Research Synthesis for Resource Managers

Evaluating management risks to Southern Sierra fisher

Thompson, Craig, William Zielinski, and Kathryn Purcell. 2011. Evaluating Management Risks Using Landscape Trajectory Analysis: A Case Study of California Fisher. Journal of Wildlife Management 75(5):1164–1176.
http://www.treesearch.fs.fed.us/pubs/38479

Scheller, Robert, Wayne Spencer, Heather Rustigian-Romsos, Alexandra Syphard, Brendan Ward, and James Strittholt. 2011. Using stochastic simulation to evaluate competing risks of wildfires and fuels management on an isolated forest carnivore. Landscape Ecology 26:1491–1504
http://consbio.org/products/publications/using-stochastic-simulation-to-evaluate-competing-risks-of-wildfires-and-fuels-management-on-an-isolated-forest-carnivor

Large, high-severity wildfires have the potential to negatively impact isolated populations of fisher (*Martes pennanti*) in the southern Sierra Nevada, which are associated with dense, structurally complex forests. Two independent 2011 studies published by Thompson and others and Scheller and others suggest that the indirect, positive effects of fuel treatments on fisher habitat suitability and population size outweigh the negative effects of these treatments. This is because fuel treatments reduce the probability of large wildfires that can degrade and fragment habitat over larger areas, despite the short-term impacts of fuel treatments on habitat quality.

Collectively, the authors used landscape-scale habitat selection, forest succession, and metapopulation models to evaluate the effect of fuels treatments and wildfire on fisher habitat suitability and population size in the southern Sierra Nevada. In both studies, researchers found

Management Implications

- Models of fisher habitat selection and metapopulation dynamics in the southern Sierra Nevada suggest the negative effects of fuel treatments on fisher habitat suitability and population size are generally smaller than the long-term positive effects of fuel treatments that reduce wildfire risk and severity.

- Under a "no action, no fire" scenario, fire-adapted landscapes remained similar to reference conditions for approximately 30 years until forest succession resulted in a loss of landscape heterogeneity.

- The modeled benefits of fuel treatments were greatest in higher quality fisher habitat and at higher elevations.

Populations of fisher (*Martes pennanti*) in the southern Sierra Nevada are at risk to large, stand-replacing wildfires that can reduce and fragment suitable habitat across forest landscapes. *Image Credit: Zane Miller, PSW.*

that properly designed fuel treatments were effective at reducing the probability of long-term impacts to fisher habitat quality and, in the case of Scheller and others, fisher population size.

Thompson and others found that although fuel treatments resulted in the reduction of certain forest elements below those found in female fisher home ranges (e.g., reduced canopy cover and density of moderate diameter trees), these reductions resulted in little overall change in fisher habitat suitability. In addition, modeled wildfire resulted in divergence from reference conditions (i.e., direct negative effects to habitat quality) that was four times greater in untreated versus the fuel-treated landscape, and the untreated landscape did not recover from the effects of wildfire after several decades.

Scheller and others found that the modeled benefits of fuel treatments under the baseline wildfire scenario were greatest within higher quality fisher habitat, although under an amplified fire regime, fuel treatments in low-quality fisher habitat also benefited fishers. The modeled benefits of treatments were also greater at higher elevations (6950–7550 feet), but this result was inconsistent with previous studies suggesting that fuel treatments were most effective within mid-elevation forests of the Sierra Nevada. Moreover, the largest net benefit of fuel treatments occurred when a more severe fire regime was simulated. The authors point out that there was large uncertainty in model projections due to stochastic (i.e. randomly determined) factors associated with wildfires and fisher population dynamics.

Collectively, these studies suggest that fisher populations in the southern Sierra Nevada would benefit from: [1] strategically-placed fuel treatments that identify and maintain, or restore, habitat features that are important for fisher populations (e.g., large oaks with cavities, large logs), [2] the application of wildland fire (e.g., managed wildfire) at the landscape-scale to help protect fisher habitat from large, stand-replacing fires, and [3] landscape-scale analysis of fisher habitat coupled with carefully-defined reference conditions (e.g., natural range of variation, habitat suitability) to facilitate understanding of the long-term risks to fisher populations.

Suggestions for further reading:

Lawler, J. J., H. D. Safford, and E. H. Girvetz. 2011. Martens and fishers in a changing climate. Pp. 371–397, in K. B. Aubry (ed). Biology and Conservation of Martens, Sables, and Fishers: a New Synthesis. Cornell University Press, Ithaca, NY.

Purcell, K. L., C.M. Thompson, and W.J. Zielinski. 2012. Fisher and American martens. Pages 47–60 in: North, M. (editor), Managing Sierra Nevada forests. U.S. Department of Agriculture Forest Service, Pacific Southwest Research Station General Technical Report PSW-GTR-237. Albany, CA.

Purcell, K.L., A.K. Mazzoni, S. Mori, and B. Boroski. 2009. Resting structures and resting habitat of fishers in the southern Sierra Nevada, CA. Forest Ecology and Management. 258: 2696–2706.

Spencer W.D., H. Rustigian-Romsos, J. Strittholt, R.M. Scheller, W. Zielinski, and R. Truex. 2011. Using occupancy and population models to assess habitat conservation opportunities for an isolated carnivore population. Biological Conservation 144:788–803.

Syphard A.D., R.M. Scheller, B.C. Ward, W.D. Spencer, and J.R. Strittholt. 2011. Simulating landscape-scale effects of fuels treatments in the Sierra Nevada, California. International Journal of Wildland Fire 20:364–383.

Underwood, E.C., J.H. Viers, J.F. Quinn, J.F., and M. North. 2010. Using topography to meet wildlife and fuels treatment objectives in fire-suppressed landscapes. Environmental Management. 46:809–819.

Zielinski, W.J., A. Gray, J.R. Dunk, C. Keyser, J. Sherlock, and G. Dixon. 2010. Using Forest Inventory and Analysis (FIA) data and the Forest Vegetation Simulator (FVS) to predict wildlife habitat suitability: resting habitat for the fisher (*Martes pennanti*). U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station General Technical Report PSW-GTR-232. Albany, CA.