

SCIENTIFIC EVALUATION OF THE STATUS OF THE NORTHERN SPOTTED OWL

CHAPTER ONE

Introduction

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INTRODUCTION

1 STATUS REVIEWS

Status Reviews are prepared for species being evaluated by the US Fish and Wildlife Service (USFWS or Service hereafter), including species either being considered for listing under the Endangered Species Act (ESA) or species already listed as threatened or endangered. Four Status Reviews or their equivalents have been prepared for the Northern Spotted Owl in 1982, 1987, 1989, and 1990. Each Status Review differed in scope, focus and length (29, 36, 96, and 61 pp respectively), and in emphasis. The 1990 review, for instance, explicitly identified habitat loss as ‘the problem’, and devoted most attention to this issue, but only one paragraph to the effect of the Barred Owl, for which little evidence was then available. Note that major reviews of Northern Spotted Owl biology were additionally prepared by the Interagency Scientific Committee to Address the Conservation of the Northern Spotted Owl (ISC or Thomas et al., 1990 hereafter), and by the Northern Spotted Owl Recovery Team (Final Draft Recovery Plan, FDRP or USDI 1992 hereafter). The ISC report was published prior to the 1990 Status Review, and is referenced therein. The ISC and the FDRP remain major resources and summaries on the biology of the Northern Spotted Owl.

Despite their importance in making decisions concerning listing status, Status Reviews do not always make recommendations on listing actions (only one Spotted Owl review, that of 1990, made a specific recommendation on listing status, although the proposal of the USFWS to list the subspecies as threatened followed the 1989 Status Review Supplement). Indeed, there are no specific guidelines on the processes to follow in developing a Status Review (e.g. public involvement), or on the level of details that are to be included. This follows from the fact that Status Reviews fill several functions, and that ‘Status Review’ is not a statutory or regulatory term. Hence, Status Reviews vary in methods, scope, and recommendations.

Under Section 4 (c) (2) of the ESA, the purpose of a five year Status Review is to evaluate information on a listed species, and to:

“(A) conduct, at least once every 5 years, a review of all species included in that list which is published pursuant to paragraph (1) and which is in effect at the time of such review; and (B) determine on the basis of such review whether any such species should – (i) be removed from such list; (ii) be changed in status from an endangered species to a threatened species; or (iii) be changed in status from a threatened species to an endangered species.”

In essence the purpose of a review is to determine:

- Whether new information suggests that the species population is increasing, decreasing, or stable
- Whether existing threats are increasing, the same, reduced, or eliminated
- If there are any new threats

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- If new information or analysis calls into question any of the conclusions in the original listing determination

Hence, five year Status Reviews are focused on the five listing factors used by USFWS in making listing decisions:

- A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range.
- B. Over-utilization for Commercial, Recreational, Scientific, or Educational Purposes.
- C. Disease or Predation.
- D. The Inadequacy of Existing Regulatory Mechanisms.
- E. Other Natural or Man-Made Factors Affecting Its Continued Existence.

In this scientific evaluation, we will be focusing on factors A., B., C., and E. The USFWS will evaluate D., regulatory mechanisms as part of their process, and also make a final evaluation on status, based on all five factors.

We will also be focusing on changes in threats since the time of listing, and the most recent Status Review (1990).

2 SUSTAINABLE ECOSYSTEMS INSTITUTE

Sustainable Ecosystems Institute (SEI) is a public benefit, non-profit organization, founded in 1992 by Dr. Deborah Brosnan. The goal of the Institute is to provide impartial scientific support for conservation decisions; the Institute is non-partisan, and seeks science-based, cooperative solutions to environmental issues. The organization has previously carried out extensive work on endangered species conservation and management, and has developed the use of peer review in such situations (Brosnan 2000).

3 REVIEW PROCESS

The overall goal of this review is to provide a comprehensive, and critical evaluation of all important information regarding the status of Northern Spotted Owls. Ultimately, this evaluation will be used by USFWS as part of its materials in making a determination on listing status under the Endangered Species Act. However, the SEI evaluation team will not be making recommendations on listing actions, or indeed on any management or policy decision. These are appropriately the responsibility of USFWS. Our process is restricted to summarizing, critiquing, analyzing, and synthesizing all available science.

The process adopted was to set up a panel of experts drawn from a range of different academic backgrounds relevant to the status review. These experts read the materials that were available or that were developed, and in a series of public meetings and other discussions, evaluated the strengths and weaknesses of the various data, hypotheses and opinions. This panel of experts

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was supported by a staff of scientists who developed materials for their use. In addition, some other scientists helped with particular chapters where their expertise was useful.

3.1 SCIENTIFIC STAFF

Overall project lead was Dr. Steven Courtney, Vice-President of SEI, who has expertise in endangered species research and management, and in the application of peer review processes to natural resource management issues.

Panel members and their particular expertise in the review were:

| | |
|-----------------------|---|
| Dr. Richard Bigley | Habitat Distribution and Trends |
| Prof. Martin Cody | Inter-specific interactions |
| Dr. Robert Fleischer | Genetics and Systematics |
| Dr. Alan Franklin | Spotted Owl biology |
| Prof. Jerry Franklin | Forest ecology |
| Prof. Rocky Gutiérrez | Spotted Owl biology |
| Dr. John Marzluff | Endangered species biology; disease ecology |
| Dr. Jack Dumbacher | Genetics and Systematics |

Dr. Dumbacher originally was part of the genetics sub-team (see below), but subsequently assumed most of the duties of a full panel member, and participated in discussions and manuscript preparation etc.

All panelists discussed all materials (not just their narrow subject areas), and are equally authors of all the chapters presented in this report. Curriculum vitae of all panelists are shown in the Appendix.

In addition to the overall panel, other team members were:

| | |
|------------------------|--|
| Dr. Jennifer Blakesley | Habitat associations, demography |
| Dr. Andy Carey | Prey |
| Mr. William La Haye | General biology |
| Mr. David Kennedy | Barred Owl |
| Prof. Barry Noon | Extinction risks and population models |

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| | |
|---------------------|------------|
| Prof. Craig Moritz | Genetics |
| Dr. W. Monahan | Morphology |
| Ms. Lisa Sztukowski | Prey |

These additional team members provided information, and helped prepare individual chapters. However, they did not participate in the writing of all the chapters as did the main Review Panel.

Team members were organized into particular sub-groups, addressing particular subject areas. These sub-groups took the lead in discussing and writing chapters. Sub-groups were:

Systematics and Genetics:

Fleischer
Dumbacher
Moritz
Monahan
Gutiérrez
Courtney

Prey:

Sztukowski
Courtney
Carey

Habitat Associations:

Blakesley
Gutiérrez
Marzluff

Habitat Trends:

Bigley
J. Franklin
Courtney

Barred Owls:

Cody
Gutiérrez
Marzluff
Courtney
Kennedy

Demography:

Blakesley
A. Franklin

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Courtney
Noon

3.2 INFORMATION

Information for the review was obtained in several ways. USFWS sought public input through a comment period; all materials (papers and comments) received by USFWS were made available to SEI. USFWS staff also prepared some preliminary analyses and summaries, which were very useful in the initial phases of the review. Tracey Fleming and collaborators had also developed a database of publications on the Northern Spotted Owl; this became the kernel of our own database.

Panelists and SEI staff also actively sought out information, through publication requests, interviews etc. Such information included the details of existing analyses, requests for new analyses, natural history observations, clarifications on techniques etc. These data and personal communications were added to the database.

SEI also requested information from the USFWS, notably analyses of habitat trends (this forms a large part of the work analyzed in chapter 6). The Service also, at our request, prepared summaries of other material, including monitoring data from HCPs, and collated information on the occupation of Spotted Owl areas after temporary occupancy by Barred Owls.

The public continued to submit material to the panel until mid July 2004. All such material was logged, and included in the review. Notable data include papers by R. Pearson, and analyses by AFRC (2004), and the genetics group of San Jose State University.

The panel members also generated new reviews and data themselves. Notable in this regard is the work in chapter 7 synthesizing information on competition and size differences in owls (by Cody), and the statistical analyses of A. Franklin (also in Chapter 7).

Finally, the panel commissioned several pieces of research and synthesis. Several appendices (e.g. chapters 3, 4, and 8) were prepared at the request of the panel. These appendices remain the sole work of their respective authors, and should not be seen as carrying the approval of the entire panel, or reflecting their authorship. They do not form part of the Status Review per se; however, they were very useful to the reports' authors, and are included with this report as background material.

In total, some 1100 documents and communications were received, and form the basis for this review, together with the transcripts from public meetings, copies of presentations, etc.

3.3 PUBLIC MEETINGS

An important part of the work of the science team was the public examination of scientific materials. Four public meetings were held (over a total of six days), during which time there was both formal presentation and discussion of scientific materials, and also structured debate on the best interpretation of these data. The goals of these meetings were to ensure that all scientific

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opinions were heard, and that the pros and cons of alternative viewpoints were vigorously and transparently debated. Much useful information was obtained through these meetings. The transcripts of discussions and the scientific presentations themselves are also part of the record of this review.

As a consequence of discussions during public meetings, several individuals and organizations prepared new materials for submission to the panel. These iterative interactions between the panelists and other scientists ensured that all information was presented and discussed, and that subjects were explored openly and fully.

3.4 OPINION

This report is to a very large extent a work of consensus. Initial draft chapters were circulated among the panel, and debated extensively by e-mail, conference call, and in meetings. Despite many initial differences of expertise and opinion, panelists were largely able to agree on the best interpretation of information, and on the relative uncertainty regarding different opinions, hypotheses and data. However, no attempt was made to enforce unanimity among the panel. On a few issues, despite vigorous and lengthy debates, several opinions remained. Throughout this document, we have indicated the degree of unanimity of the panel on different topics, and ensured that where there is a diversity of opinion this is clearly stated. As noted, on very few topics was there substantive disagreement – this may reflect on the relative certainty of many of the findings of the panel.

Nevertheless, some diversity in opinion did occur. In order to capture such variation, we include in chapter 10 a questionnaire that sets out individual responses to many key issues, including those of information quality and of uncertainty. This chapter should be referred to throughout a reading of the rest of the report, as it documents the relative unanimity of the panel on each topic.

4 SCIENTIFIC INFORMATION AND DATA QUALITY

Science proceeds as information is gathered, but also as theories develop and change. Scientific opinion, particularly in young and developing fields, is rarely static or unanimous – differences in opinion may be the fuel for the preparation of key experiments or observations. Any practicing scientist recognizes this inherent uncertainty; it is indeed the very stuff of science. Hypotheses are not proven, but disproven; initial models are replaced by better models; all scientific opinion is provisional. Chapter 10 discusses the growth of scientific information and uncertainty in more detail.

The Endangered Species Act, the Data Quality Act, and other laws affecting resource management, set out requirements for the use of science. These legal standards are important in making practical use of scientific information. However, there is no objective scientific definition for terms such ‘best available scientific information’. Sometimes, for instance, conflicting hypotheses may be equally well supported. It is important to note that science usually relies on ‘most widely accepted science’ or a majority opinion, but that very often an initial minority opinion subsequently becomes most favored.

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Peer review is the primary means by which scientific information is evaluated – it is scientific ‘quality control’. Usually (but not always), peer review is carried out at the point when information is published in a scientific journal or similar publication. A journal editor tries to ensure that external reviewers scrutinize methods, analysis, interpretation etc., in order to determine whether the work is of sufficient scientific standard to warrant publication. However, peer review is not infallible: mistakes in review do occur, and the fact that a paper has been peer-reviewed is no guarantee of infallibility. Brosnan (2000) provides a lucid explanation of some of the difficulties that arise when applying peer review approaches to resource management decisions.

In this report, we have striven to provide an objective assessment of the information available on each topic. This includes frank discussion on the uncertainty inherent in some observations and data, and our opinions on the quality of the information presented. We have distinguished between peer-reviewed information and other information. Generally, we have held a stronger regard for data and hypotheses that have already received review; however, we have also recognized that such data are not sacrosanct, and have maintained a critical attitude to the published literature. At several points in this review we point out errors in published, peer-reviewed information.

The panel discussed whether to exclude from consideration all information that has not been peer-reviewed. Eventually, we decided to include non-peer-reviewed data, because these were sometimes the only data available on a topic (and hence ‘best available science’). Examples include the monitoring data on habitat trends presented by USFWS. Some such data were also excellent, and rigorously analyzed. For instance, the meta-analysis of demographic trends was not reviewed at the time we read it – yet it represents one of the crown jewels of conservation biology. To exclude such high-quality information would have been to ignore the ‘best available information’. Nevertheless, the panel decided to distinguish all data or observations that were not peer-reviewed – these are italicized in the text thus: *Anon (2004)*.

The panel also made other judgments on scientific quality. Essentially, simple observations, or personal communications were weighed less heavily than rigorous data collection. We valued more highly those hypotheses that had been subjected to experimental test, and regarded untested hypotheses as exactly that. We also looked critically at the use of statistics, including whether there was adequate statistical power to reject hypotheses (a common error is to falsely reject ideas on the basis of weak tests that lack adequate power to detect an effect). We made no hard and fast rules about levels of statistical significance; the 95 or 99% confidence intervals widely seen in scientific literature are essentially conventions, not hard rules. Hence, when a test suggested a result that just failed to meet such levels we noted this as weak evidence, and considered the power of the test when making our evaluation. We also emphasized rigor in interpretation of statistical analyses; for instance, correlation of two factors or effects does not necessarily imply a causative relationship (effects through a third factor may explain such results). Throughout the review we attempted to consider alternative hypotheses and valued evaluations including approaches that compared alternatives (e.g. goodness of fit modeling approaches).

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Nevertheless, we recognize that the highest standards were not always met by the data available; we provided our frank evaluation of such material, including an explicit discussion of the strengths and weaknesses of the information. In chapters 10, 11, and 12 we discuss in more depth the uncertainties of information on the Northern Spotted Owl, and the risks posed by managing under such uncertainties.

5 PROCEDURES FOLLOWED

The drafting authors of each chapter (identified as such at the front of each chapter) were responsible for the initial reading and evaluation of all material on a particular topic. Each paper was read by several panelists or authors, and was critiqued and examined for errors or weaknesses. Such information was recorded and entered into the database. The ‘type’ of data or paper was also noted (peer-reviewed or not, type of publication, etc.).

The drafting authors then prepared a review chapter, which was circulated to the entire panel, often with key papers. Panelists often asked for further publications to be sent for examination. These drafts were then subject to multiple revisions, following arguments and debate. This constituted a form of internal ‘peer review’ where the drafting authors were responsible for responding to the other panelists in a new draft.

Many of the chapters were also subject to external peer review. The coordinator of the project, Courtney, selected reviewers for their impartiality and expertise. These external peer reviews were then sent to the drafting authors, who re-crafted the chapters in response to reviewers’ critiques. We accepted and made changes to the manuscript in response to comments on editorial matters (clarity etc.) analysis, overlooked publications, alternative hypotheses, and errors in interpretation. The manuscript is stronger for these reviews. However, not all criticisms were accepted. Reviewers’ comments and our responses to them are presented in the Record.

We also sought USFWS commentary on the draft chapters. We accepted comments on editorial issues (particularly ease of understanding and use by Service personnel), analysis, and overlooked publications. Although we clarified our positions in response to USFWS queries, we did not modify any of our opinions or evaluations in response to USFWS comments. Hence, this scientific evaluation represents our own impartial opinions, and is independent of any USFWS opinion regarding the Northern Spotted Owl.

6 ORGANIZATION OF REVIEW

The final decision of the USFWS on the status of the Northern Spotted Owl will be made with reference to the five factors used in listing decisions (see above). We have elected not to follow this pattern, but to organize our report along biological lines. Nevertheless, our report can be readily evaluated in reference to the listing factors:

A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range.

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Addressed in chapters 5 (habitat associations), 6 (habitat trends), and 8 (demography)

B. Over-utilization for Commercial, Recreational, Scientific, or Educational Purposes.

Regarded (as in 1990) as unimportant, and not addressed in depth in this report

C. Disease or Predation

Addressed in sections of Chapter 8 (demography)

D. The Inadequacy of Existing Regulatory Mechanisms.

Not formally addressed in terms of regulatory sufficiency (outside our agreed scope of work). Chapter 9 (conservation science) evaluated the extent to which existing conservation measures are based on sound science. Chapter 11 (threats) evaluates the likelihood of continuing threats under current conditions.

E. Other Natural or Man-Made Factors Affecting Its Continued Existence

Addressed in chapters 3 (genetics), 7 (Barred Owls), parts of 8 (demography).

As noted above, our main approach throughout this review has been to compare information available now to that at the time of listing (1990), and to update the evaluation of 1990 where appropriate.

7 GENERAL ACKNOWLEDGEMENTS

This scientific evaluation of the Northern Spotted Owl has involved the work of many scientists. Although the authors of this report are responsible for all the opinions expressed herein, the review itself is only possible because of the extraordinary efforts of the hundreds of individuals who have studied, monitored, and managed Northern Spotted Owls. The strengths of the review derive directly from this unprecedented effort in conservation biology.

We thank all the many biologists, managers and members of the public who participated directly in this review, by attending meetings, making presentations, providing data, answering questions, and engaging in debate. Again, this review benefited greatly from such input. There are so many contributors of note that it would be unfair to single out any one individual for their scientific input. However, we do thank in particular Tracey Fleming for making available his database on Spotted Owl literature that formed the basis for our own database.

Several biologists and foresters provided external peer review on our report. These reviews are discussed in detail in the Record.

We also thank our colleagues in the USFWS. In addition to providing much initial information and synthesis, USFWS staff, particularly Mr. Barry Mulder, Ms. Robin Bown, Dr. Danielle Chi,

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and Dr. Karl Halupka, have courteously assisted our process at every stage, while carefully respecting our independence. Ultimately, if this review is useful to the Service in its future deliberations on Spotted Owl status, such success is due in part to the easy cooperation showed by the Service personnel assigned to the project.