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Comment

More-Comprehensive Recovery Actions for Northern Spotted Owls in Dry Forests: Reply to Spies et al.

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Introduction

Spies et al. (2009) defend the fire-risk assessment in the recovery plan (USDI 2008) for the Northern Spotted Owl (NSO; *Strix occidentalis caurina*), but the recovery plan was recently withdrawn by the U.S. Fish & Wildlife Service due to scientific inadequacy cited in peer reviews. Spies et al.'s concerns do not change the findings in Hanson et al. (2009). Spies et al.'s "Implications for Conservation Planning" section, like the recovery plan, is based on uncorrected anecdotal and incomplete fire data, omits old-forest recruitment, and incorrectly assumes high-severity fire represents habitat loss for the NSO. The current low fire risk does not warrant the fuel-treatment focus of the recovery plan or of Spies et al. We suggest more-comprehensive recovery actions for NSO in dry forests.

Accuracy of Fire-Risk Estimates

Spies et al. do not use or improve on our fire-risk estimates. The recovery plan estimates high-severity fire rotation in old forest in one province as 69 years on the basis of an anecdotal estimate that 10,000 ha of old forest burned at high severity in the 2003 B&B fire (Spies et al. 2006). The plan extrapolates this 69-year figure across all three dry eastern Cascades provinces. However, we showed that high-severity fire in old forest in the B&B fire burned 838 ha, not 10,000 ha, and that high-severity fire rotations in dry forests of the eastern Cascades were not 69 years, but 372–4545 years, which suggests low fire risk (Hanson et al. 2009). Spies et al. agree with us that the recovery-plan estimate "was based on anecdotal information" and our estimates "may be more accurate," but our more accurate fire-risk estimates, or revised ones of their own, were not used by Spies et al. They assume fire risk is high just as in the recovery plan's flawed estimates. In addition, Spies et al. mention concerns about our recruitment estimates for older forests, but they do not revise our estimates and omit recruitment completely, as does the recovery plan. Finally, the recovery plan equates high-severity fire with habitat loss, which is incorrect (Hanson et al. 2009). Recent evidence documents Spotted Owls preferentially foraging in areas where stand-replacement fires have occurred (except when logged), probably because of higher prey abundance after fire (Clark 2007; Bond et al. 2009). Spies et al. do not use this information in their analysis. Thus, Spies et al. make suggestions regarding old-forest recruitment, but do not follow them, and do not use the best available science to evaluate fire effects to NSO habitat. Instead, they base their "Implications for Conservation Planning" section on the inaccurate fire-risk assessment in the now-withdrawn recovery plan.

Robustness of Central Findings in Hanson et al.

Data and methods will continue to improve, but our central findings are robust to the main concerns raised by Spies et al. They suggest that using a threshold of 574 RdNBR (relative delta normalized burn ratio) (we used 800) to detect high-severity fire in old forest would increase estimates of high-severity fire by 1.75 and 2.95 times in the California Klamath and California Cascades, respectively, compared with our estimates. Nevertheless, nearly complete overstory mortality (stand replacement)

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Table 1. Mean percent basal area (BA) mortality (SD) for relative delta normalized burn ratio (RdNBR) thresholds of 574 and 800 in Klamath and Sierra Nevada plots derived from raw data from Miller et al. (2009*a*).*

Region	*RdNBR*	*Mean% BA mortality (small trees included)*	*Mean% BA mortality (trees ≥30 cm dbh)*	*Mean% BA mortality (trees ≥50 cm dbh)*
Klamath	574 ± 100	60.9 (35.6), *n* = 18	51.8 (39.0), *n* = 16	48.1 (40.1), *n* = 16
Klamath	800 ± 100	75.8 (24.8), *n* = 18	67.9 (33.4), *n* = 16	58.9 (37.1), *n* = 13
Sierra Nevada	574 ± 50	60.9 (35.1), *n* = 67	51.0 (39.5), *n* = 58	41.1 (44.4), *n* = 43
Sierra Nevada	800 ± 50	83.4 (27.2), *n* = 69	76.0 (35.5), *n* = 65	60.2 (46.2), *n* = 41

**We obtained all the data from field plots on which Miller et al. was based from the author, Jay Miller, for this analysis. For the calculation of percent basal area mortality of trees ≥30 cm and ≥50 cm dbh, respectively, plots were not included if they contained no trees equal to or larger than the specified minimum sizes. Also, we used a narrower range of RdNBR values for the Sierra Nevada plots, relative to the Klamath plots, because of the larger sample sizes of plots for the Sierra Nevada. The three columns pertaining to percent basal area mortality indicate the effect of including small trees and immature forest relative to focusing on mortality of mature and overstory trees.*

is the fire severity the recovery plan equates with NSO habitat loss, and the majority of mature trees will survive at a threshold of 574, according to Miller et al. (2009*a*) actual data (Table 1). In fact, mortality at our 800 threshold still falls short of stand replacement and therefore does not overestimate it (Table 1). In general, the concerns of Spies et al. about thresholds and recruitment are not important because ratios of old-forest recruitment to high-severity fire are so high (Table 1 in Hanson et al. 2009). For example, although the 574 threshold is too low, even if it were used, old-forest recruitment would still exceed high severity in old forest by 7–15 and 15–29 times in the two provinces. Our conclusion that fire risk to NSOs is greatly overestimated in the recovery plan appears robust. Spies et al. and the recovery plan overestimate fire risk to NSOs not because of minor differences in thresholds or recruitment estimates, but because they use anecdotal fire data extrapolated from one province to several, omit old-forest recruitment entirely, and treat high-severity fire as NSO habitat loss.

Refutation of Minor Criticisms

Spies et al. misread our methods, in which we made it clear that we defined our RdNBR threshold as 800. We referred the reader to Miller et al. (2009*a*) to provide context. Miller et al. (2009*a*) report that an RdNBR of 798 is the mean for 75–100% mortality. We agree that the accuracy of RdNBR data is of concern, but Spies et al.'s error analysis is not based on the stand-replacing fire that the recovery plan equated with NSO habitat loss. Our high-severity estimates for some provinces may be lower than in Moeur et al. (2005) and Healey et al. (2008) because these authors used different methods that do not quantify actual tree mortality and methods that are not linked to data (www.mtbs.gov) specific to fire and the RdNBR method. Healey et al. (2008) also include younger forests and privately managed forests.

Spies et al. do not dispute, but do not use, our central finding that the use of short-term data in trend analyses is unreliable. Nevertheless, several citations they use in their argument are misapplied. Westerling et al. (2006) did not investigate fire severity at all, and Healey et al. (2008) did not statistically test trends in their examinations of fire severity. Miller et al. (2009*b*) report a short-term increase in fire severity, but they use only 60% of available fire data, and their study area does not overlap with ours. Yes, the increase in postdisturbance logging in Healey et al. (2008) was on Yakama Nation land, not technically federal public land, but postdisturbance logging also has increased on U.S. public lands (USFS 2009).

Spies et al. said the most significant weakness in Hanson et al. (2009) was our "assumption" that recent fire history was the single motivation for the recovery plan's recommendations. We did not, however, call fire history the only motivation. In the introduction section of Hanson et al. (2009), we cited text from the recovery plan that says the recovery plan itself identifies fire risk as the primary reason for an overhaul of the Northwest Forest Plan. Spies et al. suggest other motivating factors they believe are warranted for the overhaul, but the only nonfire and fuel factors they mention are tree stress and mortality from pathogens and competition. These two factors are only briefly mentioned in the recovery plan, and no quantitative data are presented in the plan or by Spies et al.

Spies et al. say we "did not consider" climate change. We lacked space to review this complex literature and still do. Spies et al. cite only McKenzie et al. (2004), one study in a large body of literature, as evidence that "fire. . .is projected to increase significantly," but McKenzie et al. projected no such increase in California. A recent projection shows increases and decreases in the western United States, which highlights the substantial spatial variability of projected fire patterns (Krawchuk et al. 2009).

In their final paragraph, Spies et al. say there are studies we did not acknowledge about several aspects of NSOs in the eastern Cascades that support their fuel-treatment ideas. We omitted these studies because they were not relevant to our analysis of fire risk, but they also do not support fuel-treatment arguments. Results of the first two studies suggest that reducing forest canopy cover will likely have adverse consequences for NSO nesting habitat and one significant prey species. The third study is not about NSOs.

Management Implications for Spotted Owl Recovery

Spies et al.'s main concerns and minor criticisms do not change our finding that abandoning reserves and undertaking extensive fuel treatments, proposed in the recovery plan on up to 65–70% of dry forests in the eastern Cascades, is not needed from the standpoint of current risk of habitat loss to fire. Such widespread fuel treatments also are inconsistent with the adaptive-management framework that Spies et al. support. Learning, followed by revision, is central to adaptive management and cannot occur if extensive areas are dedicated to a treatment before impacts of that treatment are well understood. Specific research that applies small-scale adaptive management is first needed to understand the response of NSOs to natural processes (e.g., fire, insect outbreaks) and to science-based actions aimed at enhancing or restoring NSO habitat. Actions found to benefit NSOs can be scaled up for wider use, and natural processes that benefit NSOs can be managed appropriately, with ongoing adaptive management. Our findings show there is an ample time for these necessary steps to be taken.

Nevertheless, there are some potentially effective active and passive steps, for which there are likely to be "no regrets," that can be implemented safely now. For example, support is widespread for actively and passively restoring older forests that have been reduced by logging across most dry mixed-conifer landscapes. Active management might include intentionally restoring old-forest habitat elements, such as large snags and fallen logs, important to owls and their prey. Passive methods for restoring older forests might include formally designating and protecting these restoration areas and expanding late-successional reserves to fully encompass remaining nesting, foraging, and roosting habitat, including areas of dense, old firs among younger forests. Because postfire logging is associated with NSOs avoiding high-severity patches they otherwise select (Clark 2007), ending postfire logging in NSO habitat will aid NSO recovery.

Actively managing wildfires for resource benefit, rather than suppressing them, could help maintain and restore NSO habitat. Fire has been incorrectly perceived as a risk to NSO when in fact it may be a key source of habitat heterogeneity required by the NSO in parts of its range (Franklin et al. 2000). Recent analyses of early aerial photography shows that eastern Cascades forests were historically shaped by mixed-severity fires (Hessburg et al. 2007). The high-severity component of mixed-severity wildfires does reduce older forest, while it also creates early-successional postfire habitat and increases natural heterogeneity. This essential process is needed for long-term NSO viability and forest recruitment and likely poses little short-term risk because NSOs may benefit from severely burned forest for foraging. This habitat is currently generated at rates far below the rate of old-forest recruitment. Natural heterogeneity from mixed-severity fires may also offer some insurance against unexpected disturbance or severe effects of climatic change.

Human-caused fires and altered microclimates from landscape fragmentation by logging, roads, and developments also warrant active management in and around NSO habitat. Temporary closure of roads accessing NSO habitat may be necessary to reduce human-caused ignitions, especially during severe droughts. Human-created forest edges that are hotter, drier, and windier than interior forests, and thus favor ignition and rapid fire spread, can be redesigned to reduce ignition and spread. The land uses that created these edges can also be modified to avoid creating edges, or the land uses themselves can simply be reduced. Restricting human access, livestock, and heavy machinery near reserves can also reduce spread of fire-fostering invasive grasses (e.g., cheatgrass [*Bromus tectorum*]). Slash from fuel treatments and other management should be managed carefully. If large quantities of slash are generated across the landscape, efforts to rapidly treat slash could damage soils or facilitate invasive-grass expansion. Failure to promptly treat slash undermines the purpose of the initial fuel treatments.

We suggest small-scale adaptive management studies to understand owl response to treatments and natural processes, combined with immediate, but cautious, use of both active and passive methods focused on "no regrets" actions that address owl habitat needs first and foremost. To do otherwise could lead to increased, not decreased, risks to the NSO.

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