson. She was, her father was a white man. And he was the owner of the last store in Johnsons. And that's why they named that place down on the river there Johnsons. And ah, she was raised by Indian people, her ah, mother and grand parents. And ah, she couldn't read or write, neither of my parents could read or write. But they were very knowledgeable about the Indian ways. Okay.
Frank: What were some of the ways when you grew up, like traditional practices, such as gathering wild foods or herbs? Hunting or even going out with elders or family members to gather basket material? What were some of those things, different practices you were raised with as a kid that you think would be important to share?
G: Well, there was lots of **basket making** going on at the time. I was, grown up during the depression days, and ah. There was not way to make any money, and ah, women made a lot of baskets and they sold them for maybe, ah, a dollar of seventy-five cents. Like, I seen in Berkeley there is ah, thousands of baskets in them museums. In DC and some of those places, all over the place. And they made lots of baskets. And the other day we was our cultural meeting, NAGPRA meeting, and we had to, ah, talk about baskets and they were insuring some of those baskets, and I was surprised some of those baskets [were] three to four thousands dollars. I thought, gee whiz, those people then made them for practically nothing. And ah, well they gathered. You see at that time, during that depression, we kinda went, we was still back in our old Indian ways. We was eating a lot of Indian foods, we caught salmon, smoked salmon. We'd fish for [lamprey] eels, either by the net, trigger net or they put the baskets. And ah, of course there was always the deer we would eat. There were a lot of herbs. I remember my father used to bring in. I was too small. He died when I was eleven years old, so I never got to learn much from him. I was just about getting big enough to go with him, then ah, fell with pneumonia and died. So I lost out there. The other thing he wanted me to do was carry on the Indian ceremonies for our family. He never did, I never got, teach me what to do, so I didn't do that. But anyway, the last trip we made, we stayed, we had a place. We raised a garden up there. We had a four hundred acre place there, a homestead.
F: Was that in the *Shrey-gon* area?
G: *Shrey-gon*. And so ah, it kept us busy. We never had much time to fool around. We stay right there at home. But the last trip he made up here, that I could remember. My mother took a little lunch, we was getting ready to put a garden in. At first he looked at the eel basket, we had some eels. I think they took maybe 3-4 eels out. And ah, he had a little coffee can with water. And he had a fir tree, and he took the ends of that fir

and boiled it for tea. And then it didn't take him very long to build a little fire. I don't know how he did it. Of course there was no, like now we look around for manzanita wood to make a fire for coals. In just a little while he had those eels roasted. And then he took, ah, hazel, and he and he twisted it like that to kinda, make a string out of it. He made a half hitch and cut little chunks off. It had to be done before you could do that. If it was not done you couldn't cut it off like that. So that's what I could remember. And ah, then he got pneumonia that same year I think, passed away. Died of pneumonia. So ah,
[Stopped because of visitors. Then interview resumes]
Glenn: We go [say], *Holm*, its beargrass. They kind of grew up along the ridges. There is always a fire some place. Somebody either goes set it.
Frank: Yeah.
G: Every body knows that and they won't go up there and gather. My area was just around that little area near *Pecwan*. There was no roads, it wasn't like that where you can just jump in the car and go miles away.
F: Yep.
G: So my area was right around in that circle, until after I come back after [boarding school]. I went to Sherman in 1936. We got the **road in there in 1935**. There wasn't much of a road. It was just kinda like ah, kind a logging skid road. And ah, but I went to Sherman for five years. Then I went to the war for another four, so I was gone like for ten years. But then by that time the road was improved quite a bit. So then ah, but. They used to burn, they would go out, and sometimes the whole family goes out. Maybe they **camp** out there, maybe a man goes **hunting**. You know, a man goes hunting, kills a deer. They kinda dry [smoke preserve] that a little big out there. It makes it a little lighter. They'll dry it out. *Hi-a mu-???* Of course bear grass, is very hard to dry, and ah. And they said, it seems like that's they way they did. With all their [things]. They have to pack it. They have to pack just what needed. They didn't pack any extra.
F: [3, 2:28]. For food you mean, and other things?
Dolly: And the materials. They didn't waste anything.
G: My mother used to..we lived right there. There was a pretty good stream going right by the place where we lived. As soon as she was gone, me and my little brother, we'd stay home and she'd be gone all day up in that creek. Around evening we would begin to get worried, you know. Maybe something happened. It was pretty rough going up in there. She went all the way up in there. I guess she took her time.
F: Did she have a little trail that went along the creek?
G: That's where she got all her **black fern**. That's where she got all her black fern.
F: For basket material?
G: For baskets. And then, the, ah, sticks. There would be just a **certain place they burned** out there. We used to have a real good place. It was just a little ways. It was partly on our property and partly on the neighbors. And, ah, there was a nice little **spring** in there. People even from Johnsons would come up. And they would go pick sticks in there.
F: Hazel sticks?
G: **Hazel sticks**. Burn them in the fall for, ah, the basket sticks are a little more. The **weather changed** quite a bit. You know it used to be around February it be would get

dry and it gets cold. It gets frosty. They would go collect. You know the hazel they drop their leaves down. They are bare during the winter time. And that mound was just full of leaves in there, and they would maybe get some other grass or fern. They are easy to burn. So it kills the close ones, and then the young sprouts shoot out and grow fast. That's where you get those **real fine sticks**. And then, for eel baskets you need **bigger sticks**. **You try to burn that in the fall**. Or maybe in the previous year you get a bigger stronger stick. You know, you get about that long [2-3 foot] for an eel basket.
F: With the bark on?
G: Yeah with the bark on. And ah,
F: So do you remember them burning for like, ah, for one type of hazel stick in the spring versus another one for, in the fall? Like, what about? Like sometimes, I heard from the basket weavers today prune back the hazel and spring burn it. And then I have heard other people say there was a fall burning too. So did you ever hear people talk about different seasons for burning hazel for different reasons?
G: Yeah. I guess that's the way they regulate their…a different kind a basket, like ah, that burden basket need a stronger, bigger sticks. We call it, *Kay-woy*, the one they pack on their back, you know?
F: Yeah.
G: The same way for the *Plack-ser*, you know that kind of flat [tray], they're made out of a little stronger sticks. I think they regulate that by the time they burn it. You know, the word would get out "we got sticks up in there just right for certain, to build certain things.
F: Different sized sticks for different baskets?
G: And then the roots: I think they kind of traded with the coast Indians for ah, for the spruce roots. We use that. The spruce roots, or you can get them [roots] up in the high country, the ah, the pine root. And then the others, like the, you know, we call them *Pah-haap,* There're long, I don't know whether that is **woodwardia**. The one they dye it.
F: Yeah. The woodwardia fern, they call it chain fern?
G: They dye it with alder bark.
F: That's the one that grows by the springs. Real big, long, kinda leaves on it.
G: Yeah. They got a pretty good sized, what do you call it?
F: Yeah. You pound it, then it get the runner, the ribbons out of it.
G: Yeah. There used to be nice ones, you know. You go up there, you go here [Hoopa Valley] to Orleans over, down through Red Cap, over through those rocks. There are some nice tall ones.
F: You ever hear them burn for those at all? You ever hear them burning back that fern to get it to grow back better?
G: I don't know whether… I couldn't answer that. I don't know whether they pruned or how they got it. If they just naturally die out or what. Fresh ones come up every year though. Maybe they don't torch it at all. I never, I never got into that. I just see them grow here and there, you know. And then of course the porcupine quills, but they get the dye for them farther up river, from those trees up high.
F: The wolf lichen, the moss. Yeah?
G: **Yellow moss**.

F: Yeah. Yellow moss. Did you ever see these older people when you were younger burning for any reason? Do ever remember them saying where they would light fires, or how they would light fires? Or see anybody do that when you were younger?
G: How's that again?
F: Did you ever see anybody when you were younger go out and actually start the fires or burn?
G: No. I started some fires myself. We burned. No, I never did see, ah. You know, since, even right here [Hoopa Valley] when the forestry, when the BIA was here, now down at Weitchpec. You go up, above Weitchpec, up the hill there.
F: Buck Mountain, Buckhorn? [Deerhorn]
G: When you are going towards Pierson's, you know, you look straight up. There are a lot of good hazel sticks there. The whole mountain is full of hazel. **You know if somebody was going to start a nice fire for burning sticks. By God, you see those fire trucks with sirens going down to put it out**. **You know, it wasn't going to hurt nothing. It wasn't going to burn the timber, just around the hazel bush**.
F: So on the road there, Hwy 96 up to Deerhorn mountain, that area? Yeah? Is that what you are talking about?
G: Yeah, it ah. It would be over by where Sid [____] lives, over that country there. Towards Lake Prairie, they road goes up to **Lake Prairie**.
F: Lake Prairie?
G: Yeah, all that through there. But, ah. you know these fires up here [Hoopa Valley, Captain John Creek south towards Tish-Tang hill side area]. Over by this hospital over there, and they go put that out.
F: You mean, that's over by Captain John creek right? All the black oaks are there? Going towards Tish-Tang point.
G: Yeah. You know, but the Indians here [on the reservation], they used to have to **sneak around to do it, because you know, if you were caught**, you could, ah, there would be a pretty big…
F: Fines? They would go to jail?
G: **Send you to prison, so ah, so you don't talk about it. You just go set the fire**. This guy, I know the guy who set that fire down by the, that burnt for nine days. If they could catch him, he would be in prison for a long time. But he's gone now. He's not alive anymore. My cousin down there, he stuttered real bad, Jim ___. He used to be up the river all the time. One time, he said to Grant [_____], he was going to school there at the old Somes Store. They were pulling somebody up from, there was a bunch of people standing around holding a guy up. By God, he fell off there, got drunk and fell off. You know that old store used to be right along the… He dropped right off.
F: Yeah, the steep bank?
G: He went down in there, drunk, and staggered around down there. So they throwed the rope down and he tied that rope around his foot and they pulled him up backwards. And so, anyway, he's the same guy. He stuttered, he said I had a hard time getting through there, he said, next year I will go through there. **You know, he just torched it off. And the next year he didn't even have to cut any brush**.
F: That was burning up around Somes Bar?
G: You know, that's ah, that's kinda, of course I could remember, and like ah, when they had CCC days here. That was in the 30's, [1930s], Roosevelt got elected in 1932.

And we was fishing down at the mouth of the river [Klamath/Requa]; commercial fishing. My bother Don, he was, like, he was born in 1914. So he took all them guys in the middle of fishing season. In 1933, they started coming. There was two CCC camps here. One down here at Socktish creek, down towards Mill Creek. They all come down and went to CCC camp. And ah, but I could remember, he used to come down. He'd walk, clear down, he'd walk all the way down home, then they went up and they went hunting back up in, *Ach-koo*, up toward Blue Creek Mountain. One of my brothers, Ed, he was older than me, and then Don was older than him. So he went through the **trail** and went to camp up there. Then he went up above our place [near *Shrey-gone*], and he cut across country. You know, he just.
F: Was he on old Indian trail or just going through under the trees?
G: **There was no tail or nothing, but it was open enough that you could do that**.
F: Open enough in the understory?
G: **But you couldn't do that now, you can't do that anyplace now. It's all brush, especially where it was logged. Where it was logged, the brush come up**. When they first started logging this country they never really knew forestry. Even the BIA didn't do that, we got eighty acres down there they never, it was a good timber growing country and had the best stand of timber in, they used to say in Humboldt county. Nice straight, just little clumps way up on top.
F: Was that redwood or Douglas fir?
G: You know they logged that. Ryerson bought it and logged it. You know, he never replanted it. The only thing that grew up was alder. Alders, and ah, and it if he planted it we should have another cutting of timber already there.
F: Was it redwood or Douglas fir they logged out?
G: What?
F: Redwood or Douglas fir?
G: Douglas fir and Port Orford Cedar.
F: Oh, ok.
G: But ah, anyway. But **just in my lifetime I can see a big difference from the time I was a boy until now**. **You know the condition**. We used to go up there to Blue Creek Mountain, it's pretty high there. It's all kinda scattered pine. You could look all over. You could see timber. Just as far as you could see. You could see the Ocean. You could look clear down to the mouth of the river. Everyplace was just timber. So I was hand pulling cedar out there. They were logging cedar for battery [?] stock. That timber is going to stand there for many years. You know, after the war was over, didn't take long before it was nothing.
F: When you were back falling timber did you used to see fire scars on the trees? Because some of those ones back up in the high country [Chimney Rock over to Sawtooth mountain], some of those cedars, those cedars have fire scars on them, and you can see where they have been burned. Did you used to see signs of fire on the timber you used to fall?
G: Yeah. We used to fall, when we used to fall cedar. And some of them used to be just standing on legs, you know, its all **burned out**.
F: Yeah. Burned underneath?
G: Burned underneath. And a lot of times we just cut the legs with and axe and they fall down. See which way it lean and then cut it. Make sure you chop the one off first

over here, to kind of steer it a little bit. But, heck, when the tree hits the ground, about that big, its…
F: Yeah, about three foot across.
G: Gee, there is a lot of cedar in there. Well, you can see fir trees, with some of them. **Some of them you can see where it has been burnt up the side. Well that means that the fire wasn't too hot.** But it's a fire, you know, you get all that duff laying on the, underneath. Seen some up around. I fell timber for, quite a few… I worked in the woods. I in timber all my life. I think I counted, how many years. I had over sixty years, you know working in timber. I spent 35 years contract logging. I just chopped up the last old yarder out here. But ah, **I can see a lot of difference. I can see a lot of difference in the way it looked**. I went to Weyerhauser, I brush raked up here. I brush raked 10,000 acres for Weyerhauser. Then we ripped about half of that. Some of the trees I brush raked, I went back there later, geez some them trees were thirty feet tall. You know, like I mentioned, you take, **we've been here for so many thousands years. They kept, done a pretty good job of keeping this way country around here, what they see what they come to when the first people come here.** We have a lot of animals, you know, we got name for, you know, like grizzly bear. There was grizzly bears here. There was wolves here. Grizzly bear is *Nee-quich.*
F: *Nee-quich*.
G: Wolf is *Worse-kersh-ney.*
F: *Worse-kersh-ney.*
G: "Bone eater", and ah, and then we have ah, *Mey-weeth*, Elk.
F: *Mey-weeth*, Elk.
G: **First [white] people come here they didn't have any meat. They never brought none. Meat like beef, there was nothing here so they wiped out all the elk. When they brought some cattle then, they really started to eating them up. They killed all them off. So they, I guess the main thing is everything went out of balance**.
F: When the white man came?
G: Yeah. They screwed up the whole, every thing was, you know. **You can't do this too much because something else happens over here. And I think that's the whole thing**. They [white people] didn't care. They want mining. Think the Karuk tribe took it more than anybody else from the miners. The miner just came in there, they didn't hit us [Yurok] very hard down here. They just started mining a little bit when they made the reservation so. Up the Trinity they [miners] hit those guys [Wintu, others] pretty hard. If they [Indians] got in the way, they [miners] just killed them. The Indians didn't have any rights. The Indians were just like animals when they first [in the designation of US law].
F: No laws to protect them or anything. No white man laws to protect the Indian or anything.
G: The Indians had no place to go: I was reading in the Destruction of California Indians [Heizer]. That this guy wrote.
F: Heizer. Heizer's book Destruction of California Indians. Pretty sad stories in there.
G: They kill for. They [miners] went and got two woman from a village. They [Indian women] was married, and made prostitutes out of them. And then the one guy, he went down there and tried to get his wife back. They [miners] shot and killed him [Indian husband] - just left him laying there. You didn't have anybody to go to. That's

the way it used to be around here. There was this old-timer – his father was the DA, district attorney here, Hammond. Harold Hammond. I can remember him. This guy his son, is ah, you know you hear of some people that are too big for light work, and too light for heavy work. So he was, he don't fit no place. His father tried to educate him. They sent him to school, after school. He just kinda bum'ed around. But he was saying, he was telling me. He said he tried. See the Indians wasn't considered a human being. They were trying some case some place. They have to undo that, undo this. I wanted to ask him again. But then he died of a heart attack. Just like, you know, we did't become citizens until 1924. But then we fought in every war. Indians took part in every war the United State every got into.
[Glenn talks about his military history and a break was taken].
F: So you were talking about *Nee-quich* and *Worse-kersh-ney*, the grizzly bear and the wolf. Did you ever hear the older people talk about how fire benefited those animals? Or that fire was better for certain animals and not others? How did Indian fire, Indian burning, help the animals out? Did you hear people talk about that at all?
G: It must have **balanced** out somehow or, otherwise, the creator wouldn't fix it that way - that lightning could… I know for **elk and grazing animals, there was plenty of feed**. This guy, he was about the same age as my father, but he lived longer. I used to go over and help him. **He said that when he was a young fella, you could ride horseback above, away from the river for miles. It was all open**. **Today, you can't. There's no big prairie. Even when I was growing up there was a lot of prairies. Big prairies on the river. There aren't any now.**
F: Were those prairies kept open by Indian burning?
G: Yeah, **they burned the prairies all of the time. There was plenty of feed for animals, the animals that they ate, like elk and deer. We used to burn. We used to burn every year.** A lot of ferns get kind of mashed down.
F: The big bracken ferns
G: Yeah, and then, **when we burned, there were all of those little trees growing, fir trees, we killed them all off and we just kept it open**. And higher up where the bigger ferns grow, the snow would mash them down to the ground. **Then when it gets dry and we'd set fire to it. In the spring, when it starts getting warmer, it wouldn't burn into the timber. The timber would still be kind of moist underneath**.
F: You mean you could burn those prairies off in the spring time?
G: Yeah, **just the prairies would burn. The timber couldn't burn**. **But you had to do it just at the right time. You couldn't do it in the middle of summer**. Same way, I think farther down in here, it **talks about burning around homes**.
F: Yeah, around villages and stuff.
G: Yeah, you got to be careful about that. There were certain times of year that they wanted to burn. **They don't want the brush to grow too much around there, but then, on the other hand, they want to keep the brush down**. I don't think, **you know in the old days, Indians didn't have to tools that they have now**. I build boats [traditional canoe]. We are talking about building another one. I always tell them that that in prehistoric times, they burned and scraped. Then, when the Europeans came along they brought axes, saws…
F: Adzes.

G: Adzes, all kinds of tools. So they left the old way of doing it and started doing that. And then now, we use a chainsaw. We've thrown the adze and cross-cut saw out, we've thrown them to the side, and we use the chainsaw and all kinds of modern tools. Anything you can think of. You can do it so much . We change with the time. So you can imagine, when it gets back to fire, that we didn't have tools to go chop the brush and make fire trails. So they had another way to do it. They probably just never let, it probably never got that brushy. Even our place, I can't go any place up there. It is just full of brush. Full of blackberries and now we are getting that scotchbroom. And that is just, **scotchbroom** is really going to choke this country out.
F: So you see that invasive weeds that that being a problem. Those exotic and invasive weeds are a problem? They are a problem, yeah?
G: What's that?
F: You think those are a problem, the **blackberries and the scotchbroom**? Those are what they call exotic, ah, invasive weeds.
G: Yeah, that's going to be a big problem. I've seen it way out in the mountains. Like by Doctor Rock and Chimney Rock. I see blackberries up in there. Bears must have packed them back. But, uh,
F: You talked earlier about how people would go on back on the **high country trails**. This anthropologist, on the east coast and others, say that Indians only managed with fire around the villages and areas close to the river. But, do you remember people talking about, or have seen signs of, or heard about people using fire further back in the high country? Like up around Doctor rock, Elk valley, Peak 8, and Chimney rock.
G: Oh, yeah, they used that high country. There's something about high country, you know, you get a different feeling when you're out up there. I don't know if you are closer to where the creator is at or what. But you want to spend some time up in there. That's what they used to do: they'd go **hunting, kill deer, and they'd dry their meat**. And **then they can tell the weather, you know, like if it was going to be turning cold or storming. So, when they'd leave and just touch everything off.** That's why we have churches. White man's church is made out of wood, it burns down. Our churches don't [burn down/are destroyed], you can burn them forever [renew them].
F: Singe the brush.
G:…so you want to be able to get there so you burn it. In a way, they were pretty smart, those who did a lot of things, to be able to survive for a long time, you know. Where are we getting to here? I'm jumping all over the place.
F: That's okay. The main thing is having to do with fire. Do you want to talk more about the prairies? You talked about wildlife. Do you remember people saying anything about traditional bulbs or other roots or Indian foods out on the prairies that did better with fire? Like I know a lot of different tribes ate the brodieas. Those little purple and white and red flowered ones. They have a little bulb in the ground. Do you ever hear about people burning to make the lilies and the wildflowers better? Do you ever hear any people talk about that?
G: No, I think Mother Nature had a way of taking care of that. **A lot of stuff growed in a swampy place where fire don't burn anyway**. But then there's others, if them **herbs** couldn't survive fires, they wouldn't be growing. We didn't cultivate anything. I don't know how, the only thing that I know that they planted is tobacco.
F: *Ha-kum*. [tobacco]

G: I never did hear about anybody cultivating any other plants. They just let everything grow, you know, off of what was growing already: huckleberries, all kinds of berries, roots or different things.
F: So you never heard about anybody managing huckleberries by fire or pruning or anything else?
G: **I think fire improves huckleberries**. I know I logged and I logged places where there were huckleberries so damn thick, they weren't even bearing any huckleberries. When I got through logging, I went back there several years later, there were so many huckleberries. So, **I think that fire did do some good with huckleberries, with any kind of berries.** You know, just like these days, we prune our fruit tress so that they could bear better. **They did it with fire, you know. But I think the whole thing is that the fire never got as hot as it would now, it you go set fire some place.** I fought a lot of fires in my lifetime, from the Mexican border clear to some up in Oregon. Fire, you can't stop it once it gets going if it has a lot of fuel. I've been on a crown fire, and that's the scariest thing to get into. I almost got a couple of CATs [tactors] burned up over in that Scar Face fire in Modoc. So, if the conditions are right and you got the fuel, it is just impossible to slow it down. That's why, all of that fire going on from Colorado to Mexico, Arizona, southern California, they're just finally realizing it [the effects of fire suppression]. I was talking to this guy, he lives in Texas now. He is high up in the government agency, he was talking about fire. **I told him that we Indians used to burn off, that we used fire**. **When the Europeans came into our country they found some of the best stands of timber in the world. So, they [Indians] must have been doing something right**. **They finally realize now that they made a mistake by stopping burning**. I see in Oregon, when I was working up there for BLM, on that road, they call it Dead Indian Road, going from Ashland over toward…
F: Klamath Falls.
G: Yeah, they were clearing the brush out from underneath the trees. They had little small CATs piling the brush up. And they burned it. They had a lot of little piles. They didn't make one big pile. It seemed like there was no danger. You see, when a fire comes up, more so in the Eastern, Modoc and that kind of way, pine is full of turpentine or whatever.
F: Yeah, pitch.
G: They just explode. If you get those smaller ones underneath, it will be thick. If a fire gets into that, with a little wind, it will start going up the bigger trees. And all at once that tree explodes. That is where I got them CATs caught in over there. We was making fire trail, the wind was going this one way. So we was pushing back, making trail, and all of a sudden that wind comes back. Hits those little trees. The next thing you know, not even five minutes, they just explode. It sounded like a freight train. My two CATs… one of my CATs got stuck in there, my D-9. The way they did, the shoved the earth right into the fire with them two big CATs. If they would have been small CATs they would have been burned up. They were just pushing those trees and earth right into the fire. They didn't like it, to have to clean that all up, but the majority got saved.

F: Got to save your self.
G: So, the main thing is the fuel. **If you have too much fuel build up around the country, once you start, it's dangerous.** Of course now, they got tankers dumping water and retardant. That slows it down. But if you get a fire going good, they try to stop these fires that have burned up millions of acres. You know in the West, in the past few years…. Anyway, **what is interesting is how Indians used fire, but that's what they did. They just burned - but they know when to burn. They aren't going to burn up their village in the middle of summer. Of course they would never let it get into that condition**.
F: All of that fuel build up
G: Maybe in a different…you know, the Indian word for setting fire is *kay-werkth*. When there is a forest fire, even after they put an end to burning, there was still burning. **In them days, the law enforcement was, they didn't have that many so the Indians got away with burning, kept on burning the country.**
F: Were they burning… go ahead.
G: I think that' why… You see, I wasn't born until 1919, 1920, I think that's when you said that in 1910, that when the government said not to burn.
F: That's when the law came down from the government [Weeks Act 1911].
G: But even I remember, when I was growing up, there was, Reggie ___, he's your tribe from up on the Salmon River, he said this guy came to school, a young guy and said "This afternoon, there is going to be a big fire on that ridge up there." By God, sure enough, smoke starts coming up. You know, they arrested him. He spent some time in prison.
F: They arrested him?
G: He went up there and set it. Yeah, he wasn't predicting there would be a fire up there.
F: He was the Karuk guy?
G: **People were setting fires all of the time. They kept up that tradition for a long time**. Until, but now, they have airplanes, you can't hardly, they got a better way of law enforcement, you can't get away with things like you used to back then. When I growed up it was still open. Like, by the time I was walking around in the woods here, in the 30's [1930's], early 30's you could go any place. I was big enough to start walking around. And you could go any place. You could look a long ways. We used to hunt in the timber and you could see a long ways, you know
F: But did you see anything…
G: Go up there and track deer through the snow. We used to have one place, there used to be a hollow log. A tree fell over and kind of burnt the root out. We used to stay in there. My brother went up there one time and it was snowing. We had a fire out there. You have to kind of huddle back in there away from… He put his shoes down there. The soles were soaking wet. He got up the next morning and his shoes were ruined.
F: He burned his shoes up, huh?
G: They shrunk right up.
F: Oh, they shrunk.

G: He had a gunny sack he wrapped his lunch in and he wrapped his feet up. It must have been three or four miles back there. He walked all of the way back. [55:00] But, anyway, I remember when the crews started coming in. My brother, he used to take some of those guys out. They was cruz'n Cedar. There was a demand for Cedar. Before the war there was a demand for cedar. They used to go, just about anyplace, across country. There were no roads, just **trails**. That's why I said that **they kept burning, they it didn't kill the big trees.**
F: How important were trails to the Yurok people for lighting fires and for managing where fire went? Did you hear people talk about that: how they used trails as part of their fire management?
G: Well, the **trails helped out**. It was just an easier way to get there. [pause] [56:00] Yeah, I guess, the Indians knew the seasons. They knew which ways the prevailing winds, you know, when it's burning a certain time of year. I imagine**, the only thing that they were really protective of, was the village. I never heard of a village burning up**. I've heard of a village being burnt up. One time I heard ah, Hupas went down and this village [in Hoopa] over here went down and burned up Requa village, [**intertribal warefare**] was burned. Some houses. But I never did hear of a village burning up someplace. You know, you hear of towns [white man] burning. They [Indians] did by fire. They sure as hell didn't have bulldozers. I think they…[pause] I hope I can help you out.
F: Well, if you are getting tired we can always stop, too. I could come back and finish up questions later on. I was wondering if you ever heard about people burning under oaks any special reseason, or if you ever heard about that.
G: I never did see them do that. Of course when you burn, of course when you get a forest fire, it burns up everything, oak and fir. But, you know, when you go pick acorns, in the olden days it was always clean under there – just acorn leaves laying around there. I know one time, there was a place down Red Mountain. It was steep ground. There was this tree that had big great acorns. They put in a ditch down like that and dug a hole. It worked just like a funnel. They would go down in there. But, when you take the leaves out, when you have bare dirt, the acorns sprout and make little trees. As long as you have that mat [duff], it doesn't do that. Nothing grows in there. **If you burned it out… when you get a hot fire, it just burns everything out. But when you get a fire that isn't too hot, you know, it can be dry on top, and there will be a little moisture underneath**. You know, the **duff layer**. Then, the top will just burn off and the bottom doesn't burn – you still have that protection, not just bare ground. Then, when the seeds drop on there, they don't grow, they need that soil down in there. But, the way that they did it, they never… not that I know of…I never did hear of where they go out and hand work in some trees to improve something. It seems like they just did it. It just did it by itself. Just by…
F: They burned, but it did multiple, many things afterwards. So they just burned but it did all of these things. It helped cleared out the leaves, burn back the brush. There's different purposes it did.
G: **That is the difference between the fires we have now day**. You know, when a fire goes through, you see sometimes, it just burns through and then it doesn't expose the bare soil. But, then, if you get a big fire, on the Pony Peak fire one time, I had a CAT up there– no, I had a power wagon up there. There was a guy building a road up

there with a CAT. They told me: "go up there and tell him that the fire was coming through there." So I drove up in there and he was building a road up the hill – up there, you know, where the Aubrey's lived? Oh, you know, I went to school with him, She married Offield, what was her name?
F: Was it Mimi Offield by Somes Bar area?
G: They lived down there around Clear Creek. The house below the road. The road went up the hill from there up toward Pony Peak. We had a camp there, Alvis lived below the road. He had a little fruit orchard. Fire camp was there. That night, the whole thing was lighting up. You could hear fire roaring up in there. I went back up there, a few days later, that fire was real hot. No trees. So, if you know how to manage that fire, you don't get that kind of conditions [high severity damage]. How do you get back be able to do that? That's the part that I…. In our meetings, the Cultural department, the Park Service is asking us about traditional burning. **How are we going to do it? You can't do it now. The time that you are supposed to burn where it would burn, they tell you can't burn**. The say we are going to need more moisture. So, they have been burning up at Bald Hills. Between Orick and…
F: Yep
G: They've been burning there. The feed comes up good for elk there. They're always after us about….I've cut redwood. I used to fall redwood. I've seen in the bark, you know, when you have a big stump, and then, in the middle someplace, you will see burnt places in there, inside.
F: Fire scars.
G: **Fire scars** inside the tree. So you know it burnt many, many years ago. So, you know whether people did it or lightning of what. Gee, redwood is hard to burn, big thick bark. That is why the **redwood is really sacred to us**, it has that thick bark for protection - the heart. I just built a canoe. You know, you have that canoe and the heart goes from that tree into your redwood. The same way that an Indian house has a heart in it. Post and beam. The redwood boards go into the Indian house. That is why redwood is always kind of sacred to us.
F: Is there anything that you want to add that you think would be the most important part about what you remember or people saying where they burned or why they burned or maybe you have recommendations about how fire should be used again today or how they should thin the forest out before they put fire back in there?
G: I don't know how you would ever do it, you know. Of course, you have a lot of better equipment these days. You have the tankers, the air tankers. [pause] I used to fight fires in Sherman. They'd come after us. We were kind of a hot-shot crew. They used to pay us thirty cents per hour. Those other guys got twenty-five cents an hour. I was doing that right until I got enlisted in the army in 1941, that's the kind of pay we got back then.
F: Was that good pay back then?
G: Yeah, that was good money. I never did have…When I enlisted in the army, I got, an enlisted man got twenty-one dollars to enlist and draftees got thirty-one dollars. For three months. But, coming through the depression, you learn to hang onto money. You didn't spend it. [pause] Yeah, well, if you think of something else, you can come back.
F: I will stop by and visit you again. If there are things that…usually too, other people that I've interviewed before say: "After you left, I was thinking a few days later that I

should have told you about what I remember my aunty saying..or what I saw after this fire went there." So, I'll stop back by again.
G: They've been doing a little bit of burning. Of course, near Orleans this side of Chimney Rock, you know Flint valley. I guess they could. That was **bear grass** in there.
F: Along the Go Road there, milepost 23.
G: I don't know, about **willow**, we never burned willow, we just let the river take care of it. The high water. And the shoots would come out of there. I guess that you get a big bunch, clump of dry stuff. You could torch that off. All of that driftwood, you'd use that for firewood.
F: Old *Cay-gep* – packing him home. (FKL tells story of coyote and driftwood)
G: He was down there, there used to be rapids down at *Keneck.* That's the center of our world. It was pretty rough water and his grandfather were soaking acorns. He said that you aren't doing it right. They asked how you do it. He said that you load all this stuff here up in the boat, and then you come down this riffle in the boat, and they end up down at the mouth of the river. These two girls are walking along and the see this log laying down there with these limb sticking up there. So, she said this is a good wood log. And she had something and she hit it, he jumped up and yelled. That was his ol'whatch'a you call-it, pecker, sticking up there.
F: Did you ever hear any stories about fire?
G: No, we had some books here… I'll ask him.
F: That's good enough for now. I appreciate it. [Interview ends]

Mildred Nixon (Hupa) Age 77. Interviewed by Frank Lake, August 17, 2005. Hoopa, Ca.
Consent for voluntary participation verbally given and signed on IRB form

Frank: So, what's your name and tribal affiliation?
Mildred: My name is Mildred Nixon. I'm a Hoopa tribal member. Did you want my age too?
F: Oh, yeah, your age.
M: And my age is 77 years old.
F: OK. And were you raised learning traditional practices? Like basket weaving material or collecting wild foods or herbs, or?
M: Yes.
F: Regalia stuff?
M: Yes, I was. And, uh, we were taught how to go out in the, uh, mountains to find food, different kinds of food and picked up acorns. And, uh, grind acorns to make acorn soup. And then, then we, uh, always found mushrooms. And whatever we found out in the woods we brought it home and ate.
F: Yeah, what were some of your favorites that you used to like to go get?
M: Oh, I used to like to go get mushrooms.
F: Yeah. The tan oak mushrooms?
M: Yeah. So that was a lot of fun.
F: Yeah?
M: You get on top of the hill and then, um, you see some, and you slip and you uncover all kinds of mushrooms.
F: And then you know you're in a good patch, huh?
M: Yeah.
F: Did you ever see, just, um, since we're talking about fire stuff, did you ever notice areas where it was burned or unburned where there was better mushrooms? Did you ever remember any of those kinds of things?
M: No, uh, where there was mushrooms, they were usually under a huckleberry brush or tan oak. And there was hardly any, anyplace where there was a fire.
F: Oh, OK, so they sometimes, they. Did better in areas that maybe isn't burned?
M: Yeah.
F: OK. And, um, what were some of these areas that you used to go? Were they here in Hoopa Valley, or were they?
M: Uh, we used to go up to, uh, Sugar Bowl, up in the mountains there for mushrooms. And to pick up acorns. And then, uh, round here in the [Hoopa] valley too. We had different places to go.
F: And, for the acorn grounds, did you ever remember the older people talking about how they would burn under those, or were there any special management with fire for some of these other foods?
M: No. No, I have never heard anything like that. If they burned or. Only thing I know is that they, they burned the underbrush next to the road and, uh, up in the mountains where there's so many underbrush that they. They just burn because they said it gets rid of some of the spiders and bugs that come around.
F: Oh, OK.

M: So, and, and I find it true that they used to, uh, we just had certain kind of bugs and, and spiders but now you don't know what you have.
F: Yeah, all kinds of different stuff.
M: Yeah. Yeah.
F: Huh. So the fire helped keep back a lot of the insects?
M: Oh, yeah, it did. And then it helped forest fires from starting, too, from along the road.
F: Yeah. OK. Good. So, do you, uh, were you ever taught or told about the use of fire by other Indian people or your family, at different places?
M: No.
F: OK. So, but it was other people that would burn?
M: Yes, other people burned. They burned for, uh, basket material. Well, we did here too,
for basket material. Because you have to burn before you get the new shoots.
F: Yeah. And what kind of plant was that?
M: That was, uh, that was hazel.
F: OK.
M: Hazel, uh, brush and, and then you burn for, uh, the, can't remember the name of the grass up in the mountains.
F: Oh, bear grass?
M: Beargrass, yeah.
F: Do you remember what time of year they said they would burn for hazel?
M: Usually around, uh, before winter set in, they start burning.
F: Oh, so they would burn in the late fall?
M: Yeah.
F: For hazel? OK. What about the beargrass, the higher up beargrass patches?
M: Uh. The bear grass, I don't know they, uh. I think about around summer time, some time they burn for that. And, uh, I don't really know what time they pick 'em. Or when they come up to pick. But I have never gone out to pick that.
F: OK. You're, you're primarily a ceremonial leader, regalia family.
M: Yeah. Yeah.
F: I know different people I've talked to who were basket weavers or hunters or fishermen they have different, different knowledge of things.
M: Yeah.
F: So, being a ceremonial family. OK. And so, how does, uh, I guess for you as a ceremonial, uh, leader, holder of that regalia, how do you see fire as important for you to do your job? As far as the community?
M: Um. The fire is very important, what kind of wood you use to, for your cooking and making your acorn soup. Heating the rocks, and there's just certain kind of rocks you heat to make your acorn soup in a basket. And, uh, and then when you burn you usually burn manzanita or, or, madrone.
F: OK.
M: And that, manzanita doesn't have that much smoke. So, and, uh, that's why we burn something like that. And then it makes the fire so hot that it, uh, really heats up our rocks until they're red hot.
F: Oh, good.

M: And then, then when we're, uh, doing that at the ceremonial fire you don't let anyone throw paper or whatever into the fire because it'll stick on the rocks. So we have to be very strict and watching them not to throw anything in there. But, uh, and then, at our ceremonial dances you have to, uh, when you first start out you pray to the higher up or God to borrow the fire. You don't own the fire. You borrow it. And while the dances are going on. And then you pray for everything you do at those dances.
F: And, was there, um. I know some of the dance places are along the river. Was there other places up out the sides of the valley where people would go that were part of the ceremonies?
M: No.
F: No. OK. So all was immediately, was down along the river.
M: Down along the river, and then we end up, up Bald Hill. For the last two dances.
F: So let's talk.
M: Two days.
F: Let's talk about Bald hill, because I always, I know that was a prairie. And looking at the 1944 area photograph, that used to be a lot more prairie there.
M: Oh, yes.
F: And its grown in with trees and brush.
M: Yeah.
F: So, what do you remember from being a little girl, to what you are now as an elder, about how that's changed, that Bald Hill there?
M: It's really changed. Wild roses came in there and just took over all that land. And, uh, and then same way with the scotch broom, or what you call it.
F: Yeah, the yellow flowered one?
M: Yeah. And they got rid of most of that, but, you still have your wild roses up there just growing all over. And blackberries.
F: Yeah, the Himalayan blackberries.
M: Yeah. So, that, that's taken over. And I remember my old people used to tell me, now you look at Bald Hill. When that grows over there it's the end of the world.
F: Hm. So, so there was a psychologically.
M: Yeah.
F: And then your sense of place and your landscape.
M: Uh huh.
F: That prairie was important.
M: Oh, yeah.
F: As far as. So, how did they used to keep that prairie open?
M: They used to, uh, cut down a lot of brush and burn.
F: OK.
M: Yeah, they used to burn Bald Hill quite often but, now, it's so many homes being built up there so they can't do that anymore. They have fires up there but, usually burn all the grass and.
F: Yeah. Do you remember what time of year people used to say when they would burn that?
M: No. I don't remember.
F: No? OK. All righty. Was there any other prairies, any other places like Bald Hill that you remember. That used to be open more, that have closed up?

M: Over here at, uh, Mill creek. That mountain there. And um, that's what the old Indians said, that that was a prairie there and you walk on the ground and it sounds hollow. Because they said that just like the old Ark, you know, uh, it's a canoe laying there upside down. And then when that covers over, then, then it's almost the end of the world too.
F: So on that side?
M: That side, Mill creek side.
F: And was that the ridge coming right there, um, that comes from the valley and heads up kind of North-East?
M: Yeah, that ridge right there.
F: OK.
M: And uh, in fact, you weren't supposed to build anything or move up there. It was supposed to be left open.
F: It was. So that was kind of like a place where people could go visit but weren't supposed to live or maybe camp or something?
M: Uh huh. That's what they told me a long time ago. I used to like to go visit the old people. And now I'm one of them.
F: Yeah. And here I am visiting you.
M: Yeah. But anyway [laughing]. They had a lot of stories to tell you, you know? That's why I used to like to visit them.
F: And how did they keep that area over there? Did they go up there and clean it out, or did they burn it, or?
M: No. No, I haven't seen any burning or anything up there. So it's kind of closing in.
F: On it's own. But do you think they used to burn it? Do you know?
M: They, I don't know. I. They could have, because it was a prairie, a pretty good sized prairie.
F: Yeah.
M: But now you can't hardly see it.
F: Um. What about other places that you saw that have changed, that have kind of grown in, or where the forest is really different now?
M: Oh. I know the river has changed a lot.
F: Oh yeah? How's that then?
M: Yeah, because, uh, it's been getting so low. And then when they, when they let the water out sometimes it will find a different channel. And so a lot of these places have a different channel than when I was growing up.
F: OK. Now, did you, I see sometimes down here behind Teswaldin, behind the motel on the other side of the river there, kind of before the cemetery, that's burned off sometime. Is that something you remember that used to be done too, when you were a little girl, did they always used to burn along the river flats?
M: No. Um. I never did remember any fires burning down there. But it was a big bar that didn't have any brush or anything on there. Because they used to have their Fourth of July celebration, you know, down there, and it was mostly all sand. They had stick games going on, and lot of things. But now that's grown in also.
F: OK. So, if you heard about how old people used to kind of burn different places a little bit there, what were some of the main reasons why they stopped burning? Or why don't people use fire as much today?

M: Because the government came and you can't burn anyplace, unless, uh, they said you can. We can't hardly even burn our own trash, we have to get permission!
F: Yeah.
M: So, they don't understand nothing like that. Why they did it, you know burn.
F: Yeah.
M: And, uh, they didn't understand why you had to burn for hazel sticks and you had to burn for get rid of most of the bugs. And, uh, they just didn't understand it so they think that they can come in here and stop you from doing all that.
F: Now, you talked about houses being developed and built different places. Has there been problems that you see with private landowners on a reservation where people can't burn places, or, how has, how has dividing the land up kind of affected how people might have burned? Has that been our problem at all?
M: I don't remember of any kind of problem.
F: OK. All right. Um. Was there any other, was there any other than for cooking rocks, and for the ceremonial fire, was there any other reasons that you remember people talking about how they would use fire? Maybe when they're out in the high country training, because a lot of those men or medicine men have to make medicine when they go up into the mountains. So that they, uh, besides their little prayer fire, do you hear, did you remember people saying that they would burn? Or anything back and off the trails or anything like that? Back when they were praying and making medicine?
M: No.
F: Um. Well, what's, uh, what's some of the other things that you might just talk about with fire, that you could remember?
M: Uh. I don't know. We haven't had that many forest fires I know, back then. And, uh, it's just when they stopped burning the underbrush and all of that then the forest got fires got spread around. And, uh, so I think them burning the underbrush and along the roads and everything did a lot of good. And we didn't have that many forest fires [big larger sized].
F: Yup. How many of those forest fires that you think were lightning versus Indians setting them, or people setting those fires?
M: A long time ago it was mostly lightning. But now I think its, I think it's uh, someone setting.
F: Someone setting that, yeah.
M: Yeah. I've heard that they set them so that firefighters could get more money or something. [laughing].
F: Yeah, so not so much for cultural purposes as much as trying to get people to get their work, huh?
M: Yeah.
F: Oh, too much. Do you remember, have you seen lightning in the years you've lived here strike different places in the valley?
M: Oh yeah. I said I wanted to watch the lightning one night here, and we were watching and so I went outside. Out there on the porch to watch it. And, uh, we didn't see that much but after I got out and went in the front yard my mulberry tree was split in half and my bull pine tree was split in half where the lightning struck and I didn't even know it.

F: It struck right here close to you?
M: Yeah. Yeah. Right in the yard.
F: So right down here in the valley, huh?
M: Uh huh. Yeah.
F: And those lightning [strikes], those would start fires I guess, too huh?
M: Yeah.
F: Well that's kind of neat. I would think down here maybe it might've been people, but the lightning comes right down low too.
M: Yeah.
F: So have you heard, uh, or do you understand or have thoughts about or have you heard some of the older people that you remember talk about the connection between, like the fire and plants and water and fish at all? Or, have they talked about any connections about how fire did other things?
M: Oh the fire, that, uh, they said it just like up Tish-Tang. The fire went through there and it just ruined the creek because uh it got rid of all the ferns and the trees and it wasn't that good after that [To sever].
F: That was the Megram fire back in 1999?
M: Yeah.
F: So that burnt really really hot?
M: Oh, yeah.
F: And came over from Horse Linto creek?
M: Yeah.
F: And so that could be damaging to the fisheries.
M: Yeah, it did. Because I remember on all these creeks, when it got hot in the valley. We used to have hot weather, you know, and then it changed to cool off in about three days and then get hot, but not like now. And, uh, the salmon used to come up, well, it was higher water then, and they'd come up, come up from the mouth and when it got too warm they'd all hang out next to the creeks where the creeks came out from the mountain.
F: Yeah.
M: And where it's nice and cool. But now you don't see that anymore.
F: You don't have that cold water coming down out of the mouths of the creeks and into the river [Trinity]?
M: Yeah. It's a creek. And, uh, the creeks, you know, isn't that high anymore. I don't know, we're just losing all our water. Whether it's because of population or what.
F: Do you think it might be some of the, all the vegetation growing, up farther, maybe?
M: Yeah, I think so. Because a lot of it is drying up. There's so many creeks in the valley that ran all year around.
F: When you were younger?
M: Yeah, when I was young, and now they're all dried up. Most of them.
F: So do you remember the older people, cause they used to leach acorns out right?
M: Yeah.
F: Did they used to go to those springs, and those little places and leach for acorns? Or?
M: They used to go, uh, along the river in the sand.

F: OK.
M: Yeah. And then, uh, get water form the spring to leach ‘em. And we still do that at our, uh, our rest day down here.
F: Yeah.
M: And, um, we soak our acorns in the sand, and, uh, get our water out of the little creek that, spring that runs there.
F: OK. Where’s your rest day at, what place is that?
M: Right down below this, right across from Mill creek. On this side.
F: On the west side of the river? OK.
M: The next road over here, where you turn in here.
F: Yeah.
M: Then right down to the river.
F: Ok. So it is on this side? I hadn’t been down to that rest day, only the one over in Hostler creek before.
M: Yeah.
F: I had always been over on the Hostler creek side.
M: Oh, yeah.
F: So, how do you think cultural burning or traditional burning can be used to for the forest today? Do you see there being a use for them to burn places?
M: I think there are a lot of places you can get to pick up acorns and the brush is growing along the road. And I think that would help out a lot.
F: Burn out those places?
M: Yeah,
F: And what time of the year do you think they would do that? Or should do that?
M: I think, ah. Gee I really don’t know.
F: Yeah. But it should just be cleared out?
M: Yeah.
F: Ok. And how do you think government agencies like, whether it is the Forest Service, off the reservation or over there at the [National] Park, Redwood National Park, or even here on the reservation with the BIA and the forestry. How do you think they could do better management by using fire? Do you have certain areas you think they should prioritize? Like would you prioritize?
M: I think they should go around and set [fire] a place where they [basket weavers] pick sticks. You know for baskets? I think they should do the burning there. And where ever you need it for your sticks. Because for your sticks, when you burn you get rid of the bugs in the sticks. And you pick the new shoots.
F: Yeah.
M: I think that will help out a lot for these basket makers.
F: I know they have been doing burning over here, where that ridge comes down to Tish-Tang camp ground.
M: Yeah.
F: And there is the black oak, and the hazel in there. Have you been over there and seen where they have been doing that?
M: No, no.
F: Well, they have burned over threw there.
M: Oh,

F: I didn't know if there was places like that, that you were thinking of, where they had burned for the sticks?
M: Yeah, they [Indians] used to burn there every year, ah, for sticks.
F: They used to?
M: Yeah, uh-huh.
F: Do you remember what years? How long ago was that?
M: Nuh-huh. [No]. Oh gosh, I don't know. Quite a few years ago.
F: When you were a younger lady?
M: Yeah. Because they used to burn, and then it wouldn't go any place because there was not timber on that mountain, you know. And, ah, now they [Hoopa Wildland Fire Department, suppression] rush over as soon as they see a little smoke. And go put it out. So a lot of people just go over there to burn it for the sticks.
F: Yeah. Is there other places like that on the reservation where you know people would usually go to burn, say hazel sticks?
M: That's the only one I usually notice.
F: Ok. What about the wild flowers and things after a fire? Have you noticed areas that have burned certain plants that come up that are better after fire versus before fire? That are important to you.
M: Let's see, they had a fire back here up at Socktish creek. And we went up and looked for flowers, wild flowers. Oh, those poor things they weren't very tall. It just ruined them. Because they, ah, they were just tiny and, so I don't know maybe. Especially the lilies, they usually grow pretty tall. They were little, short.
F: They were small, huh?
M: Lillies, uh-huh.
F: Is there, ah, any places, flowers or plants that you use for your ceremonies or regalia, dance family that are special that need fire or anything? That do better after it is burned?
M: No, no. I can't think of any.
F: Oh, ok.
M: Oh, I guess. I don't know about that either.
F: What were you thinking of?
M: That Indian root [*Lomatium* or *Angelica* sp.], you know?
F: Oh, yeah. Wild celery?
M: Yeah. It is getting pretty scarce here too.
F: Yeah. Well some of those places I have seen, where it grows under the poison oak when it burns back. Then it can kinda, from the root, it resprouts good.
M: Yeah.
F: And [fire] knocks back the poison oak. It helps it some times. But, hum. What about, I know this is a, kind a sensitive question, but for, ah, sacred places. Because I don't know the Hupa places where they [medicine people] would go train. But you don't remember people burning at those sacred places at all. Or ah, dance grounds are sacred places, so sometimes they would burn around them.
M: Yeah.
F: Any of the sacred places that you knew, you don't have to say the name, but did they use fire in some of those places at all? Clearing out the brush or anything or clearing the ground?

M: I haven't heard.
F: Oh, okey-dokes. Um, Any other stories or some of those other things you remember talking to the older people? That they, at least, maybe said about fire, at all that you think would be helpful to pass on?
M: No. I can't remember, we didn't talk to much about fires because we just took it for granted that's what we did. Is what they did was burn these spots and no forest fires was around. So, I haven't heard too much about fires.
F: So that was kind a, so that was so common and people used it so much?
M: Yeah.
F: There was no special reason to talk about fire because it was just there right?
M: Yeah.
F: I was just around, so, it was different than to day to where now you have these big fires.
M: Yeah.
F: Did you ever hear any stories or like myths of legends about fire from any of the older people that you remember or that you know?
M: No, I can't remember anything.
F: Yeah. Nothing about lightning or anything like that? Or other stories about that?
M: No.
F: Ok, well. Is there anything you would like to talk about, just in general? Because, I know, also talking with some of the language people, that said "well if you come across or talk about language things, or if you ask the elder if they can say any thing in [Indian] words". Do you want to share anything, or certain words the kinda have to do with fire or ceremonial stuff, that you think people don't know much about?
M: Yes, I, ah, since we have had this, ah, hardly any water in the Trinity River, you know, and this year is the only time they have really had any high water. And, ah, I worry about the acorns rocks that you gather along the river to cook your acorns with at the ceremonial grounds. And there are just certain kinds of rocks you pick, to get to cook you acorns and, ah, I noticed, they are getting less and less. I don't know whether the high water brings them in or what?
F: What do they look like? Have you collected them before?
M: Yeah. They are almost black. [basalt]
F: Oh, ok.
M: And shinny. And some of them, ah, you know are almost round. But, ah, I have not seen that many. And we have been trying different kinds of rocks to see if they work.
F: Yeah.
M: You know, but they don't work as good. They crack.
F: Crack and pop?
M: Yeah. But those, ah, acorn rocks. One time we went to the ocean, and we went down this road they just poured gravel there, oh, the most beautiful acorns rocks was laying there. And my father-in-law, he says, I was gathering them up, you know, "you don't gather anything outside of the reservation to take into the reservation". So I couldn't bring them back.
F: Really?
M: He said, "you get it in your own place", you know, " in Hoopa". So I didn't bring any home.

F: Was that because, ah, he thought you were in somebody's else's territory?
M: No, I don't know what it was. But, ah, you use everything where you have your ceremonial dance and everything in Hoopa.
F: Oh, ok.
M: So you don't bring in things from the outside.
F: What about those sea lion teeth for the hook man hats?
M: Oh yeah, they had to bring that in [over the from the coast] a long time ago.
F: Those fellas, they [might have] swim [this far] up the river? [laughing]
M: I guess that was trading material.
F: Oh, ok. Yeah.
M: And then, ah, there was a lot of things you couldn't bring back into the valley [Hoopa], and ah, just like, ah. Like on your fire place at the ceremonial grounds you have your fire in the same place it has been for centuries.
F: Wow.
M: And, ah, so when you get to that place, even though the river came over it, and covered everything up [with silt]. You have to dig until you find your place.
F: Your black dirt?
M: Your charcoal, and acorn rock. And acorn rocks, a lot of people use them over and over, but I never do I use everything fresh.
F: Yeah.
M: You know, ah, new. And same way with my acorns I soak them every night so they will be fresh you know, for the next day. But ah. There is a lot of short cuts you could go, but ah, I want to go they way they used to a long time ago.
F: Ok. What other things about, if you are willing to talk about the ceremonies, that you think are the most important that young people should learn about today?
M: Oh, when you come to eat. You know the young people get so hungry, and yet, at my camp, or our camp, we seat the dancers first, then we seat the elderly, and then the rest of everybody else [who came to the ceremony].
F: The general public?
M: Well then if there isn't that many, they can sit down, you know, the elders first, dancers first, elders, then the rest of the people. But we always make out good. So we are always willing to invite people to come eat with us.
F: Yep, and that's how I showed up at your camp.
M: Yeah, [laughing].
F: Which I still thank you for. I was a hungry fella sitting over on the side, waiting my turn.
M: And another thing I do to, when ah, well my husband started it, when we took over, ah. There is old people that come, you know, elderly people, and they sit in the car. And so we always made it our practice to go to their car and invite them over to eat. And they like that.
F: Good [for you doing that]. Now what about the white [albino black tail] deer and the regalia, uh, those things are harder to find. Are those things that the young men or other people in your family would have to go hunt or find? Or are those things that people would bring to you? How would you family get the regalia, that you have so much [of], that you have so much responsibility for?

M: Where my husband got all the regalia from was his family before. And, ah, and then, with others, a lot of people let you use things, you know for the dances, and ah, but most of our things are really old, and had them for years. And, then, I remember one person from out of the valley brought a white deer over to, ah, when Rudolf Socktish was the Chief. Brought it over there. Rudy was so good to us, he would call us up and, he just lived next store, and he took George and Richard over to show them how to skin out the deer, and why you skin it out that way.
F: That was a really special treat then [for those guys] to see how to do that.
M: Yeah, and then you don't eat the meat either.
F: Nope.
M: So, He used to, taught us a lot of things that. He would call over here, "Ok, school started". We'd rush over there. [laughs]
F: Good. Do you see other elders doing that today much?
M: No, no. I think a lot of things are changing you know, as you go along.
F: So how do the young people learn [traditional ecological knowledge and practices] then?
M: You have to have somebody tell. I don't think you have anybody to that really takes interest in telling the 'right' way, you know. I always wish I could go in the school. I did go in the school for a while and tell them about different things. But ah, now I always wish I could have a big class to tell them [younger people] about some of these things. So they know what to do, and how to go about it.
F: Hum. Now anything else you want to say about the regalia or the dances and that, I mean? Cuz, you know, if I write this all up like that, and you pass on, years down the road,
M: Yeah.
F: This could be your living testimony or something like that may be useful to people. So, are there certain things you would like to share if you were in a classroom and there was young people here, that you would like to say?
M: I would like to have, like my son's, to tell them about the dances and ah, the regalia, what they use and show them. We have, quite a few things, that could be shown, and why you use it, and how you use it, and that's something I'd like. And now, they do share some of our regalia, when they have dances on the outside [out of Hupa territory] in different places, so they are willing to do that, too.
F: Yeah. For example myself, I got a wolf skin I got from Alaska, that was brought from a place [trading company, Lebanon Or.]. And I was wanting to make the blinders [head bands]. I didn't know if I should cut if from the nose, from the head to the tail direction, or if I should cut from behind the arm pits, you know its open, from the belly, to [across] the back, to the belly. So I held on to it for 5-6 years. So finally this last week I cut it to start making them [blinders].
M: Oh.
F: This way, from the belly hair across the back long hair. And then I had some other person tell me, 'no you should have did it this way'. So I could have the tail piece hang on the lower part. I looked at pieces in the museum. I am not from a dance family, hum, I learned a little bit from being around my father, you know, taking me to different elders to see how things were made, but I, even me as a man, young man still in some ways, I'm still 33, wanting to learn those things. It takes, I have to take the

time and make it a priority to go visit the different regalia makers or owners to look at it, you know.
M: Oh, yeah.
F: So, that's how I learned a little bit by asking the questions. But, ah, I take for granted, I assume that people within dance families like your sons, or grandsons, that every time you bring it out, they get a little bit of knowledge each time.
M: Oh, yeah.
F: But if you aren't from that dance family, which may you [someone like me] aren't supposed to know. That's the privilege of being [from] the dance family and the responsibility.
M: But I think it should be told so, ah, young people would know, you know, and ah. Even some of their parents don't know.
F: So what do you think about certain preparations that the young people, come. If someone is going to come wear your regalia and dance, that's maybe, part of your family or not part of your family, but from the tribe, how would you like to see them prepare themselves as far as staying clean? Or other things they need to do.
M: Usually they, ah, maybe they could fast for three day, just like we do, they do for going to gather Indian root. They have to fast and go up and get it your Indian root. And then, have a little ceremony where they 'thank' the Creator and all of that. So that's some thing I don't think anybody knows.
F: And so besides fasting, is there other ways they needed to stay clean, that you think they should do?
M: No sex, no dope or, to dirty their bodies. Yeah, I even have my grandsons, two of them, teaching them, and when they fast, they just drink acorn water.
F: Yeah. Um, what about for the young ladies?
M: Young ladies.
F: If they are cooking in the kitchen or helping out like that? How do they prepare themselves?
M: We tell them what they can do and can't do, you know. And then, ah, they can't eat while the dances are going on and they can't drink. So we teach them all that. And it is, kind'a hard to teach those young kids. They kind'a get, ah, insulted or something, but we are just trying to teach them. The right way. But anyway they, usually come and ah, do a lot of washing dishes and things like that. But then with the girls, on the Indian dresses, we tell them, if they, ah, if they are going to use our dresses they have to be clean. And to take care of those dresses. And those dresses we have are 100 years old. They were originally made for the Jump Dance. So even if the girls don't dance, we dress them up in the dress and stand there. So, I know I loaned out the dresses to some girls, then when they brought it back, I opened up the suit case and they [dresses] were just piled in there. So I don't let them use them anymore. I said they have to learn how to take care of things like that.
F: Now there are things like, woman's rules about not being on their moon-time and stuff, being in the kitchen?
M: Yeah, yeah. They can't be around, fool with the food, or you know, help with the food. They could be there but, they don't participate [with food handling or cooking].

F: Ok, but your are saying, but even your dresses are made for the Jump Dance, the old ones, that they will wear them to the White Deerskin dance, but wear them to the sides or no?
M: At the Jump Dance.
F: At the Jump Dance? Ok. That's right, ok.
M: Just at the Jump Dance. But then if somebody wanted to borrow it for the Brush Dance, then they can use it there too.
F: Ok. Now is there any beliefs, that you know, about your regalia, about using necklaces for the Jump dance versus the Brush dance? Some people say you can't. If it was made for one dance, it has to stay with that dance?
M: Yeah.
F: Is there?
M: I really don't know, the men folk know about that. I don't.
F: Ok.
M: They take care of all that.
F: So what's been some of your main responsibilities for the ceremonies over the years?
M: Mostly cooking. [laughs]
F: Yeah, running the kitchen and camp?
M: Yeah. But now my two daughters took over and they are good cooks. So I don't have to do that much. But sit there and I don't even boss. [laughs]
F: Yeah, ok.
M: But I just love those dances, because a lot of work. But, I said, I love people and I just love seeing them come around and enjoying themselves.
F: So in making that medicine for the dance. What does that symbolize to you? What were you taught about why they do the Jump Dance?
M: Why they do the Jump Dance?
F: Yeah.
M: The story was told to me. They said there was a bunch, ah, Indians they heard nothing but crying, crying. This was before human beings was on earth. And they heard this crying, and crying, so they thought they well we'd go down and see what's wrong. So they went down to see what's [wrong]. Oh, this Coyote, came over from Redwood creek, and when he got up on top of the swag on top of the mountain he heard all the crying. So he said I will go down and see what's wrong. So he came down into the valley, and he asked them 'what's wrong, everybody is crying'? Well, they said look up there, up towards Willow Creek, look at that black cloud coming. And he said, they said, that's disease coming, it's going to kill us off. So anyway, they, that Coyote told them, 'well, why holler and cry about it? Why don't you try to do something?' So they start dancing and it took ten days for them dancing, and it got rid of the disease and so that's why they have the Jump Dance. To get rid of all the evil, and disease, and things that are going to go through Hoopa. So that's the story that was told to me along time ago. [laughs]
F: Neat.
M: That's what I always told the kids you know. It's easy to say and for them to understand.

F: And is [are] responsibilities those kids or people who learn that story should do besides every two years? Besides just dancing? And what do you think about that? Besides wearing the regalia and dancing, what should they do?
M: I tell them it's not only when you have your dances, when you pray, you pray all year round no matter how many years you do it for the dances. You do it everyday and you will always be taken care of. And ah, and you will always have good friends, and ah. That's what I do, I pray everyday and I know it's helped me a lot.
F: Now we didn't talk much about your education as a little girl to an adult, but. How was your Indian education, your cultural education and how was your White man, your schooling education?
M: Well, you know I didn't learn all of this when I was in elementary, it's, ah, until I got to be in high school. And ah, when I was growing up I went to school and there was all Indians. You know, I didn't go to no boarding school. But then, the BIA was your Bureau of Indian Affairs was here. And if the superintendent came in and if he had any children I always got acquainted with them. So I got to know, so that's how I got to know the white people and how they lived and everything, because I used to be at their house all the time. And, so I know a lot of my friends used to call me 'white man lover' or [laughs].
F: Tease you, huh?
M: Yeah. But I loved to meet people. No matter who they are, where they are from. And I was always that way. And so that, so I didn't really, um, learn anything about our culture through them days, but later on I started to learn. My mother and father were real good, there was eight of us in the family, and ah, they taught us so many things, that ah, and I think it helped us a lot. Because you couldn't go any place or play or anything or unless you had your chores done. And then you could get out and do what ever you wanted to. And most those years I used to swim in the river. The whole family would go down, pick apples on the way, that was our lunch. And so we were really good swimmers. But, ah, later on, now, I said the river [Trinity] isn't that good any more because it stinks you know. Because they don't have enough water running through. I know it has really changed our [Hoopa] valley. And so later on I start learning about the culture. And I wasn't in it then. I visited all these old people, and they told me a lot of stories and then I got married. And my husband, he joined the navy and he was sixteen years old and. He served his time and came back we both graduated the same year. So then we got married.
F: From high school?
M: From high school.
F: Wait, he went to war, then came back and finished high school?
M: Yeah.
F: Wow. Ok.
M: So we got married and I was 18 years old, and he was 19. We were married for 53 years.
F: Well, good for you.
M: Yeah, so he got into the [ceremonies], then they asked him to take over being a leader. So he agreed to it. So that's when we started.
F: And he learned from his family?

M: Yeah. He learned from his family. And so that's when I got, we got started early. With that business. I think we were in there for about, over 50 years. So.
F: Long time, huh?
M: Yeah.
F: Well good. We have been here for almost an hour now. I just wanted to see how you were feeling?
M: Yeah I feel ok.
F: Is there any last things, you think you would like to say or share? Whether you remember how the place changes or about fire, or even about the ceremonies?
M: About the ceremonies. I just like to see them have a class on it. And tell, ah, explain to the young people what's it for. And why you have it. I think that would help a lot of these kids, especially. A lot of these kids are more like lost. You know, because they don't know their culture. And I know my grandchildren they grew up in the culture and they are so much happier and better in their ways than a lot of them that are almost lost. You know. But I think culture is, ah, really helps a person.
F: What about? As a holder of that regalia, you have that really old regalia. What about new regalia? You know, that has to come from managing your environment and being able to get those things? Do you have ah, perspectives or anything you want to share about how you think those different animals that make up the regalia should be managed and taken care of? You would like to see? Differently?
M: Oh, A lot of people that maybe ran over or killed an animal they'd bring it to, they'd used to bring it to my husband, and then he would fix it. The way they use it, ah, in the dances.
F: Yeah. The would hit a ring tail cat or? I mink. Or someone gets an otter?
M: Yeah. And then he used to get eagles from Washington in the mail. And they are frozen of course then we would use the feathers.
F: Ok. Was there other little? Do you remember them using other things, like ah, other little birds or anything special or unique like that?
M: Oh, they used to use, they still use the red tail hawk. And then they, I remember this person had a [Jump Dance] head dress out of humming birds.
F: Humming bird chins?
M: Yeah, that's beautiful. But you would have to have a lot of humming birds.
F: I seen one, Calvin Rude had pair of them when I was a little boy. I remember seeing down at his place. I just shined like rubies and emeralds. Every which way in the sun light. That would be a lot of humming birds to get.
M: Yeah. Oh, gosh yeah. Oh, I don't know.
F: Thank you. I am going to turn this off then.
M: I hope you can use it.
F: Oh, yeah. [Interview ends]

Josephine Peters (Karuk), Age 83. Interviewed by Frank Lake (Oregon State University) Hoopa, Ca. August 17, 2005
Consent for voluntary participation verbally given and signed on IRB form

F: This starts off just kind of easy, but just your name and your tribal affiliation and if there was a place, a village that you are more affiliated with, or an area that you grew up in that you identify as yourself, where would that be?
J: Three dollar bar.
F: What's your name and your age and tribal affiliation.
J: Josephine Peters. I'm 83 years old. I was born at Somes Bar on the Three-dollar bar ranch.
F: You can relax. This will pick up everything. You can relax…. So. Okay. Were you raised learning traditional practices such as harvesting basket materials or collecting wild foods and herbs or other things like that?
J: Yeah, as a child growing up I used to go out and pick willow sticks with my two great-aunts, which was Minnie Johnny and Mary Johnny. And they were married to my great uncles. They'd make…when I'd pick the sticks and peel it and take it to them, they'd always make me a basket. And I still have one. Some of them are a good eighty years old now.
F: Besides the willow sticks did you pick other basket materials and things?
J: Yeah, I used to go with Phoebe Maddox and she used to… she lived about a half of a mile below us. And she would come up… there was a **big fire** above us on **Somes Mountain**. This little boy that went to school with us, he told us, he says "You watch," he says, "there is a **big fire up** there." Pretty soon, sure enough. The **whole mountain burned down**. There were a lot of hazel sticks there. So we would go up the following year and pick. I'd go up with Phoebe and she'd pick all of these sticks.
F: was that fire seen as a bad thing or a good thing?
J: No, no. It was seen as a good thing. In those days nobody done anything.
F: Did it torch the tops of the trees or did it just kinda creep under…
J: **It went up through the bottom**.
F: Just underneath of it all, huh?
J: And you could not even hardly notice it. We had a saw mill up there, my dad did. And it sure didn't burn the saw mill.
F: Yeah, you don't want that.
J: Yeah, all along the river, we had a lot of willow and roots. There's one, one little place beneath the road where I think they are trying to get roots. I take a few and pull them up.
F: Were there wild foods or berries or roots or medicines or things that you used to go out and gather too with your family that you learned?
J: Down below where we lived was all mined out on both sides. And there was these great big woodwardia fern would grow and I went down where Phoebe lived there was another spot where they mined and I'd go down there and pick the woodwardia fern [bring it] back home and fix it. It was all on the **trail** side, not on the road side. So nobody would go in there.

F: And I know that you know quite a bit about herbs and healing plants. Did you learn that when you were younger too? From different family member?
J: That comes to you. Because my grandma Queen was, on my father's side, was a doctor – an Indian doctor. And she married a man by the name of Francis Purcell. He came to the Fort Gaston here when we had the Fort. And he met her in Bluff Creek. They lived at Bluff Creek. He took her up Salmon River and he never did go back. He used to watch here. And when she picked different medicines, different plants, and fixed it for people. And, Woyster, his friend and Casper and Isaac Woyster was from Philadelphia where they had a big college and they were studying to be doctors and he'd send all of my grandmother's remedies back there to them.
F: Neat.
J: But, uh, I got a document, a paper there, on Isaac and my great-grandfather. It is quite the story.
F: Neat. Where are some of the other places where you learned these…you talked about Salmon River and lower Oak Bottom area, were there other places that your family specifically went when you were a young child? Did you ever learn other things on the coast or up farther upriver.
J: No, we never did go out to the coast. Of course we were, you know, there was no way of getting around. And if we got hurt or cut or sick or anything, we had to use herbs to cure ourselves. The only time we got to go anyplace was if we broke a bone or had a tooth-ache.
F: Yeah. So most of all of your experience was right there in the Somes Bar area – Oak Bottom.
J: Yes.
F: Okay. So were you ever taught or told about the use of fire by your different family or Indian people?
J: **Well, we used to burn, you know around the barn. They used to always say "well, burn everything so if we have a fire it won't burn everything."**
F: What time of year would they burn that usually?
J: **In the fall**. We'd cut wood and pile up the brush, you know. And then once there was a good rain then it kind of dries out and we used to burn the brush piles.
F: So, you'd burn the brush piles after the first rain?
J: Uh-huh [Yes].
F: Okay. Do you ever remember them talking about burning other places for different reasons?
J: Not that I know of. Not that I remember. I know we used to go up **Offield Mountain** way to pick hazel sticks.
F: Yeah.
J: Up around that lake. And after they fell all of that timber around there, they just ruined that lake.
F: Why, what happened to it after they felled the timber?
J: They just left all of that debris laying around where the lake used to be. And there used to be a lot of herbs. Of course **Indians seeded around lakes with herbs so that they'd know where to go get it.**
F: Make a little garden.

J: Arlene and Terry and I went up there one year after they logged and they just ruined everything there. There's nothing left hardly.
F: Hmmm.
J: Now, after the took the elk in there… I used to walk in towards Haypress [meadows] to gather my Prince's Pine. I'd get Prince's Pine in there and other herbs. I'd come out and meet Forest Service. They didn't look at me. They knew what I went in there for. Now you can't find any on account of the darn elk.
F: The elk get all of the Prince's Pine down?
J: They just trample things.
F: Yeah, trample it down. So, have you seen them use fire for different cultural practices like burning the willows?
J: Yeah, I used to see. **They'd set fires and everything**. Up towards **Happy Camp** they used to set quite a few fires.
F: Oh, yeah. Up Happy Camp way. What season, or what time of year was that that they'd set the fires?
J: In the **fall.**
F: In the fall time. Okay. Was there ever **spring burning** for things?
J: Not that I remember.
F: What about the willows? When did they burn the willows?
J: **We never did burn the willows**.
F: Huh.
J: **Of course after the high waters in the winter time, and it goes down, I guess the roots go back under because there'd be little shoots come up all over**.
F: **After the floods? So when did Karuk people want to start burning willows, then? Was that more recently?**
J: Just recently. I never did know of them burning willows before.
F: Huh. And why do you think that is that they want to burn the willows now?
J: I think on account of the bugs getting in them. Because generally, if you pick them in the fall they don't have many bugs in them. Just the spring ones will have bugs.
F: So the spring willows have the bugs.
J: But in the fall there's a little blue fly that comes off of them. I don't know whether they hatch from these bugs that get in the spring time or whether that's the bug.
F: Because you can see that little orange bug in there - inside the stem.
J**: In the fall you can drive through it and these little blue flies are just all over it**.
F: Yeah. What about bear grass? Did you ever about people going out to burn beargrass? And where they did that?
J: See, up there, we had no beargrass in that area. We'd have to get that from somebody that would come through with it.
F: Okay. So I know that there is bear grass up Donahue Flat way. And so maybe people would trade that in. Huh. Did you ever hear about people that would bring it: did they burn it themselves, the beargrass, and collect it or was it lightning fires that they would collect from.
J: I imagine lightning fires.

F: Lightning. Okay. What about for **oak trees**. I know that oak trees are really important for Indian people for acorns and for wildlife habitat. Did you ever hear about people using fire in oak forests?
J: Just around the **bottom of a tree**. Maybe three or four trees that had good acorns on it and we would. But we would rake the leaves away from it and then burn it.
F: So rake the leaves away from the base of the tree and then burn underneath the crown or the canopy area of it. What did the old people say, or your family say, about why people burned?
J: I don't remember what they said.
F: They just said they just do it, huh?
J: Yeah, we just did it.
F: Where there other places that you remember them talking about burning, like after **ceremonies** or for other reasons why they might use fire around there?
J: We never had much. Down at ***Katamin*** was about the only place where they had anything like that going on.
F: What did they do down at *Katamin* with fire? What do you remember?
J: I don't know what they were doing. They'd go down with fire on a stick. They used to tell us never to look. "Don't look."
F: Oh, yeah. It might have been the Fata-wan-nun carrying the firebrand.
J: Yeah, he'd come down. The medicine man'd come down. And they tell us. "Keep your eyes closed and don't look." And I had to peek. He had a deer hide around him and he went down, taking that fire on the stick, went towards the river. Of course they used to dance down by the river in those days.
F: Down there below, just off the bluff where it started to wash out?
J: Uh-huh, yeah. There was a pond down there and they'd dance around that pond. It was way back in the 20's.
F: The 1920's. Do you remember places that they burned, uh, other than the mountain? Maybe back on certain ridges or heard places of other people burning like down Weitchpec way or up toward Happy Camp?
J: Yeah, we used to hear, you know, fires. Alveretta Super's first husband got burnt in a fire.
F: Uh-oh. I didn't know that.
J: Up towards Happy Camp.
F: That's too bad. Had Indians always been using fire that you know, within your family that they talked about, for different reasons? Has that changed at all when the Forest Service first came or the white people started settling?
J: Yeah, when the **Forest Service** came, I remember when they moved across, built that building right across from us. **We used to burn and be able to make fire**. We'd have play houses make a fire. Then after they came, my dad used to be just stupefied. If he even put off a shot or something, oh they'd think that they were killing deer. And if he felled a tree, if it wasn't on our 20 acres, they get all upset about it – though they were going to do something.
F: So there was a lot of fear of the Forest Service when they came in?
J: My dad he was really…
F: So they wanted to abide by the law?
J: Uh-huh [Yes].

F: Was there other Indians that were more outlaw'ish?
J: Yeah, me.
F: What are some stories you could tell about that area that people used to do?
J: Well Dave…, he used to be one of the ones that would go around and set fires.
F: So there were **different men who used to go out and set fires**, huh? Did they do it just for cattle or for basket materials or was there different reasons that you know of?
J: No, I imagine that where the fire was above us, on **Somes Mountain**, that my uncle and we used to run **cattle** in there. So we thought we would do it for their sake too. There was a big meteor that fell one year, it must have been back in the 30's, and it landed up there and went into the mountain. And my brothers went up there with their shovels and were going to dig it out, but it just made a big crater down in the ground.
F: Oh it did, did it?
J: It must have went way down in there.
F: That's a heck of a thing. I never heard no one talk about that. I wonder if there is still anybody who know where that old meteor hole is at.
J: Well, I imagine that my oldest brother might still remember.
F: Is your oldest brother still alive?
J: Yeah, he lives in Eureka.
F: That might be interesting to ask him if he remembers where it's at and go up there and look around.
J: I kind of remember where was. It's above the **trail.** Of course the old trail went over **Somes Mountain** and came out up at **Butler'**s – part of an old homestead. I remember it was above the road, but I never seen it.
F: Huh, neat. What were some of the main reasons why Indian people stopped using fire? Was it mainly government policy?
J: **Government**, yeah. The Forest Service. They were scared of the Forest Service.
F: They were scared of the Forest Service. Do you ever remember hearing about people getting arrested or anything bad for Indian people being affected in any way directly by the law because they were burning for cultural purposes.
J: No, not that I can remember.
F: (Pause) Are there times of year when they used to not burn for different reasons? Like would there be a certain time or places where they said they wouldn't burn at all. Like the kept out of that place, that you can remember.
J: Well, I can remember…well, that was a **lightning fire** I think that hit up in there. We had a flume that went, maybe, almost a mile up in the creek to bring water down. I remember when the fire **jumped the creek** and got on our side. My brothers and uncles all went up there to save the flume.
F: An old wooden flume, yeah. It was wet but you still didn't want it to burn up or to undermine it. So how often did lightning strike in that area versus, you know, where Indians. Because sometimes, you know, there is an argument between a lot of the different researchers about just how far Indians would use fire back up in the mountains versus what was lightning burning. Did you ever get a sense of that, about where lightning struck and where Indian people would burn versus lightning?
J: Not that I really remember. But I used to hear them talk saying "**lightning started** that fire." But I always thought, well, it looked liked all of **the lightning those days was in a different direction**.

F: So lightning was always someplace else besides where it was burning.
J: We could always tell when it struck down because you could see it come right down to the ground. My old granddad used to tell us, he said, "**it always hits an old snag. Because you get an old snag," he says, "and the pitch pulls to the center of it and that what draws it to it."**
F: Oh, neat. I know for making medicine that I was always told to get that pitchy sap-wood where lightning had struck because it always had more, you know, to it. Especially if those old snags fell down, they had that hard core that was struck by lightning, that's what we had to get up in the medicine… up in the mountains for making medicine for some reason. Just that kind of lightning struck pitch tree, you know.
J: We used to gather pine pitch. Every time that we caught a cold or got a sore throat, we'd like to chew that old **pitch**. But we liked it, you know, pitch gum we used to call it.
F: Pitch gum. Was it from sugar pine or from the yellow pine or ponderosa pine? Which pine tree was it from, your pitch?
J: I don't know what kind of pine. It wasn't like these here. It grew like a fir on the ranch there. They called it *swinapich*. That means that kind of pine tree. Of course this old fella, he used to come up and bring us salmon and cut wood or cut hay for us. And, uh, I'd meet him on the road when I was coming from school and "hey swinapich girl" he used to say. One time I went home and told my dad "he swears at me everytime he sees me." I said "he calls me son of a bitch girl." So my dad went and asked him and he said "no, I don't say that, I call her *swinapich* girl." That tickled me when I got older.
F: So in your lifetime, how have forests or meadows or prairies or different areas in the rivers changed? Have you noticed areas that have changed because it hasn't been burned? And what is the greatest change that you've seen that happened?
J: well, I used to go up in **Monte Creek** a lot. Up in there. And it seemed like after the fire up there a lot of the **logs were let down in the creek**.
F: So the fire brought a lot of big logs down into the creek.
J: Of course we had the **sawmill** up in that creek too. All of that washed down into the creeks.
F: Do you remember there being more prairies or open areas?
J: Yeah, there used to be, but there all **grown over** now. Of course, down in **Merrill Creek**, there used to be a lot of open space in areas. It's all growed over in brush now.
F: So what do you think kept those areas open?
J: I imagine fire. We had a ball field up there.
F: Yeah, okay. So when fire suppression, that basically grew in those places, huh?
J: Of course there were a lot of **manzanita** up in that, sagebrush, we called it.
F: We talked a little bit about willows. That was already one of the questions. And so, so, do you think, is there other reasons, do you see how fire affects other plants and animals that you think why fire would be good in some places and not, and better in other? Bad in some places and good in others based on when you go out and collect herbs or other things or for animals? Do you see that there is a benefit to fire?
J: Well now you can't…well, where there was herbs and stuff, it's all **grown up** so darn bad that you can't even find where there used to be some. Of course we walked

that **trail** all of the time, you know, from Somes up on our side of the river. And we used to pick Indian tea and all sorts of herbs along the way. I went up part way, as far as I could go, several years back, and it was all growed over bad.
F: All grown over, huh? And do you remember what kind of plants or what kind of brush or trees grew over those places. Was it young fir trees or buckbrush, ceanothus, or what was it?
J: Just old tangly brush. Mostly, it's a vine.
F: **Honeysuckle**? The one that makes the curly sticks?
J: Yeah. Uh-huh. That's all over there now.
F: And poison oak too gets pretty thick in places. So those types of things were growing in there thicker. And that overtakes the other forbs and the herbs in there?
J: Yeah, grows them out.
F: So have you ever heard the old people, or yourself, do you see a connection between the fire and the plants and water and the fish. Have they ever talked about that, how the fire actually is good for the water and the fish in anyways. Connections between those things?
J: No, I was raised on that ranch for years.
F: It might just be…It doesn't necessarily have to be about your ranch at three-dollar, but it just might be, you know, other places in general. From more of a landscape, across the landscape in other watersheds. Uh, is there a way that you know, or have learned from elders in your time, that there's a relationship between the fire and the water, the plants…or the fire and plants and the water and fish that maybe science isn't aware of that they think that they should know about or would be good to tell people about. Is there anything there?
J: [Pause] Not that I really can remember.
F: Okay. How do you feel that traditional uses of fire can be used to restore the forest or the prairie areas or even help wildlife or things like that?
J: I think a lot of it should be **burned** now. There's nothing but blackberry vines and those rose bushes that come up and just take over. There's not **grazing land** left then.
F: So the fire would help keep back those different invasive plants. What about exotic weeds or exotic plants. How have you seen fire affect them in some ways and what would be your recommendation? Some people have different opinions about whether you should burn scotchbroom or not. Do you have any views or thoughts on that?
J: Well, I wish they would burn it all up. That really takes over. I imagine out on that Megram fire we had out up there, I went up, they took me up there several times to that, and the year afterwards we went out and we could see little fir trees sprouting. And there were a lot of herbs coming back up in there. And what got me was the **elderberry**. The elderberry was just looking like the fire didn't hurt them. As far as you could see it looked like the elderberry was still blooming in nice healthy bushes.
F: And so was that places where it burnt pretty hot or was it more of cooler fire areas.
J: No, it was down in the gully and up in the flats. There was just a lot of elderberry in that area. And there was beargrass in there. I haven't been able to go back in there. We went in with Forest Service. The Forest Service took me in there.
F: So do you know of other animals or other cultural uses for elderberry? (37:30) Because if that came back after fire that was good, then…

J: Well, the elderberry flowers are what we use to reduce fevers. We wait until the little white petals start to fall off, then we just prune the head off and save the head part. We make a tea out of that for fevers. But I did, I know one lady who used to make elderberry pie.
F: Out of the berries, yeah.
J: She made some jelly one time and gave it to me. When I ate it, it was good. I never really tried the pie.
F: Funny. Yeah.
J: I guess that's what they made the flower dance sticks with too.
F: Oh, the clapper sticks out of elderberry. Hmm.
J: We used to go way back up in Tish Tang, way back out, and get nice big ones. They were big, nice.
F: Yeah, about the size, as thick as a quarter, nice and straight. And were those elderberry or mock orange?
J: No, they were elderberry.
F: Elderberry.
J: **Mock orange** is what they made arrows out of.
F: Okay. So mock orange was for arrows. How does that do after fire? Some of those other plants that grow back.
J: They seem to come back a lot healthier.
F: But did you ever hear about people burning those plants just to get the growth, the big, long, straight shoots?
J: I don't know. Of course I never noticed that up in our area. But up in that Megram Fire is where I noticed them coming back really nicely.
F: Hmm. How do you think that the government agencies, like the National Park over at Bald Hills area, or the Forest Service could be using fire for better management of the natural resources and cultural resources? You said that they should be burning places off, but, say if you were the manager and you could have your choice of where to put the crews and had plenty of money, where would you prioritize? Where do you think they should work first?
J: I don't know. There's a lot of open areas. They did burn up there last year, didn't they?
F: Where?
J: Up around the big old ranch.
F: Which ranch?
J: ___???
F: Oh, they burned at Max Creasy's? Up at Ti Bar?
J: No, up here. Going out towards…
F: Oh, Bald Hills? Lloyd's ranch. They burn out there about every two or three years.
J: It got away from them.
F: I guess, I don't know.
J: It got away from them last year.
F: And what do you, have you driven over those hills and saw how it looks after that in the burns in the white oak, in those prairies.
J: No, I haven't been over that way.

F: Oh. I wondered if you'd seen other places that are burned around here, either where they'd prescribed fire or by these arson fires that happen, and if you have anything to say about those places that have burned recently.
J: No, I don't get out that much. But we used to go up here, up **Supply Creek**. Where the old lookout used to be. It used to be…uh… a lot of beargrass growing in there. You'd go out, we **take a lot of newspaper out and we'd burn just the bunches**.
F: The clumps. Yeah, the individual clumps of beargrass.
J: But now, it's so grow over that it's **crowding** it out. There are a few places out in the open.
F: What about a lot of the wildflowers like the lilies and things. Do you see how those do better after fire or the Indian potatoes.
J: I noticed out here that they burn this off nearly every year. We're lucky. The whole bar [Hoopa across the river (south) of the motel/casino].
F: Oh yeah, the bar out here on the flat. Across from *Tishwalitin* on the other side of the river on the other side of the cemetery. Or which one?
J: no, right here.
F: Oh, right hear along lower **Supply Creek**. Okay.
J: every year they've burned it off. And I notice this spring there were *so* many **Indian potato**es that come up and it was just purple in there.
F: Yeah.
J: This year we are lucky that they haven't set a fire yet. Every year they've burned it off. But when they once start it, the just let it burn, you know. Burn it all off so that it won't be dangerous.
F: What do you know about Indian Potatoes and those foods like that, those bulb plants?
J: We used to dig them and eat them. When we went to school up in **Somes**, there is a lot of **serpentine** up in there, you know, around there. And they [Indian potatoes] grew there. We would go out and dig them.
F: What time of year did you go out and dig them? Do you remember?
J: Spring time.
F: Spring time before they flowered or after they flowered when they were going to seed.
J: We watched til they flowered. Of course the other thing come up…I forgot the name of it. It has a big purple flower on it too, but it is more like a lily flower.
F: A big lily flower? I can stop this for a minute. Do you want me to stop this for a minute?
J: No, it's alright.
F: Like there's the one call the *pufish tayish* (Deer potato, *T. laxa*) which comes up with a straight stem and an open blue, light blue flowers.
J: That's the one I'm talking about.
F: That's the one that you used to dig and eat?
J: No, we never used that one.
F: Huh! Then there's the other one that comes up with kind of a wavy stem that has a tighter purple flower. Like little pom-poms.
J: Yeah, that's the one we'd dig.
F: That's the one you'd dig, huh?

J: There were a lot out here, though, in the spring.
F: What about the firecracker one that has the little, the red and the black and the white tip on it.
J: No, I never…
F: …seen that one. It looks like little flowers that come off of the banks.
J: No, we never bothered them. The onion. The onions have to grow where it is **swampy**. They used to grow on the other side, by the old mine. We went down to Willetz one time. We were supposed to go to this one place and we got off the wrong road and headed out towards the coast. An old road. We saw so much of that growing.
F: The onion?
J: The **onion**. When I was back in Oklahoma one year, this family came and picked me up when I got through with my lecturing there and took me over to their place and this old lady, she cooked up this big meal and she had a lot of that, she made a soup out of that one onion. And they were growing all over because it was swampy. And that was the best tasting thing.
F: What other kind of bulbs or little plants like that would you use for food down there around Somes. You dug up that one kind of Indian potato, but were there other things that you saw. What about huckleberries?
J: Huckleberries. There was **huckleberries** up on **Monte Creek** and this side of our mill. There weren't too many but I'd go up and pick in the rain.
F: Did you ever see how those did after they burned or did you prune them or anything?
J: No, they were good then, in those days. Now, it's so…they boys tell me that it's all growed up.
F: So it's all grown up with other types of brush.
J: Other brush, yeah.
F: Huh, I wonder if those draws, if they burned for huckleberries or if they pruned them. Those are some of the things that I'm also interested in. The creek areas. If they burned the upper creeks or not.
J: I noticed here that when we go and tweak them, you know, break them off, they come back better.
F: Yep. Do you want to answer your phone? (Pause). Okay, well, we've talked about a lot of things so far, but could you share with me your understanding why Indians might burn up in the high country or the sacred mountains. Did you ever hear about them burning up in the high country places at all? Like in Elk Valley or anything.
J: I never heard of the burning around there. I know they put up camps up in there. But, just little **bon fires**.
F: Yeah, just little prayer fires and stuff. What about trails? I know that trails were important to Indian people. Did you ever hear much about those maybe being used with fire in one way or another?
J: Not that I remember. They used to put, but that was after the Forest Service came, they would brush them out. Get a **crew and brush all of the trails** out. Get ready for fire season.
F: What about collecting stuff. How far back did you hear about your family or other Indian families, how far back in the mountains would the go to collect stuff or do things out that way.

J: they used to go to Haypress.
F: Haypress. Yeah. So they'd basically be hiking out there or going on horseback.
J: No, we'd hike out there.
F: And that's where you'd get your herbs, huh?
J: Of course, out there, there was nothing to do, they were clean. Of course down on the ranch and up on the mountain above us, that was **burned** off where the **cattle** were, and they trampled it and there were fleas and ticks.
F: Did you ever hear any stories or legends or myths about fire. Like how fire came to the people or how people used fire or anything like that, any stories that you ever learned.
J: Well, I heard about them but I can't remember.
F: And, uh, is there any last thing that you'd like to share or talk about that you think, that you can remember. I mean, we've talked about basket materials and herbs a little bit and different things. Is there anything you want to share that you can think of here towards the end about who burned, why they burned or…
J: No. Like when we get our pine roots and spruce roots, we always made a fire, a pit fire, you know, down in there. I had a big old hood off of my car. I'd make big coals down under, you know, get it burning, then put this hood off of my car and lay roots on top of that and just cover it back up again and kind of steam them and take them out. We used to sit out in the yard and…
F: They come out looking like sausage or intestines or something.
J: Peel that bark right off and split it right away…. We had basket class this year in school. In the evening, we all got together and made bunches of stuff. Now, kids you can't get them out to do anything. They want to learn, but they don't want to get out and get in… Our kids keep getting roots and sticks from different people that come in. My niece, Maggie, is teaching it.
F: Is she up Happy Camp way now, still?
J: No, she's in Willow Creek. I just got an announcement. This is her new baby.
F: Pretty. Neat.
J: Yeah, I was surprised that she took that job on at school, you know, to teach it. She's doing good. The kids like her.
F: Well, um, I think that's pretty much it, unless you know anything about wildlife. We haven't talked about wildlife much. Do you ever see or hear about how the deer or squirrels or birds do before or after fire or anything about how fire is important for them in anyway.
J: It helps them with their **berries**. You go into where they've logged and burnt the slash and stuff, a lot of the **black caps** grow in a couple of years, they come up, the birds eat. The squirrels get the nuts and pack them away. You know, those salamanders, they get acorns.
F: They do! *Puf puf*. The big salamander? [Pacific giant]
J: *Puf puf*.
F: They gather acorns, huh?
J: Uh-huh. You'd see a big mound and you'd move it and you'd see puf-puf there with it.
F: And he'd be under those acorns?

J: He'd be down in there, yeah. I had one under this trailer here for…oh, he was here for quite some – maybe five or six year. And he'd come out and go back. When he heard my water, he'd come out. Out there there was a gopher hole, kind of. I went to water the chickens, and when I stepped back I stepped on him. Oh, I raised my foot up quick and so I piped him down and washed him up. He looked up at me and went back under the trailer. And here last year, I found him dead out by the steps. I think the lawnmower got him. I don't think the cats bothered him.
F: Yeah, because they secrete a mucous when they get disturbed and they arch and that sometimes, they have glands on the back of their jaw, and those things won't mess with them usually. But he was all kind of mottled, pretty feller, huh?
J: Sometimes of the year he would come out and be almost orange.
F: Almost orange, huh?
J: And then again he'd be that deep brownish green.
F: Black green, uh-huh.
J: But at the up across at my old home at Oak Bottom, where the Forest Service camps are now, we used to go **pick acorns** over that way. We'd run into them. They'd be…
F: A foot and a half huh, big long ones.
J: Then them [salamander-Pac. Giant] kind that lived in the water in the creek, Monte Creek had quite a few. Somes Creek didn't. But Monte creek had some big, big ones.
F: The ones with the little gills on them?
J: Uh-huh [Yes].
F: They look like they have a little bulldog face too, huh?
J: Uh-huh. But they could come out on land, out of the water and lay up on the rocks. Then there were a lot of them black ones with the yellow bellies.
F: Those are the water dogs.
J: Water dogs. I read that book. The Klamath Knot. It told about the salamanders. And it reminded me off all of them around the **lakes**. Grandpa used to, Grandpa Marshall, used to tell us about some lake way up where they used to run **cattle**, way back up in there.
F: Up towards…this high country, **Trinity alps** country way.
J: Uh-huh. And he said that there was a lake up there and these great big things would come up to see him. They had to be them salamanders because when I read that book, it told about them. At that meeting they had awhile back in Orleans, them two guys, they both had read that book. I asked them: "yeah, wasn't that interesting?"

F: Funny. I always wonder about how those guys to after fire. Things burned and logs fall and they have their habitat, their homes under the logs and stuff, other places.
J: **Scorpions**. We used to go up and dig logs that'd been laying around. We'd take a little fork and scrape looking for scorpions.
F: Yeah, the black ones.
J: We'd pack them home and our mom would growl at us.
F: Scorpions, huh? Did you ever see how those guys did before or after fire? Where it had been burned or wasn't burned. Did it seem to bother them much?
J: Didn't seem to bother the scorpions. I guess they can lay down and get under the log. We used to have to put them out. We used to make fire…

F: What about other bugs like ticks or flies or things? Did you ever hear about fire being used to control pests, besides basket plant pests?
J: No. I don't know. The older people might have. We used to have to steal matches to do wrong.
F: Steal matches, huh? That was the important thing to go so kids could light fires.
J: We'd steal eggs out of the chicken house and go up the river bar and put them on those hot, flat rocks and cook eggs.
F: Fried eggs, huh?
J: What a waste that was. We'd all go swimming and the yolk was just all spread out and you couldn't even take it off of the rock.
F: Okay, well, we're getting close here to the time to wrap up. Is there anything else you'd like to share with me or just have me record that you think would be good to have typed up. I mean, you are doing that book project with Bev so you probably have lots of information there. But was there anything tied to other land management issues or protection of herbs or mushrooms, you know, anything like that.
J: With **mushrooms**, that was on **Monte Creek** side too. Of course that was flat up in there, a **big flat**. We used to go up there. But we **never pulled them up** like they do nowdays. We used to cut them.
F: Take a knife a cut them. Cut the tan oak mushrooms.
J: When they bring them in here by the sacks full I always cut all of that bottom off and have them take it back out. There's a lot of old ditch line up there. And he said "I'll take them up and throw them in that ditch line and cover them."
F: Do you ever see them come up again after you put the little things…
J: I threw some scraps out there one time and they came up right out here in the wood pile. Of course I had a lot of the oak wood – tan oak wood come in.
F: What about the morel mushrooms?
J: Those are the ones that came up.
F: Okay. Gottcha.
J: Then I had a log out there. We was curing it. An oak log. And those other kind of mushrooms grew off of that.
F: Kind of tannish-white.
J: **Oyster mushrooms**, yeah.
F: Oyster mushrooms, yeah.
J: Then one time, one guy brought me those, couple of years, they were that kind that come up and have a lot of little tentacles come up in a big bunch.
F: Like grandma mushrooms? The coral ones. The grandmas that come up before the tanoaks?
J: No. They were like a big sponge. They get about that big and just have a lot of little things that come up.
F: Huh. I don't know.
J: He knew what they were. He brought them to me one year, then the next year he brought me some more. Bryan Nelson is the name of the guy that brought them to me.
F: Bryan Nelson.
J: Old fella. They were good. Tastes just like a mushroom. Then Anthony used to bring me a lot of those oyster kind. He used to go out and get them. Now when they

sell them, they just take certain kinds. And the ones that they don't take, they bring back here and I can them.
F: At least you can still use them. Can't beat that, then.
J: Nope. Can't waste! I think I have a couple of jars left.
F: Alrighty. [**End of interview]**

Verna Reece (Karuk), Age 55. and Frank Reece (FR), Karuk, interviewed by Frank Lake (FL), Happy Camp, Ca. September 23, 2002
Consent for voluntary participation verbally given and signed on IRB form

FL: So tell me your name, your age and tribal affiliation.
VR: My name is Verna Reese, age, 55, I'm from the Karuk Tribe.
FL: Were you raised with traditional practices, harvesting basket material, collecting wild foods or herbs or hunting or fishing?
VR: No. I wasn't raised around none of that until a later age.
FL: About what time or age did you start, well you're a basket weaver, you do pretty good work now so when did you first start get involved with basket material?
VR: When I was about 30 years old.
FL: Yeah, what first got you started, interested in basket material or basketry stuff?
VR: I've always kinda enjoyed the baskets, lookin' at 'em and when I married Frank, he had the same interest and we used to collect. We'd buy 'em in antique stores and stuff. And we lived in Washington, Forks Washington, so we decided to move back down to our home lands and that's what we did. And I came in contact with Madeline and Grace Davis. Madeline was having a class, a basket class and I joined.
FL: That was the story ever since, huh?
VR: Yeah, and then I got with Grace. Grace is the one, taught me the materials and how to prepare it. The finer things.
FL: What kind of finer stuff? When you say finer, what?
VR: How to, like the burning, how to collect it, how to prepare it, how to, you know, store it, how to make baskets, you know the cooking baskets, baby baskets, all the stuff you don't learn in a class room. They teach you how to weave and that's about it. Not all this. Then Grace and I just kind of been real good friends. I took her out and gathered, her and Madeline both, and that's the size of it. We did everything until she got so bad that they took her away from us.
FL: What are some of the first materials you learned to work with?
VR: Bull pine roots, willow sticks. It's the first thing they gave us is a bunch of 'em. Bull pine roots to scrape kept us busy.
FL: Did you eventually go out and dig those?
VR: Yes, we dug Bull pine roots, Grace and I did. All that stuff. That's what I said, I learned more with her because she kinda took an interest with me. I guess she's seen that I was interested too.
FL: What were some of the areas that you first started learning this? Like, places? Was it here around Happy Camp area?
VR: Mostly around Ti-bar because that's where she lived and she knew all the gathering places. We did Orleans, and mostly around T-bar, on T-bar road.
FL: The one above the Forest Service station there?
VR: Uh huh, yeah, that's where we used to gather, they used to cut along the road and that's what we used to get "road kill", we used to call it.
FL: Road kill basket material!
VR: It's kinda hard to get burnt [done], they didn't burn, only time when logging, they cut everything down and no under, what do you call it, canopy? They just burn [slash] that, so it wasn't that good of material either.

FL: So some of the basket material like hazel, came after logging, wasn't as good? Why was that?
VR: Because it's out in the open. It's just kind of stalky, fat. It's different when you have kind like a canopy over it. It kind of reaches for the sun and kinda grows long, slender.
FL: But it can't be too thick, huh? Did you ever see, ideally for hazel sticks, how would you say like the trees, open enough trees underneath for it to grow but not so thick that it's like we see in a lot of places?
VR: It needs to be opened [understory]. Opened, I mean when you're loggin' clearcut logging there wasn't nothin'. It's all in the open. Yeah, you don't want a lot of brush cuz you can't get to it.
FL: So you can have overstory trees but you have to have it kind of cleaned out underneath?
VR: Right.
FL: Did she ever take you out and go look at what she thought was ideal basket material type, or did you just kinda happen upon um [it]?
VR: We just kinda happened, you know, they [US Forest Service] didn't do things for us back then. And I think the only time they ever burned was for bear grass and that was up on G-O Road. And the Forest Service [Six Rivers National Forest, Orleans Ranger District] down there has done work with us and burned bear grass.
FL: That Mile post 23 site?
VR: They had it all in different kind areas.
FL: What about bear grass? Did you ever go out and see that burn or collect any of that?
VR: We did that lots. We went out and did gathering after the burn. We never did participate in the burning.
FL: So who was always doing the burning then?
VR: The Forest Service.
FL: The Forest Service was there a difference in the time of year that you guys [Basket weavers] seen when they [USFS] did it versus the other that gave better basket material?
VR: We never questioned it, we were just thankful that we got it. Usually they do it in the fall, the right time is the fall and then you have till July to pick it. Next year's July.
FL: As you got into basket weaving, what kind of stories or things did you hear about people using fire as far as the importance of fire for Indian people as far as burning different places?
VR: So you mean basketry or anything?
FL: For whatever, just in general I mean. If you happen to know about basket material, then that's fine.
VR: What Grace told me, they used to go up on the Ti-bar Road and they do their own, and they stay up there and gather and when they do come down, they bring what they're gonna use that year. But other than that, what she tells me when to burn and, like the hazel after you collect, and its time to burn it.
FL: What time of year do you do that, in the spring time?
VR: Yeah.

FL: Was it usually too wet to get it going, how did you get the fire started? How do you prepare hazel to burn it?
VR: We never got the chance to do a burn.
FL: Oh, you didn't?
VR: No we just go by what the Forest Service. We started workin' with the Forest Service some around here, but it just kinda dwindled out and never happened again. So we're back to Nature's burn.
FL: So it's kinda like after a wildfire, after logging, go look at areas that burned after that?
VR: That's about the size of it, be thankful you got it.
FL: What about acorns or anything like that. Did you ever hear them talk about how to burn their acorns? Or what kinda places would be better to burn for acorns?
VR: I never heard them talk about burnin' acorns.
FL: That's some of the things that people talked about. What about willows? You work with willow now quite a bit. Have you, as far as cultural management for willows, mainly pruning or did you also talk about burning for willows and how that helped it?
VR: I never heard her talk about burning willows. It's just that we pruned. We pruned and cut it back a lot and tried to keep the brush away from it. But um.
FL: Even the sand bar willows, the ones in the back areas?
VR: Well you get a lot of that, you know, brush and stuff, so you have to try to keep…
FL: When you say brush, what kinda other stuff do you know, do you know any of the plants names or what they look like?
VR: Well you have grape roots one that grows in the sand bar willows.
FL: Did she ever mention how that does with fire, because you probably don't burn grape root.
VR: No we just used it.
FL: Just used it huh?
VR: Yeah.
FL: Ok. Did you remember, as far as what time of year and the weather conditions, did she ever tell you anything about how the weather was as far as how fire, how they lit fires, for like the bear grass that was burned or, about her age and the time you were learnin', [or] pretty much you just let the Forest Service do it.
VR: Yeah, she [Grace Davis] just told me they did it in the fall.
FL: OK, so bear grass was in the fall?
VR: Yeah, and the hazel was in the [Spring].
FL: Spring? OK. Did she ever talk to you about some of the main reasons why Indian people stopped using fire? Like why when she was younger, why weren't they allowed to burn anymore or how come
VR: It's just the rules. You have rules that you live by the white man's rules now. You can't just go out and, like before they used to have their own area and they took care of it.
FL: The families? Indian families?
VR: Yeah. Wherever you gathered and stuff, you took care of all that, that was your supply of basket materials.
FL: How big of an area do you think those used to be?

VR: You know, I don’t know.
FL: Just behind their village wherever they had their own areas?
VR: Yeah and people kinda respected that, you know. You take care of it and they don’t come and bother your stuff. That’s like, we go down to Weitchpec [Yurok Reservation], where they burn and gather, well, they don’t do the work there. They have somebody come in and do it all for them. Why, when I go down there, cuz, not that it’s an individual or family doing it, I wouldn’t go in and bother their stuff. You respect their labor.
FL: So that was important at least for basket weavers, even in the old time. If you knew someone’s family area, and they’re putting the time in to make sure it was thinned out and taken care of the basket material you just didn’t go in there and help yourself?
VR: No. I know we get growled at for going down to Weitchpec, gettin’ the hazel when it’s burned. [They say] “This is our area and stuff”. Our tax payers money is going down there burnin’ that. So I figure [I can collect there].
FL: Who’s burnin’ it for them down there? Do you know?
VR: Ah, I think the Forest Service and their [Yurok] fire crew. They work together to doing it.
FL: Did you see this T-bar demonstration site that they did for hazel? Up Ti-bar Road?
VR: No.
FL: Well there’s some hazel that they have thinned in there, they cut it down about four foot off the ground and then they spot piled burned some it, I guess it looked like from a couple of years ago, just up at Ti-bar Road, I don’t know if you knew about that or if
VR: I seen the guys up there working, this was quite awhile ago, they were cuttin’ along the road and then they had an area that they were cuttin’. But I thought they were supposed to burn that.
FL: They spot burned a little of that hazel but a lot of it just kinda came up. It looked like nobody even went in there and picked out sticks. You have to drive up Ti-bar Road a little ways and then right before you make the next bend where Max Creasy lives, just before that, right there’s a flat on the right hand side you see a little orange markers on the trees, and there’s the hazel, it’s cut off four foot tall. And some of it has resprouts, there’s some nice size sticks in there for makin’ pack baskets and rims, but they could’ve spot burned it, but no one did.
VR: But there’s things that go on that basket weavers or maybe a chosen few that hear about it. So it’s a.
Unknown speaker (Marie Black?): When you speak of Ti-bar Road, is that Ukonom? Goin’ out towards Ukonom.
VR: Ukonom Lookout, yes.
MB: I just was askin’ because we when we lived there in ’52 it was Ukonum. I didn’t know it was Ti-bar.
VR: Yeah, we don’t get all the information, so I think communication be nice.
FL: It’s amazing how fast rumors will spread but when you have to have somethin’ good…
VR: There isn’t that many basket weavers. We don’t have that many. But the ones that’s learning and stuff, you know they gotta learn to get the good material instead of

this what I call “road kill”. It’s good but it’s not like burned stuff. Burned stuff is a lot more pliable.
FL: So burned stuff is always better than cut back material?
MB: Fine stuff.
VR: Yeah it is.
FL: That’s one thing I’m hopin’ to find out with my research at school and stuff is, with the science is, why is burned material better than pruned, and it has somethin’ to do about stimulation of the cells on the plant that cause it to resprout, versus if you prune it versus burning. There’s a difference there with the temperature.
VR: Did you ever notice any place that has a big fire and stuff, how everything looks so healthy when it come up, like the bluebells. Be little spindly plants and then after the burn they just flourish, big leaves and everything.
FL: A lot of it has to do with the types of minerals and recycling that back down, acts like fertilizer for it and that’s why those things get better. So that’s part of the thing I’m interested in with fire, particularly from the fire standpoint, cultural management is what happens chemically and what goes on with the soils, what goes on with the plant, in its cells, the physiology of it, how it uses water to grow back better. And at least a lot of the research that I’ve done and talked with different Elders and things I’ve read is that, Indian people, they had it all worked out, they understood timing and the year and best conditions and so, and tryin’ to bring back those practices, collecting whatever information I can from science, book parts of it, from the community, Elders, other people that work with it or have experience who can help rewrite the story of the better way of how to do it.
VR: Go back to when it was good.
FL: Did you ever hear her [Grace Davis] talkin’ about times of year or certain places that they wouldn’t have burned?
VR: No.
FL: So her, your teacher’s perspective was, Grace, right? or Madeline?
VR: Grace.
FL: Was that fire almost helped everyplace?
VR: Yeah, fire’s, as far as we’re concerned if there was a fire, must be somthin’ good in there. We’d check it.
FL: Have you noticed how any of the forest has changed or loss of meadows or prairies because of the lack of fire, just in general, in your lifetime? And could you talk about that a little bit?
VR: Oh you mean like the brush overtakin’?
FL: Yeah, exactly, tell me about that.
VR: Well, without fire or anybody cuttin’ it, you can’t get to a lot of the collecting places. Because there’s so much brush.
FL: Is that more like the ceanothus kind of brush, poison oak or…
VR: It’s mostly poison oak and ceanothus and there’s all kinds of like that though, not manzanita but, ah, I don’t know what the kind of, kind of like slippery but it’s really [thick-grown in].
FL: Blackberries in places.
VR: There’s a lot of blackberries.

FL: So that’s a problem as far as getting access to the materials? Is that even if there was somethin’ you could prune, if you couldn’t burn, it’s just too thick.
VR: Yeah. Yeah it is. It’s getting’ worse. I mean the roads are even closed because of brush. You can’t even drive up a lot of these roads that you, to find anything.
FL: They’re all grown in. It’s the same way with the forests?
VR: Right.
FL: Do you remember places that used to be more open when you were younger that are grown in now that haven’t had fire? Like places that really have changed?
VR: Well, look up on Ti-bar Road. That’s where we always collected acorns and stuff and now it’s just trees layin’ all over and brush. They just don’t let it, fire our anything just clean it up. It’s just lays, and they won’t let you cut wood neither. Lot of the woodcutters come in and clean out the trees, you know, and stuff and now they won’t let you do that so many feet away from a road.
FL: That’s been a problem. Because when there’s more firewood cutting, if they’d open up areas you’d have access to them. You could still get the sticks.
VR: Now it just piles up and when we do have a fire its so hot that it destroys a lot of stuff too.
FL: Burns too hot?
VR: Right. It just needs a nice creepin’ fire.
FL: Back to willows, my research thing. I know you worked with willows too so, could you talk a little about river management along the main river for willows and what your experience has been with that.
VR: Most of my experiences is by just cutting. In the spring we cut a lot of the willows back. That’s where we keep going back. We get it cut so that it’s already pruned.
FL: Do you cut it down actually at the ground level or do you leave some of the main stems up and then prune back the tops?
VR: No. You have the main, the big willow stalk and we just cut all the little sticks off of it, or long sticks. And usually it comes up nice by fall.
FL: So you do it in the spring, like what, early May, April, what time of year?
VR: End of March [to], early May. It all depends on the weather. This year it was real early.
FL: Yeah, and then you cut ‘em back and they’ll be ready by the fall time?
VR: Yeah, you’ll have, not where you cut, Those other ones, you’ll have more somethin’ to make ‘em grow longer, the ones you didn’t cut. But they’re a lot nicer in the fall but it’s a real short
FL: Window?
VR: Yeah.
FL: And that’s mainly because of how the bark will slip or not slip off?
VR: Right.
FL: Have you ever collected down at Ferry Point?
VR: Ferry Point? I went down there and checked but it was too much bugs.
FL: Too many bugs?
VR: Right.
FL: So tell me about the bugs a little bit and why is that a problem.

VR: Well when you're cleanin' them, you leave a little indention on it, but then there's a little orange bug that gets in 'em. And then your sticks break.
FL: Do they go through the stem or the outer part of it?
VR: On the outer part. Just leave a little indention and all your sticks just break.
FL: Do you ever see the time of year those bugs hatch out? Or have you ever picked sticks and seen them? Cuz like the insides are like a little grub right? A little worm?
VR: Right.
FL: When it comes out as a winged adult of some sort, you ever see that or know the time of year that happens?
VR: No I don't.
FL: What do you think would happen if you pruned willows this time of year [August, late summer]? Do you think you'd get good growth out them or it's just always better to do it in the spring?
VR: Oh, you'd probably have it better now and then in the spring probably come out nice and long. But you still can have bugs. But I think in the fall there's hardly any bugs in the fall picking.
FL: But some sticks if you get in the fall time they could have bugs that already left, right? So they'll be weak down in the bottom or the tops or?
VR: Yeah, you'll have the same as the spring but not as many. There's a lot of stronger stick.
FL: I've heard some people talk about different ways of getting rid of the bugs. Like Marge, Ti-bar Marge, or Marge Huston was saying, you can cut 'em down and pile tops and burn 'em. Did you learn any other ways to take care for the bug, the best way to get rid of 'em?
VR: You're not gonna get rid of 'em that way. The Forest Service did it down on Chambers Flat. Did that whole area, burned it and stuff. The bugs was not as many, but they don't do the big area. You know those bugs can move, soon as you get new ones from the old tree it's gonna come over to the new tree.
FL: So it's important to burn off the whole big area then.
VR: Right.
FL: Whole flat or whole big clump of willows?
VR: Yeah, I would say so because those bugs are gonna move. It's that close to new growth.
FL: Is there a certain time or a certain age, certain heights for the willows that are better to prune or burn back versus, like if they're too young or I see some now, like the ones I'm studying, they're really tall, they been there for 10, 30 years. What time do you think is the earliest time you should start cutting them back and burnin' 'em?
VR: I wouldn't know.
FL: Just when they get big enough?
VR: Yeah. I don't know. We gather from the ground, new shoots, we've gathered those, they're long and straight. We've gathered from the old trees. We just keep goin' till we find nice long shoots.
FL: But at some point they start getting too tall for you right?
VR: Right. Yeah, it's best not to get 'em that tall.
FL: And so you knock those ones back and burn 'em?
VR: Right.

FL: I know some time before when I stopped by to talk with you, we talked about water, trees and fire. And so I was wondering if you could share with me your understanding or your thoughts about that.
VR: You mean the streams and stuff?
FL: Yeah.
VR: My way of thinkin' is that the little streams, and stuff, is getting so much brush the and stuff [vegetation] is takin' the water away from the streams. And if they get rid of that brush the streams would be more flowing.
FL: More flowing? And so do you think if they burned above them there'd be more water?
VR: I would believe it would be. Anything that's growing has gotta take water. So if you have a whole bunch of brush, it's gonna take the water.
FL: So thin those out? That's one thing I'm tryin, at least with bigger forest planning and fires, is to try to help them understand this link between the fire, the types of plants that are there, how they use the water and how our streams go down to provide water for the fish.
VR: Yeah.
FL: And so part of my interview is to ask if they understand about that, that way it helps make a case.
VR: Right.
FL: So. How do you feel different types of traditional uses of burning can be used to restore forests or other areas? How would you like to see it? I mean if you were gonna make recommendations to the Forest Service about how they should burn or what they should burn, what would you suggest?
VR: I would suggest that they try to start burnin' everything up. I mean, you know, in the spring when things kinda, they [should] start burning and let it just creep through. It would get a lot of the brush and then it would open it up for the trees to grow.
FL: In your mind when you're out drivin' around lookin' for basket material, do you have a priority, would you have 'em start at higher elevations or lower elevation forests or around oaks or firs. What kinda [places]?
VR: I think you'd have to have it low and high. Because there's things comin' out that are down low, it would be early spring and then the stuff up high would be in the couple months later because of the [seasonal change].
FL: The same plant that comes in [time to harvest] at different elevations at comes ready at different times?
VR: Right. Cuz a lot of the basket material like the hazel, go along down Dillon Creek, go along the road and go up there and pick. But you go up higher, maybe a month or so up farther where you can get to it and you wanna pick those up there. So but its, I think it needs to be…
FL: A bit of both.
VR: Yeah. Like Slater Butte, up there it's just full of hazel and ceanothus and all that stuff and it's just, after that fire, it's just, they didn't keep it back, you know, the brush, and now the brush is so dang thick up there.
FL: So after the fire allowed all this new regrowth, but if you don't get in there and prune it or burn it again, within a couple of years then it's just gonna eventually take over and be more brush.

VR: Right. They have to let that fire go through it again.
FL: So that would be a priority, reburn areas, just more than once. Keep 'em goin'? OK. What about, like ah, we talked about hazel, willows little bit, what about bear grass? When you go out to pick bear grass, what do look for that makes it a good site? If it's been burned, what kind of fire, what's the spacing of the trees maybe and then how much fuel do you see left on the ground, things like that.
VR: Well Grace was tellin' me there's a lot places up there on G-O Road that there's trees, but they're not real thick, there's the canopy and the ground has a lot of bear grass. And it's just thick through there and she said if a fire just crept through there it woulda been just perfect. So no there's not a lot of fuel, and it doesn't get hot, it something that just crawls through.
FL: The little branches and stuff, just kinda singes the bear grass?
VR: It burns it. If you have a lot of fuel on the ground, and stuff, it'll take a long time to get out again. What you want is for it to come out. Like if you do it in the fall when you have how many months till July for that to [grow].
FL: Eight or nine [inches], something like that.
VR: Yeah to get that nice new shoots [leaves] come out.
FL: And bear grass is another that's always better when it's been burned?
VR: Yeah, you can't use it [for basket material overlay, but braids maybe] if it's not burned.
FL: Why, what's, I don't work with it, what's it like?
VR: It's thick, real thick and it's not pliable so you have to burn it. You have real nice, pliable, slender bear grass.
FL: I've heard some people talk about the sharpness of the edge. Do you know anything about, like that?
VR: Yeah, it's just like a razor blade.
FL: when it's burned or unburned?
VR: Both.
FL: OK, so it [fire-burning] doesn't make it [bear grass leaf] any less sharp. It just makes it softer and [pliable].
VR: Yeah, the thicker ones [unburnt bear grass leaves], you'll cut yourself a lot easier than the softer ones.
FL: So even after burning it [bear grass] makes it softer, longer in many cases and also not as sharp?
VR: Right.
FL: Alright. So you burn in the fall and you gather in the middle of the next summer?
VR: Yeah, July.
FL: July, Ok. As far as basket weaving, are there any other plants that you know will do well after fire? We talked about bear grass, hazel, willow.
VR: The buck brush.
FL: The ceanothus, the buck brush, yeah. That does better after fire too?
VR: Yeah. They need to be cut or burned. They just get nasty when they're just keep growin', little short [stems].
FL: What were those sticks used for? They're smaller sticks right?
VR: No, they're long. You can get real long ones and I can show you out there, there's real long ones out here because Frank [Reece] burned and cut back.

FL: Right here on your own property?
VR: Uh huh.
FL: What time of year does he cut that back and burn it?
VR: You know I really don't know. I just happened to be walkin' by and wow. [Seen it there growing back]
FL: He took care of it for ya, huh?
VR: Yeah. Then he was ready to cut it down again. He just cuts. No certain time.
FL: Just when he thinks it's ready?
VR: No, when he wants brush out of the gulley. He just goes and cuts it and then all of a sudden, Don's does, he's been workin' this stuff that he kinda gets more understanding of what he
FL: He says, Oh, that's usuable material.
VR: Yeah, after he already cut a couple of them down. You have ceanothus you can get nice slender long sticks.
FL: What about some of the dogwood or anything like that? Do you ever [those]?
VR: I never use dogwood.
FL: Did you heard of anybody usin' it? No.
VR: Red bud
FL: Red bud? Hum. Some of the other basket weavers like the Miwoks and people down there south of Shasta in that area, they use the red bud.
VR: Yeah, I know we talked to a lot of people at the basket weavers [gatherings/conferences], about how to do the red but, cut 'em down and get the long shoots in the fall. That's what they use. But I never heard of us usin' it so I guess I better not mess with it.
FL: As far as places around villages, opposed to places higher up. What do think, did you ever hear Grace [Davis] talk about this. Was… how important was lightning versus Indian fire and takin' care of the things you needed as a weaver? Did she ever mention anything about that? About lightning versus what Indians would have burned?
VR: No.
FL: So you guys…[basket weavers collected] where they clipped the roads after logging fire had been there, huh?
VR: No, The lightning fires, yeah, if we know where it's at, then we go and check those like I doin' down at Dillon Creek right now [Sept. 2002]. That was lightning fire, I'm pretty sure it was. Anyway, where ever you can get to, then you start surveyin' what the hecks in there. There is bear grass in there and there's hazel. And there's the ceanothus, so we already got that area where we can go and gather.
FL: Do you find it really difficult as basket weavers today to find enough of the quality material you need?
VR: Yeah, it is.
FL: Is that one of your biggest problems?
VR: It is. The Forest Service used to try to help. You know, burn areas and stuff, but it [prescribed burning] wasn't persistent. Like you can't burn one area every year and expect that to do anything because [there] it's no fuel to burn and it's not good for every year they do it. You have to have alternating places, so you do one year here and then next year that one.

FL: And then come back to places about what, like what time of year, like if you're gonna do a hazel patch, come back after you burned it one spring. How many springs later do you think?
VR: About a couple.
FL: Three, four?
VR: About three, and that gives you enough growth to let that fire go through it again.
FL: So almost about burning as soon as there was enough fuel, branches and twigs and leaves and things that are fallin' around it to burn it again. You burn it again, huh?
VR: Right. And like you go in there and cut all these hazel sticks down, you can go back and get 'em again because of the cutting. But pretty soon then that's not [useable].
FL: Do you find with the sticks that there's a certain, like age. Like the one year or two years is the best length, because what happens when they get to be three or four years old?
VR: After that [3-4 years] they're no good because they're crooked and they got shoots [lateral branches].
FL: They start getting side braches?
VR: Yeah. You have to like, go in, like if you have what is it, spring, and then the next spring you go and pick 'em. Or else they'll start havin' shoots.
FL: The side branches on 'em?
VR: Yeah.
FL: So for baskets, you basically want the long straight slender shoot, just one whole long piece.
VR: Right.
FL: Did you ever learn any stories about, share any stories or tell about burning that might have been fun that kinda [tell about]… places? About other people or things?
VR: Not that I can remember. She used to tell me all kinds of things, I can't remember.
FL: Is there any other last things you want to say about maybe burning or basket material that you think would be important for me to know? Or be able to pass on as far as recommendations to the Forest Service or you think as a weaver, the most important things about fire that I should know or tell others about?
VR: I think I pretty much told you. There has to be burns. There's just rejuvenation or, it's too many bugs, too much brush and it's producing too many bugs to get into the, they even have them in trees now. Because there's so much brush on the ground.
FL: So do you see a problem with what they call like, forest health? The health of the trees are down because there's too many bugs infecting the trees themselves?
VR: That's right.
FL: And you think fire would help that out?
VR: Oh yes. I believe it. A lot of these things that they have, diseases, what do you call that, cedar rot?
FL: Root rot or bud worms, other things like that.
VR: I think that a lot of it [disease] is because of the brush. There's too much unhealthy stuff out there. You know, if the fire was burned, it [the land-Nature] could breathe and get strong. After a fire things do get strong. They look healthy and [clean].

FL: What about American society in general. I mean, do you think people who are here in Happy Camp who are non-Indian understand enough about fire to where they have a value for having fire back in the mountains, back in the forest?
VR: No I don't think so. And I know they're [USFS] startin' to think about fire, clearin' land and stuff. I know the Forest Service put a paper out tryin' to get people interested in that, I guess because they don't want the town to burn up or somethin', but I think they're really, realizin' that the fires Indians used to have was needed. It's needed. It keeps the fuel out of the woods.
FL: Also to make it healthier.
VR: Right.
FL: Alright, well, thanks, do you think you shared everything you wanted to? I can always come back too and follow up, if there's things you think of later on. Oh, I should have told you this. I'm interested too, when you go out and look at this fire, even up there, what was that mountain you were goin' to, Pony Peak, down towards Dillon Creek, when you drive around and you go look around there, just in your kinda mind's eye when you look out, what are you lookin' for, the openness of the stand or the fact that you might see some hazel out there and you get out and walk around. I'm curious, as a weaver, when you walk through, what are the first kinds of things that kinda key you in to where you want to go look and you think might be a worthwhile spot?
VR: Just any place I can find hazel. I just travel along and if I can see the hazel bush then I kinda scope out and I try to keep away from the canyons.
FL: Yeah so flatter ground, like some of the benches?
VR: Yeah, benches. Some hills, some of the places it's dangerous too.
FL: Too steep, roll down the hill?
VR: Right. Done that too. But it's, you try to find where you can find a lot of hazel if you can, you know, look for the bear grass and see if there's an abundance there and then you put it in your mind and go there this spring.
FL: Is there different sides of the hill, like one facing south, facing north that you noticed, or one better than the other, for hazel or for bear grass?
VR: You know, I never paid attention to that. I'm just kinda move right along and look. No I haven't really.
FL: What about elevation? Bear grass only grows in certain, I forget where it starts, like around, maybe, I don't know 1600 feet or whatever. Do you find bear grass, if it's been burned, is good lower down as well as some of the stuff found higher up?
VR: I think higher up is [better].
FL: Higher is better?
VR: Yes.
FL: What about serpentine, you know that green stone, where it's kinda rocky sometimes, there's bear grass that grows on that, is that ever used? Or more the stuff that's in the forest?
VR: More in the forest. I never did try any on the serpentine. I never really paid much attention to it.
FL: I've seen it grow there too but it's usually more open and it's too stunted. It looks like it grows on smaller, scragly little tuffs.
VR: Oh, no I never really gave it any thought.

FL: I was gonna ask you too because you go to places after it burns and look around, right?
VR: Right.
FL: Did you ever notice anything else in there, like where animals have been grazin' on stuff or nibblin' on things or the wildflowers?
VR: Oh yeah.
FL: Can you talk about that, that's interesting to me too, what your observations are, what you see after fire, what you think looks good?
VR: Animals go in there and are eatin' all our, the hazel.
FL: So they eat the hazel too, huh? After it sprouts?
VR: Yeah. They [animals] have their little nibble marks all over those [hazel plants]. You know the blue brush that comes up? Yeah, you'll see their droppings, bears and that.
FL: What about, does it kinda ruin your sticks if they nibble too much? The tops?
VR: No, it's like they're prunin' it.
FL: What about, you talked about some little flower that comes up afterwards, you said that was small, but after fire it comes back larger?
VR: Oh, the Bluebells. They're real pretty spring flowers and they, Grace and I always had this one place down by Swillup Creek, on the banks there, always stop and pick some bluebells. And it's the little spindly ones. But after that fire, my gosh, those leaves are just huge and they grew up so healthy lookin. I wish you woulda seen it.
FL: Did you notice any birds or animals or wildlife using those? Or other wildflowers in there?
VR: Yeah, they're real healthy in there. There's a, I have a friend I've shown her the wildflowers, they're all over in that burn, along the road anyway where I can [see].
FL: [Have] you ever noticed the hummingbirds, any other birds or bees on those?

VR: Yeah there's bees, but hummingbirds I never see out in the wild. Only the ones they got here.
FL: Around the feeders. They're all in town this like the bears this time of year.
VR: Easy pickins. Yeah, there's a lot of wildlife as for birds and stuff. You can hear 'em out there. You see 'um.
FL: You see their tracks, too?
VR: The animals we see.
FL: The tracks?
VR: Yeah, I think they like that. They like that ash and stuff. I think it helps 'em. When they roll in it they get the ticks and the fleas off.
FL: You seen them roll around in it [ash]?
VR: Oh yeah. I think that's [what they like].
FL: The finer stuff? The finer ash piles?
VR: I really don't know, but I know that they roll in to get the ticks [off them].
FL: And mites off them, or something?
VR: Yeah, I guess so, they like that burn stuff…
FL: [I see your basket hat], fishing caps [on the self]. I think they're pretty neat. I wear a knit cap today but if I had a little round fishing hat I'd wear it, I'd wear it to go to a conference. Look at this, this is an old style men's hat, you know, because there's a

story there then, you could talk about, that's one of the things I like about baskets. If I wore a basket or something, I go to someplace, especially if I'm at a conference talkin' about fire management and basket materials, then I could say, well, look at it, this needs to be burned, this needs to be burned, you got the whole story right there. You know. If you had a cap the same way. Does it matter if you use hazel or willow for those?
VR: The hats they usually do the hazel. Sticks are nice but sticks are not as fine as buck brush or willow. These are just nice and smooth. Hazel has a kind of thicker to it. But I've been a [hat maker], Debbie McConnell's hat, she made it with hazel, just beautiful. The one she made it for her husband.
FL: Oh yeah? I didn't see his.
VR: Real good. She's a good basket weaver.
FL: What about fir needles, those droopy firs?
VR: I just started gathering them.
FL: Somebody showed me, I peeled a few this past spring, I just got them to go zip! [Bark peeling off].
VR: I like them because they're kind of, got a rough thing.
FL: Yeah, each of the little needles, they have like a little pit, but they're strong.
VR: Yeah, and I figure when you're weavin' that, it'll hold all your work down. These things are so smooth, they don't keep pushin', down it.
FL: Kinda slides.
VR: Seemed like it would just hold on. Place it and it's there. I'd like to try that. I get so mixed up out there I don't know which ones which.
FL: Is it hard to look at a stick, when it's a certain size, you can…
VR: You can feel it.
FL: Oh, you can feel which one's which, OK.
VR: Yeah, you can feel hazel. You can feel almost all the sticks, with this hazel, and the ceanothus.
FL: The willow, they all have a different feel to them?
VR: Yeah. And look too.
FL: When I get back, done with school, that's one thing I want to learn to work on is, make burden baskets or other stuff. Just that way I can, fun to learn, and I don't see too many people do more of the open work, too, like I want to learn to make eel traps, you know whatever, because if I can help take care of this stuff too, get'in places burned, pruning it back, I figure if I learn how to use the material then I'll have a better idea of how it needs to be managed.
VR: Yeah, we need more people that have the interest to do it [basket weaving] because I can have a class down here, five or six days a week and there's nobody there, you know there's no interest. There's much too much TV and [other things].
FL: When I finish school I'll put down my beer and turn off the TV and come over. I don't watch much TV or drink beer so I guess I'm already there. At least that'll make time to sit down in one place long enough.
VR: Yeah, you're a busy person.
FL: Well, I want to finish this up. **Thank you [Interview ends].**

Walter Casey Spinks (Karuk), Age 64. Interviewed by Frank Lake. December 17, 2005. Happy Camp, Ca.
Consent for voluntary participation verbally given and signed on IRB form

Casey: You need to ask a question or two so we get some idea what we need to cover here.
Frank: Yeah, well, generally, uh, overall I just want to get your perspective about your understanding and historical experience about fires. Um, also if you want to talk about basketry management and harvesting, you know as a collector, would be some other helpful stuff. But, just start off with your name and your age and what your tribal affiliation is.
C: I am sixty-four years old.
F: Okay
C: I was born December 7, 1941. I am a member of the Karuk Tribe.
F: Alrighty. Where you raised learning traditional practices like harvesting basket materials or collecting wild foods?
C: When I was real small I always was around, my grandmother took care of me while my folks worked so she was always doing different gathering materials and gathering acorns and, you know, stuff that was, grew real close to our house where I would go along with her when she gathered, so you know, um, that's where I learned how to peel willow sticks when I was real small.
F: What was her name?
C: Dolly Pepper.
F: Dolly Pepper. And where was she from? Do you remember what village, or…?
C: She's from *Katamin*, [no] *Ishi Pishi* falls, across the river.
F: Across the river from *Katamin.*
C: That's where she lived. She had property over there. And my mother lived there til they where, til she moved down and moved just to,…we have a property just by the mouth of the salmon river – the *Ishi Pishi* side there.
F: Alrighty.
C: That is where I was born, about a half of a mile from the Salmon River (Laughs).
F: She was born down that way.
C: you know, it was just, I didn't know I was learning all of this stuff. It was just normal everyday things you know. But my mom and dad were both always working so they didn't have too much time to teach me stuff until later, but…
F: Yeah. What do you remember is was like around then, back then when you were with your grandma. Did she tell you about how things had changed or the land was similar? Especially with fire, what did you learn about that?
C: She never talked much about fire. She didn't do too much weaving because she was getting older, but she, you know, we went up and gathered acorns. I don't remember going out with her to gather willow sticks. But I remember gathering them, but I don't remember who it was exactly. We went out and gathered, she had a spot, we went out and gathered mushrooms too, in the fall. But, [coughs], she ran around, my sister is the one who ran around with her mostly because by the time I came along her sight was failing so we couldn't get out and do too much, so. My sister used to run around with her all of the time because my grandmother used to like to go visiting, you know. She

would talk about how they would leave in the afternoon and walk from there to Orleans, which is ten miles along the Ishi Pishi road, and go to the dance and then walk back at about one or two o'clock in the morning [laughs].
F: Down a long curvy road, huh?
C: Hm-huh. My grandmother wasn't very big but she walked so fast my sister said she had to practically run to keep up with her. She'd tire her out…. You know, nobody talked about burning when I was small. Uh, it was the bad thing to be back then, to be an Indian. Sp nobody talked much about the old ways. My grandmother was the only Indian elder around. I mean, I lived, she raised me, took care of me I guess, until I was about eight or so. I mean, my mom and dad would be working, so she baby sit me all the time. Matter a fact, I probably spoke more Indian when I was small than I did English, but you know, learned it equally at least. After she was gone I had no one to talk to so have kinda forgotten most of it. That's the bad thing you know when you don't have anyone to talk to you can't really keep going.
F; Yeah, yeah.
C: So lately, even hearing people say a few words helps me brings back a lot of stuff.
F; Good, good. So you mentioned about going to get acorns. What was that like? Do you remember the time of year?
C: Where we lived on Ishi Pishi Road, there was, our path was behind the house a couple of hundred yards and we would walk up there in the evening. We had a basket with a handle on it and she'd just pick a basket full like that and take it home and crack them and dry them and eat them. We weren't really surviving on it, you know, it was just a, she liked it so we would go out and get it once in awhile. She would dry it and make the acorn soup and so, you know, like I said, my father and mother both worked so we were fairly well-off Indians [laughs]. We had regular food, you know, modern food, I guess you would say. We had our smokehouse so whenever fish was a round, we would smoke it. That's what I remember about being young, , we had all of the salmon. Especially eels. I remember having eels when I was small. Then we kept moving upriver. We moved up to Rodgers Creek. From there we moved to Happy Camp from there.
[Kathy McCovey walks in and there is a break]
C: Are you recording again? When we moved out of Somes Bar, you know, there was, my grandmother, we lived at the ranch and moved here, she was mostly blind so she couldn't go out, you know, gathering, so she couldn't even weave much so I got out of that, really I didn't even pay much attention to it, you know, until Kathy started doing the Forest Service archaeology and she needed materials to learn how to weave so I started gathering it. And, uh, I had quite a bit of it here after awhile because she would gather roots on her way home at times and bring in a bunch for me to clean and prepare so we had a bit of it stored here. They started up with Following the Smoke people down there who couldn't get no material. They didn't know how to gather, or they didn't have the time, so .they asked if I could go down there sell it to them so I went down there and I did that. So that' how I really got into gathering and stuff
[Kathy to dogs: Stay down! Gosh these guys are a handful, huh?]
C: So I started with willow root. Then people said: "we need this" "We need that". The hardest to get, for me, is the hazel because it grows on mountain sides and nobody ever burns around here.

F: Ok.
C: So, uh, what little I go I found alongside the road that the highway department cut. The new growth would come out and it was pretty good. "Better than nothing" a lot of people would say. And they are happy to get anything.
F: So let's talk about willows a little bit. You saw me down there with the prescribed burn. And doing the stuff with the willows. Let's talk about willow management in general. What are your opinions on that and you perspectives on what you would like to see done to the willows to make them better. What makes a good willow stick – in your opinion?
C: Well, from what I have seen – my experience is that when we have normal weather – like we have more or less had a drought for the last 15 years or so. High water will take care of the most of the willows, I think. Once a tree gets a certain size and the water comes up it washed and knocks it down so new growth is always coming up – that's where you get the best sticks.
F: Right there along the water's edge mark?
C: The patches that grow further back are the ones that I usually work at.
F: Like on the back terrace
C: Like where you were looking at them down there, where you had the burn.
F: Yeah, at Big Bar.
C: At Big bar and Independence. I just go around until I find a bush that looks like it has nice longs stems. Not every bush will grow nice long sticks. Some of them are just naturally stubbier than others. I start gathering there. And, I noticed that after I went back the next year, where I cut new stuff would grow. But it didn't always grow that good because I would leave, you know, the main stem. So I decided to try start cutting them back by hand. I gather in about three different spots that I keep cutting back, three or four. By cutting them back to the right height they will grow real nice sticks. Because I got, one bush I can get a big bundle for, about a third of what I need. Then I just go along and look for other bushes or spots. I always have might eye out for a bush that looks like it will produce good that I can cut back.
F: When you prune them down about how high is the main stalk or stalks off the ground?
C: I shorten them down to about 3 foot high.
F: Ok, then its all the top sprouts off of that?
C: If you get a big bush – about 10, 12, 15 foot high, you uh, cut it back, it has a strong root structure so the bush will grow back, at least half again as tall as it was before you cut it. So all of these sticks that grow out are nice, big long straight sticks. So, I've been getting most of my sticks that way. I see a lot of sticks that I'd like to get to but are inaccessible. I mean, uh, you get to where there are a lot of blackberries and you can't get through them good, they get the blackberries and the willow, the one like you said, on the bench, are hard to get to. I gotta look for ones that are in between the high and low water area that keep the blackberries down that I can get to good. One spot downriver there was a path of willows along the river, that, there was an area where the water wasn't too swift, so when the high water came it piled driftwood against it. Then we had a high water that washed all of the drift wood out. That driftwood, what it did was knock down all of the big sticks, the big bushes and all new shoots grew up from those knocked over ones. There were real nice sticks there for

awhile. So you know. That's what I mean about the high water, it will either tear out the old big stuff or at least knock it over so new stems will grow up from the knocked down stems. Because, I've seen that by Yreka, where you don't get so high of water where it washes it out, but it comes and knocks it down. And you get all of this new growth and there are nice sticks that way too. But I've never really been around anybody that burned it, you know. That's something, you heard people talk about burning for, you know, to get better stuff, but… it's something that no one has ever really done.
F: The willows, I did the prescribed burn on the willows to study that because some weavers had mentioned that the need to burn them to get rid of the bugs. And other people say that it is okay if you just prune them or the high water comes up. When did you hear, or at what time period did you hear people talk about needing to burn willows?
C: This was fairly recently, when I heard about it. When I go to the basketweavers things [gatherings] and people would be looking for places to gather their materials, they would talk about needing to burn it to get rid of the bugs. I don't know if that really helps or not, you know. All I can say is that if you cut back, and the new growth that comes out, you know, if you can cut a big bush out, clear back down, all that stuff that grows out is really nice sticks. And, ah, I don't see very much bug activity. When you get a lot of old growth, you got new limbs growing out there are a lot of bugs in the wood already that are attacking the new growth. So, uh, like I said, I never went to where willows were burned and gathered materials to see if there was any difference.
F: Well we will have to see.
C: They had that fire at Camp Creek that time, I went down there the next summer afterwards. I was looking for a place to fish, mainly, I guess, but I drove down that road and all of the sticks were just beautiful long sticks growing out. I never did go back to gather because, you know, I didn't know if there was any local people from Orleans that had a prior claim on it.
F: Not a whole lot of people gather down there. I mean, I have the little point for my experiment and I work down with LaVerne [Glaze] at the mouth of Camp creek, but on the way in, I think it's Delaney's property there, between the dance areas, I see a few people but not a whole lot. But when it burns off it sure grows off nice. That's how I got started looking at this whole thing because it burned off and got ideal sticks. And everybody said "look and Camp Creek where it burned they have really nice sticks and it knocked back the bugs." That's why I started looking at that.
C: This area, like I said, that is away from the river, above the normal high water mark, that doesn't get disturbed too much and there are a lot of good willows in there. I think that's the kind of areas that you would have to burn. Because, ah, otherwise, the stuff below the high water, the normal high water would naturally knock down and damage anyway, would be more the area were you wouldn't need to. And anyway that kind of area, the high water would wash away all of your dead leaves and stuff, it makes it hard, you need [litter] to burn – to keep the fire going.
F: Very clean, yeah. Just rocks
C: There are a lot of places around that I look at that have nice looking sticks but all of the willows are so big it's hard to even get down to them because, like I said, they have the willows growing down around them, I mean the blackberries. Once they get

to a certain size, you know, they, if I look for new bushes, I go into an area where, you know, that is no more than 10-15 feet high and the limbs are small enough I can bend it over and cut the stems off the top. Once they get above a certain size you can't do that anymore. That is why, one reason I started cutting back too. Just hoping, nobody ever said "yo do this and they grow back." A lot of people do it but nobody told me about it, so [laughs]. I've got several spots, but one of the areas I picked this year was at Independence, no, at Ferry Point, there is a spot where the high water will knock down the willows. It grows up every year.
F: Out past that house there.
C: I got a lot of really nice sticks in there, but the brush is only about 8 foot tall so each stems was long and steamy but didn't have any bushiness too it. The stems are nice but there aren't too many on each bush. If you have a few nice spots like that that grow back every year you can have what you need. But, uh, the best sticks I've found are the ones, I found a really nice bush away from the river that I can cut back and go back to every year, you know, a lot of it I can't get through. I'm limited to the areas I can reach.
Like I said, where did I get my hazel? Kathy brought up a bunch, Bryan brought up a bunch where it had burned. I peeled them and dryed them and everybody wanted more so I finally went out and found patches along the river where they cut back along the roads with brushers. Now there are several burns around here that I know about that I think I can get some at least. The only thing I haven't been able to get to yet are the roots – the pine roots or the spruce roots.
F: We can talk about whatever you want about basket weaving and gathering. The hazel, when did you learn about, or based on your experience, when is the best time to gather that and burn that?
C: I never really got into the burning part. I just know what people said. What I understand is that whenever you burn it, a year later you can come back and harvest it. If you burn it in the springtime you can go back in the next spring when the shoots are just sprouting out good and the bark is easy to peel and that is what they prefer to do. The Forest Service now days all want to burn in the fall. You have to wait, you can gather the next late summer in August and September, but then the sticks don't peel very good. And, but I got patience and kind of half scrape them. Then you have to wait until next spring if you want to get them at the right time of the year. It's just a policy, you know, of when you want to burn, of when you are allowed to burn. They don't even think of trying to burn in the spring that I know of.
F: They did a place up red cap road by LePerron last spring, but that' because they had NEPA done there. But they had a wildfire in there before anyways a couple years earlier. It didn't get hot enough to burn individual patches of the hazel.
C: The only problem with burning the hazel is that the elk find out about it. They go in there. Weren't you the one telling me about that?
F: Down in Redwood National Park. They burnt the hazel and the elk ate it all up.
C: Maybe that is the advantage of picking it in the fall. You have less of a chance of the elk to find it and clean you out before you can get it for yourself. A place I have been gathering up here, there are many elk around. I see where something has been eating the brush off but they don't come eating everything down, probably deer. There may be elk in the area. I'm not sure…. I'm still learning when to gather right, you

know, and stuff. I had to kind of, get Verna, press her to find out the best time to gather in the fall. I know the sticks are best after they have completely finished their growth for the year.
F: For bark-on stuff?
C: Yeah, in the fall. If they are still growing then the ends are thin they break the tip off.
F: What about, you know because you grew up there in Ishi Pishi and Somes Bar area, in your lifetime, you know, however sixty-plus year that you can remember, how have you seen that landscape change. You know, the forest types, the in-growth, you know, it used to be more brush but it's now forest or vice-versa.
C: The only difference I see right where I lived, is of course they built a new bridge across the mouth of the salmon, and they paved the road from Somes Bar to Orleans. I drive up that road now, and there are a few more houses and they've cut down trees where they've built houses so, that's the only thing really different where people are living. The road hasn't changed basically at all besides the paving of it. My sister was gone for 30 years or so living down the valley. She came up here a few times to visit, you know. When she first moved back here in '85 or 86, whatever it was, we took a drive down Ishi Pishi Road and she was almost in tears because it looks so much the same as when she lived there. The same trees are still there in spots. The big oak trees still standing right beside the road.
F: The oak trees, but those are the long lived ones.
C: The same oak trees in the same spot, they've just paved it, that's all that's different. When we lived at Somes Bar, even in 96 it was all dirt from Orleans to Happy Camp. The oiled it where there was houses but the rest was all dirt and they had to take the grader out there once in awhile and smooth out the washboards. Hwy 96 has changed because they widened it out, of course. There hasn't been that much change. Electricity moved into that area.
F: Let's see. I don't know if you mind talking about the commercial part of it because you sell the materials. I have never learned or been involved in that but. A nice long willow shoot or a hazel stick, what is the general price range on each individual stick, or do they sell by the bundles?
C: When I first started there was this lady in McKinleyville. She was the one, that you know, bought some of my stuff first. I don't know what to charge but she gave me some prices. She said: "Everybody charges 20 cents per stick. I sold it that way for a year or two. You know, but, I can get so many willow sticks and buck brush too, the ceanothus, that I have lots of it around. When I was selling it for 20 cents I would remove as many of the sticks with bugs that I could. I thought to myself, "If I get rid of the worst ones and do a quick sort then bundle them up in sizes I could sell them for 10 cents a stick" So that's a hundred sticks for 10 dollars. Where the other way was 50 sticks for 10 dollars. Which is an advantage, when someone is making a project, if there is a bug whole at the small end then they can still use the other end, so they are gaining quite a bit of it that way.
F: Okay. So about 10-20 cents per [willow] stick?
C: 10 cents a stick. But for the hazel there are so few of them and they are so hard to get that I go 20 cents a stick. I don't bundle them, I just keep them loose and people can go through my piles and pick out the sticks they want and pay me for them. I

prefer to go out when it is warmer to get the roots. I go find these sand bars so I can dig them out. It's easier for me that way because, like I said, when the waters is high and then the river is going down, you gotta kinda, you got a tight rope along the bank to where the roots are uncovered. So I wait until the summertime when the water is low ad I can just dig in the sand.
F: I've heard other people do that too.
C: It's warm and comfortable 'til it gets too hot and it gives me a reason to quit. [coughs]
F: Want some water?
C: I can leave here at 8 o'clock in the morning and by noon it is getting too warm. If I got a good spot then I can get my bundle of roots and then take me a day or two, if I got a good spot, to peel them. I can go down a couple of times per week and gather and eventually get quite a bit that way. Like I said, I got it because Kathy was learning how to weave and she wanted to, wanted me to help gather her materials for that.
C: Anyway, we, what else do I gather? The woodwardia fern. I just drive along the the road until I find a good patch and pick what looks good and go to the other patch. Other people have patches away from the road that are generally inaccessible to me. And, uh, alder bark is kind of hard for me to get too. Because, wherever there is an alder patch is also a blackberry patch.
F: Have you gone to places where there were wildfires and gone and looked for materials there? Could you comment on what you like to look for after areas have burned?
C: Most of the fires are away from the road. I've never got into an area where, where you could get to good by a road until the Megram fire. I went up to Mill Creek gap or whatever you call it, and I got into the bear grass and I found an area, everything that was there is burned until the bare ground.
F: yeah, it was a hot fire.
C: My dad always told me that was the best way to get it, when it burns to the bare ground. As long as it doesn't get hot enough to kill the roots. As long as the roots survive. It will grow up, you can get a big bundle of sticks that come up about as big around as your thumb.
F: The bear grass?
C: A nice bundle and you can pull the whole bundle out. That is just how it was when I went to this area. I went until I picked the biggest ones. I left, I only took about every third or fourth one I saw in case someone wanted to gather in the same area too. That was the only place I have gotten to where I could get to pick bear grass after a burn. I went out to some of these places where they [USFS] tried to burn. They scorched the ground and burned just the tops of the grass off. It didn't burn down to the ground and I didn't see much difference between that and unburned, so [laughs]. It's gotta be burned right as far as I could say about it.
F: You talked about one thing your dad said to look. I'm interested in that. What were the older generation teaching you and what were some more things along that line?
C: Like I said, I didn't have too much way of teaching. Like I said, my father was a Forest Service worker. When I was small it wasn't the thing to do, to be an Indian, you know. To do Indian things much. They didn't teach me much until later. The only thing I learned when I was small was when my mom used to make nets, dip nets for

the falls. I remember when I was small watching her tie. I basically knew the knot. After my mom passed away, people wanted nets so my dad and I got together and made a pattern. I think he took one of her old nets and figured out the pattern and started making nets. My dad, he got into it too and became a teacher for the people around here who wanted to learn.
F: What was your father's name?
C: Ernest Spinks. Ernie.
F: Ernie, OK. Did he talk about iris nets at all? Did you hear much about those?
C: Nobody really talked about them. I heard people mention them and what they are made out of. It's been so long since anybody has made them that people forgot even how to gather the fibers from the materials, you know. The only one that I heard is that she would take, you get an alder log, one where the bark has fallen off and you take a clam shell and you put your iris stem against that and you can scrape it and the wood is soft enough where the fibers kind of sink into it to protect it and let you take the pith out of it.
F: Oh, take the green stuff out.
C: But I've never done it so that is one thing that I don't know nothing about.
F: Okay
C: But, uh, you know, somebody in our family had a net that was here made out of that fiber. We still have it here.
F: oh, nice. I would like to look at it sometime if we could.
C: You'd have to talk to Kathy.
F: Oh, I see, it's her property.
C: Well, it's our property.
F: Yeah, I know, gotcha.
C: We got all of our baskets locked up so you know,
F: Safe area, yeah.
C: More or less to protect them from fire [house]. That and what else do I gather? We got several spots where we go and gather the black fern. That's just a matter of taking the time. Not many people use it, so. I'm still learning now what people use, you know. Last year when I was down to Southern California, there was a lady there that had a way of dying willow sticks black. And she was making all kinds of stuff. And, uh, it's different. She kinda didn't want to talk about too much but you bury it in a certain kind of mud to blacken it. And they said you can dye bear grass yellow by using certain kinds of dyes too and that's something that I would like to learn about.
F: It's probably just like the porcupine quills with the Oregon grape root, Durango and lichen, wolf lichen or moss. So.
F: So, it's just like I say, I'm learning as I go now. I learned a few things when I was really small with my grandmother. I would go out and gather what I could remember. I guess what I really started with first of all was acorns. Always, driving around out in the woods I would find good trees right along the road where I could gather. Right in the ditch and I'd gather that once in awhile. When Kathy first started for the Forest Service, she used it, so that's why I gathered it. You can see my collection here of acorns.
F: Yeah, that's nice

C: All of this first stack close to the stove is what I was able to gather this year. They were nice acorns, big acorns, just not too many of them. A lot of the trees that I could normally count on did not produce. This is the second year that the acorn numbers were down. It was something about this year that was different from other.
C: There are certain trees that will produce every year. And I got about two five-gallon buckets out of this one small tree. I get the same amount out of the tree every year. There was another nice tree that grew along side the road and I used get three to four buckets full every year. They weren't the biggest acorns but there were lots. But them someone came along and cut my tree down for firewood. That really bummed me out.
F: SO when you go looking for good acorn trees. What makes a good acorn tree? Is it more open underneath? Are there things, other things growing with it or away from it?
C: A lot of it is just a tree of a certain size will produce best, when it is a certain age. You can go look at a hundred trees and only one or two will be good acorn producers. Even on ah, good years a lot of them won't produce. But, uh, like I said, I can't get away from the road very far so I don't know what the trees are away from the road. My niece Kathy she goes out and she can go up the hill and she can find good acorns away from the road too. It's usually a tree of a certain size, like you say, an open area, not too much underbrush under it. Those are the areas that produce the best acorns. It is every other year that we have a big crop. The same with the pepper nuts. It seems like every other year we have a lot of pepper nuts. It seems like pepper nuts on the year that we don't have acorns.
F: Oh, so they alternate kind of.
C: The acorn trees in Yreka, what are they: white oaks? They produce the acorns when the tan oaks don't. So, one way or another you can always find the acorns you needed to, from what I've learned lately. Because it always bugged me that I could never find the tan oaks to have as many acorns as the white oaks do toward Yreka. You see them underneath those trees just brown, solid masses of acorns. There are a few trees, but they never ever get that thick.
F: Did you ever hear the older people talk about how far people would go back camping and collecting things away from the river villages? Did they ever mention that to you?
C: No, they never talked about that. But, like I said, the time I grew up was after most people did that kind of gathering. We had enough logging roads where people could drive up for the day and get what they want and drive home. They had areas where they already had what they wanted scoped out so they didn't have to go and camp out like in the past. But, you know, my niece goes out and finds all of these sites where they had camps. Like I said, I learned more in the past ten years than I had before that as far as how to gather materials and what time of the year is best and everything. I'm still going out and learning stuff. What people want. Now they want to have to have a permit or trying to get that passed or something.
F: I think people are working against that though. So, how do you feel about different traditional uses of burning and how it could be used to restore the forest or the prairies or other places that would help wildlife. In your mind, based on where you've gone around this country, would you have a priority? Where would you start with fuels reduction or burning first? What areas do you think would be best to start with first on the landscape?

C: Well, right now the main burning is for materials so you'd have to go out and find the right kind of brush growing and burn it. Like right now, if someone wanted to burn properly for bear grass, they'd go out on top of Grayback, up Indian Creek. That whole mountain is nothing but bear grass. If somebody burnt that area up there, there would be enough for everybody.
F: Supply you for awhile.
C: It's just, ah. See, I never learned nothing about burning until two year ago when I was down there at the dance at Camp creek. I was talking to Mavis and she was telling me all about the burning that used to be done around Orleans. She said all of those hills around town didn't used to have no trees on them. And, uh, they burned it every year. And, what she understood was that every village site had an area where they burned close by to take care of their willow and bear grass. But they also burned to attract deer and elk. And she was telling me about these berries they used to burn off and there was always a herd of elk in there and lots of deer. So they didn't have to go out and hunt all over the country to get their meat. They would go over to the burned are and harvest an animal. And it was always there. Then they had the fish to fall back on.
F: Yep
C: That is the one thing that has really changed – the amount of fish now.
F: None to really talk about.
C: Nope. Like I said, I remember eating, always had smoked eels when I was small. We'd eat them in the wintertime. And always had salmon.
F: Who would catch those in your family, or would you?
C: My dad was the dip netter. He would go down there. I my mom and dad would go down there to *Ish Pishi* when the eels were running and catch them then. That was before I was old enough to go down with them. After I got old enough, then we kinda moved away and we never go to, I only got to go down. Well we went out once to gather eels and my dad had a platform with a set-net, but the eels weren't running that night, so [laughs]. We just sat around for awhile then went home.
F: Did they ever teach you about any time, like looking at when things flower, or how would you know what time year it was good to go get eels? Did you ever learn about that stuff? Did they ever have a saying like? Or?
C: Usually you would hear people talking about the were eels running. So you would go down and gather what you needed. Since people lived all down the river, they would know when the eels were running. So it wasn't too hard to know, you know. When the salmon was in or whatever. Just like these, now days you have newspapers, but in the past you'd always have someone that traveled around a lot and let you know when things are around.
F: Good.
C: People…tourists come up here and want to catch salmon. I have no interest in catching salmon on hook and line. I learned that if you want salmon you get them at the falls. My kind of hook and line fishing is for steelhead. Because that's fun. Hooking a salmon and fighting it for an hour, that gets to be work.
F: Yeah, it probably could be.
C: The burning part was something that I never really… I heard people talk about you need to burn for the hazel and burn for the bear grass, but s far as the willow, nobody

ever talked about burning for willow. Because I think that there was enough good sticks when the high water knocked the stuff down and good sticks would grow up. You know, you didn't have a big flood every year, then four or five years and the next time the flood came along, the willows would be big, but you could gather in meantime and then it would knock them down again.
F: With the dams regulating the flow, it doesn't flood as much any more…
C: What it is, is when it floods it doesn't get as high.
F: Yeah.
C: Since I've been gathering we've had a drought so we haven't had much high water recently. The one at 96/97 was the last high water. [1997] Now all of the willows are getting too big to really get into. The only ones where I can get good sticks are the ones where I cut them back every year. I go back and I always worry that some Forest Service is going to complain about me cutting them down. I guess they won't. Or the tourist come along and see me and say: "What the hell is he doing over there" kind of thing.
F: I think the Forest Service is learning more and more about the helpful pruning and it doesn't really hurt overall. So.
C: When you prune you got to get the right bush that is the right distance from ground water. Like where there is a spring under the gravel bar or where it is close enough to the river where it gets adequate water to grow back every year. Because the ones I'm cutting back are fairly close to the river. They are high enough where the high water doesn't come and knock them down, but close enough where they get good water. I am trying to find more and more every year where I can cut back and get a good crop going. But when I cut back from hand, what grows back is generally good sticks, there's not barely any bugs in them. If you burn them, probably, or a high water comes and knocks a whole big patch of stuff down, and its all new that grows back, that would be better. When the tree gets big, a certain size, the bugs are hatching out all of the time, and they are attacking the new growth, so when you cut it back, one way or another, you kill the bugs that's in the mature bushes. So, that's the way that I can tell.
F: Ok, you'd talked about when you gather, not taking everything in one place. Who did you learn that from? Is that a fairly common practice about harvesting stuff? Not taking everything in one are or leaving some behind.
C: I always heard that you are supposed to leave some for seed. That's what the old saying used to be. That's the way…. I Try to do things you know, The bear grass is t he main thing you know. Other things like the woodwardia and the black fern they grow from roots that grow from year to year. You don't harm them too much by clearing out a patch. I was just, bear grass when I was picking it I just felt it was wrong to go in the area and clean everything out. I wasn't sure if by pulling out the new growth after a fire, whether, if it would hurt the roots or if it would just grow out again later on. I happen to have enough with being in burned areas to know what happens. Although I've been told that you can get bear grass for two to three years in a burned area. I don't know whether that means that you can gather every third one so you have three years of picking or?
F: They flower on the second year.
C: They do. After a fire they do?
F: Yeah.

C: Like I've said, I've never been in areas enough to. That area I went to up there at Mill Creek Gap, it was a long drive up there and I went up there and gathered a whole bunch of bear grass and Kathy and Bryan went up and gathered a whole bunch so I didn't have any reason to go up there. But, ah, I gather the unburned stuff and use that for braiding and keep the burned stuff for people who are weaving. So, I like the unburned stuff for braiding because when it's done it holds together better it seems like.
F: So when you go out, in the areas where you have gone back and collected, let's talk about wildlife a little bit. Birds or other animals. Do you notice a difference in how the animals are at or the birds in areas where you've collected or you don't. Do you see [if] the birds use an area if it was pruned, differently?
C: Like I said, I only have one bush in an area where I've pruned. So that doesn't do enough to make a difference. But I went downriver one time and there was an area where I used to like to fish. And these willows that had grown there over the years. And they were some of them were three or four inches in diameter. So I went down there I and wanted to fish there and I cut all of those big ones out and threw them in the river and I went back down in the fall and the willows had spouted out and the elk had been down there and just, eating all of the new growth. So that's one of the things that I thing it needs new growth to feed the animals. That really attracts them. Probably deer and elk and everything was in there too.
F: Do you remember what part of the river that was at?
C: That was above presidio bar. There's another little road that goes down to the river there.
F: Called Black Duck Bar.
C: I don't know what it is. I call it cougar hole. Every time I went down there was cougar tracks.
F: Yep, Beavers in there too, right. Anyway.
C: I don't know where the beavers are, but I see there cuttings all down the river, so. But that was the first time that I cut a big area and when I went back where it started to sprout, where animals had moved in and the deer and the elk really like it.
F: Neat.
C: Now that area is so grown up again, I can't even fish there anymore. So I, uh, I did dig roots there, but now I think it is so brushy that I can even get down to the river to dig roots anymore.
F: Ok.
C: Besides, there are too many mountain lions around.
F: Don't want to be bending over.
C: They haven't ever bothered, but the thought of me bending over and looking like a deer or something. They might attack first and then find out later that I wasn't a deer and that's too late for me. Because Verna's husband [Frank Reece] was down there at Presidio three or four weeks ago and he had his dog with him, he was getting some sand or gravel and his dog was going crazy barking like mad. "What's he barking at?" And there was a mountain lion sitting up there on the hillside watching him. The dog finally ran up and the mountain lion went up the hill a little further and climbed up a tree and sat there. He was worried that he was trying to lure the dog up there and he

was going to attack it or something. He left. But I always, whenever I'm down in that area I get this feeling that I'm being watched.
F: Ok.
C: That's another area that they are right there where you go down to Presidio bar, there are lots of good willow bushes there but now they are getting too big and there are in an area where if they get a high water it will wash it out.
F: Ok.
C: We need another high water to wash all of that out in there. It did that before in, when was it, the mid eighties [1980'a] it had big brush growth right there. We couldn't even fish there anymore. Then we had a good high water and all of the brush was gone. It was all nice good fishing again there for a long time. Now it's all grown over again. So…I think the willows, like I said, would do good with just normal high water or a flood once in a while but we haven't had recently. I notice the solid growth because a lot of places are so over grown with brush that you can't even get down to the river anymore. A lot of places that I could fish, now it's just, have to go down with a machete to cut a hole in the brush, even reach the river to make a few good casts. It it's not good. There are some willows, because the water is, uh, haven't been no floods, the willows keep on moving, marching further towards the middle of the river. There are a lot of areas where they grow out, then get knocked down for a year or two and you get really nice ones. At the upper end of Dolan's Bar, there were some really nice ones down there. I went up there the other day and they were knocked over by this last high-water. But if they don't get washed out then they all sprout out again and have a lot of nice sticks there, a year from now. I've never had too much experience with fire.
F: Yeah.
C: I mean, the only fires that I know are forest, I mean lightning caused fires. And they are always way back on tops of mountains and I never could get to them. I'm just waiting around to see what they decide to do, with the, with the burning now days. They had lands that they burned here but something always happens and storms come along at the wrong time, before they could burn. That is mainly the problem with burning in the fall.
F: Is there any last thing that you would like to add? That you think would be important to share - about collecting stuff or priorities for where they should do more management?
C: No. Well, I'm having trouble finding roots [willows] because we haven't had high-water to move the sand around. That's one of the things that I think the dams are stopping all of the sand in the upper river. Because you go up from here to Yreka and there is very few spots where there is any sand where you can get roots, where you can dig roots. Everything is gravel. To get the sand you really have to have a high water. Then it piles sand in everywhere. It's something we are not in control of.
F: Yep.
C: It's hard to say what, ah, until someone goes out and does it, like you said, your experimenting now yourself to learn what is good and what is bad. And, uh, for so long there never any burning of any kind. The only burning we had around where I lived, my dad, he would burn the blackberries off at the ranch. You know, he would set the brush on fire in the spring and burn it all out. And the fire would burn just up

the hill a little bit and go out because it was kept burned back all of the time. So. The forest Service made him quit.
F: What happened with the blackberries?
C: They just took over the whole country. Then all of the brush up above too got to grow out. So if you do burn the blackberries it has brush to keep the fire going on up the hill [now].
F: That was some of the reasons why? The Forest Service stopped Indians from burning in some places?
C: Yep. It's just, I mean, the biggest problem is logging. They clearcut everything and what grows back after clearcuts is brush. So the trees don't have enough time to become mature enough so that they can survive any kind of fire, you know. Because there is so much brush underneath where they can burn up a bigger tree, where before they wouldn't. I know that you've seen spots like up Ishi Pishi [road], Bark Shanty road there, that big patch of big trees there. There is hardly any underbrush under them. In that kind of area you could burn through and it wouldn't even hurt the trees. It's just, uh, been so long since anybody has done anything like that that they're. It's just the white man has a price tag on anything, you know. A tree is worth this much. If you burn it up then it's lost so. When Indians burned it, they, a tree wasn't just a tree. If you kept burned underneath of it then it wouldn't kill the big ones, but you know, you just took care of what you needed to take care of. The only place that I know of where they have lots of fires in Orleans where people are always setting them. Accidentally or on purpose they were doing it, but. I know there are a lot of places around here where there are nice hazel patches but, it was hard to tell if it is on private land or public land but, you know they won't burn it. Right there, in China Creek, where you cross the creek. There are a lot of willows in there but there is private property in there too. I was wanting to go in there and cut back all the hazel one year and just see what it would do because there are pretty good patches in there. But I don't know what I would do with the brush. If I had the energy to drag it away and pile it up or something it would be one thing, but if you cut it and lay it down then you have to crawl all over the top of it.
F: Yeah. You definitely have to do something with what you treat, right?
C: Yeah. Basically, I just do what I can to find a spot where I can manicure the stuff. When I do find the hazel alongside the road I cut back even the stuff that I don't want. I cut it all back so it will all grow out next year. Try and get little patches along where I can, where there is a little bench or something where it isn't too steep that I can get to. And try to keep a patch going for awhile. I mean, when Indians burned they did the same thing, but they did it with fire instead of having to go by hand and do it.
F: Yep. Fire is a little more efficient tool in some ways.
C: Less labor intensive I guess. You can light a fire and go home and come back next year. It is all taken care of. But, from what I could, I understood, like what Mavis was telling me about all of the villages were along the river, right? There were no villages away from the river. They depended on half of their food from the fish. So all of their burning was fairly low. When the fires come, lightning fires come, my father said that the fires on ridge tops and the fires would burn downhill slow so that it didn't burn up everything.
F: Lightning fires or the fires that the Indians started?

C: No, the lightning caused fires.
F: Oh, the lighting would hit the ridge and back down the hill.
C: A lot of these fires where people go out to put them out. They build these back fires and start with the bottom end and burn up [laughs].
F: Get's real hot.
C: And they get hot. And it kills everything. And there are a lot of places like up Elk Creek, the east fork, the whole creek once you get up there about a mile up the creek is all dead, all of the old growth was gone because they said they were burning out islands of unburned timber so that the fire would go out quicker.
Kathy: They [USFS] back burned the whole top of Pony Peak. They said the fire was 4,000 acres and they were going to back fire and when they got done it was three thousand acres.
C: That's a really good place to go pick sticks but it's so damn steep for me to even get up there, you know.
F: Yeah.
C: That's my problem with gathering materials, there are places where it grows but it is out of my reach. Verna she cusses me out. She says "yeah I went up to my…[there was this one burn up here and I went up and got a lot of sticks – this one year I was able to get there]…he says that 'I can't climb up on the steep hillside' yet there on the steep hillside there are my crutch marks all up it." She's giving me a bad time. I tried to go up there last year, but my leg started hurting and I couldn't walk very far so I couldn't go up there and gather. Maybe next spring if I'm feeling good and I can go up there when the leaves are still just sprouting and it's easy to peel and Verna hasn't already beat me to it.
F: So there is competition for the good spots.
C: Yeah, there is so little of it, so there is competition for it. That's, like I said, from what I heard every village had area right behind it or close by where they burned. Not only for their basket material but also to attract game: elk, deer, probably bear moved into it too. They needed a bear for fat or whatever.
F: Fat and blanket hide, yeah.
C: There were always attracted to a fire, same as any other places. I read about this Heart Mountain Antelope Refuge in South central Oregon.
F: Yep.
C: The sagebrush out there is growing so tall, it's taking over the country and the antelope are having trouble surviving there. They need burned areas in there to clear out the area because the antelope is an animal that like nice open areas where they can run. When the brush gets too thick they can't do anything like that, so.
F: Alrighty. Well, thanks, it's been a full hour. I'm going to run out of tape pretty soon. .
C: I don't know if it helps you any, any of this?
F: Oh, it does. Good. **Thank you [Interview ends]**

Charlie Thom (Karuk) Age 72. Interviewed by Frank Lake (FL), at Five Mile Creek up-river of Orleans, CA. August 21, 2002
Consent for voluntary participation verbally given and signed on IRB form

Frank Lake: These are the questions…mainly about fire, and your knowledge about it. Basically what I want to ask you about is what's your experience in growing up as a Karuk Indian or maybe your experience with different Indians seeing how the old-time people would have used fire, and even your opinions or views of fire use today. So those are most of the questions actually. For the first one, actually, just for the record, your name and your age and your tribal affiliation, what village you might be from.
Charles Thom, Sr.: My name is Charlie Thom and I was born in 1928. I been here all my life around this area in Trinity, Humboldt and Siskiyou [counties]. I live in Siskiyou [Co.] right now, I live in Fort Jones, California where my mom and dad had a little cabin, and that's where they perished when I was a little baby. So I got to learn a lot from the old people. I was raised by my grandparents.
FL: And so were you raised learning traditional practices, like harvesting basket materials or collecting wild foods or other herbs or things like that?
CT: I sure was…We used to have a …three times a year. I know exactly the time when they come….sticks, we burn them and some would be firm and straight, and of course there are other plants too, basket material that I collected for my grandma all my life. Of course she was quite the basket maker.
FL: What was her name?
CT: … *Shoshoshone* (?)…before she got married. And my grandpa was George Charlie, on the Charlie side, and also a way on the grandpa's side, on the Thom side, as a Tin Tin Thom was my grandfather's dad.
FL: From *Katimin*?
CT: From *Katimin*, … Thom was my grandfather and my dad was … Thom, and my mother was Irene Charlie, *Shoshoshone*, … daughter. And it was a large family, four boys and two girls that my … raised, and I was the baby one.
FL: Yeah, the baby?
CT: Yeah.
FL: So do you remember some of the areas where you used to gather or where they used to tell you to go?
CT: Well my grandma told me to go get me strong basket material for the … I'd go up the hill and find me a what they call a *fishee* [Karuk plant?], what people used to make sticks out of, a stick-egg…so I get the sticks to the baby and … sides, and of course, pine roots of silver *paarak*, which we cut back or burned, whatever.
FL: *Paarak*? [Sandbar willow. Salix exigua]
CT: Yeah, *Paarak*, and of course maiden fern, also made for baskets, like finishing light work… Everything was basket in my time, even when I make … everything …design taught it, … stone, that was made out of basket, side ones made of basket, and then acorn seepage (?), that was also made out of basket. So that was all made out of basket when I was growing up. Strong hazel baskets, hazel sticks, we would burn out and chop back, whatever, all the wooden material we had was all proven, it was proven to be sacred… Professional basket maker material was nice and firm.
FL: Were you taught prayers or anything about gathering the stuff?

CT: Everything had prayer. What do we do… Everything had prayer. We don't leave anything out. Anything you do, acorn gather, mushroom gather, full of prayer.
FL: Was there's prayers for startin' fires to burn those things too?
CT: Everything, fire, I used to hammer fire with my sticks.
FL: A fire drill?
CT: A fire drill, and have a nice little…boy that fire is beautiful. You don't have to use matches or nothin'. Everything was prayerful. So today, look like we lost, couldn't make enough things because of undergrowth, undergrowth. We use to have that poison oak, we used to use poison oak for our salmon sticks.
FL: Oh yeah, for cookin' fish on, huh?
CT: Yeah, we just scrap it, scrap it and put…widen that salmon two or three feet wide and then we put the sticks through, poison oak sticks, so we was immune to poison oak…
FL: Or you taught me when I was little, to eat the little, fresh shoots in the spring.
CT: We burn them back too, so be nice and straight.
FL: So the poison oak had to be burned to be nice and straight?
CT: Oh yes.
FL: Do you know what time of year they would burn that?
CT: We used to burn it during the winter's years, spring of the year, winter year, whenever we have chance to burn it, we burn it. Like anything else, we burn it back, cut it back, all that bear grass, we do the same thing. Burn it real good. Maybe sometimes two or three acres of it.
FL: Did you ever used to go out with the old people to see how they used to burn things?
CT: Oh yes, I used to watch my grandma. We were careful about fire, you know, in them days you don't see this underbrush.
FL: So it used to be all open?
CT: Open, all open, not like this here.
FL: Pretty thick isn't it?
CT: Pretty thick. That's fuel, fuel for the fire. And then when a fire burns, it just kind of gradually, gradually burns the bottom so pure, the forest, and it smokes, and all underneath, the underbrush, the trees were healthy, and acorn trees were healthy because they were always underneath burned.
FL: So they also burned under acorns?
CT: Yes, acorn trees. They burned all the leaves, you know, with them acorns.
FL: Is there a different types of acorns you burned?
CT: Yeah, all kind of acorns, all kinds. One of the best kinds of acorns there is that … acorn, that long…
FL: Oh, ________[Live oak] acorn.
CT: Yeah, we used to put that in the ground, let the mud and water… I miss all of that stuff today.
FL: Is that a long, dark acorn?
CT: Yeah, OK. Yeah, I miss all of that today. I wish I was back in those days again. I look back, I start to tell the people, … happy life, everything was happy, the wildlife was happy, the birds were happy, humans were happy. We don't see that nowadays.
FL: What's that? Because of the fire, because they burnt?

CT: If they wasn't burnt... Everything was pure. They burned all of the undergrowth, you know, all the acorns and crops. They burned all of that you know. We would pick up acorns and eat them. They just opened you know.
FL: There was no brush underneath them?
CT: No brush underneath. Now the acorns drop and they… like that. Year after year after year. I always say, very, very poor management. We managed the forest so good, clear to the mountains, everything you could see, pure. They [land managers] don't do that. I don't know why. Well they say when they took over in 1897 or something like that, the old people used to say, the … people for fire [suppression] stole our land. They stole that land because fire got pulled for fire protection.
FL: Yeah, fire suppression?
CT: They stole that land. They thought they can…but we did all the undergrowth, old logs, whatever, let it go back to Mother Earth. Today, just look at this country, the water we have, fires, you can't go… Ten years ago they logged the place up here…Today you can't even get through the brush.
FL: Too thick.
CT: Too thick…what they used to make, nice good…baskets, nice…that's all burnt back.
FL: Is that the buck brush? [*Ceanothus* sp.]
CT: Buck brush. All burned back, they go up there, two or three feet long they can make that fine baskets, the finest baskets in the world grown right here in Northern California. Of all kinda designs. Designs that mean something. Even the butterflies, all that, were all happy, all kinds of butterflies, you know they were happy because the flowers came up, they were healthy, the snakes were abundant. Today now look around. We can hardly see water snakes [Pacific coast aquatic garter, *Thamnophis atratus*]. All the fishes are gone.
FL: So even the fire helped the streams?
CT: Fire helped the streams.
FL: Tell me how you see that. How did that work?
CT: It rained so hard, that rain and the brush was low enough to hold back lot of the sticks and stuff like that, and our … gets a hold with that. So thick, hold back the watershed like, right down, hold it. A lot of water. And your timber is abundant, it grows thick and tall, straight and tall and big. Today, you look back, they call it a plantation, and today they call a plantation is just like a branch. Big on the bottom, they grow like a branch. They call that timber? … Fifty years ago they just short and blunt. You know what they call that? Timber? Plantation, or whatever they call it….They should have followed up on it, you know what I mean, they should have followed up on the whole thing. Especially the big timber company that made a bunch of money, they should have looked at what they destroyed, at least, do something about it.[restoration forestry]
FL: Do you remember certain places that the old time Indians would like to burn, others?
CT: Yes, all the places up there [pointing towards Marble Mts., then west towards the Siskiyou Wilderness]…I go up there anytime of the year and feel good about it because everything was clean, you know. Today I go in there and I like to see it burned again.

FL: What place is that you're thinking of?
CT: Up there, up cross from Tee-Bar to maybe the Roger's place, … wildlife, … brush, I told don't cut logs in there. Or select cut, whatever, you know. They clearcut it. They should'a select cut it. Save the seedlings or whatever you want to call them. Seed trees. Save them. But they didn't. And what they're saving, on an old Indian trail I was walkin' on, there's a big sugar pine, right straight over the river, over the bluff. They could'a pull that back with a cat, and cut that because one day it's gonna fall in the river, say 400 feet on Indian trail, and I see when they clearcut it….But we didn't have no voice. We didn't have anything. And the wild berries…huckleberries, and all of them were so clean.[when formally burned]
FL: So the berries did better after fire too?
CT: Yes. The berries would grow just beautiful and the limbs were so beautiful.
FL: Were they straight or how were they?
CT: They were straight and beautifully long. And the bears go in there, course it's clean, they get in there and eat the big black berries.
FL: So the fire helped the berries and the berries helped the bears and other wildlife.
CT: Yes, you bet'cha.
FL: And that's why everything was more beautiful, you said?
CT: More beautiful. Beautiful berries. They were nice and fat.
FL: Do you remember about how many years, you said they used to go in there and burn, how many years did they do it?
CT: Well, whatever they see…they would burn it.
FL: If they needed it.
CT: Whatever they needed…In older times they come along, the rain, …the mushrooms,…
FL: So mushrooms did better after fire?
CT: Yeah. Nowadays you can't find the mushrooms. All destroyed…The perfect… is one of nature's resources and it …at one time. Gold, … copper, silver, gold mines, wild berries, wild nuts. We'd just go out there and gather. We ate good, all natural foods. The old people used to have their teeth, worn down to their gums….
FL: Because they had [nuts] the stone grind?
CT: Yeah.
FL: So they had the stone in meal so that would grind their teeth down, huh?
CT: Yeah. Hundred years…what would happen. Two hundred years, nothing would happen. Let's say…and when they brought that whiskey in there, or whatever you call it, it ruined, and all the millions of …all over, in the wild …
FL: How would fire help the woodpeckers?
CT: The smoke it balanced. You see smoke the other day? And the thunder, when the thunder hits, it kills all the… things, you know, electricity, you see the blue light all on the ground. Today you don't see that. When it hits, bang, automatically, … gone….
FL: So it used to thunder and lightning more?
CT: Right on the ground, on the Klamath right here where you are…Yep, but then when they took all the gold, and the metal they used to have, and everything else. We had contact. Where I see all these things, I see them gone. You hear thunder way up high somewhere. Not just it used to be. Just lightning and see the blue lines all over the ground. The lightning took care of the mosquitoes. Before we had balance.

FL: How much do you think lightning fire helped cleaned things up vs. Indian fire?
CT: Well lightning fire really helped us. Whatever lightning don't hit, you don't burn….
FL: So sometimes the lightning fires would hit but they wouldn't start fires?
CT: No, they would start fires. That's the main part. They would start fires if they hit. Bang….That helped it a lot. Today, after they took all the gold, you don't see the lightning down to the river. It's all up high. I seen that. Blue after lightning, you can see the gold and blue light all the way, electricity climbed all through there, bang. I seen that.
FL: Was there certain weather conditions or time of year when they would burn?
CT: We burned when we could. You would see our gatherings spots. Each village had a gathering spot, and there was a bunch of gathering spots. Now you go out there, geez, you go out there in the brush, that kind of thing, you can hardly get there, there used to be trails, now all the trails are destroyed by logging and all brushed over. You can't.
FL: So these trails, you talk about old-time Indian trails.
CT: Old-time Indian trails.
FL: How far would they go back?
CT: Top of the ridges.
FL: Top of the ridges?
CT: Yeah. These are trails …[to] meadows…even up to my place up here…That's all gone.
FL: How were the trails? Were they along the rivers and creeks or were they along ridges? Where were the trails? How did they used to be?
CT: They go from certain villages had their own trails back up into the mountains…They went way back into the mountains … bear grass or *choquille* [?]or whatever bring back a strong, what you call a strong stick plant, to carve with it you know, and pray over it you know. A stick, gee, when I was young. Gosh, what did they do to help each other…that was fun. All of that's gone.
FL: I read some stuff where it said those old Indian trails, they said some of the people, the anthropologists say Indians only lived along the main river but they didn't really use many things in the back country. So I'm curious, you know, if they were to use fire up in the high country like the Marble Mountains or Elk Valley, what would they have burned up there for?
CT: Up in the mountains it burned itself out you know because we let it burn. The shrub, tan oak, live oak about this high
FL: The shrub forms up higher.
CT: Abundant with food
FL: Acorns?
CT: Abundant. I got some in my medicine bag now I just got from Elk Valley.
FL: Was there reasons when people come from sacred places like the prayer spots, were they burned for certain reasons after that?
CT: Oh yes. We burned .. of course you know we prayed for the whole world. Of course we put a fire there, you know. I done that quite a few times in my life.
FL: A prayer fire. But would they also burn things that they left?

CT: Oh yes they burn… but to clean up the environment where we [were] at, you know. That's the reason we …can't say nothin about the world. What we believe in is ashes to ashes. … can't identify anything. So we believe ashes to ashes, being up there, like nobody was there. That's what I say…can't find nothin. Ain't true, they can't find nothin because we leave it just like there was nothin there. It was so simple. Then we know where we're at, we identify it by a stream, rock or whatever, whatever … we know at all times. If go up there I'd be lost.
FL: You can't find your way through.
CT: No, you can't find your way through. We take short cuts. I take a short cut quite a few times when I was young. I know where it was at. Yep. There's a lot of things I see that Indian people done and not been done ever since they [Federal Government-USFS] took over.
FL: Since the government took over?
CT: Yeah, since the government took over.
FL: So was that some of the main reasons why Indians stopped using fire because of the government?
CT: That's right, that's right. We were told it's full of wind around here. I'm telling you we never seen that wind till we're on top of the mountain. Scorched because of the fuel.
FL: Too much fuel now?
CT: Too much fuel. I'm telling you the truth. Like I say, each village had an old trail.
FL For gathering grounds.
CT: Yeah, gathering grounds clear back in the mountains.
FL: How far back, miles?
CT: Well you know, a roadway up on top of the ridge, you know, being cared for up there you know. We had a lot of stuff back there you know.
FL: So what is that from here, about 15, 20 miles?
CT: yeah, about 20 miles back.
FL: The people would go way back in there.
CT: Oh yeah. It was full. We lived to be 120 years old. Some lived 150. … hiking the mountain trails and feel good, ate natural food. Today we eat a lot of junk food.
FL: Yeah, different diet. Too many fats and sugars, flours, dairy products, things like that.
CT: Everything. I'm glad you brought this [acorn soup/water], boy this is the best things there is.
FL: Yeah, acorns.
CT: I could eat this three times a day.
FL: An interest of mine, another one would be, you talked about willows, do you ever remember them burning willows for any particular reasons?
CT: Well you know we used willow a lot. Make eel baskets, make all kinds of baskets, what you call storing baskets, big baskets like that, for …storing salmon in that thing. You can keep that forever, nice smoked…salmon.
FL: So part of the reason they burned was to get rid of the bugs?
CT: Yep. You get in your house, it's cool in the summer time, and nice and warm all winter…it was so well organized, like your eel net would be over there, your eel basket would be just there and then your salmon…certain flowers had a calendar,

certain flower grew, oh oh, better go down there and get rid of the salmon. Or certain bird [Yellow breasted chat, *Icteria virens*] would come. Oh oh, the eel's is comin.
FL: Yeah, what bird was that?
CT: That was a cherry bird.
FL: Cherry bird? What's he look like, what's his Indian name?
CT: Cherry bird's name? I think it's a spring bird…Of course I miss my calendar. All of that is so darned packed…recognize, you better go down there and start bringing up your fish platform, what you got in there. Got to have my catch…give some to my neighbors, old people that can't do that anymore.
FL: They shared everything they had.
CT: Yeah. They liked me because I used to do that. Tak'in some eels to my old neighbor that can't do those things no more. Oh. They would treat me so good and in return we get something.
FL: Or they'd share some knowledge with you, share something they know.
CT: Our doors were always open. Today, we have to go back to that. That's a start. Thinking about trust and respect and the whole works. Today, [society is like…] "lock the door, lock the door". My door's always open…But I tell you, I was very much happy that I didn't have to go to boarding school. I got to learn all of this.
FL: You didn't have to go to boarding school?
CT: No, my grandma didn't let me go to boarding school because I didn't have no mom and dad. Of course, she used to get aid from the state or whatever. So I stayed here and learned all this, it was good for me. I spoke my own language. Today you see…any dance I go to, you see my actions because I believe in what it is. I still do today, I still live it. I eat acorns, dried salmon, deer meat, organic like, you know. All organic. I don't I go kill my deer down-low, I go up high and kill it. Cause today the farmers they spray those toxins, pesticides and everything. Don't do that, please. They ruined my ranch up here, up that … creek because they sprayed the pesticides up here and the pesticides ran down to my folk's ranch now and the fruits all gone. All the apples and cherries. Pesticides. You can't tell me the pesticides don't poison because my two aunts, they didn't smoke and they died of cancer. Pesticides.
FL: Pesticides stuff, huh?
CT: Yep.
FL: Do you think or feel there's ways that we can use our old-time Indian burning practices to restore the forest or the prairies or other places?
CT: I firmly believe you ought to give Indians a chance. How these forests should be managed. Like all this stuff here that's burnable here, you can burn in the winter time, you know. There's a lot that can burned in the winter time. You'd be surprised what kind of forest can be managed. Might take years, it, but gonna have to do it.
FL: So what's your advice on that, to better manage the forest?
CT: Use fire with fire. Like we used to. They play fire with fire.
FL: So there'd be times when Indians would use fire, if there was, like a lightening fire or something getting in the way, or what do you mean by that, use fire for fire?
CT: Well we use fire because the forest is clean. We don't make fire like up there where they clearcut, see. That's all fuel now. Of course we don't burn that, it's all bush. In that clearcut. If we … thinned it out every year and make it, … it would be better, but it ain't.

FL: Do you notice [how] certain trees have changed? How has the forest changed because of lack of fire? The types of trees, too.
CT: Well, I tell you. The lack of fire in our forests…maybe fire went through there maybe 200, 300, 400, 500 years ago, that forest was big, tall, strong trees, no underbrush. But if you go up there now, I told my boy…Denim Flat (?) where I used to practice a lot and do a lot of things, I couldn't even get through the brush. It was outrageous. And I think that's where a controlled fire oughta do, burn all the brush out and replant it again and follow up on it.
FL: Replant or just keep burning to keep the brush back?
CT: Yeah, You have to follow up on it, you see the brush coming up, get rid of it and let the trees grow. Now you see the trees up there in the clearcuts? There's a lot of undergrowth. They're terrible. I was just up there about two weeks ago, up to where I used to run through the fields… [they have] done a lot of damage to the watershed. Not only the logging, but the miners. Everybody had a hand in it. We didn't have no voice, no voice whatsoever. That's the reason why there was genocide all the way up the river… There's darn few of us left that know the facts…
FL: When did you start noticing the biggest change to the forest?
CT: The biggest change I seen was 1949 right after the war, wasn't that something. 1947, they opened up the Klamath River, .. they really…
FL: They built roads or what did they do?
CT: They built roads, 100 miles, miles and miles of roads through the wilderness area. After that they declared non-wilderness. They just built a god damn road all over the god damn country. Miles, 3, 4, 5, 600 hundred miles just right through the area.
FL: How did that affect the fire?
CT: It really affected the fire because…putting a road in here, and a lot of the roads, they didn't care for the [hydrology]… how it run, they changed channels, the water from here, they put it over here and …from this draw they put it over there. It was crazy, and that's the reason why, very few Indian people got hired because they knew Indian people would object.
FL: They were lookin out for the resources.
CT: I saw just like anybody else. I said, What in the world, I'm just as good as the other guy, How come they never hired me? And that was the reason why. I would object to what they were doing. I know I would of. I was well trained to be a natural resource person.
FL: Tell me about your training, particularly how it relates to fire. How was that training for you growing up?
CT: My training was related to fire, light the fire where I used to pick and gather all that stuff, I'd make sure that the place where I pick up acorns, it was [catastrophic/high severity] fire protection, no underbrush, I would burn it. If I leave the acorn in the shells, the acorns would rot on top of the other, and if you put in the same place they aren't gonna grow. You take care, in the soil.
FL: So when would you burn the leaves or whatever?
CT: I'd burn it, I knew when to burn before.
FL: Sometime before a storm or… in the morning or in the afternoon. When would you do it?

CT: Not in the wind, you know. The wind blow like this [calm], you know, like this, still…We were educated, well educated people. The rest of my grandparents, they were educated. Like I said, all my life, I know about the wildlife, the fishes, the timber, the fire. And back in that time we didn't have this modern technology…we didn't have all that stuff…We didn't have no big fires. Just lately when the loggers came in and created… the soil mixing it up, whatever they did, and then the brush came up, and cleared the way, whatever, burned it, and it just grew and grew taller, 10 feet tall, maybe 20 feet tall, all brush. Just like this. I was telling that lady from Massachusetts that travels with me now. I said, you know, this oughta be burned sometime in the winter time. Cut it down.
FL: You think we should thin it first and then burn it?
CT: Yeah, then cut it down, thin it.
FL: But there's a lot of country up there now, that doesn't have roads or it's kinda high and steep. For restoration to get fire back in there, how should we do that?
CT: Well there's a lot of roads in there. They can open it up, they can open that up, lot a roads in there. You take a main road here and there. Off, ah, that main road, down in there where they log. They can open it up and …do the job and in 200 or 300 years from now, our forest will come back. But like it is. A fire will take it out. First time I do it [set fires as younger man], it would burn about 2 acres, now it would burn 7,000 acres, 700,000 acres. In them days they [fires] only burn 2 acres.
FL: So if one person would only burn 2 acres.
CT: No, lightning.
FL: Oh, lightning. How big were the Indian burns?
CT: We let it smolder. How far they burn we don't know.
FL: But how would they get put out then?
CT: The winter, the rain.
FL: In the winter, the rains would come.
CT: Then they had the knowledge to make rain too.
FL: You had medicine to make rain?
CT: We used medicine to make rain.
FL: Is that the way you kinda helped to keep the fires down then?
CT: …
FL: Did you ever use those trails for lightening fires for any reason? That you can remember people talking about?
CT: The Indian trails? Their gone.
FL: But in your grandparents time. Would they burn fires from them or would they go someplace down the ridge. How would they light the fires is my question.
CT: We watched the forest just like watchin' our water. Same thing. Watchin' water, watchin' forest. They let it smolder. And the trees were healthy. The birds were all singin' an healthy. Woodpeckers all over the place cacklin'. Today you don't see one woodpecker because of the disease that came over them and killed the bird, mites or lice or whatever.
FL: Oh, too many mites and parasites?
CT: Yep.
FL: Because there's no fire?
CT: No fire. No smoke to kill 'em. Smoke kill 'em too.

FL: So the smokes good, when it burns it helps kill the parasites, mites and stuff.
CT: Mites and the whole damn works.
FL: Was fire also used that way.
CT: The smoke does a lot and the fire does a lot. You know, I find myself killing the god damned flies. No balance.
FL: So what happened with the tree that got infested with beetles? What would they do, the old-timers?
CT: …Old … would just stand and stand and stand. All the bark fell off and the bark was just white. It was real pretty, pretty to see that….Lightening struck or whatever you know. It was time to stand and stand and stand. And next year, 10 or 30 years that stand was just over, done…But today you see stands (?) right and left. Because underbrush does a lot of pestilence, that son of a gun, all unwanted things that could be balanced by fire, smoke.
FL: How did fire help the wildlife?
CT: Good, until the fire's out, the next day or the week after you would see bunch of deer rollin' in it, happier than a son of a gun, it took care of their fleas.
FL: Rollin in the ash?
CT: Yep, bear the same thing, rollin in the ash. They know.
FL: What about the regrowth, the sprouts?
CT: The sprouts eat, it, man o man, the sprouts eat it…Some things wrong with our natural resources…Even my time and I'm not that old. In 1947 I see the change of the forest because we didn't have helicopters…We had old cats and, they didn't care what they did , what they knocked down, they didn't care. All they wanted was that fast money. They got rich too, and when they got rich, they pulled out and went to Idaho somewhere and put up a hell of a big resort.
FL: So there was a lot of money in suppressing fires?
CT: Yeah. They got way too much …, filthy rich. And of course, the filthy thieves, so god damned rich they controlled everything. Money, from the timber.
FL: So there were different views, wasn't there. Indians wanted to let the fires to burn and then the white man thought they should suppress the fires to protect the timber.
CT: Yep. Now of course the local supervisors, they OK'd everything. Let 'em cut it. They got resources up the hind end. Today they find that different. We're losin' them. Unless we have control, they'll be gone fast. Every, every, every body in this county could have a job today, cleanin' it up. By the acre, or whatever they want to do, or by the hour. You'd find us 300 years from now, it would be beautiful again. If we just change something. Look at the blackberries. Boy I'm tellin' you, they're covered from hell and back now. When I was growin' up, no blackberries at all. Now they're growin' clear up to my place at Four Roads and I have to cut them back all the time, all the time. Every year I cut it back. I'm gettin' the hang of it, alright, but still, I have my fill of the blackberries right now…It started right up here in Irving Creek.
FL: That's where you first saw the blackberries?
CT: Germans, they came up here, blackberries from Germany, up by Irving Creek…big blackberries, … I'm tellin' you. Before I went to school, loaded with blackberries…
FL: Is there anything else you want to tell me about fire that you saw, being used or anything. What I'm really interested in, this is kind of what the government is. Some

of them say, Indians didn't really have a reason to burn, or maybe they used it just for oaks or just for a few basket materials and so what I'm wanting to get from the elders who saw it or who was learning from when they were little was that other stuff. Before the 1940s, how were people burning? That's the important thing.
CT: We burned it, just burned it and our forests were clean. I seen that. I was maybe two or three or five years old, you know. Some of the trails would be nice, and it worked…And it worked. … We'd let it smolder, let it smolder….
Fl: Well that's the thing. You can tell we need to burn it but from the standpoint of the prescription, what time of the year should we burn this, and so those are the things I was hoping to get, the specifics.
CT: Well I think you got to use your common sense. One time a year, or two times a year, or whatever, you know. They don't get away, in the fall of the year when it's late in the fall or it rain, burn it. Even the old logs, just burn the old logs, … or whatever they call it, we'd burn it. I used to burn all the time, just to get warm.
FL: Make a fire?
CT: Make a fire. I'd burn a whole tree. Sometimes I would be soppin' wet and cold. I'd burn the god damned tree and let it burn.
FL: A downed log?
CT: Yeah, a downed log. I done that so many times in my young days way out in the wilderness area, way out in the mountains somewhere, I'd burn the whole tree to get warm. I'd stay there all night. Nowadays, when you find an old log, that's fuel, I used to get warm with it. Dried myself out.
FL: You talked about the wildflowers. A lot of those wildflowers are… the potatoes. Was there a…talkin' about a management area just for the roots, the bulbs, the potatoes? Or would they burn those, or how did they take care of those areas?
CT: Well I tell you, the potatoes were good. …Once you control them everything comes back and you find the potatoes like that, like a golf ball, they come back. Nowadays you see, not even like a god damn finger [tip].
FL: Yeah, not even like a pea.
CT: Not even a pea. That's crazy…I used go out and eat the god damn potatoes and I'd go out…beautiful gathered food. In my travels I didn't have to take no food with me. I never took no stuff up on the mountain with me. Only thing I'd have, a fish stick, a pocket knife.
FL: Do you remember the older people talkin' about burning meadows? The prairie areas, the grassy areas?
CT: To me, the grassy areas must a burned itself from lightning.
FL: From lightning?
CT: Yeah.
FL: The higher up ones?
CT: Yeah, the higher up ones, burned itself out. That's what I see. We didn't have to go burn it. The higher lightning come out and fresh stuff come up.
FL: What about those lower down areas, they used to be a lot more open, the prairies and grass.
CT: We did that too, we burn it. I seen that when I was a little boy. Grandma and all of us up there where we pick up acorns, you know, if we can't pick up all the acorns, we'd burn it…. Just smolder and it get away.

FL: Yeah, just creepin' along each area.
CT: It's so natural what we did. That's the reason why when the first people came in here they thought this was the most beautiful country in the world. …Berries, the wild berries, just beautiful that fruit, wild nuts, wild jays, you can see wild blue jays gettin' lots of nuts puttin' them away.
FL: What kind of nuts, hazel nuts?
CT: Hazel nuts. Ever seen a blue jay attacking a hazel nut? Cut 'em down and take his little … big bully, turn it over. I seen that. I used to watch 'em.
FL: So the hazel nuts…
CT: Hazels just too good. And use for baskets too you know
FL: Yeah so baskets and hazel nuts.
CT: We used to go way back in the mountains where there was hazel nuts.
FL: And those ones way back in the mountain would be burned too?
CT: Yeah.
FL: Was there much tall trees around them or how was the trees?
CT: …you know, that kind of thing.
FL: Yeah, the flats.
CT: I know that because my grandma used to…that kind of sticks because there weren't going (?) to last.
FL: How would she take care of those areas before she burned it? Back in there. How would she get ready to start the fire?
CT: Well, if she wanted a bunch of hazel nuts, she'd cut some down, you know, make a fire.
FL: She'd be back, stack them on there.
CT: Yeah, next time it come around it'd be shoots that low, nice, slender, straight. Oh, she was something else. She just knew exactly what she was doing with fire.
FL: What about pine nuts, the sugar pine?
CT: Oh, pine nuts. They were good.
FL: Were those treated, do better with fire around them too?
CT: Oh yes, as long as the undergrowth is down, god are they beautiful. They grow good. It's like…they grow and of course the squirrels…son of a gun. That's how we used to put our pine nuts for the winter too, let the squirrels cut it down for us.
FL: Oh yeah, Watch them ol' pitchy hands, huh?
CT: I always say, when that god damn squirrel come down lookin' for its god damn pine cone, it stayed there, we got it in a gunny sack.
FL: Too much. What about bear grass? Did you ever go with people, to see them burn the bear grass?
CT: Lot a times, lot a times.
FL: How far would they have to go back for that?
CT: Oh we didn't have to go too far, up to the ridge like that, the higher it goes the better it is. We believe in the spirit, the higher it goes the better.
FL: I notice things on that trail headin' up to the lakes, from the valley [Elk], there's a lot of bear grass around there. Would people go that far back to burn those?
CT: No, we didn't go that far, we didn't have to, we just go where it starts. Yep, I see a lot of things in my life, that was well cared for. It was abundant, that's what I say.

Even the deer. Nowadays you kill deer, full of fleas, full of ticks. You know, in them days

FL: They had to have less parasites. Would there be reasons why Indians wouldn't have fire in some places, or some things did better without fire?

CT: Well I guess the Indian people were aware of sacred places. They'd make god damn sure they were clean [Spiritual and physical preparations]. Not only just my family, but there were a lot of different families on the river done the same thing. Old people.

FL: I was just wondering if there was places where they said maybe it shouldn't have been burned.

CT: Well I don't know about that, but you know sacred places, a lot of times they squawk if they get burned.

FL: Who does?

CT: You know, the general public.

FL: But, I thought sometimes sacred sites, they [Indians] would burn around them.

CT: Yeah.

FL: They were.

CT: I tell you, in the high places…I think that's where the best god dern prayer things that man could ever use to take control of the lower parts. We controlled the salmon, we controlled everything, the steelhead, everything, everything was controlled, watershed you know. Changin' channels, that's what hurt the most up ahead. Changin' channels into another direction.

FL: The roads divertin' water.

CT: Divertin' water, roads and erosion and all that stuff you know. The next thing you know, the creek …. completely full of rock instead of trout…. No common sense today about that, the creek … full of rock instead of trout at one time…no more fish, not even water snake. All our trouts are gone in the creeks.

FL: Do you notice anything about how springs or ponds have changed because no fire in the high country or anything? No fire being burned?

CT: Well I tell you, when you don't control something, you look, you see the snow melt so fast. Indian people, they watch that. Go to high country, see Mt. Shasta. What the hells going on? Mt. Shasta ain't like it's supposed to be. There's something going through there. They're doin' burnin' or whatever they do, you know. And the weather will change, like it's gonna come pretty quick. Pretty good winter this winter.

FL: What makes you think we're going to have a good winter?

CT: The yellow jackets tell me.

FL: Yellow jackets? So when there's a lot more yellow jackets it's going to be a good winter?

CT: Yep. We're gonna have a pretty good winter… There's a lot of things that you go by. Yellow jackets, I go by yellow jackets a lot.

FL: Do you ever remember any stories about fire, like creation accounts or there's a story about how the animals stole fire. That's kind of a common one, but do you know about any other stories that talk about burning or anything like that?

CT: Well, I tell you, we used to have thunder make things. Anything powerful it'd make thunder. A woman or man passes on, or a man went to jail, …

FL: The thunder then came the lightening.

CT: Yep.
FL: Then lightning came to fires?
CT: …that's Indian ways of doing things. Makin' rain, makin' thunder. I know one time a man went to jail, [the man said] "when I get out we're going to see lightning and a half". When he got out a jail after spending many days in jail, you could feel the earth shake…He was in jail for no reason, but they put it on him, he got so mad because he didn't do nothin' they said he did, that kinda thing.
FL: Was there places that you can go that you know.
CT: [name confidential] rock.
FL: That you can go and make lightening and fire medicine? What's the name of it?
CT: [name confidential] rock. Lot of places around there named rock. You know that. Red Cap, … All these old Indian names on these places is true. The white man seen it when they came in. Right now they call it Indian creek. …Indian names for the creeks up there.
FL: We're getting close to the end here. Was there any last things you wanted to say about fire, how they used it, why they used it, anything that you think's important for me to be able to pass on and talk to people about?
CT: You gotta use fire with fire… You can't leave that fire out because that's Indian ways. We use fire with fire, it's the best way to control the forest, you have to go by experience of going into the woods, you'd see the tall trees, there we'd have a charcoal so high, 10, 20 feet maybe, or not even that, 5 feet or 4 feet, Indian people done that. Anywhere you see in the woods, hey, look at the charcoal on that tree. You tell that to some scientific person, look, where did you see lightning and how did it damage this? But you see the charcoal, not too high, cleaned it for hunting purposes.
FL: They burned areas open for hunting too?
CT: Yeah, sure.
FL: How was that?
CT: We don't have …shooter, we have bow and arrow. You know, we didn't have six shooter into… the god damn. We just got Indians sneakin' around from tree to tree….No noise.
FL: Did you ever hear of the …fire that drives animals?
CT: Well, let's see. I seen where they used fire to destroy a wild snake den.
FL: Oh yeah, how was that?
CT: There were so god damn much rattlesnakes, they didn't know where the rattlesnakes were. They went up and destroyed it with fire.
FL: How did they do it? Just put logs and stuff, pitch logs or somethin'?
CT: …They burned all the god damn things up. I seen that two or three times.
FL: See them use fire to burn anything else out?
CT: I seen old …like I said, every hunter gets cold in the woods. He'll burn a whole … not only that just one person. Lot a people. Get cold in the god damn woods, go and get whole pitch logs and …let it burn. And you get warm.
FL: And you think when you left that maybe you started some fires or would that just go out on its own?
CT: Not that kind… You don't do it in summertime, but you do it …
FL: Late fall.

CT: It gets cold and you do that thing. You know it's aint gonna get worse, it's gonna go a little ways, yeah. But you burn up that fuel. Wow, its still light (?) up yet. Some bodies burnin' it.
FL: Now they say no fires in hunting season. Just opposite.
CT: When you see all of that, you gotta add this all up and figure for yourself common sense what I told you. I did it myself and I'm only one person. But a lot of Indians done that. A lot of fuel went up to flames. Never harmed nothin'. That's what I wanted to tell you.
FL: Well, thanks. It was good.

Anonymous Woman (Yurok/Karuk), Age 61. Interviewed by Frank Lake (FL)
August 30, 2002 Grants Pass, OR.
Consent for voluntary participation verbally given and signed on IRB form

FL: Today is Friday, August 30, 2002. The first question is your name, age and tribal affiliation.
AW: My name is [requested to Anonymous], I'm 61, and I'm a Yurok/Karuk Indian.
FL: Is there any villages you identify with, some people identify with villages.
AW: No not really. I was mainly raised in Eureka, California. We moved from Orleans. If it was any it would be Orleans.
FL: Ok, alright. Were you raised with some different traditional practices, like either different subsistence activities, hunting or fishing or anything like that?
AW: My daddy used to hunt a lot around up the Orleans area, in that area, but not really. We were raised in Eureka.
FL: Part of the same story, some people have told me, well my grandparents and my parents were sent to boarding school so we weren't raised with that part of it.
AW: That's pretty much true with me too. Now, my grandmother was Martha Williams from Weitchpec and so she did a lot of the Indian traditional stuff but it was kept away from us. And my mother was in Chemawa. She went to Chemawa and really felt like she shouldn't teach us anything Indian or talk Indian and she really could. She thought it was a bad thing. And that's what they taught her, it was a bad thing and you have to assimilate in the white man world and you have to get along that way and so she didn't want us to be taken away from her or to lose us, so anything that was Indian was bad.
FL: So there was a lot of fear there just from what you experienced?
AW: Oh yes. So that's pretty much the way we were raised and school was the main thing. Go to school.
FL: Get Western educated.
AW: Once you get educated you can take care of yourself. And she used to always tell my sister, You're gonna have a hard row to hoe because she was so dark complexioned. She was very dark.
FL: So how was it then, the perception from her passed on to you kids about other traditional practices. You knew you were Indian and you saw other Indians doing things. How was that?
AW: You know I didn't really think about it that much. I didn't think about being Indian because I wasn't raised as Indian. Mother, she fairly cut us off from all our relatives. We didn't go visiting up in Hoopa or Weitchpec or Orleans even. Sometimes we'd go and visit my dad's brothers at _______ ranch up there in Orleans, but it wasn't a family type thing. She just cut us off from anything Indian.
FL: As it was attributed from her boarding school experience?
AW: I think so. I think so. She felt that if we didn't learn how to be white we weren't going to make it in this world. And it was a pretty tough place.
FL: Was that common for people of her generation too?
AW: Yes absolutely. Absolutely, I guess in Chemma [Indian boarding school in Salem, Or.] they taught her how to sew, how to dance, how to socialize and that type of thing that …

FL: It didn’t have application for being back on the river really?
AW: No. The only thing she did tell us a little bit was about the Indian devil… to scare us I guess. But other than that it was nothing.
FL: So when did you get involved more with the traditional practices. I mean now you’re a pretty good basket weaver.
AW: Well, it takes a lot of time and a lot of commitment and you have to have that time and when I was going to school and raising the family I didn’t have time to do that and I didn’t really know anybody that did it although my dad’s mother was a basket weaver and she’s mentioned in some of the books and things and of course my grandmother on my mother’s side and also my aunt. Now Craig Irving, I don’t know if you remember him, he’s a very good basket weaver, he’s Yurok. But they learned from my aunt. But I didn’t know it, I remember my grandmother coming to my house and taking one of my dolls saying that she’s gonna make a basket for it. And I could have it back but I never did see it again. The doll or the basket. Or may grandmother either. I was afraid of my grandma. She was so old and mean looking and real small. You’ll see her in the books, Cooper. Cooper, she was married to Cooper
FL: Allen?
AW: No, Henry. They’ll be really old. They lived up in Burl Mountain. So anyway, that’s pretty much how. And then after that, after I moved here to Grants Pass, that was about 10 years ago, XXXX was very much interested in basket weaving and she had her teacher, Madeleine Davis was getting old at that time and pretty much giving up and she had shown XXXX all the traditional ways of basket weaving gathering, where to gather, how to gather, and she passed it all on to her. And told her, now it’s up to you. And so XXXX was kinda at loose ends and she needed a partner so she kinda coaxed me into it. And I did have the time at that time. I took a couple of years off work and I could do that. She would call me up and say OK the willows ready, the hazels ready and away we’d go. Some days we just check in to see.
FL: Just look around?
AW: Yeah, just to see, and sometimes we’d just go out for the wildflowers. And that type of thing. I got really interested in it. And I wanted to make the doll basket for my dolls, I used to collect dolls too. And so I started and I really liked it. And I wanted to do it. Nobody else could do it so I thought that would be a good thing to know. And then as my children got older too, they were asking questions because now it’s pretty cool to be an Indian you know, you don’t have to be ashamed. So it’s kinda nice they wanted to learn a few things and maybe have some answers for the younger people.
FL: How’s that, rediscovery of your heritage and participating in it actively. How has that been for you?
AW: It’s kind of, it’s OK, but I don’t think I live it. You know, I know I’m an Indian, but I think there’s such a big gap in there it’s pretty much gone. From what I remember as a very very young child going to the Brush dances and it was a lot different than it is now. Of course there was a lot of drinking then too.
FL: Yeah. But there has been a big resurgence of the culture and traditional practices at the same time.
AW: Right. But you know, like I say with my, the way I was brought up, we were cut off from a lot of the people that I would have probably known and liked, you know.

Like you're getting back to your family and cousins, or maybe you never left, I don't know.
FL: I left for awhile, moved away to finish high school in Sacramento and college at UC Davis. So I was gone from about 1984 until about 1990. Then as soon as I got old enough to drive and I could travel, I came back up. I came to the first Brush dance at Patrick's Point, about 90 or 91, I showed up with my own quiver, head roll, bow I made everything. Geez, who's this guy? Kanawha. I jumped right back into it because I was old enough and I chose who I wanted to be as an Indian-Mexican male and the roll I want to have in this community and family, so, it's been actually stronger.
AW: I think that's really wonderful because I think that's what a lot of our younger people need, I think. A lot of our younger people are looking for answers and ways to live and they don't know. They're lost.
FL: I think I was fortunate when I was younger to be around different elders and be kinda trained, passed down certain knowledge and with that the responsibility and so that's always kept with me and I felt like I've learned this, I've learned this, at least I can come back and share a perspective. I've always been interested in the carving stuff and fishing. Now kinda like, land management stuff as a profession and so that's why I'm pursuing the kind of work and education that I am now. I like it. It keeps me busy. It's kind of a hard but it's an enjoyable way of life.
AW: Oh it is, it is. I think I probably would like to get more into it but I don't care to live where they want you to live. I'm used to my own freedoms and my own everything. So
FL: Can you tell me about some of the places? As a basket weaver, what are some of the places you've gone to collect stuff or see any places that were burned? Can you talk about that a little bit?
AW: OK. Most of the places I go is [are] the same places XXXX goes because she is teaching me. I don't care to venture out on my own here because you never know where you're pickin', in somebody elses backyard. And it's not a good thing. I went up to Washington and stopped through the Forest Service there and we went to look for some spruce roots because it's a good spruce country and they were just aghast at what we wanted to do, dig up the forest and kill their trees and cut their branches off. Just on and on. And so I think we need a lot more education in that area. And so it's kinda hard. If you go around here, it's all private land or somebody owns it or. I've been out here on the Applegate here and collecting willows, but then I felt really secretive about that too, I don't want anybody to think I'm choppin down their…
FL: I want to put you in touch with that Lomakatski group [restoration company Ashland, Or.], I have their number out there in my car. Because they're doin' active restoration stuff and we're doing a fire and restoration workshop in November. Maybe you can come out and meet some of those people and see. There's probably private land around here available where you can do your hazel burning and stuff so. It's generally increasing awareness and participation by Indians and non-Indians and private landowners on public lands is important for the continuation of a lot of this stuff.
AW: Right, I know when I do go out with XXXX, we went down to Weitchpec too, and there was a burn down there and we went up in the [woods], she goes way up on top, she does the hard stuff, she doesn't just jump out of the car and start cutting. We

walked way up in the hills there and went over the burn and gathered. We had a bunch of hazel that day, and darn if _____didn't come along. I was just sort of sitting in back of the car peeling all these hazel sticks and she says, "Well I see you picked all my hazel for me." We're being very, like, I was in the wrong place. And so they are very
FL: Proprietary?
AW: Yes, even the Indian people. I guess you know that from fishing. You have a certain spot to fish and you better fish there or you're going to be in trouble. So anyway, we did go down. We had heard that they had burned or had been a fire up there and so now we got some of the hazel shoots. But then it's usually up along the Klamath River, you know, for getting hazel [meant to say willow-*Salix exigua*]roots right down in Happy Camp, there's some pretty good places to get.
FL: At the end of the winter flow?
AW: Right. And then she's [XXXX] always going down to the Forest Service and telling them where to burn or when to burn and they say, "Yeah, yeah," and then they never do. I guess they do once in a while but, and then we go up, it's mostly all up around Happy Camp area that we do our gathering and down in Orleans under the bridge there.
FL: There's a good basket willow place there.
AW: There's willow places along there and we get our fern up at Cold Springs, black fern and that. And we usually go back into about the same places all the time. Always checkin'. Then the ceanothus we gather almost always it's really prevalent up in around that area, and if it's been cut back around the roads and stuff, the new shoots are, but I know we're always looking for burn places for our bear grass and hazel.
FL: Which is on the next subject. I mentioned that Quartz fire out here in the Applegate, Kathy Wallace is actually going to make a trip from Vacaville up this weekend to go up there. I thought it was two years after bear grass is burned. She said it's one year.
AW: One year for bear grass. Two years for hazel.
FL: Well, she says it's probably ready and she's thinking of coming up. Hopefully you didn't mind, I gave her your number and told her you're another weaver that lives up here and maybe you guys can meet and go pick together, but yeah, she says it's ready. If I had know it was ready I would have picked some up about a week ago or two weeks ago when I came through, but that's another place that's here and when I told weavers about it down in California, they're are out of bear grass so people are gonna come up here and try to gather.
AW: We gathered some down at LaVerne's [Glaze] camp, that the "Follow the Smoke". We gathered quite a bit of bear grass down there.
FL: So you got some.
AW: Do you remember meeting her? She lives down in Cave Junction area, and she said she didn't have any so I gave it to her. But I have quite a bit of material that, I got a whole room back there, stored. And it's not good to keep storing your material. You should just gather what you need and use it fresh because it's nice and flexible. Anything that gets old is old and stiff.
FL: You might get a call from Cathy. I told her. She comes up this weekend, her and her husband Ed. They're gonna collect bear grass I think in some places it was burned, it's comin' up nice.

AW: You forgot to tell me.
FL: Oh, I didn't tell you?

AW: You told me up in the Applegate, but the Applegate is a big river.
FL: Well, you'll have the information before I leave. Yeah, keep me on my toes, keep me true.
AW: Hazel's what we're always after because that's what needs to be cut and burned. If you don't burn your hazel it's just too hard to work with.
FL: Have you been out and done any of that?
AW: Yeah, I've gathered hazel, like I said, down at Weitchpec I know there's a lot of hazel down there. And then we gather it up, up there by the school in Orleans, can't think of the name, I want to say two dead squirrels on top of the roof…T-bar, up on the hill there.
FL: Yeah, above the work center of the Forest Service. Did you ever go out and help prep it as far as burning it?
AW: No, no.
FL: Just came on the gathering part of it. So what do you look for when you gather hazel?
AW: We look for the young shoots, straight.
FL: How long are they?
AW: Anywhere from 15 inches up. We even take the small ones too, the smaller ones.
FL: Just single stems or no side branches or anything?
AW: No side branches. They're weak. If you take the side branches off they're weak wherever you pulled them off. It's just the shoots that we need.
FL: And those are gathered what time of year again?
AW: You can gather them in the fall or you can gather them in the spring.
FL: You can peel the ones you get in the fall too?
AW: Yeah, in fact XXXX always says that her teacher told her that she likes the fall, especially the fall willow better because it's less buggy, it's stronger and it's ready to pick again. I think it's over now.
FL: I helped her stripe them last time I came through I stopped there and peeled willow.
AW: Yeah, it was a little bit early, but this year's been kinda funny. It's pretty hot.
FL: Yeah, our weather was different…Do you remember other places where people were talking about, or maybe XXXX has told you where people used to burn and how they'd burn things?
AW: Well that's what I really don't know. I know my dad used to tell me, now his mother was a basket weaver and they lived up in Orleans. And she had her own, pretty much her own basket patches. And they did some controlled burning, but it was just like corps [Civilian Conservation Corps], and they didn't do any big burning. He said sometimes it would get away a little bit but, you know, I don't really know where or anything. But he'd go out and gather with his mother.
FL: Have you ever heard anyone mention what time of year or under certain weather conditions they would have burned?
AW: I don't really know.

FL: I guess we talked a little bit about this with the boarding school experience and things. But what were some of the main reasons in talking with other weavers or that you're familiar with why Indian people had to stop burning, or why they stopped burning as much?
AW: I think a lot of it was the Forest Service and they controlled, they controlled a lot of the land use so there was no burning. You didn't burn anything. Even the Forest Service used to fight fire and keep the fires down. So that now we have great big fires like this Biscuit Fire, it just took the whole forest. Now there's none for the conservatives, there's none for the loggers, there's none for anybody. It's gone.
FL: The fire burns at variable intensities too, some might be light underburns, but when they show you a map of a burned area, you think the whole thing torched up but maybe it just crowned out and killed some upper trees, just portions of it. It'd be interesting to see.
AW: It is going to interesting to see what happens. Have to get in there and look around.
FL: Kathy McCovey was working [in] fire with Bryan [Colegrove] and they called down, the words already spread. That she saw a whole hill go up, a light quick flash burn of bear grass. She was like next year will be good.
AW: Yeah.
FL: Yeah I guess _____ all ready has a stake claimed on it.
AW: I suppose so, they get around in the woods all the time. They'd know. She is a good gatherer. She can really gather. She don't spend much time weaving. She's a good weaver too.
FL: Yeah. It's important for people to have a different role, do different things, to contribute to it, You know, each have do their own thing, try to help out, keep our eye open.
AW: Yeah, Casey [Spinks, Happy Camp] does a lot of the gathering too. He does a good job for a non weaver. It took me a year to learn how to gather, what to gather, how to prepare it, store it, take care of it, everything. When I got my materials, it's just that in order to do basket weaving, you got to get your materials first. So she [XXXX] taught me all different ways to get pine root, and then I started weaving I found out what I really needed, some of that stuff I gathered wasn't worth using. Because I didn't know, but now I know what I want to put in my basket, I know what it's supposed to look like.
FL: Is there a significant amount of the type of material you need to use for the baskets have to be burned? Or can other of it just be pruned?
AW: It's mostly bear grass and hazel that need to be burned.
FL: What about the willows?
AW: And the willows, no, but what we try to do when we do cut willows is get the cut willows that have been cut and then the shoots come up just like any pruning like your roses or whatever, they come back and they grow, you won't have as many, but you'll have nice straight shoots. Otherwise you get little branchy, small stubby lookin'. Stuff full of bugs.
FL: Have you, in talking to other weavers or guess your own perception of the land, how has the landscape changed historically or you've seen it because of fire suppression?

AW: It's a lot brushier, I know that, it's a lot brushier and you have to crawl around in there. I know …used to go out, there's a girl in the woods with my dad who knew the **trails** and where to go. And my dad actually was pack-trained from **Orleans down to Eureka** with the mules and stuff and they had **trails** where they came down and got supplies and things. And then took them back up. And they had different trails and things that they would go through.
FL: Do you know how they kept those trails up?
AW: He worked on that for the **Forest Service** way back then.
FL: Did they brush them or burn them out? Do you ever remember?
AW: I don't remember. He used to mostly tell me about his mules and their different personalities. Stuff like that. But boy, he'd be a good one to interview, but he's gone now about 12 years.
FL: I asked you about willows. So you think pruning would be good enough for the willows?
AW: I think so. I know we were watching some of the work that XXXX calls the connies or the convicts, they brush along the river and along the roads, all that would be a good spot to come back to, so yeah, if they cut 'em down. And then we try to when we're out cutting willows. Big cuts and cut 'em up, let 'em go back into the ground. And we're always thinking we'll come back. Sometimes we do, sometimes we don't. There's a lot of willows.
FL: There's also quite a lot of em out here between Tou Velle Park and Central Point all the way to the Valley of the Rogue [along the Rogue River] and.
AW: There is a lot of willow right here at the Applegate right down near the bridge, couple miles down the road. The only thing is we don't have a lot of sand bars along here, it can get a lot of willow root, cuts really good.
FL: In the finer sand.
AW: Uh huh, and you have straight roots instead of crooked ones.
FL: I guess that a whole other thing. Also another part of the interviews is and sharing information is, people can go out and gather sticks or dig roots, but they don't understand if they're not a basket weaver or a collector for baskets they don't understand what you need and how site specific it is and how management is a part of that.
AW: Right, that's so true.
FL: Well, based on your experience and going out with XXXX, what kind of recommendations, or changes you would like to see as far as the forests are being managed or what would be your priority if you think they could burn places. What should they burn? What kind of places?
AW: Oh I think a lot of the underbrush should be taken out everywhere, you know. Those light burns, controlled burns. They don't need a lot of these bugs and beetles they're always trying to save. I think a lot of those eat up the trees and there's a lot of bad ones that need to be burned. And take the surface layer off, and let the mushrooms grow and whatever. Yeah.
FL: So mushrooms do better too after an area has been burned?
AW: Uh Huh, all that stuff needs to be cleaned out, just like your garden.
FL: What about for wildlife habitat, do you ever hear much or talk about how wildlife respond either good or bad to fire afterwards?

AW: I'm not really sure. I don't really know. I know the poor wildlife is getting crowded clear out of everywhere.
FL: Because it's too thick.
AW: People are too thick….yeah it's really bad. That's why you have deer down in your backyard as your pet or quail. I saw a pheasant in my backyard walkin' around. That's sad, it really is. And I think a lot of the controlled burning would be good for areas and the bear grass, and if it's good for that it must be good for a lot of stuff.
FL: The Forest Service talks about having this window of weather conditions for air quality and the humidity and fuels level. Is there differences or anything you've seen in your experiences or talking to other weavers at times when the Forest Service does a prescribed burn, versus maybe when it culturally should have been burned?
AW: I'm not really sure about that. I hear so many different stories and so many weavers who say, Oh it should be burned in the fall. Then another group will come along and say, Oh, they burned that last fall, now it's not any good for the spring. So I don't really know. I would think it would be burned in the spring maybe, it would be better to pick bear grass in the fall. I don't know.
FL: I've heard people burn hazel in the spring and bear grass in the early fall. Burn willows in the early fall, right around late August, early September, kinda times. So.
AW: But I'm not really sure. I know they haven't burned last year, we'd always go down and look. I don't care when it was burned. You'll get some.
FL: So then that's also what you do now is if there places that aren't prescribed burns, like these wildfires, cooler fires, you just kinda chase those, kinda follow the smoke literally?
AW: Yeah, really.
FL: Can you tell me about that experience? What do you and XXXX do when you hear about fire?
AW: We pack our lunch and we take off, and we go and check it out, and she lives over there so she does most of the checkin' out. You know, she'll go up and she'll say, "There was a fire up at wherever, Gold Hill or something" and she'll go over there and look around and see what's going on. She'll go, this'll be good this spring or whatever. That's when I get the call, well it's ready, then I'll pack my stuff and stay for three or four days over there, I'll go and stay with her and then harvest.
FL: When the area is burnt like that and you go back and harvest, how much do you really think you're taking from an area. You don't really change it much do you?
AW: No, no. All we take is the shoots and it's just like pruning. The next year they'll come up better.
FL: I think that's also some of the other threats people worry about is if you're going in there, Indians will cut it all back or take everything and they kinda compare Indian practices to the floral industry where people will come in there and don't know the life history of the plants or the proper way to prune them or harvest them and so they're kind of competing for the same resources in the floral industry and the basket weavers, but there's a different actual effect on the community of plants and the quality.
AW: Right. XXXX says now when we go out and we gather spruce roots you put everything back. You may take maybe go out 5 feet from the tree and take some of the smaller, I don't take any more than that big.
FL: Yeah, no bigger than your pinkie, a centimeter or two centimeters across.

AW: Some people say that big but that's too hard to scrape.
FL: The size of your arm, you gotta split it?
AW: Yeah, you gotta split it, and split it and split it, and scrape it and scrape it. If you get it about that big you've… And then you put everything back, and when you're pruning through the brush you don't just go and chop the tree down, you know, you take the different branches and let the light flow through or whatever you're doing, you don't ruin anything.
FL: Have you noticed when you go out to look at these burned areas, are there places that are better than others as far as the micro site? You know, like filtered light versus open light, darker, which one's better?
AW: Oh yeah, the filtered is always. They always grow toward the sun so they'll grow out and long. And under, if you get the bear grass out that didn't have any shade, it gets stumpy, grows short.
FL: So full sun on bear grass, it gets stumpy.
AW: Yeah.
FL: Does it matter much for willow?
AW: I don't really think so because most of it is, most of what we gather is in full sun.
FL: What about ceanothus?
AW: Ceanothus? It just grows anywhere. It's just kinda ubiquitous, just every place. But I know if it's been cut too it grows better, it gets long, long shoots.
FL: What time of year would you collect that?
AW: They just stopped…in the fall [late summer]. You might get a few.
FL: And you still strip it?
AW: Yeah, you still strip it in the spring and in the fall too.
FL: So like in late May, early June, and then late August?
AW: Uh huh.
FL: I'm just learning about ceanothus. I got somebody growling at me… because I was down here along the Illinois River and they turned that road from Selma down where it's just burning up. But it was all pruned back and I was down there teachin' a class for the Siskiyou Field Institute, oh, second weekend or third weekend in June there was all nice long pieces like that, just real thin, real long, even tapered and so I just gathered a few and told the class and they said I think they use these for small trinket baskets, and somebody saw me, We need all those for the [type of baskets]… I know how to get hazel, I know how to get bear grass, I know how to get ferns.
AW: Ceanothus is almost the same as willow, it's peelin' good, you have to peel it right there. You can't save it and bring it in, then it's hard to peel, cuz it dries out so fast. I think I got a few just layin' over there in the basket I just pulled off some bushes comin' down the hill. Loran Bommlynn was tellin' me about these fir boughs.
FL: Yeah the droopy firs.
AW: He was tellin' me about them last time I saw him. That he'd stripped some off and he said those are really nice to make caps out of.
FL: They're a little stiffer, more rigid, I pick some and had them laying around and then the cat got them, busted the ends off. Is there another thing you use for baskets that you can think of, that maybe it was more common historically that they might have used?

AW: I think so. I keep hearing about this myrtlewood and cottonwood roots but I've never used them. And I've even heard of redwood roots.
FL: Yeah, somebody else was telling me about that.
AW: But I'm wondering if that doesn't bleed into your basket. I would think, the redwood stain. I don't know.
FL: I've seen western red cedar used farther north, it's a real nice dark color. But all I've ever heard about is that bull pine, or Ponderosa pine and spruce root on the coast.
AW: We use both, I prefer the spruce root, it's easier to handle than the pine, although we did get some pine one time that was just so nice.
FL: How did you do that? You just dug it up?
AW: I just dug it up. It was only like that, and it was straight.
FL: About the diameter of a nickel?
AW: Yeah, those are the ones I know I've seen XXXX get great big pine. Then split it. She's stronger than I am. I got old arthritic hands.
FL: Any last things you want to say, or anything about fire you think would be important?
AW: It would be really nice if the Forest Service got together with the Indian people and, you know, had some input of where they wanted to burn and when and things like that. In stead of, you know. It seems we're always going to but never really get to. It would be nice if we had it set up but I know they don't do things that way. They have to do funding and talk about it, you know.
FL: So there's a need for making it more accessible and actually implementing?
AW: I think if they don't get with it soon a lot of the older people are going to be too old to even tell them where, what or how, which is, you know, happening.
FL: The ones who lived before fire suppression, how the forest conditions were, and how things were managed before they pass on, have actually direct experience.
AW: Instead of hearsay or read out of the book, or somebody said. And then you have to go through all the experimental stuff, you know, instead of knowing. It would be nice. I look at older baskets and I see how the material is so fine and looks so good. And where you get it, you know.
FL: Is [are] there other risks as a basket weaver, when you're out there that you worry about? What are your threats?
AW: Well, it's mostly people I worry about, getting run out and pickin' on somebody's land I'm afraid I'm gonna get arrested or hassled or whatever. One year I took some mace out, I said I was gonna do a bear if he ever got close to me. XXXX said if he ever got that close, so we left our mace at home. But otherwise no, not really.
FL: Ok, I guess. That's it, thank you. We covered a lot of stuff. The topic was fire but a lot of it ties into the basket weaving.
AW: Land uses.
FL: Yeah, land uses. That's the important part. I want to be able to take out of it and go, well they have these recommendations based on these practices they used to do and without this opportunity to actually implement and have the access to do these things, we're going to lose it.
AW: Oh yeah, I can see that. Different people have come to me and said, You know, I want to make a basket. And where do I take them. I don't know here.

FL: So that's also along the same lines, what's the priority of awareness? You have a young person coming you're trying to teach and whose trying to learn, what should they learn about? They can learn about what materials to use but they don't have the materials in the right, properly burned or properly pruned, then how can they?
AW: Properly collected too. We always go out and say our prayers and everything and do our, Thank you for the forest and that, that'll all be gone.
FL: People's sense of reciprocity and gratefulness.
AW: Right, and where we come from.
FL: Is that it? OK. Thank you. **[Interview ends]**

Appendix B: Ethnographic Quotes

USDA Forest Service: Six Rivers National Forest-Heritage Programs/Cultural Resources. Interviews with tribal and non-tribal people in Northwestern California. On-file Eureka, CA.

Excerpts from interviews, with direct quotes and subject material descriptions. Bold indicates key words of interest.

Interview-175, Karuk Man. Age n/a and Yurok Woman, age n/a. August 2, 1979: "Old **trail** along the ridge up to **Bee mountain** and past. Indians gather [**bear] grass** and **sugar pine** nuts. Sap used too. Tree burnt to cause sap to run. **Bear Pen Flat** was a campsite people would use when going to **Red mountain** or Crescent City area. House planks used to make a temporary raft during high magnitude floods. Most valuable passions that could not be moved were put on raft tethered to a tree. When flood waters receded, the planks would be used to rebuild the house on same foundation/pit.

Interview-177, Karuk man, age: n/a. September 7, 1978: Trails: Q: Did they go right along the ridge or were they off on one side or another? A: They went right on top the ridges. They had trails all over up here because they had to walk to go any place. There weren't any roads then. **Almost all divides had trails on them that tied to main trails**. Kelsey was a packer, had had all kinds of different trails he used in addition to **Kelsey trail** running from the coast over the Southern Siskiyous, crossing the Klamath River, crossing over the Marble mountains and into the Scott Valley. Trail markers: 3 blaze cut marks was Surveyors, 2 marks was USFS, and 1 private. Indian stacked stick or other object [rock?] against tree.

Interview-183, Non-Indian man, age: n/a. August 4, 1978: Trails: "New River Indians went back and forth now they are over on the Orleans, up around Soldiers and up Cecilville and they'd come up over **Salmon Summit** and take that Trail and come across on the back on the **Devil's Backbone**. That's between **Trinity Summit and Salmon Summit** and the head of Red Cap creek and then they'd go right on through and they'd even come on into **Cecilville** and then they'd come in from **Forks of the Salmon** and they'd come over **Mirror Glen Meadows**, go on that way and come down on the **Trinity River** up here about…"

Interview-187: Yurok man, age: n/a. August 24, 1978: Bad Medicine places. Do not bring foreign material to sacred places. Doctor Rock to Chimney Rock area.

Interview-188, Yurok man, age n/a. Interviewed on July 13, 1978: Trapping: Yuroks from Sregon. People trapped marten at **Nickowiz Peak**.

Interview-189, Hupa man, age: n/a. December 8, 1978: Burning trails-Doctor training: "On the way up, he burned the trail (or portions of it) making her walk over it to show she can stand punishment”. Up to **Pony Butte** in **New River** coming from Hoopa Valley.

Interview-190, Tolowa-Yurok woman, February 15, 1979. Gathering: “Indian names for the area at the forks were HJA-GIN-ET, which means “running down” and NINT-LET meaning “face of it”. There was a **village** across the river and on the **south fork** [Smith River]. It would have bee a **stopping place** [camp] for many different people from all over since it was by the main **trail**. Since the campsites were used regularly, it’s possible utensils (pestles, mortars, etc.) were left there for the next time or next person to come along. For a large gathering of people a redwood trough could be used as a pot. The uplands were used for **gathering**. If the weather was good enough, **acorns** would be dried and ground into flour, so there would be less weight to carry back. Also, gathered many other things especially **herbs and teas**. “Swamp tea, *Ledum glandulosum*, used as a general beverage.” This tea used to clean the blood and kidneys. “Swamp tea collected at **Panther Flat**”. “Very young alder and madrone bark was used as an eye wash. The effective stuff had to be gotten where the weather was hotter. People would come inland from the coast to the **Hiouchi** area for this”. Madrone berries used. “People went to mountain areas for teas, huckleberries, madrone berries, Oregon grapes, manzanita and acorns. Manzanita was mixed with the acorn flour. Princess pine, which only grows in the mountains was gathered at higher altitudes. Would gather and dry all kinds of things in the mountains, even meat. Mountain balm is a sticky brush gathered in the high country. It’s used as a tea for colds and coughs. Wormwood Tea can be used for nerves or as a poultice for aches. The high country variety where the climate is hotter and drier is stronger. It has to be collected before the frost. Some might be planted near habitations because of common use. But the best stuff was from the mountains. Wild Iris was used for string. This got it from the mountains where it was best. The lowland stuff was too brittle. The inside bark of the cottonwood was used for dresses.”

Interview-191: Hupa consultants, Male? , age n/a: July 15, 1978. Orleans and Hupa Doctor rock (near Trinity Summit) was used to graze their cattle.

Interview-192: Doctor Rock: Non-Indian?, Male?, age n/a. February 10, 1977. There was a Civilian Conservation Corps camp below Doctor Rock in the 1930s and 1940s.

Interview-193: Non-Indian, male, age n/a. Historic Lower Trinity. April 4, 1978. **Villages**: **Horse Linto** Creek. House pits on north side of mouth. “Hoss-Lin-Tin”-a Hoopa word translating as “a series of rapids”. Friday camp is about ½ mile to the south, on the side of the hill where the road loops around towards Titlow Hill. This was a hunting area. A **trail** led down **Friday Ridge**. Elk Valley circa 1907. A trail from **Eyesee Bar at Rock Creek on** the Klamath up to **Elk Valley**. Elk Valley contained many ‘drying racks’ for meat-thinks the **trail** there went into **Dr. Rock** and on to Gasquet area. Willow Creek: No villages located there, nearest was main one as at South Fork Trinity.

Interview-195. Trinity Summit: Hupa man, age n/a. July 13, 1978: The Hupa's Doctor Rock is a little bit North of Long Prairie directly behind Jackson Swamp by Mill Creek Lake. Area was used to **graze cattle** by Hupa families/men.

Interview-196: Trinity Summit. Non-Indian man (?), age n/a. July 10, 1978. Waterdog Lake-Trinity Summit and Box Camp: Area **hunted and trapped**.

Interview-206, Karuk man, age n/a. May 7, 1979: **Hunting**: Hunting between **LePerron Peak** and **Boise Saddle**, **Devil's Backbone** and **Salmon Mountain**. **Hunting along ridges**. Deer eat moss [lichen] on trees during the winter. Big fat deer in this area.

Interview-207, Karuk man, age n/a. February 7, 1979: Trail: The trail running along the **Wilder Ditch** is the old **Prospect Hill trail**. It ran from Bacon Flat and on the Flint Valley and Elk Valley.

Interview-208: *Amaikiaram*, Ike's Falls Area: Karuk Man: October 1978. "Sandy Bar Bob was the one shot in the hip by the miners at Orleans."

Interview-209, Karuk man, age n/a: April 6, 1978: Ferris Trail: The main tail along the north side of **Chimmikanee Ridge**…went up the side of the **ridge east to Deer Lick Saddle**. This trail was used to get there, and it was also used to drive stock [**cattle**] along to the pastures on the south side of **Chimmikanee Ridge**. **This originally was open grassland, which was maintained by Indian burning**. Over hundreds and thousands of years the burning had created open grasslands for **deer and elk forage**. When the whites came it was used as pasturage at certain times of the year. Now it has grown over with oaks, madrone, and conifers. South side of many ridges in this area were so used. **Scott Valley**: There was a main **Indian Trail** north from Orleans in the mountains on east side of river to Scotts Valley. The Indians would come to trade, socialize and attend the ceremonies." Short Sale Area: Whole side of the ridge used for acorn and other food gathering.

Interview-210, Non-Indian (?) Man, age n/a. May 7, 1979: Trail: The **County trail over to Somes Bar** use to run right by his property. The **Prospect Hill trail** took off from the **Country trail** and followed out **Wilson Creek** and then up to **Hines Camp**, then followed the **ridge** on up past **Lightning Ridge** and up to **Elk and Flint Valleys**. The cattlemen used to drive **cattle** up there to graze. There was plenty of room because they used to keep the **forest floor burnt** to keep the brush down just like the Indians used to do. A fella would see a patch of brush and just toss a match into it. Since the Forest Service took over, though, every thing's grown back and you can't hardly get around any more."

Interview-211: Non-Indian man, age n/a. Orleans Mining: April 11, 1979: Burril Peak: "An old Indian told him that they used to kill deer near there. There is a rocky bluff on the ridge (south) from the Peak. It has an overhang on it. The hunter would chase them [deer] off of it."

Interview-217: Burril Peak: Non-Indian Man, 70 yrs old. Interviewed on 4/11/1979. "He remembers an Indian telling him that deer were hunted on Burrill Peak. There were driven off a rock ledge or bluff on the Bluff Creek side."

Interview-229: Hupa? Man, age n/a. Trinity Summit and Tish Tang: July 10-1979. The **Tish Tang trail** was the natural route to the **Trinity Summit** area and the **New River** area. The pack train "when going to Trinity Summit would go from the New River side and go up **Don Juan Creek**". The Trail to Trinity Summit started around the **mouth of Tish Tang Creek** and generally followed the ridge top. This trail ran through an excellent grove of **Tan-Oak below Sign Board Gap** which the Indians utilized extensively for acorn gathering."

Interview-230: Hupa, man (?) age na/. Trinity Summit and Tish Tang: July 5, 1979. "Just before **Sign Board Gap** there was a beautiful grove of tan oak where the Hupa gathered acorns extensively. When traveling along **Tish Tang Ridge** the Indians might not have walked exactly where the present trail route goes, but it was darn close." Parts of the **present trail were also the original Indian trail**.

Interview-233: Tolowa man, age n/a and woman, age n/a: Jan.15, 1980. Gathering: Woman: Used to get hazel sticks and bear grass in the **Big Flat** area. Man: Used to hunt in the Big Flat area. **Hazel** sticks have to be young shoots. They can be picked from the same tree for use in baskets for up to three seasons. The gathering areas along **Coon Mt**. County road area (which heads south), really needs burning. They would like the Forest Service to burn areas to get new hazel shoots and good bear grass. They used **French Hill-Big Flat-Ship Mountain** areas to gather in. **Huckleberries** are gathered near **Low Divide**. Oregon grape root is gotten around Gasquet, it is used for medicine. When gathering you go where the item is best. You don't always go to the same area year after year. You go where it is growing, where it is good."

Interview-234: Same people as I-233 above: Tolowa. January 30, 1980. Gathering: "Tan oak and black oak acorns are gathered in the **Fox Ridge** area but they are hard to get now because all the big trees have been destroyed." "They would like to see the Forest Service set aside areas to burn for the basket makers. The best bear grass material, after it is burned, is gotten under trees where the shade is. Concerning **hazel** sticks, they haven't been able to find any on the Gasquet District."

Interview-235: Tolowa woman, age n/a: January 15, 1980: "Oak acorns are gathered all through **Hurdygurdy** Creek."

Interview-236: Tolowa gathering: **Yurok woman, age n/a: January 16, 1980**. Bear grass and sticks (hazel) are what you get out there (on Forest Service lands). You need to set fire to areas. You set fires in spring time every year so you can eat and so you can get basket materials that are good. You need to burn not in prairies but under big trees because when the bear grass is out in the prairie it is stiffer and shorter.

Interview-278, Tolowa-Yurok. January 20, 1981: Acorn gathering area on the ridge to the west of **Myrtle Creek** T.16N, R. 1E and T.17N, R. 1E). This was one of the closest acorn gathering areas to the coast. Pestles and other implements found along Myrtle Creek as well.

Interview-281, 74 yr old Karuk man, February 3, 1981: "The south side of the mountains is where, in the past, **burning** occurred all the time to generate new shoots to grow for **animals** and **gathering.**" Most **mushroom** country was at head of Wilder creek and on **Prospect Hill** Road and I-see Road. "Where the tanoak [trees] grow about 15 inches in diameter and its damp and moist with decayed leaves, is where the tanoak mushrooms grow." "Old **trail**s on the Orleans Ranger District" of importance and concern.

Interview-282: Karuk woman, 50 years old. February 3, 1981. A place located up **Whities** over **Dear Lick** to the **saddle across Boise Creek** on a flat with apple trees on the North Fork of Redcap creek. The north side of the creek is a medicine 'fire place' or '**cross roads.**' **Rattlesnakes** there.

Interview-286: Hupa woman 60 years old, Hupa man late 30s, Hupa Woman, mid 30s. March 16, 1981. **Long Ridge** is a favored **gathering** area. Materials gathered are mountain balm, princess pine, Oregon grape, salal brush, wild ginger, June berry, iron wood, and yew wood. Pack saddle ridge is important for mountain balm gathered along the road. **Deerhorn** area round **Packsaddle ridge** is used for gathering sticks and grasses for baskets and acorns. Angelica root is gathered from creeks in Tish-Tang watershed. The Trinity Summit country/area is favored gathering location. Quality of grasses (bear grass?) is better than that down lower in elevation. Doctor training grounds around **Mill Creek lake** and **Water Dog lake**.

Interview-287, Hupa-Yurok woman. 95 years old, March 19, 1981. Her grandfather built bark huts up in the forest that he used for **hunting**. Her grandmother would dry meat up in the forest. Lighter, less weight and easier to pack down to the Hoopa Valley. This was the winter's **meat** supply. Horses used to pack the meat down. Families would go to the **mountains** together to **camp**. Their place was in the **Bald Hills** over towards **Redwood Creek at Eightmile**. Horses would **graze** on the grass there. The **trail** used to only be a horse trail, later the Indians gave free labor to help build the road.

Interview-288, Hupa man, 70s. March 23, 1981. **Hupa ethnobotany**, Indian root, Madrone, soapbrush, etc. "It is harder to get things for baskets now because there is less burning. All the brush used to be burned away all the time. Hazel sticks are used for baskets. **You need fires in that kind of place where there are hazel sticks**. Wild grass is also used for baskets. There is a place about 8-12 miles out **Mill Creek**, on the reservation, for this basket grass (bear grass). You have to know what day to **burn** for this grass if you burn on a spring day it comes back up right away. If it is **burnt** in the summer you would have to wait 2 years for it to come back up." Cooking pine roots in pit with fire. "**Acorns are not just used by people but by all the animals and birds.**" "The **deer** would feed on the acorns and get real fat. **Cattle** feed on them too." "The **Summit** country was always Indian **hunting grounds**. It was also a big summer ranch, anyone who had **cattle** would bring them up in the summer. It is supposed to be Indian hunting ground but there's not so many **deer** anymore."

Interview-290: Hupa man, 68 years old, Hupa woman 60s old. March 25, 1981. Princess pine, spearmint, and mt. balm are gathered in the Summit area. **Acorns** and **mushrooms** are **gathered** on the **Haslinden Slope** toward Willow Creek (Horse Linto Creek side of Tish-tang Ridge). These are also gathered on **Waterman Ridge** and over by **Hopkins Butte**. They are gathered in the **tanoak groves** mostly down off the roads because there are so many people out on the roads asking questions and such. Wild **berries** are gathered in cut blocks. It seems to go in cycles in any one place. Berries come back in a place for about three years then disappear and then maybe come back again. So it is hard to know what spot these might be in any year. They are afraid to go into the cut blocks now as they might have been sprayed. "**Hazel sticks** are gathered lower down where it is not so wet because it has to be **burned**. Yew wood is gathered along creeks." **Hunting** along **Trinity Summit**, Doctor Rock, **Salmon Summit** area and **Trinity Alps**, also **Waterman Ridge** towards **Lone Pine**.

Interview-291: Yurok man, 60 years old. April 10, 1981. Basketry information. Ethnobotany.

Interview-292: Yurok/Karuk woman, age n/a. April 13, 1981. "Material she gathers include bear grass, which has to be **burned** the previous year, maidenhair fern, willow shoots, hazel shoots (it does not grow every place-basically it is from Weitchpec down the river), Woodwardia fern (gathered towards Orleans), yellow moss, willow and grape roots, alder bark for dying (grows down low), and porcupine quills. The hazel is pretty hard to find, she gets it mostly in Hoopa and over towards Weitchpec. For the basket grass (bear grass) she goes wherever the Forest Service has **burned after logging**. There used to be **burning on top of Mill Creek** but she doesn't think it is done any longer. She has gone all the way over to Onion Lake on the Orleans District and sometimes to Lyons near Orick to find grass. She will generally follow the road and go to the easiest places."

Interview-293: 82 year old Yurok man. May 26, 1981. Yurok gathering. "He gathers **mushroom** at **Pecwan**. He gathers the **bear grass**, which he uses for braiding for ceremonial regalia, wherever it has been **burned**. It takes a year after it has been **burned** before it is ready to pick. Some grass is gotten from private timber lands around Big Lagoon. He collects **willow** sticks and roots along **Mad River** at Blue Lake and on **Van Duzen River**. He uses them to make **eel baskets**. He gathers **hazel** sticks around Weitchpec. The medicine root, which is used in the dances he gathers up in Hoopa and out around **Onion Lake**, towards Orleans."

Interview-294: 32 year old Karuk man. June 3, 1981. Men art and collecting of yew wood, **hazel** and other wood products. "There are rules on how the maker is suppose to think, how to collect and how to finish the product in a way that the spirits will approve. If all these things aren't done right then the maker should destroy the item because it would bring bad luck. Sometimes he will spend days and never find the right piece of wood to use. You gather what you need when you need it-not what you see when you see it. Gathers **yew** wood, which is used for pipes, etc. in shaded wet area on Tee creek because it grows straight in the shade."

Interview-296: Hupa/Karuk man, age n/a. Indian Doctor. **June 8, 1981**. "He stressed many of the plants have several uses which he did not have the time or the willingness to relate to me. Therefore, the following list of plants are those which he gave the general use as medical with no example of their medical use: Princess pine leaves, manzanita leaves, mint, mountain balm (Yerba Santa), Redwood sorrel, salal leaves, Cottonwood leaves, Douglas-fir needles, Laurel leaves. The following list of plants he did give an example of one of their many medical uses: Angelica root = A very important spiritual roots, used in many ceremonies and has medical purposes as well. Alder bark = One medical use is to make a tea for cramps. There are many other uses of this plant. Cascara bark = One use is as a laxative, also used as an infusion for other ailments. Cedar buds/leaves/bark = All three are used differently but some medical uses are for lungs/coughs/kidney troubles, etc. Cowparsnip = One use is to make a lotion for reheumatism pain, etc. Madrone root/bark/leaves = All three parts of the plant have different use but an infusion and lotion are made and used for various ailments. Nettles = One use is as a medical tea to relax the muscles, etc. Oregon grape = A medicinal tea is made which is used for kidney problems. When mixed with other plants its medicinal use is broaden. Yarrow = A medicine for stomach troubles and also used for other problems. This plant has many medical properties. Horestail = One major use for this plant is an eye medicine. Willow bark/leaves/root = All three parts of the plant are used in different medical ways. For example a medicine for headache/fever is make of the bark. Sunflower = Used as a food, used for its oil and the outer stem and root is a medicine which is used in stomach ailments, headaches, eye washes, etc. Wormwood leaves = Has very strong medical properties, among it many uses is the use for dropsy. Eucalyptus leaves = One use is as a strong medicinal tea for colds, stuffiness, etc.; also used for its oil and resin. Wild Ginger = A very important plant spiritually, used in many ceremonies, also used medically as a medium to stop bleeding. He said he does a lot of gathering for other purposes as well, such as items used to make traditional implements and food items to eat, he depends heavily on the plants to live his life. Below are listed some of the items he gathers for other than medicinal uses: Food: Tan oak acorns (in late Fall), **Mushroom** (after first good Fall rain), berries, black/salmon/blue/madrone/salal/huckle/manzanita/etc. Hazel nuts, Sugar pine nuts (late Fall), Chinquapin nuts, Indian tea (swamp tea), Clover. Non-Food: Yew wood (for pipes), Manzanita wood (for pipes), Arrowwood (mock orange), Ironwood (for Indian cards), Hazel wood (for Indian sticks), Wild Iris (fiber used in ceremonial regalia). He will travel a great distance to get the things he needs and does not collect the items he needs along the roadways as other do. He will hike back into the place it grows best. However, collection of certain medical plants… have to take place at specific… location, either upon approachment paths (e.g. **trails**), immediate vicinity, or prescribed areas. He says it is required to respect the spiritual of a plant and once taken use it for the purpose it is intended. The plants spiritual (life) is just as important as the spiritual of man to the Creator. The greatest evil that can be is the destruction of life. Never take more than you can use within a year, always leave some plants there to reseed so the plant can live on. It does not matter if you take the plant for food, pipe, or medicine the respect of the spiritual must be there and the approach must be one of respect and reverence to the spiritual of the plant. Indian tobacco if gathered and grown in the mountains where no one else can find it. Tobacco is important to the dances and the doctors 'tobacco is what you used to knock on the door, to get the spiritual's attention, it should be their tobacco, Indian tobacco.' It must be a part of you that is why you have to cultivate it yourself."

Interview-297: Non-Indian Man in 70s. June 18, 1981. **Orleans-Trails**: "The **Prospect trail** and the **Bald Mountain Trail** meet below **Hines Camp**. First real roads in the area came in 1946. Trail led from **Laird Meadow to Cedar Camp**. A big white anchor tree marked the split off to Blue Creek and **Laird Meadow from the Prospect trail**. The **Bald Mountain trail** and **Prospect Hill trail** were kept up by the Forest Service till the roads came in. The Knudson family use to drive their **cattle** up the **Prospect Trail** to graze them in **Elk Valley**. Both the Bald Mountain trail and the Prospect Hill trail converge into the **Elk Valley Trail.**"

Interview-298: 60 year old Karuk woman. July 7, 1981. "**Mushrooms** are collected in the **Prospect Hill** area. She has buried **acorns** in the traditional manner as the Indians located further south. She placed them in a pit dug in a wet area and let them sit for a few months. The acorns were sometimes placed in wooden boxes when the boxes were available. When so treated, the acorns have the flavor of black olives."

Interview-299: Karuk women in her 50s. July 7, 1981. "**Bear grass, hazel, chinquapin**, and **mushrooms** are collected in the Wilder Creek area (see map). The informant has gone looking for mushrooms in the area. Entire families would go **gathering and hunting** in the **mountains in the fall**. They would set up **camps** and dry part of their **meat** at the camps. The families would usually **gather nuts** at this time. Gather **white acorns** usually in special family –**owned plots**. Informant has buried acorns in a wet, muddy area until the acorns turn black. The animals often dug up the acorns before they were ready. List of plants and their uses: alder bark-medicine and dye, arrowwood-make arrows, mountain balm-good for arthritis, mallow-drawing agent, princess pine –good for kidneys. Her family's gathering place is the **Salmon Mountain** area. **Brodiaea and bulbs** were eaten during times of famine. Some collecting is done on family **owned plots** and some is done wherever the material is available. The same occurred in traditional times. For example, **willow** are gathered along the river by many families. Ferns are collected along Red Cap. The 5-fingered ferns collected are not the same as maidenhair ferns. **Gray willows are collected-not pussy willows**. Willow roots are used. Spruce roots are sometimes collected, steamed, split, and used like the willow roots in basket making. Yellow moss grows on fir and **sugar pine** trees in the higher elevations. Oregon grape root is collected. Many families used to dry their fish on a flat area on the south side of where **Camp Creek** meets the Klamath. Gathers **hazel** in the area of Short T.S. area, shown on attached map (north-northwest of Black Mt to Bald Mt.). Wormwood is also collected. Knows of no families that gather between **Black Mt. and Whiteys Peak**.

Interview-300: Yurok woman, about 55 years old. July 6, 1981. “Go to Weitchpec and Orleans to get **bear grass**. Picks early in morning before it gets too hot. River roots (**willow**) can be used in place of **hazel** sticks in basketry; there are not as firm as hazel. Mother collected wild **potatoes at Potatoe Patch [near Red Mt.]**. Gathers **acorns** at Weitchpec and Martin’s Ferry. Gathers at least a sackful. Collects when first wind blows in October. Gathers on side slope as wind blows acorns downhill. When caps come off easily and it is white on top, then the acorn is good. Woodwardia fern is hard to obtain; it is used for red in basketry when dyed with alder bark. Just picks the tips of **huckleberries** so not to abuse the bush and also to create a larger crop the next year. Gathered **hazel sticks on Long Prairie**. Have not gathered there since 7th or 8th grade. Have not been there since 1964. Have to gather **hazelnuts** quick before squirrels get them. Spruce root is gathered in Redwood National Park and is used in basket making. Have to take a whole piece of root after following it out to tip. To soften root, use hot water and bake it.”

Interview-301: Yurok woman, approximately 40 years old. July 7, 1981. “Gathers **bear grass** at **Bald Hill** south of Klamath. Gathers **acorns** along **French Hill** Road. Collects Woodwardia fern along Patricks Creek. Drives along road until she find what is she is looking for. If she finds a patch she will go back the next year. Gathers tea at Panther Flat. Collects **hazel** sticks at Weitchpec. Gathers black ferns at Sath. Gathers **hazelnuts** at **Big Flat**. Gathers **tanoak acorns** in **Hurdy Gurdy Creek** area. Collects **mushrooms** at **Orleans** and **Johnsons**. Would travel up to south Red Moutain from village of Sath when girl for religious purposes.”

Interview-303: Yurok woman, approximently 80 years old. July 7, 1981. “Used to go to **Martin’s Ferry** for **hazel** sticks. Gathered **acorns** at **Big Flat/Hurdy Gurdy Creek**…Used to collect **mushrooms** at **Pecwan**. Bought **$100** worth of **hazel sticks** which is about a **12” diameter bunch**.”

Interview-304: Yurok woman, 79 years old. July 6, 1981. “In old days gathered **lily bulbs** below **Red Mountain** and **Rattlesnake Mountain**. Also collected young **pine roots** in these areas. **Hazel sticks** are very scare; they have to be **burned** every year or two. Last 5 or 6 years she has gone to Orleans to gather **willow sticks** in place of **hazel sticks**. **Eel traps** are all made of **willow sticks**. Flat mats for drying fish are made out of **red willow** which is found along creek edges. Scarcity of material is a real problem for basket makers. Gathers **acorns** wherever she can find them, they are important for **animals**. Acorns are food for people and animal. There are few animals because of fewer acorns. **Huckleberries**: used to go to **Martin’s Ferry**, no she does not go to those places because they are sprayed with herbicides. Use to collect in **Low Divide Area**, does not go now because of homes in area. Used to collect Indian tea by Boy Scout Camp, Bar O, Smith River. Crowed out by (private land) owners of places where she used to collect. Used to collect **manzanita berries** and **huckleberries** along

Hardscrabble Ridge." Other information about sacred uses of Doctor Rock, Red Mt. and Peak 8.

Interview-305, Karuk man in 70s. July 23, 1981. "**Huckleberries** are gathered along **Leary Creek**. **Packsaddle Camp** was a pack train stop. It was common to **pasture animals** there for a few days. Ran **cattle** on **Salmon Summit trail**. His family would **hunt** primarily **deer** and some **bear** around **Le Perron Flat**. He has walked many of the **trails**. One **trail** followed **Rattlesnake Ridge** down to Schnable's and on the **Mill Creek Gap**. At Mill Creek the trail split. One could head towards **Hopkins Butte** or to **Packsaddle Ridge** and on to **Shelton Butte**. The trails were used as **pack trails**. The Forest Service maintained and improved **existing trails**, and packers often improved the **Indian trails**. He described the Forest Service blaze as being a slice of bark being cut off the tree with one notch cut above the slice. In the old day **people gathered** closer to home. Now days people can go to places higher in the **mountains** because of the improved road system. [Maps of actual trail routes on file at SRNF SO Eureka with "Belcher Abstract and Title Co. 1922", which are now available electronically on-line from Humboldt State University].

Interview-306. Karuk man in 50's, Karuk woman in her 40's. July 28, 1981. Karuk Gathering. "**Mushrooms** are collected near **Bald Mountain**. These **mushroom** grow in the **tan oak groves**. They are also gathered in the Dove T.S. area. **Gray willows** are gathered along the Klamath River. Some years are better than others for **gathering willows** depending on how high the **water** is. **Bear grass** is gathered on top of **Nickowitz Peak**. The informants had been to the Red Cap Quartz mine. A **trail** leads past the mine and head down to the Lockhart cabin. A trail follows **Packsaddle Ridge** to **Mill Creek Gap** and then on to the Ferris Mine. **Mushrooms** are gathered near **Le Perron Flat** and west of **Black Mountain**.

Interview-307: Tolowa man, approx. 30 years old, Yurok-Karuk woman, approx 35 yrs old. July 9, 1981. "He gathers **hazel** sticks around Weitchpec where **burned**. Also get Woodwardia fern in this area. Hazel sticks and **bear grass** has to be **burned** every year in order to be collectable. There is good **hunting** at **Hole-in-Ground** and **High and Low Divides**. He hunts when the **berries** are ripe at **Hole-in-Ground**. He saw chip (flakes) up there at High/Low Divides. **Yew** wood is collected along **creek** beds of **Shelly Creek** and **Patrick's Creek**. Orleans people gather **mushrooms under the oaks** in the **Red Cap** and **Black Mountain** areas. High Divide is a place for hunting medicine.

Interview-308: Karok woman, 58 years old, July 23, 1981. "Locates where there has been **fires**, then goes to the area the next year to collect **hazel sticks**. Gathers every year at **Haypress, Merrill Mountain** and **Elk and Flint Valleys**. Gathers **herbs** in Elk and Flint valleys because **people seeded** these areas along time ago." Ethnobotany information extensive in this report.

Interview-309: Tolowa woman, approximately 55 years old, Tolowa-Tututini woman approximately 25 years. Old. Interviewed July 7, 1981.Tolowa gathering.

"Gathers **tan oak acorns** in **Big Flat/Hurdy Gurdy** area. Collects acorns along **French Hill** road. Gathers swamp tea, black caps, and **huckleberries** along **Rowdy Creek** and **High Divide** to **Signal Peak** areas. She also gathers tea around **Panther Flat**. Interviewee's Uncle told her that their family **camped** on **Upper Coon Mountain**. This is where the family **hunted and dried deer meat** in August and September. Gathers **bear grass** along G-O road where areas have been **burned**. She travels up Klamath to **Weitchpec** and **Johnson**'s area to get **hazel sticks** as this is the only place she can find them [**burned**]. The hazel bush needs to be **burned** to produce good sticks. **Indians used to burn**; do not now because they are **not allowed to**. **Big Flat** is a very important place because it was an important **meeting place** for groups and also a place where all families from the **coast** came up to **camp** in the summer in order to **collect and hunt**. Some families lived permanently at **Big Flat.**"

Interview-310: Tolowa woman, approximately 70 years old, Tolowa woman approximately age. 65 years old. July 7, 1981. "Does not gather very much anymore because of private property and no trespassing. Her aunt gathered **acorns** from **scrub oak**. **Mushrooms** are located at **Gilbert Creek** near town of Smith River. Gathered **huckleberries** on **Little Jones Creek** (private land)…traveled to **Big Flat** long ago to gather them."

Interview-317, Karuk, man? Age: late 40s. Nov. 5, 1981. Red Cap creek mines and **trails**.

Interview-332, Karuk, 55 years old Man. Sept. 9, 1982. Trails, USFS maintenance Flint valley. Forks of **Blue trail**. Etc.. "The road to Shelton Butte was constructed in the 1930's by the Civilian Conservation Corps (CCC) and is one of the earliest roads on the Orleans District. Discussion of the **Forks of Blue Trail**. The interviewee has a familiarity with this **trail** going back many years. He states that the Forest Service maintenance and use of the trail dates back a long time, to before his personal knowledge. The trail used to be regularly maintained until the **1950's**, when the Forest Service discontinued using summer seasonal employees for this purpose. This and similar trails were important as **pack routes**, perhaps for hunters or miners, before the road system was expanded. The northeastern end of the trail for about ¾ of a mile from Flint Valley has been improved as a vehicle road; the interviewee states that to the best of his knowledge this **vehicle route follows** the earlier **foot or pack animal route**. The interviewee was asked about the barren serpentine ridge about one mile southwest of Flint Valley, where the trail is lined by several rock stacks and cairns. He says he built these features to mark the trail four or five years ago, and that there were previously no such features in the area."

Interviews from I-333 to I-343 about Trinity Summit, Grouse Prairie and South Fork Mountain.

Interview-343: Yurok woman, 81 years old. January 2, 1983. "The Yurok used Hunter, Minot, High Prairie and Wilson creeks to spear salmon. She remembers this still going on in the early 1900s (1910-1915). These creeks were also used to gain access to the better acorn collecting sites which were at higher elevations. They would also gather manzanita berries, madrone berries, maidenhair fern… ”

Interview-346: Russ Bower retired Forest Service. June 9, 1983. He started working for the Klamath National Forest in 1925 hauling supplies in an old truck. Worked at the trail camp at Oak Bottom. He worked a month on the first trail the USFS was constructing up Wooley Creek. He worked in the summer of 1932 on the Cedar Camp road job, the camp was at Dyer Ranch, then went to work in Happy Camp putting the road over Greyback Summit to tie in with the Siskiyou Forest road. Later that 1932 summer after the big fires he worked Pony Peak and Dillon Creek, then there was a 400 acre fire out on the North Fork of Red Cap creek. He went to Red Cap Guard station, mapped it and did the damage appraisal. F.W. Gent store in Orleans served meals for fifty cents in 1936. The Army ran the Civilian Conservation Corps camps, the USFS was the technical agency who took the men out each day and brought them back.
<u>Kathy Heffner</u>: "Was there much interaction in the 30's between Indian people and the Forest Service?"
<u>Russ Bower</u>: "Well, that's one of the reasons I think I got sent here. They had had a terrific incendiary problem for years in the Orleans area. I thought they were banishing me, wanting to get rid of me because nobody had ever been promoted off this District. They all resigned under a cloud or got burned out by the natives, or something. So, they told me that my job was to tame the country. I don't know, I was lucky I guess because, my people were, I was third generation in Siskiyou County and my father had worked on early day pack trains from Scott Valley to Crescent City and so I was known to some of the natives, as I knew the family, so, I don't know, I guess I just was lucky because we had some fires outside the Forest on the river slope that were set. The Indian fires weren't really incendiary, they were part of the cultural process. They had always burned off those fern prairies in the fall and the ones that we had to fight was the ones when we had no fall rain. They usually did burn the prairie off and it would go out when it hit the heavy fuels if the fall rains had already been there. There were classed as incendiary under the classification but they weren't really. I had two incendiary fires in the three years I was here [Orleans] and they were set by an outsider that came in looking for work. He got hungry and he set a couple of fire over in Redcap with the idea of getting a job and we were already on his trail, he left the country. That's the only two incendiary fires we really had on the District in three years. One of the reasons for the old incendiary problem was that there was kind of an adversary relationship between the Forest Service and the native people here."
<u>KH</u>: How do you think that developed?
<u>RB</u>: "It started from the first day they set up the National Forest. The natives had been used to using the forest resources without having to ask anybody, timber, run livestock, didn't have to answer to anybody, it was just there and they were free to use it. Then all of a sudden out of a clear sky here a fellow shows up and puts on a badge and says you gotta come and ask me whether you can do that or not – just adversary relationship that continued. In fact, I discovered that some of the people up above Somes Bar has some children and I stopped one day and they were playing a game. They weren't playing cowboys and Indians like all the rest of use used to play, they

were playing Indians and Forest Ranger. The other thing I think is that, my timber cruising experience up in Oregon was on the Klamath Indian Reservation and I worked with a larger number of Indians and I got along very fine with them, the secret was that I just treated them as human beings. On of the things, their native culture required was hazel sprouts for basketmaking and basket grass, and so forth, while under full fire protection of course they didn't have enough new sprouts. I got word that they were running out of or they were having trouble finding hazel sprouts to make their baskets so I just dropped the word, if they knew there was a patch of hazel brush that needed burning off to get sprouts, I'd help them, and we did. We burned off 70 acres over here on one of the slopes off Rattlesnake Ridge. That's all it took to breakdown that adversary relationship, cooperation."

Interview-349: Karuk man, approximately 20 years old. July 25, 1983. Between **Crawford Creek** and **Owl Mine** is a **ridge**, it's the first and the biggest ridge of a series of small ridges. On the point of this ridge is…not an easy trail." "Villages would annually **burn** the light side of the **slope around the village** to clear it of brush and encourage **new sprouts for basketry**, **mushrooms**, and **animal** feed. On the north side of **Camp Creek**, near the mouth, there is an **old trail that runs up to Wilder Creek**. This whole area was used extensively by the Wilder family in mining, hunting, and trapping activities."

Interview-350: Karuk man, approximately 59 years old. July 25, 1983. Orleans Historic. "**Red Cap** Prairie, now called Red Cap glade, was a good place for **hunting**, but is **now all grown over**. A **trail** used to run from **Big Bar**, now called Winebago Flat, along **a ridge up to the prairie**. The trail has not been open for twenty years. A **trail** went from **Red Cap Prairie** up along a **ridge** of **Cedar Camp** and then on to **Elk Valley**. Trails were marked by a blaze, one long blaze and one short one, like an 'i'. When there were not any trees, they built rock cairns 2 'high with a stick in the center. Bear grass was gathered up on top of **Cedar Camp** Road and Cedar Camp. A lot of basketmaking **material** was gathered along the **river**. Cedar Camp Road was built in the 1930's and was the only road that went clear through Elk Valley. Lew Wilder opened a **trail** from **Wilder Creek to Cedar Camp**. He also cleaned out a trail 4 or 5 years ago from **Olreans Mountain to Salmon River**. The only way to find the trail was by the blaze marks. **Lonesome Ridge trail** followed the ridge top. There is a trail from **Blue Creek along Lonesome Ridge** to **Blue Creek Mountain**. Bear grass was gathered along the road to **Deer Lick Lake**. There is a trail going from **Blue Creek Mountain to Bear Pen Flat and then to Blue Creek**.

Interview-351: Karuk woman approximately 45 years old. July 25, 1983. "**Red Cap Gulch** is where a lot of basketmaking materials such as **hazel sticks** were collected. But she also noted that it has become **too brushy** and it needs to be **burned** to allow new growth. **Mushroom** collecting was done on **Camp Creek**. She remembers that Lou Wilder opened a **trail** to **Crawford Creek** from the **Owl Mine** and a trail from **Camp Creek**, **over the mountain towards Bluff Creek**. The trails were marked by a gash cut on the trees and are still visible. **Brush was burned** in **Cedar Camp and Cedar Creek area** to bring back the **deer**. Collecting is done on

Lonesome Ridge for pick **bear grass** and **Indian tobacco**. The interviewee is concerned about the cutting of tan oak which she say is important to the **Indians and animals** for **food**. She says the old people (Karuk) think the Forest Service show no faith with respect to the Indian community and their use of the land."

Interview-352: 62 year old Karuk woman. July 26, 1983. "**Elk Valley** is a good place for **hunting deer** and **elk**. The last elk was seen there in 1924; the **underbrush has grown too thick for elk**". Ullathorne Creek had Indian village. "**Villages** on the North side of the Klamath River used **Medicine Mountain** areas, **Twin Lakes**, **Cedar Camp**, and **Elk Valley** to **camp** and to **hunt**. Indians would have base **camps** at **Head Camp** and at **Cedar Camp** where they would stay for three to four weeks and **hunt**. **Camp Creek trail** was the old **pack trail** to the various mines. Her father went out on the last pack train the local store had. This was about 1920 and they rode on horses and guided a full pack train of mules loaded with supplies for mines in this area. There were no car roads. According to her husband, **Wilder Creek trail** is very steep and very difficult to follow."

Interview-353: 62 year old Karuk woman. July 29, 1983. "People use to gather **huckleberries**, **mushrooms**, and especially **tan oak acorns three miles** up on **Camp Creek**. **Ullathorne Creek** is good for bear grass but it needs to be **burned** and it requires four or five years to grow to be good enough for basketmaking. Bear grass likes to grow in the high country. There were some mines up Camp Creek. The miners washed away all the land where sacred places were by the river. **Head Camp** is good **hunting** country, a **gathering place**, a **meeting point** and a **cross roads**. There were **trails that came up** the North side of **Camp Creek**. The Forest Service had beautiful markings but they were all destroyed. Some trails came from the **Klamath to the Sacred High Country** across this area but the exact location is unknown.

Interview-354: 20 year old Karuk man. July 30, 1983. "**Tan oak mushrooms** come with the first rain. If the stem breaks clean, don't eat it. Tan oak **mushroom** stems are stringly when broken. The original families from Orleans fled on **Chimmekanee Ridge to Scott Valley** and to **Fort Jones** when the whites came into the area.

Interview-355: 64 years old Hupa Woman, 72 years old man: August 29, 1983. These informants provided as audio tape of George Nelson, a [then] 99 year old Yurok born at Weitchpec who married a Hupa woman and lived in Hoopa valley. "In places in the area now know as **Bell Swamps** where there were **no trails**. There used to be lots of **prairies** with lush green growth. The Indians used to go down in that area to **hunt elk.**" "Old Big Willis, Hupa, use to go up **Tish Tang Ridge Trail** and over to **Graveyard Prairie** area with his family and other village members to **hunt elk**. They would **camp all summer drying their meat**." The other audio tape they had was of Amos Holmes, 91 old Hupa from Hoopa Valley. Amos learned from Abraham Jack and Robinson Shoemaker of the uses for hunting and **drying elk and deer meat** near **Ladder Rock** and Doctor rock. Next audio tape of Dave Pete, 92 plus years old, from southfork Indian village at Salyer. "They told him they used to go up there, and also the medicine men went up the **Horse Linto Trail**, he had to go up there and dance."

Interview-359: 62 years old Wailaki woman. August 6, 1983. "She is considered a prolific basketmaker making baskets like some people who knit. It takes her a lot of time to just gather the amount of materials she needs and then there is the long hours and days preparing the material. The hardest item to find in good shape is **hazel sticks**. Another item she has problems with is **bear grass**. It is necessary to **burn** both these items to get young, straight, and pliable pieces you can work with. That is important in order to make a basket you are proud of. It worries her that she is competing for sticks with many college students who all seem to gather where their teachers **gathers**. The students are young and go back to the patches without their teachers and **gather the materials incorrectly** really playing havoc on the patch. On the other hand she is glad to see young people **learning to make baskets**. She would like to see the Forest Service **burn for hazel** sticks and **bear grass** but not just burn but **burn correctly**. Bear grass needs shade and the grasses that many end up relying on are out of the Forest Service burn blocks. The interviewee gathers about **six sacks full of acorns** for her family for **one year**. She is concerned that the Forest Service is going to cut down all the tan oak for paper. **Acorns** are important to her and her family. She also gathers **mushrooms** each fall and either dries or cans them. There is nothing like these big **tan oak mushrooms**. She gathers all the variety of **berries** she can find to make jam and to can as well as **chinquapin nuts**. These are few but very good tasting." Other information about gathering to avoid herbicides.

Interview-369: Hupa, man in late 30s: August 17, 1984. Contains information about uses of **Box Camp**. This interview has a map with **specific trail locations** which go adjacent, north and south of Box Camp area.

Interview-370: 74 years old man, non-Indian. Sept. 26, 1984. Trails: "Klamath National Forest) "he heard of a **trail** to **Doe Flat from Clear Creek** on the Klamath National Forest. He tried to find it but could never locate it."

Interview-371, about 73 years old Hupa man, October 1, 1984: "He said that the area near the mouth of Horse Linto creek was an important fishing area, and most use would have been concentrated near the river. The area nearby would also have been used for **gathering acorns and berries**. Generally people from the valley go no more than about **4 miles** out for their gathering, although some families might go farther and **camp overnight**. They would go as much as **12 miles out** and higher to gather **chinquapin nuts**. Old growth trees put out the largest as well as the greatest number of **acorns**. In the old days certain spots with **old trees** were selected and returned to regularly. He remembers his grandmother would go to one place with three big trees that was **burned around so the acorns would be visible on the ground**. In earlier times particular places with old trees and lots of acorns were selected because of the difficulty of getting to other areas. Today, **acorns gathered** off small bushes are smaller than those from large trees they still taste good. He states that he believes that tanoak trees should not be cut, not only because they produce acorns, but also because they may have a value in the future."

Interview-374: 74 years old Yurok woman. October 18, 1984. "She say there was a large village there [Aikens creek], that had **fifty pits** all along the river bar and across the river clear up to where **Bluff Creek empties now**.

Interview-375: 86 years old Yurok Woman. October 6, 1984. Fish Lake: "A **trail four miles long connected the Cooper Ranch to Fish Lake** where they would go camping with their cousins, the Sandersons, and Allen. The trail was open and they used horses. It was marked usually with a single blaze and every so often by three blazes. **Everyone helped to keep the trail open.**" Other information about Cooper Ranch. "Her grandfather Yarnell Cooper, a white man from back east, bought the land. He had first landed in Shasta County where he married a full blooded Indian from that area (she couldn't recall which tribe). The wife died leaving him with a 9 year old son. They then moved to Morrick Hill with horses where he married another full blooded Indian, Yurok, and had another son, Homer Cooper. When Homer was still very young they moved to Bluff Creek where he bought the land. She doesn't recall if her grandfather was the first to live at the ranch nor does she remember hearing of a Ms. Norton who was shown to have a barn and field in this area on the 1882 GLO Plat map. There was a house and a barn on the property which were recently **burned** down by her sister because people were living there. She believes there is nothing left and that black berries have taken over the site and fields. Her grandfather lived alone on the site and her father, Henry Cooper, was a miner who worked and lived in cabins along the river. They moved to the ranch after the grandfather's death where they made a living ranching, raising **cattle**, hogs, chickens and vegetables…Her father died at the ranch and her mother and sister lived alone there. She left the ranch when she was married at age 18 and remembers having to travel on horseback and buggy. Her mother was a basket weaver who, like most of the weavers in the area, would sell their baskets for groceries at Brizard's Store.

Interview-380: Marjorie ____, Hupa woman n/a years old, Ruel ____, Hupa man, n/a years old: **July 20, 1980**. Interviewed by Delphine Fountain. **Trinity Summit Hupa**: Marjorie: "It is the summer **camp** cause they camped on all those ridges. My Grandmother said they had a summer camp and they came there. They had the Indian house at the foot of Horse Linto. Ruel: "That whole **Trinity Summit** belonged to the Indians. That was the Indian's **hunting** ground for hundreds of year"…"Just beyond **Graveyard Prairie**. You can see that rock when you go over to **Grizzly Camp** and you know the **trail** goes down this way towards **Lipses Cabin**. But it's before you go there there's a road goes down from that way **goes down the ridge**. Somebody mined down there. You follow that road down. And you go out down there and you look through those trees and you see that big cliff of rocks and you look back you see a **prairie**. They say you can get out to it by Lipses Cabin. And it runs right over like that. I've seen it. I looked at it with field glasses…Years ago you could go all over the place. There was no grease wood then. Open country." All the area was used for **elk hunting** by the Hupa. Delphine: "He [Big Willis], and his family used to walk up there from Hoopa and come up into that Graveyard Prairie area, and camp all around up in there. Ruel: Yea, they follow that ridge. Delphine: Well there must have been a **trail** there. Ruel: Yea, there is. **Old Indian trails on the ridge**. The used to follow that ridge that comes right up and brings you right out that one they call **Colt Pasture** they called it, but the right name of it is Colt Range. Everett: There's a trail that you come down this side of **Elk Horn Camp** about a mile. Ruel: That's the one that will take you out to **Johnson Prairie**. That's old Jonnie Britt's trail. You go right down to Tish Tang. Start at the creek down the mouth down and come on up there. Ruel: It was an Indian because it used to come over to Horse Lintin. Delphine: Oh, that's the one that goes to Johnson Prairie, or what did you call it? Ruel: Johnson Prairie. Delphine: And they could come up that way and come to Horse Linto village there. Ruel: Yea, you can go right up there. It was a pretty **good grade of a trail**. Ruel: They [Hupas] even went on over to **Berry Summit**. See they get that **grass for that flour**. They'd get that grass. And Redwood Indians came over and went into the Summit too." Everett: "Remember on that big fire. Old Wallace, he was in the Forest Service working there. And Charlie Waterman was there, this was really funny, you know somebody was setting them fires and Wallace said, he said. 'I'm gonna catch that guy, I know. I've been tracking him around for two days and I know I'm getting close.' Everybody in them days they wore hobnails in their shoes—you could stand up on anything. He said.'He's got five hobnails gone on one shoe and three/four on the other side.' And he was sitting there, you know, and Charlie Waterman said 'By God', he's looking at him, 'You've been tracking yourself around. You just described your own hobnails in you own shoes'.

Interview-381: Delphine Fountain interviewed Amos, Tribe ?, man, age 90 or more years old. August 19, 1983. **Trinity summit: Hupa**: Trinity Summit and Ladder Rock used for elk hunting and drying meat.

Interview-382: August 19, 1983. **George ____ (Yurok), 99 years old**. Interviewed by Delphine Fountain. **History of Trinity Summit**: George knew the Trinity Summit area and all of the **Indian trails** very well. About Horse Linto Creek: Delphine: How did you know that they called that the token rock? George: Well, there's a trail across it. D: I know. But who told you? How did you know about it? G: Well, uh, we just found the place. This Bill Bussell had a bunch of **cattle** snowed in and it was down in a hole, and it was a big **prairie** in there and those cattle got down in there and got snowed in. And that's why they called it Bell Prairies…G: They just specify that the trail comes across there. D: You told me Big Willis and them used to go up there in **Graveyard Prairie** and out that way. G: Yeah, They used to kill **elks** up there. D: You knew about that, too? G: 'Course, we used to go over there and hunt…G: We found a lot of bells in there, so we just called it Bell Prairie [meadow]. We're lucky we found this place. Nobody ever went in there. Only the **Indians weny in there to hunt**, and there's nobody ever went in there till we found this place…G: See, the **trail** went from, uh, Graveyard Prairie right around the hill and that's where that token rock is. And you went up the hill and down into this prairie, and we used to go over there and hunt. Nobody knows the place.

Interview-384: Man, **Karuk, 58 years old**. August 8, 1985. Ferris Cabin, **Indian Rocks. Salmon Summit**: There is a **trail** from Indian Rocks that goes straight down to the cabin. There is also another trail from **Bayler's Ridge**. Years ago, they put in a trail from the cabin to Red Cap Lake where they used to fish. This trail is overgrown now. The **Salmon Summit trail** was changed between Whitiey's and Bayler Ridge by the Forest Service during the Red Cap fire in 1938 or 1939. It used to be lower off the ridge top. There is a log cabin on the old trail. It was built in the 1920's… it used to be called **Box Spring Cabin**. In the late 30s early 40s his uncle, George Ferris, built a mining cabin right on the upper trail on top, half way between Whitey's Peak and Indian Rocks. He had a quartz mine and quartz mill on China Creek…There is an old cedar salt log where the trail goes through Whitey's Camp. It is the **old trail**, the new trail doesn't go through Whitey's Camp. Map I Ferris Cabin-Six Rivers NF Map 1954: Shows dashed lines of trails and cabin location.

Interview-386: **Woman, age 42 Karuk/Yurok**. August 8, 1985.
"They [Ferris family] use to walk the **trail from LePerron Flat** to the cabin, which was 12 mile hike." Alternate route along **Black Mountain trail**. "There is only one trail to the cabin in to Red Cap Lake but she can't find it now. There is a trail from Indian Rocks down to the cabin that was recently brushed out by the Ferris boys.

Interview-396: **Tolowa woman 75 years old**. February 6, 1985. **French Hill**, 1.5-2 miles west of Gasquet: "The interview indicated that the area has been used in the past for collection of various **basket making materials and various food stuffs**. The area is used for **hunting**. In the past, the Indians would periodically **burn the area** to improve hunting, access, basket material and food stuffs. Because of this burning, the country was usually **clear of underbrush**."

Interview-397: Man in 70s: Jan. 31, 1985. **French Hill**, 1.5-2 miles west of Gasquet: "He did not know exactly when the **French Hill trail** was put in but felt that it was in the mid-1920's. He believed it was in association with lookouts. He remembers that work on the road to Big Flat started in 1925. He also recalls that the ground surface was more open than it was today due to periodic **burns.**"

Interview-398: **48 year old Yurok woman**. April 24, 1986. **Klamath land transfer**. "On the south side of the Klamath River is a Forest Service parcel, there is a **long prairie** that they [Yurok] **burned** and collected **hazel sticks near Alder Camp**. There is an **old Indian trail** through the prairie. Area is across the Klamath River, southwest of Klamath town site.

Interview-399: **36 years old, Yurok and 38 years old Yurok man**. April 25, 1986. **Klamath land transfer**. "They both indicate that there was a White Deerskin Dance ground at the school and certain activities took place on the ridge associated with that dance. There is an **old trail** through there… [Indians] used to go to the mountain[s]."

Interview-405: about a **48 year old Karuk man**. May 30, 1986. **Indian Rocks**: "There were big **hunting camps** set up; the even build pole racks to **dry the meat** right there…The families [Ferris and Wilder] would stay a week at a time hunting."

E.W. Gifford: Karok Unpublished Field Notes 1939 and 1940
Excerpted from the California State Library's California Indian Library Collections, Phoebe Apperson Hearst Museum of Anthropology 1992

Burning the Countryside: The Karok habitually burned the brush with idea that better growth resulted the following year. Hazel, iris, and Xerophylbum were burned off regularly to produce better growth. July and August were best months for burning off country. Firing of hazels was done after nuts gathered. When setting a fire, the fire setters said formula (?) for a big fire, yet one which would do no harm; "Hukenvapaho. I'im absumxarak. Ti yaxachimi ista halan ishi piropi. Ti yaxachimi haswun kirivvi." Then the formulist blows in all 4 directions to keep fire from spreading. The formulist is a fire setter who knows the proper medicine. All formulas begin with "hukenvapaho". " You are a long snake. Let's see you coil around ten times. Let's see you run water in." The snake referred to is water snake (absumxarak). The reference to "run water in" refers to fire going out.
Land Ownership: Land might be sold by owner, if he wished, providing he was last of family. If not, then the decision of relatives was required. Ike's people owned land back across ridge to grove of tan bark oaks.
Xerophyllum tenax. Elk-grass, Fire-lily, Squaw-grass, Bear-grass, Turkey-beard, Bear-lily, Pine-lily (See O'Neale p. 21) *Pan yu'ra* (*Pan yu'rar* – Harrington) "Wild Grass." An important material for basket making. It is gathered in the mountains "away from here" and "after the ground has been burnt" in the last of June and July. The reason for the burning was so that only new green leaves would be on the plant. It was easier to gather and easier to work in this state. Some Indians women claim they can used only the plants that have been burnt over, while others claim this is not necessary. Georgia says you cannot possibly use the grass unless the ground has been burned over the previous year. (The Hupa used this grass the same way the Karuk did for basketry. Goddard p. 39)
Salix sessilifolia var. hindsiana. Sandbar Willow, Soft leaf willow, Valley. *Pa'a rak*. The twigs are used to make the "sticks" – the most important material for basket weaving. The twigs are first gathered in April and again in August when the new shoots are big enough to use. This is when the twigs peel easiest. After they are peeled they are allowed to dry. And are made into bundles to be used when needed. *Ish cha' ship* is the root fiber.
Corylus rostrata* var. *californica, Californian Hazel, *As' sis* – Hazel tree, ('*Asis* – Harrington), *As' sis hun ta' pan*- hazelnut (*su'un*- nut). The nuts are used as food, eaten in season or gathered and stored in big acorn baskets. *Sa'r'ip* = hazel sticks prepared for baskets. (Harrington p. 103). Young hazel shoots are material for baby baskets *stahet tu i*. A tree is burned, and the next year the young shoots are gathered, peeled and dried for about 3 weeks. Carrying baskets are made of hazel shoots.
Sacred Mountain and other sacred places: In collecting on mt. Offield , hazel, wild celery, serviceberries, etc. they could not eat, drink, go to toilet (except on rotten log) until arriving at Turtle Lake (*Asakwa ukram*) about ½ way down mt. Offield. The collected hazel just below summit. They had to bathe in lake before eating or drinking.

Lake about 2000 ft. Mt. Offield (*Ixkareyatuwichi*). The night that the priest stands up at *Katimin*, the brush on the mt. all is fired by 3 men. The priest looked at the mt. all night. Now he has to look at the mt. in blackness, since this is done on dark of the moon. *Gekaxan* is the name of these 3 assistants. They go without eating or drinking that day and cannot eat till next day. This did not cause forest fires because the burning was annual and burnt undergrowth only. Mt. Offield is not a widow. The brush is burned at *irihiv* to prevent people become widows and widowers—in other words a prophylactic against death of married people. *Iskareya* who owned *Katimin* sweathouse so ordained it. At *Panamenik*, fires were set on Bacon Flat on same side of Orleans. (Fanny Bacon, Indian who had white husband, formerly lived on site or Orleans Ranger Station.)
Tobacco. Tobacco planted in mts. After burning log. Grew larger than wild plants. Seeds of cultivated tobacco planted. Tobacco kept in basket with buckskin top…Planting in fall far away from settlement, after burning fallen logs. Seed scattered broadcast. Tobacco kept in small basket with small mouth with buckskin sewed on…In old days planted in higher mt.s --- the higher the mts., the better the tobacco.

Gifford, E.W. 1940 Karok Unpublished Field Notes, 1940. Manuscript from the Bancroft Library University of California, Berkeley, CA 94720

Burning Brush [Mary says greater abundance of snow formerly due to fires set to burn off bursh.]
Another Bigishtu'u by Mary Ike [They were going hunting and wanted to take the acorn meal along for making soup while hunting. They took baskets for purpose. They took ten deer snares with them. They camped way over on ridge on west side of river back of Amaikiaram. They set a snare near Brace's ranch. They set one here and there along the ridge. They set one right over the hill from their camp. They set the last three near lake back of Amaikiaram. Okramsukim = sukim (blue), okram (lake) is name of lake, now called Blue Lake by whites.
Correct Living (See also Rich People): [In olden days girls packed wood, made baskets, looked for food, etc. They did not run around. They went to dances only on ceremonial occasions. Boys fished, made nets, hunted, made twine—always doing something. Boys slept in sweathouse. Some men in middle age were lazy and spent much time sleeping. Some fished, got wood, hunted deer.] [Poor people never "come out right," because they don't follow advice of elders. Good people are those who have worked hard and accumulated wealth by following admonitions of elders.]
June 11, 1940. Georgia Orcutt, informant. Orleans, California. [Georgia attributes scarcity of deer now to non-burning of brush. She says that in olden days the burning of brush helped the growth of grass on which the deer fed. Now grass diminished, also deer.]
Deer Snares and Fences: [Deer Snare (*takirihivara*) was made of iris fiber rope. Medicine made ?? Set in deer trail on ridge. No deer fence built in connection with snare, but dogs drive deer into snare. Fence built near deer lick to force deer to come in on trail, so deer may be killed as they go away from the lick. The fence is just piled logs and brush. Hunter hides behind tree, builds no booth for himself. If several deer at

lick, some seem to be on lookout while others lick, no dog used at deer lick because scare deer away. Deer snare tied to tree and held up on bushed. Snared deer were shot] [No net for taking deer. Snare was nearest approach. Snare with bent pole held down by stake to which trigger attached. The trigger is a figure 4 device. When trigger is stepped on by deer. The bent over pole spring flies up lifting deer into air. Usually caught around neck or body. Fisher and wild cat caught with spring snare also, just like deer snare, except baited, with 1 or 2 deer forearm bones through which cord runs so that animal cannot gnaw through the cord.] [Favorite places for snares were trails and deer licks.] Ben F. Goodwin

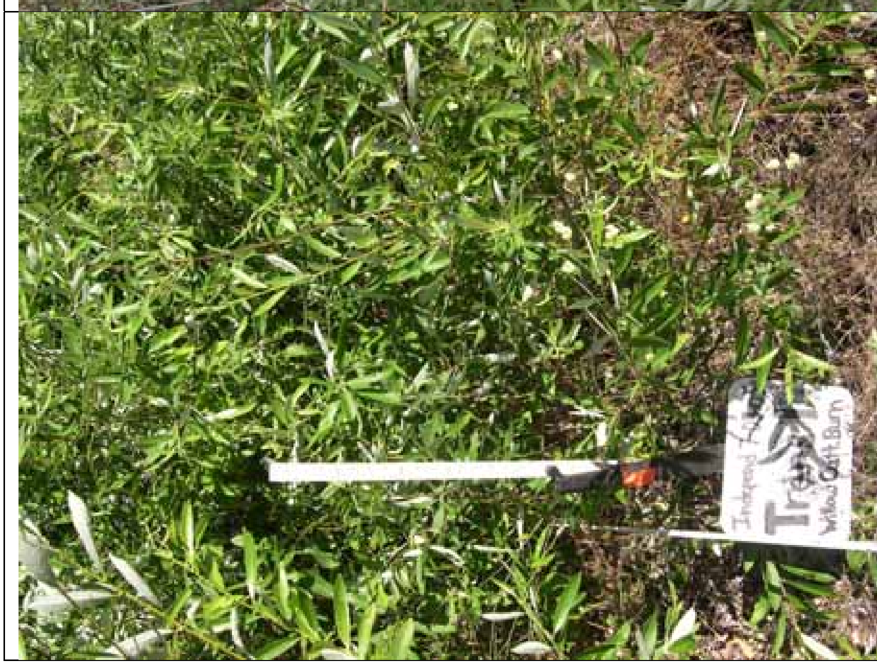
[Shan has seen deer fence over Scott Valley. Has never seen any among Karok, but says they had it. Built on hillside, especially near salt lick. Built on two sides of deer trail about 25 feet in all, so as to force deer to use trail. Snare hanging in air, with end attached to stake in ground. It was like a lasso. It caught deer around neck, or one arm and neck, i.e. one leg through noose. When deer jumps the noose tightens. The end of rope is fastened to stake. The noose is held in position by attachment to brush of fence opening. The lower edge of noose is about 1 foot above ground. If space is small fence is straight from side to side with opening in middle. If large space, converging fence. Usually of brush, with one or two firm ones at ends to hold horizontal poles laid inside the brush so as to be more or less concealed. Height about 4ft. Deer could jump over if scared, but when just walking it follows trail. No trigger arrangement in snare. Such used only for small mammals and birds. *Tatapwa* = deer snare. Elk also snared.]

Holy Mountain (Mt. Offield) [When Katimin pikiawish ends, fires are set to burn off brush off the mt. to clean off the mt. so it would be clean.] [Wide brush areas on Offield Mt. are due to annual burning at pikiawish. Mary says. All the small fir trees were killed.]

Orequ-w: Orick then and now. Published by the Orick Historical Society

Kane Ranch: On the hill above the north end of Big Lagoon: “Mary said, she remembers that everybody burned off the brush so cattle could feed. Old Indians had told ‘Pop’ that long ago Indians burned the land regularly so deer had feed and so hazel nuts and acorns would be plentiful. And another thing, said Mary, ‘We never had a tick.” (Zuber et. al. n.d.page 97)

Appendix C: Fire and Flood Effects on Vegetation: Transect Before and After Photographs for Project Sites
Independence



Independence Transect 1 Pre-Burn July 3, 2005

Independence Transect 1 Post-Burn and Flood June 28, 2006

	
Independence Transect 2 Pre-Burn July 3, 2005	**Independence Transect 2 Post-Burn and Flood June 28, 2006**

Independence Transect 3 Pre-Burn July 3, 2005

Independence Transect 3 Post-Burn and Flood June 29, 2006

	
Independence Transect 4 Pre-Burn July 6, 2005	**Independence Transect 4 Post-Burn and Flood June 29, 2006**

	
Independence Transect 5 Pre-Burn July 6, 2005	**Independence Transect 5 Post-Burn and Flood June 29, 2006**

	
Independence Transect 6 Pre-Burn July 6, 2005	**Independence Transect 6 Post-Burn and Flood June 30, 2006**

	
Independence Transect 7 Pre-Burn July 6, 2005	**Independence Transect 7 Post-Burn and Flood June 30, 2006**

Ullathorne

Ullathorne Transect 0 Pre-Burn June 23, 2005

Ullathorne Transect 0 Post-Burn and Flood June 24, 2006.

Ullathorne Transect 1 Pre-Burn
June 24, 2005

Ullathorne Transect 1 Post-Burn and Flood
June 24, 2006

	
Ullathorne Transect 2 Pre-Burn **June 25, 2005**	**Ullathorne Transect 2 Post-Burn an Flood** **July 5, 2006**

Ullathorne Transect 3 Pre-Burn
June 25, 2005

Ullathorne Transect 3 Post-Burn and Flood
July 5, 2006

	
Ullathorne Transect 4 Pre-Burn **June 26, 2005**	**Ullathorne Transect 4 Post-Burn and Flood** **June 26, 2006**

Ullathorne Transect 5 Pre-Burn
June 25, 2005

Ullathorne Transect 5 Post-Burn and Flood
June 26, 2006

	
Ullathorne Transect 6 Pre-Burn June 26, 2005	**Ullathorne Transect 6 Post-Burn and Flood June 27, 2006**

Big Bar

Big Bar Transect 0 Pre-Burn
June 14, 2005

Big Bar Transect 0 Post-Burn and Flood
June 21, 2006

	
Big Bar Transect 1 Pre-Burn **June 15, 2005**	**Transect 1 Post-Burn and Flood** **June 21, 2006**

Big Bar Transect 2 Pre-Burn
June 15, 2005

Transect 2 Post-Burn and Flood
June 22, 2006

	
Big Bar Transect 3 Pre-Burn **June 20, 2005**	**Transect 3 Post-Burn and Flood** **June 22, 2006**

Big Bar Transect 4 Pre-Burn
June 21, 2005

Transect 4 Post-Burn and Flood
June 22, 2006

Big Bar Transect 5 Pre-Burn
June 23, 2005

Transect 5 Post-Burn and Flood
June 25, 2006

	
Big Bar Transect 6 Pre-Burn **June 23, 2005**	**Transect 6 Post-Burn and Flood** **June 23, 2006**

Appendix D: Fire and Flood Effects on Sandbar Willow Riparian Community Fuel Extras

Appendix D: Table D.1a English units (tons/acre) 1 to 1000 fuels for sites

Location w/ Tons/acre	Treatment Event	1 hour	10 hour	100 hour	1-100 hour	1000 hour Sound	1000 hour Rotten	1-1000 hour
Independence	Burn plan estimate	0-2	0-1	0.05	0.0-3.05	n/a	n/a	n/a
Independence	PreBurn	0.72	3.37	3.44	7.89	2.65	1.2	11.7
Independence	Post-Burn	0.4	2.58	2.68	5.66	1.23	0.3	7.2
Independence	Post-Flood	0.31	1.86	1.8	3.97	1.33	0	5.3
Big Bar	Burn plan estimate	0.7-1.7	1.0-1.5	1.0-5.5	3.2 8.7	n/a	n/a	n/a
Big Bar	PreBurn	0.6	1.19	0.51	2.3	0	0.3	2.6
Big Bar	Post-Burn	0.47	1.11	0.38	1.96	0	0.4	2.4
Big Bar	Post-Flood	10.08	12.63	7.71	30.43	0.48	0.1	31
Ullathorne	Burn plan estimate	0.7-1.7	1.0-1.5	1.0-5.5	3.2-8.7	n/a	n/a	n/a
Ullathorne	PreBurn	0.19	1.07	0.7	1.95	0	0.3	2.3
Ullathorne	Post-Burn	0.12	0.91	1.14	2.17	0	0.3	2.4
Ullathorne	Post-Flood	0.14	0.12	0.63	1.41	0.51	0	1.9
Ferry Pt.	Control (ref)	0.35	1.79	2.02	4.17	1.23	1.8	7.2

Appendix D: Table D.1b English units (tons/acre) duff and litter for sites

Location w/ Tons/acre	Treatment Event	Duff	Litter	Total	Duff (inch)
Independence	PreBurn	6.9	8.9	27.5	1.8
Independence	Post-Burn	2.2	1	10.4	0.6
Independence	Post-Flood	0	0	5.3	0
Big Bar	PreBurn	6.6	6.7	15.9	1.7
Big Bar	Post-Burn	6.2	4.1	12.6	1.6
Big Bar	Post-Flood	0.1	0.1	31.2	0
Ullathorne	PreBurn	1.5	4.3	8.1	0.4
Ullathorne	Post-Burn	2.4	1.1	6	0.6
Ullathorne	Post-Flood	0.1	0	2	0
Ferry Pt.	Control (ref)	4.9	4.2	16.3	1.2

Appendix D: Table 2. Biomass tons/acre calculation generated by FIREMON by site

Location	Date	Trtmnt Event	Biomass (tons/ac) Shrub Live	Biomass (tons/ac) Shrub Dead	Biomass (tons/ac) Herb Live	Biomass (tons/ac) Herb Dead
Independ	9/13/2005	PreFire	2.94	2.61	1	1.02
Independ	10/25/2005	PostFire	0	0.056	0.04	0.01
Independ	1/26/2006	PostFlood	0	0.47	0.05	0
Big Bar	9/12/2005	PreFire	7.24	2.31	0.35	0.78
Big Bar	11/17/2005	PostFire	5.41	3.29	0.19	0.23
Big Bar	1/24/2006	PostFlood	2.85	1.87	0.11	0.03
Ullathorne	9/12/2005	PreFire	2.08	1.1	0.67	0.86
Ullathorne	11/15/2005	PostFire	0.27	0.99	0.19	0.04
Ullathorne	1/24/2006	PostFlood	0.95	0.34	0	0.06
Ferry Pt.	2/24/2006	Control	0.98	1.62	0.27	0.09

Table D: Table D.3. Least Square Means for all interactions between and among variables for Tukey-Kramer adjusted P-values for fuel types not significant.

variable	Effect	Location	Treatment	Estimate	Letters	StdErr	DF
% Litter plot 1	Location	Big Bar		39.86	a	2.83	18

% Litter plot 1	Location	Independ		36.67	a	2.83	18
% Litter plot 1	Location	Ullathorne		38.67	a	2.83	18
% Litter plot 1	**Treatment**		**Post Burn**	**38.57**	**a**	**4.94**	**36**
% Litter plot 1	**Treatment**		**Post Flood**	**0.43**	**b**	**0.06**	**36**
% Litter plot 1	**Treatment**		**PreBurn**	**76.19**	**c**	**2.31**	**36**
% Litter plot 1	**Location*Treatment**	**Big Bar**	**Post Burn**	**47.14**	**a**	**8.56**	**36**
% Litter plot 1	**Location*Treatment**	**Big Bar**	**Post Flood**	**1.00**	**b**	**0.11**	**36**
% Litter plot 1	**Location*Treatment**	**Big Bar**	**PreBurn**	**71.43**	**c**	**4.01**	**36**
% Litter plot 1	**Location*Treatment**	**Independ**	**Post Burn**	**40.00**	**a**	**8.56**	**36**
% Litter plot 1	**Location*Treatment**	**Independ**	**Post Flood**	**0.00**	**b**	**0.11**	**36**
% Litter plot 1	**Location*Treatment**	**Independ**	**PreBurn**	**70.00**	**c**	**4.01**	**36**
% Litter plot 1	**Location*Treatment**	**Ullathorne**	**Post Burn**	**28.57**	**a**	**8.56**	**36**
% Litter plot 1	**Location*Treatment**	**Ullathorne**	**Post Flood**	**0.29**	**b**	**0.11**	**36**
% Litter plot 1	**Location*Treatment**	**Ullathorne**	**PreBurn**	**87.14**	**c**	**4.01**	**36**
% Litter plot 2	Location	Big Bar		48.10	a	4.00	18
% Litter plot 2	Location	Independ		42.86	a	4.00	18
% Litter plot 2	Location	Ullathorne		40.33	a	4.00	18
% Litter plot 2	**Treatment**		**Post Burn**	**44.52**	**a**	**3.63**	**36**
% Litter plot 2	**Treatment**		**Post Flood**	**9.14**	**b**	**5.37**	**36**
% Litter plot 2	**Treatment**		**PreBurn**	**77.62**	**c**	**2.00**	**36**
% Litter plot 2	Location*Treatment	Big Bar	Post Burn	58.57	a	6.29	36
% Litter plot 2	Location*Treatment	Big Bar	Post Flood	17.14	b	9.30	36
% Litter plot 2	Location*Treatment	Big Bar	PreBurn	68.57	a	3.46	36
% Litter plot 2	**Location*Treatment**	**Independ**	**Post Burn**	**45.71**	**a**	**6.29**	**36**
% Litter plot 2	**Location*Treatment**	**Independ**	**Post Flood**	**10.00**	**b**	**9.30**	**36**
% Litter plot 2	**Location*Treatment**	**Independ**	**PreBurn**	**72.86**	**c**	**3.46**	**36**
% Litter plot 2	**Location*Treatment**	**Ullathorne**	**Post Burn**	**29.29**	**a**	**6.29**	**36**
% Litter plot 2	**Location*Treatment**	**Ullathorne**	**Post Flood**	**0.29**	**b**	**9.30**	**36**
% Litter plot 2	**Location*Treatment**	**Ullathorne**	**PreBurn**	**91.43**	**c**	**3.46**	**36**
10 hr	Location	Big Bar		17.90	a	7.93	18
10 hr	Location	Independ		9.67	a	7.93	18
10 hr	Location	Ullathorne		3.14	a	7.93	18
10 hr	Treatment		Post Burn	5.48	a	1.04	36
10 hr	Treatment		Post Flood	18.10	a	13.11	36
10 hr	Treatment		PreBurn	7.14	a	1.04	36
10 hr	Location*Treatment	Big Bar	Post Burn	4.00	a	1.81	36
10 hr	Location*Treatment	Big Bar	Post Flood	45.43	b	22.70	36
10 hr	Location*Treatment	Big Bar	PreBurn	4.29	a	1.80	36
10 hr	Location*Treatment	Independ	Post Burn	9.14	a	1.81	36
10 hr	Location*Treatment	Independ	Post Flood	6.57	ab	22.70	36
10 hr	Location*Treatment	Independ	PreBurn	13.29	b	1.80	36
10 hr	Location*Treatment	Ullathorne	Post Burn	3.29	a	1.81	36
10 hr	Location*Treatment	Ullathorne	Post Flood	2.29	a	22.70	36
10 hr	Location*Treatment	Ullathorne	PreBurn	3.86	a	1.80	36
100 hr	Location	Big Bar		3.24	a	1.93	18
100 hr	Location	Independ		2.95	a	1.93	18
100 hr	Location	Ullathorne		1.19	a	1.93	18
100 hr	Treatment		Post Burn	1.57	a	0.48	36
100 hr	Treatment		Post Flood	3.81	a	2.81	36

100 hr	Treatment		PreBurn	2.00	a	0.50	36
100 hr	Location*Treatment	Big Bar	Post Burn	0.43	a	0.83	36
100 hr	**Location*Treatment**	**Big Bar**	**Post Flood**	**8.71**	**b**	**4.87**	**36**
100 hr	Location*Treatment	Big Bar	PreBurn	0.57	a	0.87	36
100 hr	Location*Treatment	Independ	Post Burn	3.00	a	0.83	36
100 hr	Location*Treatment	Independ	Post Flood	2.00	a	4.87	36
100 hr	Location*Treatment	Independ	PreBurn	3.86	a	0.87	36
100 hr	Location*Treatment	Ullathorne	Post Burn	1.29	a	0.83	36
100 hr	Location*Treatment	Ullathorne	Post Flood	0.71	a	4.87	36
100 hr	Location*Treatment	Ullathorne	PreBurn	1.57	a	0.87	36
1000 hr R	Location	Big Bar		0.19	a	0.20	18
1000 hr R	Location	Independ		0.57	a	0.20	18
1000 hr R	Location	Ullathorne		0.14	a	0.20	18
1000 hr R	Treatment		Post Burn	0.33	ab	0.22	36
1000 hr R	Treatment		Post Flood	0.05	a	0.05	36
1000 hr R	Treatment		PreBurn	0.52	b	0.19	36
1000 hr R	Location*Treatment	Big Bar	Post Burn	0.29	a	0.38	36
1000 hr R	Location*Treatment	Big Bar	Post Flood	0.14	a	0.09	36
1000 hr R	Location*Treatment	Big Bar	PreBurn	0.14	a	0.33	36
1000 hr R	Location*Treatment	Independ	Post Burn	0.57	a	0.38	36
1000 hr R	Location*Treatment	Independ	Post Flood	0.00	b	0.09	36
1000 hr R	Location*Treatment	Independ	PreBurn	1.14	a	0.33	36
1000 hr R	Location*Treatment	Ullathorne	Post Burn	0.14	a	0.38	36
1000 hr R	Location*Treatment	Ullathorne	Post Flood	0.00	a	0.09	36
1000 hr R	Location*Treatment	Ullathorne	PreBurn	0.29	a	0.33	36
1000 hr S	Location	Big Bar		0.14	a	0.19	18
1000 hr S	Location	Independ		0.95	b	0.19	18
1000 hr S	Location	Ullathorne		0.05	a	0.19	18
1000 hr S	Treatment		Post Burn	0.38	a	0.17	36
1000 hr S	Treatment		Post Flood	0.38	a	0.15	36
1000 hr S	Treatment		PreBurn	0.38	a	0.21	36
1000 hr S	Location*Treatment	Big Bar	Post Burn	0.00	a	0.29	36
1000 hr S	Location*Treatment	Big Bar	Post Flood	0.43	a	0.26	36
1000 hr S	Location*Treatment	Big Bar	PreBurn	0.00	a	0.36	36
1000 hr S	Location*Treatment	Independ	Post Burn	1.14	a	0.29	36
1000 hr S	Location*Treatment	Independ	Post Flood	0.57	b	0.26	36
1000 hr S	Location*Treatment	Independ	PreBurn	1.14	ab	0.36	36
1000 hr S	Location*Treatment	Ullathorne	Post Burn	0.00	a	0.29	36
1000 hr S	Location*Treatment	Ullathorne	Post Flood	0.14	a	0.26	36
1000 hr S	Location*Treatment	Ullathorne	PreBurn	0.00	a	0.36	36
Litter/Duff depth-plot 2	Location	Big Bar		2.83	a	0.28	18
Litter/Duff depth-plot 2	Location	Independ		2.58	a	0.28	18
Litter/Duff depth-plot 2	Location	Ullathorne		0.89	b	0.28	18
Litter/Duff depth-plot 2	**Treatment**		**Post Burn**	**1.81**	**a**	**0.32**	**36**
Litter/Duff depth-plot 2	**Treatment**		**Post Flood**	**0.07**	**b**	**0.03**	**36**
Litter/Duff depth-plot 2	**Treatment**		**PreBurn**	**4.43**	**c**	**0.38**	**36**
Litter/Duff depth-plot 2	Location*Treatment	Big Bar	Post Burn	3.64	a	0.55	36
Litter/Duff depth-plot 2	**Location*Treatment**	**Big Bar**	**Post Flood**	**0.14**	**b**	**0.06**	**36**
Litter/Duff depth-plot 2	Location*Treatment	Big Bar	PreBurn	4.71	a	0.65	36

Litter/Duff depth-plot 2	**Location*Treatment**	**Independ**	**Post Burn**	**1.14**	**a**	**0.55**	**36**
Litter/Duff depth-plot 2	**Location*Treatment**	**Independ**	**Post Flood**	**0.03**	**b**	**0.06**	**36**
Litter/Duff depth-plot 2	**Location*Treatment**	**Independ**	**PreBurn**	**6.57**	**c**	**0.65**	**36**
Litter/Duff depth-plot 2	Location*Treatment	Ullathorne	Post Burn	0.64	a	0.55	36
Litter/Duff depth-plot 2	Location*Treatment	Ullathorne	Post Flood	0.03	a	0.06	36
Litter/Duff depth-plot 2	Location*Treatment	Ullathorne	PreBurn	2.00	b	0.65	36
Dead Herb cover plot 1	Location	Big Bar		32.86	a	3.92	18
Dead Herb cover plot 1	Location	Independ		18.55	b	3.92	18
Dead Herb cover plot 1	Location	Ullathorne		20.74	ab	3.92	18
Dead Herb cover plot 1	Treatment		Post Burn	11.50	a	4.11	36
Dead Herb cover plot 1	Treatment		Post Flood	3.50	a	1.59	36
Dead Herb cover plot 1	Treatment		PreBurn	57.14	b	4.11	36
Dead Herb cover plot 1	**Location*Treatment**	**Big Bar**	**Post Burn**	**23.71**	**a**	**7.12**	**36**
Dead Herb cover plot 1	**Location*Treatment**	**Big Bar**	**Post Flood**	**2.00**	**b**	**2.75**	**36**
Dead Herb cover plot 1	**Location*Treatment**	**Big Bar**	**PreBurn**	**72.86**	**c**	**7.12**	**36**
Dead Herb cover plot 1	Location*Treatment	Independ	Post Burn	2.36	a	7.12	36
Dead Herb cover plot 1	Location*Treatment	Independ	Post Flood	0.43	a	2.75	36
Dead Herb cover plot 1	Location*Treatment	Independ	PreBurn	52.86	b	7.12	36
Dead Herb cover plot 1	Location*Treatment	Ullathorne	Post Burn	8.43	a	7.12	36
Dead Herb cover plot 1	Location*Treatment	Ullathorne	Post Flood	8.07	a	2.75	36
Dead Herb cover plot 1	Location*Treatment	Ullathorne	PreBurn	45.71	b	7.12	36
Dead Herb cover plot 2	Location	Big Bar		19.64	a	4.00	18
Dead Herb cover plot 2	Location	Independ		18.26	a	4.00	18
Dead Herb cover plot 2	Location	Ullathorne		24.29	a	4.00	18
Dead Herb cover plot 2	Treatment		Post Burn	10.50	a	3.19	36
Dead Herb cover plot 2	Treatment		Post Flood	2.64	a	1.20	36
Dead Herb cover plot 2	Treatment		PreBurn	49.05	b	5.53	36
Dead Herb cover plot 2	Location*Treatment	Big Bar	Post Burn	24.43	a	5.52	36
Dead Herb cover plot 2	Location*Treatment	Big Bar	Post Flood	0.21	b	2.08	36
Dead Herb cover plot 2	Location*Treatment	Big Bar	PreBurn	34.29	a	9.58	36
Dead Herb cover plot 2	Location*Treatment	Independ	Post Burn	1.50	a	5.52	36
Dead Herb cover plot 2	Location*Treatment	Independ	Post Flood	0.43	a	2.08	36
Dead Herb cover plot 2	Location*Treatment	Independ	PreBurn	52.86	b	9.58	36
Dead Herb cover plot 2	Location*Treatment	Ullathorne	Post Burn	5.57	a	5.52	36
Dead Herb cover plot 2	Location*Treatment	Ullathorne	Post Flood	7.29	a	2.08	36
Dead Herb cover plot 2	Location*Treatment	Ullathorne	PreBurn	60.00	b	9.58	36
Dead shrub cover plot 1	Location	Big Bar		17.50	a	4.53	18
Dead shrub cover plot 1	Location	Independ		19.98	a	4.53	18
Dead shrub cover plot 1	Location	Ullathorne		12.95	a	4.53	18
Dead shrub cover plot 1	Treatment		Post Burn	20.02	a	3.65	36
Dead shrub cover plot 1	Treatment		Post Flood	6.88	b	1.53	36
Dead shrub cover plot 1	Treatment		PreBurn	23.52	a	4.07	36
Dead shrub cover plot 1	Location*Treatment	Big Bar	Post Burn	25.79	a	6.32	36
Dead shrub cover plot 1	Location*Treatment	Big Bar	Post Flood	13.71	b	2.65	36
Dead shrub cover plot 1	Location*Treatment	Big Bar	PreBurn	13.00	b	7.05	36
Dead shrub cover plot 1	**Location*Treatment**	**Independ**	**Post Burn**	**17.14**	**a**	**6.32**	**36**
Dead shrub cover plot 1	**Location*Treatment**	**Independ**	**Post Flood**	**2.79**	**b**	**2.65**	**36**
Dead shrub cover plot 1	**Location*Treatment**	**Independ**	**PreBurn**	**40.00**	**c**	**7.05**	**36**
Dead shrub cover plot 1	Location*Treatment	Ullathorne	Post Burn	17.14	a	6.32	36

Dead shrub cover plot 1	Location*Treatment	Ullathorne	Post Flood	4.14	b	2.65	36
Dead shrub cover plot 1	Location*Treatment	Ullathorne	PreBurn	17.57	a	7.05	36
Dead shrub cover plot 2	Location	Big Bar		24.29	a	4.70	18
Dead shrub cover plot 2	Location	Independ		20.02	a	4.70	18
Dead shrub cover plot 2	Location	Ullathorne		11.48	a	4.70	18
Dead shrub cover plot 2	Treatment		Post Burn	21.57	a	3.55	36
Dead shrub cover plot 2	Treatment		Post Flood	13.14	b	2.37	36
Dead shrub cover plot 2	Treatment		PreBurn	21.07	ab	4.15	36
Dead shrub cover plot 2	Location*Treatment	Big Bar	Post Burn	27.14	a	6.16	36
Dead shrub cover plot 2	Location*Treatment	Big Bar	Post Flood	21.43	a	4.10	36
Dead shrub cover plot 2	Location*Treatment	Big Bar	PreBurn	24.29	a	7.19	36
Dead shrub cover plot 2	**Location*Treatment**	**Independ**	**Post Burn**	**20.43**	**a**	**6.16**	**36**
Dead shrub cover plot 2	**Location*Treatment**	**Independ**	**Post Flood**	**9.21**	**b**	**4.10**	**36**
Dead shrub cover plot 2	**Location*Treatment**	**Independ**	**PreBurn**	**30.43**	**c**	**7.19**	**36**
Dead shrub cover plot 2	Location*Treatment	Ullathorne	Post Burn	17.14	a	6.16	36
Dead shrub cover plot 2	Location*Treatment	Ullathorne	Post Flood	8.79	b	4.10	36
Dead shrub cover plot 2	Location*Treatment	Ullathorne	PreBurn	8.50	ab	7.19	36
Herb height plot 1	Location	Big Bar		0.30	a	0.07	18
Herb height plot 1	Location	Independ		0.27	a	0.07	18
Herb height plot 1	Location	Ullathorne		0.32	a	0.07	18
Herb height plot 1	Treatment		Post Burn	0.17	a	0.03	36
Herb height plot 1	Treatment		Post Flood	0.18	a	0.06	36
Herb height plot 1	Treatment		PreBurn	0.55	b	0.07	36
Herb height plot 1	Location*Treatment	Big Bar	Post Burn	0.26	a	0.06	36
Herb height plot 1	Location*Treatment	Big Bar	Post Flood	0.20	a	0.10	36
Herb height plot 1	Location*Treatment	Big Bar	PreBurn	0.45	b	0.11	36
Herb height plot 1	Location*Treatment	Independ	Post Burn	0.14	a	0.06	36
Herb height plot 1	Location*Treatment	Independ	Post Flood	0.10	a	0.10	36
Herb height plot 1	Location*Treatment	Independ	PreBurn	0.59	b	0.11	36
Herb height plot 1	Location*Treatment	Ullathorne	Post Burn	0.11	a	0.06	36
Herb height plot 1	Location*Treatment	Ullathorne	Post Flood	0.24	a	0.10	36
Herb height plot 1	Location*Treatment	Ullathorne	PreBurn	0.61	b	0.11	36
Herb height plot 2	Location	Big Bar		0.20	a	0.05	18
Herb height plot 2	Location	Independ		0.28	a	0.05	18
Herb height plot 2	Location	Ullathorne		0.29	a	0.05	18
Herb height plot 2	Treatment		Post Burn	0.17	a	0.04	36
Herb height plot 2	Treatment		Post Flood	0.10	a	0.03	36
Herb height plot 2	Treatment		PreBurn	0.50	b	0.05	36
Herb height plot 2	**Location*Treatment**	**Big Bar**	**Post Burn**	**0.17**	**a**	**0.07**	**36**
Herb height plot 2	**Location*Treatment**	**Big Bar**	**Post Flood**	**0.04**	**b**	**0.05**	**36**
Herb height plot 2	**Location*Treatment**	**Big Bar**	**PreBurn**	**0.37**	**c**	**0.09**	**36**
Herb height plot 2	Location*Treatment	Independ	Post Burn	0.09	a	0.07	36
Herb height plot 2	Location*Treatment	Independ	Post Flood	0.13	a	0.05	36
Herb height plot 2	Location*Treatment	Independ	PreBurn	0.63	b	0.09	36
Herb height plot 2	**Location*Treatment**	**Ullathorne**	**Post Burn**	**0.26**	**a**	**0.07**	**36**
Herb height plot 2	**Location*Treatment**	**Ullathorne**	**Post Flood**	**0.13**	**b**	**0.05**	**36**
Herb height plot 2	**Location*Treatment**	**Ullathorne**	**PreBurn**	**0.50**	**c**	**0.09**	**36**
Live Herb cover plot 1	Location	Big Bar		19.57	a	4.94	18
Live Herb cover plot 1	Location	Independ		16.76	a	4.94	18

Live Herb cover plot 1	Location	Ullathorne		21.38	a	4.94	18
Live Herb cover plot 1	**Treatment**		**Post Burn**	**16.60**	**a**	**4.45**	**36**
Live Herb cover plot 1	**Treatment**		**Post Flood**	**3.95**	**b**	**2.04**	**36**
Live Herb cover plot 1	**Treatment**		**PreBurn**	**37.17**	**c**	**4.65**	**36**
Live Herb cover plot 1	Location*Treatment	Big Bar	Post Burn	21.43	a	7.70	36
Live Herb cover plot 1	Location*Treatment	Big Bar	Post Flood	5.79	b	3.53	36
Live Herb cover plot 1	Location*Treatment	Big Bar	PreBurn	31.50	a	8.05	36
Live Herb cover plot 1	Location*Treatment	Independ	Post Burn	8.50	a	7.70	36
Live Herb cover plot 1	Location*Treatment	Independ	Post Flood	6.07	a	3.53	36
Live Herb cover plot 1	Location*Treatment	Independ	PreBurn	35.71	b	8.05	36
Live Herb cover plot 1	**Location*Treatment**	**Ullathorne**	**Post Burn**	**19.86**	**a**	**7.70**	**36**
Live Herb cover plot 1	**Location*Treatment**	**Ullathorne**	**Post Flood**	**0.00**	**b**	**3.53**	**36**
Live Herb cover plot 1	**Location*Treatment**	**Ullathorne**	**PreBurn**	**44.29**	**c**	**8.05**	**36**
Live Herb cover plot 2	**Location**	**Big Bar**		**2.60**	**a**	**2.28**	**18**
Live Herb cover plot 2	**Location**	**Independ**		**26.50**	**b**	**2.28**	**18**
Live Herb cover plot 2	**Location**	**Ullathorne**		**17.43**	**c**	**2.28**	**18**
Live Herb cover plot 2	Treatment		Post Burn	13.31	a	1.91	36
Live Herb cover plot 2	Treatment		Post Flood	8.71	a	2.08	36
Live Herb cover plot 2	Treatment		PreBurn	24.50	b	3.55	36
Live Herb cover plot 2	Location*Treatment	Big Bar	Post Burn	1.43	a	3.30	36
Live Herb cover plot 2	Location*Treatment	Big Bar	Post Flood	1.86	a	3.61	36
Live Herb cover plot 2	Location*Treatment	Big Bar	PreBurn	4.50	a	6.14	36
Live Herb cover plot 2	**Location*Treatment**	**Independ**	**Post Burn**	**8.07**	**a**	**3.30**	**36**
Live Herb cover plot 2	**Location*Treatment**	**Independ**	**Post Flood**	**21.43**	**b**	**3.61**	**36**
Live Herb cover plot 2	**Location*Treatment**	**Independ**	**PreBurn**	**50.00**	**c**	**6.14**	**36**
Live Herb cover plot 2	**Location*Treatment**	**Ullathorne**	**Post Burn**	**30.43**	**a**	**3.30**	**36**
Live Herb cover plot 2	**Location*Treatment**	**Ullathorne**	**Post Flood**	**2.86**	**b**	**3.61**	**36**
Live Herb cover plot 2	**Location*Treatment**	**Ullathorne**	**PreBurn**	**19.00**	**c**	**6.14**	**36**
Live shrub cover plot 1	Location	Big Bar		21.12	a	5.29	18
Live shrub cover plot 1	Location	Independ		10.00	a	5.29	18
Live shrub cover plot 1	Location	Ullathorne		12.38	a	5.29	18
Live shrub cover plot 1	Treatment		Post Burn	6.67	a	2.56	36
Live shrub cover plot 1	Treatment		Post Flood	8.24	a	2.99	36
Live shrub cover plot 1	Treatment		PreBurn	28.60	b	5.64	36
Live shrub cover plot 1	Location*Treatment	Big Bar	Post Burn	17.14	a	4.44	36
Live shrub cover plot 1	Location*Treatment	Big Bar	Post Flood	11.86	a	5.18	36
Live shrub cover plot 1	Location*Treatment	Big Bar	PreBurn	34.36	b	9.76	36
Live shrub cover plot 1	Location*Treatment	Independ	Post Burn	0.00	a	4.44	36
Live shrub cover plot 1	Location*Treatment	Independ	Post Flood	0.00	a	5.18	36
Live shrub cover plot 1	Location*Treatment	Independ	PreBurn	30.00	b	9.76	36
Live shrub cover plot 1	Location*Treatment	Ullathorne	Post Burn	2.86	a	4.44	36
Live shrub cover plot 1	Location*Treatment	Ullathorne	Post Flood	12.86	b	5.18	36
Live shrub cover plot 1	Location*Treatment	Ullathorne	PreBurn	21.43	b	9.76	36
Live shrub cover plot 2	Location	Big Bar		43.33	a	4.76	18
Live shrub cover plot 2	Location	Independ		8.12	b	4.76	18
Live shrub cover plot 2	Location	Ullathorne		10.90	b	4.76	18
Live shrub cover plot 2	Treatment		Post Burn	16.48	a	3.45	36
Live shrub cover plot 2	Treatment		Post Flood	11.10	a	3.02	36
Live shrub cover plot 2	Treatment		PreBurn	34.79	b	3.88	36

Live shrub cover plot 2	Location*Treatment	Big Bar	Post Burn	45.71	a	5.97	36
Live shrub cover plot 2	Location*Treatment	Big Bar	Post Flood	27.14	b	5.23	36
Live shrub cover plot 2	Location*Treatment	Big Bar	PreBurn	57.14	c	6.72	36
Live shrub cover plot 2	Location*Treatment	Independ	Post Burn	0.00	a	5.97	36
Live shrub cover plot 2	Location*Treatment	Independ	Post Flood	0.00	a	5.23	36
Live shrub cover plot 2	Location*Treatment	Independ	PreBurn	24.36	b	6.72	36
Live shrub cover plot 2	Location*Treatment	Ullathorne	Post Burn	3.71	a	5.97	36
Live shrub cover plot 2	Location*Treatment	Ullathorne	Post Flood	6.14	a	5.23	36
Live shrub cover plot 2	Location*Treatment	Ullathorne	PreBurn	22.86	b	6.72	36
Shrub height plot 1	Location	Big Bar		1.81	a	0.21	18
Shrub height plot 1	Location	Independ		0.40	b	0.21	18
Shrub height plot 1	Location	Ullathorne		0.64	b	0.21	18
Shrub height plot 1	Treatment		Post Burn	0.85	a	0.15	36
Shrub height plot 1	Treatment		Post Flood	0.78	a	0.12	36
Shrub height plot 1	Treatment		PreBurn	1.23	b	0.16	36
Shrub height plot 1	Location*Treatment	Big Bar	Post Burn	1.94	a	0.26	36
Shrub height plot 1	Location*Treatment	Big Bar	Post Flood	1.49	b	0.22	36
Shrub height plot 1	Location*Treatment	Big Bar	PreBurn	2.00	a	0.27	36
Shrub height plot 1	Location*Treatment	Independ	Post Burn	0.09	a	0.26	36
Shrub height plot 1	Location*Treatment	Independ	Post Flood	0.24	a	0.22	36
Shrub height plot 1	Location*Treatment	Independ	PreBurn	0.87	b	0.27	36
Shrub height plot 1	Location*Treatment	Ullathorne	Post Burn	0.51	a	0.26	36
Shrub height plot 1	Location*Treatment	Ullathorne	Post Flood	0.60	a	0.22	36
Shrub height plot 1	Location*Treatment	Ullathorne	PreBurn	0.81	a	0.27	36
Shrub height plot 2	Location	Big Bar		1.74	a	0.22	18
Shrub height plot 2	Location	Independ		0.93	b	0.22	18
Shrub height plot 2	Location	Ullathorne		0.83	b	0.22	18
Shrub height plot 2	**Treatment**		**Post Burn**	**1.14**	**a**	**0.14**	**36**
Shrub height plot 2	**Treatment**		**Post Flood**	**0.90**	**b**	**0.14**	**36**
Shrub height plot 2	**Treatment**		**PreBurn**	**1.46**	**c**	**0.15**	**36**
Shrub height plot 2	Location*Treatment	Big Bar	Post Burn	1.84	a	0.23	36
Shrub height plot 2	Location*Treatment	Big Bar	Post Flood	1.51	b	0.24	36
Shrub height plot 2	Location*Treatment	Big Bar	PreBurn	1.86	a	0.25	36
Shrub height plot 2	Location*Treatment	Independ	Post Burn	0.64	a	0.23	36
Shrub height plot 2	Location*Treatment	Independ	Post Flood	0.69	a	0.24	36
Shrub height plot 2	Location*Treatment	Independ	PreBurn	1.47	b	0.25	36
Shrub height plot 2	Location*Treatment	Ullathorne	Post Burn	0.93	a	0.23	36
Shrub height plot 2	Location*Treatment	Ullathorne	Post Flood	0.51	b	0.24	36
Shrub height plot 2	Location*Treatment	Ullathorne	PreBurn	1.04	a	0.25	36

Appendix E: Pre-Burn, Post-Burn and Post-Flood Fuel Transect Photographs
Independence

		
Independence Pre-Burn Transect 1 September 2005	**Independence Post-Burn/Pre-Flood Transect 1 October 7, 2005**	**Independence Post-Burn/Post-Flood Transect 1 January 9, 2006**

		
Independence Pre-Burn Transect 2 September 13, 2005	**Independence Post-Burn/Pre-Flood Transect 2 October 7, 2005**	**Independence Post-Burn/Post-Flood Transect 2 January 9, 2006**

		
Independence Pre-Burn Transect 3 **September 13, 2005**	**Independence Post-Burn/Pre-Flood Transect 3** **October 7, 2005**	**Independence** **Post-Burn/Post-Flood Transect 3** **January 9, 2006**

		
Independence Pre-Burn Transect 4 **September 13, 2005**	**Independence Post-Burn/Pre-Flood Transect 4** **October 7, 2005**	**Independence** **Post-Burn/Post-Flood Transect 4** **January 9, 2006**

Independence Pre-Burn Transect 5
September 13, 2005

Independence Post-Burn/Pre-Flood
Transect 5
October 7, 2005

Independence
Post-Burn/Post-Flood Transect 5
January 9, 2006

		
Independence Pre-Burn Transect 6 **September 13, 2005**	**Independence Post-Burn/Pre-Flood Transect 6** **October 7, 2005**	**Independence** **Post-Burn/Post-Flood Transect 6** **January 9, 2006**

		
Independence Pre-Burn Transect 7 September 13, 2005	**Independence Post-Burn/Pre-Flood Transect 7 October 7, 2005**	**Independence Post-Burn/Post-Flood Transect 7 January 9, 2006**

Ullathorne

		
Ullathorne Pre-Burn Transect 0 **September 12, 2005**	**Ullathorne Post-Burn/Pre-Flood** **Transect 0** **October 14, 2005**	**Ullathorne** **Post-Burn/Post-Flood Transect 0** **January 4, 2006**

		
Ullathorne Pre-Burn Transect 1 September 12, 2005	**Ullathorne Post-Burn/Pre-Flood Transect 1 October 14, 2005**	**Ullathorne Post-Burn/Post-Flood Transect 1 January 4, 2006**

Ullathorne Pre-Burn Transect 2
September 13, 2005

Ullathorne Post-Burn/Pre-Flood Transect 2
October 14, 2005

Ullathorne
Post-Burn/Post-Flood Transect 2
January 4, 2006

Ullathorne Pre-Burn Transect 3
September 13, 2005

Ullathorne Post-Burn/Pre-Flood
Transect 3
October 14, 2005

Ullathorne
Post-Burn/Post-Flood Transect 3
January 4, 2006

		
Ullathorne Pre-Burn Transect 4 September 13, 2005	**Ullathorne Post-Burn/Pre-Flood Transect 4 October 14, 2005**	**Ullathorne Post-Burn/Post-Flood Transect 4 January 4, 2006**

Ullathorne Pre-Burn Transect 5
September 13, 2005

Ullathorne Post-Burn/Pre-Flood
Transect 5
October 14, 2005

Ullathorne
Post-Burn/Post-Flood Transect 5
January 4, 2006

		
Ullathorne Pre-Burn Transect 6 September 12, 2005	**Ullathorne Post-Burn/Pre-Flood Transect 6 October 14, 2005**	**Ullathorne Post-Burn/Post-Flood Transect 6 January 4, 2006**

Big Bar

		
Big Bar Pre-Burn Transect 0 September 12, 2005	**Big Bar Post-Burn/Pre-Flood Transect 0 November 20, 2005**	**Big Bar Post-Burn/Post-Flood Transect 0 January 6, 2006**

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<tr>
<td>Big Bar Pre-Burn Transect 1
September 12, 2005</td>
<td>Big Bar Post-Burn/Pre-Flood
Transect 1
November 16, 2005</td>
<td>Big Bar
Post-Burn/Post-Flood Transect 1
January 6, 2006</td>
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Big Bar Pre-Burn Transect 2 September 12, 2005	**Big Bar Post-Burn/Pre-Flood Transect 2 November 16, 2005**	**Big Bar Post-Burn/Post-Flood Transect 2 January 6, 2006**

		
Big Bar Pre-Burn Transect 3 September 12, 2005	**Big Bar Post-Burn/Pre-Flood Transect 3 November 16, 2005**	**Big Bar Post-Burn/Post-Flood Transect 3 January 6, 2006**

		
Big Bar Pre-Burn Transect 4 **September 12, 2005**	**Big Bar Post-Burn/Pre-Flood** **Transect 4** **November 16, 2005**	**Big Bar** **Post-Burn/Post-Flood Transect 4** **January 6, 2006**

Big Bar Pre-Burn Transect 5
September 12, 2005

Big Bar Post-Burn/Pre-Flood
Transect 5
November 20, 2005

Big Bar
Post-Burn/Post-Flood Transect 5
January 6, 2006

		
Big Bar Pre-Burn Transect 6 **September 12, 2005**	**Big Bar Post-Burn/Pre-Flood** **Transect 6** **November 20, 2005**	**Big Bar** **Post-Burn/Post-Flood Transect 6** **January 6, 2006**

Appendix F: Ethnobotany Experiment Additional Information

Appendix F: Table F.1. Differences of Least Squares Means for proportion of good stems: Part 1 of 2

Differences of Least Squares Means for proportion of good stems: Part 1 of 2							
Effect	**Treatment**	**Time**	**Treatment**	**Time**	**Estimate**	**Standard Error**	**DF**
Treatment	Burn		Control		**0.08960**	**0.02077**	**110**
Treatment	Burn		Prune		**0.05685**	**0.02077**	**110**
Treatment	Control		Prune		-0.03275	0.02077	110
Time		Post		Pre	**-0.1696**	**0.01696**	**110**
Treatment*Time	Burn	Post	Burn	Pre	-0.08359	0.02937	110
Treatment*Time	Burn	Post	Control	Post	**0.1442**	**0.02937**	**110**
Treatment*Time	Burn	Post	Control	Pre	-0.04859	0.02937	110
Treatment*Time	Burn	Post	Prune	Post	**0.1313**	**0.02937**	**110**
Treatment*Time	Burn	Post	Prune	Pre	-0.1012	0.02937	110
Treatment*Time	Burn	Pre	Control	Post	0.2278	0.02937	110
Treatment*Time	Burn	Pre	Control	Pre	0.03501	0.02937	110
Treatment*Time	Burn	Pre	Prune	Post	0.2149	0.02937	110
Treatment*Time	Burn	Pre	Prune	Pre	-0.01759	0.02937	110
Treatment*Time	Control	Post	Control	Pre	-0.1928	0.02937	110
Treatment*Time	Control	Post	Prune	Post	-0.01291	0.02937	110
Treatment*Time	Control	Post	Prune	Pre	-0.2454	0.02937	110
Treatment*Time	Control	Pre	Prune	Post	0.1799	0.02937	110
Treatment*Time	Control	Pre	Prune	Pre	-0.05259	0.02937	110
Treatment*Time	Prune	Post	Prune	Pre	-0.2325	0.02937	110

Appendix F: Table F.2. Differences of Least Squares Means for proportion of good stems: Part 2 of 2

Differences of Least Squares Means for proportion of good stems: Part 2 of 2								
Effect	**Treatment**	**Time**	**Treatment**	**Time**	**t Value**	**Pr > |t|**	**Adjustment**	**Adj P**
Treatment	Burn		Control	Treatment	**4.31**	**<.0001**	**Tukey-Kramer**	**0.0001**
Treatment	Burn		Prune	Treatment	**2.74**	**0.0072**	**Tukey-Kramer**	**0.0196**
Treatment	Control		Prune	Treatment	-1.58	0.1176	Tukey-Kramer	0.2598
Time		Post		Time	**-10.00**	**<.0001**	**Tukey-Kramer**	**<.0001**
Treatment*Time	Burn	Post	Burn	Treatment*Time	-2.85	0.0053	Tukey-Kramer	0.0577
Treatment*Time	Burn	Post	Control	Treatment*Time	**4.91**	**<.0001**	**Tukey-Kramer**	**<.0001**
Treatment*Time	Burn	Post	Control	Treatment*Time	-1.65	0.1009	Tukey-Kramer	0.5647
Treatment*Time	Burn	Post	Prune	Treatment*Time	**4.47**	**<.0001**	**Tukey-Kramer**	**0.0003**
Treatment*Time	Burn	Post	Prune	Treatment*Time	-3.45	0.0008	Tukey-Kramer	0.0102
Treatment*Time	Burn	Pre	Control	Treatment*Time	7.76	<.0001	Tukey-Kramer	<.0001
Treatment*Time	Burn	Pre	Control	Treatment*Time	1.19	0.2359	Tukey-Kramer	0.8399
Treatment*Time	Burn	Pre	Prune	Treatment*Time	7.32	<.0001	Tukey-Kramer	<.0001
Treatment*Time	Burn	Pre	Prune	Treatment*Time	-0.60	0.5505	Tukey-Kramer	0.9909
Treatment*Time	Control	Post	Control	Treatment*Time	-6.56	<.0001	Tukey-Kramer	<.0001
Treatment*Time	Control	Post	Prune	Treatment*Time	-0.44	0.6611	Tukey-Kramer	0.9979

Treatment*Time	**Control**	**Post**	**Prune**	**Treatment*Time**	-8.35	<.0001	Tukey-Kramer	<.0001
Treatment*Time	**Control**	**Pre**	**Prune**	**Treatment*Time**	6.12	<.0001	Tukey-Kramer	<.0001
Treatment*Time	**Control**	**Pre**	**Prune**	**Treatment*Time**	-1.79	0.0761	Tukey-Kramer	0.4759
Treatment*Time	**Prune**	**Post**	**Prune**	**Treatment*Time**	-7.92	<.0001	Tukey-Kramer	<.0001

Appendix F: Table F.3 Differences of Least Squares Means for stem diameter/length ratios of "good" stems pre and post treatment

Differences of Least Squares Means for stem diameter/length ratios of "good" stems pre and post treatment											
Effect	**Treat-ment**	**Time**	**Treat-ment**	**Time**	**Esti-mate**	**Standard Error**	**DF**	**t-Value**	**Pr > |t|**	**Adjust-ment**	**Adj P**
Treat-ment	**Burn**		**Control**		0.0552	0.02686	2739	2.05	0.0400	Tukey-Kramer	0.0997
Treat-ment	**Burn**		**Prune**		0.0308	0.02697	2739	1.14	0.2539	Tukey-Kramer	0.4888
Treat-ment	**Control**		**Prune**		-0.0244	0.02677	2739	-0.91	0.3617	Tukey-Kramer	0.6326
Time		**Post trmnt**		**Pre trmnt**	-0.1015	0.009213	2739	-11.0	<.0001	Tukey-Kramer	<.0001
Treat-ment*Time	**Burn**	**Post trmnt**	**Burn**	**Pre trmnt**	-0.0299	0.01678	2739	-1.73	0.0831	Tukey-Kramer	0.5096
Treat-ment*Time	**Burn**	**Post trmnt**	**Control**	**Post trmnt**	0.1225	0.02765	2739	4.43	<.0001	Tukey-Kramer	0.0001
Treat-ment*Time	**Burn**	**Post trmnt**	**Control**	**Pre trmnt**	-0.0412	0.02950	2739	-1.40	0.1625	Tukey-Kramer	0.7288
Treatment*Time	**Burn**	**Post trmnt**	**Prune**	**Post trmnt**	0.0721	0.02826	2739	2.55	0.0108	Tukey-Kramer	0.1102
Treat-ment*Time	**Burn**	**Post trmnt**	**Prune**	**Pre trmnt**	-0.0396	0.02949	2739	-1.34	0.1791	Tukey-Kramer	0.7604
Treat-ment*Time	**Burn**	**Pre trmnt**	**Control**	**Post trmnt**	0.1516	0.02869	2739	5.28	<.0001	Tukey-Kramer	<.0001
Treat-ment*Time	**Burn**	**Pre trmnt**	**Control**	**Pre trmnt**	-0.0121	0.03048	2739	-0.40	0.6909	Tukey-Kramer	0.9987
Treat-ment*Time	**Burn**	**Pre trmnt**	**Prune**	**Post trmnt**	0.1012	0.02928	2739	3.46	0.0006	Tukey-Kramer	0.0074
Treat-ment*Time	**Burn**	**Pre trmnt**	**Prune**	**Pre trmnt**	-0.0105	0.03047	2739	-0.35	0.7295	Tukey-Kramer	0.9994
Treat-ment*Time	**Control**	**Post trmnt**	**Control**	**Pre trmnt**	-0.1637	0.01477	2739	-11.08	<.0001	Tukey-Kramer	<.0001
Treat-ment*Time	**Control**	**Post trmnt**	**Prune**	**Post trmnt**	-0.0504	0.02737	2739	-1.84	0.0655	Tukey-Kramer	0.4384
Treat-ment*Time	**Control**	**Post trmnt**	**Prune**	**Pre trmnt**	-0.1621	0.02864	2739	-5.66	<.0001	Tukey-Kramer	<.0001
Treat-ment*Time	**Control**	**Pre trmnt**	**Prune**	**Post trmnt**	0.1133	0.02923	2739	3.88	0.0001	Tukey-Kramer	0.0015
Treat-ment*Time	**Control**	**Pre trmnt**	**Prune**	**Pre trmnt**	0.0016	0.03042	2739	0.05	0.9585	Tukey-Kramer	1.0000

Treat-ment* Time	**Prune**	**Post trmnt**	**Prune**	**Pre trmnt**	-0.1117	0.01625	2739	-6.88	<.0001	Tukey-Kramer	<.0001

Appendix G: Chapter 7 Additional Information

Gifford Pinchot letters to F. W. Gent of Orleans, Ca. additional material

In a letter (October 5, 1912, page 1 of 2) from Gifford Pinchot, president of the National Conservation Association to Mr. F.W. Gent, of Orleans, Ca. stated the following: "Every year since it was established, the Forest Service has been vigorsously attacked by Congress. During the past session the attack was renewed, and definite statements were made that a strong effort will be made next winter to cripple the Service and break up the National Forests. In these attacks it is charged that the Forest Service does its work badly, that its regulations and methods are tyrannical and inefficient, and that the people of the West are overwhelmingly opposed to the whole National Forest system. Whether these charges are true, or whether they are merely part of an effort to open the National Forests to exploitation by the special interests, they are important. In either case, the actual facts ought to be known." Pinchot goes on to list "Some of the charges against the National Forest" as:

1. That a National Forest is a detriment to the people who live in its neighborhood.
2. That all kinds of natural resources within the National Forests are withheld from use.
3. That prospecting is not allowed.
4. That valid mining claims are held up.
5. That the National Forests are run so as to favor the big man, and not help the homebuilder.
6. That homesteads are being taken away from settlers for ranger stations.
7. That the Forest officers are overbearing, opposed to the settler, and anxious to keep the country a wilderness by reporting against all claims, whether good or bad.
8. That the Forest officers are incompetent Eastern theorists, who know nothing about the West.
9. That timber sales are handled in the interest of monopoly for the lumber trust.
10. That cattle and sheep barons are given preference over settlers and small owners in range allotments.

Klamath National Forest 1928 Map Cost of fire suppression vs. other treatments
"It has been found, however, that actually to carry out controlled burning in our diversified mountain topography is an exceedingly difficult and costly practice. If the fires are realy 'controlled,' experience shows that it costs not less than 35 cents per acre each time the forest is burned over and may cost as much as $1, and since this must be done every few years, the cost over a period of years soon becomes prohibitive for any but the holder of a very small parcel of land. Again, while in theory it is simple to select the proper time of year for burning, in practice it has been extremely difficult to find a time when conditions are such that fires will start without developing into devastating conflagrations with all the characteristics of the summer

fires which the practice seeks to prevent. Even very light fires properly controlled cause serious damage to the forest. The young trees particularly are killed, and even the largest and most valuable veterans are not immune to death from these creeping fires. It has been found that, even when properly controlled, such fires cause a loss of value amounting to several dollars an acre each time they run through the forest. The most serious results of repeated burning of the forest is that the gradual destruction of the forest trees leads to the invasion of the land by worthless brush, and this not only makes the reestablishment of the forest difficult but makes the control of fires infinitely harder and more costly than if a full stand of timber is maintained" (Klamath National Forest Map 1928:16)

Appendix H: Conversions Tables for English to Metric
On-line conversion tables available at:
http://www.uwsp.edu/geo/faculty/heywood/Util/ComfortCalculator.htm#.
US Geological Survey:
http://vulcan.wr.usgs.gov/Miscellaneous/ConversionTables/conversion_table.html.
Conversion Formulas
BEGIN WITH FORMULA for CONVERTING
(Multiply Number of Units by Conversion Number to Obtain New Number of Units)
millimeters (mm) millimeters x 0.03937 = inches **centimeters (cm)** centimeters x 10 = millimeters
centimeters x 0.3937 = inches **meters (m)** meters x 1000 = millimeters
meters x 100 = centimeters
meters x 3.281 = feet
meters per second x 3.281 = feet per second
square meters x 10.76 = square feet
square meters x 1.196 = square yards
square meters x 0.0002471 = square acres
cubic meters x 35.31 = cubic feet
cubic meters x 1.308 = cubic yards
cubic meters x 0.0008107 = acre-feet
cubic meters per second x 35.31 = cubic feet per second
cubic meters per second x 15,850.00 = gallons per minute **kilometers (km)** kilometers x 1000 = meters
kilometers x 0.6214 = miles
square kilometers x 0.3861 = square miles
cubic kilometers x 0.2399 = cubic miles **inches (in)** inches x 25.4 = millimeters
inches x 2.54 = centimeters
square inch x 6.4516 = square centimeters **feet (ft)** feet x 12 = inches
feet x 0.3048 = meters
square feet x 0.09294 = square meters
cubic feet x 0.02832 = cubic meters
acre-foot x 1233 = cubic meters **yard (yd)** yard x 3 = feet
yard x 0.9144 = meters **miles (mi)** miles x 5280 = feet
miles x 1609.3 = meters
miles x 1.609 = kilometers
square miles x 2.590 = square kilometers
cubic miles x 4.168 = cubic kilometers **acre-foot (acre-ft)** acre-ft x 1233 = cubic meters **microradian** microradian x 0.2 = second of arc **Temperature Conversions degrees Fahrenheit (F)**
degrees Celsius (C) (F - 32) x 5/9 = C
(C x 1.8) + 32 = F (C x 2) - (C x 2 x 0.1) + 32 = F

a) double the Celsius temperature
b) subtract 10% of the doubled temperature
c) add 32

Appendix I: Orleans and Seiad, CA. USGS Gage Historical Peak Flow Records for Mid-Klamath River. Data available at: http://nwis.waterdata.usgs.gov/nwis/, June 26, 2007.

Table I.1: Orleans USFS Gage Peak Flow Records Water Year 1927 to 2006

Orleans CA. USGS Gage: 11523000
Humboldt County, California
Hydrologic Unit Code 18010209
Latitude 41°18'13",
Longitude 123°32'00" NAD27
Drainage area 8,475 square miles
Gage datum 355.98 feet above sea level NGVD29

Output formats
Table
Graph
Tab-separated file
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Water Year	Date	Gage Height (feet)	Stream-flow (cfs)	Water Year	Date	Gage Height (feet)	Stream-flow (cfs)
1927	Feb. 21, 1927	50.80	141,000[6]	1967	Jan. 29, 1967	24.07	98,600[6]
1928	Mar. 26, 1928	27.90	60,300[6]	1968	Feb. 23, 1968	25.38	109,000[6]
1929	Dec. 29, 1928	10.57	13,700[6]	1969	Jan. 21, 1969		77,800[6]
1931	Mar. 18, 1931	12.10	17,600[6]	1970	Jan. 24, 1970		175,000[6]
1932	Mar. 19, 1932	24.80	51,600[6]	1971	Jan. 17, 1971	30.96	190,000[6]
1933	Jun. 09, 1933	13.01	19,900[6]	1972	Mar. 03, 1972	32.82	191,000[6]
1934	Mar. 28, 1934	13.75	21,300[6]	1973	Dec. 22, 1972	14.89	38,400[6]
1935	Apr. 16, 1935	12.48	18,000[6]	1974	Jan. 16, 1974	37.24	279,000[6]
1936	Jan. 15, 1936	27.80	60,000[6]	1975	Mar. 18, 1975	20.04	74,800[6]
1937	Apr. 14, 1937	27.60	59,500[6]	1976	Nov. 15, 1975	14.24	35,100[6]
1938	Dec. 11, 1937	32.30	73,700[6]	1977	Sep. 29, 1977	5.12	7,800[6]
1939	Dec. 03, 1938	15.77	26,500[6]	1978	Dec. 14, 1977	23.30	111,000[6]
1940	Feb. 28, 1940	31.10	70,300[6]	1979	Jan. 11, 1979	16.61	48,200[6]
1941	Dec. 21, 1940	19.48	36,500[6]	1980	Jan. 12, 1980	24.15	121,000[6]
1942	Dec. 02, 1941	27.00	58,000[6]	1981	Dec. 02, 1980	14.67	40,300[6]
1943	Jan. 21, 1943	30.45	68,400[6]	1982	Dec. 20, 1981	30.07	201,000[6]
1944	Mar. 10, 1944	11.25	13,500[6]	1983	Dec. 17, 1982	29.88	198,000[6]
1945	Mar. 13, 1945	23.70	48,400[6]	1984	Dec. 15, 1983	20.05	76,800[6]
1946	Dec. 28, 1945	40.00	97,000[6]	1985	Nov. 12, 1984	18.57	64,400[6]
1947	Nov. 19, 1946	15.82	26,700[6]	1986	Feb. 18, 1986	37.16	278,000[6]
1948	Jan. 07, 1948	38.40	92,200[6]	1987	Mar. 12, 1987	13.19	32,600[6]
1949	Feb. 22, 1949	17.10	30,200[6]	1988	Dec. 10, 1987	17.84	58,800
1950	Mar. 17, 1950	21.40	41,900[6]	1989	Nov. 22, 1988	18.86	66,800[5]
1951	Oct. 29, 1950	32.45	74,400[6]	1990	Jan. 08, 1990	17.54	56,700[5]

1952	Feb. 02, 1952	30.20	67,600[6]	1991	Mar. 04, 1991	11.40	25,400[5]
1953	Jan. 18, 1953	49.70	137,000[6]	1992	Apr. 17, 1992	10.51	22,200[5]
1954	Nov. 23, 1953	26.16	57,500[6]	1993	Mar. 17, 1993	20.68	65,300[5]
1955	Dec. 31, 1954	15.45	26,900[6]	1994	Dec. 08, 1993	11.59	19,600[5]
1956	Dec. 22, 1955	59.40	202,000[6]	1995	Jan. 31, 1995	25.85	112,000[5]
1957	Feb. 26, 1957	33.00	79,200[6]	1996	Feb. 09, 1996	18.92	56,700[5]
1958	Jan. 29, 1958	38.10	96,800[6]	1997	Jan. 01, 1997	37.79	258,000[5]
1959	Jan. 12, 1959	31.28	73,700[6]	1998	Mar. 23, 1998	26.41	113,000[5]
1960	Feb. 08, 1960	30.35	70,700[6]	1999	Feb. 28, 1999	24.61	61,000[5]
1961	Feb. 11, 1961	26.20	57,600[6]	2000	Jan. 14, 2000	17.41	46,800
1962	Dec. 19, 1961	19.62	38,300[6]	2001	Mar. 25, 2001	8.93	11,000
1963	Dec. 02, 1962	34.80	85,300[6]	2002	Jan. 08, 2002	15.73	37,800
1964	Jan. 20, 1964	26.30	59,900[6]	2003	Dec. 27, 2002		56,000[2]
1965	Dec. 22, 1964	76.50	307,000[6]	2004	Feb. 18, 2004	20.13	63,500
1966	Jan. 06, 1966	23.65	96,200[6]	2005	Dec. 09, 2004	17.60	47,900
				2006	Dec. 30, 2005	34.80	213,000

Table I.2: Seiad USFS Gage Peak Flow Records Water Year 1913 to 2006

Seiad, CA. USGS Gage: 115205000
Siskiyou County, California
Hydrologic Unit Code 18010206
Latitude 41°51'14", Longitude 123°13'52" NAD27
Drainage area 6,940 square miles
Gage datum 1,320.00 feet above sea level NGVD29

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Water Year	Date	Gage Height (feet)	Stream-flow (cfs)	Water Year	Date	Gage Height (feet)	Stream-flow (cfs)
1913	Apr. 26, 1913	7.50	9,190[6]	1972	Mar. 03, 1972	20.20	55,800[6]
1914	Dec. 31, 1913	13.30	26,500[6]	1973	Jan. 16, 1973	8.83	10,300[6]
1915	Feb. 03, 1915	9.50	14,600[6]	1974	Jan. 16, 1974	29.65	126,000[6]
1916	Feb. 10, 1916	10.20	16,600[6]	1975	Mar. 19, 1975	14.18	26,900[6]
1917	May 14, 1917	7.90	9,760[6]	1976	Dec. 06, 1975	9.09	10,300[6]
1918	Dec. 01, 1917	6.40	6,380[6]	1977	Nov. 15, 1976	5.71	3,630[6]
1919	Feb. 09, 1919	10.00	15,300[6]	1978	Dec. 15, 1977	14.78	29,300[6]
1920	Dec. 22, 1919	5.00	3,650[6]	1979	Jan. 11, 1979	8.68	9,310[6]
1921	Feb. 21, 1921	12.10	21,800[6]	1980	Jan. 14, 1980	17.49	41,400[6]
1922	May 18, 1922	7.90	9,760[6]	1981	Feb. 14, 1981	7.49	7,250[6]

1923	Dec. 28, 1922	6.80	7,250[6]
1924	Feb. 09, 1924	6.30	6,170[6]
1925	Feb. 04, 1925	12.70	23,700[6]
1927	1927	22.00	[6,7]
1952	Feb. 02, 1952	14.10	25,400[6]
1953	Jan. 19, 1953	20.10	55,200[6]
1954	Feb. 13, 1954		20,900[6]
1955	May 21, 1955	6.44	5,990[6]
1956	Dec. 22, 1955	29.20	122,000[6]
1957	Feb. 26, 1957		25,000[6]
1958	Feb. 25, 1958	16.92	38,800[6]
1959	Jan. 12, 1959	8.90	11,000[6]
1960	Feb. 08, 1960	11.90	19,600[6]
1961	Feb. 11, 1961	11.03	17,000[6]
1962	Dec. 21, 1961	7.55	7,910[6]
1963	Dec. 02, 1962	16.08	35,100[6]
1964	Jan. 20, 1964	12.05	20,100[6]
1965	Dec. 23, 1964	33.75	165,000[6]
1966	Jan. 06, 1966	11.00	15,000[6]
1967	Jan. 29, 1967	12.24	19,600[6]
1968	Feb. 23, 1968	13.20	23,400[6]
1969	Jan. 21, 1969	11.27	16,000[6]
1970	Jan. 24, 1970	20.24	56,000[6]
1971	Jan. 17, 1971	18.50	51,800[6]
1982	Dec. 20, 1981	22.80	71,500[6]
1983	Dec. 17, 1982	14.70	29,000[6]
1984	Dec. 14, 1983	13.53	24,500[5]
1985	Nov. 12, 1984	10.20	13,800[5]
1986	Feb. 18, 1986	17.83	43,100[5]
1987	Mar. 06, 1987	7.18	6,820[5]
1988	Dec. 10, 1987	8.13	8,720[5]
1989	Mar. 10, 1989	12.14	19,700[5]
1990	Jan. 08, 1990	9.87	12,900[5]
1991	Mar. 05, 1991	6.02	4,950[5]
1992	Apr. 17, 1992	6.04	4,600[5]
1993	Mar. 18, 1993	12.52	20,900[5]
1994	Dec. 08, 1993	4.53	2,970[5]
1995	Feb. 01, 1995	14.30	26,900[5]
1996	Apr. 01, 1996		21,000[2,5]
1997	Jan. 01, 1997	28.72	117,000[5]
1998	Mar. 24, 1998	17.04	39,000[5]
1999	Feb. 28, 1999	11.78	17,900[5]
2000	Jan. 14, 2000	9.36	11,300
2001	May 16, 2001	5.00	3,560
2002	Jan. 07, 2002	8.56	9,500
2003	Dec. 29, 2002	11.25	16,400
2004	Feb. 18, 2004	11.66	17,600
2005	May 19, 2005	9.24	11,000
2006	Dec. 31, 2005	23.17	74,000