



# Northwest Forest Plan Interagency Regional Monitoring Program

## Status and Trend of Northern Spotted Owl Populations—25 Year Monitoring Report

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### Objective

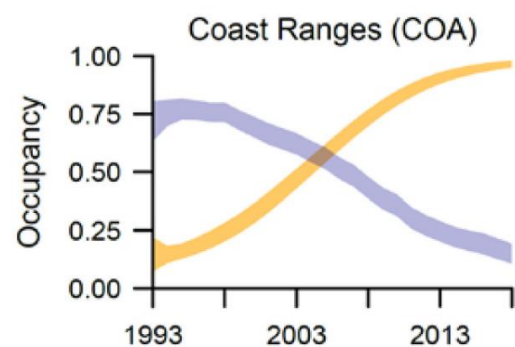
To periodically monitor (every 5 years) the effectiveness of the Northwest Forest Plan (NWFP) in arresting the downward trends in northern spotted owl (NSO) populations on federally managed forest lands since the Plan's implementation in 1994.

### Methods and New Science

We conducted annual capture-recapture demographic surveys of historic NSO territories on 8 federal study areas (1993–2018). We partnered with 3 other long-term study areas to conduct a range-wide prospective meta-analysis of population trends using 26 years of data. The analyses focused on demographic rates by evaluating: (1) trends in survival, reproduction, recruitment, rates of population change, and occupancy dynamics; and (2) the influence of environmental factors such as amount of habitat, habitat disturbances (e.g., fire and timber harvest), presence of barred owls (BO), and climate on these rates. Due to increasing complexity of the data sets and analytical procedures, a formal 3-day meta-analysis workshop was held in Corvallis, Oregon (early January, 2020) to gather leading scientists in the fields of population ecology and biostatistics to develop the analytical approach and protocols. Analyses were then formally delegated to working groups that analyzed data outside of the workshop. Data from individual study areas were not analyzed separately to reduce the complexity of the meta-analysis considerably and to be more in keeping with definition of a meta-analysis. This resulted in a streamlined meta-analysis process that was successfully conducted remotely (post January 2020 workshop) during the Covid-19 pandemic period that arose shortly after the workshop.

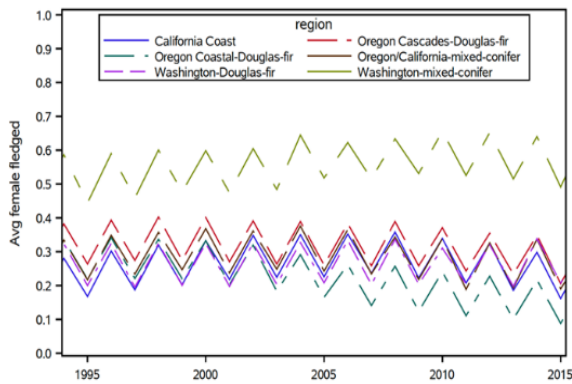
### Key Results

Our analyses indicated that the BO was the primary factor negatively affecting NSO life history traits and rates of population change. NSO populations potentially face extirpations if the negative effects of BO are not ameliorated while maintaining NSO habitat across its range. Significant population declines of 6–9% annually were observed on 6 study areas and 2–5% on 5 study areas (3–5% per year in CA). Less than 35% of the 1995 population remained on 7 study areas. Occupancy modeling corroborated the capture-recapture analyses with BO presence increasing territorial extinction and decreasing colonization of NSO. The negative effects of BO on NSO were reduced but not reversed with increasing area of habitat at the territory scale.

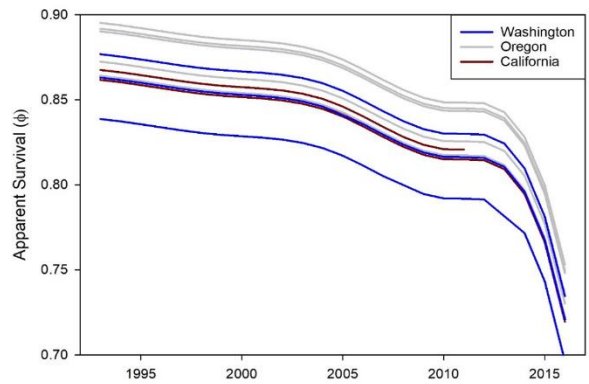


*Trends in territory occupancy for northern spotted owl pairs (blue-shaded curve) and barred owls (gold-shaded curve) within the Oregon Coast Range demographic study area.*

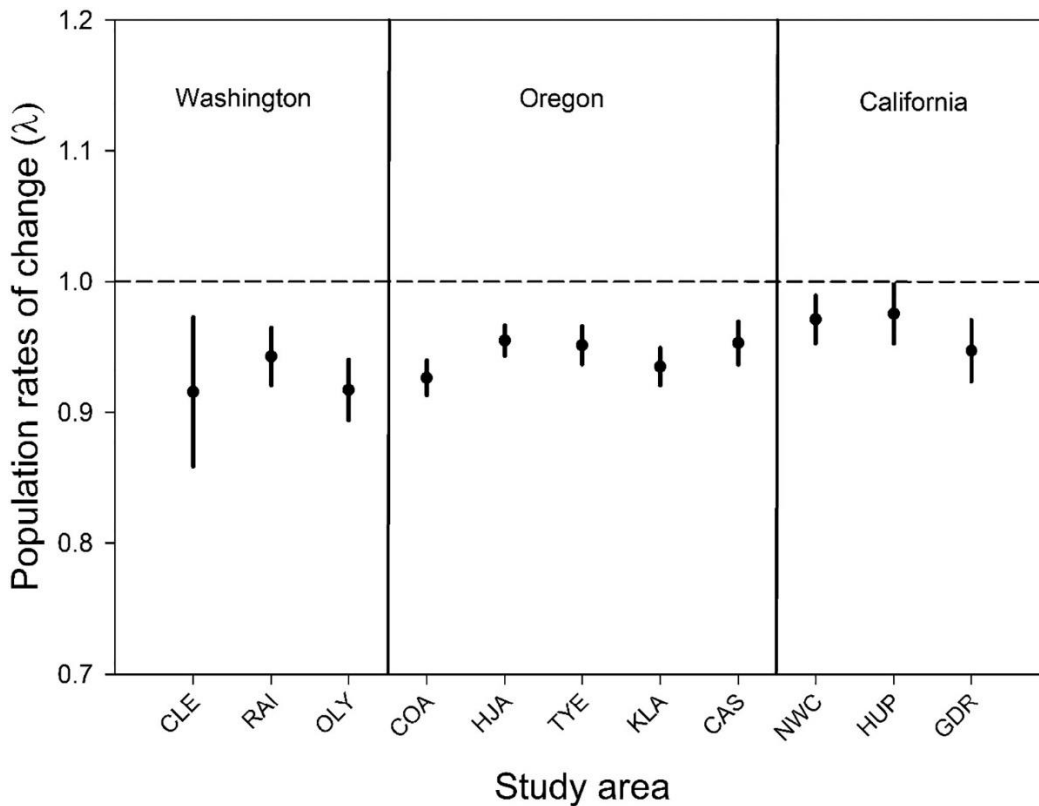




**Fecundity, based on the average number of female owls fledged each year, shows an even/odd year trend that has been mostly declining since about 2005.**



**Annual survival rates have been declining since 1993 with a noticeable steep decline since 2012.**



**Estimates of geometric mean rates of population change ( $\lambda$ ) and approximate 95% confidence intervals for northern spotted owls on 11 study areas in Washington, Oregon, and California. Means were estimated from 1995–2017 for all study areas except for the HUP study area, which included only data from 1995–2012.**

### Management Implications and Next steps

Barred owls are a primary factor negatively affecting NSO life history traits and ultimately these population trends. Without removal or reduction of BO populations, it is conceivable that NSOs will become extirpated from portions of their range or possibly linger on as small isolated populations that would be at higher risk of extirpations from large catastrophic events, as exemplified by the 2020 wildfires. Maintenance and restoration of NSO habitat can dampen NSO extinction rates and supports NSO colonization. Looming threats from large wildfires and climate change are important factors to consider in future NSO conservation and recovery efforts, especially with reduced NSO populations.