Northwest Forest Plan (NWFP) Interagency Regional Monitoring, 15 Year Report
Status and Trend of Northern Spotted Owl Populations and Habitat

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Background and New Science

***Objective**:* Northern spotted owl monitoring is designed to evaluate the success of NWFP in arresting the downward trends in spotted owl populations and habitats that were observed prior to its implementation. Specific objectives include, (1) assessing changes in population trends and demographic rates of spotted owls on federal lands within the owl's range, and (2) assessing changes in the amount and distribution of spotted owl habitats on federal lands.

***Methods**:* We are still in "phase I" monitoring, which is based on demographic surveys of territorial owl populations on eight federal study areas scattered across the owl's range while also tracking rangewide habitat conditions. Implementation of "phase II" monitoring focuses on demographic surveys on four federal study areas, supplemented by habitat monitoring, but depends on our ability to relate owl demography to habitat conditions, such that we can correlate habitat status and trends directly to population status and trends with acceptable confidence. To date, attempts to do so have produced mixed results; however, progress is occurring including results from the latest meta-analysis.

To monitor habitat we applied habitat suitability models to remotely-sensed and field-collected map data on vegetation and physical conditions to estimate the amount and distribution of nesting/roosting habitat during the 1994-1996 baseline, using 4 habitat suitability classes. We applied the baseline habitat model to the 2006-2007 "bookend" map data to estimate net change as the balance between losses and gains of suitable habitat. We then used forest disturbance data provided by LandTrendr to refine the estimates of habitat loss as determined by the bookends analysis, and to identify likely causes of habitat loss.

***New science**:* We used newly-available MaxEnt habitat suitability modeling software to estimate the amount and distribution of nesting/roosting habitat. Both published literature and tests conducted in collaboration with the marbled murrelet monitoring module indicated that MaxEnt outperformed other modeling approaches, including the BioMapper model used in the 10-year report. Also new were Gradient Nearest Neighbor (GNN) map data on forest composition and structure characteristics, and LandTrendr data on location and causes of habitat loss. These improvements in remote sensed data and advances in habitat "niche" modeling have improved our ability to better (and consistently) map the habitats that spotted owls use for nesting, roosting and dispersal across the entire NWFP monitoring area. This modeling approach has also allowed us to map "suitable habitat" for large wildfires. The overlap of owl habitat and wildfire suitability maps has provided new insights into how this natural disturbance fits within the owl's range.

Key Results

Population monitoring:

- During 1985-2008, annual rates of population change were declining on 6 of 9 study areas[1] with federal lands administered under the NWFP, with rates on the other 3 areas currently stationary.
- The average annual rate of population decline during 1985-2008 was 2.8 percent for the 8 NWFP monitoring areas, with populations in Washington exhibiting the greatest declines.
- There is now some evidence that increasing numbers of barred owls and decreasing amounts of nesting/roosting habitat have contributed to demographic declines in spotted owls, but large amounts of variation in demographic rates remain unexplained.

Habitat monitoring:

[1] There are 8 federal study areas. The Mt. Rainier study area is an independently operated study area, and included as the ninth study area in our analysis due to the amount of federal lands contained within its boundary.

- Nesting/roosting habitat on federal lands decreased by 3.4 percent, which is less than estimated at onset of plan implementation.
- The main cause for habitat loss is wildfire. Timber harvesting on federal lands accounts for less than one percent of all habitat loss. Nesting/roosting habitat loss is occurring at a faster rate in reserved land allocations than nonreserved allocations.
- Dispersal habitat is beginning to recover with a 5.2 percent net gain in spite of large losses from wildfires. However, a new dispersal analysis indicates a net decrease of 1 percent in terms of "dispersal-capable" landscapes, and that some large reserves occur in landscapes that are in poor dispersal conditions.
- On federal lands, approximately 30 percent of the 8.6 million ac of remaining nesting/roosting habitat is in landscapes we consider "fire-prone." The majority is in reserved status. Large wildfires are expected to remain the leading cause of habitat loss.

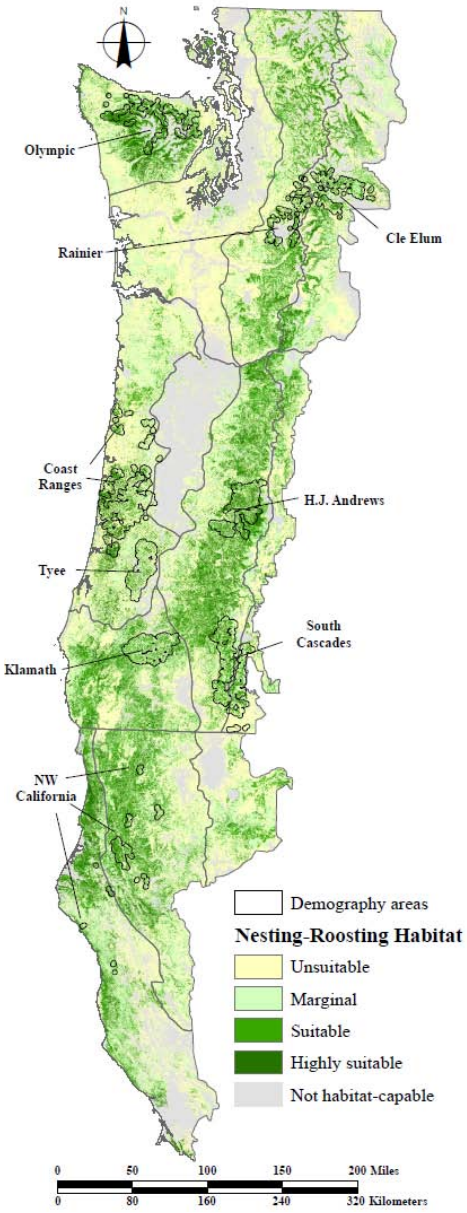

Figure 1. Rangewide map of northern spotted owl nesting/roosting habitat (2006/07) on all land ownerships.

Next Steps and Recommendations

We recommend the continued exploration of methods to implement phase II monitoring using these new maps. In particular, with these new habitat maps and GNN/LandTrendr data, we now have the capacity to undertake a meta-analysis (incorporating all 8 demography study areas) to investigate the relationship between owl demography and habitat characteristics and/or disturbances across the owl's range. Other recommendations for improving future monitoring include:

- Research and monitoring on the effects of fire and commercial and non-commercial thinning to reduce fire risks on spotted owls and their prey
- Examine options for evaluating the potential competitive effects of barred owls
- Further refinement of the "baseline" habitat map using 1994 imagery for **entire** range
- Refine methods for improving vegetation mapping that utilize GNN and LandTrendr data
- Explore the use of LiDAR to improve our ability to monitoring forest succession in its later stages and habitats that are used for nesting and roosting

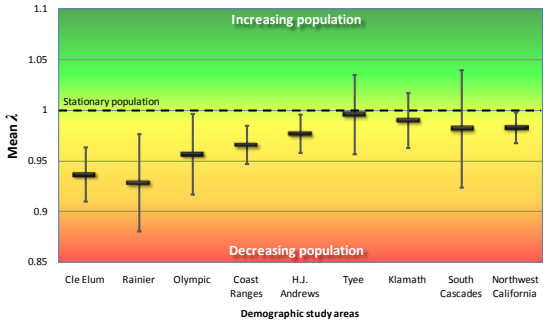

Figure 3. Estimates of mean annual rate of population change (λ), with 95-percent confidence intervals, for nine demographic study areas that contain federal lands.

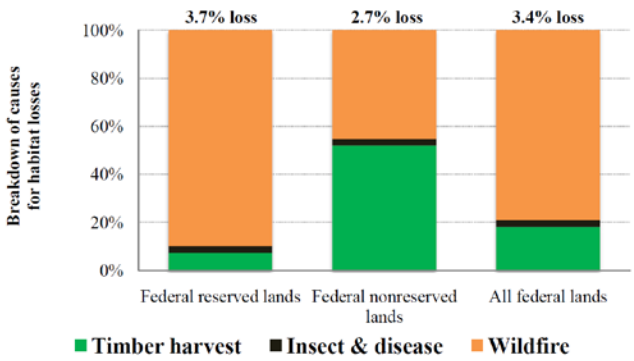

Figure 2. Estimated nesting/roosting habitat rangewide losses by cause for federally administered lands.