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U.S. DEPARTMENT OF AGRICULTURE

Rocky Mountain Research Station Science You Can Use *(in 5 minutes)*

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Spoiler Alert: Mexican Spotted Owl Habitat Trends in the Southwestern United States

One fundamental question is driving Mexican spotted owl management research: What is happening to owl habitat?

Scientists with the USDA Forest Service's Rocky Mountain Research Station (RMRS) along with partners have developed a methodology for tracking long-term trends in Mexican spotted owl habitat in the southwestern United States. The project analyzed nearly 3,000 known owl nest and roost sites, data from the Forest Service's Forest Inventory and Analysis program, Landsat imagery going back to 1986, and regional climate and local topographic information to create predictive owl habitat models.

Those models were then extrapolated over the region using the computational power of Google Earth Engine. This work is already yielding important insights about long-term trends in owl habitat across the Southwest.

"Managers can be confident that they're looking for the right features when they're out surveying for potential Mexican spotted owl nest and roost habitat," RMRS research ecologist Chris Witt says. Owl nesting and roosting areas modeled in this analysis tended to

have the structural characteristics recommended in the 2012 Mexican Spotted Owl Recovery Plan: higher canopy cover and more large trees.

Project analysis also showed significant loss of owl nesting and roosting habitat over the past 35 years across the Southwest. Large, high-severity wildfires in the region account for a considerable portion of this loss, and the researchers' future studies will evaluate how other factors (such as drought, insects, or management activities) may have contributed to habitat changes.

The researchers say it isn't surprising that wildfires have reduced owl habitat since owls prefer mature, uneven-aged stands of mixed conifers for nesting and roosting, especially forest stands with a relatively closed canopy. Owl habitat also often includes standing dead and down woody material and the understory vegetation that can act as ladder fuels.

Research ecologist Gavin Jones and other RMRS colleagues, with support from Forest Service Region 3, are working to turn these efforts into what Jones calls an "automated habitat monitoring system." New data showing real-time changes in



Mexican spotted owl. Habitat trend analysis showing a significant decline in Mexican spotted owl nesting and roosting habitat over the past 35 years across the Southwest. USDA Forest Service photo by Rene Guaderrama.

habitat will be used to update the system annually.

"Often when people create these resource maps, it's kind of a one-and-done situation," says Jones. "Then 6 months later, there's a big drought, a series of wildfires, or management activities, and suddenly the map is outdated and no



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longer reflects current conditions. Part of the innovation with Google Earth Engine is we can automate these maps to update regularly with new information.”

Rene Guaderrama, staff district biologist on the Gila National Forest in New Mexico, says the habitat models can help managers improve owl survey efficiency. Jones and Guaderrama recently field-tested the habitat maps on the Gila National Forest, and they were surprised to see how well they match ground conditions.

“Ultimately what we’re trying to find is where owls are nesting,” says Guaderrama. “We want to focus our management efforts on those areas to reduce the potential for stand-replacing fire that affects those sites. These models can help us efficiently survey large areas, so we can find these areas and manage them better.”

Further Reading

Witt, W.C. et al. [Linking robust spatiotemporal datasets to assess and monitor habitat attributes of an endangered species](#). PLoS ONE.

Jones, G.M. et al. [Spatial and temporal dynamics of Mexican spotted owl habitat in the southwestern US](#). Landscape Ecology.

Shirk, A.J. et al. [Automated habitat monitoring systems linked to adaptive management: A new paradigm for species conservation in an era of rapid environmental change](#). Landscape Ecology.

Scientists and Managers

Gavin Jones is a research ecologist in the Wildlife and Terrestrial Ecosystems program, USDA Forest Service, Rocky Mountain Research Station in Albuquerque, NM.

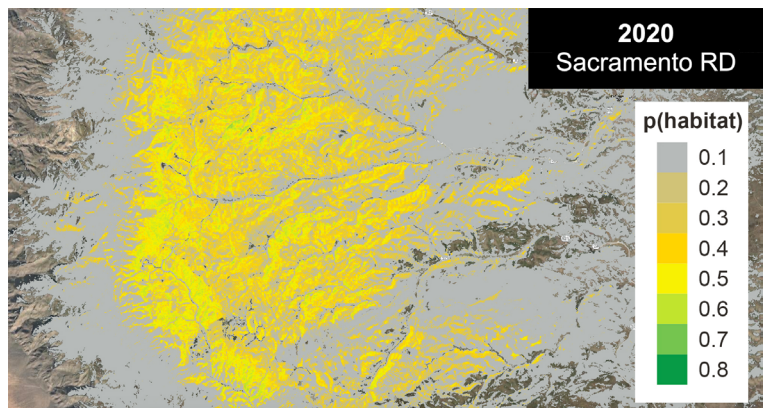
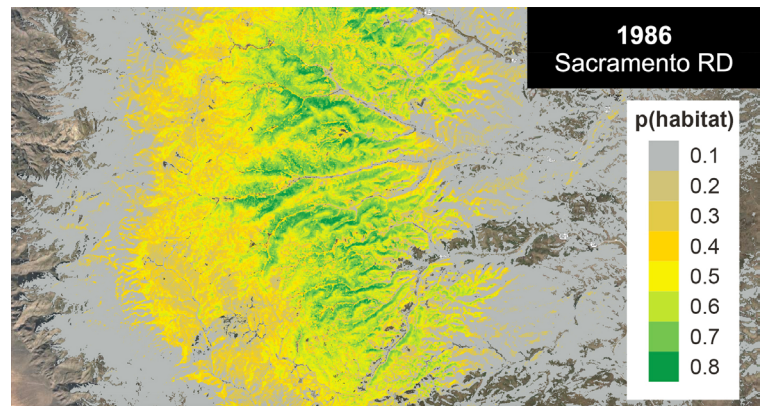
Chris Witt is an ecologist in the Forest Inventory and Analysis program, USDA Forest Service, Rocky Mountain Research Station in Ogden, Utah.

Rene Guaderrama is a staff biologist on the Black Range Ranger District of the Gila National Forest in New Mexico.

Maps showing change in Mexican spotted owl habitat suitability on the Sacramento Ranger District of the Lincoln National Forest in southern New Mexico between 1986 and 2020. Darker green areas represent areas of higher habitat suitability. Note that the map displays probable areas where this habitat could occur.

Key Findings

- RMRS researchers developed a methodology using large, existing datasets and cloud computing technology to assess and monitor trends in potential Mexican spotted owl nesting and roosting cover type and habitat across the Southwest.
- Trend analysis indicated a 38 percent decrease in areas with forest structure that owls use for nesting and roosting over the previous 35 years. When the researchers added topography and climate into the analysis, they estimated a 21 percent loss in habitat overall since 1986. Part of this loss can be attributed to large catastrophic wildfires in the region during that period.
- Mexican spotted owls choose nest and roost sites based on forest structural features that are very similar or identical to those identified in the Mexican Spotted Owl Recovery Plan.
- The Google Earth Engine app “[living maps](#)” of Mexican spotted owl habitat can be used to support adaptive management. The methods used to produce these models can also be used to assess and monitor spotted owl subspecies elsewhere along with other forest species.



The Rocky Mountain Research Station is one of seven units within USDA Forest Service Research & Development. RMRS maintains 14 field laboratories throughout a 12-state geography encompassing parts of the Great Basin, Southwest, Rocky Mountains, and the Great Plains. While anchored in the geography of the West, our research is global in scale. RMRS also administers and conducts research on 14 experimental forests, ranges and watersheds and maintains long-term research databases for these areas. Our science improves lives and landscapes. More information about Forest Service research in the Rocky Mountain Region can be found here: <https://www.fs.usda.gov/rmrs/>.

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