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Comment

Underestimating Risks to the Northern Spotted Owl in Fire-Prone Forests: Response to Hanson et al.

THOMAS A. SPIES,*ttt JAY D. MILLER, t JOSEPH B. BUCHANAN,# JOHN F. LEHMKUHL,§ JERRY F. FRANKLIN,** SEAN P. HEALEY,tt PAUL F. HESSBURG,§ HUGH D. SAFFORD,# WARREN B. COHEN,* REBECCA S.H. KENNEDY,* ERIC E. KNAPP,§§ JAMES K. AGEE,** AND MELINDA MOEUR***

*U.S. Department of Agriculture Forest Service, Pacific Northwest Research Station, 3200 Jefferson Way, Corvallis, OR 97331, U.S.A.
†U.S. Department of Agriculture Forest Service, Fire and Aviation Management, Pacific Southwest Region, McClellan CA 95652, U.S.A.
‡Washington Department of Fish and Wildlife, Wildlife Management Program, 600 Capitol Way North, Olympia, WA 98501, U.S.A.
§U.S. Department of Agriculture Forest Service, Pacific Northwest Research Station, 1133 N Western Avenue, Wenatchee, WA 98801, U.S.A.
**School of Forest Resources, University of Washington, Seattle, WA 98195, U.S.A.
††U.S. Department of Agriculture Forest Service, Rocky Mountain Research Station, 507 25th Street, Ogden UT 84401, U.S.A.
‡‡U.S. Department of Agriculture Forest Service, Pacific Southwest Region, Vallejo, CA 94592, U.S.A.
§§U.S. Department of Agriculture Forest Service, Pacific Southwest Research Station, Redding, CA 96002, U.S.A.
***U.S. Department of Agriculture Forest Service, Region 6, P.O. 3623, Portland, OR 97208, U.S.A.

Introduction

The development of conservation plans for Northern Spotted Owls (NSO) *(Strix occidentalis caurina)* in disturbance-prone landscapes requires evaluation of multiple threats and careful consideration of the consequences of management actions intended to reduce risk. Hanson et al. (2009) used downwardly revised estimates of recent old-forest losses to high-severity wildfire to argue that the recent NSO recovery plan (USDI 2008) overestimates fire risk to the NSO in dry; fire-prone forests. We believe their analysis is erroneous and deficient and does not support their conclusions. Furthermore, they show a bias against active management by ignoring recent science and risk factors in dry forests that do not support their opinions.

Change Detection and Fire Severity

Hanson et al. underestimated the area of high-severity fue because they incorrectly applied Miller's *(2009a)* method. Hanson et al. did not describe their calculation of the relative delta normalized burn ratio (RdNBR) threshold for mapping high-severity fire except for citing Miller et al. *(2009a)*. They falsely claim that Miller et al. *(2009a)* used a threshold of 798 RdNBR, the mean value for plots with >75% change in basal area sampled in the Sierra Nevada. Miller et al. *(2009a)* actually used a value of 574. This difference in threshold values can signillcantly reduce estimates of the area of high-severity fire. For example, use of a value of 574 results in 175% more high-severity fire from 1996 to 2005 in the California Klamath region and 295% more high-severity fire in the California Cascades than the estimates reported by Hanson et al.

Hanson et al. suggest their RdNBR 800 threshold is "less subject to misclassifcation error than a lower threshold would be"; however, this claim is false for two reasons. First, Hanson et al. cite a 42% commission error for California Klamath plots reported in Miller et al. *(2009a)*, but fail to consider that these errors cannot be extrapolated to the landscape because those plots were not randomly selected. Commission errors for randomly sampled plots in the Sierra Nevada averaged only 20% (Table 1). Second, one must always consider both omission and commission errors when evaluating map accuracy. When an assessment is balanced, the errors cancel out. In contrast, the

†††*email tspies@fs.fed.us*
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Table 1. Comparison of classification errors for percent change in basal area derived from RdNBR[a] = 574 threshold from Miller et al. (2009a) and RdNBR = 800 threshold from Hanson et al (2009).[b]

Data set and threshold	Omission error low (0-25%)	Omission error moderate (26-75%)	Omission error high (>75%)	Commission error low (0-25%)	Commission error moderate (26-75%)	Commission error high (>75%)	Total error (high, >75%)[c]	Total bias (%), type of bias	Number of plots
Sierra Nevada									
574	27	65	18	29	62	20	38	2, commission	893
800	27	49	43	29	67	9	52	34, omission	893
Klamath Mountains									
574	31	70	12	17	60	42	54	30, commission	87
800	31	19	56	17	51	15	71	41, omission	87

[a] *Relative delta normalized burn ratio.*
[b] *Errors calculated for plots reported in Miller et al. (2009a).*
[c] *High-severity fire, percent change in basal area.*

threshold chosen by Hanson et al. increases total misclassification rates for high-severity fire from 38% to 52% and 54% to 71% for the Sierra Nevada and the California Klamath, respectively, compared with the Miller et al. (2009a) threshold (Table 1). Moreover, it results in a net bias toward missing areas of high-severity fire (i.e., omission) for both regions.

Hanson et al. claim "high-severity percentages based on this threshold are similar to those used in a comprehensive analysis of western U.S. fires since 1984 ... (Schwind 2008)." Schwind (2008), however, only reported severity percentages for the total of all vegetation types. It is unreasonable therefore to compare the Schwind (2008) percentages with those estimated from old forests alone. Additionally, there have been no critical evaluations comparing monitoring-trends-in-burn-severity (MTBS) categorical data with data generated from setting thresholds in RdNBR. Thus, the claim by Hanson et al. that their threshold produces maps that match MTBS categorical data is unsupported.

The estimate in Hanson et al. of loss of old forest after 2002 fires in the eastern Cascades of Oregon may be more accurate than that of Spies et al. (2006), which was based on anecdotal information. Nevertheless, estimates of high-severity fire in the California and Oregon Klamath province made by Hanson et al. are considerably lower than values reported previously (Moeur et al. 2005; Healey et al. 2008), which were based on rigorous analysis of satellite imagery, and Hanson et al. did not discuss these differences.

Trends in Area of High-Severity Fire

Hanson et al. found an increasing trend in area of high-severity fire only in the Klamath provinces. That they did not find a similar trend in the Cascades may be a function of their use of a relatively short-time period that misses longer-term trends. They do not cite studies that show increases in fire occurrence or severity in the West (Westerling et al. 2006), in the dry provinces of the Northwest Forest Plan (NWFP) (USDA & USDI 1994; Healey et al. 2008; Table 2), or in the Sierra Nevada and southern Cascades (Miller et al. 2009b). Furthermore, Hanson et al. erroneously state that post disturbance salvage logging accounted for the main increase in old-forest harvests on public lands, citing Healey et al. (2008), who made no such statement.

Recruitment of Older Forest

Hanson et al.'s conclusion that losses to fire have been offset by recruitment must be qualified in several ways. First, the assumption that NSO habitat in these provinces is synonymous with forests with a mean diameter at breast height (dbh) of >50 cm is not true. Mean dbh, by itself, is not indicative of the variety of forest structures that NSOs are associated with. For example, many forests used by NSOs in eastern Washington are comparatively young (e.g., 60-130 years) (Buchanan et al. 1995) and have a mean dbh of <50 cm. Second, extrapolating a regional recruitment estimate of old forests (Moeur et al. (2005) to provinces (subregions) may not be appropriate. Third, the relatively large increase (19%) in recruitment of old forest over 10 years used in Hanson et al. may be a result of incremental growth from a bulge in the distribution of area of stands with an average diameter of 38-48 cm dbh (Fig. 26 in Moeur et al. 2005). This rate will

Table 2. Area (ha) of stand-replacement fire in older forest between 1972 and 2002 for forests in dry provinces of the Northwest Forest Plan in Oregon (OR) and Washington (WA).*

Period	E. Cascades OR	Klamath OR	E. Cascades WA	Total
1972–1982	119	94	187	400
1982–1992	124	11,289	1707	13,119
1992–2002	549	28,642	9027	38,218

**Data from Healey et al. (2008).*

likely decline in the future as the bulge moves into larger size classes and wildfire reduces the amount of forest in the smaller size classes that is available for recruitment. Fourth, reducing the risk of high-severity fire by thinning relatively small-diameter trees would actually increase mean dbh. Consequently, the risk-reduction strategy they criticize would actually increase old forest as they define it.

Implications for Conservation Planning

The most significant weakness in Hanson et al. is the assumption that recent fire history (rotations) estimated from a 100 year record (Moeur et al. 2005; Spies et al. 2006) is the single motivation for the eastern Cascades strategy in the recovery plan. Other crucial factors prompted the development of a new landscape approach. First, fire suppression in dry forests has resulted in a well-documented increased area of closed-canopy forest that has become suitable for NSOs due to the invasion of shade-tolerant conifers. Consequently, many stands that were relatively open are now closed with high accumulations of fuels that form contiguous patches, increasing the risk of large, high-intensity fires. Second, dense forests of Douglas-fir *(Pseudotsuga meneiesii)* and *Abies* spp. that function as NSO habitat (Buchanan et al. 1995) are subject to moisture stress and are at risk from insect and disease outbreaks. Third, under climatic change, which Hanson et al. did not consider, the incidence of fire in dry forest landscapes is projected to increase significantly (e.g., McKenzie et al. 2004). Fourth, recent research (e.g., Finney et al. 2007) indicates that treating at least 20-40% of a landscape over two decades would significantly reduce the intensity and growth of large fires compared with approaches with little treatment and no intentional landscape design. Fifth, many of the treated areas would be in stands dominated by ponderosa pine *(Pinus ponderosa)* rather than in stands dominated by Douglas-fir and *Abies* spp., which NSOs prefer.

Hanson et al. imply that the 1994 NWFP should remain the basis of the NSO recovery plan, apparently because they believe it will not allow widespread fuel treatment. The NWFP plan (p. B-7 USDA & USDI 1994), however, does recognize that active management is needed within late-successional reserves in dry forests, and underburning is recommended "across large areas," to reduce risk of high-severity fire. The NWFP provides an excellent foundation for a recovery plan; nevertheless, there are two reasons for modifying the NWFP in the dry eastern Cascades. First, given the threats to persistence of forest patches posed by climate change, fire, insects, and disease, more area is needed for NSO habitat in the dry provinces than in wet provinces, where fire frequency is lower. Yet, the percentage of late-successional reserves in dry provinces (28%) is lower than it is in the wet provinces (34%; Table III-5 in FEMAT 1993). Moreover, the percentage of older forest in all nonriparian reserves in the dry provinces (65%) is lower than in the wet provinces (74%; Fig. 21 in Moeur et al. 2005). Second, although thinning to reduce understories within late-successional reserves is allowed in these provinces under the NWFP the area treated is limited and lacks an intentional landscape design. Specific landscape-scale guidelines are not in the NWFP, but managers need scientifically based guidelines for conserving NSO habitat in fire-prone provinces.

An approach for management of dry forests that builds on the NWFP was proposed in the NSO recovery plan. Under this alternative, all dry-forest habitat on federal land would be incorporated in landscape-level plans that integrate management of NSO habitat, old trees, and restoration of ecologically desirable conditions. This approach also provides opportunities to rapidly restore NSO habitat when designated habitat is lost to the inevitable stand-replacement fires. The emphasis across the province would be on maintaining significant populations of mature and old forests and legacy trees and managing understories and surface fuels. Current and potential NSO habitat would be appropriately identified without considering whether it is in areas currently designated as matrix (where timber production is currently allowed) or late-successional reserves.

We agree with Hanson et al. that research and adaptive management programs, as detailed in the recover plan, are needed. Despite the lack of specific studies detailing the effects of fuel-reduction treatments on NSOs, there is a good body of knowledge for the eastern Cascades, unacknowledged by Hanson et al., on habitat selection of NSOs, prey habitat and demography, and thinning effects on stand structure and dynamics (e.g., Buchanan et al. 1995; Lehmkuhl et al. 2006; Dodson et al. 2008). Neither uncertainty nor mistrust of management should be used to prevent conservation action where the best available science indicates that such action can reduce overall risk. Instead, uncertainty should motivate careful action that when coupled with scientifically sound monitoring can promote learning and improve conservation outcomes.

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