

Summary of responses
Sustainable Ecosystems Institute

	Northern Spotted Owl Questionnaire	
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The NSO questionnaire addresses many of the important issues considered during the review process. The individual panelists' responses will show the degree of unanimity or uncertainty on different topics. They will also show which data are considered most reliable, and why panelists have reached their individual conclusions.

In filling out this questionnaire, please take the opportunity to expand on your answers. We have found that such 'explanations' can be very useful. It is also a way that you may address uncertainties, alternate hypotheses, etc. Use this also as an opportunity to comment on ambiguities or qualifications. If you are filling in an electronic copy, simply add space as necessary. If working from a hard copy, use a separate sheet for expanded responses.

Key to respondents:

AF Alan Franklin
JF Jerry Franklin
JM John Marzluff
MC Martin Cody
RB Richard Bigley
RF Rob Fleischer
RG Rocky Gutiérrez
SPC Steven Courtney

PART I. GENERAL QUESTIONS

1. Compared to other endangered species issues you have worked with, how would characterize the knowledge base for understanding the status of the Northern Spotted Owl?

XXMajor information gaps;
XX X Minor information gaps;
XXXWell understood

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Additional comment:

SPC - While many areas have been well studied (e.g. demographic study areas), other essential topics have not been considered at all.

MC - Except for a) Barred Owl influence not at all well researched; b) prey base of NSO not much studied; c) demography analysis seems very limited compared with its potential, needs more insight and original, extended analysis.

RB - Compared to other species, we have very good information on Northern Spotted Owls; they are the best-studied owl in North America. Significant progress has been made in specifics concerning their population trends and habitat selection. Considerable information gaps remain, many relate to new possible risks to the species.

RG - The northern spotted owl has one of the largest if not the largest information base for an endangered species. The fact that some key information remains unknown or uncertain points to the difficulty of determining the causative factors related to a species decline.

Major information gaps: 1) the causative mechanisms that affect survival rates, fecundity rates, and population trends, 2) the effect of barred owls on spotted owls; 3) the relationship of habitat characteristics to occupancy and performance in that habitat; 4) trends in habitat on public land over time, 5) effect of regulation on mitigating negative effects of habitat loss or change, 6) trends in habitat on private land. Minor information gaps: 1) Genetic structure, variation, and gene flow among populations (introgression of barred and spotted owls). Well understood issues are habitat use, habitat selection patterns, food habitats, home range size, general dispersal patterns, basic genetic relationships.

RF - The NSO has been the subject of a tremendous amount of research, but gaps do remain in areas such as disease, genetics, and impacts of Barred Owls.

AF - There are very few wildlife species that could be characterized as “Well understood”. The knowledge base for northern spotted owls is mixed. There are major information gaps for certain aspects, such as specific effects of barred owls on spotted owl life history parameters the causative mechanisms for observed variation in life history traits and population dynamics, and the effects of natural and anthropogenic disturbance on spotted owl population. There are minor gaps in other areas, such as genetics, and natural history.

JM - One of the best studied birds in the world

2. In your opinion the overall quality of the information available during the review process (across all subjects considered by the panel) was:

High quality, majority of conclusions strongly supported X

Generally high, most conclusions strongly supported XXXX

Mixed quality, some conclusions based on limited evidence XXX

Very mixed, some conclusions based on sparse evidence

Generally low, many conclusions based on weak evidence

Additional comment:

SPC - Barred owl, habitat trends and correlates of demographic changes are just 3 areas that were poorly known.

MC - Many of the regional reports are somewhat anecdotal in info reported, Probably as they are generated by field personnel with limited training and scientific expertise.

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RB - There is an extensive body of peer reviewed literature on Northern Spotted Owls. Most important aspects of NSO ecology have been investigated over several years, often by multiple investigators at multiple locations. Additional data and years of observation are valuable. The future evaluation of remaining issues will add an increased level of specificity to our understanding and new aspects of NSO biology like Barred Owl interactions and the threat of West Nile Virus.

RG - Mixed quality. General population dynamics, natural history of owl, and genetics are very good, but we are lacking key information on causative mechanisms (see 1 above) which leads to a mixed quality assessment because we cannot distinguish (for example) barred owl effects from some other effect on spotted owls in the northern part of their range

AF - For the most part, the quality of the published literature is high. However, many of the reports and presentations were of mixed quality and it was often difficult to evaluate the methods used, especially in the presentations because of their short duration.

3. In your opinion the overall quality of the information available during the review process (in your subject areas, and for the documents you personally read) was:

High quality, majority of conclusions strongly supported X

Generally high, most conclusions strongly supportedXXX

Mixed quality, some conclusions based on limited evidence X X X

Very mixed, some conclusions based on sparse evidence

Generally low, many conclusions based on weak evidence

Additional comment:

MC - I.e. on BO influences, basic lack of studies directly addressing BO numbers and trends, and data collected incidentally to NSO survey work leaves much to be desired.

RB - There are still considerable uncertainty and conjecture, particularly related to regional trends in habitat development and loss.

RG - The barred owl information was very mixed for the numerous issues cited in the barred owl chapter, but the population and habitat data were very good.

AF - Quality of information on trends in populations and habitat associations was generally very high. The quality of information on the effects of barred owls on spotted owls tended to be more speculative and poorly analyzed.

4. The conclusions reached during the review process were based on peer-reviewed data and papers:

In nearly all subject areas XXX

In a majority of subject areas X X XXXX

In some subject areas but not others

Additional comment:

MC - and in those areas based more on regional reports, the data quality was high even tho not peer reviewed.

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RB - For the traditional areas of owl biology (taxonomy, habitat use, demography) conclusions are solidly grounded in carefully reviewed data and interpretations. For emerging issues (Barred owl interactions, West Nile Virus) and some long-term issues (suitable habitat trends) the information is relatively new and has not benefited from the lengthy review and reexamination process of more traditional subjects.

RG - In nearly all subject areas, but was considered more heavily in the section on barred owls.

AF - See comment 5 below.

RF - There was a lot more “grey” literature in the aspects dealing with habitat and ecology of NSO, and only a handful of unpublished reports or manuscripts dealing with the areas in which I was primarily concerned (systematics, genetics, and BO/SO hybridization).

5. For some subject areas the panel relied on information that had not been peer-reviewed (reports, presentations, etc.), as noted by italicized citations throughout the report. In your opinion the degree of discussion and scrutiny by the panel assured that when such information was used, it was used appropriately.

X X XX Strongly agree

X X X X Agree with qualification

Disagree

Additional comment:

SPC - Some areas, e.g. Barred Owls, were well discussed. Other areas, such as habitat trends were not.

MC - Noting that is IS a role for field survey notes and comments, as these personnel generally know well NSO and what they are doing and saying.

RB - The panel process was essentially a peer review process.

RG - I think that non-peer reviewed information was used more than it was warranted in a few cases (e.g., barred owls and habitat relationships). I believe this was done because of the pressure to use non peer reviewed information. In one respect this was relevant in the form of panel meetings because it helped formulate the issues needed for discussion. But use of non-peer reviewed information is always suspect in my opinion because there is no way to evaluate the data (most of the time non peer reviewed papers have no data but only generalities and opinions of the authors).

AF - I think too much weight was sometimes placed on information presented in oral presentations. These presentations often were too brief and omitted too many details to be adequately reviewed by the panel.

RF - In some cases, unpublished material was given high credence because of our own “peer review”. We can tell quality from not.

6. In your opinion, the SEI review process comprehensively addressed all major issues affecting NSO populations

XX XXX X X X Strongly agree

Agree with qualification

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Disagree

Additional comment:

RB - A considerable time has passed since the last comprehensive synthesis of NSO ecology as related to potential population threats. I hope that one of the outcomes of this process is to refocus efforts to fill in the identified information gaps.

RG - I think the panel made a serious effort to uncover those areas that were essential to assessment.

PART II QUESTIONS RELATED TO GENETICS AND TAXONOMY

7. In your opinion the best available scientific evidence supports:

A significant evolutionary separation between California Spotted Owls and NSO

XXXXXXXX

**Lack of significant evolutionary separation between California Spotted Owls and NSO
There is insufficient and/or contradictory evidence so that it is hard to form a strong conclusion.**

Additional comment:

RB - There is consistent evidence that supports a solid subspecies separation between the Northern Spotted Owl and the California Spotted Owl. The preponderance of information suggests the subspecies have been separated, probably for on the order of ten thousand years.

AF - There seemed to be very strong evidence for a separation between California and Northern Spotted Owls.

RG - A significant evolutionary separation between California Spotted Owls and NSO – Clearly this is the case.

This should be a non issue from a scientific point of view. There is clear evidence that these subspecies have genetically differentiated

RF - There is no doubt that there has been, and at present is, a significant divergence between the two geographically defined taxa. Evidence of morphological divergence is mixed, but the mtDNA signal is strong and clear.

8. The differentiation between California Spotted Owls and NSO can best be characterized as that between:

Separate evolutionary species

Distinct subspecies XXXXXX

Poorly defined but biologically significant subspecies X

Distinct Populations with extensive gene flow

Clinal variation within one interbreeding population

Other:

Additional comment:

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MC - Though undoubtedly there is clinal variation within each subspecies.

RB - There is consistent evidence that supports a solid subspecies separation between the Northern Spotted Owl and the California Spotted Owl. The preponderance of information suggests the subspecies have been separated, probably for on the order of ten thousand years.

AF - I felt this question was beyond my expertise to comment on with this level of detail.

RF - There is some question about how much introgression there is and will be in the future between the subspecies, but at present, they are well-diagnosed by 75% rule and other subspecies definitions.

9. In general the conclusions drawn by the panel from the different studies on taxonomic status showed that these studies were:

In agreement with each other XXXX

Different on minor points of technique and data analysis XXX

Different on minor points of interpretation and conclusionsXX

Significantly different from each other in conclusions

So different as to render interpretation difficult

Additional comment:

RB - Increasing sophistication is being used to analyze taxonomic data. At the rate in which new information is emerging, I anticipate increased clarity in the years to come. I think the more interesting studies will investigate the levels of introgression between the NSO and the CSO.

RG - I thought the first Haig et al. paper was seriously flawed by incorrect analysis and poor choice of a genetic system relative to the question being asked.

AF - My assessment here includes the recent work by Haig et al. that seemed to contradict their earlier paper.

RF - The studies differ in methods, some with better resolution than others (e.g. mtDNA and microsatellites versus RAPDS and allozymes). In addition, authors, to some extent, interpreted the results of the lower resolution markers with greater certainty than they were due.

10. The boundaries of NSO and CSO distributions are:

Well characterized XXXX

Not well characterized, and in need of clarification XX

Not well characterized, and unlikely to be easily clarified XX

Additional comment:

MC - Because subspecies ranges are contiguous and dispersal capacity in the owls is considerable.

RB - There appears to be directional introgression northward into the historic range of the NSO. The rate is unclear. Further investigations into this process would be very helpful.

RG - I think it is general true that the subspecies boundary is definable as a zone but not a strict boundary as is the case with most parapatric subspecies. Whether this zone can be more rigorously defined would depend on additional sampling within the zone of contact.

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AF - The word “boundary” is a strong term. Rather, there are indications of a zone where the two subspecies are in contact with each other, the extent of this zone is still poorly understood.

11. The panel heard from presentations by Haig and others that there is evidence for introgression between CSO and NSO populations. Gene flow between NSO and CSO populations is:

Likely to have negative consequences for NSO fitness.

Unlikely to have negative consequences for NSO fitness. XXX

Insufficient evidence to evaluate XXXXX

Additional comment:

RB - The rate and consequences of introgression are unclear and should be monitored and reassessed in the future.

RG - Barrowclough et al. first found such introgression and it was subsequently verified by Haig et al. At this time the amount of introgression is small and it is unknown if this is recent or old gene flow at this time. The latter precludes any conclusions about whether this is good or bad or neutral in its impact or whether it will continue in the future.

RF - The data on this question are just not there. I imagine it not likely to impact fitness, but may impact listing status if the evidence of introgression is substantiated, and it continues in the future.

12. It is often held that small population sizes, and isolation of populations may result in reduced genetic variation and loss of evolutionary potential. In NSO it has been suggested that some populations may be vulnerable to such effects. Based on the evidence available to the panel, such effects:

Are significant and probably occurring

Are significant and while not yet occurring, may do so in the futureXX

Are likely insignificant XX

Are plausible, but there is insufficient evidence to determine if they are operating XXXXX

Additional comment:

RG - Small populations are vulnerable to these effects if there is no gene flow to maintain such genetic diversity. It appears that no populations are truly isolated in terms of gene flow. This is especially true in the short-term (100 years or so) when population dynamics issues will be more important to the continuance of spotted owls.

MC - Nb there have been only a couple of generations of owls since dramatic reductions of numbers and range; negative consequences might take a lot longer to show up than a couple of decades.

RB - It is unclear what effect increased fragmentation may have on effective population size and levels of inbreeding. It is likely that any additional isolation effect would have negative impacts on genetic variability. It is also likely that isolation effects will increase in the future.

AF - The hypothesis is plausible and needs to be examined further. However, the effect may be

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unlikely because of the capability of juveniles to disperse long distances.

RF - There is evidence of reduced variation in CSO in Southern California, and probably on the Olympic Peninsula. As BO and habitat effects continue to fragment and marginalize the SO populations there will be some impact on genetic variation, inbreeding and loss of adaptability, but how much and how significant a threat this will be is unpredictable.

PART III. QUESTIONS RELATING TO PREY

13. The diet of NSO has been studied in several areas. In general, the diet of NSO can be characterized as (check as many as apply):

Well understood, with good information on geographic variation in dietXXXX

Well understood in some areas but not others XX

**Understood in broad terms, but lacking information on seasonal and individual variation
XXXXXX**

Understood in broad terms, but lacking information on key issues XXX

Poorly understood

Additional comment:

MC - I am amazed that so few studies have addressed the breadth, numbers, density, and variation over time in the prey base. This is something that should have been incorporated into the heavily-funded demography studies many years ago.

RB - We have very little information on the influence of the ecology of most prey. Long-term studies of prey in relation to annual variations in weather and vegetation would make a valuable future contribution to our understanding of owl habitat associations.

RF - Owl pellets are a great benefit!

14. The effects of variation in prey abundance, habitat use, and availability on NSO populations are:

Well understood

Understood in broad terms, but not in detail XXX

Not well understood X XXXX

Additional comment:

SPC - Geographic variation in prey identity is correlated well with some aspects of owl biology. However there is no study adequately looking at prey abundance and availability across habitats and seasons

MC - For example, is the alternate-year breeding pattern largely, somewhat, or not at all attributable to local prey reduction and thus requires an interim year for prey recovery?

RB - More information on prey abundance and availability would help interpret patterns in NSO reproductive success and evaluate possible management in and around suitable habitat.

RG - Prey studies have not been funded to coincide with demographic studies even though this has long been thought to be critical to understanding spotted owl population dynamics.

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AF - Mechanisms, such as the relationships between habitat-specific fluctuations in prey density and spotted owl population dynamics, are lacking.

RF - This appears to be a gap in the demography analyses, that these factors were not uniformly studied with respect to changes in lambda, or really to habitat structure, climate, etc

15. Population dynamics of major prey species are:

Well understood

Understood in broad termsX

Not well understood: XXXXXX

Additional comment:

RB - The factors that contribute to the long-term dynamics of prey is an area of considerable uncertainty.

RG - There are no long-term woodrat studies within the range of the spotted owl but I am not sure about other species. This is necessary to understand their natural variation and dynamics in the lower half of their range. However, this does not appear to be evident for long-term prey studies on spotted owl study areas

AF - Most information is based on short-term (<5 years) studies that have not captured long-term temporal variation and the relationship between this variation and external factors.

16. Carey and others have suggested that NSOs may depress populations of some prey species (e.g. flying squirrels). Such effects could have consequences for prey persistence, coexistence of competing predators, and NSO populations themselves. The available evidence on this hypothesis can be characterized as:

Extensive, supporting a significant effect

Extensive, not supporting a significant effect

Consistent with the hypothesis, but inconclusive XXXX

Insufficient to evaluate XXXX

Additional comment:

MC - See above; as far as I am aware, there is not substantial amount of data to evaluate this potential effect, although of course there should be by now.

RB - As previously stated, long-term studies of prey ecology would be very valuable in interpreting reproductive success and foraging behavior. More information on access to prey and the role of forest succession in the absence of fire on the East Side of the Cascade Range would be valuable

RG - Carey documented this prey depletion but his study did not continue long enough to provide causative information on its overall effect on spotted owl prey. It clearly demonstrated that there needs to a variety of habitats and forest patches to the owl because of potential prey depletion.

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AF - This work was based primarily on an observational study and the link between prey and foraging owls was missing (i.e., cause and effect was lacking). This area needs more work.

PART IV. QUESTIONS RELATED TO NSO HABITAT

Initial studies of habitat showed an association of NSO with late successional habitat, at several scales. In the report, the panel considered recent information on habitat associations in different areas, and on trends in habitat. How would you evaluate the following statements:

17. Initial findings on habitat associations are generally confirmed by results published since 1990.

- XXXXX Strongly supported
- XX Supported
- X Weakly Supported
- Not supported
- N/A

18. In general, demographic performance of NSO is related to availability of late successional forest habitat.

- Strongly supported
- XXXXX Supported
- X Weakly Supported
- Not supported
- N/A

19. Late successional habitat is a limiting factor for NSO populations in significant parts of the subspecies' range

- XXX X Strongly supported
- XX Supported
- X Weakly Supported
- Not supported
- N/A

20. Home ranges composed entirely of pristine old forest are optimal for spotted owls throughout the species' range.

- Strongly supported
- Supported
- X Weakly Supported
- XXXXXXXX Not supported
- N/A

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Additional Comment:

RG - This question seems to be inappropriately worded. This statement is not supported for areas like the Klamath province but it is unknown for many other areas, and in fact may be strongly supported if such data were available for the Olympic Penn, Western Washington Cascades, Western Washington lowlands and other provinces where the primary prey is the flying squirrel.

AF - This is an ambiguous question and open to misinterpretation. My interpretation was that this may be operating in some portions of the owls range but not in other portions.

21. Forest fragmentation is equivalent to habitat fragmentation

- Strongly supported
- Supported
- Weakly Supported
- Not supported
- N/A

Additional Comment:

RG - Same problem as the above question, it is likely to be a different answer in different parts of the range.

AF - See comment in question 20.

22. In the redwood zone, NSO use significantly younger forests, whose structure resembles old-growth forests elsewhere

- Strongly supported
- Supported
- Weakly Supported
- Not supported
- N/A

23. In the eastern Cascades, NSO are associated with younger forests, whose structure may allow access to prey

- Strongly supported
- Supported
- Weakly Supported
- Not supported
- N/A

Additional Comment:

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AF - There is no support for the last portion of the statement.

24. In some areas, hardwoods are a significant component of habitat

_XXX Strongly supported
_XXX Supported
_X Weakly Supported
_Not supported
_N/A

25. In the Klamath region, heterogeneous landscapes may favor higher demographic performance

_XX_X Strongly supported
_XXXX Supported
_X Weakly Supported
_Not supported
_N/A

Additional Comment:

AF - The support is based on observational studies.

26. Elsewhere in California and southern Oregon, heterogeneous landscapes may favor higher demographic performance

_X_X Strongly supported
_X Supported
_XX Weakly Supported
_XXX Not supported
_N/A

Additional Comment:

AF - I put "Not Supported" primarily because the work is not completely finished in this area and some studies suggest a weak effect, if any.

27. In other locations (e.g. Cascades) heterogeneous landscapes may favor higher demographic performance

_Strongly supported
_X Supported
_XXX Weakly Supported
_XXX_X Not supported

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 N/A

Additional Comment:

AF - There is insufficient evidence to support this statement

28. Geographic differences in habitat use are generally explicable in terms of differences in prey availability and use

- Strongly supported**
- Supported**
- Weakly Supported**
- Not supported**
- N/A**

Additional Comment:

RG - Temperature can have a substantial effect on habitat selection.

29. Overall, the quality of data on current distribution and availability of NSO habitat as available to the review committee was:

- Excellent**
- Generally good XXX**
- Mixed in quality XX**
- Generally limited XXX**

30. NSO breeding habitat is affected negatively by timber harvest, fire, windthrow and disease, and positively by succession. Ingrowth may have both positive and negative consequences. In different regions and on different ownerships current trends can be described as:

	Positive	Possibly Positive	Neutral	Possibly Negative	Negative	Uncertain
British Columbia				X	X XXX	X

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Western Cascades, Coast Ranges, Olympic Peninsula		X	X	X	XX	X
Eastern Cascades				XXX	XX	X
Klamath			XXX	XX		X
Coastal CA (Redwoods)			XXX	XX		X
Federal lands	XX			XXX		X
State lands				XXX	X	XX
Tribal lands				XX	XXX	X
Private lands			X	XXX	X	X

Additional comment:

RB - A “Possibly negative” designation provides considerable latitude to cover our uncertainty over the habitat trends data. We have little or no insight into habitat trends on other than Federal lands. On State, private and tribal lands we lack a baseline from which change can be calculated. On the California coast, there have been very small documented losses on Federal lands and we have more confidence that developing habitat is suitable for NSO breeding.

RG - I really have a difficult time explicitly answering this question because of the specificity of the questions and the special extent of the answers. That is there is much uncertainty about the effects of these factors and how they influence owls except at the very grossest level. Perhaps these tables could be used as a basis for the federal agencies providing specific numbers?

AF - I could not fill in the table. I do not have sufficient grasp of the details for all of the regions and different land bases to provide an informed opinion. This is too speculative a question for me. I would rather see empirical data used to provide this type of information.

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31. In your opinion, major factors currently contributing to habitat loss/removal in different regions and on different ownerships are (check all that apply):

	Timber harvest	Fire	Insects	Disease	Windthrow
British Columbia	XXXXX	X			
Western Cascades, Coast Ranges, Olympic Peninsula	XXXXX	XXX			
Eastern Cascades	XX	XXXXX	XXXX	XX	
Klamath	X	XXXXX		X	
Coastal CA (Redwoods)	XXX			X	
Federal lands	X	XXXXX	XX	XX	X
State lands	XXX	XXX	X	X	X
Tribal lands	XXXXX	XX	X	X	
Private lands	XXXX				

Additional Comment:

RG - The data are not sufficient to answer this question, given what I have seen provided to the review panel.

AF - I could not fill in the table. I do not have sufficient grasp of the details for all of the regions and different land bases to provide an informed opinion. This is too speculative a question for me. I would rather see empirical data used to provide this type of information.

32 to 36. The federal agencies presented the panel with a model of forest development. Please evaluate the model:

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RB - Estimates of habitat development were calculated by a modeled projection of stands at the regional scale. Stands that reach the age of 80 years are assumed to be habitat. The method used by the Federal Agencies to model forest development might be described as a rather straightforward, mechanistic approach. Net increases in late-successional forest (80 years or greater) were estimated by decade. A lack of more detailed stand condition information precluded alternative methods of habitat development assessment.

In reality, projecting the transition of a forests age and size classes to different levels of habitat function requires extensive field verification. It is recognized that the accuracy of both estimates are approximations to be used on range- wide scales. Habitat development certainly is not a mechanistic process and there is considerable variation in the rate of natural habitat development. The habitat complexity that most definitions project as suitable habitat develops over multiple decades and is not a threshold that is achieved with an average size class. Stand age or size does not account for the history, growing conditions, species composition, and other factors that determine the rate of habitat structure development. There is considerable uncertainty in the transition between mid-seral stage stands and suitable habitat. These uncertainties still exist with remote sensing information or inventory methods that are not specifically designed to sample the key components of suitable habitat.

Given the uncertainty about the rate of complex forest structure development in the 80+ year-old stands, habitat development was likely overestimated. The extent of overestimation can not be determined. However, since many of the stands that are projected to become habitat originated after natural disturbances, it is highly plausible that the majority of the projected new habitat would function as suitable habitat when predicted, and the remainder would follow within a couple additional projection periods

RG - This model needs to be evaluated by experts in the field, but at the level of model structure, assumptions, and function. Models are useful primarily as tools to ask questions and derive hypotheses because they are highly vulnerable to parameter input which may or may not realistic.

AF - I cannot answer these questions because I am not familiar enough with the structure and assumptions of the model. The presentation was not able to provide me with these details.

32. How well does this model of ingrowth and succession approximate to development of habitat?

Xwell

Poorly

XXXUncertain

33. This model is plausible and appropriately constructed

Strongly agree

X X XX Agree with qualification

Disagree

N/A

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34. The data used in model development are sufficiently accurate for the task

Strongly agree
X X Agree with qualification
XX Disagree
N/A

35. The model is well supported by data on actual trends

X Strongly agree
X Agree with qualification
X Disagree
X N/A

36. If the model of forest development accurately represents habitat development, this would indicate a current net positive trend in habitat on federal lands. Does this agree with your best professional judgment on actual habitat trends.

XX Strongly agree
X Agree with qualification
X Disagree
N/A

Additional Comment:

MC - there has been no critical evaluation of the quality of the ingrowth as NSO habitat

PART V. QUESTIONS RELATING TO BARRED OWLS

37. In your opinion, are Barred Owls currently having negative effects (on occupancy, survival and reproduction) on NSO populations in :

	Strong effect	Slight effect	No effect	Insufficient data
British Columbia	XXXXXX			
Washington (all areas)	XXXXXX			
Oregon (Cascades and Coast ranges)	XXXX	XX		
Klamath Province		XXX	XXX	

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California Redwood Zone		XXXX	XX	
California Cascades/Sierra			XXXXXX	
On the subspecies considered as a whole	XXXX	X		X

Additional comment:

MC - The most parsimonious and reasonable explanation for NSO declines in more northerly and more mesic habitat is its failure to withstand competition from BO

RB - We have yet to realize the full extent of the impacts from the Barred Owl invasion of the West Coast. Monitoring and investigations into the interactions of the Barred Owl and The NSO have only been conducted for several years. There is substantial circumstantial information on the negative effects of Barred owl presence on NSO occupancy in Washington State. The fact that the available evidence on the impact of Barred owls on NSO varies from area to area makes one hesitant to generalize about the interspecific interactions between these species and the ultimate impact on the NSO.

RG - (did not fill in box) Barred owls could easily be having an effect on spotted owls but we have no idea of its real magnitude across the range (at the level of this question).

AF - (did not fill in box) I was unable to fill in this table because I think Barred Owls may well be having an effect on spotted owls but we have no real estimate of the magnitude of this effect.

38. In your opinion, Barred Owls will in the long-term future (50 years+) have negative effects on NSO populations in :

	Strong effect	Slight effect	No effect	Insufficient data
British Columbia	XXXXXX			
Washington (all areas)	XXXXXX			
Oregon (Cascades and Coast ranges)	XXXXX	X		
Klamath Province	XXXX	X		X
California Redwood Zone	XXXX	X		X
California Cascades/Sierra	X	XX		XXX
On the subspecies considered as a	XXXXX	X		

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Additional comment:

RB - Long-term trends are difficult to predict. I suspect that some kind of equilibrium will be reached. It will be interesting to see if the impact continues to show a strong attenuation to the south.

RG - (did not fill in box) See answer above in 37.

AF - (did not fill in box) I was unable to fill this table out because I predict the future poorly.

39. In my opinion, the probable population trends of Barred Owls in the near future (next 5 to 10 years) in the following areas are likely to be:

	Strongly increasing	Slightly increasing	No effect	Decreasing	Unsure
British Columbia	X	XXXX	X		
Washington Cascades	XXX	XXX			
Olympic Peninsula	XXX	XXX			
Oregon Cascades	XXXX	XX			
Oregon Coast Range	XXXXX				X
Klamath Province	XXX	X			XX
California Redwood Zone	XXX	X			XX
California Cascades/Sierra	X	XX	X		XX

Additional comment:

MC - It looks as if BO has peaked in density and distribution in BC, so expect no further increases. Expansion of BO into Sierra of CA seems inevitable, but the consequences for CSO are not predictable. NB even where BO is already common, we have not seen the yet seen its full effects on NSO reductions, that will surely take more time. Thus even with no further BO increases, there will likely to continued NSO reduction and displacement from traditional sites.

RB - It will be important in the short-term to gain a better insight into the theory that the Barred Owl invasion is a factor in depressing Spotted Owl survival and reproduction. Monitoring of the Barred Owl expansion in the Oregon Cascades would provide valuable information

RG - (did not fill in box) Barred owls will probably increase across the range but the rate and amount of increase I cannot speculate on without some basis or information

AF - (did not fill in box) I was unable to fill this table out because I think Barred Owls may well be having an effect on spotted owls but we have no real estimate of the magnitude of this effect. Thus, we have poor ability to predict the future trajectory of the effect.

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RF - I think this will be a major problem for NSO and possibly CSO over the next decade and beyond.

40. Currently there is some evidence that Barred Owls in British Columbia, Washington and some parts of Oregon occupy more mesic and lower elevation habitats than do NSO. In your opinion, this pattern is likely:

To be maintained

To gradually change as Barred Owls slowly invade new areas XXXX

To rapidly change as Barred Owls rapidly invade new areas X

Too difficult to say XXX

Additional comment:

RG - Obviously the initial suggestions and patterns of relationship of Barred owls to mesic environments did not last, but I have no idea what the future pattern will be.

RF - But the data are a bit too limited to be certain at present.

MC - It has already changed on OLY Penin; clearly BO needs time to fill its preferred habitat before then progressing to less preferred habitat from which NSO will be similarly displaced

RB - Barred Owls have demonstrated that they are an adaptive species; there is no reason to think they will not expand their range to less than prime habitat as the population increases.

Without monitoring we will never be able to answer this question.

AF - I don't think there is sufficient data to support the statement.

41. Currently Barred Owls in the central Washington Cascades and some areas of Coastal California are more common in old-growth habitat and reserves than in some second growth and fragmented habitat. In your opinion, this pattern is likely:

To be maintained

To gradually change as Barred Owls slowly invade new areas XXXX

To rapidly change as Barred Owls rapidly invade new areas

Too difficult to say XX

Additional comment:

MC - BO is likely to remain most common in the OG and mature forests, but if earlier successional and less mature forest provide its resources, they too will be occupied in time. It appears that BO can do well in a mix of OG and earlier forest, more so than NSO.

RG - (did not check above) I disagree with the question. The question makes the assumption that this is a true statement. The problem is that it is not known. There have been no studies to determine if this is correct assumption or pattern.

AF - I would argue that there is no data to support the statement.

JF - Not persuaded that this is true in c WA Cascades

RF - But the data are a bit too limited to be certain at present.

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42. In your opinion, the effects of forest harvest and fragmentation on Barred Owl invasion are best characterized as:

Forest harvest and fragmentation directly favors Barred Owls by creating favorable (early successional) habitat XXX

Forest harvest and fragmentation has no direct positive effect on Barred Owls X

Not possible to say at this point X XX

Other (explain)

Additional comment:

MC - however, if their effects have been to drastically reduce NSO populations and thus place it at risk to BO competition, the net effect on BO is positive

RB - Barred Owls are known to use a wide assortment of forest types as habitat. I think it is plausible that Barred Owls will thrive in a fragmented forest habitat, riparian reserves for example. Further investigation into Barred Owl habitat breadth will be useful in predicting Barred Owl expansion and perhaps the eventual equilibrium between the Barred and NSO.

RF - But the data are a bit too limited to be certain at present.

SC - There is strong evidence that BO invade old-growth and unfragmented habitat; however BO also use other habitats, so the population may be favoured indirectly

43. In my opinion, hybridization of NSO with Barred Owls is:

Common

Infrequent XX

Relatively rare X XXXXX

Other (explain)

Additional comment

MC - And not likely to be a critical factor in BO/NSO interactions

RB - The frequency of hybridization that was suggested early in the invasion has not increased despite a considerable expansion of the Barred Owl population. In my opinion, hybridization with Barred Owls is not as serious a threat to NSO as the interspecific interactions.

RF - But more genetic data need to be obtained using Sue Haig's new AFLP or microsatellite methods – introgression via backcrossing, and also via extra-pair mating, could be a relatively cryptic problem.

44. The overall quality of the data on Barred Owl populations and their effects on NSO can be characterized as

High quality, majority of conclusions strongly supported

Generally high, most conclusions strongly supported

Mixed quality, some conclusions based on limited evidence XXXXX

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Very mixed, some conclusions based on sparse evidence X
Generally low, many conclusions based on weak evidence X X

Additional comment

MC - Some conclusions based on sparse or weak evidence, but even where circumstantial and correlational, evidence overwhelmingly supports the view that BO has a strong negative effect on NSO.

RB - Even though the negative effect of Barred Owls is clearly correlational, we are still operating with considerable circumstantial information.

JMM - The details are not well known, but the effects of, and increase in, Barred Owls are so great that poor data is sufficient to document the effects. A subtle effect would not be possible to detect with the data, but this effect is not subtle.

PART VI QUESTIONS RELATED TO DEMOGRAPHY AND POPULATIONS.

45. West Nile Virus is known to affect owls in other parts of North America. The evidence that this disease will affect NSO is:

Compelling and based on firm extrapolation to NSO
Logically consistent but essentially circumstantial XXXXXX
 Speculative at this point XX

46. Please indicate your opinion on the probable status of NSO in the following areas

	Definitely declining	Probably declining	May be stable	Probably stable	Uncertain
British Columbia	XXXXXX				

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Western Cascades	XXXXX	X			
Olympic Peninsula	XXXXXX				
Eastern Cascades	XXX	XXX			
Oregon Coast Range	XX	XXX	X		
Klamath		XX	XXXX		
Coastal CA (Redwoods)	X	XX	XXX		
CA Cascades and Sierra		XX	X	X	XX

Additional Comment:

RG - (did not fill in box) I feel it is most appropriate to defer this to the results of the meta analysis which represents the single largest data set on mark recapture of an endangered species in the world. In addition, the last category is mixing two very different regions, which may be very different. Populations in the Sierra are not equal in their trends.

AF - (did not fill in box) I did not fill out this table because the empirical evidence from the recent meta-analysis provides this information better than my opinion. The results from the meta-analysis should be considered above any opinions from panel members.

PART VII QUESTIONS RELATED TO RISK AND UNCERTAINTY

We may distinguish between uncertainty regarding whether a potential threat is present, and the degree of threat or risk it may pose if present. For instance, we may not know whether a potential factor is operating, but have reason to believe that if present it will pose only a low risk (high uncertainty and low risk). In the sections that follow, please attempt to distinguish between the relative uncertainty regarding a topic or factor, and the probable risk to NSO if the factor is present.

47. Uncertainty:

How would you rate our understanding and degree of uncertainty on the following topics?

	Very uncertain	Uncertain	Adequately understood	Well understood	No opinion
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Taxonomy of Spotted Owls			XXX	XXXXX	
Genetics of NSO populations		XX	XXX	XXX	
Relationship to prey abundance and distribution		XXXXXX	XX		
Effects of Barred Owl competition where present		XXXX	XXXX		
Likely spread of Barred Owl in CA		XXXXXX	XX		
Effects and extent of past Habitat loss to harvest	X	XXXX	XX	X	
Effects and extent of current Habitat loss to harvest		XX	XXXX	X	X
Effects and extent of Habitat loss to fire		XXXXX	X	X	X
Effects and extent of Habitat loss to windthrow		XXX	XX	XX	X
Effects and extent of Habitat loss to insect damage		XXXXX	XX		X
Effects of fragmentation		XXXX	XXXX		
Likely effects of West Nile Virus	XXXXXX	XX			
Likely effects of other diseases	XXXXXX	XX			
Likely effects of predation (goshawk etc)	XX	X	XXXX	X	
Effects of weather on populations	X	X	XXXXXX		
Demographic isolation of populations	X	XXXX	XXX		
Synergistic interactions between factors	XXX	XXXXX			
Overall population trends			XXXX	XXXX	
Population Status and trends in British Columbia			XXX	XXXX	X
Population Status and trends in Washington			XXXXX	XXX	
Population Status and trends in Oregon			XXXXX	XXX	
Population Status and trends in California		XX	XXX	XXX	

Additional Comment:

RG - Causal mechanisms for effects of weather uncertain.

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48. Risk: Now evaluate many of these same topics as risks to NSO populations. Here risk is regarded as significantly contributing to the probability of extinction at local or global scales.

	High Risk	Moderate risk	Little risk	No risk	Insufficient evidence
Genetic consequences of small population size		XX	XXXXX		X
Introgression from CSO		X	XXXXX		XX
Effects of Barred Owl competition where present	XXXXXX XX				
Likely spread of Barred Owl in CA	XXXX	XX	X		X
Hybridization with Barred Owls			XXXXX X	XX	
Effects and extent of past Habitat loss to harvest	XXX	XXXX			X
Effects and extent of current Habitat loss to harvest	XX	XXX	XXX		
Effects and extent of Habitat loss to fire	XX	XXXXX	X		
Effects and extent of Habitat loss to windthrow			XXXX	XXX	X
Effects and extent of Habitat loss to insect damage		XXX	XXX	X	X
Effects and extent of Habitat loss to Sudden Oak Death		XXX	XX		XXX
Effects of fragmentation		XXXX	XXX		
Likely effects of West Nile Virus	X	XXXXX			X
Likely effects of other diseases	X	XX	XX	X	XXX
Likely effects of predation (goshawk etc)			XXX	XXX	
Effects of weather on populations		XXXX	XXXX		
Demographic isolation of populations		XX	XXXX		XX
Synergistic interactions between factors	XX	XXXX			XX

Additional Comment:

AF - Barred owl competition : high risk at a local scale, if barred owls are actually competing with spotted owls. Past habitat loss – high risk at a local scale if past habitat loss lowered habitat quality sufficiently and habitat quality interacts with extreme weather events. Current habitat loss to harvest – low risk if it remains at current low levels on public lands Sudden Oak Death - Has

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the potential to be High Risk. Other diseases – high risk - if other avian diseases are introduced into the range of the owl.

RG - I not exactly sure I understand exactly how to answer this question given the uncertainty of key information on some of these questions. So I am making the assumption that some things are true which may not be given lack of information (e.g., barred owl effects on spotted owls). Thus, I am somewhat confused as to the manner in which to evaluate and answer the question.

49. Based on your answer to the previous question, which factors are currently significant threats to NSO populations, or may pose such threats in the near-term future (5-10 years)

	<i>Current Threat</i>	<i>Probable future threat</i>
Genetic consequences of small population size		XXXX
Introgression from CSO	X	X
Effects of Barred Owl competition where present	XXXXXX XX	XXXXX
Hybridization with Barred Owls		
Effects and extent of past Habitat loss to harvest	XXXXXX	X
Effects and extent of current Habitat loss to harvest	XXXX	XXXXX
Effects and extent of Habitat loss to fire	XXXX	XXXX
Effects and extent of Habitat loss to windthrow		
Effects and extent of Habitat loss to insect damage	XX	X
Effects and extent of Habitat loss to Sudden Oak Death	X	XXXXXX
Effects of fragmentation	XX	XX
Likely effects of West Nile Virus	XX	XXXXXX XX
Likely effects of other diseases		XX
Likely effects of predation (goshawk etc)		
Effects of weather on populations	X	XX
Demographic isolation of populations		XXXXXX

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Synergistic interactions between factors	XXXXX	XXXXX
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Other (specify)

50. Many of these factors were considered at the time of listing. Please indicate whether, in your opinion, there has been a change in threat posed now, as compared to 1990 (and the direction of such change). Indicate whether such changes are due to a change in the factor itself (e.g. a new or a reduced threat) or due to a change in our understanding (new data)

	<i>Change in level of threat (increase or decrease)</i>	<i>Change in factor itself?</i>	<i>New information?</i>
Genetic consequences of small population size	I, I, I, I	XXX	
Introgression from CSO	I		XX
Effects of Barred Owl competition where present	I,I,I,I,I,I,I	XXXXXXXX	XXXX
Hybridization with Barred Owls	D,?	X	X
Effects and extent of past Habitat loss to harvest	D,D,I	XXX	X
Effects and extent of current Habitat loss to harvest	D,D,D,D,D,?	XXXXX	XXX
Effects and extent of Habitat loss to fire	I,I,I,I,I	XXXXX	X
Effects and extent of Habitat loss to windthrow	D,?		X
Effects and extent of Habitat loss to insect damage	I,I,?	XX	X
Effects and extent of Habitat loss to Sudden Oak Death	I,I,I,I,I	XXXX	XXX
Effects of fragmentation	D,I,D,D,D,D,I	XXXX	XXXX
Likely effects of West Nile Virus	I,I,I,I,I,I,I	XXXXXXXX	XX
Likely effects of other diseases	I,?	X	
Likely effects of predation (goshawk etc)	D,D		XX
Effects of weather on populations	I,I,I		XXXX
Demographic isolation of populations	I,I,I	XX	X
Synergistic interactions between factors	I,I,I,I,I	XXXX	XXX

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Additional comment:

AF - Question is confusing.

PART VIII QUESTIONS RELATED TO CONSERVATION PLANS AND MANAGEMENT

51. The federal conservation plan for NSO and other species (Northwest Forest Plan) depends upon the maintenance of populations, primarily in Late Successional Reserves, in a metapopulation structure, where each population has a high probability of survival. There have been changes in the implementation of the NWFP (lower harvest rates) and also in the impact of different threats. Based on the evidence available to the panel, and your evaluation of current threats, is this strategy based on premises that are currently well-founded, and supported by current information?

Well supported for all important issues

Well supported for most important issues XX

Well supported for only some issues XXXXX

Not well supported

Insufficient information X

Explain your answer:

MC - Does not account for BO impact. NSO may be displaced from LSR by dint of their being preferred by BO, leaving “matrix” available for NSO over a longer period (ie until BO expansion reaches into the matrix)

RB - I still believe the NWFP strategy is will supported, however our inability to explain the continued decline in NSO numbers is an area of great concern. The appearance and spread of the BO and the continued threat of catastrophic habitat loss from fire are the greatest threat to the NWFP strategy.

AF - The Plan still remains a hypothesis that needs to be tested. Analyses comparing demographic performance of spotted owls on LSR and Matrix lands are currently being conducted and the results were not yet available to the panel. This information would shed considerable light on this issue

JM - Disease and barred owls are not exluded by reserves, especially connected ones. Reserves are necessary for northern spotted owls, but not sufficient.

RF - Barred owl appears to be excluding NSO from LSRs in many areas, plus probable change in the assessment of optimal habitat based on new research (i.e., old growth, plus edge).

RG - meta-analysis did not evaluate this topic which is the appropriate forum for this analysis

PART IX QUESTIONS RELATED TO MONITORING AND RESEARCH

52. In five years the USFWS may conduct another status review. In the interim it is to be expected that there will be ongoing monitoring and research on NSO and its habitat.

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Please indicate whether you expect the following data will be critical to a future review of NSO status. Please distinguish between issues where we already have a solid understanding, and those areas where new information may be expected to change our understanding or ability to evaluate status of NSO.

	Already well understood	New information may be valuable	Ongoing monitoring essential to understanding status	New information likely to alter understanding of status
Population trends of NSO		XX	XXXXXX	XX
Prey selection of NSO	XX	XXXXXX		X
Prey dynamics		XXXXXX	XX	XX
Relation between demographic parameters and habitat		XXX	XXXX	XXX
Taxonomy of Spotted Owls	XXXXXX	X	X	
Genetic differentiation of NSO populations	XXX	XXXXX		
Population trends of Barred Owls		X	XXXXX	XXXXX
Effects of competition from Barred Owls		X	XXXXX	XXXXX
Regional differences in habitat selection of NSO	X	XXXXXX	X	X
Regional and ownership patterns in habitat trends	XX	XX	XXXXX	XX
Amounts of ingrowth of habitat	X	XXX	XXX	XXX
Effects of fire	XX	XXX	XXXXX	XX
Prevalence of WNV		XXXX	XXXXX	XXXX
Others				

Additional comment:

RG - As above, these are difficult to partition. I think there are some very key things that need to be done to advance our understanding. I also think that some very good things have happened for owl conservation that do not seem to be captured in this report (like the PNWFP) and change in regulation that have had a very positive effect on the owls, while new things have emerged as potential threats. Pigeon holing them does not seem to capture these ideas to me.