USDA Forest Service
U.S. DEPARTMENT OF AGRICULTURE

Rocky Mountain Research Station | February 2026

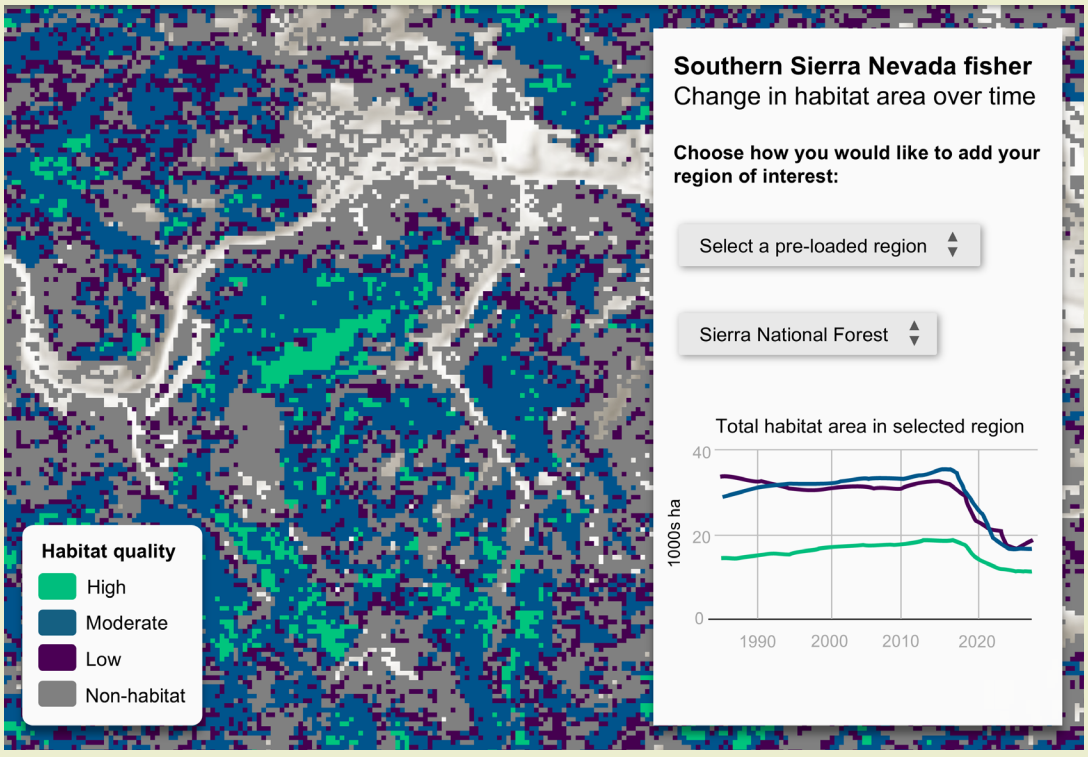
Science You Can Use *Tool*

It's Alive! "Living Maps" offer a state-of-the-art wildlife habitat monitoring system

Until recently, wildlife habitat maps were static documents that can quickly become outdated anytime landscape conditions changed due to disturbances like wildfire, drought, and timber harvest. But now, researchers at the Rocky Mountain Research Station and their collaborators have developed an approach for producing near-real-time wildlife habitat maps using Google Earth Engine. These products are called Living Maps because of their ability to stay up to date—incorporating new input data and remaining accurate over time—thus functioning like an automated wildlife habitat monitoring system.

For land managers, the interactive online applications that comprise Living Maps offer current information on the distribution and quality of wildlife habitat for species of interest, as well as the ability to generate report-ready summaries of habitat trends over time. For researchers, they provide a long-term time series of spatial data that can be used to analyze the effects of landscape-level disturbances on wildlife habitat.

Living Maps are built from robust animal-location datasets, using data from demographic studies, species recovery planning efforts, surveys, monitoring, and opportunistic observations. According to Gavin Jones, lead researcher on the project, "Our goal is to produce wildlife habitat maps that



Land managers and members of the public can interact with Living Maps using an interactive online interface where they can toggle through different visualization options to look at habitat quality and post-fire habitat changes across years. USDA Forest Service figure by G. Jones.

always reflect current conditions on the ground so that managers are never working with outdated information as they plan forest management activities." Currently, Living Maps are available for the Mexican spotted owl (currently in beta testing) and the southern Sierra Nevada fisher. The research team is developing Living Maps for additional species, including martens, Canada lynx, and fishers in the northern Rockies, pinyon jays in the Southwest, and barred owls in the Pacific Northwest.

The location data, often numbering in the hundreds or thousands of points, are run through a quality-control filter, and the highest quality data are used to build the maps. Potential high-quality habitat is then identified by linking these animal locations to a suite of environmental geospatial layers, typically including topographic, climatic, and vegetation information. The maps rely heavily on satellite-derived vegetation data, coupled with change-detection algorithms that detect subtle changes in vegetation characteristics over long time periods.

Finally, Living Maps use machine-learning algorithms to associate different environmental characteristics with animal locations and predict where on the landscape animals are most likely to be found. The maps can also be used to assess habitat change across space and time. Using Google Earth Engine and archival satellite data, managers can evaluate long-term trends in wildlife habitat from the mid-1980s to the present, helping them understand how habitat has changed over time across a species' range and plan how to conserve the highest-priority areas for the future.

Lead Scientist

Gavin Jones is a Research Ecologist with Rocky Mountain Research Station as well as an adjunct Assistant Professor in the Biology Department at the University of New Mexico.

Sue Miller is the author of this Science You Can Use Tool.

Management Considerations

- Living Maps provide near-real-time, continuously updated habitat maps using machine learning, satellite imagery, and quality-controlled animal location data, offering an up-to-date picture of wildlife habitat.
- Managers can track habitat changes over time from the 1980s to the present, enabling landscape-scale planning and identification of high-priority areas for conservation or restoration.
- These tools generate report-ready habitat summaries and spatial trends that can directly inform forest planning, species recovery efforts, and adaptive management strategies.

Living Maps are near-real-time wildlife habitat maps that stay up to date—incorporating new input data and remaining accurate over time—functioning like an automated wildlife habitat monitoring system. USDA Forest Service photo.

Further Reading

Jones, G.M.; Shirk, A.J.; Yang, Z.; [et al.]. 2022. Spatial and temporal dynamics of Mexican spotted owl habitat in the southwestern US. Landscape Ecology. 38: 23–37.

Shirk, A.J.; Jones, G.M.; Yang, Z.; [et al.]. 2022. Automated habitat monitoring systems linked to adaptive management: A new paradigm for species conservation in an era of rapid environmental change. Landscape Ecology. 38: 7-22.