

Chapter 6

Requirements for Successful Implementation

The Scientific Analysis Team Report

CHAPTER 6

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INTRODUCTION

Our analyses focused on three aspects of 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, see Chapter 1) that were considered deficient by the United States District Court. In addressing these deficiencies we developed recommendations for needed mitigation measures as instructed by the Court and by the Chief of the Forest Service. Mitigation refers primarily to avoidance of adverse effects resulting from adoption of standards and guidelines recommended to provide mitigation measures for other species associated with late-successional or old-growth forests that were judged to be at risk under current Land and Resource Management Plans, plus the preferred alternative in the Final Environmental Impact Statement (the Interagency Scientific Committee's Conservation Strategy). However, mitigation also refers to measures or actions taken that would lessen adverse effects of management activities. Such activities would include recommended additions to the network of Habitat Conservation Areas in the Final Environmental Impact Statement preferred alternative to compensate for increased risk associated with Bureau of Land Management implementing their preferred alternative of their Draft Resource Management Plans.

SUMMARY OF MITIGATION STRATEGY

The Scientific Analysis Team's overall mitigation strategy follows a step-wise approach as described in Chapter 5. We developed and recommended mitigation actions (standards and guidelines) at each step in that process and each step built upon the preceding step(s). must be understood that, although recommendations for each phase or step were developed individually, all recommendations must be viewed collectively and implemented as a complete package. Each step incrementally adds levels of habitat protection for distinct sets of species that are closely associated with old-growth forest (see Chapter 5 and its supporting appendices for full details). If some mitigation steps are not implemented, and alternate mitigation measures of equal effect are not implemented, all the species benefited by that mitigation measure will be compromised, as well as all other species benefited by the subsequent mitigation steps.

Key components of each step of our proposed strategy can be summarized as follows:

Step 1. Existing National Forest Land and Resource Management Plans-See Individual Forest Plans for specifics

- Land allocations that protect old-growth associated species including those in congressionally designated Wilderness
- Standards and guidelines that protect species closely associated with old-growth forest a Protects habitat for 160 species or ranges

Step 2a. Interagency Scientific Committee's Strategy for Conservation of the Northern Spotted Owl (Thomas et al. 1990), or a similar plan that provides high viability for the northern spotted owl on all Federalands

- Standards and guidelines from Step 1
- Addition of Habitat Conservation Areas
- Addition of 50-11-40 rule
- Standards and guidelines for conducting activities in Habitat Conservation Areas

- OR -

Step 2b. Interagency Scientific Committee's Conservation Strategy or an alternative that provides for a high probability of viable owl populations through additions to Habitat Conservation Areas to compensate for lower level of protection on lands administered by the Bureau of Land Management - see Chapter 3 for specifics

- Standards and guidelines from Steps 1 and 2a
- Addition of about 418,000 acres to the network of Habitat Conservation Areas on National Forests if Bureau of Land Management adopts the preferred alternatives of their Draft Resource Management Plans
- If Bureau of Land Management follows the Interagency Scientific Committee Strategy or adopts an alternative equal or superior to the Interagency Scientific Committee Strategy-no mitigation measure will be required and this step will not be adopted
- Protects habitat for 120 species or ranges (2a or 2b)

Step 3. Habitat Management for At-Risk Fish Species and Stocks - see Chapter 5, Appendix 5-K for specifics

- Standards and guidelines from Steps 1 and 2a or 2b
- Network of key watersheds containing at-risk fish species and stocks, good habitat, and/or high restoration potential
- Riparian Habitat Conservation Areas
 - a) Establishment of interim buffer widths for Riparian Habitat Conservation Areas
 - b) Standards and guidelines for operating within Riparian Habitat Conservation Areas
- Establishment of Watershed Analysis procedures to establish final boundaries and for conducting activities in key watersheds and Riparian Habitat Conservation Areas, and to establish restoration priorities
- Watershed Restoration of degraded habitat and for long-term habitat protection
- Protects habitat for 131 species or ranges

Step 4. Marbled Murrelet Standards-see Chapter 5 for specifics

- Standards and guidelines from Steps 1-3
- Interim standards and guidelines to conserve marbled murrelet habitat-applicable until adoption of a marbled murrelet recovery plan
 - a) Protection of all suitable habitat within 35-50 miles of marine environments
 - b) Protection of certain younger forest stands for habitat recruitment
 - c) Designation and protection of buffers around occupied habitat where recruitment stands are unavailable

- Final standards and guidelines after adoption of recovery plan-evaluate whether final plans still meet viability requirements of other species protected within murrelet conservation areas
- Protects habitat for 24 species or ranges

Step 5. Protection of Rare and Locally Endemic Species-see Chapter 5 for specifics

- Standards and guidelines from Steps 1-4
- Identify and designate protection of known localities
- Addition of standards and guidelines to reduce habitat loss or conflicts
- Design and implement standardized survey protocol
- Conduct appropriate surveys to document species presence within proposed project areas. Surveys are required for 17 species: *Ptilidium californicum* (liverwort); *Ulota megalospora*, *brothereUa roellii*, *Bauxbaumi piperi*, *B. viridus*, *Rhizumnium nudum*, *Schistostega pennata*, and *Tetraphis geniculata* (mosses); *Aleuria rehnana*, *Otidea leporina*, *O. onotica*, *O. smithii*, *Polyozellus multiplex*, and *Sarcosoma mexicana* (mushrooms); larch mountain salamander, siskiyou mountain salamander, and shasta salamander (amphibians).
- Protects habitat for 17 species or ranges

Step 6. Additional Mitigation Measures for Other Species in Upland Forest Matrix-see Chapter 5, for specifics

- Standards and guidelines from Steps 1-5
- Additional standards and guidelines to maintain critical components of habitat for particular species not provided for by Steps 1-5
- Design and implement standardized survey protocol for Del Norte salamander, lynx, and great gray owl
- Develop a standardized definition of hazard trees
- Protects habitat for 7 species or ranges

Provided that all the recommended mitigation steps and associated standards and guidelines are fully implemented, the Scientific Analysis Team believes this package will provide a high likelihood of the existence of well distributed populations of some 459 species closely associated with old-growth forests on the NationM Forests and located within the range of the northern spotted owl.

The Scientific Analysis Team identified 208 species for which we could not design specific mitigation options. We, therefore, tabulated a set of general ecological attributes of each of these species, including relative abundance, size of distributional range, endemism, association with old-growth components, specialization on specific substrates, elevation range, and overall distribution within the range of the northern spotted owl. We then evaluated whether any of the poorly known species would likely be protected by the Mitigation Steps above, considering this set of ecological conditions and the likelihood that mitigation measures will provide those conditions for the species in question. Through this process, we identified another 23 species that would likely be protected by mitigation measures designed for the better known species.

For the remaining old-growth associated species (185 species including 149 species of invertebrates, 19 nonvascular plants and fungi, 8 vascular plants, and 9 mammals), major uncertainties remain due to lack of scientific information about the distribution and habitat requirements of those species (see Chapter 5, Appendix 5-J). These uncertainties preclude

definition of specific mitigation measures to assure viability of these poorly known species. The reservation of old-growth forests in National Parks, congressionally designated Wilderness, land use plans, and our additional mitigation measures (including implementing the Interagency Scientific Committee Strategy) should contribute to assuring viability of these species, but the state of knowledge is such that viability simply cannot be assessed. We strongly recommend processes be put in place to obtain and evaluate information necessary to evaluate viability of these species. However, we recognize that additional species can always be identified about which we know too little to evaluate their viability status. Many inconspicuous life forms have never been studied and many will likely not be studied in the foreseeable future.

FULL IMPLEMENTATION

Retention of Current Standards and Guidelines (Step 1)

Retention of current standards and guidelines for Management Indicator Species and Management Requirement Species (as described in approved National Forest Land and Resource Management Plans) is required outside the areas where the standards and guidelines prepared herein are applicable, that is, within the range of the northern spotted owl. Land allocations or standards and guidelines that reduce timber harvest, preclude scheduled timber harvest, or call for no timber harvest in the National Forest Land and Resource Management Plans, and thereby ensure habitat for species associated with old-growth forests, shall not be reduced or weakened. The first step in the Scientific Analysis Team's assessments of viability was to examine Forest Plans to evaluate how well they provided for species closely associated with old-growth forest. Other steps necessary to provide for species viability and ensure against extirpation were added. Alterations detracting from the value or amounts of these areas will increase risks to viability to some unknown degree for such species. Proposals for changes in the Land and Resource Management Plans that result in elimination or degradation of such habitat must be reviewed through an adaptive management process recommended and described below.

Implementation of the Interagency Scientific Committee's Conservation Strategy (Step 2a or 2b)

The Scientific Analysis Team's proposal depends upon implementation of the Interagency Scientific Committee Strategy or another strategy that provides for a high likelihood of viability for the northern spotted owl. This may include implementation of modifications necessary to compensate for adoption by the Bureau of Land Management of their preferred alternative of the Draft Resource Management Plans. If the Bureau of Land Management adopts a management strategy that provides for spotted owl viability at levels equal or superior to that afforded the spotted owl under the Interagency Scientific Committee's Strategy, no modification to the Interagency Scientific Committee's standards and guidelines on lands managed by the Forest Service are necessary.

Implementation of the Scientific Analysis Team's Recommended Standards and Guidelines (Steps 3-6)

Scientific Analysis Team recommended a set of standards and guidelines for other species that are closely associated with old-growth forests. The Scientific Analysis Team recognized that modifications to National Forest Land and Resource Management Plans cannot be instantly accomplished while complying with the requirements of the National Environmental Policy

Act and the National Forest Management Act. The Scientific Analysis Team believes that the suggested mitigation measures can best serve to enhance species viability only if they are implemented as soon as possible while complying in good faith with applicable laws and regulations.

Ongoing Activities

We recognized there are numerous ongoing activities on National Forests, some of which involve contracts, special-use permits, rights-of-way, leases, or other binding agreements. Some of the standards and guidelines, such as those for the Riparian Habitat Conservation Areas and marbled murrelets (Chapter 5), have specific language addressing some of these ongoing activities. For the most part, though, we have not offered such specific recommendations, and therefore offer the following:

1. Ongoing activities that do not involve contractual or otherwise binding agreements should be modified to be consistent with the standards and guidelines immediately upon implementation.
2. Ongoing activities that involve contractual or other binding agreements and where the Forest Service retains discretionary authority for alterations must be assessed to determine compatibility with the standards and guidelines. Where they conflict, consideration must be given to cancellation or modification.
3. Timber sales are recognized as a high-impact activity upon old-growth forests and associated species. Current, prolonged injunctions against entering into new timber sale contracts have reduced the number of sold and awarded sales located in late-successional old-growth habitats within the range of the northern spotted owl. We do not believe blanket cancellation of timber sales under contract is warranted. Each such activity should be individually evaluated. There are likely individual situations where cancellation and alteration may be appropriate~specially timber sales, that may affect Federally listed species such as the marbled murrelet. We note that there are several reviews by the Forest Service and the Fish and Wildlife Service of ongoing activities being conducted as part of the consultation process required by Section 7 of the Endangered Species Act. Such consultation should, if appropriately conducted, provide a rigorous examination of these ongoing activities by Fish and Wildlife Service personnel with suggested alterations where deemed appropriate.

Endangered Species Act regulations which require Federal agencies to avoid irretrievable or irreversible commitments of resources until consultation is concluded are an integral part of this assessment. Adherence to this provision in the regulations should allow adequate time for completion of the site-specific analyses necessary to determine whether such projects are in compliance with those regulations, and should proceed.

As discussed in Chapter 2, consultation as required by Section 7 will not result in "*de facto*" recovery plans or conservation strategies that have high probabilities of ensuring the viability of a threatened or endangered (i.e., "listed") species. To establish a standard higher than that only avoiding jeopardy, the Scientific Analysis Team recommends, for Federally listed species for which a recovery plan or conservation strategy has not been implemented, that (1) not only the "Reasonable and Prudent Measures" or "Reasonable and Prudent Alternatives" presented

in Biological Opinions by the Fish and Wildlife Service be followed as required by law, but that (2) the "Conservation Recommendations" made in such Biological Opinions by Fish and Wildlife Service be followed until the implementation of a recovery plan or conservation strategy for the species indicates they are not needed. Adoption of such conservation recommendations will likely result in interim protection levels adequate to ensure that ongoing agency activities will not seriously erode options essential to the development of credible recovery plans or conservation strategies.

Proposed or Planned Activities

Activities or projects that are in the proposal stage must be examined to see if modifications are necessary to comply with suggested mitigation measures. If so, these activities or projects must be modified to meet the mitigation standards regardless of the stage of the planning. Several species require surveys to designate and protect occupied sites. Survey protocols must be developed and implemented prior to project implementation.

Natural disturbances play a vital role in creating and maintaining structural and ecological characteristics of late-successional forests. Disturbances such as insect outbreaks, fire, windthrow, and disease will inevitably occur within designated areas managed primarily for spotted owl habitat and habitat for other species. The Scientific Analysis Team recommends development of a post-disturbance policy by the Forest Service that would set standards and guidelines for proposed activities within all conservation areas. Such standards and guidelines should build upon those standards that the Interagency Scientific Committee put in place for salvage and fuels management within Habitat Conservation Areas for spotted owls and for key watersheds and Riparian Habitat Conservation Areas (see Chapter 5, Appendix 5-K). Some guidelines for general policy toward post-disturbance restoration activities are currently under development (S. Gregory, Oregon State University, pers. comm.). Guidelines must be developed with the overall objective that any proposed activities will be consistent with the goals and objectives for species closely associated with old-growth forests or fish stocks at risk for that site. They should be subject to review by appropriate interdisciplinary teams and the recommended oversight process. Policies should ensure that post-disturbance restoration activities do not decrease suitability of habitat conditions for species closely associated with old-growth forest.

Oversight Process

Consistent interpretation, application, and monitoring implementation of the Scientific Analysis Team's suggested standards and guidelines must be assured through a formally prescribed oversight process. This oversight process must be developed immediately by Forest Service management with involvement of other appropriate Federal and state agencies (Fish and Wildlife Service, National Marine Fisheries Service, and state fish and wildlife agencies).

Adaptive Management

The proposals we have offered as means to ensure against the loss of species viability or the extirpation of species are considered to be starting points. The Scientific Analysis Team based many recommendations on the best available information including the assistance of recognized experts and the professional judgments of team members. We believe that the mitigation measures suggested herein, if fully implemented, have a high probability of success in maintaining viable populations of old-growth associated species within the National Forests. We emphasize, however, that additional information will occasionally become available that

may justify reexamination of suggested mitigation measures. When and where new information warrants, changes in the proposed management should be made—a process known as "adaptive management". We have based much of the following discussion of adaptive management on a similar discussion by the Northern Spotted Owl Recovery Team (USDI 1992). A key priority the adaptive management process should be adequate and consistent funding of research and monitoring programs. Without such research and monitoring effort, it will not be possible to appropriately document changes that would indicate the need for, and the course of, adaptive management.

The idea of adaptive management seems straightforward and simple—that is, when better data become available, the standards and guidelines would be changed. However, such a process is, in reality, quite complex. There is often determined reluctance by organizations and individuals to alter decisions and practices that have become established. There may be uncertainty about the nature of the changes or about the consequences (biological, sociological, political, and economic) of change. Questions may also arise about the appropriate timing of indicated change.

Development of a well defined process of adaptive management can help alleviate some of these difficulties. Such a process provides a structure for dealing with new information in an orderly way and should produce rationally derived and well documented recommendations for adaptation. The following 13 steps represent one possible process.

1. Describe the aspect of the set of mitigation measures being addressed and the objective(s) that produced the original recommendation.
2. Describe the current standards and guidelines.
3. Describe the basis for the extant standards and guidelines—that is, the specific information that was used in development and how that information was synthesized. It is important to separately consider: (1) information derived from specific studies; (2) interpretations of that information; or (3) assumptions; and professional judgements.
4. Provide some assessment of the reliability of the information used in developing the standards and guidelines. This should help in ascertaining if extant standards and guidelines should be changed. This process further suggests the types of information that should be collected in anticipation of changes.
5. Describe working hypotheses about how proposed changes in standards and guidelines will function to achieve objectives. This process may entail development of specific models for the elements being considered.
6. Clearly describe the anticipated outcomes if extant standards and guidelines are followed. These predictions should include ranges of possible outcomes based both on empirical observations, expert opinions, and the use of simulation models.
7. Describe possible outcomes if standards and guidelines do not function as expected. Such assessment should help establish the basis for identification of trigger points to determine when standards and guidelines should be reexamined.

8. Describe potential changes to the standards and guidelines if outcomes are not as predicted. Identification of such potential changes early in the process will allow time to institute research and management experiments to focus on components of extant standards and guidelines deemed most critical. This action would allow assessment of future options and the likelihood that those options would be put in place at some future time.
9. Describe and implement the monitoring and research that should be collected in order to: (1) determine whether the standards and guidelines are being properly implemented; (2) determine if the standards and guidelines are producing expected results; (3) determine what changes to the standards and guidelines are appropriate; and (4) define responsibilities and establish funding and specific plans to reach objectives of the standards and guidelines.
10. Describe the conditions that set off reviews of, and changes in, standards and guidelines. There should be at least three types of such conditions: (1) passage time-that is, regularly scheduled reviews; (2) outcomes are outside those parameters expected; and (3) new information becomes available that may be relevant expected outcomes of application of the standards and guidelines.
11. When conditions identified in step 10 are reached, review monitoring and research data to determine if changes to the standards and guidelines are necessary, ttisk assessment, focused on both the original decision and the forecast change, should be incorporated in making these decisions.
12. Make decisions and implement new standards and guidelines.
13. Initiate monitoring plans to assess whether the modification is achieving the desired results. Subject the new standards and guidelines to steps 1-12.

We recommend that an adaptive management process incorporating these, or some refinement of these steps be developed immediately upon implementation of new standards and guidelines for mitigation measures. Where appropriate, this process must include other agencies. Because we envision our proposal as a preliminary step, immediate attention must be given to assigning funds and staff to carry out necessary actions to implement adaptive management.

Research and Monitoring - Research and monitoring are essential components of adaptive management. It is likely that research results will add to the understanding of whether standards and guidelines are functioning as expected or whether change is warranted. Critical tasks required for research and monitoring include: (1) identifying critical monitoring or research questions for the species or standard and guideline in question (this includes implementation, effectiveness, and validation monitoring of standards and guidelines); (2) describing appropriate inventory standards and protocols for the species in question; (3) describing how variations in inventory standards will result in varying levels of reliability in estimates of population status or trend in habitat condition; (4) identifying and coordinating interactions between monitoring

and research programs; and (5) providing adequate and continued funding and staff necessary support research and monitoring activities.

Research activities can be designed to investigate a variety of the assumptions and components of the Scientific Analysis Team's strategy and proposals. Research can provide data to refine our understanding of the habitat relationships of old-growth associated species, to investigate whether proposed actions are achieving the desired effects, and to test assumptions about how old-growth ecosystems function. Manipulative experiments may be particularly important in testing hypotheses about effects of land management activity on species. Existing experimental forests such as the H.J. Andrews in Oregon and Wind River in Washington provide ideal locations for such studies and should be allowed to continue to support such work. The Scientific Analysis Team recommends that experimental forests in Washington, Oregon, and California be exempted from restrictions placed on manipulative experiments within spotted owl, riparian, and marbled murrelet habitat conservation areas, as long as those activities are motivated by legitimate scientific research questions (as determined by peer review). Because the key watersheds, Riparian Habitat Conservation Areas and marbled murrelet conservation areas cover wide geographic areas, the Scientific Analysis Team recommends development of an oversight and review process to evaluate, coordinate, and decide on suitability of planned research in riparian and murrelet habitat conservation areas outside of Habitat Conservation Areas. A technical committee such as that formed by Federal and state agencies under the Interagency Northern Spotted Owl Conservation Group would be an appropriate body to provide such oversight.

Our analyses revealed conspicuous gaps in knowledge about the fauna associated with old-growth forest. Perhaps chief among these is the paucity of information about the distribution and habitat requirements of invertebrates, "The little things that run the World" (Wilson 1987). Olson (1992) proposed a survey protocol to investigate the relationships of invertebrate populations to the kinds, amounts, and arrangement of forest conditions and to evaluate the use of invertebrate species as environmental indicators of biological diversity. Scientific Analysis Team recommends pursuit of these suggestions to help fill this information gap.

Ongoing Planning and Evaluations - The Forest Service, Bureau of Land Management, and the Fish and Wildlife Service have ongoing research, monitoring, planning and management activities that will produce new information on spotted owls and other species associated with old-growth forest. These efforts include: recovery planning by the Department of the Interior for the northern spotted owl, by the Fish and Wildlife Service for marbled murrelets, and by the National Marine Fisheries Service for various stocks of anadromous fish; Status Reviews conducted by the Fish and Wildlife Service under requirements of the Endangered Species Act; Bureau of Land Management Resource Management Planning; and the development of conservation strategies by the Forest Service for marbled murrelets, bull trout, forest owls, goshawk, furbearers, and Pacific anadromous fishes. Information from these and other efforts will need to be quickly and thoroughly processed through strict technical assessment and the adaptive management process to ascertain if and how the standards and guidelines put forth here should be modified.

INTERAGENCY COORDINATION

The Interagency Scientific Committee identified lack of interagency and intra-governmental cooperation as a longstanding, major obstacle of efforts to produce an effective, cost-efficient spotted owl habitat management plan. This obstacle obviously continues to exist. Added to the complexities of the management of habitat for northern spotted owls, marbled murrelets, and anadromous fish, are a myriad of other issues and considerations pertaining to the hundreds of other species associated with older forest conditions. In order to ensure the best chances of success, we believe it is essential that Federal and state agencies with responsibilities in this area, develop a unified management strategy to provide for species associated with old-growth forest. Efficiencies and opportunities not available to any single agency could be greatly enhanced by such an approach. Although institutional barriers make a unified approach difficult to achieve, we believe the biological, economic, political, and social complexities make the use of a unified approach increasingly difficult to overcome, justify, or tolerate. The Scientific Analysis Team's mitigation strategy applies only to lands managed by the Forest Service; however, population viability of the marbled murrelet and many fish stocks, for example, is a function of habitat conditions on all ownerships. Conservation of range-wide habitat conditions for such species simply cannot be accomplished by one agency acting alone or by involved agencies operating with conflicting purposes.

CONCLUSIONS

We emphasize the need to treat the proposed viability evaluations of old-growth associated species and the proposed mitigation options as management hypotheses. All species that we identified as closely associated with old growth, and particularly those identified as having a risk to their viability, are deserving of further research, monitoring of habitat amount and distribution and, in some cases, monitoring of specific population parameters such as distribution, size, and trend of population. However, it should be recognized that such broad range research efforts would be very expensive and, therefore, not likely to be funded. We recommend that Forest Service research be commissioned to do an intensive problem analysis to identify the highest priority research and monitoring and suggest appropriate research for consideration by agency managers, the administration, and Congress.

Our analyses were hampered by the lack of spatially explicit resource inventories throughout the region. Better inventories are needed to facilitate future attempts to evaluate the effects of proposed land management actions and to design new conservation strategies for organisms or ecosystems.

Our effort is an initial step in a fuller process for providing underlying support to ecosystem management, planning, and evaluation. There is still much basic work required to support ecologically based land stewardship under a concept of ecosystem management. We evaluated a complex array of species-including vertebrate, vascular and nonvascular plants, and invertebrates. This led to the proposal of a comprehensive management strategy that, in total, protects adequate habitat of all those species for which there is available information. Our approach focused on the composition of old-growth forest ecosystems through an analysis on plant and animal species associated with such habitats. We anticipated that the next step toward ecosystem management would involve investigation and evaluation of ecological functions and processes as a means to understand, and perhaps design, management strategies to achieve

desired objectives. Such an approach would lead away from a species-by-species management philosophy and toward a desired state of ecosystem function which might, in turn, lead to sustainability of ecosystems and their components. The Forest Service has adopted a new forest management policy called "ecosystem management". Our effort sheds some light on the early stages of implementing this policy, specifically for old-growth forest ecosystems of the Pacific Northwest. We believe our proposal is a link to future management directions in the Forest Service.

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Glossary

GLOSSARY

Most of the terms in this glossary were taken from the glossaries of the Interagency Scientific Committee's Conservation Strategy (ISC Report), the Final Environmental Impact Statement on Management for the Northern Spotted Owl in the National Forests (FEIS), the U.S. Fish and Wildlife Service's Draft Recovery Plan for the Northern Spotted Owl (Draft Recovery Plan), or Alternatives for Management of Late-Successional Forests of the Pacific Northwest (Late-Successional Forests Report). Any remaining terms have been defined by the Scientific Analysis Team. The source of each definition appears at the end of the definition.

50-11-40 rule - a guideline developed by ISC to provide habitat conditions to facilitate movement of juvenile and adult owls across the landscape. It requires that 50 percent of the forest within a quarter-township be maintained with an average tree dbh of at 11 inches and 40 percent canopy closure. (Draft Recovery Plan)

100-year floodplain - the area adjacent to a stream which is on average inundated once a century. (Scientific Analysis Team)

Adaptive management - the process of implementing policy decisions as scientifically driven management experiments that test predictions and assumptions in management plans, and using the resulting information to improve the plans. (Draft Recovery Plan)

Age specific birth rate - rate at which individuals of a particular age produce young. (Scientific Analysis Team)

Age specific survival rate - the average proportion of individuals in a particular age group that survive for a given time period. (Scientific Analysis Team)

Agreement areas - also BLM-ODFW agreement areas; spotted owl habitat areas protected by the BLM under a cooperative agreement with the ODFW. (ISC Report)

Allee effect - a depression in the encounter rate between males and females resulting from low population densities; the probability of finding a mate drops below that required to maintain the reproductive rates necessary to support the population. (ISC Report)

Allowable sale quantity (ASQ) - the quantity of timber that may be sold from the area suitable land covered by a Forest Plan for a time period specified by the Plan. This quantity is usually expressed on an annual basis as the "average annual allowable sale quantity." (FEIS)

Alternative - one of several policies, plans, or projects proposed for decision making. (FEIS)

Anadromous fish - fish that are born in freshwater, rear there as immature, move to the ocean to grow and mature, and return to freshwater to reproduce. (Scientific Analysis Team)

Aquatic ecosystem - any body of water, such as a stream, lake, or estuary, and all organisms and non-living components, functioning as a natural system. (Late-Successional Forests Report)

Arboreal - living in the canopies of trees. (FEIS)

Aspect - the direction a slope faces with respect to the cardinal compass points.
(Draft Recovery Plan)

Associated species - a species found to be numerically more abundant in a particular forest successional stage as compared to other stages (Ruggiero et al. 1991). (FEIS)

Awarded sales - Federal timber sales that have been let to the successful bidder through a formal contract. (ISC Report)

b - the age-specific fecundity rate of adult females

B - the average annual number of new entries into the adult population (i.e., immigrants)

b(1) - the fecundity rate for one-year old females

b(2) - the fecundity rate for two-year old females

Biological diversity - the variety of life and its processes, including complexity of species, communities, gene pools, and ecological functions. (Draft Recovery Plan)

Biological opinion - the document resulting from formal consultation that states the opinion of the Fish and Wildlife Service or National Marine Fisheries Service as to whether or not a Federal action is likely to jeopardize the continued existence of listed species or results in destruction or adverse modification of critical habitat. (Scientific Analysis Team)

Block (of forest, habitat) - geographical area of trees or vegetation that is distinct from surrounding conditions. Block size may vary greatly. (Late-Successional Forests Report)

BLM - Bureau of Land Management, U.S. Department of the Interior.

Blowdown - trees felled by high winds. (Draft Recovery Plan)

Breast height - a standard height from average ground level for recording diameter, girth, or basal area, generally 4.5 feet (1.37 meters). (Draft Recovery Plan)

Broadcast burn - allowing a prescribed fire to burn over a designated area within well-defined boundaries for reduction of fuel hazard or as a silvicultural treatment, or both. (Draft Recovery Plan~)

Buffer - used in the context of marbled murrelet standards and guidelines-a forested area located adjacent to suitable (nesting) marbled murrelet habitat that reduces dangers of having sharply contrasting edges of clearcuts next to such habitat. Dangers include risk of wind damage to nest trees and young, increased predation and loss of forest interior conditions. (Scientific Analysis Team)

Canopy ~ a layer of foliage in a forest stand. This most often refers to the uppermost layer of foliage. Here it is used to describe lower layers, but over one's head~ in a multistoried stand. (Scientific Analysis Team)

Canopy closure - the degree to which the canopy (forest layers above one's head) blocks sunlight or obscures the sky. it can only be accurately determined from measurements taken under the canopy as openings in the branches and crowns must be accounted for. (Scientific Analysis Team)

Capability - the potential of an area of land to produce resources, supply goods and services, and allow resource uses. Capability depends upon current vegetation conditions and site conditions such as climate, slope, landform, soils, and geology. (Draft Recovery Plan)

Capture history - a record of the recaptures or resightings of a marked individual. Usually recorded as a string of 1's or 0's to indicate occasions when the individual was either recaptured or not recaptured. (Scientific Analysis Team)

Carrying capacity - the maximum number of organisms that can be supported in a given area of habitat at a given time. (FEIS)

Catastrophic event - a large-scale, high-intensity natural disturbance that occurs infrequently. (Late-Successional Forests Report)

Cavity nester - wildlife species, most frequently birds, that require cavities (holes) in trees for nesting and reproduction. (Late-Successional Forests Report)

Checkerboard ownership - a land ownership pattern in which every other section (square mile) is in Federal ownership as a result of Federal land grants to early western railroad companies. (ISC Report)

Classic old growth - forest stands with unusually old and very large trees that also meet criteria for old-growth forests; stands that meet the definition in Forest Service publication PNW-447. (Late-Successional Forests Report)

Clear-cut - an area where the entire stand of trees has been removed in One cutting. (Draft Recovery Plan)

Closely associated species - a species is designated as "closely associated" with a forest successional stage if the species is found to be significantly more abundant in that forest successional stage as compared to the other successional stages, if it is known to occur almost exclusively in that successional stage, or if it uses habitat components that are usually produced at that stage. (FEIS)

Cluster - an area that contains habitat capable of supporting three or more breeding pairs of spotted owls with overlapping or nearly overlapping home ranges. (Draft Recovery Plan)

Code of Federal Regulations (CFR) - a codification of the general and permanent rules published in the Federal Register by the Executive departments and agencies of the Federal Government. (FEIS)

Cohort - individuals all resulting from the same birth-pulse, and thus all of the same age. (ISC Report)

Commercial forest land - land declared suitable for producing timber crops and not withdrawn from timber production for other reasons. (Late-Successional Forest)

Commercial thinning - the removal of generally merchantable trees from an even-aged stand, usually to encourage growth of the remaining trees. (Late-Successional Forest)

Community - pertaining plant or animal species living in close association and interacting as a unit. (Late-Successional Forests Report)

Conferencing - informal discussion or correspondence consultation that takes place between the U.S. Fish and Wildlife Service and another Federal agency when it is determined that a proposed Federal action may jeopardize the continued existence of a species proposed as threatened or endangered or result in adverse modification of proposed critical habitat. (Scientific Analysis Team)

Conifer - a tree belonging to the order Gymnospermae, comprising a wide range of trees that are mostly evergreens. Conifers bear cones (hence coniferous) and needle-shaped or scale-like leaves. (Draft Recovery Plan)

Connectivity - a measure of the extent to which intervening habitat truly connects species reserves for juvenile spotted owls or other species dispersing among them. (Scientific Analysis Team)

Conservation - the process or means of achieving recovery or viable populations. (Scientific Analysis Team)

Conservation Recommendations - suggestions by the Fish and Wildlife Service or National Marine Fisheries Service in biological opinions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on Federally listed threatened or endangered species or designated critical habitat. (Scientific Analysis Team)

Conservation strategy - a management plan for a species, group of species, or ecosystem that prescribes standards and guidelines which if implemented provide a high likelihood that the species, groups of species, or ecosystem, with its full complement of species and processes, will continue to exist well-distributed throughout a planning area i.e., a viable population. (Scientific Analysis Team)

Consultation - a formal interaction between the U.S. Fish and Wildlife Service and another federal agency when it is determined that the agency's action may affect a species that has been listed as threatened or endangered or its critical habitat. (Draft Recovery Plan)

Contiguous habitat - habitat suitable to support the life needs of species that is distributed continuously or nearly continuously across the landscape. (Draft Recovery Plan)

Corridor - a defined tract of land, usually linear, through which a species must travel to reach habitat suitable for reproduction and other life-sustaining needs. (ISC Report)

Critical habitat - Under the Endangered Species Act, critical habitat is defined as "the specific areas within the geographic area occupied by a Federally listed species...on Which are found those physical and biological features essential to the conservation of the species, and that may require

special management considerations or protection; and specific areas outside the geographic area occupied by a species at the time it is listed, upon determination that such areas are essential for the conservation of the species." (FEIS)

Critical link - In this report, geographical areas located between physiographic provinces that represent most likely avenues for dispersing spotted owls provided habitat conditions are favorable for such movement. (Scientific Analysis Team)

Crown - the upper part of a tree or other woody plant which carries the main system of branches and the foliage. (Draft Recovery Plan)

Crown cover - the degree to which the crowns of trees are nearing general contact with one another. Generally measured as the percent of the ground surface that would be covered by a downward vertical projection of foliage in the crowns of trees.

Crude density - the number of individuals in an area. (Scientific Analysis Team)

Cumulative effects - those effects on the environment which result from the incremental effect of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time. (FEIS)

CWD (coarse woody debris) - portion of a tree that has fallen or been cut and left in the woods. Usually refers to pieces at least 20 inches in diameter. (Draft Recovery Plan)

DBH - diameter at breast height. The diameter of a tree measured 4 feet 6 inches above the ground on the uphill side of the tree. (FEIS)

DCA - designated conservation area. (Draft Recovery Plan)

Debris torrent - rapid movement of a large quantity of materials (wood and sediment) down a stream channel during storms or floods; generally occurs in smaller streams and results in scouring of stream bed. (Late-Successional Forests Report)

Demographic stochasticity - random fluctuations in birth and death rates. (ISC Report)

Demography - the quantitative analysis of population structure and trends; population dynamics. (Draft Recovery Plan)

Density-dependent - a process, such as fecundity, whose value depends on the number of animals in the population per unit area. (ISC Report)

Density management - In Bureau of Land Management Draft planning documents of 1992-cutting trees for the primary purpose of widening their spacing so that growth of remaining trees can be accelerated. Density management is also planned to be used by BLM to improve forest health, to open the forest canopy or to accelerate the attainment of old-growth characteristics if maintenance or restoration of biological diversity is the objective. (Scientific Analysis Team)

Density study area - an area in which the objective is to count all individuals that are present, thereby monitoring populations trends over time. (Scientific Analysis Team)

Designated conservation area (DCA) - a contiguous area of habitat to be managed and conserved for spotted owls under the Draft Recovery Plan for Northern Spotted Owl. This general description can be applied to two categories:

DCA 1 - category of DCA intended to support at least 20 pairs of spotted owls.

DCA 2 - category of DCA intended to support one to 19 pairs of spotted owls.

(Draft Recovery Plan)

Desired future conditions - an explicit description of the physical and biological characteristics of a habitat type believed necessary to meet objectives for a species.

(Late-Successional Forests Report)

df- degrees of freedom, which is usually the sample, n, minus 1 (i.e., n-1)

Dispersal - the movement, usually one way and on any time scale, of plants or animals from their point of origin to another location where they subsequently produce offspring.

(Late-Successional Forests Report)

Dispersal capability - the ability of members of a species to move from their area of birth to another suitable location and subsequently breed. (Draft Recovery Plan)

Dispersal distance - a straight-line distance that an individual travels from its birth place until it stops dispersing (assumed to be a breeding site) or dies. (ISC Report)

Dispersal habitat - habitat that supports the life needs of an individual animal during dispersal. Generally satisfies needs for foraging, roosting, and protection from predators.

(Draft Recovery Plan)

Distribution (of a species) - the spatial arrangement of a species within its range.

(Draft Recovery. Plan)

Disturbance - a significant change in structure and/or composition caused by natural events such as fire and wind or human-caused events such as cutting. (Draft Recovery Plan)

Diversity - the variety, distribution, and abundance of different plant and animal communities and species within an area. See biological diversity. (FEIS)

Down log - portion of a tree that has fallen or been cut and left in the woods.

(Draft Recovery Plan)

Draft Environmental Impact Statement (DEIS) - the draft statement of environmental effects which is required for major Federal action under Section 102 of the National Environmental Policy Act, and released to the public and other agencies for comment and review. (FEIS)

Drainage - a large area mostly bounded by ridges, encompassing part, most or all of a watershed and enclosing on the order of 5,000 acres. (Late-Successional Forests Report.)

Duff layer - the layer of loosely compacted debris underlying the litter layer on the forest floor.

Early seral stage forests - stage in forest development that includes seedling, sapling, and pole-sized trees. (Draft Recovery Plan)

East-side forests -- the 12 National Forests in Washington, Oregon, and California that lie partly or wholly east of the Cascade Mountain Range crest: Colville, Deschutes, Fremont, Klamath, Malheur, Ochoco, Okanogan, Shasta-Trinity, Umatilla, Wallowa-Whitman, Wenatchee, and Winema National Forest. (Draft Recovery Plan)

Ecological health - the state of an ecosystem in which processes and functions are adequate to maintain diversity of biotic communities commensurate with those initially found there. (Late-Successional Forests Report)

Ecosystem - an interacting system of organisms considered together with their environment; for example, marsh, watershed, and lake ecosystems. (Draft Recovery Plan)

Ecosystem approach - a strategy or plan to manage ecosystems to provide for all associated organisms~ as opposed to a strategy or plan for managing individual species. (Late-Successional Forests Report)

Edge - where plant communities meet or where successional stages or vegetative condition with plant communities come together. (Draft Recovery Plan)

Edge effect - the effect of adjoining vegetative communities on the population structure along the margin, which often provides for greater number of species and higher population densities of some species than either adjoining community. Edge may result in negative effects as well; habitat along an edge is different than in the patch of habitat, reducing the effective area of the habitat patch. (FEIS)

Emigration - permanent movement of individuals of a species from a population. (ISC Report)

Empirical - derived from direct observation or experimentation. (Draft Recovery Plan)

Endangered species - any species of animal or plant that is in danger of extinction throughout all or a significant portion of its range; plant or animal species identified by the Secretary of the Interior as endangered in accordance with the 1973 Endangered Species Act. (Draft Recovery Plan)

Endemic - a species that is unique to a specific locality. (Draft Recovery Plan)

Environmental stochasticity - random variation in environmental attributes such as temperature, precipitation, and fire frequency. (Draft Recovery Plan)

Epiphyte - a plant that grows upon another plant and that is nonparasitic. Most of the plant's necessary moisture and nutrients are derived from the atmosphere. (Draft Recovery Plan)

Even-aged forest - a forest stand composed of trees with less than a 20-year difference in age. (Draft Recovery Plan)

Even-aged management - the application of a combination of actions that result in the creation of stands in which trees of essentially the same age grow together. Managed even-aged forests are characterized by a distribution of stands of varying ages (and, therefore, tree sizes) throughout the forest area. The difference in age among trees forming the main canopy level of a stand usually does not exceed 20 percent of the age of the stand at harvest rotation age. Regeneration in a particular stand is obtained during a short period at or near the time that a stand has reached the desired age or size for harvesting. Clear-cut, shelterwood, or seed tree cutting methods produce even-aged stands. (Draft Recovery Plan)

Extended rotation - a period of years that is longer than the time necessary to grow timber crops to a specific condition of maturity. (Draft Recovery Plan)

Extinct - a species is extinct when it no longer exists. (Draft Recover./Plan)

Extirpation - the elimination of a species from a particular area. (Draft Recovery Plan)

Extirpation risk species - in this report, those species that were generally ranked as having a medium low or low viability over a 50-year period under one FEIS alternative. Extirpation related to local extinction of a species from one or more National Forests within the range of the northern spotted owl.

F1 cross - offspring resulting from a cross between two original parental stocks. (Scientific Analysis Team)

Fecundity - number of female young produced per female owl in the population of interest. (ISC Report)

Final Environmental Impact Statement (FEIS) - the final version of the of environmental effects required for major Federal actions under Section 102 of the National Environmental Policy Act. It is a revision of the draft environmental impact statement to include public and agency responses to the draft. (FEIS)

Fire regime- the characteristic frequency, extent, intensity, severity~ and seasonality of fires in an ecosystem. (Draft Recovery Plan)

Floaters - nonbreeding adults and subadults that move and live within a breeding population, often replacing breeding adults that die; nonterritorial individuals. (Draft Recovery Plan)

Forest or Forest land - lands currently supporting or capable of supporting forests at a density of 10 percent crown closure or better.

[Forest land - at least 10 percent land area covered by forest trees or formerly having had such tree cover and not currently developed for other use. (Late-Successional Forests Report)]

Forest fragmentation - the change in the forest landscape, from extensive and continuous forests of old-growth to a mosaic of younger stand conditions. (Draft Recovery Plan)

Forest landscape - land presently forested or formerly forested and not currently developed for nonforest use. (ISC Report)

Forest matrix - forest lands between designated areas managed primarily for spotted owl habitat. (FEIS)

Forest plan - a land management plan designed and adopted to guide forest management activities on a National Forest or BLM District. (Late-Successional Forests Report)

Fragmentation - the process of reducing size and connectivity of stands that comprise a forest. (FEIS)

FWS - Fish and Wildlife Service, U.S. Department of the Interior.

GIS - geographical information system. This is a computer system capable of storing and manipulating spatial (i.e., mapped) data. (Draft Recovery Plan)

Green tree - a live and growing tree. (Late-Successional Forests Report)

Green-tree retention - the silvicultural practice of retaining live, growing trees on a site during timber harvest as a future source of snags. (Late-Successional Forests Report)

Guideline - a policy statement that is not a mandatory requirement (as opposed to a standard, which is mandatory). (Draft Recovery Plan)

HA (hectare) - a measure of area in the metric system equal to approximately 2.5 acres. (Draft Recovery Plan)

Habitat - the place where a plant or animal naturally or normally lives and grows. (Draft Recovery Plan)

Habitat capability - the estimated number of pairs of spotted owls that can be supported by the kind, amount, and distribution of suitable habitat in the area. As used in the recovery plan, this means the same as capability to support spotted owl pairs. (Draft Recovery Plan)

Hard snag - a recently dead standing tree that typically still has an intact top, a high degree of bark cover, and most limbs; hard snags are required by a number of wildlife species, including cavity nesters. (Late-Successional Forests Report)

Harvest cutting method - methods used to harvest trees. Harvest cutting methods are classified as even-aged and uneven-aged. (Draft Recovery Plan)

HCA (habitat conservation area) - as proposed by the Interagency Scientific Committee~ a contiguous block of habitat to be managed and conserved for breeding pairs, connectivity, and distribution of owls; application may vary throughout its range according to local conditions. (Draft Recovery Plan)

Helicopter logging - use of helicopters to transport logs from where they are felled to a landing. (Scientific Analysis Team)

High-lead cable system - a harvest technology where cut logs are suspended above the ground and transported to a landing. (Scientific Analysis Team)

High viability risk species - in this report, those species that were generally ranked as less than high or medium high viability over a 50-year period under at least one FEIS alternatives.

Home range - the area within which an animal conducts its activities during a defined period of time. (Draft Recovery Plan)

Home range of a pair - the sum of the home ranges of each member of a pair minus the area of home range overlap. (Draft Recovery Plan)

Hybrid - an offspring that results from the mating of individuals of different races or species. (Draft Recovery Plan)

Hybridization - the crossing or mating of two different varieties of plants or animals. (Draft Recovery Plan)

Immigration - movement of individuals into a population. (Draft Recovery Plan)

Inbreeding - mating or crossing of individuals more closely related than average pairs in the population. (FEIS)

Incidental take - "take" of a threatened or endangered species that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. (FEIS)

Ingrowth - the period in time after successional growth of a forest stand when it reaches a specified age or structure class, for instance, spotted owl foraging habitat. (FEIS)

Inholding - land belonging to one landowner that occurs within a block of land belonging to another. For example, small parcels of private land that occur inside National Forests. (Draft Recovery Report)

Inner gorge- a stream reach bounded by steep valley walls which terminate upslope into a more gentle topography. Common in areas of rapid stream downcutting or uplift, such as northern California and southwestern Oregon. (Scientific Analysis Team)

Interdisciplinary team - a group of individuals with varying areas of specialty assembled to solve a problem or perform a task. The team is assembled out of recognition that no one scientific discipline is sufficiently broad enough to adequately analyze the problem and propose action. (FEIS)

Interim (short-term) solution- a 2- to 4-year period. (Late-Successional Forests Report)

Interspecific - occurring among members of different species. (Draft Recovery Plan)

Interspecific competition - the condition of rivalry that exists when a number of organisms of different species use common resources that are in short supply; or, if the resources are not in short supply, the condition that occurs when the organisms seeking that resource nevertheless harm one or another in the process. Competition usually is confined to closely related species that eat the same sort of food or live in the same sort of place. Competition typically results in ultimate elimination of the less effective organism from that ecological niche. (Draft Recovery Plan)

Intraspecific - occurring among members of single species. (Draft Recovery Plan)

ISC (Interagency Scientific Committee) - a committee of scientists that was established by the U.S. Forest Service, U.S. Bureau of Land Management, U.S. Fish and Wildlife Service, and National Park Service, to develop a conservation strategy for northern spotted owls. (Draft Recovery Plan)

ISODATA Clustering - Iterative Self Organizing Data Analysis Technique, a statistical clustering technique that assigns spectral reflectance values to groups based on spectral distance between pairs of observations. This technique operates in an iterative fashion to optimize the statistical separation between groups. (Scientific Analysis Team)

Isolate - a population that is isolated. See isolation. (Draft Recovery Plan)

Isolation - absence of genetic crossing among populations because of distance or geographic barriers. (Draft Recovery Plan)

Jeopardy - a finding made through consultation under the Endangered Species Act that the action of a federal agency is likely to jeopardize the continued existence of a threatened or endangered species. (Draft Recovery Plan)

Jolly seber models - a group of mathematical models designed to estimate survival rates of organisms that are marked and then recaptured or reobserved on subsequent occasions. (Scientific Analysis Team)

Juvenile - for spotted owls, a juvenile is normally considered to be any bird that is less than 1 year old. (Scientific Analysis Team)

Key watershed - as defined by National Forest and BLM District fish biologists, a watershed containing (1) habitat for potentially threatened species or stocks of anadromous salmonids other potentially threatened fish, or (2) greater than 6 square miles with high-quality water and fish habitat. (Late-Successional Forests Report)

Lambda - the finite rate of population change (population size in year 2 divided by the population size in year 1). (ISC Report)

Land allocation - the specification in Forest Plans of where activities, including timber harvest, can occur on a National Forest or BLM District. (Late-Successional Forests Report)

Landsat - a satellite that produces imagery used in remote sensing of forests. Analysis of this imagery produces maps of vegetation condition. (Draft Recovery Plan)

Landsat Multispectral Scanner - a satellite borne sensor, first launched in 1972, capable of recording reflected energy from the surface of the earth in four wavelength "bands" or divisions of the visible and infrared spectrum. The sensor records reflectance in the green, red, and near infrared portions of the spectrum as numeric "reflectance values" for a 180x180 km scene which is useful for mapping natural resources. (Scientific Analysis Team)

Landsat Thematic Mapper - an improved version of the Landsat MSS satellite sensor capable of recording reflected and emitted energy from the surface of the earth in seven "bands"

divisions of the visible and infrared spectrum. First launched in 1982, this sensor has improved spatial resolution and finer tuning of the spectral wavelengths for specific application to forestry, geology, agriculture, and water resource studies. (Scientific Analysis Team)

Late-Successional Forests - Forest seral stages that include mature and old-growth age classes.

Leave strips - generally narrow bands of forest trees that are left along streams and rivers to buffer aquatic habitats from upslope forest management activities. (ISC Report)

Litter layer - the loose, relatively undecomposed organic debris on the surface of the forest floor made up typically of leaves, bark, small branches, and other fallen material. (FEIS)

log (e) - the natural logarithm of a number

Long term - here, 50 to 100 years and sometimes beyond. (ISC Report)

Managed forest - forest land that is harvested on a scheduled basis and contributes to an allowable sale quantity. (ISC Report)

Management prescription - the management practices and intensity selected and scheduled for application on a specific area to attain multiple-use and other goals and objectives. (Draft Recovery Plan)

Marginal spotted owl habitat - vegetative communities, usually forest stands, that may provide for spotted owl life needs at least intermittently. Other times, depending on other environmental factors, the life needs of spotted owls would not be met. A landscape with a predominance of marginal habitat would not be thought to sustain a viable population of spotted owls. (Scientific Analysis Team)

Matrix - land within the range of the northern spotted owl that lies outside of category 1 and 2 Habitat Conservation Areas. (Scientific Analysis Team)

Mature stand - a mappable stand of trees for which the annual net rate of growth has culminated. Stand age, diameter of dominant trees, and stand structure at maturity vary by forest cover types and local site conditions. Mature stands generally contain trees with a smaller average diameter, less age class variation, and less structural complexity than old-growth stands of the same forest type. Mature stages of some forest types are suitable habitat for spotted owls; however, mature forests are not always spotted owl habitat, and spotted owl habitat is not always mature forest. (Draft Recovery Plan)

Maximum Likelihood Classification - A statistical classification technique which assigns reflectance values to groups based on the probability that an observation belongs to a particular class. (Scientific Analysis Team)

Mean - a central value of a series or set of observations obtained by dividing the sum of all observations by the number of observations. (Draft Recovery Plan)

Merchantable (trees, stands, timber) - trees or stands that people will buy for the wood they contain. (Late-Successional Forests Report.)

Mesic - pertaining to or adapted to an area that has a balanced supply of water. Neither wet nor dry. (Draft Recovery Plan)

Meta-analysis - a method or analysis that simultaneously examines multiple sets of data from different subsets of a population to determine if there are any general trends in the population. (Scientific Analysis. Team)

Meta-population - a population comprised of a set of local populations that are linked by migrants, allowing for recolonization of unoccupied habitat patches after local extinction events. (ISC Report)

Microenvironment - the sum total of all the external conditions that may influence organisms and that come to bear in a small or restricted area. (ISC Report)

Microhabitats - a restricted set of distinctive environmental conditions that constitute a small habitat, such as the area under a log. (ISC Report)

Minimum viable population - the low end of the viable population range. (Draft Recovery Plan)

Mitigation - mitigation includes: (a) avoiding the impact altogether by not taking a certain action or parts of an action; (b) minimizing impacts by limiting the degree or magnitude of the action and its implementation; (c) rectifying the impact by repairing, rehabilitating, or restoring the affected environment; (d) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and (e) compensation for the impact replacing or providing substitute resources or environments (40 CFR 1508.20). (FEIS)

Mixed conifer - as used in this document, the term "mixed conifer" refers to stands of trees, made up of pine, Douglas-fir, and true firs, that are generally found east of the Cascades. (Draft Recovery Plan)

Mixed-conifer forest - a forest community that is dominated by two or more coniferous species. (Draft Recovery Plan)

Mixed-evergreen forest - a forest community that is dominated by two or more species of broad-leaved hardwoods whose foliage persists for several years: important western species include madrone, tanoak, chinquapin, canyon live oak, and California-laurel. (Draft Recovery Plan)

Model - an idealized representation of reality developed to describe, analyze, or understand the behavior of some aspect of it; a mathematical representation of the relationships under study. The term model is applicable to a broad class of representations, ranging from a relatively simple qualitative description of a system or organization to a highly abstract set of mathematical equations. (Draft Recovery Plan)

Monitoring - a process of collecting information to evaluate whether objectives of a management plan are being realized. (FEIS)

Monitoring program - see "monitoring;" the program used to monitor a population and its habitat. (ISC Report)

Movement - shifts in locations of animals, which may be two-way such as seasonal movements, or one-way as in a shift to a new breeding territory. (FEIS)

Multiple use - the management of renewable resources so that they are utilized in the combination that will best meet the needs of people. (Draft Recovery Plan.)

Multistoried - term applied to forest stands that contain trees of various heights and diameter classes and therefore support foliage at various heights in the vertical profile of the stand. (Draft Recovery Plan)

Natal area - the location where an animal was born. (Draft Recovery Plan)

National Environmental Policy Act (NEPA) - an Act passed in 1969 to declare National policy that encourages productive and enjoyable harmony between humankind and the environment, promotes efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of humanity, enriches the understanding of the ecological systems and natural resources important to the Nation, and establishes a Council on Environmental Quality (The Principal Laws Relating to Forest Service Activities, Agric. Handb. 453. USDA Forest Service, 359p.). (FEIS)

National Forest Management Act (NFMA) - a law passed in 1976 as an amendment to the Forest and Rangeland Renewable Resources Planning Act, requiring the preparation of Forest Plans and the preparation of regulations to guide that development. (FEIS)

NEPA - National Environmental Policy Act of 1969. (ISC)
Nesting, roosting, and foraging habitat + the forest vegetation with the age class, species of trees, structure, sufficient area, and adequate food source to meet some or all of the life needs of the northern spotted owl. (FEIS)

NF - National Forest. (Draft Recovery Plan)

Nocturnal - referring to organisms that are active or functional at night. (Draft Recovery Plan)

Nominal Resolution - the stated limit to the level of detail a given sensor can record. Usually this refers to spatial resolution or the smallest land area or object which can be discerned from satellite imagery. (Scientific Analysis Team)

Northern spotted owl - one (*Strix occidentalis caurina*) of three subspecies of the spotted owl which ranges from southern British Columbia, Canada, through western Washington and Oregon, and into northwestern California; listed as a threatened species by the U.S. Fish and Wildlife Service. (Late-Successional Forests Report)

Occupancy rate - in reference to spotted owls, the percent of inventoried spotted owl habitat that is estimated to be occupied by breeding pairs of spotted owls. (Draft Recovery Plan)

OGEA - In Bureau of Land Management Draft Planning Documents of 1992-Old Growth Emphasis Areas. Areas where management emphasis will be given to providing for old-growth associated species and biological diversity. Management would provide for timber production when consistent with local and landscape level diversity. (Scientific Analysis Team)

Old-growth - a forest stand with moderate to high canopy closure; a multilayered, multispecies canopy dominated by large overstory trees; a high incidence of large trees with large, broken tops, and other indication of decadence; numerous large snags; and heavy accumulations of logs and other woody debris on the ground. (Draft Recovery Plan)

Old-growth associated species - plant and animal species that exhibit a strong association with old-growth forests. (Draft Recovery Plan)

Old-growth stand - a mappable area of old-growth forest. (Draft Recovery Plan)

Overstory - trees that provide the uppermost layer of foliage in a forest with more than one roughly horizontal layer of foliage. (Draft Recovery Plan)

Owl site - any site where there has been a recent or historic observation of a single spotted owl or a pair of owls. (Draft Recovery Plan)

P-value - the probability of finding a value of a test statistic larger than a given value

Packing - a temporary influx of organisms of various sex and age classes into remaining suitable habitat as previously available habitat is changed to unsuitable conditions. (FEIS)

Pair site - an amount of habitat that is considered capable of supporting one pair of spotted owls. (Draft Recovery Plan)

Patch - a smM1 (20-60 acre) part of the forest. This term is often used to indicate a type clearcutting (patch cuts) associated with the "staggered setting" approach to distributing harvest units across the landscape. (Late-Successional Forests Report)

Phi (Φ) - the annual probability of survival of adult females.

Physiographic province - a geographic region in which climate and geology have given rise to a distinct array of landforms. Biology and habitat relationships of spotted owls vary by physiographic province due to differences in climate, vegetation, and productivity of habitats. (Draft Recovery Plan)

Pixel - abbreviated form of "Picture Element", or the smallest division of a picture or image. (Scientific Analysis Team)

Planning area - in this document, the range of the northern spotted owl on National Forests. (FEIS)

Platform nest - a relatively fiat nest constructed on a supporting structure such as a broad branch. (Draft Recover~ Plan)

Population density - number of individuals of a species per unit area. (Draft Recovery Plan)

Population dynamics - the aggregate of changes that occur during the life of a population. Included are all phases of recruitment and growth, senility, mortality, seasonal fluctuation in biomass, and persistence of each year class and its relative dominance, as well as the effects that any or all of these factors exert on the population. (Draft Recovery Plan)

Population viability - probability that a population will persist for a specified period of time across its range despite normal fluctuations in population and environmental conditions. (FEIS)

Population viability model - a model that predicts the future state of an animal population based on its birth and death rates, habitat conditions and other environmental factors. (Scientific Analysis Team)

Population viability models - a mathematical abstraction of a system that is designed to predict the likelihood of persistence of a population under different conditions. (Scientific Analysis Team)

Potential habitat - a stand of trees of a vegetation type used by spotted owls that is not currently suitable, but is capable of growing or developing into suitable habitat in the future. In general, potential habitats are stands in the earlier successional stages of forest types used by spotted owls. (Draft Recovery Plan)

Precommercial thinning - the practice of removing some of the trees less than merchantable size from a stand so that remaining trees will grow faster. (Draft Recovery Plan)

Predator - any animal that preys externally on others, i.e., that hunts, kills, and generally feeds on a succession of hosts, i.e., the prey. (Draft Recovery Plan)

Prescribed burning - controlled fire deliberately set to meet various resource objectives. (Late-Successional Forests Report)

Prescribed fire - a fire burning under specified conditions that will accomplish certain planned objectives. The fire may result from planned or unplanned ignitions. (Draft Recovery Plan)

Presuppression - activities organized in advance of fire occurrence to ensure effective suppression action. (Draft Recovery Plan)

Protective management - measures taken by nonfederal entities to conserve spotted owls and or their habitat; measures may include participation in conservation planning (as defined in Endangered Species Act section 10) or other actions that benefit owls; entities may be states, private landowners, Indian tribes, or others. (Draft Recovery Plan)

Province - see physiographic province. (Draft Recovery Plan)

Quarter-township - an area approximately 3 miles square containing nine sections of land. (Draft Recovery Plan)

R - the number of observations of banded spotted owls in year j that were last captured in year i.

Radio-telemetry - automatic measurement and transmission of data from remote sources via radio to a receiving station for recording and analysis. In this report, it refers to the tracking of spotted owls by means of small radio transmitters attached to them. (Draft Recovery Plan)

Random - being or relating to a set or to an element of a set each of whose elements has equal probability of occurrence; also characterized by procedures to obtain such sets or elements. (Draft Recovery Plan)

Range (of a species) - the area or region over which an organism occurs. (Draft Recovery Plan)

Reasonable and prudent alternatives - alternative actions identified during formal consultation and communicated via a biological opinion, that can be implemented to avoid the likelihood of jeopardizing the continued existence of threatened or endangered species or destruction or adverse modification of critical habitat. (Scientific Analysis Team)

Reasonable and prudent measures - these actions the Fish and Wildlife Service or the National Marine Fisheries Service believe are necessary to appropriate to minimize the impacts i.e. amount or extent, of incidental take. These are communicated to a Federal agency in a biological opinion. (Scientific Analysis Team)

Record of Decision - a document separate from but associated with an environmental impact statement which states the management decision, identifies all alternatives including both the environmentally preferable and preferred alternatives, states whether all practicable means to avoid environmental harm from the preferred alternative have been adopted, and if not, why not.

Recovery - action that is necessary to reduce or resolve the threats that caused a species to be listed as threatened or endangered. (Draft Recovery Plan)

Recovery plan - a management plan developed under the authority of the Endangered Species Act which set forth management standards and population or other biological objectives for listed species. Implementation of such plans has a high likelihood that the species population and or distribution will improve to the point listing is no longer appropriate. (Scientific Analysis Team)

Rectification - the process of making imagery conform to a map projection system, usually to assign real world coordinates to image data. (Scientific Analysis Team)

Recruitment - the addition to a population from all causes, i.e., reproduction, immigration, and stocking. Recruitment may refer literally to numbers born or hatched or to numbers at a specified stage of life such as breeding age or weaning age. (Draft Recovery Plan)

Recruitment habitat - in this report pertaining to marbled murrelet mitigation-younger forest stands that presently do not have the attributes (large old-growth trees) of suitable marbled murrelet habitat but are expected to gain them through time. Protection of these stands will preserve the option to include them in a conservation strategy or recovery plan for marbled murrelets. (Scientific Analysis Team)

Reforestation - the natural or artificial restocking of an area with forest trees; most commonly used in reference to artificial restocking. (Draft Recovery Plan)

Refugia - havens of safety where populations have high probability of surviving periods of adversity. (ISC Report)

Regeneration - the actual seedlings and saplings existing in a stand; or the act of establishing young trees naturally or artificially. (Draft Recovery Plan)

Region - a Forest Service administrative unit. The two Regions affected by this proposed action are the Pacific Northwest Region (Region 6) which includes National Forests in Oregon and Washington, and the Pacific Southwest Region (Region 5) which includes National Forests California. (FEIS)

Region 5 - the National Forests of California; the Forest Service's Pacific Southwest Region. (Late-Successional Forests Report)

Region 6 - the National Forests of Washington and Oregon; the Forest Service's Pacific Northwest Region. (Late-Successional Forests Report)

Regional Forester - the Forest Service official responsible for administering a single Region. (FEIS)

Regional Guide - the guide developed to meet the requirements of the Forest and Rangeland Renewable Resources Planning Act of 1974, as amended (NFMA). Regional Guides provide standards and guidelines for addressing major issues and management concerns which need to be considered at the regional level to facilitate Forest planning. (FEIS)

Regulations - generally refers to the Code of Federal Regulations. (Draft Recovery plan)

Research Natural Area (RNA) - an area set aside by a public or private agency specifically to preserve a representative sample of an ecological community, primarily for scientific and educational purposes. In Forest Service usage, Research Natural Areas are areas designated to ensure representative samples of as many of the major naturally-occurring plant communities as possible. (FEIS)

Reserved land - lands that have been removed from the acreage base used to calculate timber yields. These lands often have a preservation or protection status. Wildernesses, research natural areas, and national recreation areas are examples of reserved lands. (Draft Recovery Plan)

Residual stand - the trees that remain standing after some event such as selection cutting. (Draft Recovery Plan)

Riparian area - geographically delineated areas with distinctive resource values and characteristics that are comprised of aquatic ecosystems, and ecosystems influenced by adjacent bodies of water. (FEIS)

Riparian Habitat Conservation Area - portions of a watershed that contribute to the creation and maintenance of fish habitat. (Scientific Analysis Team)

Risk analysis - a qualitative assessment of the probability of persistence of wildlife species and ecological systems under various alternatives and management options; generally also accounts for scientific uncertainties. (Late-Successional Forests Report)

Risk-analysis scale - a continuum of values (from low through high) describing the likelihood that habitat for associated wildlife species and fish will persist. (Late-Successional Forests Report)

Roost - the resting behavior of an animal. (Draft Recovery Plan)

Roost sites - a site where an animal roosts. Can refer to daytime and nighttime roosting. Sites often provide protection from environmental conditions and from predators. (Draft Recovery Plan)

Rotation - the planned number of years between the regeneration of an even-aged stand and its final cutting at a specified stage. (Draft Recovery Plan)

Sanitation - the removal of dead or damaged trees, or trees susceptible to insect and disease attack such as intermediate and suppressed trees, essentially to prevent the spread of pest or pathogens to promote forest health. (FEIS)

Sapling - a loose term for a young tree no longer a seedling but not yet a pole. It is generally a few feet high and 2 to 4 inches dbh, typically growing vigorously and without dead bark or more than an occasional dead branch. (Draft Recovery Plan)

Section 7 - the section of the Endangered Species Act that specifies the roles of interagency coordination in accomplishing the objective of species recovery. (Draft Recovery Plan)

Selection cutting - the annual or periodic removal of trees (particularly mature trees), individually or in small groups, from an uneven-aged forest, to realize yield and establish a new crop of irregular constitution. (FEIS)

Senescence - the process of aging. In demographic studies the usual concern is whether demographic rates change as organisms grow older. (Scientific Analysis Team)

Sensitive fish species and stocks - fish species and stocks (genetically distinct populations) of anadromous salmonids identified by the America Fisheries Society's Endangered Species Committee as needing special management considerations to avoid extinction. (Late-Successional Forests Report)

Sensitive species - In Forest Service Policy, those plant and animal species identified by a Regional Forester for which population viability is a concern, as evidenced by: a significant current or predicted downward trend in population numbers or density; or a significant current or predicted downward trend in habitat capability that would reduce a species' existing distribution (FSM 2670.5(19)). (FEIS)

Seral - a biotic community that is a developmental, transitory stage in an ecological succession. (Draft Recovery Plan)

Seral species - species associated with an early stage in the development of a biotic community. (Draft Recovery Plan)

Shelterwood - an even-aged silvicultural system in which the old forest is removed in two or more successive cuttings. (Draft Recovery Plan)

Short term - here, 1 to 50 years. (Scientific Analysis Team)

Silvicultural practices (or treatments) - the set of field techniques and general methods used to modify and manage a forest stand over time to meet desired conditions and objectives. (Late-Successional Forests Report)

Silviculture - the science and practice of controlling the establishment, composition, and growth of forests. (Draft Recovery Plan)

Simulation - the use of a computer or mathematical model to examine how an estimate may vary given different sets of assumptions about population vital rates. (Scientific Analysis Team)

Site-potential tree - a tree that has attained the maximum height possible given site conditions where it occurs.

Site productivity - the ability of a geographic area to produce biomass, as determined by conditions (e.g., soil type and depth, rainfall, temperature) in that area. (Late-Successional Forests Report)

Slash - the residue left on the ground after timber cutting. It includes unused logs, uprooted stumps, broken or uprooted stems, branches, twigs, leaves, bark, and chips. (Draft Recovery Plan)

Snag - a standing dead tree. (Draft Recovery Plan)

SOHA (spotted owl habitat area) - a habitat area designated to support one pair of owls. Such areas were prescribed in some previous plans for northern spotted owl conservation. (Draft Recovery Plan)

Spatially explicit model - a model that predicts the future state of an animal population based on mapped locations of organisms and their habitat. (Scientific Analysis Team)

Species - 1) a group of individuals that have their major characteristics in common and are potentially interfertile. 2) the Endangered Species Act defines species as including any species or subspecies of plant or animal. Distinct populations of vertebrates also are considered to be species under the act. (Draft Recovery Plan)

Spectral Class - A statistical grouping of similar spectral reflectance values from a satellite sensor which can be associated with a specific land cover class (i.e., forest, agriculture, water). (Scientific Analysis Team)

Spectral signature - specific combination of wavelengths of light energy reflected or radiated from a land surface, or, in forestry, a wavelength combination that more or less characterizes a specific forest condition or successional stage. (ISC Report)

Stage Classes - any distinguishable phase of growth or development of an organism. (FEIS)

Staggered setting - an approach to timber harvesting in which harvest units, separated by uncut units of at least the same size, are scattered across the landscape. (Late-Successional Forests Report)

Stand (tree stand) an aggregation of trees occupying a specific area and sufficiently uniform in composition, age, arrangement, and condition as to be distinguishable from the forest in adjoining areas. (Draft Recovery Plan)

Stand condition - a description of the physical properties of a stand such as crown closure or diameters. (Draft Recovery Plan)

Stand-replacing event - a disturbance that is severe enough over a large enough area (for example, 10 acres) to virtually eliminate an existing stand of trees and initiate a new stand. (Draft Recovery Plan)

Standards and guidelines - principals specifying conditions or levels of environmental quality to be achieved. (FEIS)

Stochastic - random, uncertain; involving a random variable. (Draft Recovery Plan)

Stochastic model - a model that includes representation of random events. (Draft Recovery Plan)

Stocking - the degree of occupancy of an area of land by trees as measured by basal area or number of trees and as compared to stocking standard; that is, the basal area or number of trees required to fully use the growth potential of the land. (Draft Recovery Plan)

Structural diversity - the diversity of forest structure, both vertical and horizontal, which provides for a variety of forest habitats, such as logs and multilayered forest canopy, for plants and animals. (FEIS)

Structure - the various horizontal and vertical physical elements of the forest. (Late-Successional Forests Report)

Subadult - for spotted owls, a subadult is normally considered to be any individual that is 1-2 years old.

Subpopulation - a well-defined set of interacting individuals that comprise a proportion of a larger, interbreeding population. (ISC Report)

Subspecies - a population of species occupying a particular geographic area, or less commonly, a distinct habitat, capable of interbreeding with other populations of the same species. (Draft Recovery Plan)

Successional stage - a stage or recognizable condition of a plant community that occurs during its development from bare ground to climax; for example, coniferous forests in the Blue Mountains progress through six recognized stages: grass-for; shrub-seedling; pole-sapling; young; mature; old-growth. See also Seral. (Draft Recovery Plan)

Suitable habitat - the biological and physical components necessary to meet some or all the life needs of a species. (Draft Recovery Plan)

Suitable spotted owl habitat - See nesting, roosting, and foraging habitat. (Draft Recovery Plan)

Superspecies - two closely related species that are believed to have diverged relatively recently. (Scientific Analysis Team)

Superior habitat - habitat selected in excess of availability by the majority of individual northern spotted owls. (Draft Recovery Plan)

Suppression - the action of extinguishing or confining a fire. (Draft Recovery Plan)

Survival rate - the average proportion of individuals in a sample or a population that survive for a given time period. (Scientific Analysis Team)

T-test - a statistical test that compares the value of a test statistic, t-value, to the student's t distribution.

Take - Under the Endangered Species Act, take means to harass, harm, pursue, hunt~ shoot, wound, kill, trap, capture, or collect an animal, or to attempt to engage in any such conduct. (Draft Recovery Plan)

Taking (Endangered Species Act, Section 7) - implementing an action that results in take. (Draft Recovery Plan)

Talus - broken rock forming a more or less continuous layer that may or may not be covered by duff and litter. (Scientific Analysis Team)

Taxon - a category in scientific classification system, such as class, family, or phylum. (Draft Recovery Plan)

Territorial single - an unpaired owl that is defending a territory. (Draft Recovery Plan)

Territory - the area that an animal defends, usually during breeding season, against intruders of its own species. (Draft Recovery Plan)

Texture of an ecosystem - relative surface smoothness of an ecosystem as determined by remote sensing technology or the distinctiveness of the transition between two distinct ecosystems. (ISC Report)

Threatened species - those plant or animal species likely to become endangered species throughout all or a significant portion of their range within the foreseeable future as identified by the Secretary of interior as threatened, in accordance with the 1973 Endangered Species Act. (Draft Recovery Plan)

Threshold phenomenon - pattern or trend in population growth rate that exhibits relatively long periods of slow change followed by precipitous increase or decrease in response to an environmental gradient. (ISC Report)

Threatened species- those plant or animal species likely to become endangered species throughout all or a significant portion of their range within the foreseeable future as is defined in the Endangered Species Act. (Draft Recovery Plan)

Timber production - the purposeful growing, tending, harvesting, and regeneration of regulated crops of trees to be cut into logs, bolts, or other round sections for industrial or consumer use other than for fuelwood. (Draft Recovery Plan)

Timber stand improvement - measures such as thinning, pruning, release cutting, prescribed fire, girdling, weeding, or poisoning of unwanted trees aimed at improving growing conditions for the remaining trees. (Draft Recovery Plan)

Transition period - a period of environmental change during which a population increases or decreases to a new stable equilibrium level. (Scientific Analysis Team)

Understory - the trees and other woody species growing under a more or less continuous cover of branches and foliage formed collectively by the upper portions of adjacent trees and other woody growth. (Draft Recovery Plan)

Uneven-aged management - the application of a combination of actions needed to simultaneously maintain continuous tall forest cover, recurring regeneration of desirable species, and the orderly growth and development of trees through a range of diameter or age classes. Cutting methods that develop and maintain uneven-aged stands are single-tree selection and group selection. (Draft Recovery Plan)

Unsupervised Classification - a computer-automated technique of pattern recognition which attempts to find statistically similar groups of reflectance values in satellite image data. (Scientific Analysis Team)

USDA - U.S. Department of Agriculture. (Draft Recovery Plan)

USDI - U.S. Department of Interior. (Draft Recovery Plan)

Vagility - capacity of any organism to become widely dispersed. (ISC Report)

Viability - the ability of a population to maintain sufficient size so that it persists over time in spite of normal fluctuations in numbers; usually expressed as a probability of maintaining a specific population for a specified period. (Draft Recovery Plan)

Viable population - a population which has adequate numbers and dispersion of reproductive individuals to ensure the continued existence of the species population on the planning area (FSM 1905). (FEIS)

Vital rates - the rates of key demographic functions within a population, such as the birth rate and survival rate. (Draft Recovery Plan)

Watershed - the forested area contributing water and sediments to a stream or lake. (Scientific Analysis Team)

Watershed analysis - procedure used to identify ecologically important areas of a watershed that create and maintain fish habitat. (Scientific Analysis Team)

Watershed Restoration - improving current conditions of watersheds to restore degraded fish habitat and provide long term protection to aquatic and riparian resources (Scientific Analysis Team)

Well distributed - a geographic distribution of habitats that maintains a population throughout a planning area and allows for interaction of individuals through periodic interbreeding and colonization of unoccupied habitats. (Draft Recovery Plan)

West-side forests - the 11 National Forests with the range of the northern spotted owl in Washington, Oregon, and California that lie west of the Cascade Mountain Range crest. They are the Gifford Pinchot, Mendocino, Mr. Baker-Snoqualmie, Mr. Hood, Olympic, Rogue River, Siskiyou, Siuslaw, Six Rivers, Umpqua, and Willamette National Forests. (Draft Recovery Plan)

Wetlands - areas that are inundated by surface water or groundwater with a frequency sufficient to support, and under normal circumstances do or would support, a prevalence of vegetative or aquatic life that require saturated or seasonally saturated soil conditions for growth and reproduction (Executive Order 11990). (Draft Recovery Plan)

Wetlands - areas inundated by surface water or groundwater frequently enough to support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soils for growth and reproduction. (Late-Successional Forests Report)

Wild and scenic rivers - those rivers or sections of rivers designated as such by congressional action under the 1968 Wild and Scenic Rivers Act, as supplemented and amended, or those sections of rivers designated as wild, scenic, or recreational by an act of the legislature of the state or states through which they flow. Wild and scenic rivers may be classified and administered under one or more of the following categories:

- 1) Wild River Areas - those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.
2. Scenic River Areas - those rivers or sections of rivers that are free of impoundments with watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.
3. Recreational River Areas - those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past. (Draft Recovery Plan)

Wilderness - areas designated by congressional action under the 1964 Wilderness Act. Wilderness is defined as undeveloped federal land retaining its primeval character and influence without permanent improvements or human habitation. Wilderness areas are protected and managed to preserve their natural conditions, which generally appear to have been affected primarily by the forces of nature, with the imprint of human activity substantially unnoticeable; have outstanding opportunities for solitude or for a primitive and confined type of recreation; include at least 5,000 acres or are of sufficient size to make practical their preservation, enjoyment, and use in an unimpaired condition; and may contain features of scientific, education, scenic, or historical value as well as ecologic and geologic interest. (**Draft Recovery Plan**)

Wildfire - any wildland fire that is not a prescribed fire. (Draft Recovery Plan)

Windfall - trees or parts of trees felled by high winds. See also blowdown and windthrow. (Draft Recovery Plan)

Windthrow - a tree or group of trees uprooted by the wind. (Draft Recovery Plan)

Young stands - forest stands not yet mature (generally, less than 50-80 years old; typically 20-40 years old). (Late-Successional Forests Report)

Z-test - a statistical test that compares the value of a test statistic. (z-value) to the standard normal distribution.

List of
Common and
Scientific Names

List of Common and Scientific Names

Common and scientific names of all vertebrate species listed in analyses and text, and of plant species as discussed by common name in the text. Scientific names of other species groups are presented in various appendices in Chapter 6. Species are listed here in alphabetical order by common name within each taxonomic class.

Nomenclature follows Hitchcock and Cronquist (1973) for plants, Williams et al. (1989) for fish, Nussbaum et al. (1983) for amphibians other than Olympic salamanders and for reptiles, Good et al. (1992) for Olympic salamanders, American Ornithologists' Union (1982) for birds, Jones et al. (1992) for mammals other than red tree voles, and Johnson and George (1991) for red tree vole.

Common name

Scientific name

Plants

Vascular plants

Douglas-fir	<i>Pseudotsuga menziesii</i>
Pacific yew	<i>Taxus brevifolia</i>
(Coast) Redwood	<i>Sequoia sempervirens</i>

Animals

Vertebrates

Fish species

(Also see Appendix 6-C for list of fish stocks)

Bull trout	<i>Salvelinus confluentus</i>
Chinook salmon	<i>Oncorhynchus tshawytscha</i>
Chum salmon	<i>Oncorhynchus keta</i>
Coho salmon	<i>Oncorhynchus kisutch</i>
Olympic mudminnow	<i>Novumbra hubbsi</i>
Oregon chub	<i>Oregonichthys crameria</i>
Pink salmon	<i>Oncorhynchus gorbuseha</i>
Redband trout	<i>Oncorhynchus mykiss gibbsi</i>
Redside shiner	<i>Richardsonius balteatus</i>
Sea-run cutthroat trout	<i>Oncorhynchus clarkii clarkii</i>
Sockeye salmon	<i>Oncorhynchus nerka</i>
Steelhead trout	<i>Oncorhynchus mykiss</i>

Amphibians

Arboreal salamander	Aneides lugubris
Black salamander	Aneides flavipunctatus
California slender salamander	Batrachoseps attenuatus
Cascade frog	Rana cascadae
Clouded salamander	Aneides ferrous
Cope's giant salamander	Dicamptodon copei
Del Norte salamander	Plethodon elongatus
Dunn's salamander	Plethodon dunni
Ensatina	Ensatina eschscholtzi
Foothill yellow-legged frog	Rana boylei
Larch Mt. salamander	Plethodon larseffi
Mount Lyell salamander	Hydromantes platycephalus
Northern leopard frog	Rana pipiens
Northwestern salamander	Ambystoma gracile
Olympic salamanders:	
Olympic torrent salamander	Rhyacotriton olympicus
Columbia torrent salamander	Rhyacotriton kezeri
Cascade torrent salamander	Rhyacotriton cascadae
Southern torrent salamander	Rhyacotriton variegatus
Oregon Slender salamander	Batrachoseps wrighti
Pacific giant salamander	Dicamptodon ensatus
Pacific treefrog	Hyla regilla
Red-bellied newt	Taricha rivularis
Red-legged frog	Bane aurora
Roughskin newt	Taricha granulosa
Shasta salamander	Hydromantes shastae
Siskiyou Mt. salamander	Plethodon stormi
Tailed frog	Ascaphus truei
Van Dyke's salamander	Plethodon vandykei
Western red-backed salamander	Plethodon vehiculum
Western spotted frog	Rana pretiosa
Western Toad	Bufo boreas

Reptiles

Common garter snake	Thamnophis sirtafis
Gopher snake	Pituophis melanoleucus
Northern alligator lizard	Elgaria coerluea
Rubber boa	Charina bottae
Sharp-tailed snake	Contia tenuis
Western aquatic garter snake	Thamnophis couehi
Western fence lizard	Sceloporus occidentatis
Western pond turtle	Clemmys marmorata
Western rattlesnake	Crotalus viridis
Western terrestrial garter snake	Thamnophis elegans

Birds

Acorn woodpecker	Melanerpes formicivorus
Allen's hummingbird	Selasphorus sasin
American kestrel	Falco sparverius

American robin	<i>Turdus migratorius</i>
Bald eagle	<i>Haliaeetus leucocephalus</i>
Band-tailed pigeon	<i>Columba fasciata</i>
Barred owl	<i>Strix varia</i>
Barrow's goldeneye	<i>Bucephala islandica</i>
Belted kingfisher	<i>Ceryle alcyon</i>
Black swift	<i>Cypseioides niger</i>
Black-backed woodpecker	<i>Picoides arcticus</i>
Black-capped chickadee	<i>Parus atricapillus</i>
Black-headed grosbeak	<i>Pheucticus melanocephalus</i>
Black-throated gray warbler	<i>Oendroica nigrescens</i>
Blue grouse	<i>Dendragapus obscurus</i>
Brewer's blackbird	<i>Euphagus cyanocephalus</i>
Brown creeper	<i>Certhia americana</i>
Bufflehead	<i>Bucephala albeola</i>
California quail	<i>Callipepla californica</i>
Calliope hummingbird	<i>Stellula calliope</i>
Cassin's finch	<i>Carpodacus cassinii</i>
Cedar waxwing	<i>Bombycilla cedrorum</i>
Chestnut-backed chickadee	<i>Parus rufescens</i>
Chipping sparrow	<i>Spizelia passerina</i>
Clark's nutcracker	<i>Nucifraga columbiana</i>
Common merganser	<i>Mergus merganser</i>
Common nighthawk	<i>Chordeiles minor</i>
Common raven	<i>Corvus corax</i>
Common redpoll	<i>Carduelis flammea</i>
Cooper's hawk	<i>Accipiter cooperi</i>
Dark-eyed junco	<i>Junco hyemalis</i>
Downy woodpecker	<i>Picoides pubescens</i>
Dusky flycatcher	<i>Empidonax oberholseri</i>
Evening grosbeak	<i>Coccothraustes vespertinus</i>
Flammulated owl	<i>Otus flammeolus</i>
Golden eagle	<i>Aquila chrysaetos</i>
Golden-crowned kinglet	<i>Regulus satrapa</i>
Gray jay	<i>Perisoreus canadensis</i>
Great blue heron	<i>Ardea herodias</i>
Great gray owl	<i>Strix nebulosa</i>
Great horned owl	<i>Bubo virginianus</i>
Hairy woodpecker	<i>Picoides villosus</i>
Hammond's flycatcher	<i>Empidonax hammondi</i>
Harlequin duck	<i>Histrionicus histrionicus</i>
Hermit thrush	<i>Catharus guttatus</i>
Hermit warbler	<i>Dendroica occidentalis</i>
Hooded merganser	<i>Lophodytes cucullatus</i>
House wren	<i>Troglodytes aedon</i>
Hutton's vireo	<i>Vireo huttoni</i>
Lewis woodpecker	<i>Melanerpes lewis</i>
Long-eared owl	<i>Asio otus</i>
MacGillivray's warbler	<i>Oporornis tolmiei</i>
Marbled murrelet	<i>Brachyramphus marmoratus</i>
Merlin	<i>Falco columbarius</i>
Merriam's turkey	<i>Meleagris merriami</i>
Mountain bluebird	<i>Sialia currucoides</i>
Mountain chickadee	<i>Parus gambeli</i>
Mountain quail	<i>Oreortyx pictus</i>
Mourning dove	<i>Zenaida macroura</i>
Nashville warbler	<i>Vermivora ruficapilla</i>
Northern flicker	<i>Colaptes auratus</i>
Northern goshawk	<i>Accipiter gentilis</i>
Northern pygmy-owl	<i>Glaucidium gnoma</i>
Northern saw-whet owl	<i>Aegolius acadicus</i>

Northern spotted owl	<i>Strix occidentalis caurina</i>
Nuttall's woodpecker	<i>Picoides nuttallii</i>
Olive-sided flycatcher	<i>Contopus borealis</i>
Orange-crowned warbler	<i>Vermivora celeta</i>
Osprey	<i>Pandion haliaetus</i>
Peregrine falcon	<i>Falco peregrinus</i>
Pileated woodpecker	<i>Dryocopus pileatus</i>
Pine grosbeak	<i>Pinicola enucleator</i>
Pine siskin	<i>Carduetis pinus</i>
Prairie falcon	<i>Falco mexicanus</i>
Purple finch	<i>Carpodacus purpureus</i>
Pygmy nuthatch	<i>Sitta pygmaea</i>
Red crossbill	<i>Loxia curvirostra</i>
Red-breasted nuthatch	<i>Sitta canadensis</i>
Red-breasted sapsucker	<i>Sphyrapicus tuber</i>
Red-tailed hawk	<i>Buteo jamaicensis</i>
Ruby-crowned kinglet	<i>Regulus calendula</i>
Ruffed grouse	<i>Bonasa umbellus</i>
Rufous hummingbird	<i>Selasphorus rufus</i>
Rufous-sided towhee	<i>Pipilo erythrophthalmus</i>
Sharp-shinned hawk	<i>Accipiter striatus</i>
Solitary vireo	<i>Vireo solitarius</i>
Song sparrow	<i>Melospiza melodia</i>
Spruce grouse	<i>Dendragapus canadensis</i>
Steller's jay	<i>Cyanocitta stelleri</i>
Swainson's thrush	<i>Catharus ustulatus</i>
Three-toed woodpecker	<i>Picoides tridactylus</i>
Townsend's solitaire	<i>Myadestes townsendi</i>
Townsend's warbler	<i>Dendroica townsendi</i>
Tree swallow	<i>Tachycineta bicolor</i>
Turkey vulture	<i>Cathartes aura</i>
Varied thrush	<i>Ixoreus naevius</i>
Vaux's swift	<i>Chaetura vauxi</i>
Violet-green swallow	<i>Tachycineta thalassina</i>
Warbling vireo	<i>Vireo gilvus</i>
Western bluebird	<i>Sialia mexicana</i>
Western flycatcher	<i>Empidonax difficilis</i>
Western screech owl	<i>Otus kennicottii</i>
Western tanager	<i>Piranga ludoviciana</i>
Western wood-peewee	<i>Contopus sordidulus</i>
Whip-poor-will	<i>Caprimulgus vociferus</i>
White-breasted nuthatch	<i>Sitta carolinensis</i>
White-headed woodpecker	<i>Picoides albolarvatus</i>
White-throated swift	<i>Aeronautes saxatalis</i>
White-winged crossbill	<i>Loxia leucoptera</i>
Wild turkey	<i>Meleagris gallopavo</i>
Williamson's sapsucker	<i>Sphyrapicus thyroideus</i>
Willow flycatcher	<i>Empidonax traillii</i>
Wilson's warbler	<i>Wilsonia pusilla</i>
Winter wren	<i>Troglodytes troglodytes</i>
Wood duck	<i>Aix sponsa</i>
Wren/it	<i>Chamaea fasciata</i>
Yellow warbler	<i>Dendroica petechia</i>
Yellow-rumped warbler	<i>Dendroica coronata</i>

Mammals

Allen's chipmunk	<i>Tamias senex</i>
American marten	<i>Martes americana</i>
Big brown bat	<i>Eptesicus fuscus</i>
Black bear	<i>Ursus americanus</i>
Brazilian free-tailed bat	<i>Tadarida brasiliensis</i>
Brush rabbit	<i>Sylvilagus bachmani</i>
Bushy-tailed woodrat	<i>Neotoma cinerea</i>
California chipmunk	<i>Tamias obscurus</i>
California myotis	<i>Myotis californicus</i>
Cascade golden-mantled ground squirrel	<i>Spermophilus saturatus</i>
Coast mole	<i>Scapanus orarius</i>
Columbian black-tailed deer	<i>Odocoileus hemionus columbianus</i>
Deer mouse	<i>Peromyscus maniculatus</i>
Douglas' squirrel	<i>Tamiasciurus douglasii</i>
Dusky shrew or Montane shrew	<i>Sorex monitcolus</i>
Dusky-footed woodrat	<i>Neotoma fuscipes</i>
Elk	<i>Cervus elaphus</i>
Ermine	<i>Mustela erminea</i>
Fisher	<i>Martes pennanti</i>
Forest deer mouse	<i>Peromyscus oreas</i>
Fringed myotis	<i>Myotis thysanodes</i>
Golden mantled ground squirrel	<i>Spermophilus lateralis</i>
Gray wolf	<i>Canis lupus</i>
Grizzly bear	<i>Ursus arctos</i>
Heather vole	<i>Phenacomys intermedius</i>
Hoary bat	<i>Lasiurus cinereus</i>
Keen's myotis	<i>Myotis keenii</i>
Little brown myotis	<i>Myotis lucifugus</i>
Long-eared myotis	<i>Myotis evotis</i>
Long-legged myotis	<i>Myotis volans</i>
Long-tailed weasel	<i>Mustela frenata</i>
Lynx	<i>Lynx canadensis</i>
Marsh shrew	<i>Sorex bendirii</i>
Masked shrew	<i>Sorex cinereus</i>
Mountain beaver	<i>Aplodontia tufa</i>
Mountain lion	<i>Felis concolor</i>
Mule deer	<i>Odocoileus hemionus</i>
Northern flying squirrel	<i>Glaucomys sabrinus</i>
Opposum	<i>Didelphis virginiana</i>
Pacific jumping mouse	<i>Zapus trinotatus</i>
Pacific shrew	<i>Sorex pacificus</i>
Pallid bat	<i>Antrozous pallidus</i>
Pinyon mouse	<i>Peromyscus truei</i>
Porcupine	<i>Erethizon dorsatum</i>
Raccoon	<i>Procyon lotor</i>
Red tree vole	<i>Arborimus longicaudus</i>
Red tree vole (California Pomo tree vole)	<i>Arborimus pomo</i>
Ringtail	<i>Bassariscus astutus</i>
Shrew-mole	<i>Neurotrichus gibbsii</i>
Silver-haired bat	<i>Lasiorycteris noctivagans</i>
Siskiyou chipmunk	<i>Tamias siskiyou</i>
Snowshoe hare	<i>Lepus americanus</i>
Southern red-backed vole	<i>Clethrionomys gapperi</i>
Townsend's chipmunk	<i>Tamias townsendii</i>
Trowbridge's shrew	<i>Sorex trowbridgii</i>
Vagrant shrew	<i>Sorex vagrans</i>
Western gray squirrel	<i>Sciurus griseus</i>
Western jumping mouse	<i>Zapus princeps</i>

Western red bat	<i>Lasiurus blossevillii</i>
Western red-backed vole	<i>Clethrionomys californicus</i>
Western small-footed myotis	<i>Myotis ciliolabrum</i>
Western (Townsend's) big-eared bat	<i>Plecotus townsendii</i>
White-footed vole	<i>Phenacomys albipes</i>
Wolverine	<i>Gulo gulo</i>
Yellow pine chipmunk	<i>Tamias amoenus</i>
Yellow-cheeked chipmunk	<i>Tamias ochrogenys</i>
Yuma myotis	<i>Myotis yumanensis</i>

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