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6 July 2012

Public Comments Processing
Attn: FWS–R1–ES–2011-0112
Division of Policy and Directives Management
U.S. Fish and Wildlife Service
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Dear Sir or Madam:

The Wildlife Society (TWS) appreciates the opportunity to comment on the U.S. Fish and Wildlife Service's (the Service) 2012 Proposed Rule: Revised critical habitat for the northern spotted owl. Founded in 1937, TWS is an international non-profit association dedicated to excellence in wildlife stewardship through science and education. The Society's membership includes nearly 11,000 professionals and students with expertise in all aspects of wildlife conservation and management. The Wildlife Society assembled a team of reviewers to respond to the Service's request for comments, including experts in spotted owl ecology, population dynamics, forest ecology and management, and fire ecology.

1. Request for the Service to prepare an EIS

On April 2, 2012, TWS joined several other scientific societies in calling for the Service to prepare an Environmental Impact Statement (EIS) to provide "a rational, scientific approach for the testing of 'active management' forestry … prior to utilization at any commercial scale in the spotted owl's critical habitat." We received a response from Regional Director Robyn Thorson dated May 30, 2012 denying that request. The following several paragraphs repeat our rationale and why ***we again request the Service to prepare an EIS.***

In June 2011, the Service completed a revised recovery plan for the northern spotted owl, which identified barred owl management and habitat conservation, including active forest management, as the two primary steps needed to conserve and recover the northern spotted owl. The contrast between the Service's approaches to implementing barred owl management versus habitat management as part of the critical habitat designation process could not be starker. With respect to barred owl management, the Service appears to be endorsing a scientifically rigorous, experiment-based approach to evaluate the efficacy of possible barred owl control techniques. However, with respect to habitat conservation, the Service appears poised to endorse untested "active management" forestry techniques without any scientific validation of the impact of those techniques on the northern spotted owl or its critical habitat.

Concurrent with the release of the Proposed Critical Habitat for the northern spotted owl the Service issued a 430-page EIS outlining seven alternative approaches to controlling barred owl populations. Depending on the type of barred owl control techniques and the respective demographic studies, these experiments will take 4 to 10 years. At the end of the research period the Service will decide how barred owls are to be managed long-term. In contrast, the Service has not released an EIS to evaluate how to scientifically evaluate different "active management" forestry techniques. Instead, these "active management" projects will apparently be extrapolated from just two proposed pilot projects on Bureau of Land Management (BLM) lands in western Oregon. Scientific peer review is needed determine if active forest management provisions are consistent with the best available science on owl critical habitat protection and recovery. An EIS is warranted given the spotted owl is a closed canopy dependent species and active management (forest thinning in dry provinces or modified regeneration harvests in mature moist forests) that opens up forest canopies may degrade spotted owl habitat and/or encourage further expansion of the barred owl.

The response from the Regional Director argues that an EIS is not needed because the Proposed Critical Habitat is compliant with NEPA. The notion presented is that decisions concerning active management would be made at the land management unit level and must be consistent with the Northwest Forest Plan (NWFP) and associated plans which have already gone through the NEPA process. This overlooks the salient issue: the impacts that would need NEPA review are those related to the elimination of guidelines and protections provided by the NWFP. Relaxing the NWFP to permit commercial harvesting in current late successional reserves represents a major shift in management philosophy with potentially profound impacts (detailed in Section 6 below) to a federally protected species. NEPA compliance on a case by case basis would overlook cumulative impacts to spotted owls. As the Proposed Critical Habitat strongly emphasizes, the management of spotted owls has to be based on a landscape scale perspective. The Service should follow this requirement consistently.

The Presidential Memorandum accompanying the proposed critical habitat designation stated: "on the basis of extensive scientific analysis, areas identified as critical habitat should be subject to active management, including logging, in order to produce the variety of stands of trees required for healthy forests. The proposal rejects the traditional view that land managers should take a "hands off" approach to forest habitat in order to promote species health." We are concerned that this memorandum significantly overstates both the quality and quantity of scientific research on the potential benefits of active forest management, especially in the Pacific Northwest. In particular, ***we are unaware of any scientific literature that demonstrates that active management actually enhances recovery of the spotted owl.***

We are also concerned that this memorandum and the response from the Regional Director regarding an EIS suggest that there are no choices other than the proposed active management and "hands off" management options. This is a false dilemma which creates an unnecessarily polarized decision framework. In fact, there are many actions that can be taken to benefit spotted owls that are not high risk (see Section 7, point 9 below). The response from the Regional Director relies on an opinion expressed in a short essay by James Agee from 2002. This essay argues for creating park-like forests and for suppressing fire severity. As we discuss below, more recent and far more comprehensive scientific research shows that the park-like model is an inappropriate reference condition for dry forests in the range of northern spotted owls. More importantly for spotted owl recovery, park-like forests are not used by spotted owls, and new information supports the hypothesis that today's fires can be beneficial to spotted owls. The Proposed Critical Habitat should be concerned with maintenance and provision of dense, late successional forests that are used as spotted owl habitat, and preventing loss of this habitat that would occur through creation of park-like forests. None of the research cited by the response letter in support of commercial thinning is concerned with the goal of maintaining dense, late successional forests and mixed severity fire effects, except Hessburg et al. (2007), which the letter incorrectly cites as supportive. Hessburg et al. (2007) recommend that wildfires be allowed to burn and are not supportive of commercial thinning (see Section 7, point 4 below).

The response letter also states that the goals of management are to maintain forest health. As seductive as the notion of forest health may be, it implies an economic management paradigm. While health may be the appropriate criterion for many lands, it is too simple and ambiguous where the goals are ecological (reviewed by DeLeo and Levin 1997, online at http://www.ecologyandsociety.org/vol1/iss1/art3/). The policy emphasis on healthy forests was carefully chosen during the Bush administration to politically frame its effort to commercially exploit public forests (AuCoin 2006). The use of forest health is an especially effective tool to mold public opinion because it evokes a sense of environmental protection and personal safety, especially as fear of wildland fire is also effectively promoted (AuCoin 2006). We are seeing these political tactics employed in the 2011 Recovery Plan and Proposed Critical Habitat as well as in the response letter and Presidential Memorandum.

If healthy forests were preferred by spotted owls, then industrial forests on private lands would provide quality habitat. Instead, spotted owls prefer forests with considerable tree death and disease, processes that are reduced or eliminated, if possible, in the pursuit of forest health. The Service needs to clearly distinguish the management strategies it proposes from concepts of forest health. Clear, descriptive terminology to explain target conditions for spotted owl habitat are needed. These include target rates and amounts for fire and other disturbances (i.e., mortality processes), snag recruitment, down wood, etc. Efforts to recover the northern spotted owl have been hindered by a history of political interference and the failure to employ the best available science pursuant to the Endangered Species Act. We recognize that this issue remains politically charged due to reductions in timber volume harvested on public lands (to protect the spotted owl and other endangered species and also because of changes in the global timber market and work place automation). The Presidential Memorandum clearly indicates that spotted owl recovery must be compromised by economic criteria. We are skeptical that proposed thinning and logging in Critical Habitat will end economic hardships in timber-based economies. The problems are more complicated and require long-term solutions that are stable and which recognize the full suite of values of public lands to local economies (Power 2006).

On June 4, 2012 the Service released a draft Environmental Assessment (EA) for Critical Habitat proposed for the northern spotted owl. This draft EA avoids meaningful examination of the impacts of the suggested "active management /ecological forestry" on the northern spotted owl and its habitat. In no way does this EA substitute for an EIS addressing the impact of applying "active management /ecological forestry" on northern spotted owls and their habitat.

We remain convinced that to meet the best available science mandate of the Endangered Species Act, and to meet the broad aspirations laid out in the President's March 2009 Memorandum on Scientific Integrity, an EIS with full explanation of long-term ecological impacts must guide any "active management" forestry practices in the spotted owl's critical habitat.

2. Difficulty Reviewing the Critical Habitat Proposal

Reviewing the Proposed Critical Habitat document requires an understanding of the 2011 Revised Recovery Plan for the Northern Spotted owl, Appendix C of that document as revised, Dunk et al.'s (2012) further description of the modeling process utilized in Appendix C, and the Proposed Critical Habitat document itself. This is a daunting assignment even for those most familiar with the scientific literature and other documents on recovery of the northern spotted owl. Some means of coalescing these voluminous reports and eliminating redundancies and disparities among them is needed. We were particularly distressed to find that the Service compiled a 388-page technical document (Proposed Critical Habitat for the Northern Spotted Owl) with no Table of Contents and no clear statements about the relationship among these documents. We comment on the latter topic in more detail in Section 3 below. As a consequence, we suspect the Service will receive little in the way of informed critique, especially in regard to the science behind the proposal.

3. Relationship between Proposed Critical Habitat rule and the 2011 Revised Recovery Plan for the Northern Spotted Owl

The 2011 Recovery Plan for the northern spotted owl does not include any maps of habitat conservation areas for the subspecies; therefore, we must assume that conservation of habitat for recovery planning for the owl will be guided only by designation of Critical Habitat. In our view, this is a very unorthodox approach to recovery planning for a threatened species, which places much pressure on the Service to designate Critical Habitat in a manner that provides the correct amount and distribution of habitat to provide for recovery of the subspecies. ***In addition, the designation of critical habitat ultimately allows for the consideration of economic issues, whereas a recovery plan need only consider whether the conservation areas included are required for recovery of the species in question. Thus, the lack of habitat conservation maps in the 2011 Recovery Plan for the northern spotted owl is a significant weakness in the overall recovery effort.*** Since it is not clear how much critical habitat will be designated and where it will be in relation to what is actually needed, it is extremely difficult to determine if the amount and distribution of habitat will be sufficient for recovery of the owl. At this point in time, we are very doubtful that the amount of habitat that will be proposed as Critical Habitat will be sufficient for recovery. We have reached this conclusion based on the following rationale.

First, the Service has proposed a number of outcomes that would successively decrease the amount of lands that would be designated as critical habitat by potential exclusion of all private and state lands, state park lands, and Congressionally-reserved natural areas, which would leave a total of 9,391,973 acres in Critical Habitat. This acreage is much less than what is already covered by the Northwest Forest Plan (16,394,518 acres) or specified under composite 7

(13,966,071 acres), the chosen composite, or composite 1 (18,534,462 acres), which in our opinion is the best option (Dunk et al. 2012). Second, the Proposed Critical Habitat also fails to strongly advocate for a large-scale, comprehensive, multi-forest management plan (like the Northwest Forest Plan), which provides guidelines for the amount and spacing of habitat blocks to support nesting populations of owls (see Section 4 below). Third, the Proposed Critical Habitat allows for active forest management or ecological forestry (i.e. commercial thinning) throughout most of the geographic range of the subspecies with no guidelines on how much and where this will occur. Based on the published literature, commercial thinning will have a negative effect on spotted owls and their prey populations and will further reduce the amount of habitat for the subspecies (see Section 6 below). Fourth, management of dry forests on the east side of the Cascade Mountains also allows for considerable amounts of commercial thinning to reduce the risk of fires, which will also reduce the amount of nesting, roosting, and foraging habitat for the subspecies and for their prey. Fifth, the invasion of the barred owl into the range of the northern spotted owl has increased the need for more habitat conservation to reduce the amount of competitive pressure on northern spotted owls (Dugger et al. 2011). Based on these factors, we are skeptical that the amount of critical habitat currently proposed will be sufficient to recover the northern spotted owl and facilitate removal from the Threatened and Endangered Species list. The Proposed Critical Habitat and related documents should at least explicitly evaluate these reductions in Critical Habitat, so the reader can see what the effects of these reductions in habitat conservation will be.

4. Relationship of Critical Habitat to Late-successional and Riparian Reserves of the Northwest Forest Plan

We found no direction in the Proposed Critical Habitat for how it relates to the Northwest Forest Plan (USDA 1993). It appears that the Service is not incorporating any features of the Northwest Forest Plan by direct reference. Thus, the Service is leaving it to the managing agencies, principally the U.S. Forest Service (USFS) and BLM, to proceed to develop their respective forest management plans at the Forest or District level independent of direction provided by the Northwest Forest Plan. Nor are we aware of any federal inter-agency effort to develop an overarching forest management plan as a replacement for the Northwest Forest Plan. An overarching approach to federal forest management is imperative. By ignoring the Northwest Forest Plan (or not calling for revision or creation of a replacement) the Service is allowing reversion to the uncoordinated federal forest management that prevailed prior to 1994, resulting in a systematic reduction in spotted owl habitat

We found no mention of the relationship of the Proposed Critical Habitat to the late-successional or riparian reserves established under the Northwest Forest Plan. The late-successional reserves provide an appropriately spaced network of older forest habitats for the northern spotted owl plus guidelines for how these reserves are to be managed for the owl and other species associated with late-successional forests. These late-successional reserves should serve as the backbone of critical habitat for the northern spotted owl, and there should be no attempt to de-emphasize their importance within the range of the subspecies. Any departure from the system of late-successional reserves established by the Northwest Forest Plan would not be sound ecologically and would relegate management of Northwest forests to piecemeal efforts likely varying widely among National Forests and BLM Districts and with no coordination. Such lack of an ecological viewpoint and regional coordination will subject the Service and management agencies to lawsuits on individual forest plans and timber sales and serve as a roadblock to timber harvest throughout the owl's geographic range.

We found no emphasis in the Proposed Critical Habitat to the extensive system of riparian Reserves established under the Northwest Forest Plan. Because of their extensive and connected nature, riparian reserves offer a strong basis for providing dispersal habitat for the northern spotted owl and other terrestrial wildlife, while also serving as corridors of habitat to protect stream values for aquatic species. The riparian reserves of the Northwest Forest Plan (or an equivalent system) need to be featured as a prominent component of Critical Habitat to support dispersal of northern spotted owls.

Both the riparian reserves and the late succesional reserves of the Northwest Forest Plan have incurred nearly 20 years of ingrowth since the Plan was inaugurated. Yet there appears to be little attempt to capitalize on these gains. The Proposed Critical Habitat needs to clearly identify how it relates (or does not relate) to direction provided by the Northwest Forest Plan for late successional reserves and riparian reserves. The Service currently provides no direction in the Proposed Critical Habitat as to how the late successional reserves, or portions of late successional reserves, not included in Critical Habitat should be managed. Since the late successional reserves were designed to provide reserves for the entire spectrum of old forest species (plant and animal) their continuing status as reserve--with appropriate standards and guidelines for their management--should be emphasized and retained indefinitely or until a better plan is written. Failure to do so represents abdication of any sense of an ecosystem approach to management.

5. Models, Modeling Methods, and Modeling Approach

The Proposed Critical Habitat, Appendix C of the 2010 Draft Revised Recovery Plan, and the white paper by Dunk et al. (2012) describe the three-part modeling framework for populations of northern spotted owls. Because descriptions of the modeling methods are in three different documents, which are rather voluminous and technical, review of the modeling methods and framework were difficult at best. The difficulties arise because of the highly technical nature of the models and modeling methods, incomplete descriptions of the methodology, lack of information on underlying assumptions, and apparent contradictions that characterize the three documents. We elaborate on these issues and comment on the three modeling methods below.

The modeling methods in the Proposed Critical Habitat included a habitat suitability model (MaxEnt), a conservation planning model that was used to design habitat conservation networks or scenarios (Zonation), and a population simulation model (HexSim) to predict population responses to different conservations networks and measures. Appendix C of the 2011 Recovery Plan describes the three-step modeling methods, techniques, and processes in more detail, with the relative performance of 10 different habitat conservation networks provided to illustrate this modeling framework. The white paper by Dunk et al. (2012) describes the detailed application of this modeling framework and the results from several composite network designs for conservation of northern spotted owl habitat, which are then used to generate the Proposed Critical Habitat. The purpose of the modeling framework as detailed in Appendix C was to demonstrate how it can be used to evaluate various habitat conservation networks and compare the relative performance of spotted owl populations to these different conservation measures. In addition, the modeling provides information on the efficacy of Recovery Actions 10 and 32 (2011 Recovery Plan) in recovering the owl from threatened status. Recovery Action 10 specifies the retention of habitat within occupied spotted owl sites across all ownerships to retain extant pairs and resident singles. Recovery Action 32 recommends the maintenance of all of the older and structurally complex multi-layered conifer forests on Federal and non-Federal lands across the range of the northern spotted owl. Collectively, these two recovery actions will be extremely important in the conservation of the subspecies, and the Service should be commended for including these recovery actions in the 2011 Recovery Plan and using these as the basis for the designation of critical habitat. **Recovery Actions 10 and 32 should be retained in the designation of Critical Habitat for the owl at all costs.**

We will now comment on the three major modeling methods (MaxEnt, Zonation, and HexSim) that were used in the designation of the Proposed Critical Habitat and the approaches used in the modeling. Our review of the Proposed Critical Habitat also includes a review of a portion of Appendix C of the 2011 Recovery Plan and the white paper by Dunk et al. (2012) based on the following: (1) one must understand Appendix C in order to understand and review the Proposed Critical Habitat and (2) we are concerned about some of the approaches outlined in Appendix C and Dunk et al. (2012) that are used to designate critical habitat. TWS provided review comments on Appendix C of the 2011 Recovery Plan but many of these concerns were not addressed in the final version of the 2011 Recovery Plan or the Proposed Critical Habitat. There also are a number of data requirements upon which these modeling methods depend, so we also comment on the acquisition and use of those data types and methods of use.

5A. Create a spotted owl habitat suitability map covering the U.S. range of the subspecies (Modeling Step 1)

Modeling regions

The modeling of spotted owl habitat and population response under different conservation scenarios was conducted on 11 different geographic regions within the range of the northern spotted owl. The modeling regions are different from the physiographic regions that were used in the Northwest Forest Plan and 1992 Draft Recovery Plan, and this departure from previous works is not sufficiently described or justified from an ecological standpoint. For example, the coastal regions of western Oregon and Washington are combined with the Olympic Peninsula, which is very different in climate and prey abundance from the coastal regions farther south in Oregon. Furthermore, the BLM ownership with alternating sections of private land is included in at least three different regions (Oregon Coast Range, North Coast Oregon, Klamath regions), so it is impossible to determine the performance of spotted owls in these landscapes. This is extremely important because much of the active forestry, which is proposed for forests west of the Cascade Mountains, is located on BLM lands, and recent research on competition between northern spotted owls and barred owls has indicated that older forests are limiting in these landscapes to the point that it is having negative influence on survival rates of both spotted owls and barred owls (Wiens 2012). ***We contend that a separate analysis of BLM checker-boarded lands in western Oregon is needed in order to understand the performance of northern spotted owl populations under the different habitat networks and composites on those lands.***

Vegetation data – the GNN-LT database
Accuracy of the GNN habitat map is a critical issue, and the reader is provided with this information on page C-17 of the 2011 Recovery Plan. Use of GNN structural variables with plot correlation coefficients > 0.50 seems reasonable, but use of variables with correlation coefficients between 0.31 and 0.50 based on expert opinion seems questionable when the accuracy of these variables is so low. The section on the accuracy of the GNN habitat map also suggests that there was a less quantitative evaluation of the GNN data at a larger scale (> 30m pixel), involving subjective comparisons of other habitat maps associated with owl nest sites and foraging areas with the GNN layer. How these comparisons were actually conducted is unclear. For example, did GNN data indicate that nest site centers were characterized by large, old trees with closed canopy forests? What other criteria were used to make these comparisons? This process needs better explanation.

Choice of relative habitat suitability model - MaxEnt
The Proposed Critical Habitat and Appendix C of the 2011 Recovery Plan state that site center data for the habitat suitability modeling was made available through the cooperation of a variety of sources throughout the spotted owl's range. Data came from long-term demographic studies as well as locations from other research projects, public, private, and tribal sources. We do appreciate the fact that the data set represents information from the entire range of the northern spotted owl and, therefore, most of the habitats in which the species nests. This data set represents a range-wide picture of habitats used for nesting or roosting by the subspecies.

However, the data used for modeling habitat suitability includes a mixture of nesting territories obtained from exhaustive searches covering at least ~10 percent of the range of the northern spotted owl and additional nesting centers through other non-random methods of sampling. As such, the data set was not acquired through a random sampling framework. In order to use all available data on nest site locations, the authors chose a presence-only method, MaxEnt. In order to provide useful results, MaxEnt assumes random spatial sampling (Elith et al. 2011), which Appendix C and the Critical Habitat proposal clearly states is not the case over much of the spotted owl's range. In addition, because the output from MaxEnt reflects "the probability of presence given a specific set of environmental conditions" (Elith et al. 2011), the output values for each separate modeling region were not directly comparable, yet a complete "map" was produced for use in the next two steps. It is unclear from Appendix C how this was done. The Proposed Critical Habitat should explicitly address the uncertainties associated with the Proposed Critical Habitat network as a function of the modeling framework – specifically the implications of non-random sampling of nesting centers and the approach used to create a contiguous underlying RHS (Relative Habitat Suitability) map using MaxEnt.

All of the data from the Demographic Study Areas described in Forsman et al. (2011) can be analyzed using the most rigorous methods available - occupancy analyses using detection and non-detection data (see Mackenzie et al. 2003) and estimation of extinction and colonization probabilities (Olson et al. 2005, Dugger et al. 2011). Occupancy modeling deals properly with non-detection and allows for inclusion of covariates in the analyses that would account for the influence of habitat characteristics around nest sites and the presence of barred owls, a potential competitor (Dugger et al. 2011). Future analyses of habitat suitability for northern spotted owls should use this type of analysis to test, evaluate, and calibrate the models described in the Proposed Critical Habitat.

Spotted owl location data

Within each modeling region, the Service "thinned" the spotted owl nest locations such that the minimum distance between nest locations would be 3.0 km (thinning with a 3 km distance resulted in removing ~25 percent of the locations available to us). The context of this comment suggests that thinning of data is an attempt to deal with the issue of nonrandom sampling noted above. However, it misses the mark, as any thinning of data should be based on information about sampling effort, not information about owl presence or density. Under most models of strong habitat selection, animals are expected to be found at higher or lower densities, depending on habitat characteristics. However, the Service's approach in thinning of the data assumes that high densities of owl locations represent greater-than-elsewhere sampling intensity.

Alternatively, it is possible that the authors thinned the data because their data were taken from multiple years and represented redundant locations of the same pairs over multiple years. This approach is common in the literature (e.g. Carroll 2010); however, if this is the case, they are mixing two separate issues (non-random sampling and non-independence of samples) and ***need to clarify the basis for thinning of the location data.***

Current model assumptions and output

Most models make some important assumptions, but the assumptions for this modeling process are not completely spelled out nor are their validities addressed. For example, the modeling of habitat suitability assumes that core use areas and home ranges of northern spotted owls are relatively constant in size throughout their geographic range, but this assumption is not well supported by the Proposed Critical Habitat, Appendix C of the 2011 Recovery Plan, or the published literature. Core use areas and home ranges increase in size for northern spotted owls in the northern part of their range versus those in the southern part (Thomas et al. 1990). Second, the modeling process for evaluating habitat suitability under MaxEnt assumes that some moderate amount of edge and degree of forest fragmentation is good for demography and fitness of northern spotted owls throughout their geographic range based on Franklin et al. (2000), yet this relationship has been shown mainly for northern California and one area in Oregon (Olson et al. 2005), not the remainder of the subpecies' range in Oregon and Washington. For example, Dugger et al. (2005) found no relationship between the amount of edge and demographic performance of spotted owls in southern Oregon; consequently, the validity of this assumption for the entire range of the subspecies is questionable.

We would also like to see more justification for the authors' choice of features in MaxEnt modeling. For example, the threshold feature is used, but the product feature is excluded. Why? We would predict that product features in particular might be relevant to biological hypotheses (e.g., when nesting habitat is low, increases in foraging habitat don't increase occupancy, but when nesting habitat is greater, foraging habitat has a greater impact on occupancy).

Model evaluations and calibration

The authors used a cross-validation method to evaluate the robustness of models for each region and used AUC values as a measure of a model's discrimination ability. They also regressed AUC values against the proportion of each modeling region comprised of RHS values >30, 40, and 50%. The SOS scores for all modeling regions showed selection for areas within SOS scores of 0.60 to 0.90, which indicated that the models were well calibrated. This is an important and encouraging result. They also present information on the results of the cross-validation tests which suggested that none of the modeling regions' full models were over-fit. However, more information on the "independent test data sets" is necessary before we would accept them as an adequate test. In particular, ***if these data sets suffer from the same non-random sampling as the training data, then they will not aid in determining whether the RHS and AUC values are biased by the nature of the sampling or not.***

From a positive standpoint, the model validation showed good agreement between the predicted and observed proportions of activity centers (nest sites) where owls were present. In addition, the model validation showed that the relative habitat suitability models were robust and had good generality. The models indicated that high canopy cover, density of large trees, basal area of large trees, and diameter diversity index (structural diversity within a stand) were important variables that characterized nesting sites for spotted owls. These results are important for two reasons: 1) they agree with the published literature on characteristics of nesting areas and (2) they are characteristics that will be reduced by most, if not all, commercial thinning operations to reduce the risk of fire or practice active management of forests west of the Cascades Mountains (see comments on these issues below).

Barred owls

In an attempt to reduce the influence of barred owls on spotted owl habitat use, the Service developed and tested models using GNN vegetation data from 1996 (assumed to be the period with lower barred owl influence) along with northern spotted owl location information plus or minus three years from 1996 and projected to the most current year (2006) GNN layer to predict contemporary relative habitat suitability in the absence of barred owl influences. If barred owls really do influence spotted owl presence, this changes the interpretation of further analyses based on the MaxEnt output, in particular the analysis in step 2, which does not include the impact of barred owls in any way. Analysis of occupancy dynamics for the Demographic Study Areas would alleviate this problem (Dugger et al. 2011).

5B. Develop a spotted owl conservation planning model to design an array of habitat conservation network scenarios (Modeling Step 2)

The conservation planning tool "Zonation" was used to develop a spotted owl conservation planning model that can be used to design an array of habitat conservation networks. The Service evaluated "Zonation results employing a range of values for distributional smoothing, cell removal methods, ranking values, and land status and ownership prioritization" (Page C-48 of the 2011 Recovery Plan). After doing so, they selected habitat conservation network scenarios comprised of 30, 50, and 70% of habitat value as reference areas. Without more specifics on this selection process the choice of the 30, 50, and 70% of total habitat value (Zonation) for spotted owls seemed very subjective and arbitrary. It is possible that other habitat conservation networks might be more important, effective, or efficient, so understanding the decision process associated with selection of baseline network scenarios is important. ***Can the Service tell the reader in more detail why these different levels of habitat suitability were chosen?*** For example, Zonation

90 was not investigated, and it would have represented a scenario that would provide the most habitat for the northern spotted owl (See Table C-22, Appendix C of the 2011 Recovery Plan). Such a scenario may be necessary in modeling zones where population performance was not satisfactory under the other Zonation scenarios, particularly in relation to the eventual addition of displacement effects due to barred owls (e.g., West Cascades North, West Cascades Central) (see Table 11 of Dunk et al. 2012). Was Zonation 90 ignored for political, economic, or ecological reasons? In addition, Zonation 70 for all lands under Phase 1 performed the best and was more efficient and much better for the conservation of northern spotted owl habitat than the Northwest Forest Plan, and Zonations 30 or 50. Why wasn't this option for conservation planning given more attention and support by the Service, particularly for regions with poor population performance mentioned above? ***The decisions made about the exclusion of Zonation 70 or 90 appear to be very subjective, yet they dramatically affected the results and performance of spotted owl populations in Step 2; thus, these decisions need to be explained and justified.***

It seems short-sighted to consider locations that are good or bad across the landscape based solely on current nesting and roosting habitat. For example, foraging and dispersal habitat will be important for the recovery and sustainability of spotted owl populations. Also, barred owls are very relevant to the suitability of a location to spotted owls. Recent changes in barred owl numbers and distribution emphasize another point that projections of spotted owl populations into the future should likely include simultaneous projections of habitat, climate, and competitors (Franklin et al. 2000, Dugger et al. 2011).

5C. Develop a spatially explicit spotted owl population model to test the effectiveness of different habitat conservation networks designed in step 2 (Modeling Step 3)

The modeling framework in HexSim provides a reasonable basis with which to evaluate different conservation strategies for recovering the northern spotted owl. It represents an up-to-date and theoretical model for simulating owl populations in a spatially explicit manner under different amounts of habitat and the best available estimates of demographic parameters (Forsman et al. 2011). However, we believe there are key assumptions that should be addressed for the use of this population model. The proposed critical habitat document refers the reader to the Dunk et al. (2012) white paper for a discussion of these assumptions but we were unable to locate them in this document. ***Not only should the assumptions of the modeling be included in the Proposed Critical Habitat, but the validity of the assumptions should also be addressed.***

HexSim model calibration

The principal metric used to evaluate HexSim was the estimated population size at time step 50, and these estimates were compared to population estimates of the number of breeding adults in the 8 Demographic Study Areas. For most of the study areas, the estimates from HexSim compared favorably to the empirical estimates from the field studies except for the South Cascades (CAS) and Klamath (KLA) Study Areas. In one case (CAS), the estimate from HexSim was much larger than that from the field studies, and in the other case (KLA) the estimate from HexSim was significantly smaller than from the field studies. These differences and inconsistencies raise some concerns for the validity of the modeling results from HexSim. Does the Service have an explanation for these differences and inconsistencies? Do the input parameters for HexSim need to be revised?

Choice of the Zonation framework for HexSim simulations

As stated above in Section 5B, the choice of Zonations 30, 50, and 70 for the HexSim simulations appears to be very subjective and arbitrary. First, it is not clear why Zonation 90 was not modeled since it would represent an upper bound on habitat conservation. For example, the proportion of relative habitat suitability (RHS) bins represented among various habitat conservation scenarios (Appendix C or the 2011 Recovery Plan, Table C-22) shows the greatest amount of habitat conservation for Zonation 90 for all lands. Second, Zonation 70 includes the most land and highest percent of known spotted owl nest sites compared to other network scenarios (Appendix C of the 2011 Recovery Plan, Table C-21). Third, the comparison of percent population change (rangewide) between years 25 and 250 with and without barred owl influence (Appendix C, Table C-19) indicated that Zonation 70 provided the most favorable response by spotted owl populations. Fourth, the rankings of the seven reserve scenarios used in Phase I of HexSim models indicated that Zonation 70 was ranked the best among seven Zonation percentages (Dunk et al. 2012:11). These four data sets, plus the poor performance of populations in some zones from the HexSim simulations, beg the question of ***why was more emphasis not placed on Zonation 70 or higher in subsequent HexSim simulations?***

Considering the declining trends in spotted owl populations (Forsman et al. 2011) and the influence of barred owls (Dugger et al. 2011, Wiens 2012), an emphasis on higher levels of habitat conservation (>50% Zonation) is warranted if not necessary. Unfortunately, the modeling procedures started with Zonation 50 and 70 and proceeded to reduce the amount of land in the habitat networks under the guideline of efficiency. It is unclear which the Service considers most important--efficiency or higher levels of habitat conservation for the subspecies. The Service's priority and/or the compromises that were evaluated should be clearly explained in the final Critical Habitat rule.

The modeling of population response and viability under HexSim assumes that recruits into the population become co-owners of their mother's territories, yet most owls are recruited into the population in different areas after extensive dispersal over several months and sometimes years. ***To what extent are these assumptions valid, and how would lack of validity potentially affect the results of the modeling process?***

The Service states that the modeling can be used to evaluate the population response of spotted owls to a variety of strategies for habitat conservation and abundance of barred owls. While there is potential for the model to improve recovery implementation for the spotted owl, as well as other land use management decisions, there is a danger that the weaknesses and imperfections of the model are quickly forgotten as managers take the output as gospel. ***For example, there is very little information about the effect of commercial thinning (i.e., active management) on habitat use of spotted owls. How will the Service and managers evaluate such forest management strategies without information on the potential effects of these strategies whether they are positive, neutral, or negative?***

Barred owls

The modeling suggests that there may be levels of barred owl populations below which populations of northern spotted owls remain stable but at lower abundances than previously known. This finding provides some optimism for the future status of spotted owl populations provided the input parameters and modeling results are sound; however, there are a number of assumptions underlying these conclusions, particularly the future encounter rates of spotted owls with barred owls. For example, some of the initial modeling results indicated that spotted owl populations were not stable under the encounter rates with barred owls in Forsman et al. (2011) (see Dunk et al. 2012:17 and Table C-29 of the 2011 Recovery plan). A quote from Dunk et al. (2012:15) indicates that the Service "established a maximum encounter probability of 0.375 for the modeling process because population performance ranged from marginal to poor at the higher barred owl encounter probabilities." "Marginal to poor" performance was not defined in this case and needs additional explanation. As a result, most of the modeling strategies in the Proposed Critical Habitat and Dunk et al. (2012: page 16, Table 2) were conducted with reduced encounter rates (< 0.375) with barred owls. Consequently, most of the modeling results in the Proposed Critical Habitat and those described in Dunk et al. (2012) provide more optimistic outcomes for sustainability of spotted owl populations than is likely the case. ***Instead of running models with reduced encounter rates of spotted owls with barred owls, it would have been more appropriate to model populations under scenarios that provided more habitat (Zonations ≥ 70%) for the species. Instead, the Service considered scenarios that successively reduced the overall habitat amount under guise of efficiency. Opting for more conservation of habitat for the spotted owl is likely necessary given true densities of barred owls in the landscape and their competitive pressure on spotted owls (Dugger et al. 2011, Wiens 2012).***

Furthermore, it is not completely clear how the effect of barred owls on spotted owls was modeled in HexSim. The effect of barred owls on survival of spotted owls seems clear from Table C-27 of Appendix C of the 2011 Recovery Plan. However, as indicated above, the encounter rates of spotted owls with barred owls were reduced to provide for sustainable populations; therefore, the effect of barred owls was adjusted downward to provide for sustainable populations of spotted owls. In addition, it is not clear whether the presence of barred owls affected reproductive rates of spotted owls. In one place in the Proposed Critical Habitat, the Service states that the effect of barred owls on spotted owls was modeled only on spotted owl survival. However, the Proposed Critical Habitat states that reproduction rates of spotted owls were " based on the Barred Owl Nesting Effect trait values" (meaning unclear), and "individuals whose nesting has been halted by a barred owl are assigned a 100% probability of having a clutch size of zero" (See page C-64 of the 2011 Recovery Plan). What publication or data set was used for making this decision? We are not aware of a publication that documents zero reproduction of spotted owls when barred owls are present within specified distances of a spotted owl nesting center. Did HexSim model the effects of barred owls on spotted owl reproduction or not, and if so, what was the scientific basis for this effect?

The Service states that their approach likely under-estimated the real effect of barred owls on spotted owls, and this is most likely due to setting encounter rates at a maximum of 0.375. The encounter rates for barred owls were static, and these encounter rates should be incremented over time as the data in Forman et al. (2011) show. Furthermore, since barred owls are likely to be detected imperfectly this may impact results (Wiens et al. 2011). There are some additional scenarios/demographic study areas where encounter rates with barred owls have increased then leveled off or even declined. Some modeling of these encounter rates with barred owls should be addressed as well.

The above discrepancies make it very difficult to evaluate the effect of barred owls in the modeling of spotted owl populations; this needs to be clarified and corrected. Particularly as it appears the effects of barred owls in the HexSim modeling are underestimated, maybe severely in some regions. Furthermore, the uncertainty surrounding the specific impacts of barred owls and the analysis in Appendix C further justify the need for an intensive barred owl removal experiment to understand the overall impact that barred owls are having on spotted owls.

5D. Conclusions and Critique of Modeling Framework and Approach

In general, we are supportive of the use of MaxEnt, Zonation, and HexSim as three modeling tools to assess the response of spotted owls to various strategies to conserve habitat for the subspecies. Although we have some concerns with the use and assumptions of these models, we believe they are reasonably well suited, with some exceptions, to answer questions about the amount, distribution, and location of habitat blocks for the subspecies. This assessment is based on the assumption that the models were used appropriately with the purpose of habitat conservation to support sustainable owl populations, and not to cater to political, economic, or bureaucratic intervention. Unfortunately, it appears that all three of these influences may have had an effect on the model inputs, the modeling approach, and the various composites that were selected for the modeling of Critical Habitat. This conclusion is based primarily on the information in Dunk et al. (2012) and Appendix C of the 2011 Recovery Plan. Our concerns with the modeling framework and approach are itemized below and represent our major criticisms of the modeling framework and approach.

1) The modeling framework and approach did not consider the full range of options for conservation of habitat for the species. Zonation 90 was not included in any of the modeling exercises, and Zonation 70 was never considered in its entirety (Dunk et al. 2012:16). Zonation 70 was used only in 2-3 modeling regions in Phase 3 of the modeling (primarily composite 1), even though it performed best during Phase 1 modeling (Dunk et al. 2012:11). As a result, the reader is unable to evaluate the performance of simulated owl populations under the best scenarios for habitat conservation, regardless of whether they are necessary or not.

2) We were surprised and concerned that the encounter rates of spotted owls with barred owls found in Forsman et al. (2011) were reduced downward to a maximum rate of 0.375 even though there is strong evidence in Forsman et al. (2011) that the rate is higher in some modeling regions, and Wiens et al. (2011) has shown that abundance of barred owls (and encounter rates) is much higher in the Coast Ranges of Oregon than initially thought or is documented in Forsman et al. (2011). Results in Wiens et al. (2011) were based on the use of barred owl calls instead of spotted owl calls for surveying for barred owls, which was not the case in Forsman et al. (2011). The Service used "a maximum encounter probability of 0.375 for the modeling process because population performance (of spotted owls) ranged from marginal to poor at higher barred owl encounter probabilities" (Dunk et al. 2012:15). The lower encounter rates of spotted owls with

barred owls were used in Phases 2 and 3 of the modeling, so the results from those network designs/composites represent more optimistic performances of spotted owls to habitat conditions than is likely to occur in reality. We contend that it would have been more appropriate to use Zonation 70 or even 90 to a greater extent in some modeling regions, than to arbitrarily reduce the barred owl encounter rate to a maximum of 0.375 in order to provide for sustainable populations in all modeling regions.

3) There appears to have been some degree of bureaucratic intervention in the modeling framework and approach in composites 3-6, as the modeling entertained or included recommendations from the U.S. Forest Service and Bureau of Land Management. The reasons for this intervention are not clear in Dunk et al. (2012) but we suspect that there was political and economic pressure to do so. For the most part, these modifications in the habitat network were done under the auspices of increasing efficiency, not increasing the amount of habitat conservation to benefit spotted owl recovery. In this case, efficiency was defined subjectively by the Service as the act of refining the boundaries of the RHS maps to better match the distribution of habitat likely to support occupancy by spotted owls.

4) We noted that composite 3 performed poorer than composite 1 based on population performance, yet composite 4 was based on the network in composite 3 and composite 5 was based, in part, on that in composite 4. This sequence of models based on the poor performance of composite 3 does not make sense from an ecological or conservation stand point. It is obvious that composites 1-7 do not represent the complete range of habitat networks that might provide for sustainable populations of spotted owls in most of the modeling regions. ***We contend that there should have been more attention paid to increasing habitat for spotted owls and providing for sustainable populations in all modeling regions instead of increasing efficiency. We understand the need to make any habitat network efficient but we believe that this was a case where efficiency has trumped conservation of habitat for the spotted owl and other species associated with old forest ecosystems.***

We have no clear indication that science or conservation was emphasized because the highest habitat value scenarios were not thoroughly evaluated. The lack of emphasis on habitat conservation can be seen in that the total area in composite 7 (13,966,071 acres), the chosen composite, is less than that in composite 1 (18,534,462 acres) and the Northwest Forest Plan (16,394,548 acres) (see Dunk et al. 2012:44), yet the probabilities of extinction are much less with composite 1 compared to the other composites and the Northwest Forest Plan. We contend that the guideline to increase efficiency was carried to an extreme, and as a result, has sacrificed conservation of habitat for spotted owls. This is even more germane considering that the barred owl encounter rates were decreased to provide for more sustainable populations (i.e. point number 2 above). ***Why wasn't more emphasis placed on sustainability of spotted owl populations and habitat conservation in the modeling by including networks that included Zonation 70 or even Zonation 90 in some of the modeling regions? This appears to be a gross oversight in the modeling scenarios.***

Lands proposed or considered for exclusion from the final Critical Habitat Designation

The Proposed Critical Habitat designation for the northern spotted owl includes a listing of the lands that are being proposed or considered for exclusion from the final designation of critical habitat. These different options are listed as “Possible Outcomes” in Table 1, pages 30-31 of the proposal. First, based on our concerns with the modeling methods described above, we are concerned that Table 1 of the document does not provide a list of possible additional lands for inclusion in Critical Habitat designation as a result of this review or additional modeling efforts. This appears to be an oversight in the development of the document, and there should be strong consideration to add additional lands to the rule as a result of this review (See Appendix A). We understand and support the proposal to exclude private or state lands that have HCPs, SHAs, or other formal agreements for managing spotted owl habitat. However, we do not support the exclusion of state park lands, Congressionally-reserved natural areas, or state-owned lands without formal conservation agreements, or some private lands without formal conservation agreements. ***We believe that some Congressionally-reserved lands, most state lands, and some private lands will be important inclusions in the designation of critical habitat in some regions.***

In addition, some good examples of state lands in Oregon that provide important habitat for spotted owls include the Elliott, Tillamook, and Clatsop State Forests in the Oregon Coast Ranges. State lands in Washington and California are important habitat for spotted owls in some key areas also, so they should be listed as Critical Habitat (see elsewhere for discussions about inclusion of state lands). Outcome #4 would exclude all of these “possible lands” from designation of critical habitat resulting in a total of 9,391,973 acres (Table 1, Critical Habitat proposal), which is considerably less than the amount of land in reserves in the Northwest Forest Plan (Dunk et al. 2012:44). We believe this is a poor conservation effort and it sets a bad precedent for designation of critical habitat for any listed species.

Congressionally reserved lands

It is stated in many places that “Congressionally-reserved natural areas” are proposed for exclusion from the Critical Habitat rule. It’s not clear why this is being proposed, since in many cases these areas provide important habitat for owls. The proposed exclusion of Congressionally-reserved natural areas from this Proposed Critical Habitat is particularly puzzling and unjustified. Don’t these areas contain much of the oldest seral stage forest existing on Federal lands? Didn’t these lands map out as highly suitable under the MaxEnt RHS modeling? If not, why? Many of them should represent some of the best owl habitat available and if they are not currently high quality northern spotted owl habitat, then presumably they will be some of the first to “become” or grow into northern spotted owl habitat in the near future. In addition, it is unclear whether these Congressionally-reserved lands were included explicitly in the networks investigated during the Phase I modeling (Dunk et al. 2012), so it’s difficult to assess what effect they may or may not have had on spotted owl conservation under the Proposed Critical Habitat rule. Regardless, these Congressionally-reserved lands provide important habitat for spotted owls and should not be excluded from Critical Habitat.

6. Active Forest Management, Ecological Forestry, and Forest Restoration

The Proposed Critical Habitat includes much discussion on the use of active management, ecological forestry and forest restoration in forests within the range of the northern spotted owl. These activities have been promoted by the report by Johnson and Franklin (2009), which has strong support from the Oregon Congressional delegation, industry, and Douglas County commissioners. Basically, the proposal for active management and ecological forestry includes the use of commercial thinning of forests to reduce risk of fire by reducing stem density and canopy cover. Unfortunately, the Proposed Critical Habitat proposal lacks specific information on where, how much, and the kinds of forests that these activities should be directed towards. These specifics are absolutely necessary in order to be able to evaluate their potential effects on spotted owls, their prey, and barred owls, a potential competitor. If these activities follow the guidelines of the Northwest Forest Plan and are conducted in stands < 80 years old to promote development of late-successional forest features, then they will likely have a positive long-term effect on spotted owls and their prey.

Thinning in young forests with high stem density is recommended in the Northwest Forest Plan but the limit of 80 years was placed on such activities by FEMAT (USDA 1993) because stands > 80 years old are used for foraging by spotted owls, and such activities will likely render these stands unsuitable for owls and their prey for some period of time (see points 3 and 4 below). In contrast, the Proposed Critical Habitat indicates that commercial thinning is appropriate throughout much or all of the spotted owl's geographic range and it is not limited to stands < 80 years old. In addition, there are no recommendations for research and monitoring of the effects of commercial thinning with adjustment of methodology as the potential effects are better understood (i.e. adaptive management). Without a limit on age of stands, a defined period of experimentation, and a well-designed research and monitoring program, we cannot support such an approach for spotted owl habitat and associated forests. Beyond the lack of specifics in the proposal, we have a number of reasons for not supporting active management, ecological forestry or restoration which are discussed below.

1. The impetus for the proposal for ecological forestry has strong political and economic underpinnings and was not based on ecological considerations for northern spotted owls or their prey. We contend that the impetus for any forest management should be based on sound ecological principles and goals that do not impact spotted owl habitat, not political and economic reasons.

2. The focus for these activities west of the Cascade Mountains has been BLM checker-boarded lands with alternating sections of private lands. These are lands where survival rates of spotted owls and barred owls are influenced by the amount of old (>120 years) forest in their home ranges (Wiens 2012), and the amount of old forest is limiting to population dynamics of spotted owls (Wiens 2012).

3. Commercial thinning will likely have a negative effect on habitat selection by northern spotted owls. It is well known that spotted owls select for forests that have high canopy cover, large trees, large woody debris (large snags and downed logs), and vertical and horizontal diversity in stand structure (Thomas et al. 1990). The results of the modeling of habitat associations of spotted owls by the Service in the Proposed Critical Habitat emphasized the importance of these characteristics for nesting, roosting, and foraging by

the subspecies. Commercial thinning decreases canopy cover, basal area, and vertical diversity of stands and thereby will have a negative effect on spotted owl habitat.

4. Several studies have found that spotted owls were displaced by thinning or contemporary harvest near the nest or activity center (Forsman et al. 1984, King 1993, Hicks et al. 1999, Meiman et al. 2003).

5. Commercial thinning will have a negative effect on the owl's prey base, so we have addressed that issue below. In addition, we predict that commercial thinning will tend to have a positive effect on barred owls because they use younger and more open forests compared to northern spotted owls where the two species occur together (Wiens 2012). Consequently, commercial thinning will likely be detrimental to spotted owls and favor barred owls in any competitive interactions between the two species. The Service failed to adequately consider the negative effects of commercial thinning in recommending active management, ecological forestry and restoration activities in critical habitat for the species.

Effect of commercial thinning on spotted owl prey

There are several published articles on the effects of commercial thinning on spotted owl prey, particularly northern flying squirrels, red-backed voles, and red tree voles. The Service was either not aware of this information or they ignored it while developing the proposal for ecological forestry in the Proposed Critical Habitat. This information indicates that commercial thinning has negative effects on abundance of flying squirrels (Manning et al. 2012, Wilson 2010, Gomez et al. 2003, Waters and Zabel 1995), and these effects may last up to 15 years or longer (Wilson 2010). Flying squirrels are the spotted owl's primary prey by number and biomass throughout most of the owl's range. In addition, commercial thinning has negative effects on the abundance of red-backed voles (Suzuki and Hayes 2003, Manning et al. unpublished data), which is also an important prey species for the spotted owl. There has not been as much research on the effects of commercial thinning on red tree voles but since this species lives in the forest canopy, feeds exclusively on needles of Douglas-fir, and moves between interconnected trees, thinning activities will most certainly have negative effects on this prey species as well (E. Forsman, pers. comm.). Forests where tree voles have been studied (Swingle and Forsman 2009) and later thinned do not support tree vole populations (E. Forsman pers.comm.). We conclude that these negative effects will out-weigh any potential, currently unproven, positive effects of commercial thinning on forest structure and owls in the future.

Summary

Nowhere in the Proposed Critical Habitat rule is the relationship between the rule, the Northwest Forest Plan, and recommendation for "active forestry management" adequately discussed. There must be some sort of process in place for performing landscape-level planning, and the Northwest Forest Plan must be explicitly incorporated into the implementation of conservation and management of Critical Habitat, or there will be no way to truly manage and conserve critical habitat for the subspecies in a holistic way. We are particularly adamant about this because "active forest management" (i.e. commercial thinning) will likely have negative effects on northern spotted owl habitat and prey populations (also see comments in Section 7 below). To the contrary, we currently have no scientific evidence that shows "short term losses" to suitable spotted owl habitat due to "active forest management" activities really do result in "long-term gains" in owl habitat. What is the temporal framework being discussed here? What constitutes "long-term" vs. "short-term" in regards to suitable nesting/roosting/foraging spotted owl habitat? These are important considerations regarding the survival and persistence of long-lived species with low reproductive rates that rely on forests that are typically >80 years of age. ***We know of no published science that supports the claim of long-term benefits of active forest management to spotted owls. The Service is making a huge assumption that active forest management will actually benefit owls at some point in the future. We believe that this assumption and associated risks are not appropriate for managing habitat for a threatened species, and the Service should not include such proposals in the final designation of Critical Habitat and management under the Recovery plan.***

7. Fire and Forest Management

The 2011 Recovery Plan and the draft Revised Critical Habitat Proposal represent a more balanced and scientific treatment of the effects of fire than do previous iterations of northern spotted owl Recovery Plans. The emphasis in the 2011 Recovery Plan and the Proposed Critical Habitat on restoring ecological processes is fundamentally sound and entirely consistent with the recent scientific literature. There is consensus that process-based management should help conserve northern spotted owl habitat and restore ecosystems. In addition, the Proposed Critical Habitat recommends "more than reducing fuels and thinning trees to promote low-severity fires; management will need to develop 'more natural patterns and patch size distributions of forest structure, composition, fuels, and fire regime area' (Hessburg et al. 2007 p 21)." This is a very positive step to move beyond just thinning and fuel reduction. The Service has altered the 2011 Recovery Plan in many respects in response to shifting paradigms about fire, as requested in our previous peer reviews. The 2011 Recovery Plan and the Proposed Critical Habitat also emphasize the need for a landscape-scale perspective with regard to fire, which is essential to conserve the spotted owl. The changes from the 2008 Recovery Plan to the current plan, including the removal of erroneous data and the assumption that fire disturbances equaled habitat loss, illustrate the need for independent peer review. We appreciate the opportunity to again provide comments on fire and forest management.

However, we also recognize that the 2011 Recovery Plan and the Proposed Critical Habitat exhibit many of the same scientific deficiencies that independent peer reviews identified in the 2008 and 2010 Recovery Plans. We recognize that a key challenge for the Service and spotted owl recovery has been that scientific understanding of both the effects of fire on spotted owls and historical forest conditions have been changing rapidly in recent years and some of the most relevant science is quite new. As such, the quantity of this science is much smaller than the work it supersedes. This is one reason the Service has indicated for not embracing the new research findings by Hessburg et al. (2007) and Baker (2012), describing historically mixed fire severity and dense forests. This fails to recognize the limitations of earlier work and anecdotes for describing historic forest conditions and fire regimes, and the strengths of the more recent work.

Additionally, there is pressure on the agency to support commercially-based forest management under the assumption that this will solve many social and forest health goals and not conflict with spotted owl habitat protection (see points 3 and 7 below). The 2011 Recovery Plan and the Critical Habitat Proposal necessarily had to make choices about embracing the most current science and trying to address goals beyond protecting owl habitat. Despite positive language about restoring process, the 2011 Recovery Plan and the Critical Habitat Proposal have not embraced the most recent science in terms of specific management recommendations.

Conversely, these documents have elected to support commercial management that would cause at least short-term “adverse impacts.” This decision is based on the older view that forests were open and had low severity fire regimes. The Service presents no analysis of the methods and data of Hessburg et al. (2007) and Baker (2012) to suggest that the historical conditions they describe are inaccurate. The letter from Regional Director Robyn Thorson dated May 30, 2012 denying the request for an EIS on thinning impacts relies on the fact that there are many studies that support thinning, but she seems unaware of the extent to which these are predicated on the low severity, open forest model of historic conditions. We request that this approach be replaced by an analysis of the data describing past conditions.

In addition, this assumption that adverse impacts of commercial thinning would be short term could be tested, and we previously requested this, going so far as to provide an example of long-term effects of forest treatments using empirical data. However, the Service continues to avoid presenting any test or analysis of any kind of its forest management assumption. Moreover, the recommended management option is aimed at suppressing “natural processes” while mechanical processes would predominate. This contradicts language about restoring “natural processes” and does not satisfy the requirement that the agency “ensure that actions are not likely to result in the destruction or adverse modification of that critical habitat” (2011 Recovery Plan, p. 14062). In fact, existing evidence suggests that the recommended management would adversely modify habitat.

The impression we are left with is that criteria other than spotted owl recovery played an excessive role in the development of the 2011 Recovery Plan and Proposed Critical Habitat to the extent that the substance of independent peer reviews was not respectfully considered and peer review was effectively bypassed (not only ours’ but also those of other scientific organizations). Thus, to a large degree, our comments in this section revisit the same topics we addressed in previous reviews. We incorporate those previous comments by reference and consequently focus now on newer information.

We suggest that the approach that should be taken by the Service with fire management should be similar to the approach being taken with barred owl management (the contrast between approaches to barred owl and fire management is striking). We again stress the need for adaptive management and use of the best available science (including honoring the efforts of scientific peer-reviews and responding to them), specifically applying it for the recovery of the spotted owl without confounding effects of undisclosed commercial criteria. Commercial criteria can be applied as a second phase after Critical Habitat exclusions are determined. Alternatively, if commercial criteria are to be applied simultaneously with criteria specific to spotted owl recovery, an economic and feasibility analysis is needed. This would have to include a feasibility assessment for the largely non-commercial future maintenance of all harvested forests to prevent them from becoming as fire prone or more fire prone (less resilient) than prior to treatment (Naficy et al. 2011). Otherwise, the impacts of proposed management cannot be determined.

Economic impacts are outside the scope of our comments here, but we note that the unsustainable past management, market forces and industry automation and outsourcing have been identified as causes for reduced timber harvesting and ecological degradation (Power 2006). Credible solutions must therefore address these factors and the need for economic diversification to prevent the kind of hardships that have occurred from recurring. Obviously, this broadens the scope of planning a great deal beyond the expertise and domain of the Service and most others promoting commercial management of spotted owl habitat as a solution for economic difficulties.

In the following sections, we identify nine specific improvements that can be made to the Proposed Critical Habitat.

1) Consider the effects of fire in the modeling process to define Critical Habitat and its protection

'Severely burned forest' does not fall under any definition of "suitable foraging habitat" for spotted owls (see Table C-7 in Appendix C of 2011 Recovery Plan). However, with respect to habitat use, Bond et al. (2009) found that California spotted owls occupying burned forests 4 years post-fire preferentially foraged in severely burned forests more than other categories of burn severity (specifically unburned forests) within about 1.5 km of a core-use area. Post-fire logging, which confounds other studies, was minor in this study. The findings suggest that at least some spotted owl prey populations increase rapidly in resource-rich early successional environments (Lawrence 1966). Spotted owl diet in this study was dominated by pocket gophers and woodrats (Bond et al. in review). Bond et al. (2009) recommended that burned forests within 1.5 km of nests or roosts of California spotted owls not be salvage-logged until long-term effects of fire on spotted owls and their prey are more fully understood. Clark (2007) investigated post-fire space use and habitat selection of northern spotted owls in southwestern Oregon. Average sizes of home ranges of spotted owls were larger after the fire/logging than before, but not different between burned/logged and unburned landscapes. Nesting, roosting, and foraging habitat that burned with low, moderate, or severe fire was selected by foraging spotted owls in recently burned landscapes, and roosting and foraging habitat with moderate severity burns was also selected. Clark (2007) also recommended against logging after fire because it reduced the overall habitat suitability of the area.

Although the 2011 Recovery Plan's discussion on spotted owls and fire (III-29 to III-30) was a major improvement over the previous Recovery Plans, and recognized that under some circumstances severe fire might provide a benefit to owls, the modeling inputs to assess "suitable habitat" could not have adequately incorporated a spatial pattern of early successional post-fire forests that might enhance suitable foraging habitat. There are no studies on northern spotted owls in burned landscapes without the confounding effects of post-fire logging. These studies are especially needed in regions where northern flying squirrels are the main prey item. In other words, all studies of habitat selection by northern spotted owls have been conducted in unburned landscapes with the exception of Clark (2007) and thus the available data on habitat suitability for input into the models simply could not incorporate data from burned forests. The impacts of fire on spotted owls is a very complex issue and we are concerned that the complexity is not reflected in the 2011 Recovery Plan's modeling process and in the Service's endorsement of thinning and logging to try to suppress fire disturbances in Critical Habitat in the East Cascades and Klamath. In addition, since the Service is concerned about loss of habitat, we are surprised the Proposed Critical Habitat makes no mention of protecting burned habitat from post-fire logging. We direct the Service to our previous comments about the need for this consideration (TWS 2008, 2010).

2) Include information regarding effects of fire on spotted owl site occupancy and demographic processes

We need more data on fire effects on occupancy, vital rates, and habitat selection of northern spotted owls in forests not compromised by post-fire logging, especially where northern flying squirrels are the predominant prey. However, there is some existing and new information which suggests that fire is not the threat to spotted owls that it is assumed to be in the 2011 Recovery Plan and Proposed Critical Habitat. The Proposed Critical Habitat should be updated to include this new information. ***Much of the current information is from studies on the Mexican or California subspecies of Strix occidentalis, but it needs to be considered as it constitutes the best available science. For completeness, we review all the relevant science regarding fire and spotted owls and suggest this information be incorporated into a revision.***

In general, studies on reproduction of all the three subspecies of spotted owls after fire indicate that as long as a burned territory is capable of supporting a pair of owls, productivity in burned sites will be no different (Bond et al. 2002, Jenness et al. 2004, Clark 2007), or in some cases may be greater than in unburned sites (Roberts 2008). Bond et al. (2002:1026) found that productivity of burned spotted owl territories was higher than overall annual rates of reproduction for unburned territories, although sample size was small. Jenness et al. (2004) observed Mexican spotted owls successfully reproducing at three sites with 8, 31, and 32% high-severity fire within a 1-km circle of their nest. Moreover, reproductively successful sites had a significantly higher percentage of burned area than other occupied sites affected by fire (including single owls and non-reproducing pairs). Clark (2007) found no evidence of a difference in northern spotted owl productivity among burned and unburned study areas in southwestern Oregon. Clark postulated that "as long as a territory is capable of supporting a pair of spotted owls following wildfire, owl pairs in burned landscapes will produce young at a similar rate as unburned landscapes." Roberts (2008) found no support for a model of reproduction that included burn history as *more* fledglings were produced in burned than unburned forests. As with occupancy, reproduction was influenced by habitat variables, where basal area of all trees >10 cm was associated with increased reproduction.

In summary, a reasonable assessment of the available science and knowledge of spotted owl ecology is that some amount of moderate- to high-severity fire within a northern spotted owl core-use area may not affect occupancy probability (Roberts et al. 2011, Lee et al. in press) and may be beneficial to reproduction (Bond et al. 2002, Jenness et al. 2004, Roberts et al. 2011) and foraging (Clark 2007, Bond et al. 2009). ***All of these studies indicate that all three subspecies of spotted owls are adapted to forested communities that have been influenced by fire either***

recently or historically, and it is incorrect to assume that all fires will affect spotted owls negatively.

We strongly recommend research be carried out to determine habitat use and selection by spotted owls in the dry-forest landscapes. It would be valuable to determine optimal amount and spatial configuration of fire that confer or reduce fitness benefits *before* widespread treatments are conducted. In the absence of this knowledge, we suggest that historical fire patterns, as described under #4 below, be a guide for optimum amount and spatial configuration of fire.

3) Describe impacts of proposed treatments in the context of the requirement that the agency "ensure that actions are not likely to result in the destruction or adverse modification of that critical habitat" [2011 Recovery Plan, p14062]

Treatments that create more open forests (commercial thinning and patch cutting) are problematic in spotted owl habitat because they may convert suitable habitat to non-habitat by reducing canopy cover, tree density, and tree basal area below critical levels (see above). Treatment targets suggested in Johnson and Franklin (2009) would reduce basal area below the minimum level (27 m^2/ha) in stands used by spotted owls for nesting in dry forests (Pidgeon 1995, Buchanan et al. 1995). Thinning treatments often focus on forest health and therefore target removal of trees with mistletoe. Spotted owls preferentially nest in trees with mistletoe brooms. Thinning and logging can also reduce snags and down wood, especially if goals are to reduce fuels to increase forest "resiliency." Snags and down wood are important habitat features for spotted owls that decrease if dying trees are removed and woody debris burned in slash piles.

Existing research on the specific impacts of thinning treatments on spotted owls is minimal. We are aware of only a few studies on northern spotted owls that have investigated the effects of forest thinning on demography or habitat selection of northern spotted owls (Meiman et al. 2003, NCASI unpublished data) or their prey (Gomez et al. 2005, Manning et al. 2012, Wilson 2010). The study by the National Council for Air and Stream Improvement (NCASI) was a large study with many pairs of owls but the results are not published nor are they available to the public. Mieman et al. (2003) documented a case study of a shift in the core use area by a male spotted owl following thinning in westside forests. There is an equal paucity of information on the effects of thinning or patch cutting on spotted owls or their prey for eastside forests except for the study by Lehmkuhl et al. (2006).

A study on California spotted owls in the northern Sierra Nevada analyzed a landscape in which 11 territories were active during some or all of the time period (USDA 2010). There were four cases where the treatments were immediately followed by abandonment of the core use areas (USDA 2010). In most of these cases, new owls recolonized areas of the landscape fairly near the abandoned cores. These results appear to support those of Seamans and Gutiérrez (2007) in that a very small amount of treatment can lead to abandonment and change the suitability of an area for colonization. The authors caution that site fidelity may obscure possible negative effects of habitat change. In addition, the home range size was found to positively correlate with the amount of treatment, suggesting that treatments caused owls to increase their home ranges in order to acquire necessary resources, primarily prey. Spotted owls selected against strategically thinned units (DFPZs or Defensible Fuel Profile Zones), so the authors hypothesized that the DFPZs were unfavorable to spotted owl prey.

Thinning and burning may also be detrimental to the primary food source of a focal prey of spotted owls, the northern flying squirrel. These treatments may reduce squirrel populations by diminishing their primary food source, fungal fruiting bodies, or truffles, which occur in the forest litter (Manning et al. 2012, Meyer et al. 2007). In the drier forests, woodrats may become the focal prey. Research has shown that thinning will reduce woodrat populations unless snags, mistletoe and down logs are retained (Lehmkuhl et al. 2006).

4) Bring the restoration reference framework up-to-date using published spatially extensive reconstructions now available for 700,000 ha of dry forests in the eastern Cascades

Hessburg et al. (2007) completely changed scientific understanding of fire and forest structure in dry forests in the Pacific Northwest. However, the Proposed Critical Habitat currently uses primarily pre-2007 scientific literature that portrayed dry forests as having been shaped by low- and occasionally mixed-severity fires, with forests open, low-density and dominated by large old trees (Proposed Critical Habitat, p49). The Proposed Critical Habitat, while citing Hessburg et al. (2007) at times, is fundamentally based on these pre-2007 ideas, which have since been refuted. It is noteworthy that Paul Hessburg himself, a chief source of pre-2007 scientific understanding, provided the refutation (Hessburg et al. 2007). When analysis was expanded to the scale of 300,000 ha in Washington (Hessburg et al. 2007) and to 400,000 ha in Oregon (Baker 2012), most of the pre-2007 understanding of historical fires and forest structure in dry forests was not supported. The fundamental limitation of the pre-2007 scientific literature was that it was based on scattered anecdotes, small-plot studies, and limited tree-ring reconstructions (Baker 2012).

The pre-2007 literature was not all wrong, but it could not detect the substantial variability in fire and forest structure in historical dry forests that was found when large land areas were studied. This highlights the importance of the landscape perspective. Following are some of the cases in the Proposed Critical Habitat that are now known to warrant updating based on landscape scale assessments of historical conditions:

a) Natural disturbance regimes of dry forests are described in the Proposed Critical Habitat (p. 49) as historically having only low- and mixed-severity fires. In contrast, the evidence from Hessburg et al. (2007) and Baker (2012) show that high-severity fires (fire disturbances) played a major role in structuring historical dry forests and owl habitat in the eastern Cascades of Washington and Oregon. About 20 percent of a 300,000 ha study area in mixed-conifer forests, mostly in eastern Washington, was dominated historically by high-severity fire (Hessburg et al. 2007). Similarly, 26 percent of about 400,000 ha of dry mixed-conifer and ponderosa pine forest in the eastern Cascades of Oregon were dominated historically by high-severity fire (Baker 2012). Low- and mixed-severity fire occurred as well, but low-severity fire likely burned at lower rates than previously thought, allowing shrubs and small trees to become abundant and even dense in forest understories (Baker 2012).

b) The idea that "this homogenized landscape may be altering the size and intensity of current disturbances..." (Proposed Critical Habitat, p. 49) is not supported by earlier research or by these spatially extensive reconstructions. First, earlier evidence showed that these landscapes are not more homogeneous today, but are instead exceedingly fragmented relative to historical landscapes (e.g., Hessburg et al. 1999). This is also evident from the extensive road network and fine patchwork of harvesting units associated with industrial logging over the last century. More heterogeneity of this kind is not needed; instead, as Hessburg et al. (2007) explained, what is needed for ecological restoration is to more closely mimic historical patch sizes and variability, which would likely lead to larger, less fragmented patches. Second, the historical rate of high-severity fire (the fire rotation) in these forests was 435 years (Baker 2012), little different from the recent 469-year fire rotation in old forests in the eastern Oregon Cascades (Hanson et al. 2009), suggesting no increase in the intensity of fire or the rate of high-severity fire. This lack of change in fire was also found in Colorado (Williams and Baker, in press). It may simply indicate the dominant and continuing control over rates and patterns of large fires by climate rather than fuels. Large fires are the fires that generally produce and maintain landscape heterogeneity (Moritz et al. 2011).

c) The idea that "understory vegetation in these forests has shifted in response to fire exclusion from grasses and shrubs to shade-tolerant conifers, reducing fire tolerance of these forests and increasing drought stress on dominant tree species" (Proposed Critical Habitat, p. 49) was refuted by two studies. First, "small trees (10-40 cm dbh) in dry forests of the Oregon eastern Cascades were > 50% of trees across 72.3% of forest area" (Baker 2012:1) and "Even understory shade-tolerant trees were common." Understory firs were present on 27.8% of forest area...and understory firs were most abundant in dry mixed-conifer, where 36.4% had understory firs" (Baker 2012, p. 12). Second, dominant overstory trees grew primarily in dense stands, not in stands where they were free of competition (Baker 2012). Moreover, dominant overstory pines are not adversely affected by competition in stands affected by fire exclusion; water stress was higher in repeatedly burned forests, in an explicit study of this hypothesis (Keeling et al. 2011).

5) Better recognize the ecological benefits of contemporary fire regimes

The most recent and definitive science that evaluated whole landscapes provides a new context in which to evaluate the effects of contemporary fire regimes. Heterogeneous fire can benefit spotted owl foraging opportunity (Bond et al. 2009) and is consistent with restoration. Contemporary fires are heterogeneous and much like those of the past (e.g., Baker 2012). The Proposed Critical Habitat suggests maintaining and restoring ecological processes, including fire. Yet the management endorsed by the 2011 Recovery Plan and the Proposed Critical Habitat still suggests suppressing contemporary fire effects through timber management. It is as if these documents were developed without any knowledge of the empirical data on contemporary fire effects, because they appear to support the idea that there is a higher probability or risk of high severity fire (disturbance) than there was historically with frequent surface fire. For this to be the case, the scenario in Figure 1 would have to apply. Past fire would have had to have been almost exclusively low-severity surface fire and the greatly reduced amount of fire today would have to be mostly high severity. This is the only way that the risk or probability of high severity fire could be increased with a concomitant dramatic decrease in fire.

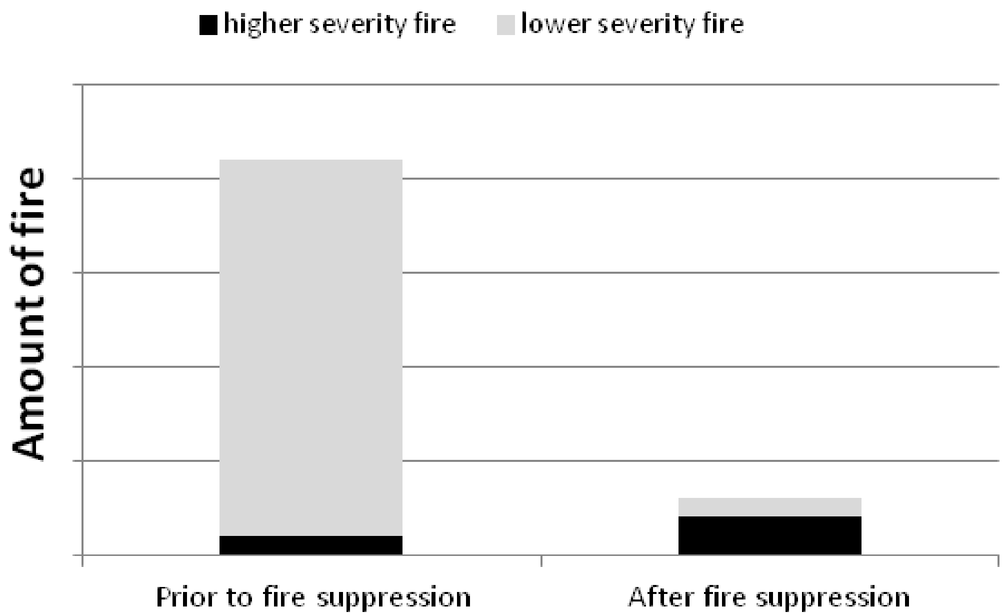

Figure 1. A model of past frequent surface fire regimes and contemporary infrequent higher severity regimes.

However, as discussed under point 4 above, past fires were mixed in severity with high-severity fire playing a more important role that previously assumed. In addition, empirical data refute the idea that the current fire regime is dominated by high-severity fire. Instead, contemporary fire (all area burned) is dominated by low- and moderate-severity fire much like historical fire. Thus, proportions of low- and high-severity fire are similar, past and present, but overall amounts of fire are lower today due to fire exclusion, as shown in Figure 2. This change in fire regimes means that the fire that is occurring is essential for process restoration and supports management recommended in Hessburg et al. (2007) and Baker (2012), and not approaches based on suppressing fire effects or improving suppression capability.

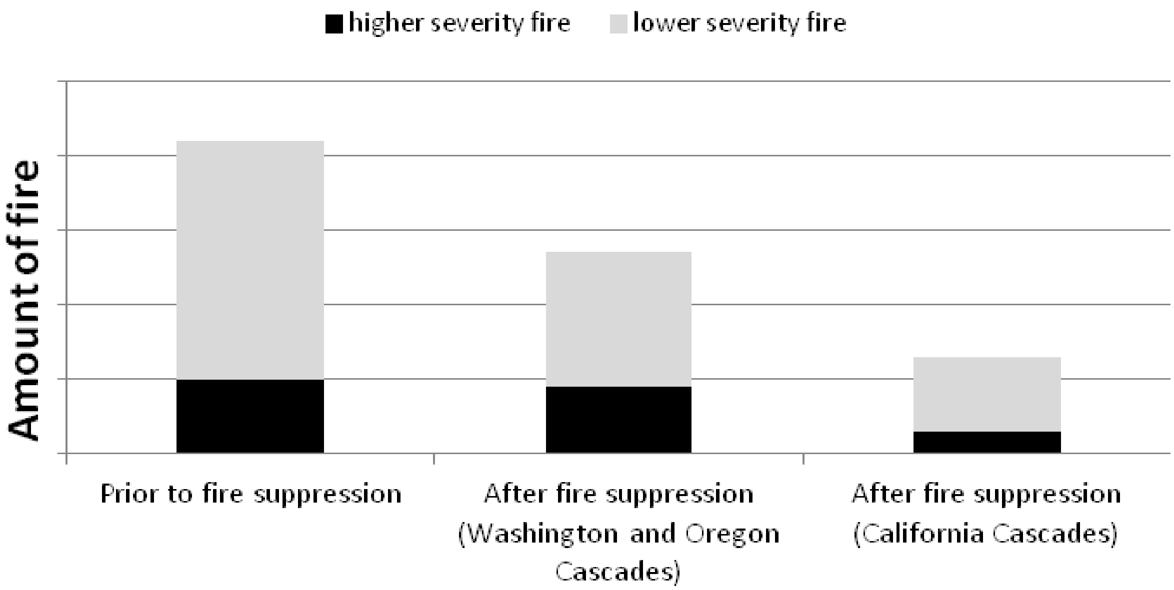

Figure 2. A model of past and contemporary mixed-severity fire that has decreased mainly in amount and less in fire behavior.

6) Analyze future fire risk using fire rotations and old-forest recruitment

The effects of current fires and the effects of treatments aimed at suppressing their impacts can be evaluated in a quantitative framework. Fire rotations are necessary to evaluate future fire risk, because if the fire rotation is currently long, then projected increases in fire, even if a large multiplier, may have limited immediate ecological importance. Fire rotation is the expected time for fire to burn across an area equal to a landscape of interest one time.

Current fire rotations in Pacific Northwest forests are generally long, based on annual mean area burned from 1980-2000 (Littell et al. 2009). In the Cascades, mean annual area burned was 0.00141 of total area, a fire rotation of 709 years (1 / 0.0041). In the Middle Rocky Mountains, which includes the Blue Mountains in northeastern Oregon, annual area burned was 0.00391, a fire rotation of 256 years. In the Sierra Steppe-Mixed Forest, annual area burned was 0.00408, a fire rotation of 245 years. These fire rotations are for all fires, whether low or high severity. Hanson et al. (2009) estimated fire rotation for high-severity fire in dry forests of the eastern Cascades of Washington, Oregon, and California for 1984-2005 at 889 years.

Since the Pacific Decadal Oscillation shifted to the cool phase in recent years, there has been less fire in the Pacific Northwest and a more up-to-date rotation can be calculated. Using data from 1984-2010 and the interagency Monitoring Trends in Burn Severity (MTBS) classification of high severity fire, we calculated the rotation for the dry Cascades as 913 years, even though the MTBS classification of high severity fire includes a wider range of fire effects than the classification used by Hanson et al. (2009).

Rates of fire alone do not predict potential impacts on spotted owls, as these rates must be compared to the rate at which new habitat is recruited to assess the net effect (Hanson et al. 2009). Recruitment of new forests can be based on the actual rate measured in USFS FIA plots. We selected plots from forest types in the dry Cascades that are used by spotted owls. From these data (n = 304 plots) we found that it took 89 years for forests to reach 27 m^2/ha basal area of live trees following a stand-initiating disturbance in the dry Cascades (27 m^2/ha is the minimum basal area in dry forests where spotted owls have been found to nest (Pidgeon 1995, Buchanan et al. 1995, Buchanan and Irwin 1998). The rate of recruitment over the last 89 years may be an underestimate for today's conditions, because forest growth rates have increased (Latta et al. 2009).

When recruitment is included, the rotation of high-severity fire can be varied to consider how any given rotation affects future forest amounts. The blue line in Figure 3 below shows the amount of forest with > 27 m^2 basal area that would occur in the dry Cascades in 20 years with current growth rates, as a function of high-severity fire rotation. The amount of this habitat that would occur if the current rotation of 913 years continued for 20 years is marked for reference. This amount is an 11 percent increase, which illustrates that current fire risk is low, not high as presumed by the 2011 Recovery Plan and Proposed Critical Habitat. In fact, even if no fire occurred over the next 20 years, there would only be slightly more forest than if the rate of high-severity fire from the last 20 years continued.

The red line in Figure 3 shows the effect of thinning 5 percent of forests having > 27 m^2 basal to a target of < 27 m^2 basal area. This reduction in basal area to a target level below minimum amounts in dry forests used for nesting by spotted owls (Pidgeon 1995, Buchanan et al. 1995, Buchanan and Irwin 1998) is based on prescriptions described by Johnson and Franklin (2009) and currently being implemented by BLM. They are dictated by commercial criteria, but are nonetheless described as beneficial to spotted owls in planning documents due to the presumption they would lead to more habitat. The simple mathematical relationships and assumptions from the real world that are incorporated into the figure below illustrate the futility of trying to create more habitat using commercial logging (ecological forestry) approaches that do not leave sufficient basal area for owls to use during critical periods in their life history. Even if the 5 percent treatment completely eliminated fire (rotation is infinity over the next 20 years), there would be 2-3 percent less habitat than there would be with no treatment. Thinning 10 percent would result in loss of about 7-8 percent of habitat, even if all fire was eliminated. If we assume that treatment of modest amounts of area does not eliminate fire at landscape scales, we find that there will be even less habitat maintained compared to the no-treatment option. Based on simple mathematical accounting, the only way to avoid net loss of Critical Habitat is to avoid treatments that cause any habitat loss, even if it is temporary. The 2011 Recovery Plan and the Proposed Critical Habitat admit that the thinning and logging treatments they endorse will cause habitat to be lost, but, having done no mathematical analysis, assume the impossible (that the treatments that eliminate habitat will lead to an increase in habitat).

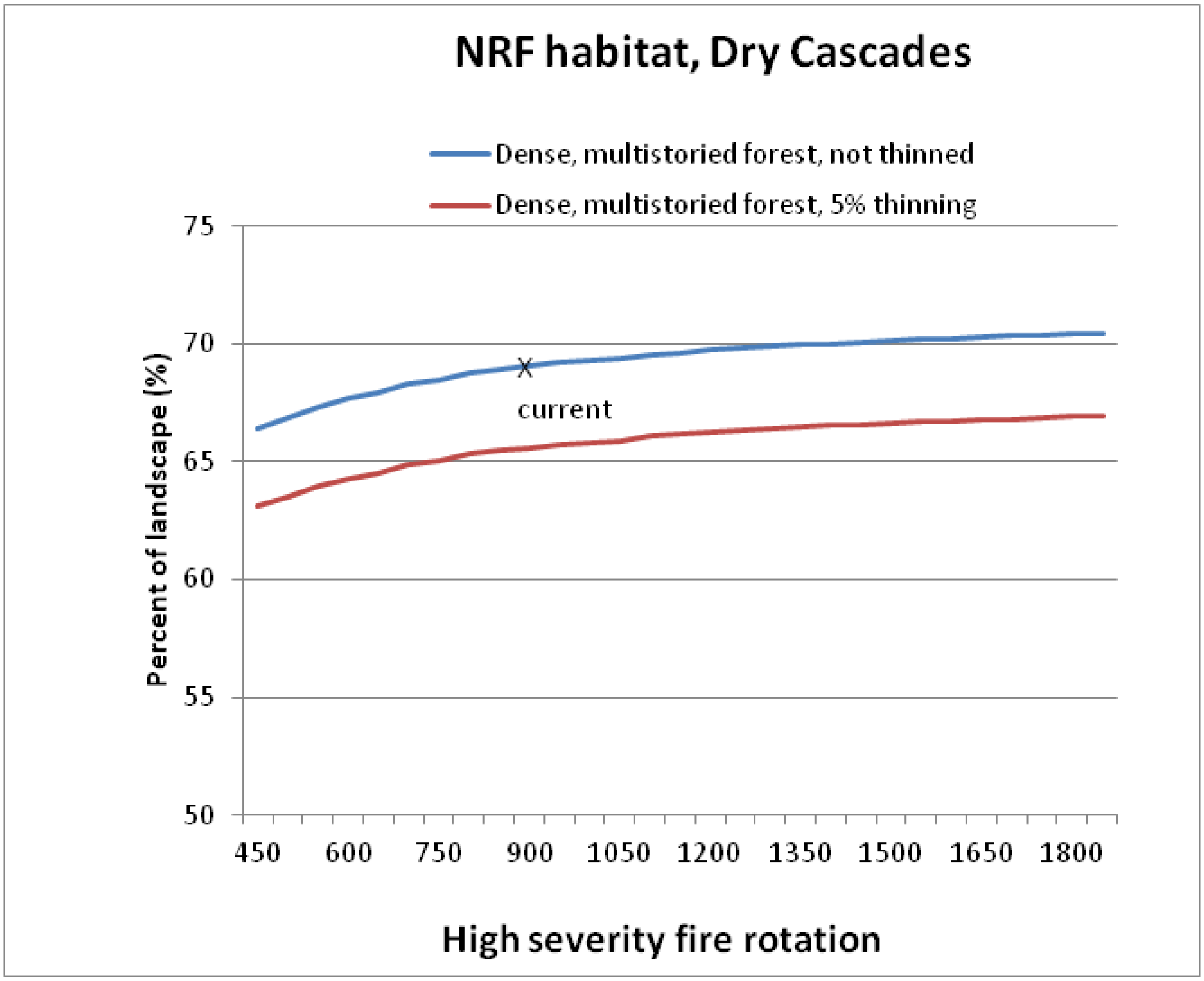

Figure 3. Amount of nesting, roosting, and foraging habitat in the range of the northern spotted owl in the dry Cascades 20 years in the future as a function of the high severity rotation over that time period.

These conclusions about thinning effects on future habitat apply even if severe fire increases due to climate change, invasive grasses, or reduced fire suppression[1]. Future projections of fire in northern spotted owl habitat may suggest more fire may occur than currently occurs, but do not predict how much (Shafer et al. 2010). However, for the Washington eastern Cascades, Littell et al. (2010) projected 1.43 times as much fire by the 2040s. Hanson et al. (2009) estimated the recent high-severity fire rotation in dry forests in the Washington eastern Cascades as 372 years,

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1 The common perception that fire severity is increasing due to fire suppression has been refuted in studies in closed forest types like those constituting northern spotted owl habitat. In Douglas-fir dominated forests, the most common type used by spotted owls in the dry forest provinces, fire severity has been found to decrease with increasing time-since fire (Odion et al. 2004, 2010, Miller et al. 2012). In drier ponderosa and mixed conifer forests, which are less used by spotted owls, fire severity has been found to be poorly predicted by metrics of the effects of fire suppression (Odion and Hanson 2008), or to increase only slightly (Miller et al. 2012) and far too little to compensate for the effects of fire suppression in reducing higher severity fire.

so an increase of 1.43 times would lead to a future fire rotation of 260 years. This means that only about 8 percent of dry-forest area would be expected to burn severely in the next 20 years.

Spracklen et al. (2009) projected area burned in the Pacific Northwest in A.D. 2046-2055 to be 1.78 times recent area burned. Using either our estimate of 913 years or the Hanson et al. (2009) estimate of 889 years in dry forests of the eastern Cascades would lead to a high-severity fire rotation of about 500 years, which means that only about 4 percent of dry-forest types would be expected to burn in the next 20 years. Using the Littell et al. (2009) estimates, for a recent high-severity fire rotation of 709 years in the Cascades would lead to a fire rotation of 398 years, which means only about 5 percent of dry-forest landscape would be expected to burn in the next 20 years. Thus, this worst-case analysis shows expected rates of 4-8 percent of dry-forest area burning at high severity in the next 20 years, assuming that projected rates of burning right now were elevated to the levels projected to not be reached until the 2040s. This worst-case scenario shows that the amount of burning would be more significant in areas with shorter current fire rotations, but does not suggest a fire-risk emergency in any area. As long as recruitment rates exceed rates of high-severity fire, forested habitat for spotted owl nesting and roosting will increase. This will happen as long as high-severity fire rotations are greater than 89 years (about 10 times today's rate). If fire becomes more prevalent than this, reducing it by methods that eliminate habitat would not protect spotted owls; it would still increase habitat loss. Methods that reduce severe fire without eliminating habitat would be needed. These include various means of ignition management, which has been found to be a more effective means of reducing fire than fuel management (Cary et al. 2009).

The conclusions of the 2011 Recovery Plan, carried forward in the Proposed Critical Habitat, can be updated to provide these missing, but essential assessments of future fire risk. It is essential to estimate current and projected future fire rotations and evaluate them relative to the rate at which nesting and roosting habitat is being recruited. When these calculations are made, fire risk appears low now and over the next 20 years, even under a worst-case scenario. There remains ample time for careful experiments, ecological restoration, and other actions to recover northern spotted owls and restore ecosystems in Critical Habitat (Hanson et al. 2009). This is good news, of course, because it reduces the needed pace of recovery and restoration actions and allows small-scale experiments to test effects on owls to be conducted and evaluated before expanding actions to large landscape scales.

7) Replace the endorsement of ecological forestry with ecological restoration, as ecological restoration is the best tool to achieve the specific recovery needs of owls and ecosystems

The Proposed Critical Habitat and the 2011 Recovery Plan both endorse ecological forestry and the concept of forest health, but appear to often presume that ecological forestry is generally a part of ecological restoration. For example, the 2011 Recovery Plan puts them together "as part of a spotted owl recovery strategy that includes 'ecological forestry and restoration'" (2011 Recovery Plan, III-11). The scientific literature does not support this, as in general there has been a clear distinction between ecological forestry and ecological restoration. We suggest it is ecological restoration, not ecological forestry and 'forest health' that is needed in parts of Critical Habitat.

Ecological forestry was developed to modify past single-focus forestry (e.g., timber production) so that harvesting includes more values and better emulates the effects of natural disturbance (e.g., Carey 2007, Franklin et al. 2007). For example, Franklin et al. (2007) discusses only how to modify common silvicultural methods to more closely mimic effects of natural disturbances. That study presumes logging will occur, and seeks to modify what is done, so the outcome is less ecologically damaging. It is the same goal and focus in Drever et al. (2006) and Carey (2007), which the Proposed Critical Habitat cites as examples of ecological forestry. Ecological forestry is all about ecologically better wood production.

However, timber harvesting for wood production, even if less ecologically damaging under ecological forestry, is not identified as a needed recovery action for spotted owls, or as a general ecosystem restoration need in either the Proposed Critical Habitat or the 2011 Recovery Plan. Regeneration harvests in moist forests are mentioned in the background material regarding Recovery Action 6 in the 2011 Recovery Plan (III-19), but we wonder why the Proposed Critical Habitat does not say they are discouraged? No scientific justification is provided in the Proposed Critical Habitat for why timber harvesting, whether truly bad for owls or somewhat less bad because of ecological forestry principles, is specifically *needed* in Critical Habitat for a threatened species that is continuing to decline. Regeneration harvests in moist forests will certainly reduce the rate at which old forest is recruited, which appears clearly detrimental to owls and to ecological restoration. Old forest has already been reduced by past logging and the northern spotted owl continues to decline as a result. The Proposed Critical Habitat and the 2011 Recovery Plan endorsement of ecological forestry are hard to justify from a scientific perspective.

Where owl habitat improvement and ecosystem restoration are needed in some parts of Critical Habitat, it is ecological restoration not ecological forestry that is needed, as wood production is not needed for spotted owls. Ecological restoration seeks to restore owl habitat or the ecosystem more generally, through a variety of means, using reference information as a framework. Silviculture is suggested and appropriate only to a limited extent in particular stands in moist forests, under Recovery Action 6 to accelerate development of older complex forest, a very specific focus that is not the primary focus of ecological forestry. Ecological forestry's focus on wood production is not needed in Critical Habitat.

Similarly, since spotted owls prefer forests with disease and mortality processes (e.g., snags, downed wood, and mistletoe are important habitat features), 'forest health' is not an appropriate goal, unless health is properly clarified to include disturbance, disease and mortality. Forest health, undefined, implies an absence of disturbance, disease and mortality. More broadly, in resource-extraction disciplines like forestry, eco-forestry, silviculture, or other forms of agriculture, health implies optimum growth for commodity production (DeLeo and Levin 1997). When management is based on health and other forest production goals, it typically conflicts with restoration of ecological processes. A case in point is fire suppression.

8) Dismiss the Johnson and Franklin (2009) ecological forestry framework, as it uses an out-of-date reference framework, has goals that are incompatible with critical habitat, and would be damaging for both owls and ecosystems

Prior to the report by Johnson and Franklin (2009) and publication by Long (2009), thinning and fuel reduction were not a focus of "ecological forestry," which aimed at improved logging in moist forests. However, Johnson and Franklin (2009) and Long (2009) first suggested that ecological forestry is compatible with ecological restoration in dry forests, even though significant wood production is still a goal which conflicts with restoring naturally heterogeneous fire processes. These are essentially the first documents to make that claim, but it is made only for dry forests. In contrast, research since 2007 (Hessburg et al. 2007, Baker 2012) shows that this claim relies on the wrong reference framework. Both Johnson and Franklin (2009) and Long (2009) envision that fire exclusion in dry forests led to a surplus of small- to medium-size trees that can be harvested to provide jobs and simultaneously accomplish restoration, certainly a politically enticing possibility. Johnson and Franklin (2009) recommend reducing trees <150 years old, protecting older trees, shifting composition toward fire-resistant pines and larch, reducing surface and ladder fuels to lower vulnerability to high-severity fire and insects, and maintaining small- and medium-scale spatial heterogeneity. The problem is that the ecological reference information for these proposed actions is the out-of-date, pre-2007 science (see No. 3 above). The key Hessburg et al. (2007) study is not even cited by Johnson and Franklin (2009). Hessburg et al. (2007) and Baker (2012) show that, if Johnson and Franklin's (2009) proposals were followed, dry forests would be even more altered than they are now, not restored. Here are the reasons:

First, ecological forestry was based on the idea that by mimicking natural disturbances, wood production could be more ecologically sound. However, the Johnson and Franklin method seeks to reduce fuels and lower fire risk, but if successful, this would reduce the mixed- and high-severity fire that was a substantial component of historical fire regimes in dry forests (Hessburg et al. 2007, Baker 2012), increasing the adverse impacts of fire suppression. Thus, Johnson and Franklin (2009) do not follow the ecological forestry principle of mimicking natural disturbance. Their proposed method will also not achieve a goal of the Proposed Critical Habitat (p. 7) which is "to address the conservation of broader ecological processes", including maintaining natural fire regimes. Similarly, the 2011 Recovery Plan states: "It is not our intent...to do landscape-wide treatments for the purpose of excluding disturbance events such as fires, including high-severity fires. On the contrary, we are looking to support the disturbance regimes inherent to these systems..." (2011 Recovery Plan, III-32). Johnson and Franklin's methods, if successful, would actually exacerbate fire exclusion and further alter natural fire processes, thus degrading these ecosystems, not restoring them.

Second, Johnson and Franklin would remove trees < 150 years old, and retain trees > 150 years old, on the presumption that trees < 150 years old are the result of fire exclusion. However, the onset of fire suppression was not 150 years ago. Fires were widespread up until the 1930's in most areas. In addition, because of industrial logging, trees < 150 years old are usually the most abundant trees, and often nearly the only trees. This is the situation in most dry forests. What would be left in areas without many older trees? Moreover, removing young and small trees is based on outdated theory that has been disproven. Hessburg et al. (2007) showed that historical dry mixed-conifer forests were actually dominated by pole- to intermediate-sized trees, the very trees that Johnson and Franklin propose to remove. Similarly, Baker (2012) showed that 60 percent of historical trees in dry forests of the Oregon eastern Cascades were 10-40 cm in diameter. Moreover, 40-cm trees were on average only 105-120 years old and represented a larger fraction of the forest than the 60 percent of trees that were < 150 years old. ***Thus, Johnson and Franklin's method would remove the trees that historically dominated dry forests, leading to ecological degradation, not ecological restoration.***

Third, the proposed thinning and fuel reduction of Johnson and Franklin aims to create widespread open, low-density forests that did not historically dominate dry-forest landscapes (Hessburg et al. 2007). Open, low-density forests historically were found in small parts of dry-forest landscapes, but relatively dense and even very dense forests were the norm in historical dry forests of Oregon's eastern Cascades (Baker 2012). Thus, regarding tree density, Johnson and Franklin's (2009) method would also not restore historical forests, but alter them further.

Finally, removing understory trees, as Johnson and Franklin propose, would further alter these forests, since understory trees were abundant in most historical forests. For example, 57 percent of dry forest area in the eastern Cascades of Oregon had small understory trees, these understory trees were dense on 30% of the dry-forest area, (Baker 2012).

Thus, for these four reasons, the Johnson and Franklin (2009) proposal for ecological forestry would create an unnatural forest, one that would not benefit spotted owls or ecosystem restoration. Because the reference framework is outdated, the methods of Johnson and Franklin (2009) would not just be benign, but would actually significantly alter most dry forests. Ecological forestry surely is not needed for spotted owl conservation or ecosystem restoration. In fact, research in the Sierra Nevada documented that basal area of all trees >10 cm was associated with increased occupancy and reproduction of spotted owls (Roberts et al. 2011*).* ***The Proposed Critical Habitat can avoid contributing to spotted owl decline and further degradation of dry-forest ecosystems by removing any endorsement of ecological forestry, and by also removing the Adverse Modifications section that says "actions...that apply ecological forestry principles...are likely to be consistent with the conservation of the northern Spotted Owl and management of its critical habitat" (Proposed Critical Habitat, p. 9, 184). They are not consistent with conservation of northern spotted owls or their prey.***

9) Include a plan with sideboards for restoring and managing critical habitat that builds on the Northwest Forest Plan and uses the spatially extensive reconstructions

Given the new habitat modeling and spatially extensive reconstructions for dry forests, it is a good time to use this new science to create a plan, which uses the Northwest Forest Plan for improving owl habitat and ecosystem restoration for designation of Critical Habitat. Unfortunately, the Proposed Critical Habitat draft misses the opportunity to do this in a way that builds on the Northwest Forest Plan, and it even appears to back away from the key guidelines of it. The Proposed Critical Habitat envisions planning would occur as "landscape assessments" at the scale of National Forests, Ranger Districts, or BLM Districts (Proposed Critical Habitat, p141). Downgrading planning and management to that scale contributed to the situation the led to the Northwest Forest Plan in the first place; and it is difficult to obtain a consistent outcome without an overall plan (see section above on the relationship of Critical Habitat to the Northwest Forest Plan for more on this topic).

The current Proposed Critical Habitat does not provide the needed spatial plan for Critical Habitat and no limitations or guidance on how much treatment or what kinds in what proportions. Without these sideboards, we doubt that the Service can effectively evaluate whether proposed actions are likely to jeopardize the continued existence of northern spotted owls or will fail at ecosystem restoration. Clear limitations on total area to be treated, patterns of treatment, and extent of other activities appear necessary in the Proposed Critical Habitat document itself, based on the needs of both spotted owls and ecosystems. Individual consultations under Section 7 of Endangered Species Act cannot easily replace what could be accomplished through a systematic plan. Averting cumulative impacts by good planning is central to NEPA and also appears essential to effectively manage critical habitat for owls and ecosystems.

The primary recommended planning method is to allocate land to areas for spotted owl conservation and recovery vs. process restoration (Prather et al. 2008, USDA 2010), but this is also out of date. The Proposed Critical Habitat (p. 141) suggests that process-restoration activities (i.e., primarily fuel reduction and thinning) may conflict with owl conservation and recovery, since thinning may "degrade or remove existing northern spotted owl habitat." However, at the top of p. 141 in the Proposed Critical Habitat is the quote from Hessburg et al. (2007) that more is needed for ecosystem restoration than reducing fuels and thinning trees. Hessburg et al.'s findings suggest there is no longer widespread inherent conflict between owl habitat protection and ecosystem restoration. Baker (2012) supports and expands on Hessburg et al. (2007), including additional ecological restoration suggestions. Since reducing fire risk is not needed in the near term to protect owl habitat (Roberts et al. 2008, Bond et al. 2009, Roberts et al. 2011) or restore ecosystems (Hanson et al. 2009, Baker 2012), these two goals do not appear to be in conflict.

The spatially extensive landscape reconstructions needed for planning ecosystem restoration in dry forests across Critical Habitat are available right now and can be used to identify and prioritize ecological restoration actions. The reconstructions provide detailed understanding not possible for any other region of dry forests in the West (Hessburg et al. 2007, Baker 2012), and it is unlikely that much more detailed and spatially complete data will ever become available. These studies are similar in their findings and lead to similar guidance as to how to restore ecosystems to create "more natural patterns and patch size distributions of forest structure, composition, fuels, and fire regime area" (Hessburg et al. 2007) that the Proposed Critical Habitat (p. 141) cites as the key ecosystem restoration need. Specifically, Hessburg et al. (2007) provided proportions of historical dry forests by forest-structural class and by fire severity.

Earlier research included many other attributes of historical landscapes (e.g., Hessburg et al. 1999, 2000). Baker (2012) provided: (1) detailed spatial reconstructions of historical tree density and fire severity as well as quartiles of tree density and fir composition, (2) historical fir abundance by region and distributions of fir concentrations versus environment, (3) historical tree diameter distributions, (4) abundance of understory trees and shrubs, and (5) estimates of rates and patterns of historical low- and high-severity fire. Digital maps are likely available from both studies. ***The studies of Hessburg et al. (1999, 2000) and Baker (2012) provide an extraordinary level of information for planning how to restore and manage dry forests of the***

eastern Cascades in Oregon and Washington. These studies could easily be used in a Critical Habitat Proposal to create the needed guidelines for ecological restoration of dry forests.

8. Importance of State-Owned Lands

TWS has commented on the importance of State owned lands in Oregon, Washington, and California for conservation and recovery efforts for the northern spotted owl in previous reviews. DNR lands in Washington, Oregon Department of Forestry lands in Oregon, and California Department of Forestry lands in California can and should play a role in the conservation of habitat for the subspecies. The Service is referred to previous reviews on various drafts of the recovery plan to find these comments. TWS supports the use federal lands for the majority of critical habitat for spotted owls but contends that state-owned lands are important in portions of all three states to support the network on federal lands. Consequently, TWS encourages the Service to do everything in its power to make use of state-owned lands wherever it is necessary. For example, the Elliott, Tillamook, and Clatsop State Forests in the Coast Ranges of western Oregon are located in key areas where they can and should provide for nesting, roosting, and foraging habitat for northern spotted owls. Similarly, DNR lands in western Washington occur around the Olympic Peninsula and federal lands in the Cascade Mountains where they also can and should provide nesting, roosting, and foraging habitat for the subspecies. Comparable areas in state ownership also occur in California.

Having said the above, there are some aspects of the critical habitat proposal pertaining to state owned lands that concern us. First, most of the modeling of conservation benefits of the various habitat networks combines state-owned lands with private lands (Critical Habitat Proposal, p. 37). This combination of state-owned and private lands is inappropriate since state-owned lands should have a higher responsibility for habitat conservation for the subspecies than private lands. Second, in all of the "Possible Outcomes" for exclusion of land from the final critical habitat designation, state-owned lands and private lands are either included or excluded from the designation together. This implies that private lands have equal responsibility for habitat conservation as do state-owned lands. Again, this is inappropriate, and it needs to be corrected so that state lands share some of the responsibility for habitat conservation for the northern spotted owl.

9. Other Comments and Concerns

Dispersal habitat

It is a mistake to make assumptions about the "quality" of dispersal habitat based on the very limited habitat use studies available on dispersing northern spotted owls (Critical Habitat proposal: p 60-62,100-101). In particular, just because dispersing birds can be located in younger age class forests, does not mean the use of these habitats have neutral or positive effects on their survival. There is a large discussion here about the "qualities" of dispersal habitat, but really very little scientific evidence exists linking survival of juvenile spotted owls to use of specific habitats. The Service notes that high quality nesting and roosting habitat for spotted owls is most likely high-quality dispersal habitat and this is certainly likely in that high survival and reproduction habitat for breeding birds is likely high survival habitat for dispersing birds as well. Conversely however, one cannot assume that because younger seral stage habitats are used by dispersing juveniles that they are not conferring some survival disadvantage compared to older forest (Franklin et al. 2000, Olson et al. 2004, Dugger et al. 2005).

10. Important Habitat that the Modeling Approach Missed

The designation of the Proposed Critical Habitat appears to have been driven solely by the modeling process, and it apparently did not attempt to incorporate knowledge of unique forest situations, conditions and opportunities to add or delete lands. Low elevation forests on federal and state lands along the margins of the Puget Trough, Willamette Valley, Umpqua Valley, and Rogue River Valley and similar situations in California were largely not included in the Proposed Critical Habitat. Some of these blocks were designated as late-successional reserves in the Northwest Forest Plan but are not included in the current proposal likely because of adherence to a modeling approach. Even though many of these forests are in small parcels surrounded by private lands they are important refugia for spotted owls and their prey (e.g., tree voles, flying squirrels) in landscapes dominated by private lands that are intensively managed for timber production. If they are not afforded the protection of Critical Habitat it is probable that spotted owls will disappear from some of the most productive forest areas in their range. In addition, these low elevation refugia are likely repositories of plant and animal diversity that will be lost or greatly reduced if they are converted to intensively managed forests. Even if these lands are small, fragmented parcels, they represent some of the most productive forests and habitats for northern spotted owls and associated species. They certainly merit protection by designation as Critical Habitat. This is especially important if the Service wishes to portray this rule and the 2011 Recovery Plan as ecosystem approaches instead of a single-species approach. See Appendix A for more on the evaluation of the maps of Proposed Critical Habitat.

Another situation where the modeling approach to designation of Critical Habitat appears to have failed is exemplified by inordinately broad gaps in Proposed Critical Habitat between fragmented populations of the northern spotted owl. Here the absence of connections of the Olympic Peninsula owl population to the Cascades of western Washington is a prime example. We also believe that the habitat connections across the Columbia River, the I-90 corridor in Washington, and portions of I-5 in Oregon and California should be strengthened, as should connections across the suburbanizing valleys throughout the range of the owl.

One of the strong points of the 2011 Recovery Plan for the northern spotted owl was the recommendation to protect all occupied nesting territories and high quality habitat for the owl. The Critical Habitat designation should be designed to accomplish this. How else can the Service identify and afford some level of protection to these often small and fragmented areas? It seems to us that by not identifying and designating these areas as Critical Habitat the Service abandons them to the discretion of the managing entities. To afford these important parcels appropriate status will require stepping outside of relying solely on a computer modeling approach to identifying Critical Habitat. We view the absence of attention to protect "all occupied nesting territories and high quality habitat" as essentially nullifying that very important point in the 2011 Recovery Plan. Surely that was not the Service's intention.

A modeling approach to designing Critical Habitat offers a mechanistic and objective means to achieve that end. But, it misses opportunities to incorporate on-the-ground knowledge of

unique forest situations or to apply human insight to overcome problems (such as those described above). We call for a modified approach to Critical Habitat designation that incorporates a rule set to address these issues and involve ecological decision- making, which is not afforded by a computer model alone (see Appendix A for more details).

We hope the Service will seriously consider these comments. Thank you for considering the view of wildlife professionals. If you need further information or have questions about our comments, please contact Laura Bies, Director of Government affairs (laura@wildlife.org; 301-897-9770 x308).

Sincerely,

Paul R. Krausman

Paul Krausman, CWB
President

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Appendix A: Review of Maps from Proposed Critical Habitat Rule for Northern Spotted Owls

Three members of the TWS Review Committee had an opportunity to view various GIS scenarios of the Proposed Critical Habitat projected on a large screen. The various overlays provided an enhanced appreciation/understanding of both the areas proposed for Critical Habitat designation and areas omitted. What follows are notes/comments recorded at that viewing session. The three committee members were most familiar with spotted owls and forest conditions in Washington and Oregon; these comments reflect that bias.

Positive Features:

Oregon

- Portions of the Clatsop, Tillamook, and Elliott State Forests are included in the Critical Habitat designation – this is an improvement that will hopefully allow for recovery of spotted owls and tree voles on state lands in western Oregon.

- Van Duzer corridor along OR highway 18 is included

- State Forest lands west of Mary's Peak are included

  The Proposed Critical Habitat included historical nesting sites on the Deschutes NF and parts of the B & B burn, which will hopefully recover and provide habitat for spotted owls.

- BLM lands northeast of Roseburg are included as nesting and dispersal habitat

California

- Critical Habitat is provided in Marin County of Northern California for owl nesting habitat and habitat for the Sonoma tree vole

- Private and Forest Service lands in northwest California are included

Note: The general sense was that the inclusion of these areas in addition to a strong network of Critical Habitat units represented a positive feature of the proposal. Elimination of these identified areas in the final designation of Critical Habitat would markedly weaken the effort.

Concerns:

Washington

- Private and DNR lands in southwest Washington are excluded from Critical Habitat

DNR lands on the west side of the Olympic Peninsula are not included in Critical Habitat. This seems odd because it leaves the spotted owl population on the Olympic Peninsula isolated from other areas.

- There was no apparent attempt to connect the Olympic Peninsula to the western Washington Cascades. This is an important area where connectivity may be important for dispersal and genetic transfer.

- We note that Critical Habitat in the Columbia River George Scenic Area on the Oregon side does not extend down to the river. Likewise, some federal lands on the Washington side of the Columbia River are not designated as Critical Habitat. If the objective is to facilitate dispersal across the river it seems to us that Critical Habitat should include forests all the way down to the riverbank. Because there is very little federal land adjacent to the Columbia River in Washington to serve as a dispersal link across the river, we also suggest that the Service should consider taking advantage of suitable habitat on the east side of the Little White Salmon River in Washington above Drano Lake which is partly held by NGOs and a Service hatchery.

Oregon

- We note that numerous small and isolated old-forest stands on federal lands or state lands around the Forest Grove Watershed, McDonald Dunn State Forest, BLM lands west of Scappoose, fragmented BLM lands in North Coast Range of OR, and federal lands west of Estacada were not included in the Critical Habitat network. Many of these areas were historically occupied by spotted owls. So, we are curious why they would not be included in the Critical Habitat network?

  We note that fragments of old forest on BLM lands along the margins of the Willamette Valley, some of which were previously designated as Late Successional Reserves in the Northwest Forest Plan are not included as Critical Habitat. We suggest that these fragments of old forest in areas that have been mostly logged over are important islands of diversity in otherwise simplified landscapes, and should be retained as Critical Habitat for spotted owls and their prey.

- USFS lands east of the Kalmiopsis Wilderness area in southwestern Oregon were excluded – this leaves a large gap that could be important for dispersal – why was some of this area not included in the Critical Habitat proposal?

- BLM lands around the margins of the Medford Valley were excluded from Critical Habitat – why?

- Late Successional Reserves on the Winema National Forest east of Upper Klamath Lake were not included – why?

California

- Northwest Forest Plan Late Successional Reserves in northern California were excluded—why?

- Late Successional Reserves on U. S. Forest Service lands in the California Cascades were left out—why?

- Critical Habitat does not appear to provide connectivity of suitable habitat along the margins of I-5 in northern California – why?