



Northwest Forest Plan Interagency Regional Monitoring Program

A New Way of Monitoring Northern Spotted Owl Populations

Raymond Davis and Damon Lesmeister – 12/16/20

Northern spotted owl populations have been monitored under the Northwest Forest Plan (NWFP) Effectiveness Monitoring Program for the last quarter-century using mark-and-recapture methods. Owl territories have been surveyed annually in 8 federal demographic study areas and meta-analyses conducted every 5 years.

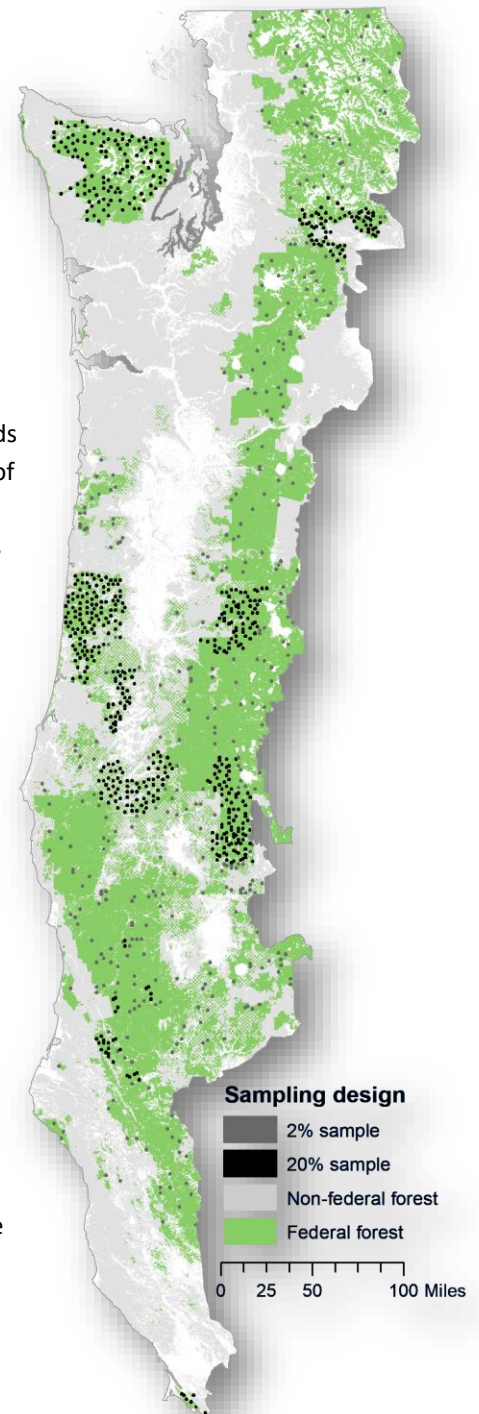
From its onset, population monitoring was designed to occur in 2 phases. Phase I continued the existing demographic studies scattered throughout the owl's range that preceded the NWFP. As such, demographic parameters were used as monitoring indicators. The plan was to transition to a Phase II which would rely on a predictive modeling approach informed by habitat monitoring. Under this approach, population size and distribution become the monitoring indicators.

Barred owls have complicated the relationship between spotted owl population trends and habitat, which requires that Phase II monitoring also include annual survey data of spotted and barred owls, in addition to the ongoing habitat monitoring. With recent technological and analytical advancements, passive bioacoustics monitoring methods have proven effective for detecting both species.

A phased transition from demographic studies (Phase I) to passive bioacoustics (Phase II) will occur over the next 2 field seasons with a full transition complete by 2023. A 2-year overlap of demography with passive bioacoustics will be conducted on federal demographic study areas. Some study areas already have 2 years of overlap, so on those study areas demography will be discontinued and only bioacoustics will be used moving forward. Starting in 2023, demography studies will be totally phased out and a 20% random sample using passive bioacoustics will be conducted on all study areas with an additional 2% random sample of all federal forest lands throughout the NWFP area.

This new passive bioacoustics monitoring design has been rigorously tested in the field and thru computer population simulations to ensure it provides a statistically valid monitoring method that will detect changes in distribution and populations at both the physiographic province as well as the rangewide scale.

Multiple federal, state, and private entities have relied on annual monitoring survey data to support their project work. The monitoring program is committed to continue working with our partners to provide annual information on spotted owl, as well as barred owl use. Annual monitoring reports and periodic modeled population trend predictions and publications will occur in similar fashion to current program. Parallel efforts are underway to develop a passive bioacoustic survey protocol for pre-project clearance that fits into the broader monitoring framework.



Advantages to this new monitoring approach include:

- Better spatial coverage of federal lands within the owl's range thus better geographic inferences
- Monitoring both spotted owls and barred owls, as well as multiple other vocal wildlife species
- Less invasive for spotted owls (no call-back surveys, "mousing", or handling of owls)
- Safer to field crews (working in 2-person teams and no night work)
- More cost-effective
- Pre-project surveys will provide supplemental information in support of regional monitoring
- Monitoring, in turn, will provide information, maps, and annual reports to support project work

For more information, contact Raymond Davis, Northern Spotted Owl monitoring lead - raymond.davis@usda.gov or Damon Lesmeister, Research Wildlife Biologist – damon.lesmeister@usda.gov

Reading material:

Lesmeister, D. B., R. J. Davis, L. S. Duchac, and Z. J. Ruff. 2019. Research update on using passive acoustics to monitor northern spotted owl populations in Washington and Oregon. 2018 annual research report. USDA Forest Service, Pacific Northwest Research Station. Corvallis, OR. 21 p. (unpublished report available upon request)

Duchac, L. S., D. B. Lesmeister, K. M. Dugger, Z. J. Ruff, and R. J. Davis. 2020. Passive acoustic monitoring effectively detects northern spotted owls and barred owls over a range of forest conditions. *The Condor* 122:1–22.

Howell, B. L., D. B. Lesmeister, and S. A. Gremel. 2020. A sound alternative: Using bioacoustics to study northern spotted owls. *The Wildlife Professional* 14(5): 42–45.

Ruff, Z. J., D. B. Lesmeister, L. S. Duchac, B. K. Padmaraju, and C. M. Sullivan. 2020. Automatic identification of avian vocalizations with deep convolutional neural networks. *Remote Sensing in Ecology and Conservation* 6(1):79-92.

Ruff, Z. J., D. B. Lesmeister, C. L. Appel, and C. M. Sullivan. 2020. A convolutional neural network and R-Shiny App for automated identification and classification of animal sounds. *bioRxiv* 2020.07.15.204685; doi: <https://doi.org/10.1101/2020.07.15.204685>

Lesmeister, D. B., C. L. Appel, R. J. Davis, C. B. Yackulic, and Z. J. Ruff. *In Press*. Simulating the effort necessary to detect changes in northern spotted owl (*Strix occidentalis caurina*) populations using passive acoustic monitoring. Res. Pap. PNW-RP-XXX. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. XX p. (current draft available upon request)