

Chapter 1

Introduction,
Synthesis of the
Scientific Analysis
Team Report,
and Observations

"... All aspects of such a decision should be weighed in the balance. The issues are not limited to questions of owls and timber supply, as important as those are. The matter is not that simple- it never has been..." The Interagency Scientific Committee.

CHAPTER 1

Introduction, Synthesis of the Scientific Analysis Team Report, and Observations

Table of Contents

The Assignment	3
The Scientific Analysis Team - Personnel and Assignments	3
An Historical Perspective on the Issue of Management of Late-Successional Forests	6
Questions to be Answered by the Scientific Analysis Team	8
Examination of Assumptions Made in the Forest Service's Final Environmental Impact Statement	9
Expansion of the Number of Species Closely Associated with Old-Growth Forests to be Assessed	9
Peer Review of the Scientific Analysis Team's Report	10
Results	11
Question 1 - Does Exemption of 13 Bureau of Land Management Timber Sales From the Requirements of the Endangered Species Act Necessitate Changes in Viability Assessments in the Forest Service's Final Environmental Impact Statement?	11
Question 2 - Does New Information Necessitate Changes in Management Proposed in the Forest Service's Final Environmental Impact Statement?	13
Question 3 - What Are the Risks to Other Species Associated with Old-Growth Forests? What Are Appropriate Mitigation Measures?	18
Requirements for Successful Implementation of Mitigation Measures for Species Associated with Old-Growth Forests	22
Monitoring and Research	23
The Effect of Suggested Standards and Guidelines of Altered Management by Other Land Holders	24
Management Options Other Than the Scientific Analysis Team's Suggestions	25
Alternatives from the Scientific Panel's Report	25
Alternatives for Management of Habitat for At-Risk Fish Species/Stocks	27

Table of Contents (Continued)

Restrictions on Manager’s Decision Space

 Restrictions Resulting from Compliance with the Endangered Species Act and
 "Viability Regulations" of the National Forest Management Act

 Potential Restrictions Resulting from Ecosystem Management

 No Free Lunch

 References

Appendix 1-A An Historical Perspective on the Evolution of the Spotted Owl Issue and
 Its Incorporation Into *de facto* Forest Management Policy

Note: There is limited use of acronyms and abbreviations in the text of this report. However, in an effort to make tables and figures easier to read and compare, some acronyms and abbreviations were used. See the list of acronyms and abbreviations on the inside front cover of this report.

CHAPTER 1

Introduction, Synthesis of the Scientific Analysis Team Report, and Observations

THE ASSIGNMENT

The Scientific Analysis Team - Personnel and Assignments

The Scientific Analysis Team was formed by the Chief of the Forest Service to respond to questions and concerns expressed by U.S. District Court Judge William L. Dwyer regarding the Forest Service's Final Environmental Impact Statement on Management for the Northern Spotted Owl in the National Forests (USDA 1992) (hereafter referred to as the Final Environmental Impact Statement). The following persons were assigned to the team.

<u>Name</u>	<u>Title</u>
Jack Ward Thomas, Ph.D	Team Leader and Chief Research Wildlife Biologist, Forest Service, Pacific Northwest Research Station, Forestry and Range Sciences Laboratory, La Grande, Oregon
Martin G. Raphael, Ph.D	Associate Team Leader, Principal Research Wildlife Biologist, Forest Service, Pacific Northwest Research Station, Forestry Sciences Laboratory, Olympia, Washington
Eric D. Forsman, Ph.D	Research Wildlife Biologist, Forest Service, Pacific Northwest Research Station, Forestry Sciences Laboratory, Corvallis, Oregon
A. Grant Gunderson	Threatened, Endangered, and Sensitive Species Program Manager, Forest Service, Pacific Northwest Region, Portland, Oregon
Richard S. Holthausen	National Wildlife Ecologist, Forest Service, Pacific Northwest Research Station, Forestry Sciences Laboratory, Corvallis, Oregon
Bruce G. Marcot, Ph.D	Wildlife Ecologist, Forest Service, Pacific Northwest Research Station, Ecological Framework for Management, Research, Development and Application Program, Portland, Oregon

The Scientific Analysis Team Report

Gordon H. Reeves, Ph.D	Research Fish Biologist, Forest Service, Pacific Northwest Research Station, Forestry Sciences Laboratory, Corvallis, Oregon
James R. Sedell, Ph.D	Principal Research Ecologist, Forest Service, Pacific Northwest Research Station, Forestry Sciences Laboratory, Corvallis, Oregon
David M. Solis	Spotted Owl Program Manager, Forest Service, Pacific Southwest Region, San Francisco, California

In addition, the team leaders recruited one additional team member who had done extensive work with the Northern Spotted Owl Recovery Team (USDI) on the subject of species plants and animals that are likely associated with late-successional forests. This was invaluable assistance proved to be great asset to the Scientific Analysis Team. He is:

Robert G. Anthony, Ph.D	Assistant Leader, Oregon Cooperative Wildlife Research Unit, Fish and Wildlife Service (USDI), Corvallis, Oregon
-------------------------	--

In addition, the Scientific Analysis Team recruited 13 experts to assist in the completion of the work assigned. These persons contributed so significantly to the Scientific Analysis Team effort that we considered them as Associate Scientific Analysis Team Members. They are as follows:

Scientific Analysis Team: Associate Team Members

Bruce Bingham, Ph.D	Research Plant Ecologist, Forest Service, Pacific Southwest Forest and Range Experiment Station, Redwood Sciences Laboratory, Arcata, California
Amedee Brickey	District Wildlife Biologist, Forest Service, Sierra National Forest, Pine Ridge-Ranger District, Shaver Lake, California
Gordon E. Grant, Ph.D	Research Hydrologist, Forest Service, Pacific Northwest Research Station, Forestry Sciences Laboratory, Corvallis, Oregon
Patricia Greenlee	Threatened and Endangered Species Coordinator, Forest Service, Willamette National Forest, Eugene, Oregon
R. Dennis Harr, Ph.D	Principal Research Hydrologist, Forest Service, Pacific Northwest Research Station, Forestry Sciences Laboratory, Seattle, Washington
Mauragrace Healey	Writer/Editor, Forest Service, National Forest System, Northern Spotted Owl Environmental Impact Statement Team, Portland, Oregon
Barbra Hill	Zone Wildlife Biologist, Forest Service, Gifford Pinchot National Forest, Amboy, Washington
Robin Leshner	Botanist, Forest Service, Mount Baker-Snoqualmie National Forest, Seattle, Washington

Kadonna Pennell	Administrative Officer, Forest Service, National Forest System, Northern Spotted Owl Environmental Impact Statement Team, Portland, Oregon
Frances Schmechel	Zone Wildlife Biologist, Forest Service, Gifford Pinchot National Forest, Vancouver, Washington
Marilyn Stoll	Wildlife Biologist, Forest Service, Olympic National Forest, Olympia, Washington
James Valenti	Computer Assistant, Forest Service, Olympic National Forest, Olympia, Washington
John A. Young	Geographer, Forest Service, Pacific Northwest Research Station, Forestry Sciences Laboratory, Olympia, Washington
Joan Ziegltrum, Ph.D.	Forest Botanist, Forest Service, Olympic National Forest, Olympia, Washington
Robert R. Ziemer, Ph.D	Principal Research Hydrologist, Forest Service, Pacific Southwest Forest and Range Experiment Station, Redwood Sciences Laboratory, Arcata, California

While we consider this report a joint effort and collectively stand behind the entire report, the team members were given individual assignments and were primarily responsible for developing various sections of this report. These assignments were as follows:

<u>Section of the Report</u>	<u>Title</u>	<u>Team Member Assigned</u>
Chapter 1	Introduction, Synthesis of the Scientific Analysis Team Report, and Observations	Thomas
Chapter 2	Effects of Exempting Thirteen Bureau of Land Management Timber Sales From the Requirements of the Endangered Species Act on the Viability Assessments in the Final Environmental Impact Statement	Gunderson and Solis
Chapter 3	Effects of Bureau of Land Management Implementing Preferred Alternatives in Draft Resource Management Plans on the Viability Assessments in the Final Environmental Impact Statement	Gunderson and Solis
Chapter 4	New Information on the Northern Spotted Owl	Forsman and Marco

Chapter 5	Risk Analysis of Species in Old-Growth Forests of the Pacific Northwest: Viability Assessment and Mitigation Measures in National Forests	Marcot, Rapheal Anthony, and Holthausen
Appendix 5-K	Strategy for Managing Habitat of At-Risk Fish Species and Stocks in National Forests Within the Range of the Northern Spotted Owl	Sedell and Reeves
Chapter 6	Requirements for Successful Implementation	Raphael and Gunderson

The Scientific Analysis Team was assigned three distinct and very different tasks to accomplish. Although these tasks are all related in the sense that all contribute to strengthening the information to be used in the Forest Service's Final Environmental Impact Statement, they do not produce an integrated whole. The approach taken by the Scientific Analysis Team was to develop chapters responsive to the particular assigned tasks. Each chapter, therefore, stands alone. There was, and could be, no "flow" between chapters.

The report covers complex natural resource issues, many of which have a unique "jargon". There are also many technical terms which are associated with the general subject area. We have attempted to avoid the jargon and limit our use of the technical terms. A glossary has been included to assist the reader. Common names of the species we address have been used in the text except where none were available. For a complete listing of the common and scientific names of the species see the List of Common and Scientific Names.

It must be noted that in fulfilling our tasks we have reached many conclusions. We have based these conclusions and recommendations on conversations with experts, extant literature, and professional judgement. All conclusions in this report are those of the Scientific Analysis Team alone, unless otherwise noted.

An Historical Perspective on the Issue of Management of Late-Successional Forests

To fully comprehend the situation that has led, seemingly inexorably, to the commissioning of the Scientific Analysis Team to address the specific questions described below, it may be important to examine the history of how land managers can deal with threatened or endangered species, the welfare of other terrestrial species associated with late-successional forests, and the maintenance of habitat for sensitive fish species or stocks or both. This historical perspective is presented in detail in Appendix 1-A.

This chronology of events can be logically interpreted as increasing philosophical, scientific, legal: legislative, and societal concern with retaining biodiversity through a process of managing land

and resources. These concerns are related to retaining the processes and functions of ecosystems. If so, it appears that a significant objective of land management (particularly that of the National Forests) can now be described as the preservation of biodiversity.

It is difficult not to accept this, if the regulations issued pursuant to National Forest Management Act of 1976 that calls for maintenance of viable populations of native and desired non-native vertebrates well distributed within the planning areas (interpreted by the Scientific Analysis Team as National Forests within the range of the northern spotted owl) are to be taken seriously. And the Federal courts have said that the Act is to be so considered.

The consequence of the Forest Service not meeting that objective is that not only will the agency be in violation of the National Forest Management Act, the species in question will likely be listed as "threatened" or "endangered" under the mandates of the Endangered Species Act of 1973 as amended. It may be increasingly significant to Forest Service managers that the Endangered Species Act declares its purpose to be the preservation of the ecosystems on which a threatened or endangered species depend.

Eight revisions to the original 1973 Endangered Species Act have been enacted (two in 1976, 1977, 1978, 1979, 1982, 1984 and 1988). The most current (1988) version of that Act states, "The purpose of this Act is to provide a means whereby the ecosystem upon which endangered species and threatened species depend may be conserved..." This statement of purpose has been kept essentially intact through all seven revisions of the Act. This provision may become more significant to Federal land managers with increasing shifts toward "ecosystem management". The Federal courts have not hesitated to force Federal agencies into compliance with those laws - even to the point of closing down commodity production from Federal lands, such as timber cutting in late-successional forests. Is it possible, then, that only after these objectives of providing for the viability of species, especially those considered threatened or endangered (which can be viewed in the context of "biodiversity" or "ecosystem management"), can the production of goods and services from these lands proceed.

This trend toward ecosystem management was seemingly further advanced by the recent declaration by Chief of the Forest Service, Dale Robertson, in late 1992. He stated that the Forest Service would, henceforth, practice "ecosystem management" on the National Forests.

These events seem, at least to us, to be evolving in the cauldron of a mixture of laws and regulations, case law, and pronouncements by political leaders and agency leaders into a *de facto* policy for management of National Forests. However, it is not for scientists to determine policy. The Scientific Analysis Team does feel that it is appropriate to point out what seems to be occurring, as the directly affects how scientists must interact with natural resource managers. Much of the increasing confusion and acrimony surrounding the management of National Forests Could be reduced or resolved through a clear statement of policy - either through the process of law or by edict by persons in authority.

Consideration by the Scientific Analysis Team of other species that are likely associated with late-successional forests on National Forests within the range of the northern spotted owl demonstrates how complex ecosystem management can be. And, this is the consideration of but one stage of forest land development in but one part of the United States. In addition, such an assessment represents the first of many steps needed to facilitate a true understanding of ecosystem management by a land management agency.

This process may give scientists, land managers, the courts, and the public some appreciation for the complexity of "ecosystem management" whether undertaken one species at a time or as a whole. We applaud the concept of ecosystem management and recognize the boldness that is required to commit to such a dramatic change in the paradigm that presently guides natural resource management. It is likely that continued total reliance on a species-by-species approach to preserve biodiversity will fail because of inefficiency and economics, and the associated direct and opportunity costs (Thomas et al. 1990).

Questions to be Answered by the Scientific Analysis Team

The Scientific Analysis Team was formed by the Chief of the Forest Service to respond to concerns expressed by U.S. District Court Judge William L. Dwyer on July 30, 1992, regarding the Forest Service's 1992 Final Environmental Impact Statement on Management for the Northern Spotted Owl in the National Forests (USDA 1992). The questions addressed to the Forest Service by the judge that were assigned to the Scientific Analysis Team for response were:

1. Does the May 15, 1992, decision by the Endangered Species Committee to allow cutting of 13 timber sales prepared by the Bureau of Land Management and judged by the Fish and Wildlife Service to cause "jeopardy" for the northern spotted owl necessitate changes in spotted owl viability assessments of the alternatives in the Final Environmental Impact Statement? If there are changes in the viability assessments, what mitigation options are recommended? These questions are addressed in Chapters 2 and 3.
2. Does any information that has become available since the publication of the Forest Service's Final Environmental Impact Statement necessitate revision of the standards and guidelines of the selected alternative in the Final Environmental Impact Statement or change the probabilities of maintaining viable populations of the northern spotted owl that were assigned to the alternatives in the Final Environmental Impact Statement? If a revision of the standards and guidelines of the selected alternative is warranted, what are the recommendations for mitigation measures? These questions are addressed in Chapter 4.
3. Would the Forest Service's implementation of the selected alternative in the Final Environmental Impact Statement (the Interagency Scientific Committee's Conservation Strategy) lead to the extirpation in Forest Service planning areas (National Forests) of of the 32 species identified in the Final Environmental Impact Statement as being closely associated with late-successional and old-growth forests? In addition, the Chief of the Forest Service asked us that, if that is so, what mitigation options are recommended to assure that extirpation does not occur? These questions are addressed in Chapter 5.

Upon careful review of this assignment, it became apparent to the Scientific Analysis Team that additional assessments were required to fully respond to the concerns expressed by Judge Dwyer. These additional tasks were determined as described below (see Chapters 2 and 3).

Instructions to the Scientific Analysis Team from Forest Service administrators to analyze Bureau of Land Management's cutting of the 13 timber sales released by the Endangered Species Committee included the direction to assume that the Bureau of Land Management would continue to operate under current management plans after the sales were cut (see Chapter for a more complete discussion). It is a much more likely situation that the Bureau of Land Management would operate under the preferred alternative in their Draft Resource Management

Plans released in August 1992. Therefore, the Scientific Analysis Team also analyzed the effect on spotted owl viability of the Bureau of Land Management acting under their preferred alternative coupled with the various alternatives in the Final Environmental Impact Statement.

Examination of Assumptions Made in the Forest Service's Final Environmental Impact Statement

1. In the Final Environmental Impact Statement, it was assumed that Bureau of Land Management would adopt a forest management strategy for the northern spotted owl that would be at least equal to the Interagency Scientific Committee's Conservation Strategy in maintaining viability of the subspecies.
2. In the Final Environmental Impact Statement, it also was assumed that consultation between the Bureau of Land Management and the Fish and Wildlife Service under Section 7 of the Endangered Species Act regarding proposed timber sales would produce a *de facto* spotted owl habitat management plan that would be equal or superior to the Interagency Scientific Committee's Conservation Strategy in providing for viability of the spotted owl. Our confidence in that this assumption was reduced by the Fish and Wildlife Service's decision to not call "jeopardy" on Bureau of Land Management timber sales that were in conflict with Interagency Scientific Committee Strategy guidelines on dispersal habitat in areas currently deficient in such habitat. Because we could not determine precisely on what basis jeopardy calls can be made in a consistent fashion in keeping with applicable regulations, our confidence that such a process will produce a *de facto* plan was eroded.

This conclusion was reinforced when the Bureau of Land Management appealed the Fish and Wildlife Service's "jeopardy" decision on 44 proposed timber sales. And, when the Endangered Species Committee exempted 13 of the 44 sales from the requirements of the Endangered Species Act, this assumption was further eroded. In addition, the Endangered Species Committee invited the Bureau of Land Management, if a jeopardy call on Bureau of Land Management's forest management plan was made by the Fish and Wildlife Service, to appeal for exemption of the entire forest management plan rather than on a timber sale-by-timber sale basis.

Our discussions with Fish and Wildlife Service personnel reinforced our opinion that Section 7 consultation on proposed actions between Federal land management agencies and the Fish and Wildlife Service that might effect spotted owls will not cause those agencies to conform with Interagency Scientific Committee guidelines or bring about the implementation of a fully coordinated plan for Federal lands.

Expansion of the Number of Species Closely Associated with Old-Growth Forests to be Assessed

Instructions from Judge Dwyer were to determine if the adoption of the Interagency Scientific Committee's Conservation Strategy by the ~Forest Service would cause extirpation, by planning area (which was interpreted by the Scientific Analysis Team as National Forests within the range of the northern spotted owl), of any of 32 species identified in the Final Environmental Impact Statement (USDA 1992) as closely associated with late-successional or old-growth forests. During the preliminary stages of our analysis it became obvious to us that there were numerous other species likely associated with such forests. Accordingly, it seemed logical to fully address the concern for other species (vertebrates, invertebrates, vascular, and nonvascular plants).

Therefore, an assessment of the status of a much broader array of species thought to be associated with old-growth forests was conducted in concert with members of the Northern Spotted Owl Recovery Team.

Peer Review of the Scientific Analysis Team's Report

The Deputy Chief of the Forest Service's National Forest System (J. Overbay pers. comm.) directed that the Scientific Analysis Team's report be submitted for peer review. The Scientific Analysis Team welcomed that instruction. Further, the Scientific Analysis Team concluded that the peer reviewers should be selected by other fully qualified persons outside the Scientific Analysis Team. Therefore, six professional societies were contacted to provide names of qualified reviewers. These reviewers were contacted by the Scientific Analysis Team's Administrative Officer in the order that the names were listed until a reviewer was found that was available and willing to conduct the review under the prescribed timelines (response within three weeks). There was no contact between any member of the Scientific Analysis Team and the reviewers until after their reviews were submitted to the Scientific Analysis Team. The Scientific Analysis Team leader sent letters of instruction to the peer reviewers and did provide a missing appendix to the reviewers after the reviews were complete with the solicitation of additional comments, if such seemed appropriate. No additional comments were received.

The organizations that provided names of qualified peer reviewers were: (1) American Fishery Society, (2) The Wildlife Society, (3) Society of American Foresters, (4) Society for Conservation Biology, (5) Ecological Society of America, and (6) American Ornithologists' Union.

The Scientific Analysis Team collectively scrutinized each peer review in detail and revised the final report to satisfy peer review comments. Detailed notes were kept to document the team's reactions and responses to the peer reviews. These peer reviews and details of our response to peer review comments are on file at the Pacific Northwest Regional Office of the Forest Service, Portland, Oregon.

RESULTS

A brief synopsis of the answers to the three questions is presented in this chapter. There is a full discussion in the chapters that follow.

Question 1 - Does Exemption of 13 Bureau of Land Management Timber Sales From the Requirements of the Endangered Species Act Necessitate Changes in Viability Assessments in the Forest Service's Final Environmental Impact Statement?

See Chapters 2 and 3.

Criteria for Risk Management - Each evaluation of the risk of management plans to spotted owl viability was conducted through an assessment of the following criteria:

1. Potential change in the amount and size of blocks of habitat
2. Distribution of habitat
3. Capability of the habitat to support pairs of spotted owls
4. Dispersal habitat
5. Spacing between Habitat Conservation Areas
6. Patch size of habitat
7. Clustering of spotted owl pairs

The information from the evaluation of each of these items pointed out shortcomings that could be addressed through mitigation measures.

Evaluation of Bureau of Land Management Management Scenarios - Three scenarios for Bureau of Land Management management were examined.

Exemption of 13 Bureau of Land Management Timber Sales as a One-Time Action.

See Chapter 2. This scenario assumes that the exemption by the Endangered Species Committee of the 13 Bureau of Land Management timber sales from the requirements of the Endangered Species Act is a one-time action. It is further assumed that Bureau of Land Management will, thereafter, comply with the Interagency Scientific Committee's Conservation Strategy or some other strategy that provides an equally high likelihood of viability for the northern spotted owl. The Scientific Analysis Team found that: 1) such action would cause only a slight increase in risk to spotted owl viability across its range and 2) such action would not warrant a change in the overall viability assessment presented in the Final Environmental Impact Statement. Therefore, the Scientific Analysis Team did not deem it necessary to suggest any mitigation measures to the Forest Service's selected alternative in the Final Environmental Impact Statement to compensate for this slight increase in risk to spotted owl viability.

Exemption of 13 Bureau of Land Management Timber Sales With Compliance Thereafter With Current Management Plans. See Chapter 2. According to this scenario, if the Bureau of Land Management continues the management of its forested lands in Oregon under current plans which provide for 109 reserved areas for northern spotted owls (called Bureau of Land Management/Oregon Department of Fish and Wildlife Agreement Areas) and Management Framework Plans prepared in the 1980's, the amounts and quality of spotted owl habitat will continue a precipitous decline. This decline will ultimately reduce the likely contribution of the

Bureau of Land Management's lands to supporting a viable population of spotted owls to near zero. If such a management scheme were followed, dramatic increases in Habitat Conservation Areas would be required for lands managed by the Forest System to attain an overall "high" viability rating for the northern spotted owl.

Mitigation Measures Recommended. Given this scenario, we estimated that approximately 1,134,000 acres would need to be added to the network of Habitat Conservation Areas on National Forests. This only partially compensates for the lack of contribution to spotted owl habitat by Bureau of Land Management administered lands, but does result in a high viability rating for the preferred alternative in the Final Environmental Impact Statement.

The Scientific Analysis Team, however, considered that the chances of the Bureau of Land Management following such a strategy in the future are not likely. We only addressed this scenario because it was specifically assigned to us.

Adoption of Bureau of Land Management's Preferred Alternative in the Draft Resource Management Plans. See Chapter 3. After detailed examination of Bureau of Land Management's preferred alternative in their Draft Resource Management Plans, the Scientific Analysis Team concluded that adoption of those plans has a high probability of not providing a level of management of spotted owl habitat equal or superior to that provided by the Interagency Scientific Committee's Conservation Strategy. This increased risk can be attributed to: (1) allowing 40-50 years to pass before meeting provisions for dispersal habitat; (2) conducting precommercial and commercial thinning in younger developing stands in management areas with emphasis on maintaining and producing old-growth forest characteristics; and (3) lack provisions for protection of all territorial owl pairs in the Oregon Coast Range. This area is of special concern due to loss of habitat and severe fragmentation of extant late-successional forests. The period of high risk for the Bureau of Land Management's preferred alternative is expected to occur most dramatically during the same period over which the spotted owl is at some additional risk across its range under the Interagency Scientific Committee's Conservation Strategy. This risk to the owls' viability under the Interagency Scientific Committee's Conservation Strategy results from continued habitat loss to the point that the rate of loss matches the rate of gain (i.e., equilibrium is attained); and the possibility of increasing isolation of the Oregon Coast Range spotted owl population. With participation by all Federal agencies, though, the Interagency Scientific Committee's Conservation Strategy was deemed adequate to provide for the northern spotted owl.

Mitigation Measures Recommended. The Scientific Analysis Team concluded that the Bureau of Land Management's action in adopting the preferred alternative of their Draft Resource Management Plans, which is likely to be less effective than the Forest Service's selected alternative (the Interagency Scientific Committee's Conservation Strategy), would change the likelihood of maintaining spotted owl viability across its range from "high" to "medium". This change in the overall viability rating would result if no mitigation measures were adopted for National Forests to compensate for increased risks on lands administered by the Bureau of Land Management.

The Scientific Analysis Team recommended mitigation measures be adopted on lands managed by the Forest Service to make up for significantly increased risks on lands administered by the Bureau of Land Management.

If the recommended mitigation measures are implemented, the probability of maintaining a viable population of spotted owls is increased from "moderate" to "high". This mitigation measure includes additions of approximately 418,000 acres to the Habitat Conservation Areas designated by the Interagency Scientific Committee and strategically located on National Forests (Siuslaw, Siskiyou, Umpqua, and Willamette) adjacent lands administered by the Bureau of Land Management. This mitigation measure will protect enough habitat and additional pairs of spotted owls to compensate for pairs displaced on lands administered by the Bureau of Land Management if the higher-risk strategy proposed in the Bureau of Land Management Preferred Alternative in their Draft Resource Management Plans fails to perform as expected. We consider that to be a distinct probability.

The increased size of some Habitat Conservation Areas will also ensure that spotted owl territories contain enough owl pairs to maintain persistence of breeding pairs over several decades. Larger Habitat Conservation Area sizes will also result in decreasing distances between Habitat Conservation Areas, thereby increasing the chances of successful dispersal between Habitat Conservation Areas. For example, nearest-neighbor distances between Habitat Conservation Areas on lands managed by the Forest Service in the Oregon Coast Range is decreased from 8.2 to 2.8 miles with the additions. In combination, these mitigation measures may maintain a subpopulation in the Oregon Coast Range with enough numbers and adequate habitat to enhance the probability of maintenance of population persistence.

Question 2 - Does New Information Necessitate Changes in Management Proposed in the Forest Service's Final Environmental Impact Statement?

See Chapter 4. Since January 1992, a variety of new information has been released relative to the biology of the northern spotted owl, including new information on the demographics and population density of the owl, dispersal, and hybridization with the barred owl. We present summaries of new information that has been released since January 1992, including updated information for four of the five study areas described by David Anderson and Kenneth Burnham of the Fish and Wildlife Service. Implications of the new information are discussed relative to the selected alternative in the Final Environmental Impact Statement.

Demographic Studies - See Chapter 4. Between 1985 and 1987, researchers initiated five long-term demographic studies of spotted owls in Washington, Oregon, and northwestern California. These studies were designed to investigate demographic rates of spotted owls, including age-specific birth and death rates and population trends. Data from these five studies were analyzed in a workshop at Fort Collins, Colorado, in September 1991.

The Fort Collins workshop produced an analysis of each of five individual study areas as well as a "meta-analysis" in which data from all areas were examined in combination to determine any overall trends. A synopsis of the Fort Collins workshop was written by Anderson and Burnham and provided to the Northern Spotted Owl Recovery Team in November 1991 for inclusion in its Recovery Plan for the Northern Spotted Owl (USDI 1992a).

The analysis done at the Fort Collins workshop indicated that populations of territorial spotted owl females on all five study areas were declining. Estimated rates of decline on the individual study areas ranged from 6 to 16 percent per year, with an overall average of approximately 10 percent per year.

The demographic meta-analysis performed at the Fort Collins workshop indicated that not only were populations declining on the individual study areas, but female survival rates were declining over time at an increasing rate. This was probably the most troubling finding from the Fort Collins workshop because an accelerated decline in survival rates could be indicative of a population that has passed some sort of demographic threshold and is rapidly proceeding to extirpation or extinction.

Since the results of the Fort Collins workshop were released, there has been considerable discussion within the scientific community concerning possible biases in the demographic data on which the assessment relied. The primary concern was that emigration of juveniles and adults might cause survival rates to be underestimated. In the analysis technique used, undetected emigrants are considered to be dead when, in fact, some may still be alive. To the extent that birds emigrate, survive, and go undetected, the models used in the assessment overestimate recapture rates and underestimate survival. It is known that undetected emigration of juveniles and adults does occur, based on results of radio-telemetry studies.

Studies using radio-marking techniques of juvenile spotted owls in 1991-1992 indicated that 22, 44, and 45 percent of juveniles from the three study area survived the first year of life, left the demographic study areas, and would not have been detected by banding alone had they not been wearing radio transmitters.

Although it is probable that some of these emigrants will be detected by conventional calling and banding techniques as they move around and acquire territories in future years, the high rates of first-year emigration from the demographic study areas do suggest that undetected emigration is causing a negative bias in juvenile survival estimates derived from banding data. Survival estimates based on the radio-marked samples of juveniles in the 1991-92 study were considerably higher than the average values estimated from demographic studies. Comparatively high survival of the radio-marked birds may reflect the reduction of bias caused by emigration, but could also be the result of a particularly mild fall, winter, and spring in 1991-92. We believe it will take several more years of study before essentially unbiased estimates of survival rates of juvenile spotted owls are available for all demographic study areas.

Although there is less evidence to indicate significant emigration by adult owls, there is a concern that demographic analyses can be biased by such emigration because estimates of population growth rates are most sensitive to changes in adult survival rates. If anything, emigration of adult owls will lead to underestimates of adult survival rates and a corresponding underestimate of the rate of change of population growth rate.

The parameter used to estimate age-specific birth rates at the Fort Collins workshop was fecundity (defined as the number of female young produced per year per territorial female). Estimates of fecundity from the demographic studies are believed to be reasonably accurate, although several sources of counteracting bias are possible.

The Scientific Analysis Team contacted research biologists working on the five demographic study areas from which the data was acquired that was examined by Anderson and Burnham at the Fort Collins workshop to see if they could update their individual demographic estimates with 1992 data. Researchers working on four of the five study areas provided updated estimates of survival and fecundity. Adding one more year of data resulted in only minor changes in estimates of average survival rates and fecundity. New estimates of population growth rates will be calculated from the 1992 data during 1993. Because our update of demographic rates on four

of the five individual study areas indicates little change in survival and fecundity rates from the original Anderson and Burnham analysis, we do not anticipate that the revised population change estimates will differ appreciably from the original results reported by Anderson and Burnham (1992).

Population Density Studies - An alternative method of evaluating population trends is to examine actual changes in the number of territorial owls per unit area over time. The Scientific Analysis Team summarized density estimates for 12 density study areas. An analysis of these data indicated that of 10 areas with three or more years of data, only two areas near Medford, Oregon, appeared to be undergoing significant declines. Crude densities (number per total area considered) were essentially stable on seven areas, and increasing on one area. A meta-analysis of the combined data set indicated that the populations were declining at a rate of 3.2 percent per year. Although this analysis was based on relatively short time periods (2 to 8 years) of data collection, we concluded that there was little evidence of significant changes in crude density on most of the study areas.

Declines in Owl Populations Related to Declines in Habitat - An analysis of timber-cutting records on the five study areas indicated that spotted owl habitat on Federally administered lands was declining at 0.9 to 1.5 percent per year on Forest Service study areas and 1.3 to 3.1 percent per year on Bureau of Land Management study areas. Timber cutting records were not available for non-Federal (state and private) lands. Analysis of rates of habitat loss using Landsat data that covered all land ownerships indicated rates of habitat loss between 1.1 percent and 5.4 percent per year. Rates of habitat loss were lower than estimated rates of population decline from demographic studies and greater than rates of population decline based on changes in owl numbers on density study areas. The one exception was the Medford area where relatively high rates of decline based on changes in owl numbers matched high rates of decline in habitat estimated from Landsat analyses.

It is apparent to the Scientific Analysis Team that results from demographic analyses of data on territorial females and changes in owl density of territorial pairs suggest quite different relationships between habitat loss and population response. One method (demographic studies) suggests that territorial populations of owls are declining substantially faster than the rate of habitat loss. The other method (population density studies) indicates that populations territorial owls are either stable or declining at about the same rate as habitat loss. It is not apparent, however, how floaters (non-territorial, non-breeding adult owls) may fill vacancies the territorial populations.

Thresholds in the Metapopulation of Owls - After the release of the Anderson and Burnham (1992) report, some experienced scientists suggested that the declining survival rates of female spotted owls were indicative of a population that had dropped below a demographic threshold and was declining precipitously toward extinction. The Scientific Analysis Team concluded from an examination of all available data that it is highly unlikely the overall spotted owl population has fallen below such a demographic threshold. In fact, given the size of the population, the extent of the presently occupied range, stable fecundity rates, and the amount of habitat that still exists, we consider it highly unlikely that any thresholds have been passed with the possible exception of some subpopulations in highly isolated and heavily cutover areas, such as southwestern Washington.

Viability Ratings and Spatially Explicit Models - Viability ratings for spotted owl populations under the five alternatives in the Final Environmental Impact Statement were ranked using the seven criteria presented on page 11. Subsequently, the Forest Service was criticized for not using more quantitative, spatially explicit models to rank alternatives presented in the Final Environmental Impact Statement. Although the Scientific Analysis Team agrees that the use of quantitative, spatially explicit models to examine alternatives is a good idea, there are several reasons why the Forest Service has not done so. We consider those reasons as valid.

First, at the time the Final Environmental Impact Statement was released, the only spatially explicit owl/habitat model that we were aware of was still in the development stage and not fully tested. Second, and more importantly, the use of a spatially explicit model requires detailed, spatially explicit maps of present and anticipated future habitat and proposed logging areas (i.e., areas of habitat loss). Although digital maps of old-growth and mature forest have been produced, to some extent and to varying degrees of accuracy, by several agencies and private organizations, maps of most age classes younger than old growth are incomplete or lacking, making it difficult to use spatially explicit models to evaluate current, and especially future distribution of habitat of various kinds used by owls for dispersal, foraging, and nesting. Thus, use of a spatially explicit model at this point would involve many assumptions about the amount and distribution of habitat and harvest areas that are unsubstantiated by currently available data.

There has been considerable refinement of spatially explicit models designed to examine relationships between spotted owl populations and changes in habitat. Given that such models are available, the Scientific Analysis Team suggests that the Forest Service continue to acquire adequate Geographic Information System technology and develop maps of habitat and harvest alternatives that can be used to assess alternatives for the spotted owl and other species associated with late-successional forests. Whereas maps of old growth have been developed by the Forest Service and several other parties, these maps are based on different characteristics and are not generally compatible.

Hybridization Between Barred and Spotted Owls - Since 1989, crosses (hybrids) between barred owls and spotted owls have been confirmed at four widely separated locations within the range of the northern spotted owl. Although records of hybridization between barred owls and spotted owls are an interesting biological phenomenon, biologists do not know what the ultimate outcome will be. Hybridization is common in nature, having been recorded in about 10 percent of the nonmarine bird species in North America. In most species where it occurs, hybridization is an uncommon event, and thus has little effect on the parental species, that is, they still continue as distinct species.

The Scientific Analysis Team believes that hybridization between spotted and barred owls is rare because so few hybrids have been detected during the last 15 years, despite the fact that hundreds of observers have been conducting surveys for spotted owls. Nevertheless, the barred owl is rapidly extending its range into the range of the spotted owl, and the incidence of hybridization could possibly increase as the numbers of barred owls increase. We simply do not know what the outcome will be. Even in the absence of interbreeding, the barred owl may represent a threat to the spotted owl from either competition or displacement.

We conclude there is little the Forest Service or other forest management agencies can or should do to influence the eventual outcome of the extension of the barred owl range. It is not at all clear that this range extension is the result of forest management practices. It is equally unclear whether a change in management practices (e.g., saving all the old-growth forests or stopping all timber cutting) will have any effect on the rate or extent of the extension of the barred owl range. In light of this uncertainty and the evidence that hybridization is uncommon, we believe the most reasonable course of action is to continue to manage habitat for large clusters of spotted owls dispersed across the historical range of the species.

Surveys for Spotted Owls - Since the release of the Final Environmental Impact Statement, additional surveys of spotted owls have been completed. These surveys indicate that the population of spotted owls in British Columbia is probably less than 100 pairs. We believe that protection of the Canadian population of spotted owls is important, particularly from the standpoint of maintenance of a widely distributed population.

Between 1987 and 1992, pairs of owls were detected at 3,591 sites in Washington, Oregon, and northwestern California. As each of these sites was not always verified by searches in subsequent years, the occupied sites in 1992 would likely be less than that number by some unknown amount. Because there are still areas that have not been searched for owls, it seems likely that the actual population is larger than the confirmed population. The increase in the number of confirmed owl pairs should not be interpreted as evidence of a population increase. Data from the density study areas and the demographic studies do not support such an interpretation.

The increase in the number of confirmed owl pairs results from greatly increased survey efforts during the last 10 years, including, (1) a greatly expanded effort to inventory owls, (2) initiation of numerous demographic studies across the range of the owl, and (3) increased surveys associated with timber sales in order to comply with Section 7 consultation requirements of the Endangered Species Act. Given the dramatic increase in survey effort since 1985, we are not surprised that significantly more owls have been located.

The total number of owls that exist under current conditions is not particularly relevant - what is much more important is the total number of owls projected to occur when a final management plan is fully implemented and habitat levels stabilize. The plan proposed by the Interagency Scientific Committee assumed that most pairs of owls outside Habitat Conservation Areas would eventually disappear as habitat was removed and simultaneously fragmented, eventually resulting in a population of about 2,200 pairs of owls within the network of Habitat Conservation Areas. This estimate is largely independent of the size of the current population. What does change as a result of the size of the current population of spotted owls is that we can be somewhat more confident that the population will survive through the short-term transition period while the plan is being implemented.

Review of Literature Available Since Publication of the Forest Service's Final Environmental Impact Statement - As part of our process, we reviewed all the available literature concerning northern spotted owls published since the preparation of the Final Environmental Impact Statement. In addition, we reviewed progress reports and other unpublished information and interviewed research scientists who were conducting ongoing research. A complete annotated bibliography of this information was prepared and appears as Appendix 4-B of this report. The Scientific Analysis Team evaluated this information and concluded that such information did not alter the underlying construct of the Interagency

Scientific Committee's Conservation Strategy nor indicate any reason to alter the details of that strategy except as necessary to mitigate for Bureau of Land Management actions.

Evaluation of Whether New Information Warrants Changes in Proposed

Management Schemes - The Scientific Analysis Team finds that the new information examined does not warrant proposing more restrictive measures for protecting northern spotted owl habitat. Assuming that the selected alternative in the Forest Service's Final Environmental Impact Statement is fully implemented, and our recommendations (see Chapter 3) for increased reserved areas for spotted owls on lands managed by the Forest Service to compensate for Bureau of Land Management management actions are initiated if that becomes necessary, the Scientific Analysis Team concludes that the preferred alternative of the Final Environmental Impact Statement will provide a high likelihood of maintaining a viable, well distributed population of northern spotted owls.

Question 3 - What Are The Risks To Other Species Associated With Old-Growth Forests? What Are Appropriate Mitigation Measures?

See Chapter 5.

The Rationale for Expanding the Assessment Beyond the 32 Species Identified in

the Forest Service's Final Environmental Impact Statement - The Final Environmental Impact Statement identified 32 species of terrestrial vertebrates other than the northern spotted owl as closely associated with old-growth forests. We refined the basis for identifying these species and expanded the evaluation beyond terrestrial vertebrates (amphibians, reptiles, birds, and mammals) to include plants, invertebrates, and fish species/stocks. This assessment was conducted because: (1) a full examination is in keeping with the mandates of the regulations issued pursuant to the National Forest Management Act to maintain viable populations of all native species well distributed within the planning area(s); (2) such an assessment avoids "piecemeal" consideration of evolving concerns with individual species with the inherent potential of infinite delays in plan approval; and (3) such an approach is in keeping with the Forest Service's recent commitment to "ecosystem management." We caution, however, that the effort reported in this publication is not a complete ecosystem assessment; it is a significant step.

Methods - The Scientific Analysis Team expanded the evaluation of the risk of extirpation under the adoption of the Forest Service's Final Environmental Impact Statement Alternative B (the Interagency Scientific Committee's Conservation Strategy) to assess *all* species that have been identified as being associated with old-growth forests. This evaluation took place in three phases:

1. Identification of species associated with old-growth forests.
2. Evaluation of the viability status of each such species under the five management alternatives described in the Final Environmental impact Statement. This evaluation included an estimate of the likelihood of extirpation from planning areas (interpreted by the Scientific Analysis Team as National Forests within the range of the northern spotted owl).
3. Identification of potential mitigation measures to ensure high viability of all species identified as closely associated with old-growth forests that were determined to have a medium or high rate of extirpation under the Interagency Scientific Committee's Conservation Strategy.

We compiled what came to be called the "long list" of all species associated with old-growth forests. These lists emerged from a review of literature, unpublished studies and data bases, Forest Service ecology data bases, and professional knowledge. A set of criteria was developed to help judge the degrees of the association of the species with old-growth forest ecosystems. These criteria were used to reduce the "long list" to a "short list" of species that seemed likely to actually be associated with late-successional, old-growth forests. We then set up evaluation panels of seven to eight recognized experts in each of five specialty areas: (1) fungi, lichens, and nonvascular plants; (2) vascular plants; (3) amphibians and reptiles; (4) birds; and (5) The panels assessed risks to viability and probabilities of extirpation of individual species within those groups. In a separate process, we consulted with experts on fish habitat to develop lists and viability ratings of sensitive fish stocks. We consulted with invertebrate specialists for the same purposes. Panelists and consultants were provided summary data, distribution maps, and other information to aid in their deliberations.

To determine the likelihood of viability of each species under various planning alternatives described in the Final Environmental Impact Statement, each panel reviewed the available information for those species on the "short list" that were within their area of expertise, by planning area where appropriate. From this evaluation emerged a viability assessment for each species at three levels. Those rated by the panels as having a "high" or "medium high" likelihood of overall viability were considered as being at low risk of extinction or extirpation from one or more planning areas (i.e., National Forests). Those having a "medium" likelihood overall viability were considered as having a "medium" risk of extirpation. Those species ranked as having a "medium low" or "low" likelihood of overall viability were considered as having high risk of extirpation. Each species was evaluated for each alternative in the Final Environmental Impact Statement. The period of evaluation was 50 years. The Scientific Analysis Team considered that these categories of risk correspond to the population viability language presented in the regulations (36 CFR 219.19) issued pursuant to the National Forest Management Act.

Results - Details concerning the species identified as closely associated with old-growth forests are found in Chapter 5.

Number of Species Associated With Late-Successional Forests - The Scientific Analysis Team identified 667 species that have a high likelihood of being associated with old-growth forests. This total was made up of 35 species of mammals, 38 birds, 21 reptiles and amphibians, 112 fish stocks, 149 invertebrates, 122 vascular plants, and 190 nonvascular plants and fungi.

Evaluation of the Provision of Habitat Needs of Species Associated With Late-Successional Forests by Increments of Protected Areas - Building on the Interagency Scientific Committee's Conservation Strategy, to provide mitigation measures for viability of species associated with old-growth forests requires some approach of "tiering" from one set of mitigation measures to the next. It should be remembered that the Interagency Scientific Committee's Conservation Strategy tiered off designated land allocations such as National Parks and congressionally designated Wilderness in extant Federal land use plans. The combination of the Land and Resource Management Plans for the National Forests and the Interagency Scientific Committee's Conservation Strategy provide for high viability of 280 of the identified at-risk species. The Scientific Analysis Team continued that process by next considering the mitigation measures suggested to deal with the 112 fish stocks considered to be at risk.

Mitigation measures for at risk fish stocks were taken from the array of six management options for those at-risk fish stocks prepared by a panel of fish habitat and watershed experts for managing Pacific anadromous fish habitat on National Forests throughout the western states. This group is known as the Pacific Salmon Workgroup and Field Team (hereafter referred to as the Pacific Salmon Workgroup, also known as "PacFish").

Each management option developed by the Pacific Salmon Workgroup has a different risk rating for the fish stocks in question. The option we recommend in this report was deemed by the scientists of the Pacific Salmon Workgroup and by the Scientific Analysis Team as having a "high" probability of providing for the viability of the fish stocks in question only insofar as spawning, rearing, and migration habitat on National Forests is concerned. Other factors influencing the viability of these fish runs (such as ocean fishing, irrigation drawdown, or runoff from agricultural lands) is beyond the capability of the Forest Service to address.

The Pacific Salmon Workgroup presented one other option that yields a "high" probability of success, but at a greater impact to commodity resources. Two other options are rated at "moderately high" (i.e., somewhat better than 50/50) probability of viability. In selecting such an option, one would have to consider if such a risk is acceptable to the management agencies and to the courts in dealing with a critical habitat component for fish stocks that are very likely to be listed as either "threatened" or "endangered" under the Endangered Species Act.

The Scientific Analysis Team's aquatic and riparian mitigation measures involve four components: (1) a network of key watersheds containing at-risk fish species and stocks, good quality habitat and/or high potential for restoration; (2) establishment of Riparian Habitat Conservation Areas with minimum interim buffer widths for different sized streams and a set of standards and guidelines for operating within Riparian Habitat Conservation Areas; (3) conducting an intensive watershed analysis to establish final boundaries for Riparian Habitat Conservation Areas and watershed restoration priorities; (4) watershed restoration of degraded habitat for the long-term protection of aquatic and riparian habitats.

The minimum interim buffer widths for Riparian Habitat Conservation Areas consist of: 300 feet on each side of lakes and fish bearing streams; 150 feet on each side of permanent non-fish bearing streams; 150 feet of ponds and reservoirs and of wetlands larger than one acre; and 100 feet on each side of seasonal intermittent streams and wetlands less than one acre in size, as well as landslide and landslide-prone areas. Within these protection areas, timber management and other ground disturbing activities are prohibited unless a site-specific watershed analysis indicates such activities will accelerate meeting desired ecological conditions. Within key watersheds and inventoried roadless areas detailed watershed analysis must precede management activities.

The combination of reserves in National Parks and congressionally designated Wilderness, Land and Resource Management Plans, the Interagency Scientific Committee's Conservation Strategy, and Riparian Habitat Conservation Areas provide for protecting an additional 19 species at risk of high viability in addition to the 112 fish stocks the mitigation measures were designed to protect.

The next step in determining mitigation measures was the consideration of requirements for nesting habitat on lands managed by the Forest Service for the marbled murrelet. This species was listed as "threatened" under the authority of the Endangered Species Act on September 28, 1992. This listing ensures that a recovery plan for this species will be forthcoming eventually from the Fish and Wildlife Service. It is the Scientific Analysis Team's opinion that the prudent course of action is to reserve all marbled murrelet habitat on National Forests within 50 miles of marine habitats in Washington and most of Oregon, and within 35 miles in southern Oregon and California.

In addition, we recommend that habitat recruitment stands (i.e., stands that have capability to become marbled murrelet suitable nesting habitat) equal to 50 percent of the total extant suitable habitat also be selected and protected. The mitigation measures suggested are considered by the Scientific Analysis Team to be interim guides to preserve options until a recovery plan is prepared.

It seems likely that such a recovery plan for the marbled murrelet will build on the Recovery Plan for the Northern Spotted Owl (basically the Interagency Scientific Committee's Conservation Strategy) and some form of Riparian Habitat Conservation Areas will be designated to protect at-risk fish stocks. The Scientific Analysis Team estimates that 24 additional at-risk species can be assured viability by the combination of the above described actions. These actions will preserve a wide array of existing options for those preparing the recovery plan for the marbled murrelet. Further, it should be recognized that similar protection might well be imposed by the Fish and Wildlife Service even in a step-by-step series of Section 7 consultations, when any action is proposed that may disturb actual or potential nesting habitat. This proactive move is biologically appropriate and could save time and money over the long term.

There were another 17 at-risk species identified as rare or locally endemic. Mitigation measures vary for this group by species, but generally depend on surveys for occurrence of the species and protection on a site-specific basis. Another seven species that are more broadly distributed require some considerations in management of the forest matrix between protected late-successional old-growth forest areas. Such action includes leaving some large dead trees standing on site during silvicultural manipulations including logging, protection of talus areas, and buffering meadows and other natural openings, with areas of protected forests, use of prescribed fire, and minimizing the construction of roads.

For the remaining at-risk species, information was lacking to design specific mitigation options. Based on general life-history attributes of these species, we determined that habitat requirements of 23 species would likely be met by the combination of all the mitigation measures mentioned above. This left 149 species of invertebrates and 36 species of plants (9 nonvascular plants and fungi, 8 vascular plants) and vertebrates (9 mammals, all species of bats) of which so little known that we were unable to assess their viability or the prescription of mitigation measures. Inability to assess viability does not imply that species would be at risk nor does it imply the opposite. Intuitively, the reservations of late-successional, old-growth forests in National Parks and congressionally designated Wilderness, and specified in land use plans, the Interagency Scientific Committee's Conservation Strategy, Riparian Habitat Conservation Areas, and marbled murrelet habitat reserves should provide significant resources of old-growth forest habitat for insuring the viability of such species. The additional mitigation measures described for rare

or locally endemic species above should further add to the probability of maintaining viable populations. Yet, the state of knowledge about these species is such that their viability cannot be assessed.

The Scientific Analysis Team suggests that information necessary to evaluate viability of these species be obtained and evaluated. It is logical to assume that such a process would reveal that some of these species have a low risk of extirpation or extinction. For those species that are determined to be at risk, it is likely that specific mitigation measures can be developed to ensure a low risk. However, this cannot be done without additional information. We believe that the assessment we have completed is the best we could do with extant empirical information, expert opinion, and common sense. As new information is generated we recommend that it be considered through the adaptive management process.

We conclude that, with the institution of the Interagency Scientific Committee's Conservation Strategy and the implementation of the mitigation measures described above, that 482 of the 518 (93 percent) plants and vertebrates closely associated with old-growth forests can be considered to have a low risk for extirpation or extinction. The remaining risk to the other species is impossible to assess.

Requirements for Successful Implementation of Mitigation Measures for Species Associated With Old-Growth Forests

See Chapter 6.

The Scientific Analysis Team developed a step-wise approach for providing protection of habitat for species closely associated with old-growth forests adequate to sustain viability (see Chapter 5). There were six distinct steps involved in this process. These steps, collectively, comprised the mitigation measures necessary to assure viability for the 482 plant and animal species determined to be associated with late-successional forests. There were 36 species about which so little is known that assessment of risk to these species was not possible. Full implementation of the suggested mitigation steps consists of the following:

1. Retention of all land allocations and standards and guidelines in Forest Service Land and Resource Management Plans that provide protection for species closely associated with late-successional forests or the fish species/stocks considered to be at risk.
2. Implementation of the Interagency Scientific Committee's Conservation Strategy or the Department of the Interior's Recovery Plan for the Northern Spotted Owl. This may include additions to the Habitat Conservation Areas designated in the Interagency Scientific Committee's Conservation Strategy (as described in Chapter 3) to compensate for management of lands administered by the Bureau of Land Management.
3. Immediate implementation, on an interim basis, of the Scientific Analysis Team's recommended standards and guidelines for species closely associated with old-growth forests or components of old-growth forests and the fish species and stocks considered to be at risk. The Scientific Analysis Team recognizes that meeting the requirements of the National Environmental Policy Act must precede permanent implementation.

4. Ongoing activities involving contractual obligations for the Forest Service should be reviewed on a case-by-case basis to determine compatibility with the standards and guidelines. We do not believe blanket cancellation of timber sales under contract is warranted, rather, each sale must be individually evaluated and considered for cancellation or modification. Where Federally-listed species that are clearly associated with old-growth forests, such as the marbled murrelet, are effected we recommend that the conservation recommendations (discretionary suggestions by the Fish and Wildlife Service) offered Biological Opinions issued through Section 7 consultation be followed until the adoption of a recovery plan or conservation strategy for the species.
5. Proposed or planned activities, regardless of their point in the planning process, must be immediately modified to be consistent with the standards and guidelines.
6. The Scientific Analysis Team recommends that the Forest Service develop a policy to address appropriate habitat management response following wildfires, wind storms, insect-induced tree kills, or other significant mortality factors. This policy should build upon the standards and guidelines of the Interagency Scientific Committee's Conservation Strategy for salvage and fuels management inside Habitat Conservation Areas.
7. Establishment of a formally prescribed oversight process for consistent interpretation and application of the standards and guidelines suggested by the Scientific Analysis Team.
8. Development of an adaptive management process that will foster and guide development of new information, as well as facilitate the review and interpretation of that information as it becomes available. Research and monitoring are critical elements of adaptive management and as such must be given high priority. It is likely that data generated by research and monitoring will be the information used in the adaptive management process. The adaptive management process will indicate where and when modification of the standards and guidelines is warranted.
9. Finally, the Scientific Analysis Team emphasizes the need for full interagency cooperation that will result in unified strategies to provide for species closely associated with old growth and old-growth components. The Interagency Scientific Committee recognized the lack of interagency and intergovernmental cooperation as a potential major obstacle to efforts to produce an effective, cost efficient northern spotted owl habitat management plan. This obstacle continues to exist as the issue increases in complexity.

Monitoring and Research

The Scientific Analysis Team identified monitoring and adaptive management as critical elements of their suggested management and mitigation measures. To be effective, such monitoring and adaptive management will require interagency cooperation, development of "trigger" points to signal needs for, or opportunities to, alter management direction, consistent execution and assessment of the results of monitoring, and the continuation of research efforts to fill critical gaps in knowledge.

Though such monitoring will be costly and time consuming, we consider it essential. The Scientific Analysis Team proposes an overall strategy of management and mitigation that, in the case of species of plants and animals associated with old-growth forests, is based to a large degree on expert opinion. The risk inherent in moving ahead in overall forest management with so little

quantitative information for those plants and animals may be significant. We acknowledge that risk and consider it acceptable in the short term only if adequate research and monitoring are instituted and pursued vigorously in a coordinated, rigorous, and conscientious manner. We are cognizant that the monitoring plans in the Land and Resource Management Plans, which were designed to compensate partially for risk, have not, in general, been carried out in a manner consistent with this goal.

If the Scientific Analysis Team's recommendations for mitigation are accepted and instituted, monitoring and associated research will be essential to successful implementation. And, if, for whatever reason, no monitoring is instituted, the standards and guidelines we have suggested should be substantially enhanced to compensate for the risk of failure inherent in untested management strategies based to such a large extent on expert judgment.

The Effect of Suggested Standards and Guidelines of Altered Management by Other Land Holders

The attorneys for the Forest Service argued before Judge William Dwyer in the ongoing case of Seattle Audubon et al. vs. Moseley et al. that when a species is listed as "threatened", the requirements of the Endangered Species Act of 1973 supersede the necessity for the Forest Service to continue to be governed by the National Forest Management Act and the regulations promulgated pursuant to that Act (36 CFR 219; Planning Regulations for Implementing Section 6 of the National Forest Management Act) which deal with the management of habitat for that species. Of particular concern were the regulations requiring the Forest Service to maintain viable populations of vertebrates well distributed by planning area. The Court rejected that argument. We assumed in our assessments, therefore, that the requirements of both Acts must be simultaneously met.

The Scientific Analysis Team considered this ruling as particularly germane as we went about our assigned tasks. Because our task was to consider a series of questions dealing with the management of National Forests and development of management scenarios for consideration by decision makers, it was necessary to predicate our response on our interpretation of the requirements of the Endangered Species Act and the National Forest Management Act. This process may be considered inappropriate to some (i.e., those who believe that scientists should deal strictly with science and leave interpretation of the law and policy to others). However, it is obvious, at least to us, that one cannot deal with science as applied to management without interpretation of the boundaries prescribed by law, regulations, policy, and science.

In the process of suggesting standards and guidelines to provide mitigation measures for risk to viability of species associated with old-growth forests (including the northern spotted owl, marbled murrelet, and sensitive fish species/stocks) the Scientific Analysis Team was faced with a number of situations in which only a portion of either the range or the overall habitat requirements, or both, of the individual species under consideration were met on lands managed by the Forest Service. An example of this situation is the case of stocks of anadromous fish whose best or only remaining spawning and rearing areas, or both, occur on National Forests. These fish stocks are subject to a myriad of debilitating factors that occur elsewhere, such as degraded riverine habitats between the spawning grounds and the ocean, the occurrence of catastrophic events, and the continued introduction of hatchery fish. Obviously, none of these debilitating influences on fish stocks of interest are within the control of the Forest Service.

It is, nonetheless, required that the Forest Service maintain that part of the habitat under its control in such a condition that any fish that do return to those spawning and rearing areas have a chance to reproduce and grow. This protection of the portion of the habitat under management by the Forest Service would be required regardless of management of other lands. In this case, if the spawning and rearing areas are lost, the fish stocks that are wholly or significantly dependent on those spawning and rearing areas are, likewise, lost.

When this concept is applied to all species dependent on late-successional forests, it begs a question. Do these standards and guidelines apply regardless of what other land managers, whose lands also harbor the species in question, do on their lands? Or, in other words, would added attention to the welfare of these species by other land managers reduce the stringency of the standards and guidelines set forth herein for those species? With the exception of the mitigation measures proposed for adoption by the Forest Service for the northern spotted owl to compensate for significant risks to that species in proposed plans of the Bureau of Land Management, the answer is "no." To satisfy the requirements of the regulations issued pursuant to the National Forest Management Act, the Scientific Analysis Team felt that the standards and guidelines (or replacements that are equal or superior in effect) must stay in place, regardless activities on lands managed by others.

MANAGEMENT OPTIONS OTHER THAN THE SCIENTIFIC ANALYSIS TEAM'S SUGGESTIONS

Alternatives From the Scientific Panel's Report

The Agriculture Committee and the Merchant Marine Committee of the U.S. House of Representatives (Johnson et al. 1991) established the Scientific Panel on Late-Successional Forest Ecosystems (hereafter referred to as the Scientific Panel, also known as "The Gang of Four") which presented an array of 14 alternatives for management of late-successional and old-growth forests and intervening lands on the Federally managed lands of the Pacific Northwest within the range of the northern spotted owl. These 14 alternatives ranged from an alternative that maintained historic timber harvest levels to one in which essentially all late-successional old-growth forests would be preserved. The latter included additions necessary to produce a high probability of viability of the northern spotted owl, and protection of habitat for at-risk fish stocks.

A qualitative risk assessment was performed for each alternative that considered: (1) maintenance of a functional late-successional/old-growth forest network, (2) viable northern spotted owl populations, (3) habitat for nesting of marbled murrelets, (4) habitat for other late-successional old-growth forests associated species, and (5) spawning and rearing habitat for sensitive fish stocks.

The Scientific Analysis Team operated under instructions which evolved from the necessity to answer questions from the Federal Court on the Forest Service's Final Environmental Impact Statement and, therefore, approached the issue of protecting the late-successional forest ecosystem from a different angle than did the Scientific Panel.

The Scientific Analysis Team made the following assumptions: (1) the assessment was limited to Federal lands, specifically those managed by the Forest Service; (2) Land and Resource

Management Plans for each National Forest within the range of the northern spotted owl were considered to be in place, except as modified by adoption of the Interagency Scientific Committee's Conservation Strategy; (3) the Interagency Scientific Committee's Conservation Strategy was assumed to be the management alternative for the northern spotted owl; (4) maintenance of habitat for the marbled murrelet (listed September 28, 1992 as a "threatened" species by the Fish and Wildlife Service) was mandated; and (5) species associated with old-growth forests were to be identified and mitigation measures presented for protection.

The Scientific Panel classified late-successional/old-growth forests as those that were "most ecologically significant (LS/OG1)", "ecologically significant (LS/OG2)", and the remainder such forests "LS/OG3." The criteria used to make these classifications were habitat block size, fragmentation, location, stand attributes, stand age, productivity, elevation, and the occurrence of spotted owls, marbled murrelets, and other late-successional/old-growth associated species.

In terms of risk, the cumulative result of the Scientific Analysis Team's efforts most closely resembles Alternative 10, Option A, of the Scientific Panel's report for the range of the northern spotted owl excluding the Oregon Coast Range. Alternative 14, Option A, is similar to the cumulative situation described by the Scientific Analysis Team for Federal lands in the Coast Ranges.

In addition, the Scientific Panel's report presented three options for the management of the matrix (forested areas between reserved areas). Option A, mentioned above, implements the Land and Resource Management Plan standards and guidelines for each National Forest. It also imposes the 50-11-40 rule (Thomas et al. 1990) with the addendum for retention on cutover areas of six green trees/acre exceeding the average diameter of other trees in the stand before cutting, two large snags/acre, and two large down logs/acre (Johnson et al. 1991). The 50-11-40 rule calls for the Federal land within each quarter-township to have 50 percent or more of the forested acres in a state where stands average at least 11 inches or more in diameter at breast height with at least 40 percent or more canopy closure (Thomas et al. 1990).

The Scientific Panel did not have the detailed information on the species associated with late-successional forest conditions that was developed during the Scientific Analysis Team effort. Yet, the overall outcome in the risk ratings between the alternatives described are, at least superficially, similar. We strongly recommend, however, that if options from the Scientific Panel's report are considered for implementation, that the mitigation measures for identified endemic, localized, or very specialized species developed by the Scientific Analysis Team and described herein are incorporated with that option.

Only a limited subset (4 of 14) of the alternatives presented by the Scientific Panel, however, provided a "high" probability of success for all of the following factors of concern: a functional network of late-successional/old-growth forests, viable spotted owl populations, habitat for marbled murrelet nesting, habitat for other species associated with late-successional/old-growth forests, and habitat for sensitive fish species/stocks.

If additional options are desired for management beyond or in addition to those in this report, the Scientific Analysis Team suggests consideration of the options presented in the report of the Scientific Panel on Late-Successional Forest Ecosystems.

Alternatives for Management of Habitat for At-Risk Fish Species/Stocks

Likewise, if appropriate decision makers desire other options for management of the habitat of sensitive fish species/stocks other than those presented in this report, we suggest careful consideration of all of the assessments and management alternatives which provide a "high" level of probability as proposed by the Pacific Salmon Workgroup. This team of experts on fish habitat and watersheds presented eight alternatives for management of fish habitat on Federal lands.

The Scientific Analysis Team presents, herein, one of the two alternatives developed by the Pacific Salmon Workgroup that was rated as having a "high" probability of success in protecting spawning and rearing habitat. It seemed to us prudent, if not essential, that when dealing with the numerous sensitive fish stocks that have a significant potential to be listed as threatened or endangered under the requirements of the Endangered Species Act, that a management scheme have a high probability of protection of critical habitat for those stocks. We note that there is one other option put forward by the Pacific Salmon Workgroup that also has a high probability of success. We consider this other option as an appropriate replacement for the one detailed in this report.

If it seems appropriate to decision makers to assume the increased risk of failure to maintain habitat for sensitive fish species/stocks, management scenarios presented by the Pacific Salmon Workgroup with chances of success of "moderate" or even less might be considered for adoption. However, we strongly emphasize that if any aspect of the package we put forward is altered, the overall assessment of the cumulative effect in terms of maintaining viable populations of species closely associated with old-growth forests should be redone.

RESTRICTIONS ON MANAGERS' DECISION SPACE

Restrictions Resulting From Compliance With the Endangered Species Act and "Viability Regulations" of the National Forest Management Act

Land managers are concerned with what some refer to as accumulating constraints on management prerogatives. These constraints are perceived as causing increasing loss of decision space (i.e., the feasibility of performing alternative courses of management action) with each additional objective for management that is considered. This is particularly true of meeting the requirements of the Endangered Species Act and the regulations issued pursuant to the National Forest Management Act to maintain viable populations of vertebrate species well distributed within the planning area (individual National Forests). The new policy of the Forest Service announced in late 1992 to enter into a new era of "ecosystem management" seems, to us, to be absolutely in keeping with meeting the underlying objectives of these Acts. It will, however, not be achieved without further tightening the decision space for achievement of other multiple-use management goals, such as timber harvest, grazing, and fish and wildlife species for consumptive use.

Examination of the history leading up to the listing as threatened or endangered of the northern spotted owl (Thomas et al. 1990, Thomas and Verner 1992, and Meslow and Bruce 1992), marbled murrelet, and several species of anadromous fish lead us to the conclusion that early warnings were inadequately addressed, probably due to associated political, economic, and

social costs (Thomas and Verner 1992). With the advantage of hindsight, we see that this led, inevitably, to the listing of various species as threatened or endangered with more to come. At the point that species were officially listed, management prerogatives were severely limited due to the introduction of overriding new objectives to protect and recover listed species, and with the de facto sharing of authority for management decisions that bear on the welfare of listed species with the Fish and Wildlife Service or the National Marine Fisheries Service or both.

Potential Restrictions Resulting From Ecosystem Management

Moving to an ecosystem management approach seems most appropriate at this time (Thomas et al. 1990) because a species-by-species approach seems to be becoming increasingly burdensome (USDI 1992a and USDA 1992). However, the assessment made in this report of the status species of plants and animals that are suspected of being associated with late-successional forests is just one part of the ecosystem management approach. It has produced a tiny preview of considerations that may be included in ecosystem management.

"Ecosystem management" is considered by some as a new buzz word to follow behind "new perspectives" and as merely fluff. We disagree. The concept is sound and the evolving scientific concept and knowledge make it possible to embark on this quantum shift in management paradigm.

Having committed to ecosystem management, it is essential to move forward quickly to develop the supporting conceptual framework for a truly new way of managing land. While, in our opinion, this framework simply does not exist, it is being formulated, developed and implemented in a piecemeal fashion by scientist/manager teams at a significant number of locations around the region. Further, it will take a concentrated effort by the scientific and land management communities to develop that framework. It will not be easy - but the Forest Service is now committed to "ecosystem management". This commitment must be quickly matched with action if credibility is to be maintained.

No Free Lunch

Although there are, in theory, many management options to address the cumulative problems being produced by the listing of the northern spotted owl, the marbled murrelet, and several species of anadromous fish species/stocks (with more species very likely to be listed), they not address the need to consider ecosystem integrity in land management. All such options are concomitantly subject to scrutiny by the scientific community and the courts and will inevitably impinge on the decision space of land managers and impinge on the traditional production levels of commodities, such as timber harvest, grazing, and big game production, from the lands in question. It is unrealistic to expect otherwise. We find, as other resource analysts before us, that there is simply "no free lunch" (Johnson et al. 1991).

It might be useful for managers to consider as objectives management activities to preserve threatened or endangered species and meet the implied biodiversity retention requirements in the concept of "ecosystem management". When considered as constraints, these actions are automatically and inappropriately interpreted as reducing decision space (i.e., management prerogatives). When viewed as objectives, management of biodiversity through ecosystem management creates a very broad, challenging, uncharted decision space for managers.

References

- Anderson, D.R.; Burnham, K.P. 1992. Demographic analysis of northern spotted owl populations. Pages 319-328 in: Recovery plan for the northern spotted owl - draft. Portland, OR: U.S. Department of the Interior. 662 p.
- Johnson, K.N.; Franklin, J.F.; Thomas, J.W.; Gordon, j. 1991. Alternatives for management of late-successional forests in the Pacific Northwest - a report to the Agriculture Committee and the Merchant Marine and Fisheries Committee of the U.S. House of Representatives. 59 p.
- Meslow, E.C.; Bruce, C. 1992. An historical perspective on the evolution of the spotted owl issue into de facto policy. Multilith. 19 p. Unpublished draft prepared for the Scientific Analysis Team. On file with: Oregon Cooperative Wildlife Research Unit, Corvallis, OR.
- Overbay, J.C. 1992. Personal communication. Washington, DC: U.S. Department of Agriculture, Forest Service, National Forest System, Deputy Chief.
- Thomas, J.W.; Forsman, E.D.; Lint, J.B, [and others]. 1990. A conservation strategy for the northern spotted owl: a report of the Interagency Scientific Committee to address the conservation of the northern spotted owl. Portland, OR: U.S. Department of Agriculture, Forest Service; U.S. Department of the Interior, Bureau of Land Management, Fish and Wildlife Service, and National Park Service. 427 p.
- Thomas, J.W.; Verner, J. 1992. Accommodation with socio-economic factors under the Endangered Species Act - more than meets the eye. Proceedings of the 57th North American wildlife and natural resources conference. 627-641 p.
- USDA Forest Service. 1992. Final environmental impact statement on management for the northern spotted owl in the National Forests. Portland, OR: U.S. Department of Agriculture, Forest Service, National Forest System. 2 vol.
- USDI. 1992. Recovery plan for the northern spotted owl - draft. Portland, OR: U.S. Department of the Interior. 662 p.

Appendix 1-A

An Historical Perspective on the Evolution of the Spotted Owl Issue and Its Incorporation Into *de facto* Forest Management Policy.

Appendix 1-A

An Historical Perspective on the Evolution of the Spotted Owl Issue and Its Incorporation Into de facto Forest Management Policy

This chronology was developed from information presented by Thomas et al. (1990), Thomas and Verner (1992), and Meslow and Bruce (1992).

Introduction

Our objective is to provide an overview of the development of the spotted owl issue and the incorporation of this issue into *de facto* forest management policy for lands managed by the Forest Service to preserve biodiversity through an application of ecosystem management. What began as a northern spotted owl research effort rapidly evolved into an agency and interagency management planning effort. Along the way, the issue has drawn increasing public and political attention. Because of the Endangered Species Act, and the listing of the northern spotted owl (*Strix occidentalis caurina*) by the Fish and Wildlife Service as threatened, the owl now serves as the surrogate for other old-forest associated species and for the old-forest system of the Pacific Northwest. The owl's status under the Endangered Species Act and the processes mandated under the National Environmental Policy Act (U.S. Laws 1970) have moved spotted owl habitat management and the management of public forests in the Pacific Northwest into the courts. A more detailed description of events follows.

Early Concerns With Biodiversity – 1953

In 1953, Aldo Leopold's (1953) now widely quoted admonition concerning the value biodiversity was printed: "...to keep every cog and wheel is the first precaution of intelligent tinkering." This general concept, so eloquently expressed, was a precursor to the Endangered Species Act of 1973 (U.S. Laws 1973) and the National Forest Management Act of 1979 (U.S. Laws 1976).

Early Investigations - Late 1960's

Little was known about the northern spotted owl until the 1960's. The subspecies was considered a rare or uncommon resident of the conifer forests of southwestern British Columbia, western Washington, western Oregon, and northwestern California. In 1967-1968, Eric Forsman and Richard Reynolds, both undergraduates at Oregon State University, began to search for spotted owls in Oregon. Their efforts revealed that spotted owls could regularly be located in old forests including some sites where Joe Marshall (1942) and Ira Gabrielson and Stanley Jewett (1940) had found spotted owls many years earlier. Forsman and Reynolds brought their findings to the attention of Howard Wight, then a professor at Oregon State University. Forsman spent the next several years in the U.S Army; on his return to Oregon State University in 1972 he began a graduate program under the direction of Wight who was, by then, the Leader of the Oregon Cooperative Wildlife Research Unit and a Fish and Wildlife Service employee.

Recognition of Conflict with Timber Primacy –1972

Shortly after initiating field work, Forsman and Wight discerned that northern spotted owls were most consistently found in old-forest stands and that these were the forest stands most commonly slated for cutting. Wight, Reynolds, and Forsman brought their emerging suspicions to the attention of various responsible agencies - the Fish and Wildlife Service, Forest Service,

Bureau of Land Management, and Oregon Department of Fish and Wildlife (then the Oregon Game Commission). On September 26, 1972, John McGuire, Chief of the Forest Service, wrote Spencer Smith, Director of the Fish and Wildlife Service as follows:

"Dear Spencer,

Thank you for your memorandum of August 18 with which you sent information on the Oregon Cooperative Wildlife Research Unit's study of the spotted owl. In view of the study findings, we can certainly appreciate your concern regarding the future of this bird.

We are sending this information to our field offices in Portland, San Francisco, and Albuquerque. We are also suggesting to our Portland office that they work with your field people, the local Bureau of Land Management offices, and the state wildlife agencies to improve or develop interim guidelines for location and protection of the spotted owl's habitat until more complete information is available regarding the owl's habitat needs.

Sincerely,

John R. McGuire"

California Investigations – 1973

In 1973, Ed Schneegas, Director for Fish and Wildlife, Regional Office, Pacific Southwest Region of the Forest Service, was responsible for initiating the first survey for the spotted owl in California. Gordon Gould, later with the California Department of Fish and Game, conducted the study in 1973-74. Gould found that the owl was more abundant than previously supposed in California. His study also suggested an association between spotted owls and older forests.

Oregon Endangered Species Task Force – 1973

When, in 1973, the Fish and Wildlife Service revised the "Red Book", which was a precursor to the official list of nationally endangered species, the northern spotted owl was included. Shortly thereafter, John McKean, Director of the Oregon Game Commission, proposed that an interagency task force of qualified specialists be formed to address endangered species management in Oregon. The objective of that task force was to prevent the necessity of listing any more species as threatened or endangered in Oregon. The Oregon Endangered Species Task Force was formed in 1973.

At the suggestion of Howard Wight, the task force agreed to address the needs of species associated with old-growth forests. He further suggested that the northern spotted owl should be the first to receive attention. The task force recommended to state and Federal agencies that 300 acres of old-growth habitat be retained around each spotted owl location as interim protection until statewide guidelines could be adopted within a year. Note that the recommendation was to reserve a specific acreage of forests from timber harvest at identified owl sites. This seemed a logical approach to management of spotted owl habitat given the information available at the time. Unfortunately, this recommendation established a pattern of site-by-site reserves that was the operative management paradigm for 15 years. The recommendation was rejected by the Pacific Northwest Region of the Forest Service and by the Oregon State office of the Bureau of Land Management because they wanted a statewide population management goal established

before proceeding further. By this time (1973), spotted owls had been located at about 100 sites in Oregon.

Endangered Species Act – 1973

The Endangered Species Act became law late in 1973. The northern spotted owl was not included on the Federalist of threatened or endangered species. Thus, this Act had no immediate effect on the management of spotted owl habitat. This Act did, however, immediately serve as the yardstick for measuring species protection needs (USDI 1973). One result of the Oregon Endangered Species Task Force's work was the preparation of an Oregon State list of threatened and endangered species which was adopted by the Oregon Wildlife Commission (Marshall 1969 and ODFW 1975). Prophetically, the northern spotted owl was listed "threatened" on this administrative list which had no statutory authority at the time: Later, revisions of the Endangered Species Act would include the requirement for recovery plans which would direct attention to the preservation of the ecosystem of which the listed species is a part.

National Forest Management Act – 1976

In a compromise made to gain support of the community of scientists for passage of the National Forest Management Act, there were provisions made in the Act for a committee of scientists to prepare materials for inclusion in the regulations issued pursuant to the Act. As a result, there was a provision included that required the Forest Service to conduct management so that viable populations of native and desirable non-native vertebrates be maintained within the planning areas (i.e., National Forests). Regulations adopted pursuant to the National Forest Management Act directed the Forest Service to maintain well distributed, viable populations of all native vertebrates on National Forests. This meant that not only was the Forest Service directed to not cause any additional species to be listed as threatened or endangered - the agency was directed to not sever portions of a species range. This is an even stronger mandate than that of the Endangered Species Act to maintain individual species.

First Oregon Owl Plan Takes Shape – 1976

Howard Wight died in 1975 but research efforts in Oregon and California on the biology of the northern spotted owl continued. Forsman and Gould were joined in their research by other scientists in 1980 - most notably R.J. Gutierrez and colleagues operating out of Humboldt State University, Arcata, California. No research studies employed radio-telemetry techniques, however, until Forsman began his Ph.D. work on the H.J. Andrews Experimental Forest in 1975 (Forsman 1976). During 1976, the Oregon Endangered Species Task Force recommended a long-range goal of maintaining "...400 pairs of spotted owls on public lands in Oregon consistent with the specific habitat requirement of the species." The task force also indicated that it would, "identify the number of spotted owl habitats and their distribution needed to maintain a viable population throughout their distribution in Oregon." Considering the task force's policy was interim (that is, to be followed while the guidelines were being developed) the task force recommended that the involved agencies, "protect spotted owl sightings and nest sites consistent with the specific habitat requirements as described by Forsman, 1976, and other observers."

Early in 1977, both the Forest Service and the Bureau of Land Management agreed to protect spotted owl habitat in accordance with task force recommendations. In late 1977, the Oregon Spotted Owl Management Plan was submitted to the various agency administrators for review and comment. The plan suggested habitat management areas that included habitat capable of

supporting clusters of 3-6 pairs, with a minimum of 1,200 acres of contiguous habitat per pair. Each pair was to have a core area of at least 300 acres of old-growth forest (or oldest available forest). At least 50 percent of the remaining 900 acres were to be in forests older than 30 years. Core areas for two or more pairs of owls were to be no more than 1 mile apart (center to center). Management areas were to be a maximum of 8 to 12 miles apart for multiple pair habitat areas and less for single pairs.

Management areas were allocated to agencies based on the area of land administered. The Forest Service was expected to provide for 290 pairs and the Bureau of Land Management for 90 pairs. State and private lands, as well as those managed by the National Park Service, were expected to accommodate 20 pairs though no formal agreement was performed that involved these entities. A major oversight was made in allocating pairs to the Bureau of Land Management because these lands were spread over twice as much area as those managed by the Forest Service due to checkerboard ownership patterns of one-square-mile blocks. The result was that managed owl sites on lands administered by the Bureau of Land Management were about twice as far from one another as those on lands managed by the Forest Service. The plan also specified ranges in values for several of the criteria. It would soon become apparent as these guides were actually implemented that only the minimum value in a suggested range of values was ever operative when it came to land allocation for the conservation of the spotted owl. This initial "Oregon Spotted Owl Management Plan" was devised without the benefit of information from radio-telemetry studies to establish home range size and habitat use measures.

Both the Forest Service and the Bureau of Land Management agreed to implement the recommendations of the suggested management plan via the agencies' ongoing land management planning processes. Final decisions on the distribution, number and location of sites managed for spotted owls were to be made that included public input through the land management planning process. This was 1977, 4 years after the task force began work on the plan.

Oregon-Washington Spotted Owl Subcommittee Established – 1978

A regional interagency organization, called the Oregon-Washington Interagency Wildlife Committee, was established in 1978 to address the variety of wildlife issues common to both states. That committee commissioned a subcommittee of biologists and administrators to deal with spotted owl issues. This Spotted Owl Subcommittee replaced the function of the Oregon Endangered Species Task Force. In December of 1978, the subcommittee refined the Oregon Spotted Owl Management Plan by addressing the need to manage unprotected pairs, encouraging private landowner participation, relocating management areas, and developing a process for periodic plan review.

Efforts to Preserve Habitat for the Spotted Owl Increase – 1979

By 1978, it was evident that effective spotted owl habitat conservation would have a significant impact on the amount of timber cut in the Pacific Northwest Region. The effort expended on owl surveys increased considerably on many forests in Oregon and Washington. In 1979, a Washington Spotted Owl Working Group was initiated. In 1980, the Regional Forester for the Forest Service's Pacific Northwest Region directed National Forest Supervisors in Washington to protect habitat for all confirmed pairs of spotted owls in accordance with the criteria of the Oregon Spotted Owl Management Plan. The 1981, National Forests in Washington were further directed to provide protection to 112 pairs of owls, pending issuance of the Draft Regional Guide for the Pacific Northwest Region later that year.

Oregon Owl Plan Revised- 1981

In 1981, in response to new data derived from radio-telemetry studies by Forsman (1980, 1981), the Spotted Owl Subcommittee revised the 1977 Oregon Spotted Owl Management Plan. The recommendation was that 1,000 acres of old-growth forest be maintained for each pair within a 1.5 mile radius of the nest site. The 1,000 acre figure represented the minimum acreage of old-growth forest found within the home range of six pairs of owls (Forsman and Meslow 1985); the mean acreage of old-growth forest within the home ranges of those six pairs was 2,264 acres, but the subcommittee, again, opted to manage for the minimum. The 1.5-mile radius represented the area within which most of the foraging by nesting pairs took place. These recommendations were forwarded to the Forest Service and Bureau of Land Management in Oregon. The Pacific Northwest Region of the Forest Service agreed to adopt the new recommendations, but only to the extent that they would "maintain the option" to manage for 1,000 acres if further research proved it necessary. The Bureau of Land Management continued to protect 300 acres for each managed pair.

California Standards and Guidelines Formulated- 1981

Regional standards and guidelines for management of the spotted owl (regardless of subspecies) on National Forests in California were formulated in 1981. They were modeled after the Oregon Spotted Owl Management Plan, except that the concept of replacement habitat was added. Habitat areas were to contain 1,000 acres of the oldest available trees provided were owl habitat plus 650 to 1,650 acres of replacement habitat. The acreage of replacement habitat varied according to whether the habitat area was preserved or managed. When possible, areas selected for management were selected to accommodate three closely spaced pairs of owls. Implementation of this plan began in 1982 under the standards and guidelines identified in the land management planning process carried out under the National Environmental Policy Act.

First Status Review – 1981

The Portland Regional Office of the Fish and Wildlife Service undertook a status review of the northern spotted owl in 1981 because of concerns about the decline in acres of old-growth forest (USDI 1982). The Fish and Wildlife Service concluded that the subspecies did not meet listing requirements under the Endangered Species Act. The report stated, "...the owls' dependence on large areas of old-growth coniferous forest make them extremely vulnerable. If current trends in old-growth timber harvest continue, the Northern Spotted Owl could become endangered in a relatively short time."

Old-Growth Wildlife Research and Development Program Initiated – 1982

The Forest Service, in cooperation with the Bureau of Land Management, initiated the Old-Growth Wildlife Research and Development Program in 1982 to address the old forest/wildlife issues in western Washington and Oregon. (This program was rechartered in 1986 as the Spotted Owl Research, Development and Application Program and included both the Pacific Northwest and Pacific Southwest Research Stations of the Forest Service.) Under the auspices of this program a variety of studies of spotted owls, other old-forest species, and their habitats have been conducted in Washington, Oregon and California. These studies continue and have generated numerous reports and publications.

Bureau of Land Management/Oregon Department of Fish and Wildlife Agreement – 1982

Also in 1982, the Bureau of Land Management issued a proposed decision on their Coos Bay District Timber Management Plan. The Oregon Fish and Wildlife Commission found that the proposed plan failed to meet State wildlife policies and existing Federal laws, and would not provide adequate habitat for the northern spotted owl. The Oregon Land Conservation and Development Commission sustained this objection. As a result, the Bureau of Land Management and the Oregon Department of Fish and Wildlife were requested by the commission to negotiate a settlement. The negotiation culminated in a 5-year agreement, signed in 1983, in which the two agencies agreed that Bureau of Land Management would, "...manage habitat to maintain a population of 90 pairs of spotted owls, with appropriate distribution of pairs, as a contribution to maintaining a minimum viable population in western Oregon."

Research in Washington - 1983

In 1983, the Washington Department of Wildlife began a 3-year cooperative study with the Forest Service to monitor the effectiveness of the proposed Forest Service spotted owl management strategy. This work led to additional studies of home range size and habitat use.

Forest Service Regional Guide- 1984

The Forest Service issued the final Regional Guide (USDA 1984) for their Pacific Northwest Region in 1984. The Regional Guide called for the National Forests to analyze the effects of protecting at least 375 pairs in Oregon and Washington as they developed Land and Resource Management Plans. Managers of National Forests were to follow the 1981 proposed revision of the Oregon Interagency Spotted Owl Management Plan which had been modified to include Washington. Shortly thereafter, the Forest Service's Pacific Northwest Regional Office provided further direction for spacing requirements between reserved areas of forest needed to maintain a well distributed population, This increased to 551 the number of spotted owl habitat areas proposed for management under Land and Resource Management Plans in Oregon and Washington.

Forest Service Supplemental Environmental Impact Statement – 1984

Later in 1984, a consortium of conservation groups appealed the Forest Service's Pacific Northwest Regional (Oregon and Washington) Guide on the grounds that the standards and guidelines it contained were inadequate and that the proposed habitat management approach constituted a major Federal action requiring an Environmental Impact Statement. The Chief of the Forest Service denied the appeal. The Deputy Assistant Secretary of Agriculture reversed that decision and directed the Forest Service to prepare a supplemental Environmental Impact Statement on spotted owl standards and guidelines. Preparation of this document began in 1985.

Forest Service Standards and Guidelines in California- 1984

By 1984, several National Forests had not yet begun to implement the Forest Service's Southwest Region's (California) standards and guidelines that had been issued two years earlier because of delays in preparation of individual Forests' Land and Resource Management Plans. The California Department of Fish and Game and Forest Service Southwest Region agreed that

regional standards and guidelines should be implemented promptly before existing spotted owl habitat management opportunities were lost. As a result, a network of spotted owl habitat areas were established on National Forests in the western Sierra Nevada and northwestern California. The Society of American Foresters Speaks on Management of Old-Growth Forests - 1984
In 1984, the Society of American Foresters released an assessment of the old-growth issue and a position statement (Society of American Foresters 1984). It is significant to note that this group of professional foresters recognized that no information or techniques existed for the silvicultural manipulation or cutting of old-growth forests while concurrently producing or maintaining old-growth characteristics.

National Audubon Advisory Panel – 1985

The National Audubon Society formed a "blue-ribbon advisory panel" in 1985 to review the status of the northern spotted owl in Washington, Oregon and northern California. The panel recommended, in 1986, that a minimum of 1,500 pairs of spotted owls be maintained in the three states, including the Sierra Nevada Range of California, and that additional habitat acreage be protected for pairs of owls in the range of the northern subspecies (Dawson et al. 1986). A variation of this recommendation was included as "Alternative M" in the spotted owl Supplemental Environmental Impact Statement under development at that time by the Forest Service.

Oregon Fish and Wildlife Suggests More Spotted Owls on Lands Administered by the Bureau of Land Management – 1985

After an evaluation of spotted owl management areas, the Oregon Department of Fish and Wildlife recommended, in 1985, that the Bureau of Land Management establish a minimum of 40 additional spotted owl habitat areas. The recommendation was made because many of the 90 sites that the Bureau of Land Management was protecting were characterized by poor habitat and low occupancy; this exacerbated the problem of an already low population density of spotted owl habitat sites. The Bureau of Land Management did not act on this recommendation for 2 years, at which point they agreed to manage for an additional 20 pairs of owls (110 total) on sites that would be jointly selected by the two agencies.

Private Industry Becomes Involved in Research – 1986

Private industry became involved in research efforts on spotted owls in 1986 through the National Council for Air and Stream Improvement. Larry Irwin was selected as lead scientist and was stationed in Corvallis, Oregon. Industry research that focused on habitat use by spotted owls soon involved all three states on both public and private lands.

Bureau Of Land Management Environmental Assessment - 1986

In 1986, the Bureau of Land Management initiated a statewide environmental assessment of the spotted owl in Oregon to determine if new information required that a supplemental Environmental Impact Statement be prepared for their existing timber management plans. After public review, the Bureau of Land Management decided, in 1987, that a supplemental Environmental Impact Statement was not warranted.

Fish and Wildlife Service Petition to List the Northern Spotted Owl as "Threatened" - The Second Time- 1987

The Fish and Wildlife Service acknowledged, in early 1987, that they had received a petition from Greenworld to list the northern spotted owl as an endangered subspecies under the Endangered Species Act. A new status review was undertaken and, in December 1987, the Fish and Wildlife Service announced that listing was not warranted (USDI 1987). That decision was appealed to the Seattle Federal Court by conservation groups in 1988. The Court determined that the decision not to list was not biologically based and ordered the Fish and Wildlife Service to readdress the listing decision.

California's Planning Process – 1987

In early 1987, the California Department of Fish and Game began filing "nonconcurrences" with regulations of the California Department of Forestry on timber harvest plans that proposed cutting old-growth stands in north coastal California. Later that year, environmental groups brought suit to stop several sales where "nonconcurrences" had been filed by field staff but the California Department of Forestry approved the sale anyway. This litigation caused a review of the Department of Forestry's planning process for cutting of trees and of the Board of Forestry's rules relating to the handling of sensitive wildlife species. In 1989, the California Legislature passed AB 1580, which directed the Department of Forestry to develop a system to better track how planning decisions are made regarding the cutting of timber, and to develop a data base on timberland habitats and wildlife species so that cumulative impacts of timber cutting could be better analyzed. At the same time, the Board of Forestry directed the Department of Forestry to develop a habitat conservation plan so that planning for timber cutting and logging could continue if the northern spotted owl was listed as threatened under the Endangered Species Act at some future date. At this time, the California Department of Forestry had completed a draft habitat conservation plan.

Spotted Owl Listed By Sates – 1988

In 1988, the Washington Wildlife Commission listed the northern spotted owl as "endangered." As a result of the listing, the Washington Department of Wildlife began to develop a state recovery plan with participation by agency and private organizations. Late in the year, the Oregon Fish and Wildlife Commission, acting under the auspices of the new Oregon State Endangered Species Act, reaffirmed the unofficial listing of the spotted owl as "threatened" in Oregon. Such a listing required habitat protection on all State lands but not on private lands. Protection on private forest lands is being addressed by the Oregon Department of Forestry under recent amendments to the Oregon State Forest Practices Act.

The Latest Revision of the Endangered Species Act - 1988

The Endangered Species Act of 1973 was last revised in 1988. It should be noted that though the Act has been revised eight times (twice in 1976, 1977, 1978, 1979, 1982, 1984, and 1988), the overall effect has been to strengthen provisions for protection of species and the ecosystems on which they depend.

Spotted Owl Subcommittee - New Guidelines – 1988

In April 1988, the Spotted Owl Subcommittee proposed new management guidelines for the northern spotted owl that, for the first time, addressed the entire range of the subspecies in Washington, Oregon and northern California. The main features of the new recommendations were to maintain larger population centers, protect all remaining habitat in areas of special concern (such as the Oregon Coast Ranges), regenerate habitat in problem areas, maintain interconnecting network of habitat areas of one to three pairs per township, retain an amount of habitat per cluster pair that reflected the mean amount of old-growth habitat in home ranges as indicated by data from radio-marked pairs, and provide for replacement habitat. Needs for monitoring and coordination between agencies were also addressed. These recommendations were not acted on by any of the agencies responsible for managing the spotted owl or its habitat. The Spotted Owl Subcommittee has not been active since issuing the above guidelines which were never implemented.

The Wildlife Society Issues an Assessment on Old Growth as Wildlife Habitat – 1988

The Wildlife Society, a organization of wildlife biologists, released an assessment of old growth as a critical and specialized habitat for wildlife (Thomas et al. 1988). On the basis of that assessment, The Wildlife Society issued a position statement that identified old growth as a particularly important and decreasing habitat for wildlife. That statement recognized old-growth forests as significant ecosystems and warned that the issue was National in scope.

Interagency Agreement to Cooperate on Management of the Owl and its Habitat – 1988

A new interagency agreement was signed in August 1988 by the heads of the Bureau of Land Management, Forest Service, Fish and Wildlife Service and the National Park Service. In that agreement, the agencies agreed to work toward a common goal of ensuring population viability for the spotted owl throughout its range. The interagency agreement served as the umbrella under which the Interagency Spotted Owl Scientific Committee was formed in 1989.

Forest Service Final Supplement to the Environmental Impact Statement – 1988

In late 1988, the Chief of the Forest Service issued a Record of Decision on the Supplement to the Environmental Impact Statement for an Amendment to the Pacific Northwest Regional Guide (USDA 1988). The selected alternative directed the 13 National Forests in the Pacific Northwest Region within the range of the northern spotted owl to establish a Spotted Owl Habitat Area Network. Standards and guidelines differed by physiographic province. Amounts of old-forest habitat to be provided per pair in the network varied from 1,000 acres in southern Oregon to 3,000 acres on the Olympic Peninsula. Habitat was to be identified within 1.5 miles of the "core area" for an owl pair in Oregon and within 2.1 miles in Washington. Habitat areas for three or more pairs were to be no more than 12 miles apart; single pair areas were to be no more than six miles apart. Soon after it was issued, the Record of Decision was appealed by the Washington Department of Wildlife, and by both timber and environmental groups, for essentially opposite reasons. The Assistant Secretary of Agriculture denied both appeals.

Fish and Wildlife Service Proposes Listing (for the Third Time) – 1989

The Fish and Wildlife Service initiated another status review (USDI 1989) of the northern spotted owl in January 1989 to supplement the 1987 review. The status review was completed in

April and the spotted owl was deemed to warrant protection as a threatened species under the Endangered Species Act. As a result of this decision, a Fish and Wildlife Service listing review team was established in October 1989 to review this proposal and make a final recommendation, in light of the public comments received, on whether or not to list the spotted owl in June 1990. The proposal to list the owl had triggered the Forest Service and the Bureau of Land Management to confer with the Fish and Wildlife Service under the provisions of Section 7 of the Endangered Species Act. Interim guidelines were prepared by the Fish and Wildlife Service to assist the agencies in evaluating timber sales that would impact spotted owls.

Hatfield-Adams Amendment or Northwest Compromise- 1989

Environmental groups obtained injunctions prohibiting the sale of old-growth timber on lands administered by the Bureau of Land Management near spotted owl sites. Continuous litigation finally resulted in the "Northwest Compromise," also known as the Hatfield-Adams Amendment of 1989. This legislation applied to Oregon and Washington and was attached as a rider (Section 318) to the 1990 Interior and related agencies appropriations bill. It declared the Forest Service's Environmental Impact Statement and Bureau of Land Management's supplemental management plans for spotted owls sufficient for preparing timber sales for fiscal year 1990. The "compromise" expanded the acreage in Forest Service spotted owl habitat areas by 12-25 percent and established 12 new Agreement Areas on lands administered by the Bureau of Land Management, for a period of one year. It also instructed the Forest Service and the Bureau of Land Management to minimize fragmentation of "ecologically significant" stands of old-growth timber in Oregon and Washington. Citizen's advisory boards were established to assist the two agencies in preparing and modifying the 1990 sales. The law also called for the formation of the Interagency Scientific Committee.

Interagency Scientific Committee Established- 1989

As a result of the uncertainty surrounding the status of the northern spotted owl, the Forest Service recommended the formation of an Interagency Scientific Committee to address the issue. The recommendation was agreed to by the heads of the Bureau of Land Management, Forest Service, National Park Service, and Fish and Wildlife Service; in October 1989 the Interagency Spotted Owl Scientific Committee was established. The charge to the committee was "to develop a scientifically credible conservation strategy for the northern spotted owl." The 17 member team contained representatives from the four involved Federal agencies, the three states, timber industry, environmental organizations, and academia. The committee report was called "A Conservation Strategy for the Northern Spotted Owl," (frequently referred to as the "Thomas Report" after the Committee Chairman, Jack Ward Thomas) and was completed and released in April 1990. The Conservation Strategy is one directed specifically at the conservation of the northern spotted owl; it does not purport to address other species or the old-forest ecosystem.

The Conservation Strategy addressed only Federal lands through a system of Habitat Conservation Areas most of adequate size to accommodate 20 pairs or more of owls, and distributed at 12-mile or less spacing throughout the range of the northern spotted owl. No further timber harvest was to occur in the Habitat Conservation Areas and existing cutover areas therein were to be allowed to grow back into superior owl habitat. The forested areas between the Habitat Conservation Areas (called the matrix) were to be managed to facilitate dispersal of owls between Habitat Conservation Areas. Implementation of the 50-11-40 rule establishes the appropriate forest condition: at least 50 percent of each quarter-township (3 miles by 3 miles), was to be maintained in trees averaging at least 11 inches in diameter at breast height and at

least 40 percent canopy closure. The 50-11-40 conditions can be routinely met under the usual economic forest rotations of 70 to 100 years in the Pacific Northwest. The committee's report fine tuned this basic approach for problem areas. Importantly, the Conservation Strategy called for a program of adaptive management in the forest matrix directed at developing silvicultural schemes which might facilitate habitat conditions that would allow persistence of the spotted owl in the managed forest landscape. When this could be demonstrated, the Habitat Conservation Areas could be dissolved.

The report of the Interagency Scientific Committee has received wide distribution, close and repeated scrutiny, and wide acclaim in the scientific community. The Conservation Strategy calls for the reservation of 5.8 million acres of Federal land previously not reserved from timber cutting. As a result, cutting of timber on Federal lands within the range of the northern spotted owl would be about half the level of the 1980's. This strategy is a key building block in the development of "ecosystem management" strategies in the Pacific Northwest.

Fish and Wildlife Service Lists Owl as Threatened - 1990

In June 1990, after completion of the fourth status review of the northern spotted owl (Anderson et al. 1990), the Fish and Wildlife Service listed the owl as threatened throughout-its range.

The Balance Alternative – 1990

Understandably concerned by the economic impact of the Interagency Scientific Committee's report, the Bush administration appointed a task force headed by Assistant Secretary of Agriculture James Moseley to examine the Committee's report and find lower cost alternatives. After numerous delays, the task force provided no report but, instead, issued a press release on September 21, 1990, to the effect that the Forest Service would operate in a "manner not inconsistent with" the Interagency Scientific Committee's Conservation Strategy. The Bureau of Land Management would proceed with timber sales under the "Jamison" strategy. The "Jamison Strategy" was never peer reviewed nor presented in any form other than a press release. These decisions were not accompanied by Environmental Impact Statements, nor were they formally stated or adopted in a Record of Decision in the Federal Register.

Forest Service Required to Prepare EIS – 1991

In the fall of 1991, the Forest Service was challenged in Federal District Court by the Seattle Audubon Society for failure to formally adopt a credible conservation strategy that would comply, simultaneously, with the requirements of the Endangered Species Act, National Forest Management Act and National Environmental Policy Act. During the ensuing trial, the socio-economic impacts of constraining timber sales in spotted owl habitat on National Forests were presented. The attorneys for the Forest Service were joined by intervenors representing the timber industry in arguing that the Interagency Scientific Committee's Conservation Strategy was both sound and adequate. The attorneys for Seattle Audubon argued the reverse. These same parties, and some of the same attorneys, would reverse roles and positions in hearings a few months later during the proceedings of the Endangered Species Committee (also known as the "God Squad"). On May 23, 1991, Judge Dwyer ruled against the Forest Service, issued an injunction against further timber sales in spotted owl habitat on National Forests, pending Forest Service adoption of a spotted owl habitat management plan following the process described in the National Environmental Policy Act. Judge Dwyer further made it clear that the Forest Service was to comply, simultaneously, with both the National Forest Management Act and the

Endangered Species Act. He gave the agency 10 months to accomplish the task. Timber sales in spotted owl habitat on National Forests within the owl's range were at a standstill pending the successful completion of the Environmental Impact Statement on Management of the Northern Spotted Owl in the National Forests.

Critical Habitat Delineated – 1991

The Endangered Species Act requires the Fish and Wildlife Service, upon listing a species, to designate critical habitat for that species. Critical habitat includes areas within which any proposed action which may adversely affect a listed species requires consultation with the Fish and Wildlife Service. The Fish and Wildlife Service initially declined to designate critical habitat for the northern spotted owl because of the very real difficulty of identifying various components of owl habitat and their importance to the owl. This decision was challenged in Federal District Court in early February 1991 and Judge Zilly ordered the Fish and Wildlife Service to complete mapping of critical habitat by the end of April 1991. The Fish and Wildlife Service initially proposed 11.6 million acres of critical habitat. After a public comment period, this total was reduced to 8.2 million acres (USDI 1991). After further public comment, the Fish and Wildlife Service's final determination of critical habitat designated 6.9 million acres arranged to minimize impacts on private lands (USDI 1992b).

The Report of the Scientific Panel on Late-Successional Forest Ecosystems - 1991

In late May of 1991, the Agriculture Committee and the Merchant Marine and Fisheries Committee of the U.S. House of Representatives commissioned four scientists (K. Norman Johnson of Oregon State University, John Gordon of Yale University, Jerry Franklin of the University of Washington, and Jack Ward Thomas of the Forest Service) to carry out a series of tasks that would result in an array of alternatives for the management of late-successional forests on Federal lands within the range of the northern spotted owl. This group was called the Scientific Panel on Late-Successional Forest Ecosystems (hereafter referred to as the Scientific Panel, also known as "The Gang of Four"). This team was specifically directed to consider the welfare of all species of vertebrates associated with late-successional forests, at-risk fish stocks, and the integrity of the ecosystems on which they depend. This enlarged the scope of the question surrounding management of late-successional forests beyond that concerned with spotted owls. On October 8, 1991, the Scientific Panel delivered their report to Congress, outlining 14 basic alternatives and 34 scenarios for management along with risk assessments for the northern spotted owl, marbled murrelet, at-risk fish stocks, ecosystem integrity, and other vertebrate species associated with late-successional forests. The potential timber harvest yield and job numbers associated with each alternative were shown.

The Recovery Plan for the Northern Spotted Owl -1991

The Endangered Species Act requires that a recovery plan be prepared for any listed species. The preparation of the Recovery Plan for the Northern Spotted Owl was directed by the office of the Secretary of the Interior, Manual Lujan Jr. This included selection of recovery team members in February 1991. The composition of the team was not traditional. Further, this was the first time that the task of selecting a recovery team had not been accomplished by the Fish and Wildlife Service. In this single case, the team was selected by the Secretary's office. The 16 member team included Donald Knowles, Associate Deputy Secretary of Interior (Team Coordinator), an economist and water specialist; John Beuter, Deputy Assistant Secretary of Agriculture, and economist; representatives of the three state governors - two attorneys and an

economist; the chief of the Division of Forestry for Bureau of Land Management - a forester; an engineer and political scientist from the Office of Policy Analysis, Department of the Interior; the Supervisory Forester for the Bureau of Indian Affairs; the Forest Service Program Manager for the Spotted Owl Research, Development and Application Program - a forester; a Professor of Forestry at Oregon State University - a silviculturist; and six biologists (the biologists were a distinct minority).

The Northern Spotted Owl Recovery Team met regularly beginning in early 1991 and delivered a Draft Recovery Plan (USDI 1992a) to Secretary Lujan in mid-December 1991. Release of the Draft Recovery Plan was delayed until May 14, 1992, partly in response to President Bush's order for a 90-day moratorium on all proposed government regulations anticipated to have negative economic impact (State of the Union Address, January 28, 1992). The Draft Recovery Plan (USDI 1992a) closely resembles the Interagency Scientific Committee's Conservation Strategy (Thomas et al. 1990).

However there were some differences between the Recovery Plan and the Conservation Strategy: the boundaries of Habitat Conservation Areas were adjusted to better match existing habitat conditions; and new Habitat Conservation Areas were added along the Oregon coast. In addition, the Recovery Plan opened the door for limited commercial and precommercial thinning and salvage in the Habitat Conservation Areas. The Draft Recovery Plan was available for public comment until July 13, 1992. The Recovery Plan itself was not binding on any agency or entity; rather it sets the standard against which actions affecting recovery of the listed species will be judged. Secretary of the Interior Manual Lujan left office on January 20, 1992, without signing the Recovery Plan. As of February 19, 1993, the Recovery Plan was ready for printing and had not been signed.

Convening of the God Squad - 1991

In June 1991, after consultation with the Fish and Wildlife Service, the Bureau of Land Management received "jeopardy opinions" on 44 of their 175 timber sales prepared for 1991. The Fish and Wildlife Service ruled that cutting of these sales would jeopardize the long-term survival of the spotted owl, mostly due to the loss of habitat considered crucial for dispersal. The Bureau of Land Management requested an exemption from Section 7 of the Endangered Species Act which would, if granted, allow them to cut the 44 sales. On October 1, 1991, Secretary Lujan determined that the Bureau of Land Management's application met threshold criteria and subsequently convened the Endangered Species Committee, the so-called "God Squad." This committee is comprised of six Cabinet level appointees and one nominee from the involved state (Oregon in this case).

A month-long evidentiary hearing was held in Portland in January 1992, at which testimony from 97 witnesses was heard. In this adversarial proceeding, the Bureau of Land Management and intervenors from the timber industry and affected Oregon counties put the science of the Interagency Scientific Committee's Conservation Strategy on trial. The intervenors had now reversed the position that they had taken in the Seattle Audubon Society vs. Evans case and sought, as one attorney was quoted, "...to defrock the high priests of the cult of biology." A public hearing followed in February 1992. A record of the hearings was prepared, summarized, and on May 14, 1992, the Endangered Species Committee met and by a vote of 5 to 2 exempted 13 of the 44 sales from the provisions of the Endangered Species Act. However, as a mitigation measure for exempting the 13, sales the Endangered Species Committee directed the Bureau of

Land Management to implement the Recovery Plan as expeditiously as possible. Further, the Bureau of Land Management was directed to use the Recovery Plan as the basis for its 10-year plan, in preparation as of February 1993, and to use the best available scientific and commercial data in preparing that plan.

A workshop (now referred to as the Fort Collins workshop) of scientists conducting research into the demographics of the northern spotted owl concluded that populations on five study areas, and in total, were declining at a rate of some 7.5 percent per year and that this rate was increasing over time.

Secretary Lujan's Owl Preservation Plan – 1992

Concurrent with the release of the Recovery Plan, the Secretary of the Interior released an Administration sponsored "Owl Preservation Plan" drafted by five assistant and deputy assistant secretaries of agriculture and interior. Their effort, dubbed by some as the "Extinction Plan", mimicked the Draft Recovery Plan but severed about 50 percent of the range of the northern spotted owl. Scientists, assembled to evaluate the risk associated with this plan, indicated there was a 50/50 chance that a sequence of events would lead to the extinction of the northern spotted owl. Secretary Lujan recognized that the institution of this plan would require changes in both the Endangered Species Act and the National Forest Management Act. Congress chose not to act or hold hearings (as of February 19, 1993) on this suggestion.

Bureau of Land Management Timber Sales Enjoined – 1992

On February 19, 1992, Federal District Court Judge Helen Frye temporarily enjoined timber sales on lands administered by the Bureau of Land Management until the agency determined how logging would affect the spotted owl. It is unclear whether the Bureau of Land Management's 10-year management plans, due in mid-1993, will suffice for the required Supplemental Environmental Impact Statement. On June 8, 1992, Judge Frye extended the injunction. The Bureau of Land Management is not selling timber in spotted owl habitat as of February 19, 1993.

Forest Service Spotted Owl Environmental Impact Statement Submitted and Rejected – 1992

The Forest Service completed the Final Environmental Impact Statement on Management for the Northern Spotted Owl in the National Forests required by Judge Dwyer in January 1992, and on March 3, 1992, Assistant Secretary of Agriculture James Mosely issued a Record of Decision adopting the Forest Service's preferred alternative - the equivalent of the Interagency Scientific Committee's Conservation Strategy. On March 25, 1992, the Seattle Audubon Society challenged the legality of the Environmental Impact Statement and Record of Decision alleging that (1) the impact statement failed to consider new information pertinent to assessing the environmental consequences to the owl of continued logging of its habitat (in violation of the National Environmental Policy Act) and (2) did not prescribe measures to protect critical habitat, address the viability of other old-growth dependent species (all held to be in violation of the National Forest Management Act). Following a hearing on May 22, 1992, Judge Dwyer ruled May 28, that the Forest Service had not fully complied with the National Environmental Policy Act. On May 29, 1992, Judge Dwyer enjoined Forest Service timber sales in spotted owl habitat.

Scientific Analysis Team Formed – 1992

On July 30, 1992, the Chief of the Forest Service named a team of Forest Service scientists and technical specialists under the leadership of Jack Ward Thomas to provide assessments necessary to answer Judge William Dwyer's questions in the Seattle Audubon case. The team was further assigned to evaluate all the species that may be associated with late-successional forests and to suggest mitigation measures to assure high viability for those species. At-risk fish were included.

Fish and Wildlife Service Required to Prepare Environmental Impact Statement on Designation of Critical Habitat – 1992

In December of 1992, a Federal District Court upheld the claim of the Government of Douglas County, Oregon, that the Fish and Wildlife Service is required to prepare an Environmental Impact Statement on designation of critical habitat under the Endangered Species Act.

Congressional Action Attempted – 1992

In June 1992, with timber sales enjoined on lands managed by both the Forest Service and the Bureau of Land Management, there was effort by Congress to resolve the owl habitat management issue. Both House Agriculture and Interior Committees considered legislation. Both Committees based their possible solutions on options offered to those Committees by the Scientific Panel in 1991. The options that received the most attention offer protection to the spotted owl comparable to the Recovery Plan but fall short of comparable protection for the other resources. No legislation was offered by the Committees to the full House.

Bureau of Land Management Releases Draft Resource Management Plans- 1992

In August 1992, the Bureau of Land Management released their Draft Resource Management Plans for the lands they manage in Western Oregon. The preferred alternative in those plans put forward an "ecosystem management strategy" that was not in keeping with the Draft Recovery Plan (USDI 1992a).

The Forest Conference - 1993

As of the printing of this document, a Forest Conference is scheduled for April 1993.

The Move Toward "Ecosystem Management" – 1993

In 1992, the Forest Service established a policy of "ecosystem management." Secretary of the Interior, Bruce Babbitt, made a public statement in that regard on February 16, 1993. What "ecosystem management" means is unclear in both concept and detail as of February 19, 1993.

As of this Writing- March 1993

After more than 20 years, there is still no resolution to the debate surrounding the conservation of the spotted owl and old-growth ecosystems of the Pacific Northwest.

References

- Anderson, D.R.; Bart, J.; Edwards, T.C., Jr., [and others]. 1990. Status review - northern spotted owl, *Strix occidentalis caurina*. Portland, OR: U.S. Department of the Interior, Fish and Wildlife Service. 99 p.
- Dawson, W.R.; Ligon, J.D.; Murphy, J.R., [and others]. 1986. Report of the advisory panel on the spotted owl. Audubon Conservation Report. 7: 6.
- Forsman, E.D. 1976. A preliminary investigation of the spotted owl in Oregon. Corvallis, OR: Oregon State University. 127 p. M.S. thesis.
- Forsman, E.D. 1980. Habitat utilization by spotted owls in the west-central Cascades of Oregon. Corvallis, OR: Oregon State University. 95p. Ph.D. dissertation.
- Forsman, E.D. 1981. Habitat utilization by spotted owls on the Eugene District of the Bureau of Land Management. Eugene, OR: U.S. Department of the Interior, Bureau of Land Management. 63 p. Unpublished draft.
- Forsman, E.D.; Meslow, E.C. 1985. Old growth forest retention for spotted owls, how much do they need? Pages 58-59 in: Gutierrez, R.J.; Carey, A.B., eds. Ecology and management of the spotted owl in the Pacific Northwest. Gen. Tech. Rep. PNW-185. U.S. Department of Agriculture, Forest Service. 119 p.
- Gabrielson, I.N.; Jewett, S.G. 1940. Birds of Oregon. Corvallis, OR: Oregon State College. 650 p.
- Gould, G.I. 1974. The status of the spotted owl in California. Report 74-6. Sacramento, CA: California Department of Fish and Game. 56 p.
- Leopold, A. 1953. Round river - from the journals of Aldo Leopold. Leopold, L.B., ed. New York, NY: Oxford University Press. 147 p.
- Marshall, D.B. 1969. Endangered plants and animals of Oregon. Vol. III, Birds. Special Report 278. Corvallis, OR: Oregon State University, Agricultural Experiment Station. 23 p.
- Marshall, J.T., Jr. 1942. Food and habitat of the spotted owl. Condor. 44: 66-67.
- Meslow, E.C.; Bruce, C. 1992. An historical perspective on the evolution of the spotted owl issue into de facto policy. Multilith. 19 p. Unpublished draft prepared for the Scientific Analysis Team. On file with: Oregon Cooperative Wildlife Research Unit, Corvallis, OR.
- Oregon Department of Fish and Wildlife. 1975. Threatened and endangered wildlife in Oregon. 1 p. Unpublished.
- Society of American Foresters. 1984. Report of the SAF Task Force on scheduling the harvest of old-growth timber. Pages 3-35 in: Scheduling the harvest of old-growth. SAF Policy Series. Washington, DC: Society of American Foresters.

Thomas, J.W.; Ruggiero, L.F.; Mannon, R.W., [and others]. 1988. Management and conservation of old-growth forests in the United States. *Wildlife Society Bulletin*. 16: 252-262.

Thomas, J.W.; Forsman, E.D.; Lint, J.B., [and others]. 1990. A conservation strategy for the northern spotted owl: a report of the Interagency Scientific Committee to address the conservation of the northern spotted owl. Portland, OR: U.S. Department of Agriculture, Forest Service; U.S. Department of the Interior, Bureau of Land Management, Fish and Wildlife Service, and National Park Service. 427 p.

Thomas, J.W.; Verner, J. 1992. Accommodation with socio-economic factors under the Endangered Species Act - more than meets the eye. *Proceedings of the 57th North American wildlife and natural resources conference*. 627-641 p.

USDA Forest Service. 1984. *Regional Guide for the Pacific Northwest Region*. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region.

USDA Forest Service. 1988. Final supplement to the environmental impact statement for an amendment to the Pacific Northwest Regional Guide. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region. Vol. 1 - spotted owl guidelines. 296 p. Volume 2 - spotted owl guidelines, appendices. 321 p.

USDA Forest Service. 1992. Final environmental impact statement on management for the northern spotted owl in the National Forests. Portland, OR: U.S. Department of Agriculture, Forest Service, National Forest System. 2 vol.

USDI. 1973. Bureau of Sports Fisheries and Wildlife. *Threatened wildlife of the United States*. Resource Publication 114. Washington, DC: Bureau of Sports Fisheries and Wildlife. 289 p.

USDI. 1982. *The northern spotted owl: a status review*. Portland, OR: U.S. Department of the Interior, Fish and Wildlife Service, Endangered Species Program. 29 p.

USDI. 1992a. *Recovery plan for the northern spotted owl - draft*. Washington, DC: U.S. Department of the Interior. 662 p.

USDI Fish and Wildlife Service. 1987. *The northern spotted owl status review*. Portland, OR: U.S. Department of the Interior, Fish and Wildlife Service. 50 p.

USDI Fish and Wildlife Service. 1989. *The northern spotted owl - a status review supplement*. Portland, OR: U.S. Department of the interior, Fish and Wildlife Service. 10 p.

USDI Fish and Wildlife Service. 1991. *Endangered and threatened wildlife and plants; revised proposed determination of critical habitat for the northern spotted owl; proposed rule*. 50 CFR Part 17. Washington, DC: Federal Register. 56(156): 40001-40143.

USDI Fish and Wildlife Service. 1992b. *Endangered and threatened wildlife and plants; determination of critical habitat for the northern spotted owl; final rule*. 50 CFR Part 17. Washington, DC: Federal Register. 57(1): 1795-1838.

U.S. Laws, Statutes, etc.; Public Law 91-190. [S.1075], National Environmental Policy Act of 1969. Act of January I, 1970. In its: United States statutes at large, 1969. 42 U.S.C. sec. 4321, et seq. (1970). Washington, DC: U.S. Government Printing Office: 852-856. Vol. 83.

U.S. Laws, Statutes, etc.; Public Law 93-205. [S.1983], Endangered Species Act of 1973. Act of December 28, 1973. In its: United States statutes at large, 1973. 16 U.S.C. sec. 668, et seq. (1976). Washington, DC: U.S. Government Printing Office: 884. Vol. 87.

U.S. Laws, Statutes, etc.; Public Law 94-588. [S.3091], National Forest Management Act of 1976. Act of Oct. 22, 1976. United States Code Congressional and Administrative News. 94th Congress, 2nd Session. Washington, DC.