Committee on Resources
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Testimony of Dr. Mark S. Boyce

Dr. Mark S. Boyce,
Vallier Chair of Ecology and Wisconsin Distinguished Professor
University of Wisconsin-Stevens Point
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Committee on Resources
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New Research and Adaptive Management of Pacific Northwest Forests

Madam Chair and members of the Subcommittee, I am honored to have the opportunity to present my thoughts on the importance of recent research on the northern spotted owl for the management of forests in the Pacific Northwest. My name is Mark S. Boyce. I received Masters and Ph.D. degrees from Yale University and had a NATO postdoctoral fellowship at Oxford University. I currently hold the position of Vallier Chair of Ecology and Wisconsin Distinguished Professor in the College of Natural Resources at the University of Wisconsin Stevens Point in the largest undergraduate natural resources program in the United States. I have recently completed a 3 -year tenure as editor-in-chief for the *Journal of Wildlife Management* which is The Wildlife Society" s research periodical. I serve as President of the Wisconsin Chapter of the Wildlife Society, and Vice President for Sciences of the Wisconsin Academy of Sciences, Arts and Letters.

I have published about 150 scientific papers and six books including *Ecosystem Management: Applications for Sustainable Forest and Wildlife Resources (I* 997, Yale University Press; with Alan Haney), *The Greater Yellowstone Ecosystem: Redefining America Is Wilderness Heritage (I* 99 1, Yale University Press; with Robert B. Keiter), and *The Jackson Elk Herd: Intensive Wildlife Management in North America (I* 989, Cambridge University Press). I have conducted research on spotted owls since 1987, when I was asked by the National Council for Air and Stream Improvement (NCASI) to review the USDA Forest Service's Draft Supplemental Environmental Impact Statement on the northern spotted owl. Subsequently I have studied spotted owls in Oregon and Washington with research funded primarily by the USDI Bureau of Land Management and NCASI. I am coauthor with Joseph S. Meyer and Larry L. Irwin on a peer-reviewed monograph on spotted owl habitat ecology that recently has been accepted for publication in *Wildlife Monographs,* and will appear in print this summer.

I wish to speak about some highlights of our research on spotted owls, and the ramifications of this research for management of forests in the Pacific Northwest. Despite the fact that our research speaks to important aspects of spotted owl habitats, I am concerned that our research will see little application because there exists so much inertia in the current forest management plan. Thus, a general issue that I wish to address is the importance of accommodating science in management, and how government must have the flexibility to

change when new scientific information becomes available.

As a population ecologist, I believe that I am well qualified to speak to the issue of management of the northern spotted owl because it was a population model for spotted owls that structured the design for management of the Pacific Northwest forests. The principles for this model were outlined initially by Russell Lande in 1987, and subsequently were expanded into computer simulation models used by the Interagency Scientific Committee (ISC) as well as President Clinton's Forest Ecosystem Management Assessment Team (FEMAT; see Lamberson et al. 1992. *Conservation Biology* 6:505-512; Noon & McKelvey 1996. *Annual Reviews of Ecology and Systematics27:135-162)*. These models predicted that isolated patches of habitat would be less likely to be occupied, and they predicted that forest edge had deleterious consequences for the owls. We designed our research to evaluate the underlying premise that dispersal by owls was key to determining the location of owl territories and how frequently these territories were actually occupied by owls. In addition, we designed research to evaluate the hypothesis that the location and juxtaposition of timber harvests resulting in forest fragmentation were shaping the distribution and habitat occupancy by spotted owls. Likewise, we studied how the extent of forest edges in an area influenced territory locations and site occupancy. But we found no evidence that isolation, edge, or fragmentation influence owl occupancy and distribution. Instead, our results indicated that the distribution and site use by spotted owls could be attributed entirely to habitat losses, primarily loss of old growth forests. And given the documented declines in old growth habitats, declines in the owl population could be attributed solely to loss of these habitats.

Our results are specific to southwestern Oregon where essentially the owl habitat has not been fragmented sufficiently for there to be any effect of landscape patterns on owl distribution and occupancy. If the landscape were substantially more fragmented and habitat patches were much more isolated than is presently the case, we cannot rule out the possibility that fragmentation might be a significant contributor to patterns of spotted owl distribution and site occupancy.

Another important result from our research is that in southwestern Oregon, some of the best spotted-owl habitat occurs when old growth is adjacent to young pole-timber stands. Research by Sakai and Noon (1993, *Journal of Wildlife Management* 57:373-382) indicates that our observation is attributable to the importance of dusky-footed woodrats that are produced at a higher frequency in young-aged stands. This would argue for the importance of having logging dispersed amongst owl habitat areas, in contrast with the large old-growth reserve concept, but so far this has not been found to be the case.

We developed new models focused on owl habitat called resource selection functions. These habitat-based models do an excellent job of predicting the observed distribution of owls and we believe that habitat models like ours should be used in evaluating what constitutes owl habitat in the Pacific Northwest. Furthermore, we believe that our habitat-based models could be used effectively to evaluate forest management alternatives.

Our results have vast implications for the management of the Pacific Northwest forests for spotted owls and timber production. First, the ability of the owls to disperse appears sufficient to ensure colonization of habitat patches given the scale at which the landscape is currently fragmented in southwestern Oregon. Therefore, our results lead us to question the justification for the strategy of managing for large blocks of old growth in Habitat Conservation Areas (HCAs). Indeed, our results lead to the hypothesis that a greater total population of spotted owls could be maintained on the landscape if smaller blocks (on the order of 1-2 square miles) of old growth were more widely dispersed across the landscape. This way we could maintain owls more broadly across the landscape supported by rodents emerging from shrublands and pole timber

stands. Perhaps the FEMAT approach to managing Pacific Northwest forests is optimal. But we do not know this, and we will never know if we do not evaluate it when presented with new information.

On the Olympic Peninsula, woodrats are not as important a component of the diet as in Oregon. Yet research on habitats of spotted owls from the Olympic Peninsula indicated that the habitat model that we derived for SW Oregon was about equally effective for Olympic Peninsula owls. Larry Irwin has found similar results on Plumb Creek lands on the east slope of the Cascades of Washington. Our habitat models for the northern spotted owl appear to have widespread application, i.e., they apply under a variety of habitat situations.

Our results are typical of science in general, i.e., we test hypotheses about how nature works. Research is designed to test hypotheses. When we reject the hypotheses we must revisit the hypotheses and develop new ones. This ponderous slow process by which science works ensures that we have reliable knowledge. But when science is applied to the management of natural resources, it also requires that we have the flexibility to alter management to take advantage of new information. This interface between science and management is called adaptive management. Scientists first develop a hypothesis about how we think the system works, often framed in a mathematical or computer model. Then we design management experiments that can test this hypothesis.

For example, we might hypothesize that selective cutting regimes could hasten the recovery of old growth characteristics. To evaluate such a hypothesis, we need to design selective harvesting experiments in areas where the consequences to spotted owls can be monitored and the result of the experiment evaluated.

This raises my primary concern about current forest management in the Pacific Northwest. Now that the plan developed by President Clinton's Forest Ecosystem Management Assessment Team (FEMAT) is largely in place, we seem to have little opportunity for changing the management plan. Furthermore, even though the FEMAT plan and the previous Interagency Scientific Committee (ISC) plan called for adaptive management, implementation of adaptive management has been slow in coming. In some instances the US Fish and Wildlife Service has not granted permission to perform experimental management on areas that were established for

the express purpose of conducting adaptive management, i.e., Adaptive Management Areas (AMAs). Certainly we can never evaluate the consequences of forest management if we do not continue to monitor spotted owl populations.

Madam Chair and members of the committee, I urge you to do what is necessary to ensure that the USDA Forest Service and the USDI Fish and Wildlife Service work together to ensure that adaptive management protocols are implemented on each and every adaptive management area that was set aside by FEMAT. Careftilly planned logging on these sites cannot threaten the persistence of the northern spotted owl on the short term. And on the long term, these experimental management exercises can only work to ensure the long-term viability of the owl. Without adherence to adaptive management protocols, we will never find creative solutions to the difficult forest management situation in the Pacific Northwest. Only through experimental management on AMAs and careful monitoring of owl populations can we expect to move out of the current management gridlock. I am convinced that scientific management can provide solutions so that we can have owls, old growth forests, logging, anadromous fisheries, and people in the forests of the Pacific Northwest.

Our current government contains institutional barriers to the implementation of adaptive management. I

believe that we can do a better job of scientific management. But overcoming these institutional barriers is an enormously complex task. Therefore I would like to encourage Congress to enlist the support of the National Research Council to design institutional mechanisms that would facilitate adaptive management.

Thank you for the opportunity to express my views.

INFLUENCE OF HABITAT ABUNDANCE AND FRAGMENTATION ON NORTHERN SPOTTED OWLS IN WESTERN OREGON

JOSEPH S. MEYER, Departrnent of Zoology and Physiology, University of Wyoming, Laramie, WY 82071-3166
LARRY L. IRWIN, National Council of the Paper Industry for Air and Stream Improvement, P.O. Box 68, Stevensville, MT 59870
MARK S. BOYCE, College of Natural Resources. University of Wisconsin, Stevens Point, WI 54481-3897

Abstract: Current management for the northern spotted owl (Strix occidentalis caurina) is largely driven by metapopulation models or individually-based models that assume the success of juvenile dispersal in a fragmented landscape is a primary factor determining the future existence of spotted owls in the Pacific Northwest. We tested hypotheses about fragmentation by comparing sites known to be occupied by spotted owls with random sites to determine if relationships existed between landscape indices and spotted owl presence and productivity in western Oregon.

From a total of 445 known spotted owl sites within the Bureau of Land Management's (BLM) checkerboard patterned lands in western Oregon, we randomly selected (1) 50 long-term data sites to determine if landscape characteristics influenced site occupancy or reproduction, (2) 50 random owl sites to evaluate possible biases in the long-term data sites, and (3) 50 random landscape locations for comparison with the 50 random owl sites.

BLM staff classified from aerial photographs the mosaic of forest successional stages within a 3.4-km-radius circle surrounding each of the 150 sites. From these mosaics, we calculated several indices of landscape characteristics and forest fragmentation for 0.8-, 1.6-, 2.4-, and 3.4-km radius circles. Results were combined with data on occupancy and reproduction to test the null hypotheses that landscape characteristics did not affect site location, site occupancy, or reproductive success of spotted owls.

Landscape indices did not differ between long-term owl sites and randomly selected owl sites, indicating little bias in our sample of long-term data sites. Landscape characteristics at random owl sites differed significantly from those at random landscape locations. Differences were greatest for 0.8-km-radius circles surrounding the study sites, suggesting that site selection by spotted owls may be most strongly affected by landscape characteristics within a 0.8-km-radius circle (<200 ha). Statistically significant differences also were found for radii up to 3.4 ktn, but most of those differences did not contribute significant new information beyond the differences existing in the core area of the circles.

Random owl sites contained more old-growth forest, larger average size of old-growth patches, and larger maximum size of old-growth patches than occurred in random landscape locations, for all circle radii (P < 0.0 1). Additionally, random owl sites contained less young-age forest within 0.8-km-radius circles than did random landscape locations. However, amount of clearcut forest did not differ between random owl sites and random landscape locations.

None of the forest fragmentation indices except size of old-growth patches was strongly related to site selection, none was strongly related to frequency of occupation of sites, and only fractal dimension was moderately related to reproduction. Instead, the major influences of landscape pattern were related to amount of habitat. Amount of habitat dominated in resource selection probability functions (RSPF) for western Oregon, and these RSPF's can be used to predict the probability that a given landscape mosaic will be a suitable spotted owl site.

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