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# Eugene District Resource Management Plan and Environmental Impact Statement

Volume II



As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interest of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

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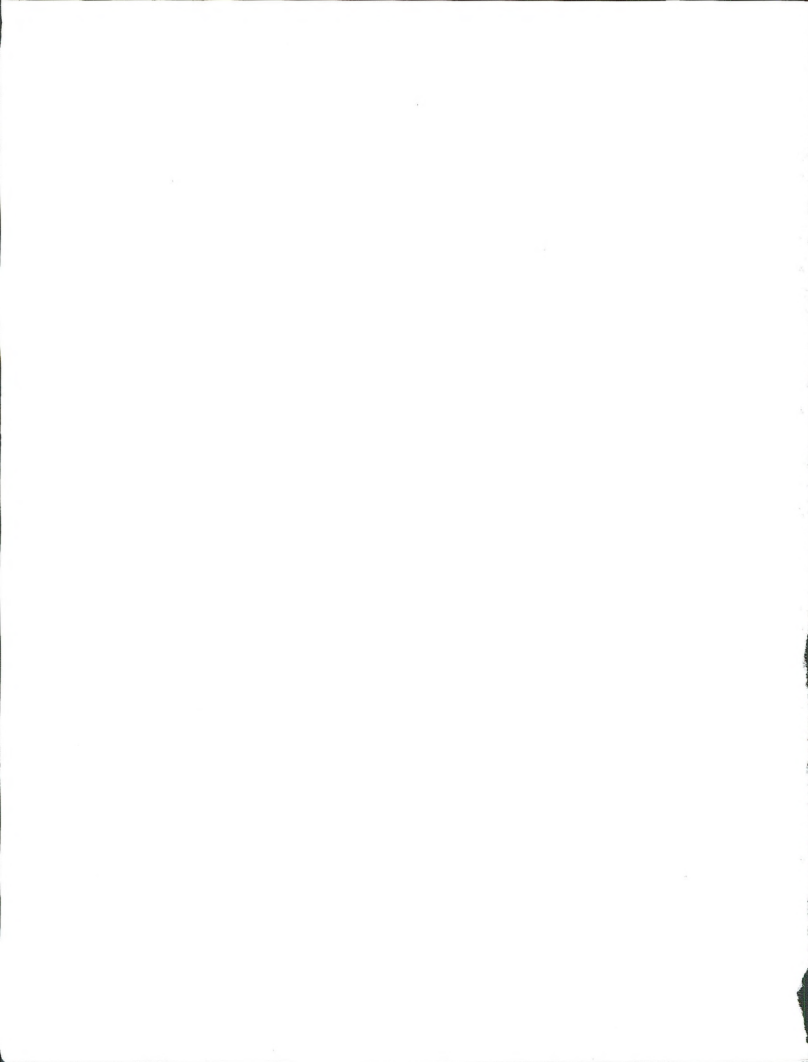
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# Appendices

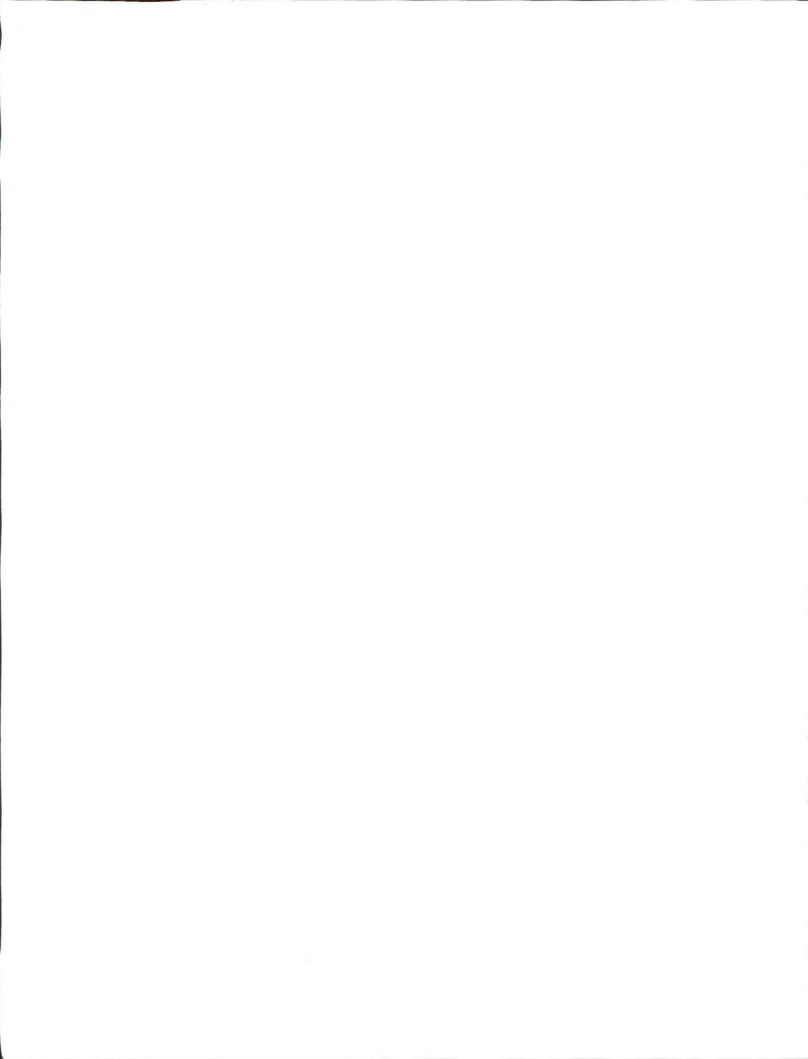
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# Chapter 1

## Appendix



## Appendix 1-A. Legal Guidelines

The following statutes and executive orders (as amended) constitute the major legal guidance for planning and management of lands administered by BLM in western Oregon. This list is not necessarily all inclusive but does represent the primary legal guidance to be considered in preparation of the Resource Management Plan.

Federal Land Policy and Management Act of 1976 (FLPMA)	43 USC 1701
The O&C Sustained Yield Act of 1937	43 USC 1181a
National Environmental Policy Act of 1969 (NEPA)	42 USC 4321
Environmental Quality Improvement Act of 1970	42 USC 4371
Executive Order 11514, Protection and Enhancement of Environmental Quality (1970)	
Taylor Grazing Act	43 USC 315
Recreation and Public Purposes Act	43 USC 869
Unlawful Inclosures or Occupancy Act	43 USC 1061
Mining and Minerals Policy Act of 1970	30 USC 21a
Mining Act of 1872	30 USC 26
Mineral Leasing Act of 1920 (Mineral Lands Leasing Act)	30 USC 181
Materials Act of 1947	30 USC 601
Geothermal Steam Act of 1970	30 USC 1001
Geothermal Energy Act of 1980	30 USC 1501
Antiquities Act of 1906	16 USC 431
Historic Sites, Buildings, and Antiquities Act	16 USC 461
National Historic Preservation Act	16 USC 470
Archaeological Resources Protection Act of 1979	16 USC 470aa
Reservoir Salvage Act of 1960	16 USC 580m-n
Fish and Wildlife Coordination Act	16 USC 661
Bald Eagle Protection Act	16 USC 668
Sikes Act	16 USC 670a
Migratory Bird Treaty Act	16 USC 703
Migratory Bird Conservation Act	16 USC 715
Wilderness Act	16 USC 1131
National Trail Systems Act	16 USC 1241
Wild and Scenic Rivers Act	16 USC 1271
Executive Order 11644, Use of Off-Road Vehicles on the Public Lands (1972)	
Executive Order 11989, Off-Road Vehicles on Public Lands (1977)	
Wild Free-Roaming Horses and Burros Act	16 USC 1331
Coastal Zone Management Act of 1972	16 USC 1451
Endangered Species Act of 1973	16 USC 1531
Soil and Water Resources Conservation Act of 1977	16 USC 2001
Executive Order 11988, Floodplain Management (1977)	
Executive Order 11990, Protection of Wetlands (1977)	
Coastal Barriers Resources Act	16 USC 3501
Land and Water Conservation Fund Act of 1965	16 USC 4601-4
Federal Water Pollution Control Act/Clean Water Act	33 USC 1251
Safe Drinking Water Act	42 USC 300 (f)
American Indian Religious Freedom Act	42 USC 1996
Resource Conservation and Recovery Act of 1976	42 USC 6901
Clean Air Act	42 USC 7401
Comprehensive Environmental Response, Compensation and Liability Act of 1980	42 USC 9601
Emergency Planning and Community Right-to-Know Act of 1986	42 USC 11001





## Appendix 1-B. Portions of *Record of Decision, Northwest Area Noxious Weed Control Program*

The following is verbatim from the *Supplemental Record of Decision, Northwest Area Noxious Weed Control Program* of May 5, 1987. (The remainder of the Supplemental Record of Decision, including the Rationale, is incorporated by reference):

### The Decision and Its Specific Provisions

To control or eradicate noxious weeds, BLM will use six commercial products containing herbicides: Banvel, Rodeo, Tordon 22K, Tordon 2K, Esteron 99 and DMA-4. These formulations contain different herbicides designed to kill or retard the growth of noxious weeds: dicamba in Banvel; glyphosate in Rodeo; picloram in Tordon 22K and Tordon 2K; and 2,4-D in Esteron 99 and DMA-4.

BLM will use the herbicide formulations as part of its ongoing program for controlling or eradicating noxious weeds. BLM has been using three methods. If noxious weeds are susceptible to insects, pathogens, or grazing by goats or sheep, BLM may introduce those biological agents to retard weed growth. BLM may also use laborers to manually remove noxious weeds and apply mechanical treatment—burning, mowing, and tilling. With this record of decision, BLM may use the herbicide formulations as a fourth technique.<sup>1</sup>

The provisions governing the use of Banvel, Rodeo, Tordon 22K, Tordon 2K, Esteron 99 and DMA-4 to control or eradicate noxious weeds parallels the features stated under Alternative I in the FEIS, Chapter I; the SEIS, Appendix I; and BLM policy statements and manuals referred to in those documents. The word "parallels" is used because the decision in several instances differs from the original proposal by requiring the more judicious use of the substances to avoid or minimize environmental effects of their use.

BLM will apply Banvel, Rodeo, Tordon 22K, Tordon 2K, Esteron 99 and DMA-4 only in accordance with the standards that the Environmental Protection Agency (EPA) imposes upon their public use. These standards are stated on the product labels.

BLM will use the commercial products only if the noxious weeds targeted for treatment are susceptible or highly susceptible to their herbicides. What this means is that the commercial products' herbicides, with one treatment, can retard at least 85 percent of the growth of the targeted noxious weeds. BLM will not use herbicide formulations if another method is more effective.

The herbicide formulations may be applied by helicopter; by ground vehicles equipped with boom or hand-gun sprayers; or by workers with backpack sprayers, broadcast cyclone sprayers, or tools for hand wiping the substances onto the plants.

Ordinarily, two considerations govern the choice of method. The choice first depends upon the treatment objective, topography of the treatment area, expected costs, and equipment limitations. The second consideration is the selectivity of the herbicides. Since Rodeo, which contains glyphosate, is not selective in the plants it kills or retards, it may be applied only from the ground to the noxious weeds targeted for treatment. And because the other herbicide formulations are toxic to conifer seedlings, the same restriction applies to how these herbicides are applied if conifers are being grown as commercial timber on the site to be treated. The restriction does not apply once the conifer seedlings become dormant, usually in the late summer. Unless conifers are present, the herbicides in Banvel (dicamba), Tordon 22K and Tordon 2K (picloram), and Esteron 99 and DMA-4 (2,4-D) may be applied by any method.

In applying the herbicide formulations, BLM will also abide by the following measures to reduce environmental impacts. None of the products may be applied within 500 feet of any residence or other place of human occupation unless the occupant or resident gives his consent in writing. Commercial products will not be applied within 100 feet of any croplands or by helicopter within 100 feet of any surface waters or identified ground water recharge area. Nor will the commercial products be applied by ground vehicles equipped with boom sprayers within 25 feet of any waters. Spot treatments with vehicle-mounted hand-guns or with backpacks will not be applied within 10

<sup>1</sup>BLM will not use products containing dicamba, glyphosate, picloram, and 2,4-D on public lands administered by its Oregon State Office until the court dissolves its injunction in *Northwest Coalition for Alternatives to Pesticides v. Block et al.*, No 83-8272-E (D. Ore. 1984).

feet of water. Herbicides will be wiped on individual plants up to the current water line and will be applied by helicopters only when wind velocity does not exceed 5 miles per hour. Wind speeds may not exceed 8 miles per hour under any other herbicide application method.

Certain restrictions also govern the equipment used to apply the formulations. Spray nozzles on all helicopters and ground vehicles must be set to produce spray droplets with a median diameter of 200 microns or larger. Helicopter and ground vehicle equipment must also operate with a boom pressure of 20-35 pounds per square inch, unless the herbicide's label specifies a different pressure. Aerial applications must be within 100 feet of the ground. Backpack applications of liquid formulations will be allowed only with low nozzle pressure and within 2.5 feet of the ground. Granular formulations will be applied by broadcast spreaders only within 3.5 feet of the ground.

One final set of restrictions governs the maximum amount of the herbicides in each of the commercial products that may be applied. The FEIS, as modified by the SEIS, includes a table showing the maximum rates of application. BLM's proposal was to apply dicamba at 6 pounds per acre, glyphosate at 3 pounds per acre, picloram at 1 pound per acre, and 2,4-D at 3 pounds per acre. If, however, small animals susceptible to dicamba or 2,4-D are on the site to be treated and represent sensitive wildlife species in the area, BLM will not use these substances if glyphosate or picloram can be used instead. Or, if that is not possible, BLM will substantially reduce the amount of dicamba or 2,4-D to be applied per application. In addition, BLM ordinarily will apply the commercial products only once a year to any site and, except under circumstances where control or eradication goals are not achieved, no more than three times during the program's span.

The provisions governing BLM's use of herbicides in this program require measures to mitigate possible environmental effects. More mitigation measures are included in the FEIS, the SEIS, and the policy statements and manuals they cite. All are incorporated by reference into this supplemental record of decision. The purpose of the mitigation measures is to ensure the judicious use of the herbicides.

BLM projects that it will annually use the herbicide formulations to control or eradicate noxious weeds on about 21,300 acres of the public lands in the Northwest: 7,800 acres in Idaho, 5,600 acres in Montana, 6,600 acres in Oregon and Washington, and 1,300 acres in Wyoming.

BLM will treat public lands infested or potentially threatened by noxious weeds according to a set of priorities, which are detailed in the SEIS, page 119. The priorities represent BLM's commitment to pursue all existing methods for controlling or eradicating noxious weeds, including the use of herbicide formulations, with no undue reliance on any one means. The priorities detailed in the SEIS are part of this decision.

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*The following is verbatim from the original Record of Decision of April 7, 1986. (The remainder of the Record of Decision is incorporated by reference):*

## Management Emphasis

To give definition to the integrated management called for by this decision, the Bureau also shall treat public lands infested or potentially threatened by noxious weeds according to a set of priorities. The priorities are three-fold: (1) prevention, i.e., stopping noxious weed species from being introduced onto public lands; (2) eradication, i.e., halting the spread of noxious weeds by eradicating invading noxious weeds; and (3) control, i.e., limiting well established infestations competing with desired vegetation. The remaining program direction on setting priorities for treatment largely represents a paraphrase of the consensus reached in Idaho between the BLM State Office there and affected interests.

Priority I and II - prevention and eradication of new invaders. Prevention is often the most practical means of controlling noxious weeds. This priority shall be accomplished in part by educating public land users, and where possible, conditioning their use in a way that improves the chances that new weed seeds are not carried onto public lands. The agency's first treatment priority shall be stopping a given species from contaminating an area. More concretely, priority in treatment shall be given to those areas that noxious weeds have newly invaded. Eradicating new invaders shall have highest priority in treatment and funding.

Priority III - control. Weed species in this treatment priority are those that have become so established that for all practical purposes eradication is not feasible. Under this priority, noxious weeds will be treated for the purpose of reducing the population to a level that restores an area's ecological balance and productivity. The amount of control must be balanced between the costs involved and the prospect for success. Components of this category include: (1) emphasis will be placed on containing and preventing further spread of the infestation; (2) highest priority will be given to "breakouts" from the infested area and along rights-of-

way or adjacent to private property; and (3) biological agents, when and where available, will be emphasized on main infestations when the agent demonstrates practical effectiveness against the weed.

## Program Design Features

To give further definition to the Bureau's program, and recognizing that the available techniques carry different costs, efficiencies and environmental risks, the decision adopts the program design features from the EIS (Appendix I and Chapter 1) for deciding upon and governing use of a particular technique. In stating the design features, the agency does so to make personnel charged with implementing the program aware of the concerns and

constraints about using different means. The design features are to strengthen and supplement the judgement of qualified agency professionals who have on the ground knowledge and familiarity with local conditions and needs.

Four chemicals are authorized for use under this decision. They are 2,4-D, picloram, dicamba, and glyphosate. Other or new herbicides could be proposed for use in the future, but before their use, all required environmental analysis, including a hazard assessment similar to that in Appendix K of the EIS, will be conducted and appropriately documented.

The Bureau will use the herbicide to which the targeted weed species is most susceptible and will be of least detriment to non-target vegetation.

The chemicals may be applied individually or in combination. Glyphosate, picloram, dicamba and 2,4-D will be applied only when in accordance with the Environmental Protection Agency's label and registration restrictions. All safety requirements and project features described in Appendix I of the EIS will be followed. All application methods may be used for each herbicide except glyphosate; it will not be applied aerially.

Conditions indicating preference for a particular method of application are as follows:

- Applications using backpack spraying, hand wiping and cyclone broadcast spreading (granular formulations only) will be used in areas not accessible by ground vehicles. Treatment area will generally range in size from individual plants to a few acres.

- Applications using a vehicle mounted boom or handgun will be used in areas readily accessible by vehicle. Booms are used to treat continuous weed concentration areas (i.e., along rights-of-way) while handguns are used to treat concentrated spots.
- Aerial applications will be accomplished using helicopters to treat larger contiguous areas, but normally not exceeding 100 acres in size.

Minimum buffer strips will meet or exceed state-mandated standards for all herbicides applied.

- In aerial applications a 500 foot unsprayed buffer strip will be left next to inhabited dwellings unless waived in writing by the resident. A buffer strip of 100 feet will be left next to cropland and barns.
- Boom sprayers will not be used within 25 feet of water bodies.
- Granular formulations will be applied no closer than 10 feet from the high water line of streams and other water bodies.
- Contact systemic herbicides wiped on individual plants may be used up to the existing high water line.

Wind velocities for chemical applications of herbicides must be 10 mph or less in all instances. Where aerial applications of liquid herbicides are utilized, the wind speed must be 5 mph or less. Where vehicle and hand applications of herbicides are used, the wind velocity must be 8 mph or less except in riparian areas where the wind speed must be 5 mph or less.

Spray nozzles are designed for aerial and ground vehicles spray equipment to produce droplets large enough (200 microns or larger) in order to limit the amount of drift. Aerial application equipment will normally operate with a boom pressure of 20 to 35 pounds per square inch, unless the product label specifies a different pressure. Backpack application of liquid herbicide will occur with low nozzle pressure and within 2.5 feet of the ground surface. Applications of granular formulations through use of broadcast spreaders occur from about 3.5 feet above the ground.

Four major methods of manual and mechanical control are authorized for use under this decision. These are hand pulling and using hand tools, tillage, mowing and controlled burning.

- Hand pulling and using hand tools to remove noxious weeds may be used when no other

means is available to control or eradicate the targeted noxious weed.

- Tillage, either by burial or disturbing the root system, to control or eradicate noxious weeds may be used under these circumstances:
  - slope does not exceed 10 percent.
  - nontarget species adversely affected represent an insubstantial amount of vegetation cover or forage for wildlife.
- Mowing may be used to control or eradicate noxious weeds under these circumstances:
  - the targeted noxious weed lacks rosettes or rhizomes and fails to produce seed heads close to the ground.
  - the targeted noxious weed is easily accessible by vehicles.
- Controlled burning may be used to control or eradicate noxious weeds under these circumstances:
  - the targeted noxious weed represents the vast majority of plants in the treatment area.
  - the burn is in accordance with BLM's Fire Management Policy (BLM Manual 9210).
  - the burned area can be rehabilitated to prevent erosion and resource degradation.
  - burning permit, when required, must be obtained.

Biological agents will be considered for use where they have demonstrated practical effectiveness in controlling the target noxious weed species. This does not preclude the use of biological agents from an experimental standpoint.

Each biological agent must be cleared for use on the targeted noxious weed as required under Executive Order No. 11987 (May 24, 1977). The following conditions are the most favorable for successful biological control.

- The biological agent is highly selective and will only affect the weed species intended for control.
- The mobility of the biological agent is sufficient to allow spread among the targeted weed community.

- The development of populations of biological parasites should be able to overtake the population of the target weed species.
- Biological agents used in a particular area or region of the targeted noxious weed should be able to adapt and be capable of surviving and reproducing.

## Mitigation Measures

A number of mitigating measures which exceed standard BLM requirements, have been identified in the Environmental Impact Statement and are adopted by this Record of Decision. The program design features just announced also can be thought of as mitigating measures. In addition to the measures governing chemical treatments announced in the project design feature section here and the EIS, the following provisions also apply.

1. Due to the low no observable effect level (NOEL) for reproductive effects from Dicamba, female applicators will be restricted from working with Dicamba.
2. Due to the lowered margin of safety for the mixer loader from accidents, the mixer loader will wear a full length apron, face shield, rubber gloves, and liquid repellent footwear during the mixing and loading operation.
3. To prevent gross errors in the field in mixing, regular testing on field calibration and calculation will take place.
4. Due to the remote nature of the treatment areas, sufficient clean water will be available on the sprayer mixing and project sites to assure the opportunity for workers to wash off any chemicals splashed inadvertently onto skin.

To reiterate, all chemicals will be applied only when it is in accordance with EPA standards specified on the herbicide's label.

## Monitoring and Studies

Table 1 summarizes the major monitoring activities which will be conducted under the decision. The purpose of the monitoring plan is to ensure that implementation occurs as planned and to ascertain the effectiveness of project design features and mitigation measures in meeting planned objectives. Information gained from monitoring will also be used to develop an improved data base from which to build future plans.

Much of the monitoring will be accomplished through normal operating procedures such as contract administration and staff review. Special systems have been developed to measure the biological and physical impacts of plan implementation. For example, control effectiveness will be monitored by post-treatment surveys designed to measure the actual effectiveness of a treatment or combination of treatments. When appropriate, monitoring will include recommendations for additional treatment and/or site rehabilitation.

## Implementation and Additional Analysis

This Record of Decision is the next followup program step after completion of a final EIS. The process includes selection of the best alternative, or combination of alternatives, which in this case is Alternative 1. The decision becomes effective upon signature and issuance of this ROD, and BLM will proceed to implement the decision.

The EIS is a regional programmatic statement for controlling noxious weeds on BLM-administered land in Idaho, Montana, Oregon, Washington, and Wyoming and is intended to guide this program for the next 10-15 years. Site-specific environmental analysis and documentation (including application of categorical exclusions where appropriate) will be accomplished at the district level on proposed weed control plans. During site-specific analysis and documentation, public involvement will occur in accordance with the CEQ Regulations for implementing NEPA. Interdisciplinary impact analyses will be based upon this and other EISs, such as resource management plan, timber management plan, and grazing management plan EISs.

If analysis finds potential for significant impacts not already described in an existing EIS, another EIS or a supplement to an existing EIS may be required.

**Table 1. Monitoring Plan**

Monitoring Element	Method	Frequency	Characteristics Evaluated
Pretreatment Survey	On site visual inspection	Each treatment area	Species present, density endangered species present, control options, method chosen
Post Treatment Survey	On site inspection	Each treatment area	Effectiveness, need for retreatment, corrective measures or mitigation
Pesticide Use Proposal	Review of proposal and EPA registration by authorized certified applicator.	Prior to any herbicide application	Proposal compared to EPA registration requirements and ROD compliance
Water Monitoring Samples	Pre and post treatment water samples when program is near potable sources and could get into water.	As needed	Potential water contamination
Coordination Monitoring	Weed management plans submitted to Washington D.C.	Yearly	Coordination of plan
Biological Establishment	Survey of biocontrol agents release and establishment	State/District yearly	Establishment, effectiveness, and rate of spread of biological control agents.
Threatened and Endangered Surveys	Survey for T&E species prior to action	Each project	Presence of T&E species
Cultural Resource Surveys	Survey for archeological and historical resources	Each project which involves surface disturbance	Presence of cultural resources



# Appendix 1-C. Key Sections of 1992 *Record of Decision*, the *Western Oregon Program - Management of Competing Vegetation Environmental Impact Statement*

## The Decision

In managing competing and unwanted vegetation, the BLM's Decision is to combine features from the eight original alternatives to implement integrated vegetative management, emphasize a preventive strategy, reduce reliance on herbicides, and maintain the flexibility to potentially use all available treatment options in western Oregon. The Decision provides western Oregon-wide program guidance for the vegetation management program in a manner that is flexible for addressing site-specific variables occurring in the resource areas in the Cascade, Coastal and Klamath Provinces in western Oregon.

The BLM has given considerable analysis to the formulation and selection of the Decision features, weighed the risks associated with its implementation against the risks and severity of possible adverse impacts, evaluated public comments, consulted with professionals including accredited toxicologists, analyzed the process involving the USFS mediation document and their implementation guide, solicited public input on the FEIS, and released a draft ROD for public review and comment.

As the FEIS provided, the Decision combines features from the original alternatives in the FEIS, identifies a vegetative management process, specifies project design features and mitigating measures. The Decision emphasizes planning and monitoring, employing a preventive strategy, and reducing reliance on herbicide use.

Important distinctions specific to this approach are as follows:

- A judicious approach to vegetative management through systematic (sequential) program and site-specific planning and analysis where vegetation manipulation is expected to be needed.
  - Development of action thresholds for plant communities with the intent of defining conditions that trigger potential needs for corrective treatments, anticipating competition problems, and assisting in monitoring activities. Involves verifying appropriate thresholds for local conditions and effectiveness of the prescription and techniques.
- A specified limit on yearly potential herbicide acreage available to reduce reliance on herbicides.
  - Pursuit of adequate funding to make alternative treatments feasible.
  - Recognition that herbicides, their formulations, and application techniques vary widely in their potential health effects, and that these decisions should be made on a site-specific basis with the risks of each method and their potential exposures being an important part of the Job Hazard Analysis and risk assessment.

A cap is placed on herbicide treatment in western Oregon in any one year; it will not exceed 8,800 acres. This Decision will retain the current emphasis for the BLM to continue its search for nonchemical methods of vegetative management when control is needed.

Another important part of the Decision is the acceptance of the qualitative risk assessment of BLM Appendix L done by the University of Washington (USFS 1988 FEIS, Appendix H), which was reserved in the FEIS until development of the Final ROD. Acceptance of the qualitative risk assessment signifies its incorporation into the FEIS and this ROD. This qualitative risk assessment addresses the quality of the data underlying the quantitative risk assessment.

The potential impacts of the Decision are within the scope of impacts discussed in the FEIS for the eight alternatives and the significant aspects of their environmental consequences.

## Scope of the Decision

This FEIS and ROD apply to all BLM-administered land in the Coos Bay, Eugene, Medford, Roseburg, and Salem districts, and the portion of the Lakeview District previously within the Medford District prior to 1987. Further, the decision applies only to the portion of each activity that pertains to management of competitive and unwanted vegetation. Excepted from the decision is noxious weed control which is analyzed in a separate document, the Northwest Area Noxious Weed Control Program EIS (1986).

The Decision approach is to emphasize the use of prevention and natural processes to manage compet-

ing and unwanted vegetation. The decision applies to vegetation management planning and control activities, and sets guidelines and standard operating procedures for implementing such programs.

Treatment options available for consideration in the integrated management program include biological, manual, prescribed fire, mechanical, and chemical methods and techniques. In forest land management programs, these treatments are often essential for the establishment and maintenance of desired plants and for achieving good growth rates of desired vegetation to meet management goals. While controlling competition is key to both of these objectives, the manner in which adequate control of competitive vegetation is achieved varies. It is the variability, need, and manner of manipulation to ameliorate harmful competitive or unwanted vegetation that must be identified, analyzed and communicated on a site-by-site basis.

Planning and implementation of activities on a site-specific project basis will be done according to the NEPA process, and correlated with guidance set forth in this FEIS/ROD and approved land use plans. Site-specific projects may be planned and analyzed on either an individual or group basis.

## General Provisions

The focus is two-fold: (1) To prevent or minimize the need for future vegetation management or corrective action and also subsequently the need for later treatments, and (2) To emphasize the use of preventive and natural processes.

The Decision is designed to protect human health and promote long-term productivity of the forest ecosystem while meeting the goals and objectives of management plans for such activities as timber production, habitat management, and maintenance of both transportation systems and recreation sites.

It combines a number of features from the eight original alternatives when corrective action is needed, minimizes impacts on air quality from prescribed fire, and reduces the potential for adverse human health effects.

To facilitate ongoing public involvement, the Decision provides for an interactive review of the vegetation management process throughout planning until project implementation. A public consultation process is also defined.

## Guidelines for implementing the Decision are as follows:

- *Ecological relationships will be emphasized in designing program activities to meet land management objectives (such as timber harvest, roadside maintenance, wildlife habitat restoration).*
- *Human health risks to the public and workers will be evaluated to determine major design features.*
- *Where prevention is no longer a viable option, effective early treatment and alternatives to herbicides of special consideration are to be given priority.*

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## Vegetation Management Process

Definite steps recognized in the vegetative management process are as follows:

### Step 1

Site analysis determines site conditions and potential needs for treatments according to objectives for the site.

### Step 2

Strategies are evaluated to select the best planned course of action to implement a preventive approach, in the long term at a minimum.

### Step 3

Project design for proposed treatment is developed which includes mitigating measures, public involvement, risk management, monitoring, and predicting of vegetation response.

### Step 4

Vegetative management action implemented.

### Step 5

Monitoring initiated to determine if course of action taken was effective and if further action is needed to promote the preventive approach.

## Important Concepts to the Process

Concepts integral to the vegetation management process for the preventive approach include Integrated Pest Management, Prevention, Thresholds, and



Scheduling of Detection and Action as described in the following sections.

## Integrated Pest Management (IPM)

"IPM is a systems approach to reduce pest damage (competitive and unwanted vegetation) to tolerable levels through a variety of techniques, including natural predators and parasites, genetically resistant hosts, environmental modifications and when necessary and appropriate, chemical pesticides." (BLM M-9220) For clarity, the decision expands the IPM definition in the FEIS glossary to reflect the generic definition. Further, for consistency, this definition will be used in all BLM western Oregon vegetation management planning and implementation.

IPM generally relies upon a combination of strategies, treatment options and techniques as preventive and corrective defense mechanisms against competitive and unwanted vegetation. When initiated early IPM can avoid vegetative management problems and, when needed, employ a variety of methods and techniques.

The BLM recognizes that the success of IPM is dependent upon several factors: knowledge of vegetative management strategies; a broad range of specific technical skills; planning, monitoring and implementing of multiple interactive steps over a fairly long time frame; potentially-high initial capital investments (e.g., mowers in roadside vegetative control); and consistent funding. Without the development of a vegetative community strategy, and without the planning that considers both single and sequential steps and treatment options, it is common for timing to be short between problem identification and action, and for there to be a lack of the available skills, workmonths, and funding to achieve the objectives. In the latter instances, and when unexpected situations occur, corrective or rescue actions are necessary to meet management objectives; IPM is then limited to select control alternatives or no action.

In view of the importance of an effective IPM program to the prevention strategy, the BLM will strive to have appropriate resources available. The BLM will encourage research on specific forest ecosystems and continue analysis on a site-by-site basis, linking these necessary steps to implement effective IPM programs and enable vegetative manipulation that avoids or reduces competitive and unwanted vegetation to acceptable levels. The BLM will also continue to support research towards gaining a thorough knowledge of the requirements of competitive and unwanted vegetation, and of the needs and vegetative growth

characteristics of desired vegetation. Any actions that are similar or cumulative should ideally be anticipated during project planning stages and used to determine both the need and timing for control efforts under an IPM program.

## Prevention Strategy

A key to implementing the Decision is the major emphasis on prevention as the priority strategy being accomplished through planning, to identify and take advantage of any situations where competitive or unwanted vegetation may not interfere with objectives, or to reduce the need for corrective actions.

In the context of the Decision, the term "prevention" will mean "to detect and ameliorate the conditions that cause or favor the presence of competing or unwanted vegetation in the forests. Prevention is in contrast to treatment, which refers to activities for controlling or eradicating infestations of competing or unwanted vegetation. It also should not be confused with early treatment, which refers to activities for controlling or eradicating existing, small infestations of competing or unwanted vegetation before they interfere with the agency's objectives for managing that area or adjacent lands." (USFS, Med. Doc., 1989.)

Emphasis is on prevention and then early action if action is needed. Other strategies include no action, correction, maintenance, and rescue and restoration. The potential for prevention or another strategy to achieve the goals for a given site will be analyzed prior to commencing any sequence of treatments. The concept of prevention as a planned course of action in forest management has continued to develop and gain emphasis during the past decade as an accepted vegetative management strategy. It was a scoping issue in 1982 at which time it was proposed that such practices be considered under all alternatives and used whenever feasible.

## Thresholds Concept

Determining damage and action thresholds is an important part of determining the need for action during the vegetation management analysis process. Thresholds are a measure of the degree or level of competition which depletes environmental resources to the disadvantage of a desired plant.

The appropriate timing of vegetative manipulation should involve determining both damage and action thresholds for control of competitive and unwanted vegetation. Damage thresholds refer to the levels of

vegetation abundance where there is a marked decrease in rate of the desired plants' survival and growth.

There appear to be two separate thresholds: one for tree survival and establishment, and another for growth maintenance and release. A survival damage threshold may have a competitive vegetation density level many times greater than the levels desired for optimal growth (free-to-grow), at least for short periods. Also, adequate growth often infers far less than that for "free-to-grow" status.

Because plant communities are a complex aggregation of plants and animals, the thresholds need to be identified and tested for efficacy and dose response at the plant community, or on a more localized level, and over various time periods including periods of drought and adequate moisture. Variance of floristics, dominance, growth habits, and succession from site-to-site may indicate a need for intensive vegetative control in some locations and during some time periods, yet very little control in other years and locations. Meeting the management objectives and maintaining forest health for one or more similar sites is the key to determining thresholds and selecting a vegetative management approach.

Determination of competitive thresholds give managers a better analytical approach in making choices about treatment need, treatment method, technique efficacy, and seedling performance on similar or comparable sites. It will also help determine the appropriate degree of tool intensity necessary to attain an expected level of plantation performance (Wagner et al 1989; Radosevich, et al 1990 New Zealand). To emphasize effective preventive strategies, the BLM will continue developing, modeling, testing, and evaluating appropriate thresholds for action on a plant or ecological community basis.

## Scheduling of Detection and Action

Because planning is essential to the prevention strategy, it is necessary to document site evaluations, develop a time-line for the occurrence of expected problems if action is prescribed, and use a pretreatment survey to verify if action is expected to be implemented. Strategies such as planning to avoid certain competitive conditions, developing alternative silvicultural schemes, and taking early action will generally minimize damage and often preclude further treatment.

The time to detect and ameliorate unwanted or competitive vegetation conditions is early in the project planning stages, before growth loss of desired vegeta-

tion becomes serious, and before major corrective action is required. This determination of need can occur during regularly scheduled surveys, project analysis, and young stand monitoring.

## Priorities

Based upon the foregoing, BLM establishes the following vegetation management priorities in selecting and designing treatment methods to achieve site-specific management objectives:

**Priority 1** - Plan at the earliest opportunity to detect and ameliorate conditions that cause or favor the presence of competitive and unwanted vegetation. Also, review data from past treatments of comparable sites to determine potential need and treatment effectiveness.

**Priority 2** - Search for, and use, effective nonchemical methods of vegetation control and selective treatments when feasible. Manipulate the potential vegetation and timing of any prescribed actions to attain the desired conditions and minimize the overall need for control of competitive vegetation.

**Priority 3** - Use herbicides only after fully considering the effectiveness of all reasonable treatment options, combinations with various methods of manipulation, and herbicide environmental effects, safety, human health risks (exposure), specificity, effectiveness, and their relative costs of implementation. This includes reducing both use levels and exposures to herbicide by employing application techniques and efficient formulations to improve effectiveness and selectivity, minimizing size of treatment areas, and where feasible combining the herbicide option within a mix of other treatments and methods for a program of integrated pest management.

Because not all potential problems develop and many that develop do not reach a threshold level, it may be appropriate for managers to defer action on some units or portions of units to see if problems do develop or if the potential is serious. Generally, however, whenever treatment is needed it is best to take the earliest available action identified to maintain adequate conditions and growth for desired plants. The earliest action often is to manipulate or reduce the problem vegetation while that vegetation is small and easy to treat.

It may not always be necessary to collect new data to respond to issues and evaluate alternatives strategies. Applicable information may be found in existing site records, or from other comparable sites.

## Herbicides Available for Use

When herbicides are considered, BLM could use formulations that contain one or more of the following herbicides: asulam, atrazine, 2,4-D, dicamba, glyphosate, hexazinone, picloram, and triclopyr. These herbicides were analyzed for use in the FEIS, and in Appendices D and H which are incorporated into the BLM's FEIS. Use of these chemicals is subject to special mitigation measures summarized in this ROD, and the guidance provided in the Herbicide Profiles.

The selection of herbicides to use, along with the guidance provided in this ROD, recognized that some data gaps exist (see Chapter 6). However, in general, the data gaps occurred where initial experiments did not meet current standards. Also, see Appendix D which was prepared to address data gaps.

## Herbicide Formulations and Inert Ingredients

The BLM encourages the use of the least toxic inert ingredients available and requires the disclosure of data necessary to determine conditions of safety before a product can be used.

The reason for this precaution is that most chronic tests of herbicides do not use the full formula, but test only the active ingredient. A high proportion of these formulations have "inert" ingredients which often are neither chemically nor biologically inert and may have substantial toxicity themselves (see Appendix H).

Accordingly, only those formulations that do not contain inert ingredients on EPA's List 1 and 2 will be used, unless the risk associated with the listed inert ingredients is evaluated and the formulation found acceptable. In addition to considering EPA information to judge and select the least hazardous inert formulations available for use, BLM will use publicly available manufacturers' data and request acknowledgement about List 1 and 2 inert ingredients.

Two inert ingredients of concern—kerosene and diesel oil (both petroleum distillates)—have been reviewed by the BLM. It was determined that kerosene and diesel oil would not add significantly to the potency of the formulations. Their use will, however, be subject to the following guidelines:

- Kerosene will not be used in herbicide applications except as an inert ingredient in the formulations of 2,4-D (Esteron) and triclopyr (Garlon 4).

- Diesel oil will not be used in herbicide applications as a carrier; however, diesel oil may be used as an adjuvant (not to exceed five percent of spray mixture) (USFS, Region 6 FEIS).

## Herbicide Use Restrictions and Precautions

An annual cap of 8,800 acres is placed on herbicide use during the effective life of this FEIS to reduce reliance on herbicides. Herbicides will be used only when other methods are ineffective, or will increase project cost unreasonably. This decision does not infer that herbicides are ineffective or costly. Rather, this decision to limit herbicide use arises from a concern among many people, including professionals, about the use of herbicides.

Further, when selecting a herbicide, the BLM will use only those herbicides for which herbicide profiles are, or will be, available.

Although markedly less toxic than insecticides, herbicides must be handled and applied with care. This need for caution is the reason that EPA registers herbicides, the BLM conducts risk analyses for program and public risk and worker job hazard analysis on site-specific projects. Another precautionary measure in the use of herbicides is that the personnel involved in planning, applying, supervising, and reviewing herbicide applications must be certified.

Precautionary measures BLM will employ relative to all herbicide use include conducting periodic literature reviews by accredited toxicologists, providing information sheets for each of the herbicides approved for consideration, strictly adhering to label regulations, and thoroughly training its applicators in safety precautions as well as proper application technology.

Specific protective measures for herbicide use are provided in Chapter 5 and Appendix B. It should be recognized that further review may show that expanded use of herbicides is justified, or that further prudence is appropriate.

## *Herbicides of Special Consideration*

Due to their known or uncertain adverse human health effects the herbicides 2,4-D, asulam, and atrazine will be placed in a Special Consideration Category requiring special precautions, consideration and analysis whenever they are proposed for use. This will include ensuring that all feasible effective alternatives are considered and protection measures such as aerial

restrictions, worker protection and posting and controlling access have been implemented. (See the section on Effectiveness of Practice in Meeting Objectives for a related discussion on selection of herbicides of special consideration.)

Asulam, atrazine and 2,4-D have either incomplete or highly conflicting information about their human health effects. All three have cancer potency values noted in the FEIS, as if they are associated with or are carcinogenic, and recent toxicological data continue to recommend a cautious and conservative approach. Atrazine has controversial and potentially high risk reproductive MOS values, especially for workers and is a confirmed ground water contaminate.

Due to the above, the application technique and placement of atrazine and 2,4-D will require additional controls. A risk management strategy for the public and a job hazard analysis for workers will be developed to assure high risk exposures do not occur.

## Program Implementation

### Program Design

Implementation of the vegetative management program has two parts: standard operating procedures and project design features. The standards are a list of important measures that are applied on a regular basis for the various types of vegetation treatment. Project design features are intended to ensure the proper and safe implementation of treatment methods, and are selected based upon site-specific analysis. Analysis of specific treatment areas may result in modification of the project design features, or the identification of others, to provide adequate protection to nontarget organisms and human health. Standard operating procedures are listed below, followed by a list of common project design features.

### Standard Operating Procedures

#### Strategy

Use prevention and natural processes as the preferred strategy to manage competing and unwanted vegetation. Conduct planning and monitoring to anticipate, and take steps to avoid, potential vegetation management problems. When needed, plan corrective actions to occur early and timely as compatible with a long-term preventive strategy and natural disturbance and recovery pattern in the site-specific area.

## Safety

Always consider the safety of both the general public and workers. This includes determining the degree of exposure, hazard and risk posed by various vegetation management treatment methods for forestry workers, forest users, and nearby residents.

Program-wide risk assessment will be conducted by the program leaders prior to any treatment where there is potential for direct or indirect effects on human health to evaluate human health exposure to any hazardous substances and injuries. Keep in mind that this preliminary analysis is about generalities, not site-specific instances. Low-risk or low exposure methods will be sought for implementation to minimize public exposure to injurious situations.

In general, the risk assessment process will involve three evaluation components: Hazard, Exposure, and Risk. These components and their interrelationship are described below:

*Hazard Evaluation:* Identify harmful characteristics of the proposed vegetation management methods.

*Exposure Evaluation:* Estimate the kinds and levels of exposure and doses likely to result from potential exposures under routine, worst case, and accidental scenarios.

*Risk Evaluation:* Combine hazard information with dose level exposures to predict the health effects under the given conditions of exposure.

These evaluations are conducted for two groups of people: the general public and the occupationally exposed. A Job Hazard Analysis (JHA) is used to anticipate site-specific human health effects. For the general public, evaluation is done for single exposures and exposures over a 30-year time period.

When considering potentially harmful situations in site-specific evaluations, estimate exposure by identifying: (1) who is being exposed, (2) when the exposure will occur, (3) where exposure would occur, and (4) the amount, duration, and frequency of exposure. These estimates should then be compared to the average conditions found in the FEIS risk assessment and used to determine design and adequacy of mitigating measures.

The "amount" of exposure is the actual quantity or level of a substance that comes in contact with an individual. "Duration" is length of contact, and "frequency" is the number of encounters with the substance. Other

factors to consider in exposure analysis include proximity (distance) to human habitation, water source, or potential food stuffs, and recreation use patterns, weather conditions, and access to site.

All employees active in vegetation management will be trained in the safe use of prescribed fire, cutting tools and equipment operation, herbicides, and other techniques. Proper protective clothing will be worn by employees as prescribed in use manuals for methods such as chemicals and fire (BLM Manual H-1112-1).

The project design of prescribed fire will include consideration of such measures as smoke management, reduction, avoidance, and scheduling to protect recreationists and rural residents from smoke exposure (see Appendix B).

Information packets containing data on the potential hazards of chemical treatment methods will be made available to employees, the public, and contractors (see Appendix B and Herbicide Profiles, Appendix C). As new data becomes available, the information packets will be supplemented.

## Worker Protection, Public and Occupational Accident/Incident and Illness Reporting

All workers who use or are exposed to hazardous tools/equipment including herbicide applications will utilize protective clothing and equipment that meet the specifications of the BLM Safety Manual, labels approved by the Environmental Protection Agency (EPA), and/or BLM risk analysis. (See worker protection in BLM Manual 9022; Manual Handbooks 1112-1, Chapters 14-16; and H-9011-1.)

A Job Hazard Analysis will be used for monitoring the impacts on human health. In addition an incidents-accidents system will be used for reporting employee, contractor, volunteer and public. In addition to injuries and illnesses, the system will be used to report vehicle accidents, property damage and fire losses (485 DM, Chapter 7 and BLM H-1112-1). Forms CA-1 and/or CA-2 for occupational exposure or injury and DI-134 for all reported accidents, incidents, and illnesses will be used.

The Report of Accident/ Incident (DI-134) will be used additionally to report health effects associated with vegetation management projects for forwarding to the Program Coordinator to be entered the Safety Management Information System (SMIS), reported to OSHA and used internally for trend analyses. The

Federal Record System retains records for any employees exposed to toxic substances or harmful physical agents for 30 years (29 CFR Ch XVII 1910.20). Contractors will be required by stipulation to complete a DI-134 for each employee. The DI-134 along with the Project Accomplishment Report (herbicide use report) will list date of project work, specific assignments, herbicide formulation (if any) and ingredients used, safety or health hazards, and any health complaints.

## Public Involvement

Determine the need or level of public involvement by reviewing the type of management actions. BLM management actions are divided into five categories (Manual 1790-1):

- Exempt from NEPA. Includes Congressional, emergency and rejected proposals.
- Categorical exclusions. Specifically identified actions, not restricted by exceptions list, that do not require an environmental assessment (EA).
- Actions already covered by an existing FONSI and EA, or EIS. Timber sales and multi-year EA. (Noxious weed control is in a separate EIS.)
- Actions covered by an EIS and require an EA.
- Actions that require an environmental impact statement.

Public Involvement is to be encouraged and facilitated in vegetation management environmental analyses. The level and degree of public involvement will depend on public interest, type of analysis performed, and the method of treatment proposed.

The BLM will provide public notice whenever a site-specific project is considered to prevent or treat competing or unwanted vegetation with any proposed measure of treatment. (Excepted are actions exempt from NEPA or covered within a categorical exclusion.)

Public notice will precede the screening stage of the environmental analysis of the project under NEPA guidelines. Notification methods will include, at a minimum, a notice in local newspapers. Additional standard methods may include posting of public notices in the state office, district office and resource areas; and in other public rooms used to distribute public information concerning proposed Bureau actions. Notification lists maintained by the program

coordinators will be used in notifying the interested public of any proposed use of herbicides.

In case of an action with effects primarily of local concern, the notice may include: areawide clearing-houses, notices to potentially interested community organizations, direct mailing to owners and occupants of affected property, and posting of notice on and off site in the area where the action is located. The level of controversy will determine the need for notices and posting. Herbicide use areas will be posted. Notices must indicate procedures for interested persons to get information or status reports.

The public will be notified of the availability of the EA and FONSI (Finding of No Significant Impacts additional to those not already analyzed in a program's EIS). The manager responsible for authorizing the action determines the appropriate means of public notification and ensures its availability based on the extent of concern and interest in the action. All individuals or organizations that have requested notification on a specific action should be notified by mail where feasible. When considering the use of herbicides of special consideration the potential use will be made known to the public at the earliest practical time.

Before a decision is made to proceed with controversial treatment methods such as herbicides, the public will be invited to review and comment on the site-specific analysis of the project. When a decision is made for a site-specific project the public will be promptly notified of the final decision whether it is to proceed, or not to proceed.

Environmental analysis and public involvement will normally occur as indicated in four levels of project screening:

1. Screen unit for need of action, and set priorities. Where: Reforestation of timber sales or wildfire areas. Actions where no herbicides are proposed for use and the proposed treatment qualifies for categorical exclusions. Examples of current categorical exclusions:
  - Precommercial thinning
  - Manual maintenance and release.
  - Paper mulching and spot scalping.
2. Screen for need and complete environmental analysis. (Outside exclusions or controversial.)
  - Mechanical site preparation
3. Screen for need, complete environmental analysis, inform downstream water users.
  - Biological and grazing methods.

4. Screen for need, complete environmental analysis, inform downstream water users, notify adjacent property owners, provide public notification when there is a probable public exposure, and request response from those individuals who are hypersensitive. This screening should be done when proposing projects for herbicides and prescribed fire to determine appropriate risk management measures.

Considerations for public involvement when proposing vegetative management, regardless of type of treatment, is summarized on Table 5-2.

## Project Design Features

Review site-specific conditions to determine which of the following project design features are needed.

### Notify Private Landowners and Downstream Water Users

Residents and adjacent landowners within 0.5-mile of proposed treatment sites who likely could be directly affected by chemical drift, smoke, food or water contamination, or an accidental spill will be notified prior to any chemical, broadcast burning, or biological application, and actions will be taken to minimize any potential effects.

### Minimum Width Buffer Strips

District guidelines as well as State water quality standards will be met by using buffer strips, contractual stipulations on method and techniques, and other site-specific criteria. Concerns to consider in planning and selecting a vegetative management strategy, treatment, or technique and in determining site-specific project design include stream bank stabilization, sediment rates, temperature, sensitive vegetation and other organisms, and bacteria counts. Buffer strips will meet resource management plan criteria and site-specific conditions.

When herbicides are used, the minimum buffer strips listed below will be reserved adjacent to class I and Important Class II (BLM order III and above) streams, lakes and ponds, pasture and agricultural lands. These minimum buffers will be in accordance with current interim protection requirements of the Oregon State Forest Practice Act requirements and definitions, or as specified on the herbicide use label.

## Minimum Buffer Widths for Waterways When Herbicides are Proposed for Use

Application Technique	Minimum buffer Width
Manual wipe-on	High water mark
Manual	10 feet
Vehicle	50 feet
Aerial (Flowing stream)	100 feet
Aerial (Lakes and ponds)	200 feet

Applications of atrazine, a persistent chemical, in areas having shallow water tables or where aquifers are located in alluvial deposits along major streams, will be subject to guidelines for above-ground waterway buffers.

For mechanical and burning treatments, the minimum buffer along streams will be 25 feet.

### *Residences, Domestic Water Diversions and Agricultural Areas*

Minimum buffer strips near residential, domestic water, and agricultural areas is determined by the site-specific application technique.

For aerial application of herbicides in areas adjacent to residences, a minimum buffer strip measuring at least 600 feet wide will not be treated unless a written waiver is provided by the landowner. For domestic water diversions in a drainage where aerial herbicide application is used, the minimum buffer will be 200 feet. Additional risk (exposure) assessment may be required for aerial herbicide treatment within 600 feet of a residence.

Aerial application of herbicides of special consideration (e.g., 2,4-D, asulam and atrazine) will be prohibited within 0.25-mile (1,380 feet) of residences.

For ground applications of herbicides, the minimum untreated buffer reserved between treatment areas and residences will be 100 feet.

Local conditions may require an expansion of the minimum widths. Some examples of site-specific factors that may necessitate additional buffer width include mode of transport (direct application, drift, and

water flow), adjacent topography, buffer vegetation structure and functions, and nearby agricultural areas or gardens.

## Other Sensitive Conditions

Buffer strips may also be recommended for wildlife habitat, scenic corridors, and other concerns as identified in land use plans.

## Monitoring and Evaluation

Monitoring of the western Oregon vegetation management program will be done in accordance with established BLM procedures as provided for in BLM Manual H-1734-1, land use plans, and as indicated below. The need and type of monitoring will be dictated by the nature of critical components in the site-specific treatment area.

General guidelines for monitoring are as follows:

- Monitoring is to be done annually at both the program-wide and site-specific basis, and for worker and human health concerns. The Program Coordinators will: (1) project three-year estimates of proposed methods and techniques, (2) describe whether management actions are making satisfactory progress toward meeting objectives to reduce reliance on herbicides and meet prescribed fire air quality goals, and (3) present criteria for meeting goals.
- Site-specific post-treatment monitoring will be conducted to aid future planning, and at a minimum will include:
  - Efficacy of treatment or no treatment.
  - Costs, both direct and indirect.
  - Analysis of mitigating measures, unintended effects, and accidents.
  - Estimate of degree of success.
  - Assessment of both short and long-term effects on vegetation.
- Water Quality monitoring will be conducted per goals in land use plans to meet or exceed Best Management Practices guidelines. Monitoring of the spray operation will be conducted to determine if mitigating measures are being observed, are effective in maintaining water quality, and are in compliance with state water quality standards and herbicide label requirements. The potential for contamination of aquifers used by fish, or for municipal water or irrigation, will be considered in site-specific environmental assessments.

Appendix 1

- The program-wide assessment will consider:
    - How well strategy is meeting management objectives (site preparation, seedling survival, improving wildlife habitat, roadside maintenance). Include "no action" locations in comparisons.
    - Whether assumptions are correct and potential impacts are as expected.
    - Effectiveness of mitigating measures.
    - Impacts on other resources (i.e., wildlife, water, air).
    - How projected need for herbicide and prescribed fire treatments can be reduced.
    - Consistency with federal agencies, state and local governments.
    - New data that would require alteration of program.
  - Recording and reporting human health concerns would be done to verify job hazard analysis and risk assessments and would include review of:
    - Exposure incidence.
    - Accidents.
    - Worker health complaints.
    - Recording of treatment methods, including for herbicides: the exact identity, formulation, manufacture, mixture and method of application.
  - BLM Herbicide (Pesticide) Application Record, and worker and public Reports of Accidents/Incidents or Illnesses (DI-134, CA1 or CA2) for vegetative management projects.
  - Names of personnel working on herbicide projects, their assignments and dates of actual work (29 CFR XVII, 1910.20)
  - The Program Coordinator will be incorporate any new data that would require alteration of the program.
  - Conduct young stand monitoring during standard stocking survey at intervals of one, three, and five years and record treatment effectiveness, or as a post treatment evaluation survey on a sampling basis to be filed with BLM Project Implementation (Herbicide Application) Records.
  - Submit annual report to Oregon State and Washington Offices for herbicide usage describing the acreage, amount, usage, location, and use strength for each chemical used. Retain project records for three years.
- The above monitoring, along with planning and providing "no action" units or portions of units will help to determine effectiveness and need for action as a baseline comparison. Through these actions, the BLM will be able to determine if the actions are giving the desired management results.



# Appendix 1-D

## Summary of Scoping

Scoping of the Eugene District Resource Management Plan/Environmental Impact Statement (RMP/EIS) began in September 1986, when a mailer was sent to a mailing list of 400 parties inviting them to identify issues and concerns for BLM to consider in the planning process. Two open houses were held by BLM's Eugene District during the comment period, to help interested parties focus on the question.

With the comments received, the District's planning team and managers distilled and developed a list of issues and concerns. BLM distinguished an issue as a matter of controversy or dispute over resource management activities or land use that is well defined or topically discrete and can be addressed in the formulation of planning alternatives. In practice, issues are resolved by resource allocations and restrictions. Concerns, on the other hand, are generally not so well defined, or do not directly involve controversy or disputes over resource management activities or land use allocations, and do not lend themselves to formulating land use alternatives. Concerns are usually addressed by analysis and documentation in the RMP/EIS. Some concerns are not addressed by the RMP/EIS, as they are beyond the control of the State Director, are unrelated administrative problems, or are not within the legal jurisdiction of BLM.

The issues and concerns identified are described in Chapter 1. This list of issues and concerns was sent to interested parties in March of 1987. Subsequent scoping was related to refinement of the issues, and determination of a reasonable range of alternatives to address in the RMP/EIS. This latter facet of scoping was handled through the development of State Director guidance for formulation of alternatives. The development of State Director guidance for the RMP process is discussed in Appendix 1-E. This guidance also directed a number of sensitivity analyses of the primary alternatives, to address relevant management options that could not be effectively addressed in a manageable array of fully analyzed alternatives.

In public comments and internal discussions, there were a number of alternatives, or potential elements of alternatives, considered but eliminated from detailed analysis. These are summarized in the following discussions:

- Alternatives that would meet specified timber production target levels (e.g., one identified in a regional supply analysis or one that would maintain

the level in existing plans). Such alternatives could be explicitly designed only with an optimization model. Early in the planning process, BLM chose not to invest the many millions of dollars that would have been necessary to adopt and use an optimization model in its western Oregon planning effort.

- Alternatives that explicitly reflect the policies and programs of the O&C counties, and of the State. Until opportunities and tradeoffs are fully analyzed, such alternatives could not be formulated. At that point in the process, it was BLM's intent to develop a Preferred Alternative consistent with those policies and programs to the extent they are consistent with each other and also consistent with Federal laws and regulations.
- An alternative based on the assumption that Federal Land Policy and Management Act (FLPMA), rather than the O&C Act, was the predominant statutory mandate for management of the O&C and Coos Bay Wagon Road (CBWR) lands. None of the initial set of alternatives was based on a specific real or assumed statutory mandate. BLM believes that management under FLPMA falls within the range established by the initial set of alternatives.
- A "no planned timber harvest" alternative. BLM considers such an alternative for all BLM administered lands in western Oregon outside the reasonable range of alternatives. The counterpart of a no-timber-harvest alternative would be an alternative that would remove all merchantable timber over the life of the plan. Such a radical departure from sustained yield principles on either end is clearly outside the reasonable range of alternatives.
- Alternatives considering neither intensive management practices nor the "allowable cut effect" in setting an allowable sale quantity. The impact of foregoing these can be identified from the Sensitivity Analysis of the Preferred Alternative.
- An alternative that would forego slash burning; one that would forego use of herbicides. These activities and the options of foregoing them were addressed in BLM's EIS, Western Oregon Program-Management of Competing Vegetation, 1989. This RMP/EIS is tiered to that EIS.

- An alternative that uses uneven-aged management as the predominant silvicultural system. In many locations that prescription would fail to meet reforestation standards, a violation of the sustained yield mandate. Uneven-aged management is considered for use in stands where it would be economically and environmentally feasible and reforestation standards could be met.
- An alternative that excludes Site IV lands from timber harvest. Such an alternative would not address any important environmental or resource management objectives better than options already being addressed.
- An alternative that maximizes timber production subject to the constraint of economic feasibility. Analysis of the economic feasibility of alternative A showed that such a constraint would negligibly affect the Allowable Sale Quantity (ASQ) of that alternative.
- Alternatives that vary in size of spotted owl habitat protected for each nest site. In light of the Interagency Scientific Committee report and subsequent proposals by the Fish and Wildlife Service, BLM concluded that such variation had little relevance.
- An alternative that would protect 110 spotted owl areas, as provided for in the 1987 revised BLM-ODFW agreement, was originally proposed by BLM. After the Interagency Scientific Committee report was released in 1990, this alternative no longer seemed relevant.
- An alternative that manages as VRM Class II all lands inventoried as VRM Classes III and IV. Such an alternative would only be logical if matched with the other goals of an alternative with a very constrained timber harvest base. This management option, intended to optimize protection of scenic values even on areas identified in inventories as low in scenic value, was felt to be too arbitrary to warrant its application as an additional constraint to alternatives that severely restrict timber production to emphasize more meaningful objectives.
- An alternative protecting a minimum of a quarter-mile wide Riparian Management Areas (RMAs) along 3rd order and higher streams, Class I streams and other water; and maintaining and enhancing water quality at the highest level of water quality required for municipal use. Such an alternative would exclude almost all commercial forestlands from timber management. Such extensive RMAs would be far in excess of what is needed to protect water quality and riparian values. Thus, it was considered outside the range of reasonable alternatives.

## Appendix 1-E. State Director Guidance for the RMP Process

According to Bureau regulations for preparing RMPs, "the State Director shall provide quality control and supervisory review, including plan approval, for plans and related environmental impact statements and shall provide additional guidance, as necessary, for use by District and Area Managers." "Guidance" means "any type of written communications or instructions that transmits objectives, goals, constraints or any other direction that helps District and Area Managers and staff know how to prepare a specific resource management plan."

Early in the process of concurrently preparing this RMP and five other RMPs which together cover all BLM-administered lands in western Oregon, the BLM State Director decided to develop comprehensive procedural guidance as planning criteria to assure consistent treatment of a variety of issues and concerns in the six plans. The intent to do this was conveyed to known interested parties in a mailer sent out by each BLM district office with planning responsibility on March 27, 1987. Suggestions for content of that guidance were solicited in the mailer.

There was limited public response, but that response, along with internal BLM recommendations, led to formulation of a proposed set of topics for State Director guidance. A mailer describing those topics were sent to the public for comment on August 11, 1987. Using further but still limited public comments, BLM modified its list of topics slightly and drafted Proposed State Director Guidance, which was sent out for public review by interested parties on May 13, 1988.

Although less than a hundred individuals and groups responded, many of the comments received were thoughtful and constructive, and addressed the proposals in depth. BLM undertook a substantial revision of many sections of the proposed guidance. This revision was done on a staggered schedule, to distribute the workload and provide timely guidance to the districts for each step in the process.

The first element of the guidance completed was Guidance for the Preparation of the Analysis of the Management Situation (AMS). This document summarizes important information about existing resource conditions, uses and

demands, as well as about management activities and natural relationships. It provides the baseline for subsequent steps in the planning process, such as the design of alternatives and analysis of environmental consequences. The AMS also provides most of the data to be summarized in the "affected environment" chapter of the EIS. The AMS guidance prescribed minimum contents and table formats for the AMS for each plan. That guidance was essentially completed in October 1988, and slightly revised during 1989 and 1990.

A master glossary for the AMS was prepared as part of the State Director Guidance. It was completed in 1989, and later revised for inclusion in each Draft RMP.

The Guidance for Formulation of Alternatives was essentially completed in October 1990 but underwent modest revision during 1991 and 1992. A copy of the final version of this guidance is included in this appendix.

Two other sections, Guidance for Analytical Techniques Needed to Estimate Effects of Alternatives and Guidance for Use of the Completed Plan, were completed in July 1991, with slight modification of the former in 1992. Descriptions of complex analytical techniques have been appendicized to discussions of the relevant analyses in Chapters 3 and 4. The Use of the Completed Plan section was wrapped into the equivalent section of Chapter 2 of the Draft RMP/EIS.

The original draft guidance had two other sections that never became final. Guidance for the Executive Summary was dropped because the State Director's staff prepared that summary. Guidance for expressing consistency with plans, programs and policies of other agencies was never formalized, as BLM staff worked with state agencies and county planners until the Draft RMP/EISs were almost complete, on ways to express such consistency.



# Guidance for Formulation of Alternatives

## Introduction

The purpose of alternatives is to identify a range of reasonable combinations of resource uses and management practices that respond to planning issues and provide management direction for all resources. Five common alternatives will be addressed in each RMP, to provide a consistent set of distinct choices among potential management strategies.

A no change from the existing land use plan alternative will also be addressed. This is the "no action" alternative. In the other alternatives all existing land use decisions not found valid for continued implementation after 1990 (through an analysis summarized in the Analysis of the Management Situation), will be reconsidered.

Common alternatives that identify specific management actions along District boundaries will be consistent. Examples include elk management areas, spotted owl corridors or visual corridors.

This Guidance for Formulation of Alternatives may be modified later based on information identified in the districts' analyses of the management situation, or refinements that flow from the districts' site-specific development of common alternatives.

## Goals and Objectives of the Common Alternatives

The purpose of the goal and objective statements for the five common alternatives (A through E) is to guide development of specific criteria. Each alternative, if implemented, is intended to achieve or meet its goal. Goal and objective statements focus on general direction of alternatives rather than technical points in issue-related criteria for the alternatives. In each alternative all resource management values would be accommodated to the extent consistent with the primary goals and objectives for that alternative.

## Specific Guidance on Common Alternatives

The common alternatives would differ primarily in the way they allocate primary uses of lands (for example, lands allocated to intensive forest management, and lands allocated to protection of riparian zones).

The discussion on page 4 through part of pages 14 and 15 describes criteria for addressing each of the eleven planning issues in the formulation of the common alternatives. It also describes how land use allocations and management actions would vary in response to each issue. Within the specific constraints provided by the guidance for addressing each issue, the districts have flexibility to formulate the common alternatives as they consider appropriate to meet the goals and objectives of each alternative.

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**Alternative A****Alternative B**

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**GOALS:**

Emphasize high production of timber and other economically important values on all lands to contribute to community stability.

Emphasize timber production to contribute to community stability consistent with the variety of other land uses such as fish and wildlife habitat, recreation, and scenic resources on O&C and CBWR lands. Give equal consideration to all resource values on public domain lands.

**OBJECTIVES:**

- Produce the highest sustained yield of timber on all suitable forest lands legally available for harvest.
  - Contribute to ecological functions important to timber productivity and to habitat diversity to the extent possible consistent with the allocation for timber production.
  - Manage threatened and endangered species habitat as legally required.
  - Provide Research Natural Areas and eligible Areas of Critical Environmental Concern to the extent consistent with the allocation for timber production.
  - Manage appropriate Congressionally designated areas to maintain and enhance their scenic values.
  - Meet legal requirements for protection of wetlands and water quality, to protect anadromous fish habitat and other relevant values.
  - Emphasize substantial developed and dispersed motorized recreation uses.
  - Find no additional rivers suitable for designation under the Wild and Scenic Rivers Act.
  - Make land tenure adjustments which enhance BLM long-term sustained yield timber harvest opportunities.
  - Provide no special management in rural (residential) interface areas.
- Produce a high sustained yield of timber on O&C and CBWR lands, and on public domain lands where nontimber uses and values are of lesser importance than timber production.
  - Contribute to ecological functions important to timber productivity and to habitat diversity using a system that maintains old growth and mature forest in large and small blocks.
  - Protect habitat of all threatened and endangered species and species with high potential for listing. Protect habitat of other species of substantial concern to the extent consistent with high timber production.
  - Retain existing Research Natural Areas (RNAs) and Areas of Critical Environmental Concern (ACECs). Provide new ones from eligible areas to the extent consistent with the emphasis on timber production.
  - Manage scenic resources in selected areas of high recreation use.
  - Meet legal requirements for protection of wetlands and water quality and provide moderate additional protection for anadromous fish habitat, other substantial streams, and other water.
  - Provide for a wide range of developed and dispersed motorized recreation uses and opportunities, to minimize conflicts among recreation user groups.
  - Find eligible river segments suitable for designation as recreational, if they are important and manageable, and designation would not cause adverse economic impact.
  - Make land tenure adjustments which enhance BLM long-term sustained yield timber harvest opportunities on O&C and CBWR lands, and which benefit a variety of uses and values on public domain lands.
  - Adopt appropriate special forest management practices on BLM-administered lands intermingled with or adjacent to rural interface areas zoned for most dense residential occupancy.

## Alternative C

Provide timber production to contribute to community stability consistent with maintenance of biological diversity and the variety of other uses such as fish and wildlife habitat, recreation, and scenic resources on all lands.

- Produce a moderate sustained yield of timber.
- Provide biological diversity using a system that maintains some old growth and mature forest, focusing on protection of areas where special status plant and animal species cluster.
- Protect habitat of all threatened and endangered species and species with high potential for listing. Protect habitat of other species of substantial concern through emphasis on biological diversity and to the extent consistent with moderate timber production.
- Retain existing RNAs and ACECs. Provide new ones from eligible areas except where lands managed by others are considered to provide more appropriate opportunities.
- Manage scenic resources in selected high use areas, particularly emphasizing protection in corridors of existing and proposed wild and scenic rivers and major trails.
- Provide substantial protection for anadromous fish habitat, other substantial streams and other water environments.
- Provide for a wide range of recreation opportunities emphasizing dispersed use, while reducing conflicts among recreational user groups.
- Find eligible river segments suitable for designation as scenic or recreational, if they are important and manageable, but not suitable for designation as scenic if designation would cause adverse economic impact.
- Make land tenure adjustments to benefit a variety of uses and values.
- Adopt appropriate special forest management practices in rural interface areas zoned for moderate or high density residential occupancy.

## Alternative D

Emphasize protection and reestablishment of spotted owl habitat, along with management and enhancement of other values such as dispersed nonmotorized recreation opportunities and scenic resources, while sustaining some timber production.

- Produce a sustained yield of timber consistent with allocations for other uses and values.
- Protect habitat of the spotted owl in accordance with the Owl Conservation Strategy.
- Protect habitat of all threatened and endangered species, species with high potential for listing, and species of related concern.
- Retain all existing RNAs and ACECs. Provide new ones from eligible areas except where lands managed by others are considered to provide more appropriate opportunities.
- Manage all identified scenic resources.
- Provide substantial protection for wetlands and riparian areas along most streams and other water.
- Emphasize dispersed nonmotorized recreation opportunities.
- Find eligible river segments suitable for designation as wild, scenic or recreational, if they are important and manageable.
- Make land tenure adjustments which would emphasize enhancement of nontimber uses and values.
- Adopt special timber harvest and forest management practices in rural interface areas zoned for moderate or high density residential occupancy.

## Alternative E

Emphasize protection of older forests and management and enhancement of values such as dispersed nonmotorized recreation opportunities and scenic resources.

- Produce a sustained yield of timber consistent with allocations for other uses and values.
- Protect all old growth and older mature forests.
- Protect habitat of all threatened and endangered species, species with high potential for listing and species of related concern.
- Retain all existing RNAs and ACECs and designate all eligible areas.
- Manage all identified scenic resources and provide some visual resource protection for all lands.
- Manage all riparian areas and wetlands to maintain and improve water quality and fisheries habitat, and contribute to wildlife habitat diversity.
- Emphasize dispersed nonmotorized outdoor recreation opportunities.
- Find all eligible river segments suitable for designation as wild, scenic or recreational rivers.
- Make land tenure adjustments which would emphasize enhancement of nontimber uses and values.
- Adopt special timber harvest and forest management practices extensively buffering rural interface areas zoned for moderate or high density residential occupancy and other rural interface areas as appropriate.

**Issue No. 1: Timber Production Practices:** Which forest lands should be available for timber management, and what practices should be used on those lands?

Guidance for All Common Alternatives: Lands allocated to intensive forest management under any of these alternatives would normally provide the highest nondeclining harvest level (even flow) of timber when the following conditions prevail:

- Effective silvicultural techniques (such as clear cutting, shelterwood or partial cutting) appropriate to the land allocations are used.
- All feasible site preparation and intensive management practices are applied.
- Anticipated merchantability is the only constraint on minimum average stand diameter slated for future harvest. (In some areas this may result in harvest of timber stands as young as 40 years for several decades during the early to middle part of the next century under some alternatives.)
- Adequate budgets are available to support the resultant timber sale program and allied intensive management practices, as well as scheduled monitoring linked to those activities.

The common alternatives assume these practices and conditions on the lands allocated to intensive timber management, but incorporate less intensive management practices on other available forest lands to the extent needed to be consistent with the allocation of those lands.

Where consistent with the goals and objectives of each alternative, the following silvicultural and harvest practices would be implemented on lands allocated primarily to timber management, to meet multiple land use objectives:

Minimize regeneration delay by reforesting harvested sites as soon as practical. Calculate an empirical regeneration period based on representative stocking survey results, expected timber sale contract lengths and management objectives.

Reforest harvested lands with indigenous commercial tree species. Emphasis would be placed on utilization of genetically improved stock in accordance with the Western Oregon Tree Improvement plan.

Manage tree seed orchards to produce adequate supplies of genetically improved seed.

Use available site preparation and seedling protection practices, including herbicides, using an integrated vegetation management approach. Emphasize those techniques that have proved most effective in assuring seedling survival and growth. (Actual practices will be based on site-specific analysis following completion of the RMP.)

Convert to conifers those lands classified as commercial forest lands presently occupied by grass, hardwoods and brush.

Allocate all forest lands for timber production consistent with the management direction for other resources (Issue Nos. 2 and 3, etc.) in this alternative, except the following:

Nonsuitable Woodland (See Figure 1-E-1 for Chart showing TPCC categories.)



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**Alternative B****Alternative C****Alternative D****Alternative E**

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Allocate all forest lands for timber production consistent with the management direction for other resources in this alternative, except the following:

Nonsuitable Woodland  
Suitable Woodland - Low Site

Allocate all forest lands for timber production consistent with the management direction for other resources, except the following:

Nonsuitable Woodland  
Suitable Woodland - Low Site  
Suitable Woodland - Nonsuitable  
Commercial Forest Land

Allocate all forest lands for timber production consistent with the management direction for other resources, except the following:

Nonsuitable Woodland  
Suitable Woodland - All Categories

Allocate all forest lands for timber production consistent with the management direction for other resources, except the following:

Nonsuitable Woodland  
Suitable Woodland - All Categories  
The Fragile Gradient-Restricted  
component of the Fragile  
Suitable TPCC category  
Site Class V

## Issue No. 1 (Continued)

Plan hardwood sites for management of a sustained yield of hardwoods, where consistent with allocations for other uses or values.

Implement commercial thinning of present and future stands where practicable and where research indicates increased gains in timber production are likely.

Practice initial spacing control of seedlings/saplings through planting or thinning in conjunction with the control of competing vegetation, to maximize wood production by concentrating site resources in individual tree growth.

Plan nitrogen fertilization applications for all present and future stands where research indicates increased wood yields would result.

Plant specific root disease centers with resistant tree species.

Consider uneven-age management in stands where this method would be economically feasible and would maintain environmental values.

Consider efficiency of field operations and assurance of prompt reforestation in selecting the size of timber harvest units.

Apply proper soil management measures to maintain soil productivity.

## Issue Nos. 2 and 3: Old-Growth Forests and Habitat Diversity

To what extent and where should old-growth and/or mature forest habitats be retained, maintained or reestablished to meet various resource objectives? To what extent and where should BLM manage habitat to support populations of native wildlife species?

Any wildlife habitat management practice (such as nest boxes, road closures and forage seeding) not listed in the following could be implemented under any of the alternatives, as long as it is compatible with other management objectives. All special habitat features would be managed to protect their values. Mature and old-growth forests would be retained where Congressional designation of areas requires it. Snags and/or wildlife trees (to be converted to snags) would be retained where they occur on lands not allocated to timber harvest, except where public safety is a concern, and if left standing as nonmerchantable material on available forest lands. Where it would contribute to meeting wildlife tree objectives, create snags in areas not allocated primarily to timber production. A habitat goal of timber sale contracts would be to leave all snags and nonmerchantable trees that can be left consistent with safety considerations.

Mature and old-growth forests would be retained on most lands excluded from planned timber harvest by inclusion in the following allocations and TPCC categories:

Nonsuitable Woodland  
Riparian Management Areas  
Existing high-use recreation sites  
T&E species recovery areas where timber harvest is prohibited  
Wilderness Areas

## Alternative B

## Alternative C

## Alternative D

## Alternative E

Contribute to habitat diversity using a system that protects mature and old-growth forest in large and small blocks. Mature and old-growth components of the forest would be distributed in a corridor system by seed zone and elevation. In the corridor system large blocks of approximately 640 acres would be connected by a series of small, stepping stone blocks of approximately 80 acres, spaced at about one-mile intervals. Blocks would be limited to defined corridor areas.

Public Domain lands and the following allocations and TPCC categories on O&C and CBWR would receive priority for placement into the system, to the extent that they fit; for instance, if they provide needed habitat and are suitably located to contribute to the system.

**Nonsuitable Woodland**  
 Suitable Woodland - Low Site Riparian Management Areas  
 Recreation Sites  
 T&E species recovery areas where timber harvest is prohibited  
 Special Areas (Natural Areas, ACECs)

Wilderness Areas

This alternative would provide for retention and improvement of biological diversity. Blocks of forest land at least 600 acres in size and, where relevant opportunities exist, at least 2500 acres in size (including cornering tracts) would be identified as old-growth restoration and retention areas, totalling 15 to 20 percent of BLM-administered forest land. Identification of these areas would focus on protection of older forest stands, connectivity between larger reserves and subregions, and protection of identified areas where special status plant and animal species cluster.

The remaining BLM-administered forest lands, not excluded from timber harvest to address other issues, would be subject to intermediate harvests for density management where feasible, to maintain open canopy conditions and promote retention of mixed species, as well as accelerate development of old-growth structure conditions and prepare the stands for regeneration harvest

This alternative would manage habitats on BLM-administered lands to provide for a number and distribution of spotted owls that ensures continued existence of a well distributed population on those lands, so they may interact with spotted owls throughout the geographic range of the species, as recommended by the Conservation Strategy for the Northern Spotted Owl.

Suitable wildlife trees would be retained to contribute to the maintenance or attainment of cavity-dweller populations on BLM-administered lands at 60 percent of the optimum woodpecker population level. Wildlife tree and down log management practices would be used on the available forest lands, including but not limited to retention of green culls, snags and down logs. All special habitat features would be appropriately buffered.

This alternative would preserve the following:

- all existing forest stands over 150 years old.
- additional lands within 400 feet of the above stands, to assist in maintaining natural ecological elements, protect the older stands from edge effect and natural disaster, and interconnect them into a sustainable network.
- all suitable habitat forest stands which most closely match the lands within two miles of each spotted owl site occupied by a single or pair of owls in the last six years (1985-1990). In addition protect younger forest where needed to provide contiguous habitat within a mile of those sites.
- in each section where BLM administrators at least half of the land, a 40-acre block of the oldest stands remaining, concentrated around headwaters streams, to provide habitat for amphibians and nesting for pileated woodpeckers.

## Issue Nos. 2 and 3 (Continued)

**Issue No. 4: Threatened and Endangered (and Other Special Status) Species Habitat**

What should BLM do to manage Federally listed threatened or endangered plants and animals and to prevent future Federal listing of plants and animals as threatened or endangered species?

Protect, monitor and manage habitats of Federal listed and proposed species in accordance with the Endangered Species Act and recovery plans, as legally required for self-sustaining survival.

Timber production constraints would be assumed in the formulation of the alternative only if critical habitat has been designated or there is a recovery or conservation plan within a month after completion of the Analysis of the Management Situation. Manage for the conservation of, and mitigate actions to protect habitats of, Federal Candidate, State Listed and Bureau Sensitive species where such actions would not diminish commercial use such as timber production.

**Issue No. 5: Special Areas**

What areas on BLM-administered lands need special management to prevent irreparable damage to important historic, cultural or scenic values; to protect botanical or fish and wildlife resources or other natural systems or processes; and to protect life and safety from natural hazards? Which of these areas should be formally designated as Areas of Critical Environmental Concern (ACEC)?

Any areas considered appropriate for Research Natural Area (RNA) designation would also be considered appropriate for ACEC designation.

Designate potential ACECs that meet criteria only if the relevant values are not protected by other authorities (e.g., Wild River designation, the Endangered Species Act). Existing ACECs and potential ACECs that meet the preceding standard, including RNAs and proposed RNAs, would be retained or designated on nonforest lands or unsuitable woodlands of no substantial mineral potential. Other existing ACECs and RNAs would be revoked.

Alternative B	Alternative C	Alternative D	Alternative E
<p>Suitable wildlife trees and/or snags would be retained to maintain, where possible, cavity-dweller populations at 40 percent of the optimum woodpecker population levels in new timber harvest units. Wildlife tree management practices would be used on the available forest lands, including retention only of green culls and snags.</p>	<p>in the future. Regeneration harvests on these lands would be either heavy partial cuts (green-tree retention) or group selection cuts, and would not occur until after a stand had established old-growth characteristics.</p> <p>The lands in old-growth restoration and retention areas, which have not attained old-growth characteristics, would be subject to similar density management, where feasible, until they attain such a condition.</p>		<p>In addition to retention of wildlife trees on lands not allocated to timber management, suitable wildlife trees would be retained to contribute to the maintenance of cavity-nester populations at 60 percent of the maximum potential population level on lands allocated to timber management. Wildlife tree and down log management practices would be used on the available forest lands, including but not limited to retention of green culls, snags and down logs. All special habitats would be appropriately buffered.</p>
	<p>Suitable wildlife trees would be retained to contribute to the maintenance or attainment of cavity-dweller populations on BLM administered lands at 60 percent of the optimum woodpecker population level. Wildlife tree and down log management practices would be used on the available forest lands, including but not limited to retention of green culls, snags and down logs. All special habitat features would be appropriately buffered.</p>		
<p>Same as Alternative A, except protect habitats of Federal Candidate, State Listed and Bureau Sensitive Species to the full extent on public domain land, and protect habitats of Federal Candidate (i.e., Category 1 and 2) species known only to occur on BLM-administered lands to the extent considered necessary to prevent their federal listing.</p>	<p>Same as Alternative B except for additional protection of special status species provided by criteria for Issues 2 and 3.</p>	<p>Manage all BLM-administered lands to support the conservation and protection of all Federal Candidate, State Listed, and Bureau Sensitive species and their habitats.</p>	<p>Same as Alternative D.</p>
<p>Retain all existing ACECs and RNAs. Designate potential ACECs that meet criteria only if the relevant values are not protected by other authorities. Do not allocate new RNAs on available O&amp;C or CBWR land if a similar feature can be protected on a National Forest. Designate all potential ACECs (including RNAs) on Public Domain lands, nonforest lands, nonsuitable woodlands, and other lands allocated to nontimber uses.</p>	<p>Retain all existing ACECs and RNAs. Designate potential ACECs that meet criteria only if the relevant values are not protected by other authorities.</p>	<p>Retain all existing and designate all potential ACECs.</p>	<p>Same as Alternative D.</p>

## All Common Alternatives

## Alternative A

**Issue No. 6: Visual Resources**

Which, if any, areas of BLM lands should be managed to reduce visual impacts or enhance visual (scenic) quality?

Note: Guidance for Issue 11 (Rural Interface Area Management) also addresses and defines visual resource management for Alternatives B, C, D and E in rural interface areas, except where this Issue 6 guidance sets a higher standard of visual resource management. Guidance for Issue 9A (Wild and Scenic Rivers) establishes criteria that will substantially dictate visual resource management by alternative in proposed wild and scenic river corridors. See Issue 9A and Issue 11 guidance for details.

Provide VRM Class I management within existing boundaries designated by Congress for exclusive management. Manage all other available (for timber harvest) forest land under VRM Class IV management objectives. Manage other lands as inventoried.

**Issue Nos. 7 and 8: Stream/Riparian/Water Quality**

Where and how should riparian zones be managed to protect and improve water quality, fisheries and wildlife habitat? What actions should be undertaken to comply with state water quality standards? What should BLM do to manage for special needs such as municipal and domestic use?

Guidance for All Common Alternatives: Establish Riparian Management Areas (RMAs) on perennial streams (generally, 3rd order and larger streams), lakes, ponds and other waters, to meet Oregon Forest Practices Act requirements and Oregon water quality standards. Typical average widths of RMAs by alternative are displayed in Table 1. Within those RMAs no lands would be considered "available" (to offer timber for sale as part of the allowable sale quantity). Some timber harvest may occur, however, to achieve resource management objectives. These activities may include road construction and yarding corridors across streams and riparian zones to facilitate timber harvest outside the RMA.

Logging, road building and site preparation methods would be designed to minimize the number and/or size of mass soil movements and to maintain the integrity of the RMAs. Other activities such as mining, recreation and ORV use would be regulated to protect water quality. Stream and riparian habitat improvement measures may be taken on any streams to improve water quality, fish habitat and/or wildlife habitat. Activities would be designed to meet Oregon Forest Practices Act (OFPA) requirements and Oregon water quality standards.

Protect wetlands in accordance with Executive Order 11988 and 11990.

Comply with written agreements with public water systems serving municipalities.

**Issue No. 9: Recreation Resources**

What areas or sites should be designed and/or managed to protect or enhance a variety of recreational opportunities?

Manage for dispersed recreation activities consistent with managed forest settings, including hunting, fishing, sightseeing, riding/hiking, and rafting. Maintain and manage existing recreation facilities which make available significant dispersed recreation opportunities, including recreation sites, boat ramps, trails, interpretive signs and related improvements. Manage existing Special Recreation Management Areas (SRMAs) and delineate Extensive Recreation Management Areas (ERMAs).

Manage existing high-use recreation sites and trails and expand them where needed. Close low use recreation sites and trails. Designate lands open to off-road vehicles (ORV) and leave roads open to motorized use, except where such designation would conflict with other allocations.

## Alternative B

## Alternative C

## Alternative D

## Alternative E

Provide VRM Class I management within existing boundaries designated by Congress for exclusive management. Manage as inventoried all available forest land adjacent to (within a quarter mile) developed recreation sites, state and federal highways, state scenic waterways, and rivers designated under the federal Wild and Scenic Rivers Act. Manage all other available forest land under VRM Class IV management objectives. Manage other lands as inventoried.

Same as Alternative B, except on available forest land where BLM-administered land makes up more than half of a watershed, manage lands as inventoried.

Manage all lands as inventoried.

Same as Alternative D, except manage as VRM Class III all BLM-administered lands inventoried as Class IV; and manage as VRM Class I BLM-administered lands adjacent to (within a quarter mile) developed recreation sites, state and federal highways, state scenic waterways and rivers designated under the federal Wild and Scenic Rivers act.

Table 3-1. Riparian Management Areas

Stream Order	Average RMA Width* (each side of the stream in feet)				
	ALT. A	ALT. B	ALT. C	ALT. D	ALT. E
1				50	50
2				60	60
3				140	200
4				200	200
5				280	280
6				320	320
Lakes, Ponds & Other Waters	75	100	150	200	400

\* Actual RMA widths would be determined by on-the-ground riparian vegetation, terrain and stream characteristics, but would be a minimum of 50 feet on all 3rd order and larger streams. First and second order streams would have RMAs designated if perennial or if the beneficial uses warrant.

Same as Alternative A, except support the State's Regional Economic Development Plan for the geographic area, retain options for new SRMAs and high value potential recreation sites and trails on Public Domain lands, maintain and/or improve all existing developed recreation sites, and consider reopening sites closed in recent years.

Allocate and manage new SRMAs. Continue management of all existing recreation sites and trails, and consider reopening sites closed in recent years. Emphasize wildlife viewing, interpretation and related old-growth forest recreation opportunities, both to attract nonlocal visitors and to serve local users. Retain options for future development of high value potential sites, trails and sightseeing opportunities. Impose additional ORV limitations or road closures to protect wildlife habitat or old-growth forest recreation opportunities, minimize conflicts with hikers and horseback riders, or meet other resource objectives.

Same as Alternative C, except manage for an optimum range of nonmotorized recreation. Retain options for future development of recreation sites and facilities for dispersed recreation opportunities. Retain existing pockets of old-growth forest that are both adjacent to and accessible from existing or potential recreation areas. Prohibit ORV and road use as appropriate to improve wildlife habitat or protect the ecosystem.

Same as Alternative D.

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## All Common Alternatives

## Alternative A

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### Issue No. 9A: Wild and Scenic Rivers

What, if any, rivers should be found suitable for designation?

Provide interim protection for all river segments determined to be suitable, until Congressional action on BLM plan recommendations. Interim protection should be appropriate to the highest category for which the river is determined to be suitable. Manage Congressionally designated rivers consistent with their designation.

No rivers found suitable for designation under any classification.

### Issue No. 10: Land Tenure

In what areas would BLM-administered lands be sold, exchanged or transferred out of federal ownership under other authorities to improve management efficiency and benefit resource program objectives? In what areas would BLM attempt to acquire lands to improve management efficiency and benefit resource program objectives?

A major lands program effort would use exchanges to consolidate land ownership patterns to benefit one or more of the resources managed, such as timber, watershed, wildlife habitat, recreation, cultural, botanical, and minerals.

Land tenure adjustment would be guided by a three-zone concept utilizing the following standards:

Zone 1 includes areas currently identified as having high public resource values, and other efficiently managed lands. The natural resource values may require protection by federal law, Executive Order or policy. These lands may have other values or natural systems which merit long term public ownership. They do not meet the criteria for sale under FLPMA Section 203(a) and would generally be retained in public ownership. The Zone 1 boundaries should be relatively close to or on BLM property lines except where the intent is to show preferred acquisition areas.

Zone 2 includes lands that are suitable for exchange because they form discontinuous ownership patterns, are less efficient to manage than Zone 1 lands, and may not be accessible to the general public. Where appropriate opportunities are identified, these BLM-administered lands may be exchanged for other lands in Zones 1 or 2, transferred to other public agencies, or given some form of cooperative management. These lands would not be expected to meet the criteria for sale under Section 203(a), and would not be identified as suitable for such sale.

Zone 3 includes lands that are scattered and isolated with no known unique natural resource values. Zone 3 lands are available for use in exchanges for private inholdings in Zone 1 (high priority) or Zone 2 (moderate priority). They are also potentially suitable for disposal through sale

Exchanges would be made to acquire lands which would enhance the nondeclining harvest level of the commercial forest land managed by BLM, by improving age class distribution or other harvest level determination factors. Factors to consider include site quality, access to public forest land, logical logging units, and management of public forest land to facilitate timber harvest. No exchanges would be made to acquire lands more valuable for nontimber uses. No commercial timberland would be sold or leased. Leases or conveyance of land in Zones 2 and 3 other than commercial timberland would be made under the Recreation and Public Purposes Act to provide appropriate facilities or services.



## Alternative B

No rivers found suitable for designation as wild or scenic. River segments eligible for wild, scenic or recreational classification found suitable for designation as recreational, if all of the following circumstances exist:

- no net adverse economic impacts on the local economy.
- river segment possesses at least one outstandingly remarkable value for which it is considered by BLM to be the top river in the State Comprehensive Outdoor Recreation Plan (SCORP) region.
- BLM can effectively manage the outstanding values of the river segment.

Exchanges of O&C and CBWR lands would be made primarily to acquire lands which would enhance timber management opportunities. Exchanges of public domain lands would be made to benefit one or more of the resources managed, including nontimber values. Sale of O&C and CBWR lands other than available commercial forest lands, and of public domain lands, would be made to dispose of lands that meet any of the criteria of FLPMA Section 203(a). Leases on such lands would be made to accommodate other uses. Leases or conveyances under the Recreation and Public Purposes Act would be made in Zones 2 and 3 to provide appropriate facilities or services.

## Alternative C

River segments eligible for scenic or recreational river status found suitable for designation consistent with their highest potential classification, and river segments eligible for wild classification found suitable for designation as scenic, if all of the following circumstances exist. If only the economic impact test is not met, find suitable for designation as recreational.

- no net adverse impacts on the local economy.
- river segment possesses at least one outstandingly remarkable value for which it is considered by BLM to be among the top two rivers in the SCORP region.
- BLM can effectively manage the outstanding values of the river segment.

Same as Alternative B, except emphasis would also be given to exchanges of O&C and CBWR lands that would contribute to conservation of biological diversity.

## Alternative D

Eligible river segments found suitable for designation consistent with their highest potential classification if the following circumstances exist.

- river segment possesses at least one outstandingly remarkable value for which it is considered by BLM to be among the top four rivers in the SCORP region.
- BLM can effectively manage the outstanding values of the river segment.

Land exchanges would be made to benefit one or more of the resources managed. Exchanges involving disposal of timber to acquire lands containing greater nontimber values would be emphasized. Sales of lands other than available commercial forest lands would be made to dispose of lands that meet criteria (1) or (2) of FLPMA Section 203(a), but sales of land that meet only criterion (3) would not be made. No lands would be leased, except leases and conveyances under the Recreation and Public Purposes Act would be made in Zones 2 and 3 to provide facilities or services for the benefit of the public.

## Alternative E

All eligible river segments found suitable for designation consistent with their highest potential classification.

Same as Alternative D.

All Common Alternatives

Alternative A

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Issue No. 10. (Continued).

under FLPMA Section 203(a) if important recreation, wildlife, watershed, threatened or endangered species habitat, and/or cultural values are not identified during disposal clearance reviews and no viable exchange proposals for them can be identified. The discussion of Zone 3 lands must state which of the disposal criteria in FLPMA, Section 203(a), apply. Zone 3 lands would also be available for transfer to another agency or to local governments, as needed to accommodate community expansion and other public purposes.

Issue No. 11: Rural Interface Area Management

No special management actions except those that address other issues.

Which BLM-administered lands should be allocated to receive special management practices due to the concerns of residents who live in close proximity? (Rural interface areas are areas where BLM-administered lands are adjacent to or intermingled with privately owned lands where county zoning has created or allows for creation of lots as small as 1 to 20 acres. In most rural interface areas concerns of the residents are related to forest management practices, visual quality and potential affects on domestic water sources and water supplies.)

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Alternative B

Alternative C

Alternative D

Alternative E

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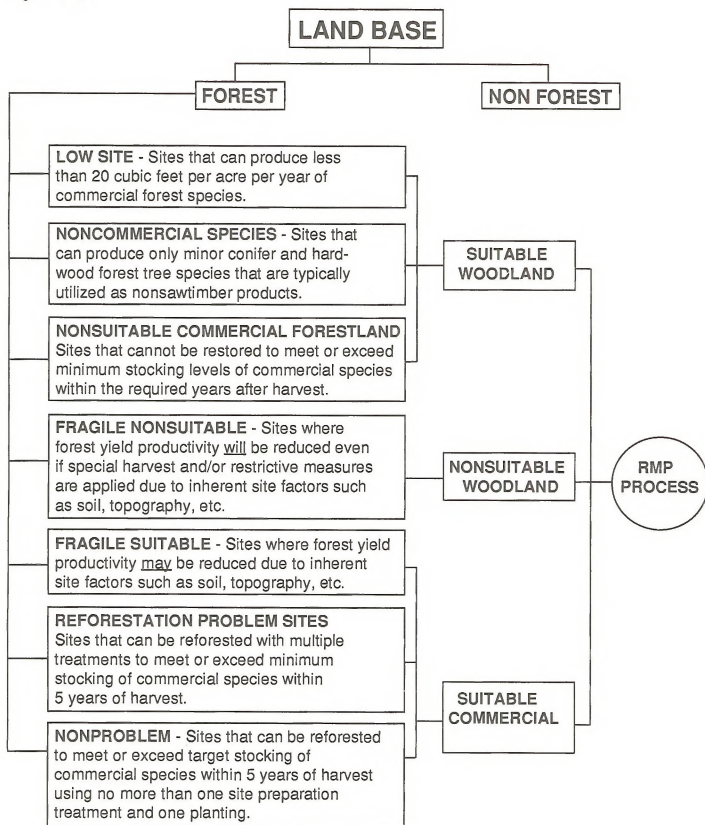
On BLM-administered lands within one quarter mile of private lands in identified rural interface areas zoned for 1 to 5-acre lots, customary forest management practices would be altered, where realistically feasible, to mitigate the adjacent neighbors' concerns (i.e., management would look for alternative methods of practicing intensive forest management). Examples of management options include harvest regimes other than clearcutting, hand application rather than aerial application of herbicides and pesticides, inclusion of additional buffers for domestic water sources, and hand piling slash for burning as opposed to broadcast burning. All BLM-administered lands within a quarter mile of designated rural interface areas 1 to 5-acre lots would be managed for VRM class III objectives.

Same as Alternative B except that lands zoned for 1 to 20-acre lots would also be included as the rural interface area.

On BLM-administered lands within one quarter mile of private lands in rural interface areas zoned for 1 to 20-acre lots, there would be no herbicide spraying, no clear cutting, and no prescribed burning. BLM-administered lands within this area would be managed for VRM class II objectives.

Same as Alternative D except BLM-administered lands within one half mile of private lands in rural interface areas would be managed as discussed in Alternative D. Areas zoned for lots larger than 20 acres, but with tax lots of 20 acres or less and/or existing legal multiple residences, may also be addressed in this alternative.

Figure 1-E-1



## Sensitivity Analyses

Sensitivity analysis is a process of examining specific opportunity costs and trade-offs which would result from making changes in single sensitive elements of an alternative. Such analyses are helpful in developing the preferred alternative, to make it most effective in reconciling potential conflicts and optimizing overall benefits. The sensitivity analysis will have the further benefit of informing the public about certain trade-offs, which should facilitate their offering informed preferences in their comments on the Draft RMP/EIS.

Because of the number of issues, concerns and alternatives, sensitivity analysis must be tightly focused to be manageable. The analysis, therefore, will focus on mid-range common alternatives and the preferred alternative.

At a minimum, the following will be analyzed for effects on timber harvest (ASQ) and related jobs and county revenues, and on other relevant resources or values:

1. For alternatives B, C and D, effects of substituting the next higher and next lower common alternative levels of riparian zone protection, and of providing only legally required (Alternative A) protection of riparian zones to preserve commercial trees on suitable forest or woodland. For the preferred alternative, the effects of substituting the alternative A and E levels.
2. For Alternative B, the effects of allocating no lands specifically for maintenance of older forest stands; or of managing the lands allocated for such protection on 250-year or longer rotation, with explicit provision for replacement; or of managing the lands allocated for timber production on 150-year rotation.
3. For Alternatives B and C, the effects of managing all lands allocated for timber production entirely under either of alternative C's partial retention approaches.
4. For Alternative C, the effects of managing the lands allocated for timber production entirely for 15 to 20 percent partial retention, but in the first decades not harvesting in the oldest 20 percent of them.
5. For Alternatives B and D, the effects of substituting the USF&WS proposed spotted owl recovery plan for each alternative's older forest or spotted owl protection approach. For the preferred alternative, to provide a similar analysis, the effects of substituting the 50-11-40 rule for provision of connectivity by special management in Connectivity Areas.
6. For Alternative C, the effects of allocating the restoration and retention blocks to 35+ percent partial retention management, or of accelerating density management in those blocks in the first decade to the extent practical.
7. For Alternative D, the effects of a minimum harvest age constraint of 60 years (vis-a-vis 40 years in D in many plans).
8. For the preferred alternative:
  - The effects of precluding all timber harvest in old growth ecosystem areas.
  - No regeneration harvest of stands younger than cumulation of mean annual increment.
  - No constraint on minimum age of stands subject to regeneration harvest in General Forest Management Areas.
  - Foregoing planting genetically selected stock, vegetation management for release and precommercial thinning, fertilization, and stand conversion. To be analyzed for each practice individually and for all combined.

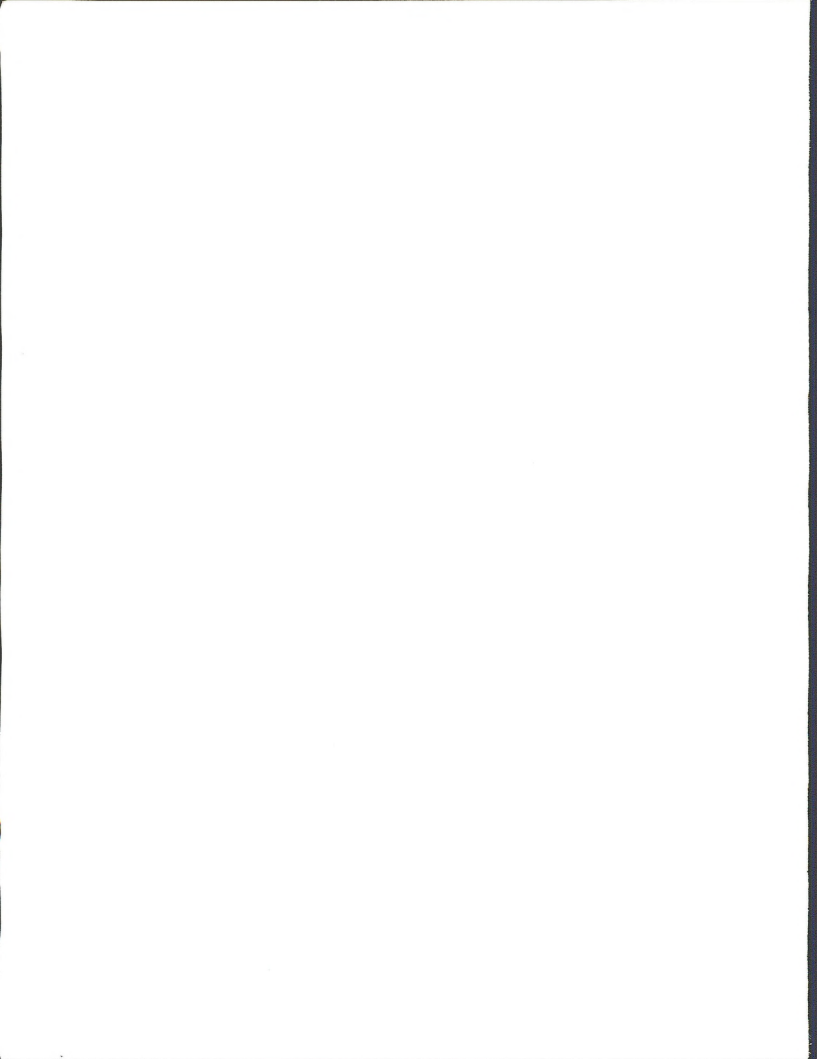
Other sensitivity analysis elements or increments may be added as deemed appropriate by a district.

Estimated effects on ASQ, together with resulting local employment and county revenues for each analysis, will be quantified. Effects on other resource attributes will be quantified only where available analytical techniques are readily applicable. Otherwise, effects will be compared to relevant environmental consequence conclusions for the basic plan alternatives.



# Chapter 2

## Appendix





## Introduction

This Appendix has two major sections: Best Management Practices (BMPs), and TPCC Fragile Restricted Code Guidance. The BMPs described in this document are designed to achieve watershed objectives of maintaining or improving water quality and soil productivity and are not an all-inclusive listing. For any given action, the actual BMPs needed to meet management goals are selected by an interdisciplinary team on a site specific basis. These BMPs are a compilation of existing policies, guidelines, and commonly employed practices designed to minimize water quality degradation and loss of soil productivity. The implementation of these BMPs will be the beginning of an iterative process that includes the monitoring and modification of BMPs. This process is considered the primary mechanism to achieve Oregon State Water Quality Standards.

This Appendix is designed to ensure compliance with the:

Clean Water Act of 1987. Section 319 requires that the States determine those waters that will not meet the goals of the act, to determine those nonpoint source activities that are contributing pollution, and develop a process of determining BMPs to reduce such pollution to the "maximum extent practicable." The Bureau of Land Management has been named a "designated agency" to carry out those provisions including the determining BMPs.

Oregon Administrative Rules (chapter 340, section 340-41), Department of Environmental Quality (DEQ). These rules contain water quality standards for the identified beneficial uses of water in relation to the antidegradation policy, the requirement for the highest and best control of waste activities, temperature, and turbidity.

The recommended practices listed in the second section of this Appendix, TPCC Fragile Code Guidance, are restrictive or mitigation measures necessary to avoid unacceptable soil productivity loss for lands classified as fragile-suitable, restricted. The goal of the practices listed is to prevent or mitigate adverse impacts while meeting other resource objectives. Practices listed in the TPCC Fragile Restricted Guidance section are not all-inclusive. The actual practices used for land classified as fragile restricted are selected by an interdisciplinary team on a site specific basis.

## Best Management Practices (BMP's)

### I. Timber Harvest

#### A. Timber Sale Planning Design

**Objective:** Use the planning process to ensure that timber sales are designed to maintain favorable conditions of soil productivity, water flow, and water quality for beneficial uses in the watershed. Selection of some of the following practices will help meet this objective.

**Practices:**

1. Use interdisciplinary teams to identify applicable BMPs.
2. Use timber production capability classification (TPCC) and field investigation to classify areas as nonsuitable for timber production.
3. Use TPCC and field investigations to classify areas as fragile suitable, restricted.
4. Identify, evaluate and map potential problems (e.g., unstable areas and landforms, saturated areas, etc.). Design measures to avoid negatively impacting potentially unstable ground.
5. Design harvest units to mitigate potential adverse impacts to soil and water. Evaluation factors include the following: soil characteristics, watershed physiography, current watershed and stream channel conditions, proposed roads, skid trails, and logging system design.
6. Plan mitigation measures, if adverse impacts to water quality/quantity or soil productivity are anticipated from the proposed action.
7. Analyze watershed cumulative effects and provide mitigation measures, if necessary to meet water quality standards.

8. Disperse management activities over time and space, within a watershed, in order to meet District thresholds.
9. Where cumulative effects analysis predicts degradation beyond District thresholds, defer all timber sale units in any watershed until substantial recovery has taken place.
10. Include on timber sale maps and/or contracts the location of all stream channels and wetlands (springs, meadows, lakes, bogs, etc.).
11. Locate fragile (nonsuitable and suitable) areas that require special management practices.
12. Include on timber sale maps and/or contracts the location of protection required for each stream channel, wetland, and fragile area.
13. Design RMAs to meet the criteria set in the Preferred Alternative.
14. Select the logging methods that meet water quality standards and soil productivity goals.
15. Leave large downed woody debris on site in amounts that are equal to or greater than those designated in the RMP.

#### B. Riparian Management Area (RMA) Protection

Objectives: To prevent damage to riparian ecosystems and disturbance to streambanks, protect the natural flow of streams, and preserve nutrient cycling from woody debris. Selection of some of the following practices will help meet these objectives.

##### Practices:

1. Allow no chemical loading operations or similar toxic pollutant activities within 200 feet of all water bodies.
2. Directionally fall trees away from RMA when harvesting within a tree length of a RMA. Where no RMA has been designated, directionally fall trees away from the stream.

3. Do not fell any snags within RMAs. (This BMP will be implemented in all instances where safety and fire hazards are avoidable)
4. Logs down prior to logging are to be left in the RMA.
5. No skid trails are to be placed in the RMA except at designated crossings.
6. Avoid locating log landings within 50 feet of RMAs.
7. Provide total protection to lands susceptible to mass wasting, e.g., unstable or oversteepened streambanks and headwalls.
8. Restrict use of tractors in and adjacent to water.
9. When absolutely necessary to yard through RMAs, restrict yarding in RMAs to corridors that are perpendicular to streams. Management guidelines for corridors are:
  - Restrict corridors to the minimum number feasible.
  - Corridors will not exceed 50 feet in width, nor reduce crown cover on a project stream segment to less than 75 percent of predisturbance conditions.
  - Logs will be fully suspended over water and adjacent banks.
10. Remove all logging slash in streams (resulting from the current timber sale) for a distance of 100 feet above culverts, or the distance necessary to protect the culvert. Place slash above high-water mark.

#### C. Yarding Methods

Objectives: To minimize loss of soil productivity, and reduce potential for surface runoff and subsequent degradation due to surface disturbance or compaction. Selection of some of the following practices will help meet these objectives.

1. Cable
    - a. Suspend the front end of logs above the ground during yarding. (This BMP is desirable at all times and will be selected when yarding is to be done over streams or highly erodible soils).
    - b. Fully suspend logs above the ground during yarding when crossing RMAs, streams with fragile banks and sideslopes, and TPCC designated fragile soils.
    - c. Use seasonal restriction, if required suspension cannot be achieved by yarding equipment.
    - d. Hand water bar cable yarding corridors immediately after use on sensitive soils where gouging occurs.
    - e. Respool cables where necessary to protect RMAs or other sensitive areas.
  2. Ground-based
    - a. Use existing skid roads wherever possible.
    - b. Limit new skid trails to slopes less than 35 percent.
    - c. Use designated skid roads to limit areal extent of skid roads plus landings to less than 10 percent of the unit.
    - d. Restrict tractor operations to designated trails, and limit operations to periods of low soil moisture, when soils have the most resistance to compaction (dry season).
    - e. In partial cut areas, locate skid roads so that they can be used for final harvest.
    - f. Till compacted trails, including skid trails from previous entries, with a properly designed self-drafting winged subsoiler.
    - g. Avoid tractor yarding on areas where soil damage cannot be mitigated.
    - h. Avoid placement of skid roads through areas of high water tables or where the skid roads would channel water into unstable headwall areas.
    - i. Water bar skid roads whenever surface erosion is likely.
    - j. Avoid use of wide track vehicles or more than one machine on a skid road at any given time to minimize the width of the skid roads. (On multiple pass skid roads, wide track vehicles result in wider skid roads, and after multiple passes, drive the compaction deeper than a regular width track; however, they are good for one-pass operations such as incidental scattered salvage or site preparation).
    - k. If timber harvesting activities will produce slash that covers the skid trails to the extent they cannot be relocated, prior to felling timber and with a properly designed winged subsoiler, till existing skid trails that are not scheduled for reuse.
  3. Aerial
    - a. Use helicopter, balloon, or skyline yarding to avoid or minimize new road construction, or to provide for complete suspension in sensitive watersheds.
    - b. Place landings away from water-courses to prevent petroleum products or other pollutants from entering the water.
- II. Roads
- A. Planning
 

Objective: To plan road systems in a manner that meets resource objectives and minimizes resource damage. Selection of some of the following practices will help meet this objective.

Practices:

    1. Use an interdisciplinary process to develop an overall transportation system.
    2. Establish road management objectives that minimize adverse environmental impacts.

3. Avoid fragile and unstable areas.
4. Minimize the percent of the land base converted to roads and landings; avoid heavy concentrations of roads and landings to minimize impacts from increased peak flows and erosion of the compacted surface.
5. Develop a District road closure plan using an interdisciplinary team.

B. Location

Objective: To minimize mass soil movement, erosion, and sedimentation. Selection of some of the following practices will help meet this objective.

Practices:

1. Locate roads out of riparian management areas (RMAs) except where no other alternative exists (such as crossings).
2. Locate roads on stable positions (e.g., ridges, natural benches, and flatter transitional slopes near ridges and valley bottoms). Implement extra mitigation measures when crossing unstable areas is unavoidable.
3. Avoid headwalls whenever possible.
4. No construction on potentially unstable areas.
5. Locate roads to minimize heights of cuts. Avoid high, steeply sloping cuts in highly fractured bedrock or deep soil.
6. Locate roads on well-drained soil types. Avoid wet areas by rolling the grade.
7. Avoid locating roads through areas where the geologic bedding planes or weathering surfaces are inclined with the slope.
8. Locate stream crossing sites where channels are well defined, unobstructed, and straight.

C. General Road Design Features

Objective: To design the lowest standard of road consistent with use objectives and resource protection needs. Selection of some of the following practices will help meet this objective.

Practices:

1. Road design standards and design criteria are based on road management objectives such as traffic requirements of the project and the overall transportation plan, an economic analysis, safety requirements, resource objectives, and the minimization of damage to the environment.
2. Consider future maintenance concerns and needs when designing roads.
3. Preferred road gradients are 2-10 percent with a maximum sustained grade of 15 percent. Use steeper grades in those situations where they will result in less environmental impact. Avoid grades less than two percent.
4. Outsloping - outsloping of the road prism for surface drainage is normally recommended for local spurs or minor collector roads where low volume traffic and lower traffic speeds are anticipated. It is also recommended in situations where long intervals between maintenance will occur and where minimum excavation is desired. Outsloping is not recommended on sustained gradients over 8-10 percent.
5. Insloping - insloping of the road prism is an acceptable practice on roads with gradients over 10 percent and where the underlying soil formation is very rocky and not subject to appreciable erosion or failure.
6. Crown and Ditch - The traditional "crown" and "ditch" configuration is recommended for arterial and collector roads where traffic volume, speed, intensity and user comfort are a consideration. Gradients may range from 2 to 15 percent so long as adequate drainage away from the road surface and ditchlines is maintained.
7. Minimize excavation.
8. Locate stable waste disposal areas suitable for depositing excess excavated material.

9. Endhaul waste materials generated during road and ditch maintenance, if side slopes exceed 60 percent or where unacceptable environmental damage may occur if sidecasting is used.
10. Where slopes have been overloaded, endhaul sidecast materials.
11. Surface roads, if they will be subject to traffic during wet weather. The depth and gradation of surfacing will usually be determined by traffic type, frequency, weight, maintenance objectives and the stability and strength of the road foundation and surface materials.
12. Provide for vegetative or artificial stabilization of cut and fill slopes in the design process.
13. Prior to completion of design drawings, field check the design to ensure that it fits the terrain, drainage needs have been satisfied, and all critical slope conditions have been satisfied.
14. Do not divert water directly into headwalls — vary the grade or install cross drains to channel water away from headwalls — check maintenance on existing roads to ensure water is not allowed to remain on the road and/or diverted into unstable headwall areas.
15. Unless a road is needed for future entry, use a temporary road and reclaim it after use, using methods such as blocking, ripping seeding, mulching, fertilizing, and water barring.
16. Minimize potential erosion on a road — if it is dirt surface, reclaim it; otherwise apply rock aggregate to minimize surface erosion.
17. Select landing locations on the basis of minimal excavation, erosion potential, or slope stability concerns.
18. Avoid landing locations alongside or in meadows, wetland areas, or other special habitat features.
19. Shape landings to direct surface water runoff to preselected spots where it can be dispersed to natural, well-vegetated, stable ground.

#### D. Design of Cross Drains

Objective: To minimize concentrated water volume and velocity within the road prism, in order to reduce the risk of slope movement, erosion, and sedimentation. Selection of some of the following practices will help meet this objective.

##### Practices:

1. Design placement of all cross drains to avoid discharge onto erodible (unprotected) slopes or directly into stream channels. Provide a buffer or sediment basin between the cross drain outlet and the stream channel.
2. Locate culverts or drainage dips in such a manner as to avoid outflows onto unstable terrain such as headwalls, landslide features or block failure zones. Provide adequate spacing to avoid accumulation of water in ditches or surfaces through these areas.
3. Provide energy dissipators or armoring at cross drain outlets or drain dips where water is discharged onto loose material, erodible soil, or steep slopes.
4. Use the guide for drainage spacing according to soil erosion classes and road grade shown in Section II.F.23., Table 1.
5. Use drainage dips and/or lead-off ditches in lieu of culverts on roads that have gradients less than 10 percent, or where road management objectives result in blocking roads. Avoid drainage dips on road gradients over 10 percent.
6. Locate drainage dips where water might accumulate, or where there is an outside berm that prevents drainage from the roadway.
7. Cut all cannon culverts to the proper length, downspout, and provide for energy dissipation if needed.
8. Design cross drainage culverts or drainage dips immediately upgrade of stream crossings to prevent ditch sediment from entering the stream.

9. Varying road gradients is a recommended design practice in erodible and unstable soils to reduce surface water volume and velocities, and the necessity for culverts.
10. Use slotted riser inlets in areas with highly erosive soils to prevent culvert plugging.

#### E. Design of Stream Crossings

Objective: To preclude stream crossings from being a direct source of sediment to streams, thus minimizing water quality degradation and providing unobstructed movement for aquatic fauna. Selection of some of the following practices will help meet this objective.

Practices:

1. Pipe arch culverts are appropriate on most fishery streams. Bottomless arch culverts and bridges will be necessary in some instances where gradients greater than five percent, stream discharge, and value of the fishery resource dictate that special engineering considerations are necessary to ensure uninterrupted fish passage. A round culvert may be suitable on streams where fish passage is not a concern.
2. Use the theoretical 50-year flood as design criteria for pipe arches or culverts having an end area 35 square feet or greater. Use the theoretical 25-year flood as design criteria for culverts with less than 35 square feet end area.
3. Minimize the number of crossings on any particular stream.
4. Where feasible, design culvert placement on a straight reach of stream to minimize erosion at both ends of the culvert. Design adequate stream bank protection (e.g., riprap) where scouring could occur. Avoid locations requiring that the stream channel be straightened beyond the length of a culvert to facilitate installation of a road crossing.

5. Evaluate the advantages and disadvantages of a temporary versus permanent crossing structure. This evaluation should take into account economics, maintenance, and resource requirements for access to the area during all seasons over the long-term.
6. Reconstruct deteriorating or poorly built stream crossings with bridges or culverts, ensuring proper alignment and grade.
7. Increase the size of culverts to reduce the amount of highly erosive fill.
8. Low ford stream crossings are appropriate only when site conditions make it impractical or uneconomical to utilize a permanent or temporary crossing structure.

#### F. Construction

Objective: To create a stable roadway that will minimize soil erosion and water quality degradation. Selection of some of the following practices will help meet this objective.

Practices:

1. Limit road construction to the dry season (generally between May 15 and October 15). When conditions permit operations outside of the dry season, keep erosion control measures current with ground disturbance, to the extent that the affected area can be rapidly closed/ blocked and weatherized, if weather conditions warrant.
2. Manage road construction so that it can be completed and bare soil can be protected and stabilized prior to fall rains.
3. Confine construction of pioneer roads to within the roadway construction limits.
4. Conduct pioneer road construction to prevent undercutting the designated final upslope as well as avoiding the deposition of materials outside the designated roadway limits.
5. Construct embankments out of appropriate materials (no slash or other organic matter) using one or more of the following methods:

- a. Layer placement (tractor compaction)
  - b. Layer placement (roller compaction)
  - c. Controlled compaction (85-90 percent maximum density).
6. Do not sidecast where it will adversely affect water quality or weaken stable slopes.
  7. Install surface water drainage measures prior to fall rains.
  8. Clear drainage ditches and natural watercourses of woody material deposited by construction or logging upstream from culvert installations.
  9. Confine major culvert installation to the period of June 15 to September 15 to minimize sedimentation and the adverse effects of sediment on aquatic life.
  10. For larger streams, divert streams around culvert installation work areas to minimize sedimentation during construction.
  11. On streams with important fishery values, install the culvert as close to horizontal as possible (do not exceed 0.5 percent slope). Place culverts on larger nonfishery streams in the streambed at the existing slope gradient. Energy dissipators (e.g., large rock) placed at the outfall of culverts on small nonfishery streams are recommended to reduce water velocity and minimize scour at the outlet end.
  12. Countersink culverts 6-8 inches below the streambed to minimize scouring at the outlet. Increase culvert diameters accordingly to minimize chances of plugging.
  13. Confine activities by heavy equipment in the streambed to the area that is necessary for installation or removal of the structure. Restrict construction equipment to within the approved work area and out of the streambed.
  14. Permanent stream crossing structures are recommended to be in place before heavy equipment moves beyond the crossing area. Where this is not feasible, install temporary crossings to minimize stream disturbance.
  15. Place riprap on any fill material next to culvert inlets and outlets.
  16. Where possible, limit the installation and removal of temporary crossing structures to once during the same year, and within the prescribed work period. Installation and removal should occur between June 15 and September 15 to minimize adverse effects of increased sediment on aquatic life.
  17. Use rock that is as soil-free as possible with temporary culverts. Whenever possible, use washed river rock covered by crushed rock as a compacted running surface.
  18. Spread and reshape clean fill material as close as possible to the original topography after a crossing is removed in order that the stream remains in its channel during high flow.
  19. Limit activities of mechanized equipment in the stream channel to the area that is necessary for installation and removal operations.
  20. Remove stream crossing drainage structures and in-channel fill material during low flow and prior to fall rains. Reestablish natural drainage configuration.
  21. Use washed rock/gravel in a low water ford crossing, if frequent use is anticipated. Surface the approaches with rock aggregate within 150 feet of each side of a low water ford to minimize washing and softening of the road surface.
  22. Construct water bars on dirt roads, spur roads, and skid trails prior to fall rains.
  23. Use the following table for water bar spacing, based on gradient and erosion class.

Table 1 - Water Bar Spacing (In Feet)

Gradients (%)	Erosion Class		
	High	Moderate	Low
3-5	200	300	400
6-10	150	200	300
11-15	100	150	200
16-20	75	100	150
21-35	50	75	100
36+	50	50	50

Spacing is determined by slope distance and is the maximum allowed for the grade.

#### G. Road Renovation/Improvement

**Objective:** To restore or improve a road to a desired standard to minimize sediment production and water quality degradation. Selection of some of the following practices will help meet this objective.

**Practices:**

1. Change flat gradients to a minimum of two percent or provide raised subgrade sections (turnpike) to avoid accumulation of surface water on the road prism.
2. Reconstruct unstable culvert catch basins to specifications. Catch basins in solid rock need not be reconstructed provided that culvert entrance specifications are met.
3. Identify potential off-site water problems or excessive flows and add necessary drainage facilities.
4. Identify ditchline and outlet erosion caused by excessive flows, and add necessary drainage facilities and armoring.
5. Replace undersized culverts, and repair damaged culverts and downspouts.
6. Add additional full-round culverts, half-round culverts and energy dissipators as needed.

7. Correct special drainage problems (i.e., high water table, seeps) that affect stability of subgrade through the use of perforated drains, geotextiles, drainage bays, etc.
8. Eliminate undesirable berms that impair drainage away from the road prism.
9. Restore outslope or crown sections.
10. Avoid disturbing cutbanks while reconstructing ditches or catch basins.
11. Surface inadequately surfaced roads that are to be left open to traffic during wet weather.
12. Require roadside brushing be done in a manner that prevents disturbance to root systems (i.e., prohibit using excavators for brushing).
13. Revegetate all cut and fill slopes by seeding, fertilizing, hydromulching, netting, mulching, and/or planting native trees or shrubs.
14. Install stabilization features such as debris racks, binwalls, and rock blankets as needed.

#### H. Maintenance

**Objective:** To maintain roads in a manner that provides for water quality protection by minimizing surface erosion, rutting failures, sidecasting and blockage of drainage facilities. Selection of some of the following practices will help meet this objective.

**Practices:**

1. Provide the basic custodial maintenance required to protect the road investment to ensure that erosion damage to adjacent land and resources is held to a minimum.
2. Perform blading and shaping in such a manner as to conserve existing surface material, retain the original crowned or outsloped self-drainage cross section, and prevent or remove rutting berms (except those designed for slope protection) and other irregularities that retard normal surface runoff. Avoid dumping



loose ditch or surface material over the shoulder where it would cause stream sedimentation or weaken landslide prone areas. Avoid undercutting of road cuts.

3. Keep road inlet and outlet ditches, catch basins and culverts free of obstruction, particularly before and during prolonged winter rainfall. Minimize routine machine cleaning of ditches during wet weather.
4. Promptly remove landslide material when it is obstructing the road surface and ditchline drainage, and utilize the landslide material for needed road improvements elsewhere or dispose of it in a stable waste area. Avoid sidecasting landslide material where it would overload embankments or natural slopes, or flow into downslope drainage courses.
5. Retain vegetation on cut slopes unless it poses a safety hazard or restricts maintenance activities. Accomplish roadside brushing by cutting vegetation rather than pulling it out and disturbing the soil.
6. Patrol areas subject to road damage during periods of high precipitation.
7. Reclaim/vegetate all roads not needed for future management activities.
8. Revegetate bare cut and fill slopes.
9. Stabilize major slope failures (landslides) by subsurface drainage, rock blankets, or other methods.

#### I. Road Closures

Objectives: To prevent erosion and sedimentation of streams from unmaintained roads, and restore site productivity to roads no longer needed. Selection of some of the following practices will help meet these objectives.

##### Practices:

1. Barricade or block the road surface using gates, guard rails, earth/log barricades, boulders, logging debris or a combination of these methods. Avoid blocking roads that would need future maintenance (i.e., culverts, potential landslides, etc.) with

unremovable barricades. Use guardrails, gates or other barricades capable of being opened for roads needing future maintenance.

2. Follow-up on road closures to ensure they are maintained in accordance with design criteria.
3. Install water bars, cross sloping or drainage dips, if not already on road, to ensure drainage.
4. Till with a winged subsoiler, mulch and/or seed for erosion control and site productivity restoration.

#### J. Water Source Development

Objective: To supply water for road construction, dust abatement, and fire protection while maintaining existing water quality and supply. Selection of some of the following practices will help meet this objective.

##### Practices:

1. Design and construct durable, long-term water sources.
2. Avoid reduction of downstream flow that would detrimentally affect aquatic resources, fish passage or other uses.
3. Direct overflow from waterholding developments back into the stream.
4. Locate road approaches in instream water source developments to minimize potential impacts in the riparian zone. Rock surface these approaches to reduce the effects of sediment washing into the stream.
5. Avoid use of road fills for water impoundment dams unless specially designed for that purpose.
6. Construct water sources during the dry season (generally between May 15 and October 15).

#### K. Restoration of Rock Quarries

Objective: To minimize sediment production from quarries that are susceptible to erosion due to steep sideslopes, lack of vegetation, or their proximity to water courses. Selection of some of the following practices will help meet this objective.

Practices:

1. Wherever possible, prior to excavation of the site, remove and stockpile topsoil for surface dressing to be used in the reclamation of the site.
2. Use seeding, mulching and drainage to minimize erosion.
3. Rip, water bar, block, fertilize and seed access roads to rock quarries where no future entry is planned. Reclaim depleted quarries to enhance other resource uses.

III. Silviculture

A. RMA Protection

Objectives: To prevent damage to riparian ecosystems, disturbance to streambanks, deterioration of water quality, and accumulation of slash in streams. Selection of some of the following practices will help meet this objective.

Practices:

1. No cutting of vegetation within RMAs except to meet RMA management objectives.
2. Directionally fell trees away from RMAs when cutting vegetation within a tree length of any stream or RMA.

B. Mechanical Methods

Objective: To maintain soil productivity and water quality while meeting the silviculture objectives. Selection of some of the following practices will help meet this objective.

Practices:

1. When using tracked equipment for site preparation, limit the use of such equipment to areas of less than 30 percent slopes.
2. Do not compact skeletal or shallow soils.
3. Till all compacted areas with a properly designed winged subsoiler. This could be waived if inspection reveals that less than two percent of the area is compacted. Compaction of less than two percent is considered to impair less than one percent growth loss.

4. On sites that do not annually dry out enough to provide resistance to traditional tracked equipment, use low-ground-pressure, track-type excavators. The narrow window for dry soils on these sites presents a high risk for impacts, as they do not offer the consistency needed for contract administration. These sites are located in the *Udic* moisture regime, which is dry less than 45 days within the four months following June, in six years out of ten.
5. Prohibit tractor operations or piling within RMAs, or within 25 feet of any water course.
6. Restrict tractor operations to dry conditions with less than 25 percent soil moisture content in the upper six inches of soil.
7. Construct small diameter piles or pile in windrows.
8. Avoid piling large logs and stumps.
9. Pile small material (3-8" diameter size predominantly).
10. Burn piles when soil and duff moistures are high.

C. Chemical Methods

Objectives: To protect water quality from chemical pollution, and to enhance soil productivity. Selection of some of the following practices will help meet these objectives.

Practices:

1. Refer to Vegetation Management EIS.
2. Select areas for fertilization listed as TPCC FNR (low nutrient).
3. Target fertilizer for areas that have been impacted from past practices (e.g., intense burns) for possible mitigation.
4. Avoid aerial application of chemicals when wind speeds would cause drift.
5. Locate heliports and storage areas away from stream channels.

6. Do not apply chemicals within 100 feet of perennial streams, or channels with beneficial uses(s) recognized by the State.
7. Do not apply chemicals directly into intermittent streams or channels without beneficial use(s) recognized by the State.

#### D. Broadcast Burning

Objectives: To maintain long-term soil productivity, organic matter, duff, and water quality when burning is used as a management practice. Selection of some of the following practices will help meet this objective.

Practices:

1. Evaluate need for burning based on soils, plant community and site preparation criteria. Burn under conditions when a light burn can be achieved (see guidelines below) to protect soil productivity. The following standards should not be exceeded.
  - a. Category 1 Soils (highly sensitive) - Avoid burning.
  - b. Category 2 Soils (moderately sensitive) - Reduce disturbance, fire intensity and duration by using the following methods:
    - Burn under conditions that result in low intensity fires.
    - Burn when soils and duff are moist.
    - Avoid burning sparsely vegetated areas on slopes greater than 65 percent.
    - Pull slash and woody debris adjacent to landings onto landings before burning.
  - c. Category 3 Soils (least sensitive) - Write prescriptions to protect a large percentage of the nutrient capital and other beneficial properties in the soil and the forest floor. (Low and moderate intensity burns)
2. No intentional burning within RMAs unless necessary to meet RMA management objectives.

#### 3. Fire Trails

- a. Construct tractor fire trails utilizing a brush blade with one-pass construction during periods of dry soil moisture.
- b. Where the fire trail construction has resulted in compacted surfaces, rip and water bar the fire trail (use properly designed winged ripper).
- c. Avoid the placement of tractor constructed fire trails on slopes in excess of 35 percent.
- d. Avoid the placement of any fire trails where water would be channeled into areas of slope instability.
- e. Water bar all fire trails that may carry water in order to minimize surface erosion.

#### IV. Other Activities

##### A. Firewood

Objective: To prevent erosion from road use, and water quality degradation during firewood operations. Selection of some of the following practices will help meet these objectives.

Practices:

1. Seasonal restriction on firewood cutting when access to cutting area is on an unsurfaced road.
2. Clean all road surfaces, ditches and catch basins of debris from wood cutting.

##### B. Wildfire Control

Objective: To minimize water quality degradation, and maintain soil productivity while achieving rapid and safe suppression of wildfire. Selection of some of the following practices will help meet these objectives.

Practices:

1. Limit use of heavy equipment near RMAs and on steep slopes when possible. Where fire trail entry into a RMA is essential, angle the approach rather than have it perpendicular to the RMA.
2. Attempt to keep fire retardant out of water sources.

3. Utilize information from burned area surveys to determine if watershed emergency fire rehabilitation is needed.
  4. Develop a fire rehabilitation plan through an interdisciplinary process.
  5. Select treatments on the basis of on-site values, downstream values, probability of successful implementation, social and environmental considerations (including protection of native plant community), and cost as compared to benefits.
  6. Examples of emergency fire rehabilitation treatments include: 1) seeding grasses or other vegetation as needed to provide a protective cover as quickly as possible; 2) mulching with straw or other suitable material; 3) fertilizing; 4) channel stabilization structures; 5) trash racks above road drainage structures; and 6) water bars on fire lines.
- C. Watershed Rehabilitation and Fish Habitat Improvement Projects

Objective: To minimize damage to riparian vegetation, streambanks, and stream channels. Selection of some of the following practices will help meet this objective.

Practices:

1. Use an interdisciplinary team.
2. Use corrective measures to repair degraded watershed conditions and restore to predisturbance conditions with a vegetative cover that will maintain or improve soil stability, reduce surface runoff, increase infiltration, and reduce flood occurrence and flood damages.
3. Carefully plan access needs for individual work sites within a project area to minimize exposure of bare soil, compaction and possible damage to tree roots. Utilize existing trails to the extent practical.
4. Confine work timing in stream channels in accordance with the Memorandum of Understanding with Oregon Department of Fish and Wildlife to minimize the area of the stream that would be affected by sedimentation during the low flow period.

5. Keep equipment out of streams to the extent possible.
6. Limit the amount of streambank excavation to the minimum that is necessary to ensure stability of enhancement structures. Place excavated material as far above the high water marks as possible to avoid its reentry to the stream.
7. Whenever possible, obtain logs for habitat improvement structures from outside the riparian zone or at least 200 feet from the stream channel to maintain integrity of riparian habitat and streambanks.
8. Inspect all mechanized equipment daily to help ensure toxic materials such as fuel and hydraulic fluid do not enter the stream.
9. Utilize water bars, barricades and seeding to stabilize bare soil areas.
10. Place woody debris in RMAs and streams, create snags and plant conifers and woody riparian vegetation where previous management activities have removed them.
11. Design water source developments and improvements to protect riparian values.
12. Manage livestock use of riparian areas by fencing, other water source development, livestock numbers, and/or season of use.

D. Mining

Objective: To minimize unnecessary disturbance to soils, riparian ecosystems, streambanks, and stream channels within constraints of surface mining regulations. Selection of some of the following practices will help meet this objective.

Practices:

1. Require the claimant to obtain all required State and Federal operating permits.
2. Locate, design, operate and maintain sediment settling ponds in conformance with State Department of Environmental Quality (DEQ) guidelines.

3. If possible, design, locate and construct stream crossings in conformance with practices described in sections II.D and II.E.
4. Use existing roads, skid trails and stream crossings whenever possible.
5. Adequate drainage of surface runoff will be necessary for roads that are constructed or reconstructed for vehicular access to the mining area. If roads are to be utilized during winter months (Oct. 15 - April 15) rock aggregate is to be used to surface those roads.
6. As appropriate, rip, water bar, seed, mulch, and barricade according to BLM specifications, all roads and trails constructed for exploratory purposes that are not needed for the mining operation.
7. Reclamation of the mining area and access roads and trails will be conducted at the conclusion of mining operations.
8. Construct a berm or trench between disturbed areas and water courses when needed to protect water quality.
9. Stockpile topsoil for use during reclamation of the site. In the interim, stockpiled topsoil must be stabilized to prevent erosion and contamination of other resources in the area.
10. If erosion is predicted to occur during the period from October 15 to May 15, contour and mulch disturbed areas that will not be mined for at least 30 days.
11. If possible, retain an undisturbed riparian buffer strip between mining operations and water courses to protect integrity of streambanks, provide for water temperature control, and for filtration of sediment from surface runoff.
12. Whenever possible, confine operations to bench areas rather than allow encroachment on the stream.
13. Locate and maintain sanitation facilities in accordance with State and local regulations and District policies.

#### E. Wetlands

Objective: Maintain the integrity and functional ability of wetlands by avoiding disturbance of these areas whenever possible. Selection of some of the following practices will help meet this objective.

##### Practices:

1. All wetlands destroyed by construction activities will be ameliorated by creating replacement wetland areas.
2. Avoid disturbance of permanent high water table areas.
3. Fall and yard timber in a direction away from wetlands.
4. Utilize seasonal restrictions or full suspension over areas when entry is determined to be required.
5. Avoid the use of tractors or other ground-based equipment that may cause disturbance of the wetlands.
6. Manipulate vegetation in order to enhance or create springs and wetland areas.

#### TPCC Fragile Restricted Code Guidance

##### I. Fragile Sutable Restricted — Soil Moisture (FSR)

Sites with thin light-colored topsoils and gravelly, often shallow soils with low moisture storage capacity. Available water holding capacity in the top 12 inches ranges from 1 to 1.5 inches.

##### Concerns:

Because of low moisture supplying capacity and thin topsoil, soil displacement or compaction significantly impacts the growth of biomass. Soil compaction or displacement further reduces the soil's ability to absorb and store moisture, reducing survival and growth of conifer seedlings.

##### Restrictive or Mitigation Practices:

1. Avoid ground-based logging equipment.
2. Avoid wet-season yarding, except with suspension of logs.

3. Avoid scarification or tilling of soil.
4. Avoid tractor fire trails.
5. Do not prescribe burn or, if burning is absolutely necessary, burn only when fire intensity and duration will be low (see burning guidelines).

## II. Fragile Suitable Restricted — Nutrient (FNR)

Soils on this site are typically well to excessively drained. They occur primarily on ridges, convex hillslopes, at elevations above 2,800 feet. Soils typically have thin topsoils. Organic matter turnover rates slow and a high proportion of site nutrients is stored in the aboveground biomass.

### Concerns:

The highest demand for plant nutrients occurs during the first 15 to 20 years after a plantation is established. Removal of nitrogen on sites already below optimum levels for growth will have an immediate impact on new plantations. Although natural precipitation supplies small amounts of nitrogen, it must be emphasized that nutrients in deficient soils will not be available in sufficient quantities during the period of maximum need by the young stand of trees.

Studies indicate that scarification and burning that result in high biomass removal on nutrient-deficient soils could have an immediate detrimental impact on growth.

### Restrictive or Mitigation Practices

1. Avoid burning on these sites when possible. Burning is often not needed to control plant competition on low fertility sites.
2. Avoid burning on steeper slopes and southerly aspects.
3. Encourage nitrogen-fixing vegetation.
4. Use fertilizer to increase nutrient levels.
5. Avoid use of ground-based yarding equipment such as tractors and rubber-tired skidders.
6. Avoid scarification and tractor slash piling.

## III. Fragile Suitable Restricted — Slope Gradient (FGR)

Steep hillslopes of greater than 70 percent, adjacent to streams or in headwalls of drainages. Soils are shallow to moderately deep, noncohesive and gravelly.

### Concerns:

Disturbances of logging or road construction may accelerate soil erosion, raveling and sliding, and may contribute to debris avalanches (sluice-outs). When such materials enter streams, there are serious impacts to water quality and to riparian (streamside) vegetation.

### Restriction or Mitigation Practices:

1. Avoid placing roads in headwalls steeper than 70 percent and minimize sidecasting of excess road construction materials.
2. Avoid practices that add water to headwalls or disrupt the natural drainage.
3. Patrol culverts in high-hazard areas during high runoff events.
4. Avoid placement of new materials into landslide areas.
5. Direct road runoff into ditch lines by insloping or use of dips.
6. Place downspouts on culverts where they discharge onto steep slopes.
7. Utilize full suspension yarding.

## IV. Fragile Suitable Restricted — Mass Movement Potential (FPR)

These sites occur primarily in undulating topography containing depressions and sag ponds. Parent material is primarily volcanic rock. Slopes of the slump scarp may be steep but the average hillslope is on gradients of less than 70 percent. Soils are typically deep and highly productive.

**Concerns:**

These sites are subject to slow mass movement. Any practice that increases weight or soil pore pressure, or reduces support at the toe, accelerates movement. Run-off from compacted soil on roads and skidtrails that diverts water into unstable areas is a common cause of increased instability.

**Recommended Practices:**

1. Avoid unloading toeslopes of landslides.
2. Avoid placing waste material on landslide features.
3. Divert road drainage away from unstable areas.
4. Maintain or reestablish natural drainage after harvest operations.
5. Evaluate unstable slopes and design measures to enhance their stability.

**Fragile Suitable Restricted — Groundwater (FWR)**

These are very moist, imperfectly drained sites, usually in depressions or adjacent to streams or unstable areas where the water table is near the surface much of the year. (Soils have high-chroma mottles or gleying within 6 to 14 inches of the surface. Slough sedge and skunk cabbage are absent.) The

vegetation is dominated by alder and western hemlock overstories, and oxalis, vine maple, and sword-fern understories. Salmonberry and devils-club are minor components.

**Concerns:**

These sites may or may not contain water-tolerant species, but removal of trees could reduce transpiration rates. Yarding may disrupt surface water flows. This can raise the water table and increase the period of the year in which soils are wet. This, in turn, could reduce production, increase competition of unwanted vegetation, and change the adapted species.

**Recommended Practices:**

1. Minimize practices that disrupt natural drainage, such as dragging logs through wet areas or leaving skidtrails that block natural drainage.
2. Avoid use of ground-based logging equipment when soils are wet.
3. Avoid scarification.
4. Plant species adapted to the site, such as western hemlock, western red cedar, or alder.





# Appendix 2-B

## Allowable Sale Quantity Calculation Process

This Appendix describes the information, models, and processes used to estimate the Allowable Sale Quantity (ASQ) for each plan alternative and to portray implementation of that harvest for ten years in a Geographic Information System (GIS) to facilitate analysis of environmental impacts. It should be noted that all of the inventory and yield simulation data are estimates with statistical errors around them and this means that the resulting ASQ also reflects a level of uncertainty. In Alternative C and the draft Preferred Alternative, the use of nontraditional silviculture regimes and modeling techniques increased the uncertainty relative to the other alternatives.

### Selection of the Harvest Scheduling Model

Early in the planning effort in 1986, BLM began to explore the timber harvest scheduling model options available. A timber harvest scheduling model combines forest inventory data with proposed timber management prescriptions to determine potential annual timber harvest levels and sustainability over the long-term. By early 1987, we tentatively identified a model called TRIM-PLUS as best meeting our needs. In the spring of 1987, public workshops were held for interested parties in some of BLM's western Oregon offices. After considering the comments received and testing the model, BLM selected the TRIM-PLUS Model.

The features of TRIM-PLUS that made it seem to be the optimum approach for BLM use were its ability to:

- make non-declining harvest level calculations based on different minimum harvest ages for different groups of acres.
- calculate a harvest level including multiple land use classes simultaneously.
- be used at the District level by BLM personnel on personal computers.
- provide report generating capabilities.
- provide simplified input and output data.
- provide relatively inexpensive computer runs.

Although harvest scheduling models of various degrees of complexity were considered, it was our intent to identify a relatively simple and reliable state-of-the-art system. We wanted to be able to interface the selected model with other specific resource analysis models and procedures that use automated resource databases and geographic information systems. The RMP process identified different land use allocations and TRIM-PLUS reflected the resulting harvest impacts to each land use allocation.

### Allowable Sale Quantity Calculation Process

Allowable Sale Quantity (ASQ) is an expression of the maximum non-declining level of timber harvest sustainable over time. The ASQ was estimated using TRIM-PLUS, a binary search type model designed to operate on desktop PCs. TRIM-PLUS functions similarly to the SIMIX model used by the BLM to generate ASQs in the 1970s and 1980s. ASQ volumes from TRIM-PLUS were calculated in merchantable cubic feet. Equivalent estimates in board feet were provided to help interpret the information.

Within TRIM-PLUS, data was segregated by administrative unit, land use allocation, forest type, existing stand condition, or a variety of other factors. These groups of data are called Basic Resource Units (BRUs). TRIM-PLUS required a variety of information in order to complete ASQ computations and harvest scheduling. The information included: 1) acreage, 2) existing stand conditions, 3) volumes, and 4) management assumptions and yields.

### Acreage

Acreages for the harvest calculations were derived from digitized GIS maps of the forest inventories overlaid with land use allocations for each alternative. This data is stored in a relational database called MICRO\*STORMS. Also included in this data base are the results of the Timber Production Capability Classification, Operations Inventory, and Continuous Forest Inventory including data about past management, current conditions, recommendations, site productivity and limitations, and volumes. Selected information from these or other data files has been linked to the GIS maps.

## Existing Stand Condition

Existing Stand Condition (ESC) codes help to group, sort and track similar kinds of stands, and help place units of land into the proper BRU. Each forest inventory stand was assigned a code from the following list that best describes that stand.

## Existing Stand Condition Codes

Code	ESC Description
1	Well stocked managed stands
2	Minimum stocked managed stands
3	Below minimum stocked managed stands
4	Overstocked managed stands
5	Planted with genetically improved stock
6	Precommercial thinned and fertilized
10	Commercial thinned
11	Commercial thinned and fertilized
30	Mortality salvaged
40	Unmanaged stand 36-500 years old
50	Brushfield/Backlog/Hardwood conversion
60	Sold; uncut
61	Cut; site not prepared for planting
62	Site prepared, not planted
99	Non-forest (these are not included in BRUs or TRIM-PLUS)

## Current Volumes

Tree volumes on present stands were derived from permanent inventory plots distributed throughout the District. Both conifers and hardwoods were cruised by certified BLM cruisers to the same standards used in timber sale preparation. Cubic foot volumes were computed from the inventory data using a BLM software program called UNIT1. Summary plot data was stored in the MICRO-STORMS database file called CFI. These data include general site descriptors, board foot and cubic volume, growth, basal area, trees per acre, and average DBH and tree heights.

## Management Assumptions and Yields

Assumptions about future management that affect ASQ levels from TRIM-PLUS include: minimum harvest age, regeneration lag, future stocking levels, anticipated gains for planting genetically improved stock, the frequency and acres of precommercial thinning, commercial thinning and fertilization, and the stand age when these treatments are applied. Details of these assumptions are available at the District office.

TRIM-PLUS allows up to eight separate management prescriptions within each BRU that can be used to simulate various management assumptions or intensity levels. Each of these prescriptions requires yields and acres by age class, and information about shifting acres from one prescription to another during growth or at harvest.

Empiric yields were estimated from the measured inventory plot volume. Empiric yields were preferred over published yield tables or yield simulations whenever sufficient plot data was available to build yield tables. See Appendix A of the Analysis of the Management Situation (AMS) for the Eugene District for the details about empiric yield estimation.

Yields were estimated using the Stand Projection System (SPS) when insufficient empiric data was available. SPS is a computer program written by Dr. James Arney to simulate the growth and development of forest stands. The model is primarily designed to simulate Douglas-fir or western hemlock stands, but will also handle hardwoods and other species. Site index, fertilization, thinning, stocking levels, stand clumpiness and economics are some of the variables that SPS can use in making yield projections. The BLM version of SPS incorporates volume regressions and cruising standards from each western Oregon BLM District.

A series of SPS runs were made to determine what combinations of practices would result in the highest yields. For example, on average quality sites on the Eugene District, precommercial thinning at age 10 to 280 trees per acre, fertilizing every 20 years thereafter, and commercial thinning at age 50 produced the highest yields for even aged clear cut management regimes.

Yield gains from the genetic tree improvement program have been estimated by the District geneticist. To incorporate these gains into TRIM-PLUS, the site index input into SPS was raised to match the height gains from measured progeny test plantation trees. Details of this procedure are also available at the District Office.

## The Allowable Cut Effect (ACE)

The forest is composed primarily of old growth and recently cut-over stands that exhibit a relatively low average annual growth. This results from slow or negative growth of the old stands and the fact that growth is not measurable (in end-product terms) in the young stands until they reach 20 or 30 years of age. Such a forest is in transition from an unmanaged to a managed or regulated state. In the classical sense, the regulated state is achieved when average annual harvest and growth are in equilibrium. At this point, maximum yield on a sustainable basis is reached. To compute an allowable cut on a forest in the transition state using this criteria would be extremely conservative and greatly lengthen the time until the regulated state was achieved. The BLM uses an alternative approach. It projects growth into the future based upon assumptions about management levels and utilizes excess harvest age timber to bridge the time gap until the ultimate growth level is achieved. This process of taking credit now for future growth increases expected to result from management has been termed the "Allowable Cut Effect" (ACE).

## Alternative D - Harvest Scheduling Model

In Alternative D, the spatial constraints of the 50-11-40 rule feature of the Interagency Scientific Committee Report on the Northern Spotted Owl precluded the use of TRIM-PLUS. The 50-11-40 rule requires that at least 50 percent of the forested acreage in a quarter township contain trees 11" in diameter or larger with a 40 percent or greater crown closure in perpetuity. The acreage available for possible timber harvest is equal to the number of BLM forest acres in excess of the 50-11-40 requirements within each quarter township that are outside Habitat Conservation Areas (HCAs). As stands are harvested and grow through time, the 50-11-40 status of the forest inventory within a quarter township changes. TRIM-PLUS, under its current configuration, cannot track the decadal changes in acreage, which is over the 50 percent threshold by quarter township. The BLM developed a simple harvest scheduling model, which can track the spatial constraint of 50-11-40. The harvest scheduling model was developed within the forest stand database "MICRO\*STORMS."

The MICRO\*STORMS database contains the basic stand information needed to estimate the initial inventory status for every township quarter within an SYU. For each quarter township, the age class distributions were calculated for the areas available and unavailable for harvest. This age class distribution was further

subdivided into acreage above and below 40 percent crown closure. Stands that are 40 years of age were assumed to meet the 11-inch portion of the rule. The acres in each quarter township that do not count in applying the 50-11-40 rule, i.e., nonforest and HCA1 and HCA2s, were identified. The number of acres over the 50-11-40 threshold were determined for each township quarter. A maximum limit of harvest was also applied to smooth large oscillations in the harvest level that resulted from application of the 50-11-40 constraint alone. This secondary constraint did not reduce the evenflow harvest level for the simulation. The harvest level for a quarter township for any given harvest period was determined by the number of acres over the 50 percent threshold or the rotation constraint whichever allows less harvest.

Since the model allowed only a single yield function, the BLM normal empiric yield function was used. One average starting volume for each age class was assigned. As the model progresses through time, the volumes were recalculated based on approach to normality.

The model harvested oldest age class first and assumed a three-year regeneration lag.

As the model progressed through each decade, the amount of acres in excess of the 50-11-40 threshold was recalculated to determine the harvest level for each township quarter. The estimated District ASQ was the sum of the harvests from each quarter township.

## The Ten-Year Representative Timber Management Scenario Process

The purpose of the ten-year scenario was to allow analysis of environmental impacts within a geographic information system (GIS). All forest stands age class 40 or older were mapped into operational harvest units called Representative Timber Units (RTU) on a GIS theme called "potential harvest." In addition, roads called Representative Timber Roads (RTR) that would be constructed to harvest those units were mapped. For each alternative, the maps of the RTUs and RTRs were overlaid in GIS with the harvestable land base. The harvestable acreage for each RTU and RTR was downloaded from GIS into the MICRO\*STORMS PC database. After an ASQ was derived using TRIM-PLUS, sufficient RTUs and RTRs of the appropriate land use allocation and age were selected to match the harvest schedule as closely as possible. The initial selection of the individual RTUs was automated within MICRO\*STORMS to distribute the units widely across the landscape. The initial solution was adjusted to add roads and account for the acreage and volume result-

*Appendix 2*

ing from the roads. In Alternative D, the selected units were adjusted to reflect implementation of the 50-11-40 rule. In Alternative C and the draft Preferred Alternative, the number of units selected was inflated where patch cutting was expected to harvest only a portion of the available acreage. Only regeneration harvest RTUs were selected, but roads for both regeneration harvest and commercial thinning or density management were selected. The final selected units and roads were uploaded into GIS to create the map that was used for analysis of environmental impacts.

# Appendix 2-C

## Silvicultural Systems and Practices Considered in the Common Alternatives

In addition to dealing with land use allocations and objectives, the RMP addresses the selection and impacts of different silvicultural systems and with practices used to implement those systems. This Appendix details both the systems and practices considered in the common alternatives.

### Silvicultural Systems

Silvicultural systems define the sequence of management practices that take place over the entire life of stands in managed forest landscapes. These systems are designed for the successful and sustainable implementation of land use objectives, which may include: timber production, retention of visual quality,

retention of biological diversity, creation of wildlife habitat, or maintenance long-term soil productivity and of watershed condition. They are also designed to be consistent with the current conditions, the physical sites, and the ecosystems of the lands to be managed. Silvicultural systems must be reasonable and implementable as well as economically feasible.

In development of the RMP, three general silvicultural systems were designed to meet the primary and secondary objectives of the alternatives. These general silviculture systems include Even-aged, Shelterwood Retention, and Structural Retention. The following table indicates which silviculture systems are associated with each of the alternatives:

Silviculture System	Alt. NA and A & B	Alt. C	Alt. D	Alt. E	Preferred Alt.
<b>Even-Aged</b>					
No Tree Retention	X				
1-2 Tree Retention/Ac.			X	X	
6-8 Tree Retention/Ac.					X GFMA
12-16 Tree Retention/Ac.					X VRM/RIF
<b>Shelter Wood Retention</b>					
20+ Tree Retention/Ac.				X VRM/RIF	
<b>Structural Retention</b>					
6-8 Tree Retention/Ac.					X OGEA
12-16 Tree Retention/Ac.		X			X CONNECT

The abbreviations in the table represent the following Preferred Alternative Land Use Allocations:

GFMA - General Forest Management Area  
VRM/RIF - Visual Resource Management/Rural Interface  
OGEA - Old Growth Emphasis Area  
CONNECT - Connectivity Management Area

The retention levels in this table are live green trees and do not include snags or down logs.

Each general silvicultural system was designed to move stands from their current condition along a developmental path toward a desired or "target" stand condition. Target stand conditions include even-aged, high volume stands in the case of even-aged and shelterwood retention systems and ecologically diverse stands in the case of structural retention systems. Each silvicultural system consists of three phases: stand regeneration, stand management, and stand harvesting.

Several formulations of each general system were developed to evaluate different levels of management intensity, different rotation lengths, and different developmental trajectories for each stand.

## Design and Selection of Silvicultural Systems

Silvicultural systems are designed at a general level for the planning process and at a more detailed, site specific level for individual forest management actions. At both levels, the design process follows the same steps.

Silvicultural prescriptions begin by considering land use allocations and management objectives. Current stand conditions and landscape conditions, together with physical site characteristics usually limit the number of ways a stand can be managed.

Selection of a method for reaching a target stand or landscape condition requires consideration of successional pathways and functional relationships within particular plant communities. It also requires knowledge of the biological potential of the site, processes required to maintain forest health, and habitat requirements of plant and animal species. In addition, the selected method must assure that harvested land can be reforested and that the managed ecosystem is sustainable. Reforestation is the most critical part of any silvicultural system.

Successful implementation of the silvicultural system, together with providing for environmental protection and maintenance of long-term site productivity is the basis for the design of timber sale actions and for the selection of the logging systems and transportation systems.

Silvicultural system design also considers wood quality and value through features such as rotation lengths, tree pruning, and stand density regulation.

## Even-Aged Systems

Even-aged systems involve the management of both existing even-aged or near even-aged stands and the creation of new even-aged stands through harvesting or stand conversion actions. This silviculture system is associated with Alternatives A, B, D, E and portions of the Preferred Alternative (General Forest Management Area).

Even-aged systems can provide for some level of structural retention, including wildlife trees and down woody debris, but at levels equal to or below those detailed for structural retention systems. In some areas, such as those infected with diseases or root rot and those of high blowdown hazard, retention of an overstory may not be successful.

The green tree retention levels in the even-aged silviculture system are as follows:

- Alternatives A and B - no green tree retention
- Alternatives D and E - 1-2 green trees per acre
- Preferred Alternative - 6-8 green trees per acre (General Forest Management Area)
- 12-16 green trees per acre (Connectivity)

The large conifers retained would proportionally represent the total range of tree size classes present that are larger than 15 inches in diameter. Where possible, 50 percent of the retained trees would be at least 20 inches in diameter and 25 percent would be at least 36 inches in diameter. Retained trees reserved would represent the average quality of trees on the unit and they would be left to become snags and down logs. The trees would be selected to provide the best wildlife habitat available while minimizing the merchantable volume foregone from harvest.

Retained structures would usually not be uniformly distributed in harvested stands. The location of reserve trees would be varied or clumped according to the characteristics of stands and sites and the specific objectives. Some or all of the reserved green trees may be girdled or topped to provide snags until the re-established stand becomes large enough for snag recruitment.

The general sequence and kind of silviculture treatments used on stands under this prescription would be the same as those now used in the even-aged management, with the exception that aerially applied

herbicides would not be done where there was green tree retention. These practices include site preparation, maintenance, release, precommercial thinning, fertilization, commercial thinning and tree pruning.

#### **Stand Regeneration:**

The clear cut method is an even-aged reproductive cutting method in which an entire stand or part of a stand is harvested in a single entry with the exception of designated wildlife trees and snags. It permits the establishment of an even-aged stand with the fewest number of entries and allows aerial management practices to be implemented safely and efficiently in situations where green trees are not retained.

Clear cuts are usually regenerated through planting following site preparation. For the next decade and subsequent decades, clear cuts are planned to be planted with genetically improved stock whenever it is available. Natural regeneration may occur through seed dispersal from retained trees and trees in adjacent timber stands. The clear cut method of regeneration may be used in previously unentered stands or in stands previously subjected to management.

In the Eugene District, clear cut harvest units may require actions in addition to conifer planting in order to secure regeneration. These practices include seedling shading, protection from animal damage, and control of competing vegetation.

#### **Stand Management:**

Following the regeneration phase, even-aged systems are subjected to treatments designed primarily to produce higher timber yields.

Stand management practices include control of species composition and stand density. Release practices are employed to ensure that tree growth is not slowed by competing vegetation and that commercial trees are not displaced by non-merchantable or lower valued plants. Density control through precommercial thinning assures that growth is concentrated in the stems of selected trees.

Control of stand density and species composition makes it possible to increase harvest volumes through commercial thinning. As stands age, fewer and fewer trees are required to fully occupy a site. Density control permits the growth of surplus conifers to merchantable sizes. These trees may be harvested in commercial thinnings which increase total rotation yields.

For more productive sites, forest fertilization may be employed to temporarily increase stand growth. Following precommercial thinning or release, stands may experience significant growth retardation, called "thinning shock." The severity of this retardation may be reduced through application of fertilizer. Forest fertilization may also be used to improve tree vigor.

#### **Stand Harvesting:**

Stand harvesting may occur at any age above a minimum harvest age set to meet land use objectives as well as economic and logging practicality requirements.

The sustainable harvest level is highest if minimum harvest age is set at the lowest practical age. Over time rotation lengths would approach the age of Culmination of Mean Annual Increment (CMAI), if the minimum harvest age is equal to or less than the age of CMAI. CMAI varies with site quality, the kind of silvicultural practices employed, and the timing of those practices. For most regimes and sites in the Eugene District, CMAI occurs between 60 and 90 years of age.

### **Shelterwood Retention Systems**

Shelterwood Retention refers to modified even-aged systems that have sometimes been termed "irregular shelterwoods." In this system, overstory trees are retained until understorey conifers are large enough to fulfill management objectives such as preserving visual qualities. Overstorey trees (20+ trees per acre) may be retained for a period of 15 to 40 years. A wide variety of stand conditions exist across the planning area. In some areas, such as those infected with diseases or root rot and those of high blowdown hazard, retention of an overstorey may not be successful. This silviculture system is associated with the Rural Interface Areas in Alternatives D and E.

#### **Stand Regeneration:**

Shelterwood retention units are normally planted but, like shelterwoods, also receive varying amounts of natural regeneration. Planting stock will reflect genetic selection when such stock is available but, since the performance of genetic stock and its percent representation in stands created under these regimes are uncertain, no yield gain would be assumed for tree improvement.

### Stand Management:

Like even-age systems, shelterwood retention stands receive treatments designed to increase yield. Control of species composition and density are as critical or more critical in shelterwood retention systems than in even-aged systems to produce economically harvestable tree sizes in reasonable periods of time. Following the removal harvest, fertilization may be applied to accelerate stand development and to reduce the shock and damage of overstory removal.

### Stand Harvesting:

Harvest of retained shelterwood trees occurs in one or more entries 15 to 40 years after the regeneration harvest and when stand development has proceeded to a point at which soil or visual requirements are met.

Stand harvesting may occur at any age above a minimum harvest age set to meet land use objectives as well as economic and logging practicality requirements.

The sustainable harvest level is highest if minimum harvest age is set at the lowest practical age. Over time rotation lengths would approach the age of Culmination of Mean Annual Increment (CMAI), if the minimum harvest age is equal to or less than the age of CMAI. CMAI varies with site quality, the kind of silvicultural practices employed, and the timing of those practices. For most regimes and sites in the Eugene District, CMAI occurs between 60 and 90 years of age.

## Structural Retention Systems

These silvicultural systems are designed to retain or to recreate forest ecosystems that resemble natural systems in composition, structure and ecosystem function. They do not simply retain specific structural components of forest stands on harvest, but are flexible to meet the requirements of stands and sites. Retained structural components including live trees, snags, and large down wood, may be clumped or distributed in various ways in the landscape. Hardwoods would be retained or restored in re-established stands at a level consistent with the identified target stand objective. Through retention and re-creation of structure and through appropriate selection and timing of treatments, these systems attempt to retain natural ecosystem processes and habitat niches. In some areas, such as those infected with diseases or root rot and those of high blowdown hazard, retention of an overstory may not be successful.

Structural retention systems attempt to provide for maintenance of site productivity, wildlife habitat, and a high level of biological diversity in a managed landscape.

Silvicultural practices used are modifications of those used in even-aged systems, and reflect attempts to redirect ecosystem processes, rather than to replace those processes with agricultural-style management.

Stands, which result from the use of structural retention systems, will usually be multiple-canopied and multiple-aged, but will not be all-aged. These systems differ in some ways from "selection forestry" although many elements of selection cutting are included in these systems. Classical selection methods involve removal of individual trees (individual tree selection) or groups of trees (group selection) to produce or retain an all-aged forest composed of all size classes of trees, rather than a multiple-canopied forest.

Two levels of structural retention were designed, together with a method for restoring structure to even-aged stands.

**12-16 Green Tree Retention per acre** is a regeneration harvest designed to retain the high level of live trees while providing enough disturbance to allow regeneration and growth of the naturally occurring mixture of tree species, including shade intolerant species and hardwoods. This retention level would provide both future large snags and down logs and large live trees to meet structural objectives. This silviculture system is associated with Alternative C and portions of the Preferred Alternative (Connectivity and Rural Interface/Visual Resource Management).

**6-8 Green Tree Retention per acre** is a regeneration harvest designed to retain only enough green trees from which to create the large snag and down log components during the first 50-60 years of the rotation. The long-term target structural components would be produced by managing the densities of re-established stands to develop old growth structure within 120-150 years after harvest entry. This silviculture system is associated with portions of the Preferred Alternative (nondeferred Old Growth Emphasis Areas).

Harvest entries would reserve all snags and down woody debris, which may be safely and practically left. Site productivity and wildlife habitat objectives would be met at the stand level, but variation would occur from acre to acre. Reserve trees would represent the average quality of trees in the units. The location of reserve trees or patches would be based on consideration of wildlife habitat features,



wet areas, wind firmness, logging system design, reforestation and species diversity requirements. The location of reserve trees and logging and silviculture practices within treatment units would be designed to fully, effectively protect the habitat of special status species.

#### **Stand Regeneration:**

The regeneration phase relies primarily on the planting of Douglas-fir supplemented by natural seeding, together with subsequent stand management, to achieve a near natural mixture of species in each seral stage. Genetically improved Douglas-fir stock would be used, where available, with no assumption of increased yield. Natural seeding will provide a mixture of species and a mixture of improved and natural Douglas-fir stock.

#### **Stand Management:**

Stands created under this system receive treatments designed to meet structural and functional objectives.

Density management is a series of thinnings designed to restore species and structural diversity to even-aged managed stands. Density management is applied to create fine-grained patch detail and to reduce stand density to levels below that normally occurring at time of commercial thinning. This results in more rapid development of large trees and multiple-canopy structures. Tolerant species can be planted or naturally regenerated in small openings to provide species diversity and multiple canopy level structure.

Forest fertilization would be used as appropriate, but, because of uncertainty of its effect on diverse stands, would not result in an assumed yield increase. Snags would be retained or created to provide cavity nester habitat and a future supply of down logs.

#### **Stand Harvesting:**

These systems seek to retain or to recreate the habitat characteristics of older forests and rotations are generally longer than those usually employed in even-aged systems, but (with the exception of the draft Preferred Alternative Old Growth Emphasis Areas) shorter than the average natural replacement interval for stands. The regeneration harvest rotation varies from 70 to 300 year intervals. Harvesting is expected to occur across stands and in patch cuts of varying sizes, with structures retained in the

patches. Regeneration harvest unit sizes could range from small patches (1/2 to 5 acres) up to the limit of the Oregon State Forest Practices Act (120 acres).

### **Silvicultural Practices Potentially Available for All Systems**

For each silvicultural system a variety of practices, other than harvesting, would be planned for specific periods in the rotation. These practices act to keep the forest on desired developmental trajectories, to speed the development of desired habitat components, to increase timber yields, and to improve timber quality.

While both the type of practice used and its timing vary between systems, most silvicultural systems require the full range of forest management tools and practices for their successful implementation.

#### **Stand Conversion:**

Stand conversion is a process in which vegetation, which currently dominates a site, is removed and is replaced with species that better meet management objectives. Typically, on sites which could support commercial conifers, vegetation such as hardwoods, grass, and shrubs, are removed and are replaced with a mixture of commercial conifer species required to meet management objectives.

Stand conversion units are planned to be planted with improved stock whenever it is available.

#### **Salvage of Mortality Volume:**

All silvicultural systems provide for the salvage of mortality volume under prescriptions designed to ensure that such actions meet the requirements of allocations and objectives.

Mortality in established stands results either from competition and self-thinning or from forest disturbances such as fire, windstorms, disease, or insect attack. The mortality associated with self-thinning is harvested in commercial thinnings or is prevented through other density management and species control practices. Mortality of scattered trees or entire stands that arises from disturbances, and which is above the levels needed to meet excavator habitat and down woody debris requirements, could be harvested in mortality salvage operations.

While forests may differ in their susceptibility to disturbance, based on stand age, stand condition, plant community or physical site, all are subject to disturbance agents. Forests that have been undis-

turbed for long periods of time, and those which are in poor health, have increased risk to widespread mortality from insects, fire, windstorms, and disease. (Waring and Schlesinger, 1985).

Forest condition and current weather cycles on the Eugene District make it likely that mortality levels over the next decade will be similar to those experienced in the last decade.

## Site Preparation

If needed, site preparation procedures would be used to prepare newly harvested or inadequately stocked areas for planting or for natural regeneration. Site preparation occurs before planting. The methods used are selected to (a) provide physical access to planting sites; (b) to control fire hazard; (c) to provide initial physical control of the site to channel limited site resources into the conifer crop; (d) to influence the plant community which redevelops onto the site; (e) to influence or control animal populations; and (f) to ensure the maintenance of site productivity.

Four types of site preparation techniques would be utilized. These are prescribed burning, herbicide application, mechanical, and manual methods. Prescribed burning for site preparation could include broadcast burns and pile burns. To protect air quality, burning would occur under conditions consistent with the Oregon Smoke Management Plan. Broadcast burning prescriptions would be written to minimize the detrimental impacts of fire on other resources. Emphasis would be placed on protecting the physical and chemical properties of soils and the retention of coarse woody debris. Broadcast burning would be avoided on highly sensitive soils (those soils recognized as unusually erodible, nutrient deficient or low organic matter), in most instances. Any burning on such soils, if considered essential to obtain adequate reforestation, would be accomplished under site specific prescriptions designed to minimize detrimental impacts on soil properties. On other soils, burn prescriptions would be designed to protect beneficial soil properties and result in moderate and low intensity burns.

Herbicides would be used to control competing vegetation to aid in seedling establishment. Use would occur only after careful site specific environmental analysis and local public involvement and would be governed by the procedures established in BLM's Record of Decision (ROD) Western Oregon Program - Management of Competing Vegetation, 1991. Herbicides would be applied by one of several ground methods. Application specifications would be designed to

minimize the potential for drift or volatilization of chemicals. Handling, storage, and application of chemicals would be in accordance with the Oregon Forest Practices Rules.

Mechanical site preparation could consist of piling or windrowing of slash and competing vegetation. Track-type tractors equipped with a brush blade would be restricted to areas with suitable soil types and slopes less than 35 percent. Track-type tractor site preparation would meet the following minimum conditions: 1) minimize piling of large woody material; (2) avoid displacing duff layers and topsoil into piles or windrows; (3) make only two machine passes (one round trip) over the same area; and (4) operate at soil moistures that maximize resistance to compaction. A low ground pressure backhoe/loader grapple or other special equipment or techniques that would achieve the same insignificant (less than one percent) growth loss result may be used instead of the preceding techniques, especially on soils considered unsuitable for tractor operations. All compacted areas would be tilled with properly designed equipment.

Manual site preparation could consist of shrub pulling or cutting, site hoeing, grubbing of unwanted vegetation, or piling of slash.

## Reforestation

### Conifer Planting:

Conifer planting would be utilized where appropriate to assure that reforestation objectives are met. The production of planting stock requires seed (cone) collection from wild stands or from seed orchards and the production of planting stock in bare-root nurseries or container shadehouses. Careful handling, storage, transportation, and planting, together with subsequent stand maintenance and protection, are necessary in order to ensure reforestation success.

### Natural Reforestation:

Within all silvicultural systems, but most extensively in shelterwood retention or structural retention systems or on rocky woodlands, natural regeneration would be used to supplement planting to the maximum extent possible. Reliance on natural reforestation could result in loss of growth gains from genetically improved stock or delay in establishing future stands.

#### **Stand Protection:**

Stand protection procedures would be designed to protect newly planted seedlings from natural hazards. Such treatments could include protecting seedlings from the sun by shading, and bud capping or placing plastic tubes or netting over seedlings to protect from animal browsing or clipping. Control measures to deal with populations of animals such as mountain beaver, gophers, or porcupines would be considered if populations of these animals reached levels high enough to threaten stands. Treatment acres would be determined annually in conjunction with normal reforestation surveys.

Stands would also be managed to decrease the risk of destruction from wildfire. Management practices could include stand manipulation treatments such as underburning, limbing, density management, or hand piling of slash. Retention of hardwoods in stands may result in somewhat higher levels of resistance to low intensity fires.

#### **Stand Maintenance:**

Maintenance treatments occur after planting and are designed to promote survival and establishment of conifer seedlings by reducing competition from unwanted vegetation, usually grass, shrubs, or hardwood trees.

In all alternatives, retention of species diversity, including hardwoods and shrubs, would occur, but the levels vary between alternatives. Maintenance and other vegetation management actions would be planned to meet species diversity goals.

Maintenance actions may involve the implementation of preventative or ecosystem based strategies or may involve direct control actions against unwanted vegetation using such techniques as mulching, brush cutting or pulling, plantation grazing, or herbicide application. The choice between such methods is made under the same decision framework listed for site preparation.

Where feasible, prevention or ecosystem-based strategies would be used in place of physical site treatment by chemical, manual, or machine methods. Such strategies are used to prevent or reduce the need for future vegetation control by applying known ecological relationships in site specific timber management activities. For example, such strategies could include not using fire where species of competing vegetation would be expected to sprout prolifically following fire.

#### **Precommercial Thinning and Release:**

Precommercial thinning and release practices are designed to control stand density and species composition. Thinning and release may occur simultaneously or separately depending on considerations including stand conditions, cost, and the efficacy of methods. The practices have the objectives of meeting stand diversity objectives, growth objectives, and species composition objectives. Their principal effect on timber yield is permitting earlier harvest through development of larger log sizes, increasing the percent of stand volume on desired species, creating stand densities and size distributions conducive to commercial thinning, and permitting genetic tree improvement and forest fertilization to increase yields without loss of additional gross growth to density related mortality.

Site specific decision making processes for herbicide release treatments follow the same processes as those listed for site preparation.

In all alternatives, retention of a level of species diversity, including hardwoods and shrubs, would occur. Maintenance and other vegetation management actions would be planned to meet species diversity goals.

To be fully effective, precommercial thinning and release must be scheduled at the correct time in a stand's development, that is, usually before growth retardation or stand differentiation occur. A significant problem with thinning or release of stands, which are too old or under very high levels of competition, is thinning shock that results in growth loss and sometimes of partial stand mortality (Staebler, 1956) (Harrington and Reukema, 1983). Hand cutting of dense hardwood or shrub canopies around suppressed young conifers appears to result in particularly severe shock (Lewis, 1977). Thinning shock can sometimes be lessened by chemical methods of treatment that retain partial shade from surrounding dead stems. Another problem with precommercial thinning or release of stands which are too old is that the diameters of the trees remaining may be too small to keep the trees upright.

#### **Commercial Thinning and Density Management:**

Commercial thinnings are scheduled any time after developing stands reach a combination of stem diameter and surplus volume that permits a commercial entry. Commercial thinning may be effective in increasing recoverable timber production out to age as late as 110 (Williamson and Price, 1971) (Williamson, 1982).

Density management would reduce stocking in portions of stands to lower levels than commercial thinning in order to accelerate the development of old growth structural characteristics in even-aged stands (Newton and Cole, 1987). Density management would promote the growth of some large trees, the introduction or release of shade tolerant understory species, development of deep multiple canopy layers, and maintain a cross section of stand diameter, species, and density distributions.

For existing stands, the initial density management entries would occur in stands 40 to 80 years old. Intervals between treatments range from 10 to 30 years depending on the stand condition. Overall, there would be a maximum of three commercial entries out to an age as late as 110 years.

#### Forest Fertilization:

Stand growth is limited by the supply of available nutrients, particularly by available nitrogen. The supply of soil nutrients may be conserved through proper design of management actions and may be augmented through either forest fertilization or through retention of species and structural diversity in stands. Forest fertilization practices are designed based on extensive research literature, including work in Oregon. Fertilization actions are usually designed to apply 200 pounds of available nitrogen with helicopters in the form of urea based prill (46 percent available nitrogen). Large-scale hand application is usually impractical and limited to applications to individual trees to increase cone production.

The effect of fertilization on yield over the lifetime of a stand has been the subject of various analyses, of which Miller, Clendenen, and Bruce (1988) and Wang (1990) are most applicable to Oregon. Wang's analysis is more conservative in estimation of long-term yield responses. He did not find a statistically significant effect of site index or stand age on fertilization response. Other researchers have found that percent response increased as site quality decreased.

Forest fertilization actions are usually sequenced with thinning actions and are spaced 10 years to 15 years apart. The effect of forest fertilization on very poor sites (site class 5), on uneven-aged stands, and on stands older than 70 years of age is unknown although some positive response is probable.

Fertilization has the effect of accelerating stand and seral development. Since fertilizer increases the rate at which tree canopies expand and increases tree vigor, it has been observed to reduce thinning shock and accelerate release response.

#### Tree Pruning:

Pruning of young stands is carried out to increase wood quality through the production of clear wood on rotations shorter than would be required without the action. Pruning helps to avoid production of wood with loose knots, yielding lumber which is tight-knotted, but not necessarily clear. Pruning appears to be necessary to produce high quality wood from stands that are managed at very low densities in order to meet biological diversity objectives. Trees in such stands would have long crowns and would produce wood with large knots without pruning.

# Appendix 2-D

## BLM Tree Improvement Program and the Genetic Diversity of Improved Species

Tree improvement programs, implemented by the BLM to date, were designed to increase the production of timber volume in managed stands. Only the Douglas-fir species has been subject to genetic selection for growth performance.

In addition, BLM maintains a program designed to increase blister-rust (a mortality causing disease of sugar pine and white pine) resistance of sugar pine, and to preserve these species as part of the managed forest.

The BLM genetics programs are designed to conserve the genetic diversity of improved species as the basis for future genetic adaptation (Daniels, 1990).

The breeding programs are based on the ability to detect and select desired traits from genetic variability naturally present in tree species. Through management, the frequency of these selected traits is increased in proportion to the host of other traits present in the total population.

### Douglas-fir

Douglas-fir exhibits high levels of genetic variability compared to other forest tree species. Studies of genetic diversity in Douglas-fir have consistently shown that a great deal of variation exists in this species for genes controlling quantitative traits (Silen, 1978). Considerable variability is also indicated by physiological, morphological, and biochemical data. Variability is great both within individual stands and between stands located across a wide range of geographic and environmental conditions.

Data suggests that to conserve natural genetic diversity it is necessary to design tree improvement programs so that variability both within stands and between stands is maintained.

The Bureau is a member of the Northwest Tree Improvement Cooperative, which encompasses about 6 million acres of lands managed by Federal, State, County, and private organizations. The cooperative has subdivided the land base of the participants into approximately 70 breeding units, defined by differences in geography and elevation. Breeding units range in size from 30,000 to 200,000 acres, dependent

on the perceived environmental variation present. Units appear to differ genetically. One of the functions of the breeding unit design is to conserve genetic diversity within populations of selected tree species.

Project design features used to enhance gene conservation includes selection of a large number of parent trees within each breeding unit. This number varies with the size of the breeding unit, ranging from 160 to 900 parent trees per unit. Parent trees are selected on the basis of measurable growth characteristics such as age, growth rate, form, and vigor. Numerous breeding units and the selection of hundreds of parent trees per unit provide a broad genetic base for breeding program and seed orchard development.

Another feature of the cooperative program that contributes to gene conservation is the establishment of progeny test plantations. Parent trees selected for breeding and seed orchard use undergo a standardized field testing of their offspring. A series of progeny tests, comprising 6 to 12 test plantations, are established within each breeding unit.

Each test plantation contains several thousand well maintained and individually identified test trees. Approximately 650 progeny test plantations containing nearly 3 million individual trees have been established. At least one parent is known for each tested individual.

Growth data for each individual tree is systematically collected, analyzed, and stored for both short-term and long-term use.

The BLM's western Oregon tree improvement program contains 52 Douglas-fir breeding units. Seed orchards have been or will be established for each of these. Seed orchards consist of 50 to 100 unrelated parent trees, each selected for its superior growth rate, and stable performance across the breeding unit, as demonstrated in the progeny test plantations. Studies have shown that for quantitative traits (e.g., growth rate) the number of different genotypes that can be generated through recombination is extremely large (Kang, 1980). Therefore, a very diverse population can be created from a relatively small number of individuals within a seed orchard.

Seed orchards will be used for the production of seed for reforestation utilizing parent trees selected primarily for stable performance and rapid growth rates. While such selection would reduce the frequency of certain characteristics in the total population, it would not completely eliminate characteristics upon which selection was not based. The gene pool could actually be broadened by breeding trees that would otherwise be unable to cross pollinate in the wild due to physical separation.

Tree breeding has not resulted in dangerous uniformity in forestry (Ledig, 1988). Adams (1981) studied isozymes of Douglas-fir and reported plantations reforested with seed from the first generation seed orchards are not measurably less variable than natural populations in the same breeding units, and certainly would be as variable, if not more so, than plantations regenerated from seed of commercial collections or seed trees.

He further concluded that tree improvement efforts may lead to a broader genetic base in populations than that occurring with present regeneration, at least in the earlier generations of breeding programs. To maintain a broad genetic base, however, care must be taken in the long-term not to overuse specific genetic lines (Ledig, 1988).

## Eugene District Tree Improvement Program Description

In 1965 the Eugene District initiated a tree improvement program. The BLM's program is modeled after others for forest tree species and has changed over time as the technology has developed. Douglas-fir and western white pine are the species being managed. The goals of the program are to increase growth and disease resistance and maintain broad genetic diversity. The plans for tree improvement are described in two documents: **Tree Improvement Plan Eugene District** (March 1987) and **Updated Tree Improvement Plan For Western Oregon** (December 1987).

Breeding units are the operational units for the program. The units vary in size from 60,000 to 150,000 acres. Each breeding unit is a separate program. All of the tree improvement programs are conducted as cooperative programs with other BLM Districts, State, other Federal agencies and/or private landowners. Tree improvement work includes tree selection, progeny tests, breeding work and seed orchards.

Parent trees were selected in natural stands throughout the District. Cones were collected from each and the seed used to grow seedlings for testing. Progeny test sites were established on representative sites throughout each breeding unit. Periodic measurements were completed in each site and the data analyzed to determine which families have the best growth. Long-term measurements are planned to monitor trends or changes in growth. Data from progeny test sites is used for seed orchard development and other program decisions. Breeding work involves controlled crossing among the best parents. These full-sibling families will be field tested and used to develop a second generation program. Seed orchards are established by grafting cuttings from parents. Each breeding unit has a corresponding seed orchard unit.

Improved reforestation seed is collected from the top ranking parents in the field and from seed orchards. Eugene District seed orchards are located at the BLM's Travis Tyrrell Orchard near Lorane, and Walter Horning Orchard near Colton. Western white pine seed is produced in cooperation with the U.S. Forest Service at the Dorena Tree Improvement Center near Cottage Grove.

The Eugene District tree improvement program, including all cooperators, has approximately 2,000 Douglas-fir tree selections completed and from seed has established 54 progeny test sites ranging in age from 8 to 20 years from seed. BLM has 167 acres of seed orchard established and to date has planted 5,400 acres of improved reforestation stock.

## Appendix 2-E

# Special Status Species Tables

**Table 2-5a - Sensitive Plant Protection by Alternative**

Acres of Sensitive Plant Sites Known to Occur in the Eugene BLM District								
Species	Category	NA	A	B	C	D	E	PA
<i>Lomatium bradshawii*</i>	FE	7	7	7	7	7	7	7
<i>Aster vialis</i>	FC2	302	0	0	0	302	302	302
<i>Montia howellii*</i>	FC2	7	7	7	7	7	7	7
<i>Frasera umpquaensis</i>	FC2	29	0	0	0	29	29	29
<i>Horkelia congesta*</i> <i>ssp. congesta</i>	BS	7	7	7	7	7	7	7
<i>Cimicifuga elata</i>	BS	189	0	0	0	189	189	189
<i>Lycopodium inundatum*</i>	AS	6	6	6	6	6	6	6
<i>Microcala quadrangularis*</i>	AS	8	8	8	8	8	8	8
<i>Poa laxiflora</i>	AS	4	0	3	3	4	4	4
<i>Utricularia gibba*</i>	AS	6	6	6	6	6	6	6
<b>Total Acres</b>		<b>538</b>	<b>14</b>	<b>17</b>	<b>17</b>	<b>538</b>	<b>538</b>	<b>538</b>

FE = Federal Endangered

FC = Federal Candidate

BS = BLM Bureau Sensitive

AS = BLM Assessment Species

\*Acres will not total up when adding columns because several species occur together at the same sites. These sites were not counted twice for the same acres.

Table 2-5b - Special Status Species Habitat Protection by Alternative

**Species: *Lomatium bradshawii* (Federal Endangered)**

**Action 1:** Maintain existing site for *Lomatium bradshawii* within previously designated ACEC (7 acres)

**Action 2:** Develop a Habitat Management Plan for *Lomatium* that identifies actions necessary for protection and habitat enhancement needed for maintaining a minimum viable population, including prescribed burning, habitat restoration, exotic species control and monitoring.

**Action 3:** Work cooperatively with research institutions and other public and private agencies in securing funding or volunteer services for various research projects necessary in attaining information for management of *Lomatium*.

**Action 4:** Acquire privately owned *Lomatium* sites for Federal protection that would assist in recovery efforts. Where acquisition is not possible, develop cooperative agreements and conservation easements to protect *Lomatium* sites.

**Action 5:** Work with adjacent landowners, right-of-way recipients, etc. in regulating activities adjacent to the BLM *Lomatium* population that could have negative impacts on the population.

No Action	A	B	C	D	E	Preferred
Implement Action	Implement Action	Implement Action	Implement Action	Implement Action	Implement Action	Implement Action

**Species: *Aster vialis* (Federal Candidate)**

**Action 1:** Maintain existing sites for *Aster vialis* within Eugene BLM administered lands (302 acres)

**Action 2:** Develop a Habitat Management Plan (HMP) for *Aster* that identifies actions necessary for protection and habitat enhancement needed for maintaining minimum viable population levels, including ungulate control, insect predation, site manipulation and experimental procedures such as prescribed understory burning.

**Action 3:** Maintain existing forest buffers established for individual populations, and allow the development of additional buffers where sites are adjacent to or in clear cuts.

**Action 4:** Maintain existing gate closures on roads known to contain *Aster* and, where possible, implement new closures on any Eugene BLM controlled roads where *Aster* is found. Work with private industry and other agencies responsible for roads not controlled by BLM in protecting BLM *Aster* sites by gating roads or through other protective measures. Coordinate with Road Maintenance crews on all activities associated with roadside populations of *Aster*, and consider dust abatement programs during critical pollination times or other critical life history stages.

**Action 5:** Acquire privately owned *Aster* sites for Federal protection. Where acquisitions are not possible, develop cooperative agreements and conservation easements to protect *Aster* sites.

**Action 6:** Implement a brush control program on roadside populations that are rapidly undergoing brush invasion. Coordinate with the U.S. Fish and Wildlife Service in program implementation.

**Action 7:** Work with adjacent landowners, right-of-way recipients, etc. in regulating activities adjacent to the *Aster* locations that could have negative impacts on the population.

**Action 8:** Work cooperatively with research institutions and other public and private agencies in securing funding or volunteer services for various research projects necessary in attaining information for management of *Aster*.

No Action	A	B	C	D	E	Preferred
Implement Action	No Action	No Action	No Action	Implement Action	Implement Action	Implement Action



Table 2-5b - Special Status Species Habitat Protection by Alternative (cont.)

Species: *Frasera umpquaensis* (Federal Candidate)

Action 1: Maintain existing site for *Frasera* within previously designated ACEC/RNA (29 acres).

Action 2: Develop a site specific management plan to accompany draft Species Management Guide/Habitat Management Plan presently being developed cooperatively between BLM and the U.S. Forest Service. Identify site specific goals for maintaining and monitoring this BLM administered population.

Action 3: Work cooperatively with research institutions and other public and private agencies in securing funding or volunteer services for various research projects necessary in attaining information for management of *Frasera*.

No Action	A	B	C	D	E	Preferred
Implement Action	No Action	No Action	No Action	Implement Action	Implement Action	Implement Action

Species: *Cimicifuga elata* (Bureau Sensitive)

Action 1: Maintain existing sites for *Cimicifuga* on Eugene BLM administered lands (189 acres).

Action 2: Conduct inventories for *Cimicifuga* within all Eugene BLM administered lands to help determine an accurate status determination for this plant species.

Action 3: Develop an Interagency Habitat Management Plan cooperatively with other BLM Districts and National Forests, identifying site specific management actions needed for maintaining viable populations including site manipulation or restoration if necessary.

Action 4: Maintain existing forest buffers established for individual populations, and allow the development of additional buffers where sites are adjacent to or in clear cuts.

Action 5: Work with adjacent landowners, right-of-way recipients, etc. in regulating activities adjacent to *Cimicifuga* sites that could have negative impacts on the populations.

Action 6: Work cooperatively with research institutions and other public and private agencies in securing funding or volunteer services for various research or inventory projects necessary in attaining information for management of *Cimicifuga*.

Action 7: Maintain existing gate closures on roads known to contain *Cimicifuga* and, where possible, implement new closures on any Eugene BLM controlled roads where *Cimicifuga* is found. If new sites are found on BLM land adjacent to roads privately managed, work with these agencies in protecting the species either by gating roads or through other protective measures. Coordinate with Road Maintenance crews on all activities associated with roadside populations of *Cimicifuga*.

No Action	A	B	C	D	E	Preferred
Implement Action	No Action	No Action	No Action	Implement Action	Implement Action	Implement Action

Table 2-5b - Special Status Species Habitat Protection by Alternative (cont.)

Species: *Montia howellii* (Federal Candidate)

Action 1: Maintain existing sites for *Montia* within previously designated ACEC (7 acres).

Action 2: Develop Habitat Management Plan (HMP) for *Montia* that identifies actions necessary for protection and habitat manipulation needed for maintaining a minimum viable population, including prescribed burning, other disturbance treatments, exotic species control and monitoring.

Action 3: Work cooperatively with research institutions and other public and private agencies in securing funding or volunteer services for various research projects necessary in attaining information for management of *Montia*.

Action 4: Work with adjacent landowners, right-of-way recipients, etc. in regulating activities adjacent and within the BLM *Montia* population that could have negative impacts on the population.

Action 5: Conduct inventories for *Montia* within the Willamette Valley with emphasis on other Federal or State managed lands to help determine an accurate status determination for this plant species.

No Action	A	B	C	D	E	Preferred
Implement Action	Implement Action	Implement Action	Implement Action	Implement Action	Implement Action	Implement Action

Species: *Horkella congesta* ssp. *congesta* (Bureau Sensitive)

Action 1: Maintain existing site for *Horkella* within previously designated ACEC (7 acres).

Action 2: Develop a Habitat Management Plan (HMP) for *Horkella* that identifies actions necessary for protection and habitat enhancement needed for maintaining a minimum viable population, including prescribed burning, habitat restoration, exotic species control, and monitoring.

Action 3: Work cooperatively with research institutions and other public and private agencies in securing funding or volunteer services for various research projects necessary in attaining information for management of *Horkella*.

Action 4: Work with adjacent landowners, right-of-way recipients, etc. in regulating activities adjacent to the BLM *Horkella* population that could have negative impacts on the population.

Action 5: Conduct inventories for *Horkella* within the Willamette Valley to help determine an accurate status determination for this plant species.

No Action	A	B	C	D	E	Preferred
Implement Action	Implement Action	Implement Action	Implement Action	Implement Action	Implement Action	Implement Action

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**Table 2-5c - Special Status Species Habitat Protection by Alternative\***


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**peregrine falcon, Pacific western big-eared bat, fringed myotis & pallid bat:**

**Action** - Avoid potentially disturbing activities on, or near, cliffs, or rock outcrops, determined to have the potential for use by these species.

All Alternatives - Defer actions that would conflict with the needs of these species pending inventories and the development of habitat management plans. Such actions may include, but are not limited to, 1) rock quarrying, 2) rock climbing, 3) removal of forest cover that would influence environmental conditions at the cliff site, and 4) road construction that would open the site to increased human intrusion and associated disturbance.

**bald eagle:**

**Action 1** - Avoid potentially disturbing activities in, or near, occupied habitat and manage suitable-but-unoccupied habitat to ensure maintenance of habitat sufficient for eagle recovery.

All Alternatives - Prohibit timber harvest, road construction, and other potentially disturbing activities in accordance with the recovery plan; manage public access on BLM controlled roads that would otherwise allow disturbance during critical seasons of the year.

**Action 2** - Eliminate threats to currently occupied habitat caused by an existing non-BLM controlled mainline road.

All Alternatives - Work cooperatively with other public agencies and private organizations/individuals, as needed, to relocate an asphalt surface road that bisects a winter roost site in the Coburg Hills.

**Action 3** - Eliminate threats from adjacent privately owned land that pose a serious risk to currently occupied habitat in the Coburg Hills.

All Alternatives - Work cooperatively with other public agencies and private organizations, or individuals, to obtain Federal ownership of lands (by purchase or exchange), or conservation easements previously identified as high priority for management.

**Action 4** - Construct pond/wetland habitats in the Willamette Valley fringe as supplemental forage areas for wintering eagles.

All Alternatives - Work cooperatively with other public agencies and private organizations, or individuals, to identify and develop such opportunities; acquire lands (by purchase or exchange), or conservation easements, as needed. Also see Action 2 under waterfowl.

**spotted owl:**

**Action** - Avoid potentially disturbing activities near known nest sites and activity centers.

All Alternatives - Restrict timber harvest, road construction, and other potentially disturbing activities to areas more than a half mile from such sites during the nesting season, or as specified in the recovery plan.

**marbled murrelet, goshawk, pileated woodpecker, saw-whet owl, great gray owl, marten & fisher:**

**Action 1** - Avoid potentially disturbing activities in, or near, known nest, or den sites.

No Action and Alternative A - N/A

Alternatives B, C, D, E and Preferred Alternative - Restrict timber harvest, road construction, and other potentially disturbing activities during critical seasons of the year to distances that would not disrupt nesting/denning activities. Safe distances vary between species and site specific situations; they will be determined on a case-by-case basis based on the most current scientific information available.

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**Table 2-5c - Special Status Species Habitat Protection by Alternative\* (cont.)**

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**Action 2 - Maintain known nest and den sites in conditions suitable for future nesting and denning.**

No Action and Alternative A - N/A

Alternatives B, C, D, E and Preferred Alternative - Retain trees (standing and fallen) and other vegetation critical to the structural and ecological integrity of the sites. Specific requirements such as site size and numbers and sizes of trees to be retained, vary between species and with site-specific situations and will be determined on a case-by-case basis based on the most current scientific information available.

**northern red-legged frog, foothill yellow-legged frog, northwestern pond turtle, harlequin duck, white-footed vole, and tailed frog:**

**Action 1 - Restore aquatic and wetland/riparian habitats crucial to these species and manage for essential habitat conditions on a watershed basis.**

All Alternatives - Work cooperatively with other public agencies and private organizations, or individuals, to acquire Federal ownership of (by purchase or exchange) or obtain conservation easements on lands previously identified as high priority for acquisition due to their aquatic/riparian habitat values. Such stream segments are crucial to the restoration of biological connectivity between critical stream segments on BLM lands.

**Action 2 - Create pond/wetland habitats.**

All Alternatives - Create pond/wetland habitats where habitat and population inventories indicate such projects would benefit dependent species. Projects would be confined to riparian zones, or other lands not dedicated to high levels of timber production.

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\* Identifies management actions planned in addition to alternative prescriptions.

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**Table 2-5d - Priority Species Habitat Protection by Alternative\***


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Species that require, or extensively use, large trees (green or dead) to support large stick nests (e.g., osprey, golden eagle, red-tailed hawk and great blue heron), raptors and carnivores (e.g., mountain lion and black bear) that use large hollow tree boles (standing or fallen) for nesting or denning:

**Action 1** - Avoid potentially disturbing activities on, or near, known nest and den sites.

No Action and Alternative A - N/A

Alternatives B, C, D, E and Preferred Alternative - Restrict timber harvest, road construction, and other potentially disturbing activities during critical seasons of the year to distances that would not disrupt nesting activities. Safe distances vary between species and site specific situations; they will be determined on a case-by-case basis.

**Action 2** - Maintain known nest and den sites in conditions suitable for future nesting.

No Action and Alternative A - N/A

Alternatives B, C, D, E and Preferred Alternative - Retain trees (standing and fallen) and other vegetation critical to the structural and ecological integrity of the sites. Specific requirements such as site size and numbers/sizes of trees to be retained, etc., vary between species and with site-specific situations and will be determined on a case-by-case basis based on the most current scientific information available.

**Secretive species (i.e., highly sensitive to human activities in wild land situations) for example, great blue heron, black bear and elk:**

**Action** - Implement access management actions on roads that provide vehicle access to crucial habitats.

No Action - Limited to spur roads to protect special habitat features and habitats of special status species and species of special interest.

Alternatives A and B - N/A

Alternative C - Manage a maximum of 750 miles of spur roads within, and adjacent to, old growth blocks, and other areas crucial to species sensitive to human intrusion.

Alternatives D and E - Manage a maximum of 750 miles of roads, including 580 miles in ODFW elk emphasis areas.

Preferred Alternative - Manage a maximum 470 miles of road, including 300 miles in ODFW elk emphasis areas.

**elk (and other big game species):**

**Action 1** - Develop "permanent pastures" to provide high quality forage during periods when large proportions of the total forest landscape (all lands) are in seral stages that are low in forage productivity.

No Action, Alternatives A, B, C, D and Preferred Alternative - N/A

Alternative E - Develop 10 acres per BLM section within ODFW elk emphasis areas.

**Action 2** - Restore degraded riparian values within ODFW elk emphasis areas.

No Action and Alternative A - N/A

Alternatives B, C, D, E and Preferred Alternative - Work cooperatively with other public agencies and private organizations, or individuals, to acquire lands (by purchase or exchange) containing high value riparian habitat needed to restore biological connectivity between BLM lands of high value to elk - or acquire conservation easements.

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**Table 2-5d - Priority Species Habitat Protection by Alternative\* (cont.)**

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Action 3 - Close roads to provide security and reduce poaching - see "secretive species", above.

waterfowl:

Action 1 - Acquire wetlands having outstanding value for waterfowl, or the potential for such. This action (land purchase or exchange, or development of conservation easements) applies to all alternatives. It is implementable through cooperative efforts with other agencies and private landowners.

Action 2 - Develop pond/wetland habitats, similar in size to Hult Pond, or smaller, on streams within the Willamette Valley fringe. This action may be combined with Action 1, above. It applies to all alternatives, and is implementable through cooperative efforts with other agencies and private landowners. Also, see Action 4 for bald eagle in the special status species Table 2-5c.

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\* Identifies management actions planned in addition to alternative prescriptions.

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## Appendix 2-F

# Potential Management of Candidate ACECs Dropped from ACEC Consideration

Area Name	Acres Dropped	Description Primary Values	Alternative	Managed for:
Fawn Creek	100	Plant Community/ Historic: The area was nominated for Douglas-fir stand adjacent to old homestead and school that occurs off of BLM land.	NA	Area would be managed for timber harvest.
			A	Area would be managed for timber harvest.
			B	Area would be managed for timber harvest.
			C	Area would be managed for 35-50% basal area retention.
			D	Area would be managed for old growth values.
			E	Area would be managed for old growth values.
			PA	Area would be avail- able for regeneration harvest.
Coburg Hill	40	Plant Community/ Scenic Area/Visual: the area was nominated for a Douglas-fir stand along crest of Coburg Hills visible from Interstate 5.	NA	Area would be managed for timber harvest.
			A	Area would be managed for timber harvest.
			B	Area would be managed for timber harvest.
			C	Area would be managed for 15-25% basal area retention.
			D	Area would be managed for old growth values.
			E	Area would be managed for old growth values.
			PA	Area would be avail- able for timber harvest.

## Appendix 2-F (cont.)

Area Name	Dropped	Acres Primary Values	Description Alternative	Managed for:
Bunker Hill	36	Plant Community: The area was nominated for remnant stand of old growth Douglas-fir.	NA	Area would be managed for timber harvest.
			A	Area would be managed for timber harvest.
			B	Area would be managed for timber harvest.
			C	Area would be managed for 35-50% basal area retention.
			D	Area would be managed for old growth values.
			E	Area would be managed for old growth values.
			PA	Area would be avail- able for timber harvest.
McKenzie River RFI	98	Plant Community/ Wildlife: The area was nominated for important raptor habitat within an identified Key Raptor Area; old growth forest.	NA	Area would be managed for timber harvest.
			A	Area would be managed for timber harvest.
			B	Area would be managed for timber harvest.
			C	Area would be managed for 35-50% basal area retention.
			D	Area would be managed for old growth values.
			E	Area would be managed for old growth values.
			PA	Area would be avail- able for timber harvest.



# Appendix 2-G

## Management Guidelines and Standards for National Wild and Scenic Rivers

The Wild and Scenic Rivers Act (Public Law 90-542 as amended) established a method for providing Federal protection for certain of our remaining free flowing rivers, and preserving them and their immediate environments for the use and enjoyment of present and future generations. Rivers are included in the system so that they may benefit from the protective management and control of development for which the Act provides. The following guidelines and standards are extracted in part from the February 3, 1970, and August 26, 1982, joint Department of the Interior and Department of Agriculture guidelines. They would apply to formally designated rivers through incorporation in formal management plans, which are normally developed within three years of designation. The guidelines also apply, on an interim basis, to BLM administered lands along BLM study rivers, as well as other rivers or river segments that have been found by the Bureau to be eligible for consideration as components of the National Wild and Scenic River (W&SR) System. In the latter instance, interim application of the guidelines will continue until lifted by a determination of nonsuitability through BLM's planning (RMP) process or by Congressional action.

Section 10(a) of the Act states that:

"Each component of the National Wild and Scenic Rivers System shall be administered in such a manner as to protect and enhance the values which caused it to be included in said system without, insofar as is consistent therewith, limiting other uses that do not substantially interfere with public use and enjoyment of these values. In such administration, primary emphasis shall be given to protecting its aesthetic, scenic, historic, and scientific features. Management plans for any such component may establish varying degrees of intensity for its protection and development, based on the special attributes of the area."

This section is interpreted by the Secretaries of the Interior and Agriculture as stating a nondegradation and enhancement policy for all designated river areas, regardless of classification.

The Congress with Presidential approval may determine which river segments will be added to the W&SR System. When a river is designated, and BLM is identified as the administering Federal agency, BLM will establish administrative boundaries to protect the identified Outstandingly Remarkable Values. By law, the land inside the boundaries normally may not exceed an average of 320 acres per river mile over the designated portion of the river. BLM would delineate boundaries based on natural or man-made features (canyon rims, roads and ridgetops, etc.) and with consideration of legally identifiable property lines.

A river management plan must be also completed by the administering Federal agency, within three years after designating legislation. Existing State, local and Federal laws continue in effect during the interim along with general Department of Interior guidelines. If Federal designation overlaps State Scenic Waterway designation, a joint Federal/State management plan would be developed. All management plans will address the roles of Federal, State, County and relevant Indian tribal governments in management of the river.

Discussion of BLM's inventory to determine which river stretches are eligible for consideration as components of the system is presented in Chapter 3 and Appendix 3-J. Also included in that appendix are discussions of the criteria for eligibility for each classification (wild, scenic, recreational) for which any river reviewed has been found eligible and the results of BLM's eligibility studies.

The guidelines that follow are presented for each separate river classification (recreational, scenic and wild).

### Recreational River Areas

Recreational river areas are defined by the Act to be "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."

## Management Objective for Recreational River Areas

Management of recreational river areas should give primary emphasis to protecting the values which make it an Outstandingly Remarkable Value while providing river-related outdoor recreation opportunities in a recreational setting. Recreational classification is a determination of the level of development and does not prescribe or assume recreation development or enhancement. Management of recreational river areas can and should maintain and provide outdoor recreation opportunities. The basic distinctions between a "scenic" and a "recreational" river area are the degree of access, extent of shoreline development, historical impoundment or diversion, and types of land use. In general, a variety of agricultural, water management, silvicultural, recreational, and other practices or structures are compatible with recreational river values, providing such practices or structures are carried on in such a way that there is no substantial adverse effect on the river and its immediate environment.

## Management Standards for Recreational River Areas

Recreation facilities may be established in proximity to the river, although recreational river classification does not require extensive recreational developments. Recreational facilities may still be kept to a minimum, with visitor services provided outside the river area. Future construction of impoundments, diversions, straightening, riprapping, and other modification of the waterway or adjacent lands would not be permitted except in instances where such developments would not have a direct and adverse effect on the river and its immediate environment. The following program management standards apply:

1. **Forestry Practices:** Forestry practices including timber harvesting would be allowed under standard restrictions to avoid adverse effects on the river environment and its associated values.
2. **Hydroelectric Power and Water Resource Development:** No development of hydroelectric power facilities would be permitted. Existing low dams, diversion works, riprap and other minor structures may be maintained provided the waterway remains generally natural in appearance. New structures may be allowed provided that the area remains generally natural in appearance and the structures harmonize with the surrounding environment.

3. **Mining:** Subject to existing regulations (e.g., 43 CFR 3809) and any future regulations that the Secretary of the Interior may prescribe to protect values of rivers included in the W&SR System; new mining claims are allowed and existing operations are allowed to continue. All mineral activity on Federally administered land must be conducted in a manner that minimizes surface disturbance, water sedimentation and pollution, and visual impairment. Reasonable mining claim and mineral lease access will be permitted. Mining claims, subject to valid existing rights, within the recreational river area boundary can be patented only as to the mineral estate and not the surface estate (subject to proof of discovery prior to the effective date of designation).
4. **Road and Trail Construction:** Existing parallel roads can be maintained on one or both river banks. There can be several bridge crossings and numerous river access points. Roads, trails, and visitor areas must conform to construction and maintenance standards and be free of recognized hazards.
5. **Agricultural Practices and Livestock Grazing:** Lands may be managed for a full range of agriculture and livestock grazing uses, consistent with current practices.
6. **Recreation Facilities:** Interpretive centers, administrative headquarters, campgrounds and picnic areas may be established in proximity to the river. However, recreational classification does not require extensive recreation development.
7. **Public Use and Access:** Recreation use including, but not limited to, hiking, fishing, hunting and boating is encouraged in recreational river areas to the extent consistent with the protection of the river environment. Public use and access may be regulated and distributed where necessary to protect and enhance recreational river values. Any new structures must meet established safety and health standards or in their absence be free of any recognized hazard.
8. **Rights-of-Way:** New transmission lines, natural gas lines, water lines, etc., are discouraged unless specifically prohibited outright by other plans, orders and laws. Where no reasonable alternate location exists, additional or new facilities should be restricted to existing rights-of-way. Where new rights-of-way are unavoidable,

locations and construction techniques will be selected to minimize adverse effects on recreational river area related values and fully evaluated during the site selection process.

9. **Motorized Travel:** Motorized travel on land will generally be permitted, on existing roads. Controls will usually be similar to that of surrounding lands. Motorized travel on water will be in accordance with existing regulations or restrictions.
10. **Instream Flow Assessment:** To the extent practical, consistent with resource management objectives, quantify instream flow and protection requirements related to Outstandingly Remarkable and other resource values identified through the RMP process. Where possible, conduct a comprehensive, interdisciplinary, resource value-based assessment in order to delineate resource values, relate flows to resource conditions, and formulate flow protection strategies that incorporate legal, technical, and administrative aspects in order to secure instream flows which address values associated with the recreational river segment.

### Scenic River Areas

Scenic river areas are defined by the Act to be "Those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads."

### Management Objective for Scenic River Areas

Management of scenic river areas should maintain and provide outdoor recreation opportunities in a near natural setting. In general, a wide range of agricultural, water management, silvicultural and other practices or structures could be compatible with scenic river values, providing such practices or structures are carried on in such a way that there is no substantial adverse effect on the river and its immediate environment.

### Management Standards for Scenic River Areas

The same limitations set forth for recreational river areas are applicable, except that developments should harmonize with the environment, and developments on shore lands should be screened from the river. The following program management standards apply:

1. **Forestry Practices:** Silvicultural practices including timber harvesting could be allowed provided that such practices are carried on in such a way that there is no substantial adverse effect on the river and its immediate environment. The river area should be maintained in its near natural condition. Timber outside the boundary, but within the visual seen area, should be managed and harvested in a manner which provides special emphasis on visual quality. Preferably, reestablishment of tree cover would be through natural revegetation. Cutting of dead and down materials for fuelwood should be limited. Where necessary, restrictions on use of wood for fuel may be prescribed.
2. **Hydroelectric Power and Water Resource Development:** No development of hydroelectric power facilities would be permitted. Flood control dams and levees would be prohibited. All water supply dams and major diversions are prohibited. Maintenance of existing facilities and construction of some new structures would be permitted provided that the area remains natural in appearance and the practices or structures harmonize with the surrounding environment.
3. **Mining:** Subject to existing regulations (e.g., 43 CFR 3809) and any future regulations that the Secretary of the Interior may prescribe to protect the values of rivers included in the W&SR System; new mining claims are allowed and mineral leases can be allowed. All mineral activity on Federally administered land must be conducted in a manner that minimizes surface disturbance, water sedimentation and pollution, and visual impairment. Reasonable mining claim and mineral lease access will be permitted. Mining claims, subject to valid existing rights, within the scenic river area boundary can be patented only as to the mineral estate and not the surface estate (subject to proof of discovery prior to the effective date of designation).
4. **Road and Trail Construction:** Roads or trails may occasionally bridge the river area and short stretches of conspicuous roads or long stretches of inconspicuous and well-screened roads could be allowed. Maintenance of existing roads and trails, and any new roads or trails, will be based on the type of use for which the roads or trails are constructed and the type of use that will occur in the river area.
5. **Agricultural Practices and Livestock Grazing:** A wide range of agricultural and livestock grazing uses is permitted to the extent currently practiced. Row crops are not considered as an intrusion of

the "largely primitive" nature of scenic corridors as long as there is not a substantial adverse effect on the natural-like appearance of the river area.

6. **Recreation Facilities:** Larger-scale public use facilities, such as moderate-sized campgrounds, interpretive centers, or administrative headquarters are allowed if such facilities are screened from the river.
7. **Public Use and Access:** Recreation use including, but not limited to, hiking, fishing, hunting and boating is encouraged in scenic river areas to the extent consistent with the protection of the river environment. Public use and access may be regulated and distributed where necessary to protect and enhance scenic river values.
8. **Rights-of-Way:** New transmission lines, natural gas lines, etc., are discouraged unless specifically authorized by other plans, orders or laws. Where no reasonable alternative exists, additional or new facilities should be restricted to existing rights-of-way. Where new rights-of-way are unavoidable, locations and construction techniques will be selected to minimize adverse effects on scenic river area related values and fully evaluated during the site selection process.
9. **Motorized Travel:** Motorized travel on land or water may be permitted, prohibited or restricted to protect river values. Prescriptions for management of motorized use may allow for search and rescue and other emergency situations.
10. **Instream Flow Assessment:** To the extent practical, consistent with resource management objectives, quantify instream flow and protection requirements related to Outstandingly Remarkable and other resource values identified through the RMP process. Where possible, conduct a comprehensive, interdisciplinary, resource value-based assessment in order to delineate resource values, relate flows to resource conditions, and formulate flow protection strategies which incorporate legal, technical, and administrative aspects in order to secure instream flows which address values associated with the scenic river segment.

## Wild River Areas

Wild river areas are defined by the Act to include "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."

### Management Objective for Wild River Areas

Management of wild river areas should give primary emphasis to protecting the values which make it Outstandingly Remarkable while providing river-related outdoor recreation opportunities in a primitive setting.

### Management Standards for Wild River Areas

Allowable management practices might include construction of minor structures for such purposes as improvement of fish and game habitat; grazing; protection from fire, insects, or disease; and rehabilitation or stabilization of damaged resources, provided the area will remain natural appearing and the practices or structures are compatible and in harmony with the environment. Developments such as trail bridges, occasional fencing, natural-appearing water diversions, ditches, flow measurement or other water management devices, and similar facilities may be permitted if they are unobtrusive and do not have a significant direct and adverse effect on the natural character of the river area. The following program management standards apply:

1. **Forestry Practices:** Cutting of trees will not be permitted except when needed in association with a primitive recreation experience (such as clearing for trails) and for visitor safety or to protect the environment (such as control of fire). Timber outside the boundary, but within the visual corridors should, where feasible, be managed and harvested in a manner to provide special emphasis to visual quality.
2. **Hydroelectric Power and Water Resource Development:** No development of hydroelectric power facilities would be permitted. No new flood control dams, levees, or other works are allowed in the channel or river corridor. All water supply dams and major diversions are prohibited. The natural appearance and essentially primitive character of the river area must be maintained. Federal agency groundwater development for

- range, wildlife, recreation or administrative facilities may be permitted, if there are no adverse effects on river related Outstandingly Remarkable Values.
3. Mining: New mining claims and mineral leases are prohibited on Federal lands constituting the river bed or bank or located within 1/4 mile from the ordinary high water mark on both sides of the river. Valid existing claims would not be abrogated and, subject to existing regulations (e.g., 43 CFR 3809) and any future regulations that the Secretary of the Interior may prescribe to protect the rivers included in the W&SR System, existing mining activity would be allowed to continue. All mineral activity on Federally administered land must be conducted in a manner that minimizes surface disturbance, water sedimentation, pollution, and visual impairment. Reasonable mining claim and mineral lease access will be permitted. Mining claims, subject to valid existing rights, within the wild river area boundary can be patented only as to the mineral estate and not the surface estate (subject to proof of discovery prior to the effective date of designation).
  4. Road and Trail Construction: No construction of new roads, trails, or other provisions for overland motorized travel would be permitted within the river corridor. A few inconspicuous roads or unobtrusive trail bridges leading to the boundary of the river area may be permitted.
  5. Agricultural Practices and Livestock Grazing: Agricultural use is restricted to a limited amount of domestic livestock grazing and hay production to the extent practiced prior to designation. Row crops are prohibited.
  6. Recreation Facilities: Major public-use areas, such as campgrounds, interpretive centers, or administrative headquarters are located outside wild river areas. Simple comfort and convenience facilities, such as toilets, tables, fireplaces, shelters and refuse containers may be provided as necessary within the river area. These should harmonize with the surroundings. Unobtrusive hiking and horseback riding trail bridges could be allowed on tributaries, but would not normally cross the designated river.
  7. Public Use and Access: Recreation use including, but not limited to, hiking, fishing, hunting and boating is encouraged in wild river areas to the extent consistent with the protection of the river environment. Public use and access may be regulated and distributed where necessary to protect and enhance wild river values.
  8. Rights-of-Way: New transmission lines, natural gas lines, water lines, etc., are discouraged unless specifically authorized by other plans, orders or laws. Where no reasonable alternate location exists, additional or new facilities should be restricted to existing rights-of-way. Where new rights-of-way are unavoidable, locations and construction techniques will be selected to minimize adverse effects on wild river area related values and fully evaluated during the site selection process.
  9. Motorized Travel: Motorized travel on land or water could be permitted, but it is generally not compatible with this river classification. Normally, motorized use will be prohibited in a wild river area. Prescriptions for management of motorized use may allow for search and rescue and other emergency situations.
  10. Instream Flow Assessment: To the extent practical and consistent with resource management objectives, instream flows sufficient to meet the purposes of the designated WSR river should be protected and enhanced if possible. Based on the results of an instream flow assessment, implement flow protection strategies and actions that incorporate legal, technical, and administrative aspects in order to secure instream flow protection for applicable river segments. Protection strategies should be addressed and incorporated in river management plans.

### Management Objectives Common to Wild, Scenic and Recreational Rivers

**Fire Protection and Suppression:** Management and suppression of fires within a designated river area will be carried out in a manner compatible with contiguous Federal lands. On wildfires, suppression methods will be utilized that minimize long-term impacts on the river and river area. Presuppression and prevention activities will be conducted in a manner which reflects management objectives for the specific river segment. Prescribed fire may be used to maintain or restore ecological condition or meet objectives of the river management plan.

**Insects, Diseases and Noxious Weeds:** The control of forest and rangeland pests, diseases and noxious weed infestations will be carried out in a manner compatible with the intent of the Act and management objectives of contiguous Federal lands.

**Cultural Resources:** Historic and prehistoric resource sites will be identified, evaluated and protected in a manner compatible with the management objectives of the river and in accordance with applicable regulations and policies. Where appropriate, historic or prehistoric sites will be stabilized, enhanced and interpreted.

**Water Quality:** Water quality will be maintained or improved to meet Federal criteria or Federally approved state standards. (River management plans shall prescribe a process for monitoring water quality on a continuing basis.)

**Fish and Wildlife Habitat Improvement:** The construction and maintenance of minor structures for the protection, conservation, rehabilitation or enhancement of fish and wildlife habitat are acceptable provided they do not affect the free flowing characteristics of the WSR river, are compatible with the river's classification, that the area remains natural in appearance and the practices or structures harmonize with the surrounding environment.

**Water Rights:** In the process of evaluating river segments, authorizing officials are held to established principles of law with respect to water rights. Under provisions of Section 13 of the Act, as well as other statutes, river studies shall not interfere (except for licenses under Section 7(b) of the Act, pertaining to Section 5(a) W&SR river studies) with existing rights, including the right of access, with respect to the beds of navigable streams, tributaries, or river segments. In addition, under the Federal Land Policy and Management Act and the Federal Power Act, the BLM has conditioning authority to control any proposed projects which would be incompatible or potentially degrading to river and/or other identified resource values.

### **Oregon Scenic Waterways Act**

In 1969 the State of Oregon passed the Oregon Scenic Waterways Act. This legislation established a program that protects designated rivers throughout Oregon and is administered by the Oregon Department of Parks and Recreation. Its goals are to protect the free-flowing character of designated rivers for fish, wildlife and recreation. Dams, reservoirs, impoundments and placer mining are prohibited on state scenic waterways. The Act requires review of new development along designated rivers. It does not affect existing water rights, development or uses.

### **Management Constraints on Private Lands**

Designation of a river under the Wild and Scenic Rivers Act gives the Federal government no authority to regulate or zone private lands. Land use controls on private lands are solely a matter of State and local zoning regulations. Although the W&SR Act includes provisions encouraging the protection of river values through State and governmental land use planning, these provisions are not binding on local governments. The Federal government is responsible for assuring that designated rivers are managed in a manner which meets the intent of the W&SR Act.

River management plans may prescribe land use or development limitations to protect a river's Outstandingly Remarkable Values. Many uses may be compatible with a wild, scenic or recreational classification as long as the rivers are administered so as to protect and enhance the values which caused them to be included in the national system. Most existing uses and activities on adjoining private lands may continue. Timber harvest activities on private lands within a W&SR boundary would continue to be regulated by the Oregon Forest Practices Act.

The primary consideration in any river or land use limitation would be the protection and enhancement of a designated river's Outstandingly Remarkable Value(s). BLM will work closely with landowners to assure that all uses will be consistent with the intent of the W&SR Act. Those uses that clearly threaten identified Outstandingly Remarkable Values would be addressed on a case-by-case basis.

Specific management goals for new building, other structure or road construction on private lands along designated rivers would be addressed through the individual river management plans. Federal guidelines allow different degrees of development along rivers classified as wild, scenic or recreational. In consultation with landowners involved, every effort would be made to reduce adverse impacts to an acceptable level on proposals for major up-grading, realignment and/or new construction of roads. Maintenance of existing roads would generally not alter a river's condition and thus would not be restricted.

On designated rivers, BLM could negotiate with a landowner to purchase specific development rights necessary to prevent any threat to the river's identified Outstandingly Remarkable Values if all other efforts fail to reduce anticipated adverse impacts to an acceptable

level. Another option, where mutually agreeable, would be a land exchange providing the private landowner with comparable lands outside the administrative boundary of a river.

The W&SR Act specifically prohibits the use of condemnation in the fee title purchase of lands if 50 percent or more of the land within the boundary is already in public ownership. While the Act provides the Federal government with authority to purchase scenic, conservation or access easements through condemnation proceedings, this is considered to be a measure of last resort. In the event condemnation was considered necessary, the only landowner rights purchased would be those considered necessary to prevent the threat to the river.

If BLM acquires an easement on private land, depending upon its terms and conditions, public access rights may or may not be involved. For example, a scenic easement could only involve the protection of narrowly defined visual qualities with no provisions for public use. A trail or road easement would involve public use provisions. Any provisions for public use of private lands must be specifically purchased from the land-

owner. BLM would work closely with landowners to minimize public use of nonfederal lands, through brochures, maps, signs and/or other appropriate means, except in locations where rights to such use are acquired.

W&SR designation does not affect a private landowner's rights to control trespass. Landowners can charge a fee for crossing private lands to fish designated rivers except where a public access easement exists. The designation of a river into the National W&SR system does not change landowner rights unless all or a portion of these use rights are acquired from the landowner.

On navigable rivers, the river bed and banks to the mean high water mark are state lands and are available under state laws for public use. Private landowners control public access to their property along the banks of non-navigable rivers. The designation of a river into the National W&SR system has no bearing upon the determination of navigability.

Ownership and use of valid water rights are not affected by a W&SR designation.





# Appendix 2-H

## Introduction to the Wild and Scenic Rivers Suitability Assessments

This appendix contains the suitability assessments for each of the nine river segments identified by the Eugene District. The National Wild and Scenic Rivers System (NWSRS) suitability evaluation process and criteria used in this assessment are described in this introduction.

### Background

Section 5(d) of the National Wild and Scenic Rivers Act (Public Law 90-542) requires the BLM in all planning for water and related land resources to give consideration to potential national wild, scenic and recreational river areas. National wild and scenic river study guidelines are found in BLM Manual 8351, U.S. Department of Agriculture and Interior guidelines published in the Federal Register Volume 7, No. 173, September 7, 1982, and in various BLM memoranda and policy statements. Of the 16 river segments found eligible for inclusion in the NWSRS, nine river segments met minimal manageability criteria for further suitability assessment. All nine river segments are located within Oregon State Comprehensive Recreation Plan (SCORP) Region 8 (see Map 2-WSR-10 at the end of Appendix 2-H).

### Evaluation Process

The RMP/EIS process for evaluating which river segments within the planning area have potential for addition to the National Wild and Scenic Rivers System involves three separate steps: 1) determination of eligibility, 2) establishing the highest tentative classification, and 3) finding of suitability or nonsuitability. Final designation decisions are made by Congress. The following is a summary of each evaluation step.

### Determination of Eligibility

To be eligible for designation, a river or river segment must be, (1) free-flowing and (2) possess at least one Outstandingly Remarkable Value. The National Wild and Scenic Rivers Act identifies these as scenic, recreational, geologic, fish, wildlife, historic, cultural or other similar values. Fifty-eight streams were reviewed by the Eugene District to fulfill this analysis requirement for eligibility determination. See Tables 3-WSR-1 and 3-WSR-2 in Chapter 3 for river listings.

### Establishing River Classification

A river area classification (Wild, Scenic or Recreational) must be tentatively established for each eligible river segment. This classification is based on four criteria: 1) the level and extent of water resources development; 2) shoreline development; 3) water quality; and 4) accessibility associated with the river segment. Appendix 3-J and Table 3-WSR-3 of Chapter 3, contains eligibility and classification determinations as well as classification criteria respectively. A summary of the District's eligible rivers and their highest potential classification is shown in Table 3-WSR-1 of Chapter 3.

### Finding of Suitability

Each eligible river segment must be found suitable or non-suitable for inclusion in the Wild and Scenic Rivers System. Suitability findings serve as the basis for formal and/or informal recommendations to Congress for their decision whether to add or not to add the river segment(s) to the national system. A summary of suitability findings by alternative is displayed in Table 2-4 of this chapter. Criteria specified in Section 4(a) of the Wild and Scenic Rivers Act provides a basis for suitability assessment. These criteria are specifically addressed in the individual suitability assessments and are as follows:

1. The characteristics that do or do not make the area a worthy addition to the national system.
2. The current status of land ownership and use in the area.
3. The reasonably foreseeable potential uses of the land and water, which would be enhanced, foreclosed, or curtailed if the area were included in the national system.
4. The Federal agency that should administer the river area.
5. The extent to which administrative costs could be shared by State and local government agencies.
6. The estimated cost to the United States for administering the area, including necessary acquisitions of land and interests in land.

The following paragraphs discuss in more detail the process/direction involved in applying each of the above suitability criteria.

**Suitability Criteria 1: Characteristics that do or do not make the area a worthy addition to the National system.**

Based on planning criteria from the State Director's Guidance for Formulation of Planning Alternatives (see Appendix 1-E), BLM made a comparison of Outstandingly Remarkable Values associated with each eligible river segment in each SCORP region. Rivers were found suitable for designation in the NWSRS by alternative based on whether one or more of their Outstandingly Remarkable Values were ranked among the top four (Alternative D), top two (Alternative C), or highest (Alternative B) in their SCORP regions. Rivers that were already in the NWSRS were included in this ranking.

The top four rivers per Outstandingly Remarkable Values were determined and coordinated between the BLM Districts and the National Forests within SCORP Region 8. This ranking included the three designated rivers (the North Fork Middle Fork Willamette, Quartzville Creek, and the McKenzie River) and the two Congressionally-mandated study rivers (the South Fork McKenzie and Blue River) flowing through Region 8. The only Eugene BLM eligible river segment that ranked in the top four for any Outstandingly Remarkable Values in SCORP Region 8 was the McKenzie River. Table 2-WSR-1 summarizes the top four rivers for each Outstandingly Remarkable Value.

**Suitability Criteria 2: Current status of land ownership and use in the area.**

**Table 2-WSR-1 - Ranking of Outstandingly Remarkable Values in Region 8**

River Segment	Rec	Geol	Fish	Wildlife	Scenic	Cult	Hist	Other*
Alesea River	X							
McKenzie River	X		X		X			
S. Fork McKenzie						X		
S. Santiam River	X		X		X	X		
Opal Creek					X			
Elkhorn Creek				X	X			
Crabtree Creek						X		
Nestucca River	X		X					
Middle Fork Willamette			X	X		X		
N. Fork Alesea				X				
N. Fork Middle Fork Willamette				X				
Walker Creek								X
N. Fork Breitenbush River								X
N. Fork Middle Fork Willamette								X
N. Santiam River								X

\* Other (water quality, hydrological, botanical, vegetation, ecological, biological, and diversity)

To qualify for suitability assessment in the RMP/EIS, the BLM must have sufficient administrative control of lands and resources within an approximately one-half mile wide corridor (extending a quarter mile from the ordinary high water mark on both sides of a river segment) to allow for the protection of river related values. For this RMP, a 40 percent adjacent land ownership policy was set by the BLM. This 40 percent was deemed to be the minimum sufficient Federal ownership to effectively manage the area. Five of the river segments identified by the Eugene District have 40 or more percent of BLM adjoining lands. The other four river segments identified lack this percentage, but lie within proposed Special Recreational Management Areas (SRMAs), and still have a meaningful amount of BLM adjacent lands in comparison to other land ownerships. The intensity of management BLM has committed to SRMAs, justifies a finding of river area manageability.

**Suitability Criteria 3: Reasonably foreseeable potential uses of the land and water, which would be enhanced, foreclosed, or curtailed, if the area were included in the National system.**

The basic objective of a river designation is to maintain the river's existing condition. Private landowners frequently fear the Federal government's power to acquire land through condemnation, which causes much opposition to designate and manage wild and scenic rivers. In actuality, however, the power of the Federal government to condemn and acquire privately owned lands within the boundaries of a river area is limited and infrequently used. If a land use or development clearly threatens the Outstandingly Remarkable Values, which resulted in the river's designation, efforts will be made to remove the threat through local, State and/or Federal means. Appendix 2-G of this chapter contains Management Guidelines and Standards for National Wild and Scenic Rivers. Under the Wild and Scenic Rivers Act (Section 6), except for the acquisition of land or interest in lands, for which just compensation is made, the managing agency cannot regulate the use of private property. Section 6(b) further prohibits Federal condemnation to purchase fee title lands when 50 percent or more of a designated river corridor is public land (Federal, State, County, etc.). However, Section 6(b) does allow the use of condemnation to purchase scenic easements as a measure necessary to remove or prevent a threat to the river or its Outstandingly Remarkable Values. Section 6(a) prohibits the managing agency from acquiring fee title to an average of more than 100 acres per river mile within a half-mile wide corridor. Section 6(c) states that the managing Federal agency may not condemn and

acquire lands or interests in lands zoned by incorporated cities, villages, counties or borough if their respective ordinances are consistent with the purposes of the Act.

Private land ownership is legitimate within designated river boundaries, and existing private land uses are often consistent with Wild, Scenic, or Recreational river management goals. Carefully conducted ranching, farming, mining, and forest management activities within the "Scenic" and "Recreational" river classifications may continue. Assistance to private landowners may be provided by the Federal government to encourage practices which enhance the river's Outstandingly Remarkable Values, natural values and conditions.

Under Statewide Planning Goal 5, the Land Conservation and Development Commission requires counties to conserve open space and protect natural and scenic resources, including potential and designated Federal wild, scenic and recreational river areas. Where land use conflicts with inventoried Goal 5 resource sites area identified, counties are expected to resolve the conflicting uses through programs developed to achieve the goal. Therefore, depending on how the conflict is resolved, some private land uses along potential river segments may ultimately be affected by county plan and zone designations.

The issue of hydroelectric power potential is addressed by using data contained in Oregon State University's Water Resources Research Institute's 1979 study entitled, "A Resource Survey of Low-Head Hydroelectric Power Potential in Oregon." The gross theoretical potential hydroelectric power for each river segment assessed has been determined and is expressed in kilowatts. The formula used is:  $P = cQH_e$

$$\begin{aligned} \text{where: } P &= \text{power (kilowatts)} \\ c &= \text{conversion factor} = 0.08475 \\ Q &= \text{stream flow (ft}^3/\text{sec)} \\ H &= \text{head (feet)} \\ e &= \text{efficiency} = 1.0 \\ P &= (0.08475) (Q) (H) (1.0) = \text{___ kilowatts} \end{aligned}$$

Stream flow (Q) is the average annual stream flow determined at the approximate mid-point of the stream reach. Mid-point was used, to be consistent with the Oregon State study. This figure is based on available stream flow records and/or from estimate drainage basin runoff. Stream flow has to be at least 35 ft<sup>3</sup>/second for a reach to be considered to have hydroelectric power potential. Head is determined as the total fall

in the entire length of the stream reach. Efficiency is the water power, after friction loss, that is converted to electricity. In this formula, an idealistic situation, efficiency equals 100 percent or no friction loss.

Stream reaches that are determined not to be eligible, or suitable, for wild and scenic river designation, do not need an analysis of hydroelectric potential, because the potential will not be legislatively precluded.

#### **Suitability Criteria 4: Administering agency.**

The administering agency, for the purposes of these assessments, is assumed to be the BLM. Congress may specify a different agency to administer a component of the NWSRS; however, given the existing Federal land management jurisdictions, transfer of management responsibility to an agency other than BLM is unlikely.

#### **Suitability Criteria 5: Shared costs by other agencies.**

In the light of the financial constraints imposed by Oregon Ballot Measure 5, and the past few years of reduced O&C timber receipts, the ability of State, County and local agencies to share in these costs could be limiting. The burden would most likely be on the managing Federal agency, in this case, BLM.

#### **Suitability Criteria 6: Costs to the United States.**

When estimating the cost to the United States for administering the area, the following were taken under consideration.

1. For management plan development, costs included considerations for: public meetings, reviews, publicity, writer(s) and planner(s), further studies (if needed); and multiplier costs based on controversies, draft and publishing costs.
2. For yearly administration costs, considerations for the level of development and protection of the identified Outstandingly Remarkable Values are included.

## **Recommendations to Congress**

The District's summary of the Analysis of the Management Situation (AMS) stated that a separate Legislative Environmental Impact Statement (LEIS) would be prepared for a river or river segments found suitable for designation as a component of the NWSRS. The LEIS would have been the method of forwarding the findings and recommendations to Congress. However, since publication of this summary, it has been decided that this RMP/EIS will supplant the LEIS requirement analyzing river suitability for inclusion in the system.

## **Interim Management**

All BLM administered land within one-quarter mile on either side of all eligible river segments will be afforded interim management necessary for protection of identified Outstandingly Remarkable Values until a final suitability determination is made. Those rivers found suitable will continue to be interim managed pending formal designation through Congressional legislation.

## **Public Involvement**

So far, there has been minimal public involvement concerning the suitability of rivers found eligible for potential designation. Comments regarding designation into the NWSRS have been evenly divided. Concerns were raised about adequately protecting the Outstandingly Remarkable Values on eligible rivers, mining restrictions, and the eligibility screening process itself. Public responses are on file at the Eugene District Office.

The following nine suitability assessments begin with a findings summary succeeded by a detailed discussion of the river segment and the factors considered in each evaluation. The suitability assessments are for: Fish, Sharps, Whittaker, Greenleaf, Bear, and Marten Creeks; McKenzie River, Segment A; Siuslaw River, Segment C; and Siuslaw River, Segment B.

## Bear Creek

### Summary

The 1.8 miles segment of Bear Creek from T. 16 S., R. 3 E., Sec. 28 to the confluence with McKenzie River is found not suitable for designation under the National Wild and Scenic Rivers System.

### Background

#### Description of the River

The Eugene District identified as eligible a 1.8 river miles segment from its headwaters in T. 16 S., R. 3 E., Sec. 28, to the confluence with McKenzie River (see Map 2-WSR-1 at the end of Appendix 2-H). Section 28 was selected as a starting point for the segment since water flows are more dependable at this point.

Bear Creek is a tributary to the McKenzie River within the McKenzie River Basin. The segment lies north of the McKenzie River between Ben and Kay Dorris State Park and Nimrod. The creek segment generally flows in a southwesterly direction and averages approximately 20 to 50 feet in width.

Most of the timber in Bear Creek Basin is regrowth from a fire, which occurred about 80 years ago, and most of the corridor has been untouched by logging. Some pockets of old growth do exist. The riparian area consists mostly of red alder, bigleaf maple and some scattered Pacific yew and western red cedar. Highway 126 crosses the river at its mouth. Public access to the segment is very limited due to surrounding private lands and lack of public roads.

Bear Creek has good water quality and is rated "B" (moderate nonpoint source pollution problems) by the Statewide water assessment report. BLM through its monitoring program has shown the water quality to exceed Oregon Chapter 340 standards. There is one domestic water right on Bear Creek.

#### Eligibility Determination

Bear Creek is free-flowing within the 1.8 miles segment. There is one Outstandingly Remarkable Value - fish. The steelhead run is one of the few remaining native, wild runs in the McKenzie River Basin. The river segment has a moderate gradient with rapids and pools adequate for rearing habitat. Cutthroat and rainbow trout as well as sculpins occupy the stream

area. One-half mile from the mouth, a 10-foot falls blocks upstream migration of anadromous fish. Above the falls, a healthy population of resident cutthroat trout are suspected to be genetically unique to the region. This type of cutthroat trout is only known to occur on two other streams within the planning area.

The Bear Creek aquatic and riparian habitats are essentially intact along its main stem. It is one of the very few lower elevation streams with riparian communities largely unfragmented, with a diverse plant community. It has a good population of resident and anadromous native salmonoids, and a diverse amphibian community. While some of the same values can be found in other drainages, it is the completeness and good condition of the riparian and aquatic system in Bear Creek that gives it its high resource values. Because of its excellent water quality and basically unaltered system, it is being considered as a reference stream by EPA.

Since the Outstandingly Remarkable Values were examined, additional field studies in 1991 have shown the tailed frog to inhabit the Bear Creek drainage as well as two others within the planning area. While this does not change the Outstandingly Remarkable Value status for wildlife, the following has been observed. The tailed frog is not presently eligible for official Federal or State status but is of concern in Oregon and Washington. At a minimum, this species needs protection or mitigation in BLM activities. The tailed frog will be considered at a level of special status species separate from Bureau Sensitive, and will be referred to as an Assessment Species (AS).

#### Classification Determination

The river has two segments. One, within BLM lands, has a potential classification of wild. The other, within private lands, has a potential classification of recreational. The river is free of any impoundments, diversions, or stream bank modifications. Water quality and quantity are excellent and support the river corridor's Outstandingly Remarkable Value.

Bear Creek is not easily accessible to the public. BLM Road Number 16-3-33.1 is within the corridor but stops short of the creek, requiring a cross-country hike. Highway 126 does bridge the creek at its mouth, but public access is hindered by the surrounding private lands within that area. Criteria for the classification summary can be found in Table 3-WSR-3 of Chapter 3.

### Bear Creek Potential Classification Summary (within BLM lands)

Activity	Wild	Scenic	Recreational
Water resources development	M	M	M
Shoreline development	M	M	M
Water quality	M	M	M
Accessibility	M	M	DNM

### Bear Creek Potential Classification Summary (within Private lands)

Activity	Wild	Scenic	Recreational
Water resources development	M	M	M
Shoreline development	DNM	DNM	M
Water quality	M	M	M
Accessibility	DNM	DNM	M

M = Meets criteria

DNM = Does not meet criteria

### Suitability Factors

#### Ranking of Outstandingly Remarkable Value (fish)

This river segment did not make the Outstandingly Remarkable Values list shown in Table 2-WSR-1 of the Introduction. Compared to other rivers within SCORP Region 8, this river ranked relatively low for fish values.

#### Current Land Ownership

The Eugene District administers 1.6 stream frontage miles (both sides included), which are 89 percent of the river segment and 88 percent of the land base within the corridor, as shown below. These acreages are based upon GIS Interim boundaries, pending finalization through the development of a river management plan. Boundaries and acreages, as identified, are subject to revision through that planning process and may change.

### Bear Creek Segment Ownership and Status Within the River Corridor

Ownership	Acres	Percent	River Miles	Percent
BLM Public Domain	—	—	—	—
O&C lands	490	88	1.8 (BLM)	89
Private individuals (18)	68	12	0.2 (Pvt)	11
<b>Total</b>	<b>558</b>	<b>100</b>	<b>1.8</b>	<b>100</b>

#### Current Land Use

Timber harvesting on public lands has been limited within the corridor. One timber sale unit of 23 acres was logged in 1984 and replanted in 1985. It is now regenerating and is not highly visible from the river. Approximately five percent of the private ownership has been clear cut during the last five years (1986-1991). Private land clear cuts have varied in size from five to 20 acres.

Private land developments within the river corridor include approximately 18 residences. These developments are all located within a quarter-mile of the mouth of the river.

There are no known mining claims located within the river corridor and no Federal mineral leases are in effect.

Lane County has zoned the river corridor as F-1, F-2 and RR-5. All BLM land is within zone F-1, which is designed to conserve forestland for forest use. Forty acres of the private lands are within the zone F-2, which is designed to conserve forestland for forest uses, while recognizing that these lands are impacted by nonforest uses. Residential construction may be allowed when that residence is deemed necessary to the forest management of the lot. The minimum lot size is 20 acres except for preexisting legal lots, which may be smaller. Twenty-seven acres of the private ownership falls within zone RR5, which is rural residential with a five-acre minimum ownership.

#### Reasonable Foreseeable Uses of the Land and Water Which Would be Affected By Designation

Appendix 2-G of this Draft RMP/EIS provides a general description of land uses and management practices appropriate for Wild, Scenic, and Recreational river areas.

#### Uses That Would Be Enhanced By Designation (Including Outstandingly Remarkable Values)

The basic objective of wild and scenic river designation is to maintain the river's existing condition, and protect the identified Outstandingly Remarkable Value. Designation as wild would lead to VRM I management of BLM administered land in the one-half mile river corridor, enhancing its scenic values and wildlife habitat. If the river were designated as scenic, this could lead to VRM II management. If the designation were recreational, BLM management would be similar in most respects to management without designation, but BLM's increased management presence would enhance the river's Outstandingly Remarkable Value. Fish populations would be preserved by ensuring an improved rearing habitat (see Appendix 2-G).

#### Uses That Would Be Foreclosed By Designation

Designation as wild would lead to no timber harvest. No development of hydroelectric power facilities would be permitted. There is no Federal Energy Regulatory Commission (FERC) application, irrigation, or other proposals for dams or diversions on file for this river segment. Therefore, there is no conflict regarding this issue. The theoretical hydroelectric power potential for this river is estimated to be:

$$P = \frac{c}{1000} \frac{Q}{8.45} H_e = 2,202 \text{ kilowatts}$$

No new mining claims would be allowed. BLM could not sell or otherwise dispose of public lands (see Appendix 2-G).

#### Uses That Would Be Curtailed By Designation

Any recreational facilities would be limited to basic structures, which would harmonize with the surroundings. Any rights-of-way for transmission, gas, water lines, etc. would be discouraged unless unavoidable (see Appendix 2-G).

#### How the River Segment (and Outstandingly Remarkable Values) Would Be Managed If it Were Not Designated or if Designated at a Lower Classification

If the river were not added to the National Wild and Scenic Rivers System, the BLM would manage its lands to protect the riparian values and for continuation of existing levels of use within the corridor. The Outstandingly Remarkable Value of fish would be protected by such management, and would not be diminished or lost under the Preferred Alternative management options. Harvest activities could continue and would be managed under VRM Class IV standards. This would diminish the scenic attributes of the river

corridor. The Outstandingly Remarkable Value of fish, especially the subspecies of resident trout, could still be protected by current riparian management. Designation as scenic could lead to VRM Class II management, constraining timber management on those lands and diminishing the rate of timber harvest from them. Designation as either scenic or recreational would lead to application of a higher water quality standard, requiring more careful timing of BLM timber sales in the upstream watershed, which could also diminish the rate of timber harvest (see Appendix 2-G). BLM would be able to dispose of public land within the one-half mile river study corridor, if disposal were consistent with the Preferred Alternative.

#### Administering Agency

If Bear Creek were added to the National Wild and Scenic Rivers System, the BLM would continue to manage the land and resources it currently administers, unless Congress designates some other agency.

#### Costs Shared

It is not anticipated that any costs would be shared among other government agencies for this river segment.

#### Cost of United States

The estimated cost of preparing a required river management plan for this stream segment would be \$28,400. Annual river management and protection costs for the identified Outstandingly Remarkable Value is estimated to be \$3,000.

#### Finding and Rationale

##### Finding

The 1.8 miles segment of Bear Creek from T. 16 S., R. 3 E., Sec. 28 to the confluence with McKenzie River is found not suitable for Federal designation under the Wild and Scenic Rivers System.

##### Rationale, Characteristics Which Do Not Make the Area a Worthy Addition to the System

The low comparative rating (see Table 2-WSR-1 of the Introduction) of the river's Outstandingly Remarkable Value (fish) makes it a marginal potential addition to the National Wild and Scenic Rivers System. The Outstandingly Remarkable Value of fish, while unique, is not threatened. There are no current or foreseeable proposals for dam construction or irrigation develop-

ments for the river corridor. On private timber lands, the requirements of the Oregon forest Practices Act should protect this Outstandingly Remarkable Value from impacts associated with timber management.

Considering all the factors, BLM believes the river segments's Outstandingly Remarkable Value can best be protected by a combination of the actions set forth in the Preferred Alternative of this Draft RMP/EIS, and by management of private land consistent with County zoning and State law.

## Fish Creek

### Summary

The five-mile segment of Fish Creek from the confluence with Lake Creek to its headwaters in T. 16 S., R. 7 W., Sec. 22 is found not suitable for designation under the National Wild and Scenic Rivers System.

### Background

#### Description of the River

The Eugene District identified as eligible a five-mile segment from its headwaters in T. 16 S., R. 7 W., Sec. 22, to the confluence with Lake Creek (see Map 2-WSR-2 at the end of Appendix 2-H). The entire segment is classified as Recreational.

Fish Creek is a tributary of Lake Creek and lies within the Coast Range south of the community of Triangle Lake. The creek segment generally flows in a westerly direction and averages approximately 10 to 60 feet in width.

BLM Road Number 16-7-30 parallels the river segment, providing public access to the river. Bank fishing attracts local visitors. Further discussion of access can be found in the Classification Determination section.

Parts of the one-half mile river study corridor (one-quarter mile each side of the river) have been clear cut. The remaining timber consists mostly of Douglas-fir and scattered hardwoods, mostly alder. More timber discussion is in the Land Use section.

Fish Creek has good water quality that is sufficient to support the river corridor's Outstandingly Remarkable Value. The water quality is rated "B" (moderate nonpoint source pollution problems) by the Statewide water assessment report. Limited monitoring has not shown any serious water quality problems and Oregon Chapter 340 standards are being met. The primary beneficial use of the Fish Creek waters is anadromous fish rearing.

#### Eligibility Determination

Fish Creek is free-flowing within the river segment. There is one identified Outstandingly Remarkable Value - fish. The river is a major spawning stream in the region for three species: coho, steelhead, and chinook. Resident and sea run cutthroat trout and anadromous lampreys are found also within this segment. Fish Creek exhibits some of the highest quality spawning and rearing habitat in the Lake Creek Basin due to its 50-50 pool to riffle ratio, spawning gravel present, and low gradient. Over half of the coho run in the Siuslaw Basin is nurtured in this stream. Beaver dams add diversity to the segment's aquatic habitat and increase available rearing areas. Sixty percent of Fish Creek has good shading, which moderates the stream's temperature. On-going riparian management projects, such as the reintroduction of western red cedar, have been initiated to produce large woody structures within the riparian floor.

#### Classification

The river's highest potential classification is recreational, as shown below. The river is free of any impoundments, diversions, or stream bank modifications. Water quality and quantity is relatively good and supports the river corridor's Outstandingly Remarkable Values.

The river is accessible by BLM Road Number 16-7-30. This road parallels the river for its entire length. The road is not heavily traveled. Primary uses of the road are for recreation, logging activities, and access by local residents. The road is visible from the river and passing vehicle traffic can be heard from the river's bank. The river segment is bridged at four locations by BLM roads. Below is a summary of Fish Creek's classification. Criteria for the summary can be found in Table 3-WSR-3 of Chapter 3.



## Fish Creek Potential Classification Summary

Activity	Wild	Scenic	Recreational
Water resources development	M	M	M
Shoreline development	DNM	M	M
Water quality	M	M	M
Accessibility	DNM	DNM	M

M = Meets criteria  
DNM = Does not meet criteria

## Suitability Factors

### Ranking of Outstandingly Remarkable Values

This river segment did not make the Outstandingly Remarkable Values list shown in Table 2-WSR-1 of the Introduction. Compared to other rivers within SCORP Region 8, this river ranked relatively low for fish values.

### Current Land Ownership

The Eugene District administers 3.9 stream frontage miles (both sides included), which is 76 percent of the river segment but 63 percent of the land base, as shown below. These acreages are based upon GIS interim boundaries, pending finalization through the development of a river management plan. Boundaries and acreages, as identified, are subject to revision through that planning process and may change.

## Greenleaf Creek Segment Ownership and Status Within the River Corridor

Ownership	Acre	Percent	River Miles	Percent
BLM Public Domain	—	—		
O&C lands	909	63	3.9 (BLM)	76
International Paper Co.	399	27		
Seneca Saw Mill Co.	139	10		
Private individuals (3)	5	<1	1.2 (Pvt.)	24
<b>Total</b>	<b>1,452</b>	<b>100</b>	<b>5.1</b>	<b>100</b>

## Current Land Use

Land use within the one-half mile river corridor are varied. Timber harvest activities on private lands continue. Within the last five years (1987-1991), approximately 50 acres have been commercially thinned. Timber harvesting activities on public lands within this corridor has been limited. Within the last ten years (1981-1991), eight timber sale units have been sold ranging in size from eight acres to 39 acres, totalling 216 acres.

Private residential developments within the river corridor include two residences. There is one undeveloped lot. Private residential lots are less than five acres in size.

Lane County zoning within the river corridor is F-1 and F-2. Zone F-1, which is designed to conserve forestland for forest use, is within BLM and timber company lands. Zone F-2 is designed to conserve forestland for forest uses, while recognizing that these lands are impacted by nonforest uses. Residential construction may be allowed when that residence is deemed necessary to the forest management of the lot. The minimum lot size is 20 acres except for preexisting legal lots, which may be smaller. The private individual lots are within zone F-2. See Lane County zoning codes (16.210 - 16.231) for further details.

There are no known mining claims located within the river corridor and no Federal mineral leases are in effect.

### Reasonable Foreseeable Uses of the Land and Water Which Would be Affected By Designation

Appendix 2-G of this Draft RMP/EIS provides a general description of land uses and management practices appropriate for Wild, Scenic, and Recreational river areas.

### Uses That Would Be Enhanced By Designation (Including Outstandingly Remarkable Values)

The basic objective of wild and scenic river designation is to maintain the river's existing condition, and protect the identified Outstandingly Remarkable Values. With designation, BLM management would enhance the river segment's Outstandingly Remarkable Values, in this case, fish. BLM management would be similar in most respects to management without designation. Management of riparian areas would provide appropriate protection of fisheries' habitat. Designation would ensure the continued availability of fish habitat. Increased public use due to its higher visibility could require more management of recreational use, thus enhancing recreation (see Appendix 2-G).

### Uses That Would Be Foreclosed By Designation

Designation would foreclose any uses of the area for dams or diversions. Currently, there is no Federal Energy Regulatory Commission (FERC) application, irrigation, or other proposals for dams or diversions on file for this river segment. Therefore, there is no conflict regarding this issue. The potential hydroelectric power available Fish Creek is estimated to be:

$$P = (0.08475) (14.66) (880) (1.0) = 1094 \text{ kilowatts}$$

BLM could not sell or otherwise dispose of public lands (see Appendix 2-G).

### Uses That Would Be Curtailed By Designation

Designation would lead to application of a higher water quality standard, requiring more careful timing of BLM timber sales in the upstream watershed, which could also diminish the rate of timber harvest. New mining claims would be allowed but under certain regulations (see Appendix 2-G).

### How the River Segment (and Outstandingly Remarkable Values) Would Be Managed if Not Designated

BLM would continue to protect fishery areas along the river. The Outstandingly Remarkable Value of fish would be protected by such management, and should not be diminished or lost under the Preferred Alternative management option. Lands outside the riparian zone would be subject to timber harvest with the exception of areas protected for wildlife, and would be managed under VRM Class IV standards. BLM would continue to manage any recreational use opportunities and developments along the river. The potential would exist for hydroelectric power developments or other projects requiring dams or diversions. The potential would exist, therefore, for substantial alteration to the river's free flowing character. There would also be a potential for disposal of public land, if disposal were consistent with the Preferred Alternative, along the river corridor through operation of the public land laws, including the mining laws.

### Administering Agency

If Fish Creek were added to the National Wild and Scenic Rivers System, the BLM would continue to manage the land and resources, unless Congress designates another agency to do so.

### Costs Shared

It is not anticipated that any costs would be shared among other government agencies for this river segment.

### Cost of United States

The estimated cost of preparing a required river management plan for this stream segment would be \$28,400. Annual river management and protection costs for identified Outstandingly Remarkable Values are estimated to be \$3,000.

## Finding and Rationale

### Finding

The five-mile segment of Fish Creek is found not suitable for Federal designation as a recreational river under the Wild and Scenic Rivers System, and will not be recommended to Congress.

### Rationale, Characteristics Which Do Not Make the Area a Worthy Addition to the System

The low comparative rating of the river's one Outstandingly Remarkable Value, fish, makes it a marginal potential addition to the National Wild and Scenic Rivers System. BLM's intent in the Preferred Alternative of this Draft RMP/EIS is to protect this Outstandingly Remarkable Value on BLM administered land. Designation into the National System is not needed to protect this value. The Outstandingly Remarkable Value is not threatened by dam construction or irrigation development as there are no current or foreseeable proposals for the river corridor. On private land not subdivided or eligible for subdivision, the requirements of the Oregon Forest Practices Act should protect the Outstandingly Remarkable Value from impacts associated with timber management.

Considering all the factors, BLM believes the river segment's Outstandingly Remarkable Value can best be protected by a combination of the actions set forth in the Preferred Alternative of this Draft RMP/EIS, and by management of private land consistent with County zoning and State law.

## Greenleaf Creek

### Summary

The seven-mile segment of Greenleaf Creek from the confluence with Lake Creek to its headwaters in T. 16 S., R. 8 W., Sec. 2 is found not suitable for designation under the National Wild and Scenic Rivers System.

### Background

#### Description of the River

The Eugene District identified as eligible a seven-mile river segment from its headwaters in T. 16 S., R. 8 W., Sec. 2, to the confluence with Lake Creek in T. 17 S., R. 8 W., Sec. 2 (see Map 2-WSR-3 at the end of Appendix 2-H). The entire segment is classified as Recreational.

Greenleaf Creek is a tributary of Lake Creek in the Siuslaw River Basin and lies within the Coast Range between the communities of Triangle Lake and Deadwood. The creek segment generally flows in a southerly direction and averages approximately 20 to 40 feet in width.

BLM Road Number 16-8-35.1 parallels the lower three miles of the river segment providing public access to the river. Highway 36 crosses the river segment near its mouth. Public access to the upper portion of this segment is very limited. Fishing opportunities attract local visitors. A more detailed discussion of roads and bridges can be found in the Classification Determination section.

Parts of the one-half mile river study corridor (one-quarter mile each side of the river) have been clear cut in the past. The timber remaining consists mostly of Douglas-fir and scattered incense cedar with hardwoods of alder and maple. Most of the clear cuts are regenerating.

Greenleaf Creek has good water quality that is sufficient to support the river corridor's Outstandingly Remarkable Value. The DEQ 1988 Statewide Assessment of Nonpoint Sources of Water Pollution has rated this creek as "B" (moderate nonpoint source pollution problems). Extensive monitoring has shown that water quality exceeds Oregon's Chapter 340 standards. The primary beneficial use of the Greenleaf Creek waters is anadromous fish rearing.

### Eligibility

Greenleaf Creek is free-flowing within the seven-mile study segment. There is one identified Outstandingly Remarkable Value - fish. Besides shiners, dace, and sculpins, the river segment has a high population of steelhead and a unique resident cutthroat trout subspecies above some natural barriers. This unique trout subspecies is known to occur only in two other streams within the planning area. ODF&W reports Greenleaf as one of the best steelhead rivers on the Coast and uses this segment as an index stream for monitoring spawning and populations of salmon and trout. In 1991, ODF&W used Greenleaf's wild steelhead runs as an egg source for brood stock. The high population of steelhead is attributed to the segment's rearing habitat. Varied steep gradient and boulder cascades make Greenleaf more adaptable to steelhead than coho. The first two miles have a low gradient (excellent spawning gravel) and lateral scour pools (providing rearing habitat), making this portion excellent for fish production. Further upstream, the gradient steepens into cascades with 3-10 foot drops. The next portion of the stream decreases in gradient and contains some log jams and beaver activity. Again, low gradient increases spawning gravel opportunities. Beyond this section, bedrock sheets begin to dominate the substrate, where high velocities at peak flows and minimal structure make this marginal habitat for fish. BLM surveys throughout the Siuslaw Basin indicate a general decline in populations of anadromous fish, making Greenleaf a valuable and critical habitat supporter for the remnant wild anadromous fish runs.

Since the Outstandingly Remarkable Values were examined, additional field studies in 1991 have shown the tailed frog to inhabit the Greenleaf drainage as well as two others within the planning area. While this does not change the Outstandingly Remarkable Value status for wildlife, the following has been observed. The tailed frog is not presently eligible for official Federal or State status but is of concern in Oregon and Washington. At a minimum, this species needs protection or mitigation in BLM activities. The tailed frog will be considered at a level of special status species separate from Bureau Sensitive, and will be referred to as an Assessment Species (AS).

### Classification

The river's highest potential classification is recreational, as shown below. The river is free of any impoundments, diversions, or stream bank modifications. Water quality and quantity is good and supports the river corridor's Outstandingly Remarkable Value.

Greenleaf Creek is accessible by a parallel road (BLM Road Number 16-8-35.1) along its lower three miles. Bridges cross the creek at its mouth (Highway 36) and near the end of Road Number 16-8-35.1. Road Number 16-8-35.1 is lightly travelled and connects to nonmaintained BLM Road Number 16-8-22, which currently is impassible. Primary use of Road Number 16-8-35.1 is for logging activities. From the stream bank, the road is visible and traffic can be heard. Criteria for the classification summary below can be located in Table 3-WSR-3 of Chapter 3.

### Greenleaf Creek Potential Classification Summary

Activity	Wild	Scenic	Recreational
Water resources development	M	M	M
Shoreline development	M	M	M
Water quality	M	M	M
Accessibility	DNM	DNM	M

M = Meets criteria

DNM = Does not meet criteria

### Suitability Factors

#### Ranking of Outstandingly Remarkable Values

This river segment did not make the Outstandingly Remarkable Values list shown in Table 2-WSR-1 of the Introduction. Compared to other rivers within SCORP Region 8, this river was ranked relatively low for fish values.

#### Current Land Ownership

The Eugene BLM District administers 4.3 stream frontage miles (both sides included), which is 58 percent of the river segment but 60 percent of the land base, as shown below. These acreages are based upon GIS interim boundaries, pending finalization through the development of a river management plan. Boundaries and acreages, as identified, are subject to revision through that planning process and may change.

### Greenleaf Creek Segment Ownership and Status Within the River Corridor

Ownership	Acres	Percent	River Miles	Percent
BLM Public Domain	6	<1		
O&C lands	1,341	60	4.3 (BLM)	58
State of Oregon	328	15		
Bohemia Inc.	373	17		
John Hancock Mutual Life Ins.	29	1		
Willamette Industries, Inc.	10	<1		
Private individuals (4)	29	1	3.1 (All Private)	42
Parker	133	6		
<b>Total</b>	<b>2,249</b>	<b>100</b>	<b>7.4</b>	<b>100</b>

#### Current Land Use

Land uses within the one-half mile river corridor are varied. Timber harvest activities on private lands continue. Within the last five years, 1987-1991, approximately one unit of ten acres has been clear cut. Timber harvesting on public lands within this corridor has been limited. Within the last ten years, 1981-1991, two timber sale units have been sold ranging in size from 50 to 56 acres, totaling 106 acres. These units have been logged. Currently, no timber sales are planned for this river corridor on BLM lands. The BLM has left riparian buffers of widths varying from comparatively narrow in canyon areas to broad in areas of lower gradient. BLM has proposed a potential three-mile hiking trail along the upper end of this segment. The trail would provide interpretative opportunities within the boundary.

There is one private land residential development within the river corridor that does not involve attendant river frontage improvements (i.e., landscaping, boat dock, etc.). There are three additional individual undeveloped lots ranging in size from less than one acre to 32 acres. Parker, the largest individual owner, has 133 acres.

Lane County zoning within the river corridor is F-1, F-2 and E-40. Some of the Bohemia and all of the private lands are within zone E-40, which is exclusive farm use with minimum lot size of 40 acres. The Willamette Industries' lands are zoned F-2. This zone, which is designed to conserve forestland for forest uses, while recognizing that these lands are impacted by nonforest uses. Residential construction may be allowed when that residence is deemed necessary to the forest management of the lot. The minimum lot size is 20

acres, except for preexisting legal lots, which may be smaller. The rest of the land ownership falls within zone F-1, which is designed to conserve forestland for forest use. Residential construction is not allowed except for replacement of existing residences. See Lane County zoning codes (16.210 - 16.231) for further details.

There are no known mining claims located within the river corridor and no Federal mineral leases are in effect.

#### **Reasonable Foreseeable Uses of the Land and Water Which Would Be Affected By Designation**

Appendix 2-G of this Draft RMP/EIS provides a general description of land uses and management practices appropriate for Wild, Scenic, and Recreational river areas.

#### **Uses That Would Be Enhanced By Designation (Including Outstandingly Remarkable Values)**

The basic objective of wild and scenic river designation is to maintain the river's existing condition and protect the identified Outstandingly Remarkable Value. With designation, BLM management would be similar in most respects to management without designation, but BLM's management presence would enhance the river segment's Outstandingly Remarkable Value use. Designation would enhance wildlife populations by helping to preserve existing habitat for the tailed frog. Management of riparian areas would provide appropriate protection of fisheries habitat. Designation would ensure the continued availability of fish habitat (see Appendix 2-G).

#### **Uses That Would Be Foreclosed By Designation**

Designation would foreclose any uses of the area for dams or diversions. Currently, there is no Federal Energy Regulatory Commission (FERC) application, irrigation, or other proposals for dams or diversions on file for this river segment. Therefore, there is no conflict regarding this issue. The theoretical hydroelectric power potential for this river is estimated to be:

$$P = \frac{c}{3.6} \frac{Q}{1000} H e = (0.08475) (30.63) (960) (1.0) = 2,493 \text{ kilowatts}$$

BLM could not sell or otherwise dispose of public lands (see Appendix 2-G).

#### **Uses That Would Be Curtailed By Designation**

Designation would lead to application of a higher water quality standard, requiring more careful timing of BLM timber sales in the upstream watershed, which could diminish the rate of timber harvest. New mining claims would be allowed but under strict regulations (see Appendix 2-G).

#### **How the River Segment (and Outstandingly Remarkable Values) Would Be Managed if It Were Not Designated**

BLM would continue to protect fisheries and wildlife habitat areas along the river. The Outstandingly Remarkable Value of fish would be protected by such management and would not be diminished or lost under these management options. The tailed frog located within this segment would continue to be monitored. Land outside the riparian zone would be managed for timber harvest with the exception of areas protected for wildlife. BLM would continue to manage any recreational use opportunities and developments along the river. The potential would exist for hydroelectric power developments or other projects requiring dams or diversions. The potential would exist, therefore, for substantial alteration to the river's free-flowing character. There would also be a potential for disposal of public land along the river corridor, if disposal were consistent with the Preferred Alternative through operation of the public land laws, including the mining laws.

#### **Administering Agency**

If Greenleaf Creek were to be added to the National Wild and Scenic Rivers System, it is assumed the BLM would continue to manage the land and resources unless Congress designates some other agency.

#### **Costs Shared**

It is not anticipated that any costs would be shared among other government agencies for this river segment.

#### **Cost of United States**

The estimated cost of preparing a required river management plan for this stream segment would be approximately \$28,400. Annual river management and protection costs for identified Outstandingly Remarkable Value are estimated to be approximately \$3,000.

## Finding and Rationale

### Finding

The seven-mile segment of Greenleaf Creek is found not suitable for Federal designation under the Wild and Scenic Rivers System and will not be recommended to Congress.

### Rationale, Characteristics Which Do Not Make the Area a Worthy Addition to the System

The low comparative rating (see Table 2-WSR-1 in the Introduction) of the rivers one Outstandingly Remarkable Value, fish, makes it a marginal potential addition to the National Wild and Scenic River System. The Outstandingly Remarkable Value of fish, while unique, is not threatened. There are no current or foreseeable proposals for dam construction or irrigation development. On private forestlands, the requirements of the Oregon Forest Practices Act should protect this Outstandingly Remarkable Value from impacts associated with timber management.

Considering all the factors, BLM believes the river segment's Outstandingly Remarkable Value can best be protected by a combination of the actions described above and set forth in the Preferred Alternative of this Draft RMP/EIS, and by management of private land being consistent with County zoning and State law.

## Marten Creek

### Summary

The four-mile segment of Marten Creek from its headwaters in T. 17 S., R. 3 E., Sec. 18 to its confluence with the McKenzie River is found not suitable for designation under the National Wild and Scenic Rivers System.

## Background

### Description of the River

The Eugene District identified Marten Creek as eligible along its four river mile segment. This segment starts from its headwaters in T. 17 S., R. 3 E., Sec. 18 and flows northwesterly to its confluence with the McKenzie River (see Map 2-WSR-4 at the end of Appendix 2-H). The segment lies south of the McKenzie River between Ben and Kay Dorris State Park and Goodpasture Bridge. Several tributaries feed into this segment including Gale Creek.

Goodpasture Road (county road number 1094), bridges the river near its mouth, making this the most accessible point to the river. Access elsewhere to the river is very limited. BLM Road Number 17-2E-1.2 lies within the one-half mile boundary, requiring a cross-country hike to reach the stream.

Timber harvests have been limited due to a fire 80 years ago. The area consists mostly of Douglas-fir forest intermixed with hardwoods. Dominating the riparian area are red alder, bigleaf maple and some Douglas-fir.

Marten Creek has good water quality and is rated "B" (moderate nonpoint source pollution problems) by the Statewide water assessment report. BLM, through its monitoring program, has shown the water quality exceeds Oregon Chapter 340 standards. There is one domestic water right on Marten Creek.

### Eligibility Determination

Marten Creek is free-flowing within the four-mile study segment. There is one Outstandingly Remarkable Value - fish. The river has outstanding values in fish production for steelhead, chinook, sculpins, cutthroat and rainbow trout. The large flow, low to moderate gradient with extensive riffles and spawning gravel of the lower reaches make this stream good habitat for runs of chinook and steelhead. The creek is 60 percent shaded, which contributes to its relatively cool summer water temperatures, making it a productive rearing habitat. There is some good structure in the stream, and 30 percent of the habitat is comprised of pools providing cover and winter habitat.

Marten Creek aquatic and riparian habitats are essentially intact along its main stem, although major portions of tributaries have been harvested. It is one of the very few lower elevation streams with riparian communities largely unfragmented, with a diverse plant community. It has a good population of resident and anadromous native salmonoids, and a diverse amphibian community. While some of the same values can be found in other drainages, it is the completeness and good condition of the riparian and aquatic system in Marten Creek that gives it its high resource values. Because of its excellent water quality and basically unaltered system, it is being considered as a reference stream by EPA.

Since the Outstandingly Remarkable Values were examined, additional field studies in 1991 have shown the tailed frog to inhabit Marten Creek drainage as well as two other drainages within the planning area. While this does not change the Outstandingly Remarkable Value status for wildlife, the following has been observed. The tailed frog is not presently eligible for

official Federal or State status but is of concern in Oregon and Washington. At a minimum, this species needs protection or mitigation in BLM activities. The tailed frog will be considered at a level of special status species separate from Bureau Sensitive, and will be referred to as an Assessment Species (AS).

#### Classification Determination

The river's highest potential classification is recreational within private lands and wild within Federal lands, as shown in the table below. The river is free of any impoundments, diversions, or stream bank modifications. Shoreline development within private ownership includes dispersed residential dwellings and associated structures. Logging activity has been very minimal and is screened by stream side vegetation or topography. Water quality and quantity is excellent and supports the river corridor's Outstandingly Remarkable Value. Classification criteria can be found in Table 3-WSR-3 of Chapter 3.

#### Marten Creek Potential Classification Summary (within BLM lands)

Activity	Wild	Scenic	Recreational
Water resources development	M	M	M
Shoreline development	M	M	M
Water quality	M	M	M
Accessibility	M	M	DNM

#### Marten Creek Potential Classification Summary (within private lands)

Activity	Wild	Scenic	Recreational
Water resources development	M	M	M
Shoreline development	DNM	DNM	M
Water quality	M	M	M
Accessibility	DNM	DNM	M

M = Meets criteria  
DNM = Does not meet criteria

## Suitability Factors

#### Ranking of Outstandingly Remarkable Value (fish)

This river segment did not make the Outstandingly Remarkable Values list shown in Table 2-WSR-1 of the Introduction. Compared to other rivers within SCORP Region 8, this river was ranked relatively low for fish values.

#### Current Land Status

The Eugene District administers 3.3 stream frontage miles (both sides included), which are 85 percent of the river segment and 73 percent of the land base within the corridor, as shown below. These acreages are based upon GIS interim boundaries, pending finalization through the development of a river management plan. Boundaries and acreages, as identified, are subject to revision through that planning process and may change.

#### Marten Creek Segment Ownership and Status Within the River Corridor

Ownership	Acre	Percent	River Miles	Percent
BLM Public Domain	129	11	3.3 (BLM)	85
O&C lands	814	73		
Giustina Woodlands	29	3		
Private individuals (approximately 11)	145	13	0.6 (Pvt)	15
<b>Total</b>	<b>1,117</b>	<b>100</b>	<b>3.9</b>	<b>100</b>

#### Current Land Use

Timber harvesting on public lands has been limited. Two timber units of 26 and 28 acres each have been harvested in the last ten years (1981-1991). These units are located near the headwaters and are now regenerating. Private residential developments within the river corridor include several residences.

There are no known mining claims located within the river corridor and no Federal mineral leases are in effect.

Lane County has zoned the river corridor as F-1, F-2, RR10 and CR. F-1 includes all BLM and Giustina lands and is designed to conserve forestland for forest use. The individual ownerships fall within F-2, RR10 and CR. The F-2 zone is designed to conserve forestland for forest uses, while recognizing that these lands are impacted by nonforest uses. Residential construction

may be allowed when the residence is deemed necessary to the forest management of the lot. The minimum lot size is 20 acres except for preexisting legal lots, which may be smaller. RR10 is rural residential with 10 acres minimum. CR is commercial rural that is designed in part to provide goods, services and facilities to residents and tourists. See Lane County zoning codes (16.210-16.231) for further details.

#### Reasonable Foreseeable Uses of the Land and Water Which Would Be Affected By Designation

Appendix 2-G of this Draft RMP/EIS provides a general description of land uses and management practices appropriate for Wild, Scenic, and Recreational river areas.

#### Uses That Would Be Enhanced By Designation (Including Outstandingly Remarkable Values)

The basic objective of designation is to maintain the river's existing condition and protect the identified Outstandingly Remarkable Value, in this case, fish. With designation as wild, scenic values (not identified as outstanding) would also be enhanced. VRM Class I would be the management objective. If the river were designated as scenic, scenic values would be under Class II management. If the river were designated as recreational, BLM management would be similar in most respects to management without designation. Designation would ensure the continued availability of fish habitat occurring in this river segment. Designation would also enhance wildlife populations by helping to preserve existing habitat as for the tailed frog (see Appendix 2-G).

#### Uses That Would Be Foreclosed By Designation

Designation as wild would lead to no timber harvest. No development of hydroelectric power facilities would be permitted. There is no Federal Energy Regulatory Commission (FERC) application, irrigation, or other proposals for dams or diversions on file for this river segment, therefore, there is no conflict regarding this issue. The theoretical hydroelectric power potential for this segment of Marten Creek is estimated to be:

$$P = \frac{c}{8.8} Q H e$$

$P = (0.08475) (43.06) (400) (1.0) = 1,460 \text{ kilowatts}$

No new mining claims would be allowed. BLM could not sell or otherwise dispose of public lands (see Appendix 2-G).

#### Uses That Would Be Curtailed By Designation

Designation as scenic could lead to VRM Class II management of BLM administered lands in the one-half corridor, constraining timber management on those lands and diminishing the rate of timber harvest from them. Designation as either scenic or recreational would lead to application of a higher water quality standard, requiring more careful timing of BLM timber sales in the upstream watershed, which could also diminish the rate of timber harvest. As wild, any recreational facilities would be limited to basic structures, which would harmonize with the surroundings. Any rights-of-way for transmission, gas, water lines, etc. would be discouraged unless unavoidable (see Appendix 2-G).

#### How the River Segment (and Outstandingly Remarkable Values) Would Be Managed if It Were Not Designated or If Designated at a Lower Classification

If the river were not added to the National Wild and Scenic Rivers System, the BLM would manage for the protection of the riparian values. The Outstandingly Remarkable Value of fish would be protected by such management, and would not be diminished or lost under the Preferred Alternative management option. Lands outside the riparian zone but within the McKenzie SRMA would be subject to timber harvest, but would be managed under VRM Class II standards. Timber harvesting outside the McKenzie SRMA visual boundary would be managed as Class IV. BLM would be able to dispose of public land within the one-half mile study corridor if disposal were consistent with the Preferred Alternative.

#### Administering Agency

If Marten Creek were added to the National Wild and Scenic Rivers System, the BLM would continue to manage the land and resources it currently administers, unless Congress designates some other agency.

#### Costs Shared

It is not anticipated that any costs would be shared among other government agencies for this river segment.

#### Cost to the United States

The estimated cost of preparing a required river management plan for this stream segment would be \$28,400. Annual river management protection cost for the identified Outstandingly Remarkable Value use is estimated to be \$3,000.



## Finding and Rationale

### Finding

The four-mile segment of Marten Creek from its headwaters in T. 17 S., R. 3 E., Sec. 18 to its confluence with McKenzie River is found not suitable for designation under the National Wild and Scenic Rivers System.

### Rationale, Characteristics Which Do Not Make the Area a Worthy Addition to the System

The low comparative rating (see Table 2-WSR-1 of the Introduction) of the river's Outstandingly Remarkable Value makes it a marginal potential addition to the National Wild and Scenic Rivers System. BLM's Intent in the Preferred Alternative of this Draft RMP/EIS is to protect this Outstandingly Remarkable Value on BLM administered land, and BLM feels that designation is not needed to protect this value. The Outstandingly Remarkable Value is not threatened by dam construction or irrigation development as there are no current or foreseeable proposals for the river corridor. On private land not subdivided or eligible for subdivision, the requirements of the Oregon Forest Practices Act should protect this Outstandingly Remarkable Value from impacts associated with timber management.

In addition, although County zoning permits additional development of private lands, such development would probably effect this value only slightly. Considering all the factors, BLM believes the river segment's Outstandingly Remarkable Value can best be protected by a combination of the actions set forth in the Preferred Alternative of this Draft RMP/EIS, and by management of private land consistent with County zoning and State law.

## McKenzie River, Segment A

### Summary

The 11-mile segment of the McKenzie River from the border of Forest Service land in T. 17 S., R. 3 E., Sec. 2 to Goodpasture Bridge is found suitable for designation under the National Wild and Scenic Rivers System. The highest potential classification is recreational.

### Background

#### Description of the River

The Eugene District identified as eligible an 11 river mile segment from T. 17 S., R. 3 E., Sec. 2, to Goodpasture Bridge (see Map 2-WSR-5 at the end of Appendix 2-H). The McKenzie River lies east of Eugene/Springfield, Oregon and is a major tributary to the Willamette River. The segment generally flows in a westerly direction. This segment lies within the BLM proposed McKenzie River Special Recreation Management Area (SRMA). The SRMA will focus on developing recreational opportunities on BLM lands within its boundary. The upper part of the McKenzie River, from Clear Lake to Paradise Campground, is already designated as a National Scenic River by Congress and as a State Scenic Waterway.

Within this segment the north bank is paralleled by Highway 126. This is a major transportation route to eastern Oregon. The south bank is paralleled approximately 80 percent by County road 1094 (Goodpasture Road), which dead ends. Primary uses of the county road are for recreational and logging activities, and access to local residences. Both roads are visible and audible at times from the river, but the immediate scenery usually overrides any effects of traffic sounds. Both roads also provide public access to the river bank.

Parts of the one-half mile river corridor (one-quarter mile each side of the river) have been logged. The river bank is intermixed with hardwoods and conifers. Steep rising banks and lowlands make this a scenic area. See the current Land Use section for further discussion.

Within this segment there are several recreational facilities and interest points, which attract both local and regional (more than 25 miles away) visitors. See the Eligibility Determination section for further details.

The McKenzie River has good water quality and is rated "A2" by the Statewide water assessment report. This rating means moderate to serious nonpoint source pollution. Problems have been reported by some sources and challenged by others. The concerns about the McKenzie River water quality are due to the high values of the beneficial uses of this river, one of these being the source for Eugene's municipal water supply, and as well as for many domestic and irrigation users. The water quality has almost always been exceptional for a river of this size. The McKenzie with its low sediment levels, low turbidity, low levels of organic nutrients and cold temperatures has been called the "Blue McKenzie." Summer flows are usually adequate to meet all allocations.

#### Eligibility Determination

The McKenzie River, Segment A, is free-flowing within the 11-mile study segment. The Eugene District identified four Outstandingly Remarkable Values: fish, wildlife, recreation, and scenic, which are discussed below.

**Wildlife:** There are many osprey nest sites along this segment. During the summer the osprey are readily observed searching for fish along the river segment.

The Pacific Bald Eagle Recovery Plan lists the McKenzie River as a key area in the recovery of the bald eagle population. Three nest sites along the McKenzie have been discussed in the Working Implementation Plan for Bald Eagle Recovery in Oregon and Washington.

**Fish:** The river segment has populations of native rainbow and cutthroat trout. Bull trout have experienced declines and are now under a catch and release status by the ODF&W. Normally the anadromous fish runs of chinook and steelhead are good, attracting local and regional fishermen. The river also supports white fish, dace, suckers and sculpins.

**Recreational:** Within this segment there are several recreational facilities and attractions: Ben and Kay Dorris State Park; two BLM boat landings (Rennie and Silver Creek); Watchable Wildlife interpretive area; and two Lane County Recreation and Public Purposes leases with BLM (Whitewater and Marten Rapids County Parks). Within the river segment there are three well-known points of interest: Eagle Rock, Brown's Hole and Marten's Rapids. The main recreational attractions are fishing (both bank and drift boat) and white water rafting. The water is class 2-3, and many commercial guides (fishing and

rafting) operate on the river. Other recreational activities include picnicking, photography, watching wildlife, other types of boating, swimming, and driving for pleasure.

**Scenic:** Eagle Rock, a landmark that protrudes from the south bank of the river, is one of the reasons the McKenzie is so outstanding to behold. In general, the view area is rated by BLM standards as having a scenic quality of A (outstanding).

#### Classification Determination

The river's highest potential classification is recreational, as shown below. The river is free of any impoundments, diversions, or streambank modifications. Water quality and quantity is relatively good and supports the river corridor's Outstandingly Remarkable Values. Classification criteria can be found in Table 3-WSR-1 of Chapter 3.

#### McKenzie River Segment A Potential Classification Summary

Activity	Wild	Scenic	Recreational
Water resources development	M	M	M
Shoreline development	DNM	DNM	M
Water quality	M	M	M
Accessibility	DNM	DNM	M

M = Meets criteria  
DNM = Does not meet criteria

#### Suitability Factors

##### Ranking of Outstandingly Remarkable Values

This river did make the Outstandingly Remarkable Values list shown in Table 2-WSR-1 of the Introduction, for the Outstandingly Remarkable Values of fish, recreation and scenic features. Compared to other rivers within SCORP Region 8, this river was noted as having exceptional values.

##### Current Land Status

The Eugene District administers 3.5 stream frontage miles (both sides included), which are 32 percent of the river segment and 32 percent of the land base, as shown below. These acreages are based upon GIS

interior boundaries, pending finalization through the development of a river management plan. Boundaries and acreages, as identified, are subject to revision through that planning process and may change.

### McKenzie River, Segment A, Segment Ownership and Status Within the River Corridor

Ownership	Acres	Percent	River Miles	Percent
BLM Public Domain	348	9	3.5 (BLM)	32
O&C lands	846	23		
BLM subtotal	1,194	32		
State				
Lane County				
Timber Companies:				
Giustina Land and Timber				
John Hancock Mutual				
Life Ins.				
Rosboro Lumber				
Seneca Sawmill				
Weyerhaeuser				
Willamette Industries				
Private individuals (numerous)			7.5 (All Private)	68
All Private subtotal	2,591	68		
<b>Total</b>	<b>3,785</b>	<b>100</b>	<b>11</b>	<b>100</b>

### Current Land Use

Private individual land use within the one-half mile river corridor are varied. Private timber companies have harvested timber within the watershed of the river area within the last ten years (1981-1991). Private developments within the river corridor include numerous residences, many involving attendant river frontage improvements (i.e., landscaping, boat dock, etc.). Livestock grazing and agricultural activities do occur within intermingled private lands within the river corridor. Timber harvesting on public lands has been limited; two timber sale harvest units were sold and harvested within the last ten years (1981-1991). These units were 39 and 12 acres each.

There are no known mining claims located within the river corridor and no federal mineral leases are in effect.

Lane County has a variety of zones along this river corridor. Most BLM and private timber company lands fall within zones F-1 and F-2. Zone F-1 is designed to conserve forestland for forest use. Zone F-2 is designed to conserve forestland for forest uses, while recognizing that these lands are impacted by nonforest uses. Residential construction may be allowed when the residence is deemed necessary to the forest management of the lot. The minimum lot size is 20 acres except for preexisting legal lots, which may be smaller. Private individual ownerships fall within zones RR5, RR10, and CR. Zone RR5 is rural residential with a five-acre minimum lot, RR10 is rural residential with a ten-acre minimum lot. Zone CR is commercial rural, which is designed in part to provide goods, services and facilities to residents and tourists. See Lane County zoning codes (16.210-16.231) for further details.

### Reasonable Foreseeable Uses of the Land and Water Which Would Be Affected By Designation

Appendix 2-G of this Draft RMP/EIS provides a general description of land uses and management practices appropriate for Wild, Scenic, and Recreational river areas.

### Uses That Would Be Enhanced By Designation (Including Outstandingly Remarkable Values)

The basic objective of designation is to maintain the river's existing condition, and protect the identified Outstandingly Remarkable Values. Designation would lead to VRM II management of BLM administered land within the one-half mile river corridor, enhancing its scenic value and thus, indirectly, its recreational, fish, and wildlife uses. In other words, designation would ensure the continued protection of the identified Outstandingly Remarkable Values from any negative effects, and the free flowing character of this river segment. See Appendix 2-G.

### Uses That Would Be Foreclosed By Designation

No development of hydroelectric power facilities would be permitted within the river segment. There is no Federal Energy Regulatory Commission (FERC) application, irrigation, or other proposals for dams or diversions on file within this river segment. Therefore, there is no conflict regarding this issue. The theoretical hydroelectric power potential for this segment of McKenzie River, Segment A, is estimated to be:

$$P = \frac{c}{P} \frac{Q}{(4,036)} \frac{H}{(210)} \frac{e}{(1.0)} = 71,865 \text{ kilowatts}$$

BLM could not sell, lease or dispose of its lands (see Appendix 2-G).

### Uses That Would Be Curtailed By Designation

Designation would lead to VRM Class II management of BLM administered lands in the one-half mile corridor, constraining timber management on those lands and diminishing the rate of timber harvest from them. Designation would lead to application of a higher water quality standard, requiring more careful timing of BLM timber sales in the upstream watershed, which could also diminish the rate of timber harvest. New mining claims would be allowed but under strict regulations. There may be Federal efforts to acquire scenic easements or scenic tracts along the river, which may limit development of these tracts after acquisition. There may be restrictions on new land uses, developments, and activities again to prevent any negative effects on the identified Outstandingly Remarkable Values (see Appendix 2-G).

### How the River Segment (and Outstandingly Remarkable Values) Would Be Managed If It Were Not Designated

If the river were not added to the National Wild and Scenic Rivers System, BLM would still provide interim management, and continue to manage the public land to protect the river's Outstandingly Remarkable Values, including protection of riparian values, fisheries, wildlife habitat, and scenic resources. Public land within the proposed McKenzie SRMA boundary would continue to be managed to enhance the area's recreational opportunities and to mitigate inappropriate uses. Scenic quality would be protected through the application of VRM Class II standards, which would ensure that timber management activities would not be noticeable to river users. Public land outside the river's watershed would be managed under VRM Class IV standards.

The major difference in BLM's management would involve land and easement actions. BLM would be able to dispose of public land within the one-half mile river study corridor, if disposal were consistent with the Preferred Alternative, and would probably not seek scenic easements from private landowners along the river. BLM would, however, continue to seek acquisition of certain undeveloped private lands through exchange or other methods from willing owners.

### Administering Agency

If the McKenzie River, Segment A, were added to the National Wild and Scenic Rivers System, the BLM would continue to manage the land and resources it currently administers, unless Congress designated another agency.

### Costs Shared

It is not anticipated that any costs would be shared among other government agencies for this river segment.

### Costs to the United States

The estimated cost of preparing a required river management plan for this stream segment would be \$118,000. Annual river management and protection costs for identified Outstandingly Remarkable Values are estimated to be between \$6,000 and 24,000.

### Finding and Rationale

#### Finding

The 11-mile segment of the McKenzie River from the Forest Service boundary to Goodpasture Bridge is found suitable for Federal designation as part of the Wild and Scenic Rivers System. A potential classification of recreational is recommended.

#### Rationale, Characteristics Which Do Make the Area a Worthy Addition to the System

With the block of Federal ownership within the one-half mile corridor of this segment, and the relative high ranking of fish, recreation, and scenic as well as wildlife values (see Table 2-WSR-1 of the Introduction), this area would make a meaningful addition to the National System. The recreation value surpasses similar resource values of many rivers within SCORP Region 8. The fisheries Outstandingly Remarkable Value is one of the most remarkable in the State. The scenic values are some of the best to preserve. The wildlife Outstandingly Remarkable Value, while somewhat common in the region, enhances the other values in the study segment. The greatest positive effect from designation would be the long-term protection of the identified Outstandingly Remarkable Values and free-flowing character of this river segment.

## Sharps Creek

### Summary

The 11-mile segment of Sharps Creek from Clark Creek to the confluence with Row River is found not suitable for designation as a recreational river under the National Wild and Scenic Rivers System.

### Background

#### Description of the River

The Eugene District identified as eligible an 11-mile river segment from Clark Creek to the confluence with Row River (see Map 2-WSR-6 at the end of Appendix 2-I).

Sharps Creek is a tributary of Row River and lies within the Cascade Range. The segment is east of Cottage Grove and directly south of the community of Culp Creek. The river segment generally flows in a north-westerly direction and averages 20 to 50 feet in width. A paved County road, number 2460, parallels the river for the entire segment, bridging it in four places, providing public access to the river. There are several other BLM and private roads branching off from this mainline, which lie within the river corridor. Primary uses of these roads are for recreational and logging activities, and access by the public. The County road is visible, and traffic can be heard from the river.

A BLM campground, Sharps Creek Recreation Site, is within the segment. Fishing, camping, and swimming are the main recreational opportunities at this site. Placer mining claims occupy most of the public land parcels along this segment. Recreational mining for gold occurs only near and within the Sharps Creek Recreation Site.

Parts of the one-half mile river corridor (one-quarter mile each side of the river) have been clear cut while other areas remain with Douglas-fir forests and riparian hardwoods. All BLM timber harvests have left riparian buffer areas along the segment. See Land Use section for further discussion.

Sharps Creek has good water quality and is rated "B" (moderate nonpoint source pollution problems) by the Statewide water assessment report. Water quality for recreational use of rivers is not required to continually meet or exceed Federally approved State standards. Therefore, current water quality does not affect its qualifications for inclusion in the National Wild and Scenic Rivers System.

### Eligibility Determination

Sharps Creek is free-flowing within the 11-mile study segment. There is one Outstandingly Remarkable Value - recreation. Recreational activities include fishing, camping, swimming, and recreational mining. Currently the area has many active mining sites. The District receives many requests from the public each year for recreational mining in this area.

### Classification Determination

The river's highest potential classification is recreational, as shown in the table below. The river is free of any impoundments, diversions, or stream bank modifications. Classification criteria can be found in Table 3-WSR-3 of Chapter 3.

### Sharps Creek Potential Classification Summary

Activity	Wild	Scenic	Recreational
Water resources development	M	M	M
Shoreline development	DNM	M	M
Water quality	DNM	M	M
Accessibility	DNM	DNM	M

M = Meets criteria

DNM = Does not meet criteria

### Suitability Factors

#### Ranking of Outstandingly Remarkable Values

This river segment did not make the Outstandingly Remarkable Values list shown in Table 2-WSR-1 of the Introduction. Compared to other rivers within SCORP Region 8, this river ranked relatively low for recreational values.

#### Current Land Ownership

The Eugene District administers 4.4 stream frontage miles (both sides included), which is 40 percent of the river segment, but 36 percent of the land base within the corridor, as shown below. These acreages are based upon GIS interim boundaries, pending finalization through the development of a river management plan. Boundaries and acreages, as identified, are subject to revision through that planning process and may change.

## Sharps Creek Segment Ownership and Status Within the River Corridor

Ownership	Acres	Percent	River Miles	Percent
BLM Public Domain	—	—		
O&C lands	1,200	36	4.4 (BLM)	40
Forest Service	169	5		
Bohemia Inc.	76	2		
Weyerhaeuser Co.	1,674	50		
Private Individuals (2)	241	7	6.7 (All Private)	60
Total	3,360	100	11.1	100

### Current Land Use

Land use within the one-half mile river corridor is varied. Harvesting timber stands on private lands continues with five percent clear cut during the last five years (1986-1991). Private land clear cuts have varied in size, ranging from five to forty acres. Harvest units range from one to sixty-six acres; some partial cut and some clear cut. On public lands, nine timber sale harvest units, or parts of units, were harvested from 1981-1991, totalling 97 acres within the corridor. Livestock grazing and agricultural activities occur within the river corridor on the intermingled private lands. There is one private residence within the river corridor. The river corridor is within the BLM's proposed Sharps Creek Special Recreation Management Area (SRMA). The SRMA has potential for hiking trails, expanding and improving Sharps Creek Recreation Site and developing other day use areas. As of November 19, 1991, there were 27 mining claims located within the river corridor and no Federal mineral leases in effect.

Lane County has zoned lands within the river corridor as F-1, F-2, and M-3. The F-1 zone is designed to conserve forestland for forest use. Residential construction is not allowed except for replacement of existing residences. Zone F-1 has 2,987 acres of BLM, Weyerhaeuser, Forest Service, and individual private lands. Zone F-2, which is designed to conserve forestlands for forest uses, while recognizing that these lands are impacted by nonforest uses, has 343 acres of Weyerhaeuser, Bohemia and BLM lands. Zone M-3, which is designed for industrial use, has 30 acres of Bohemia land. See Lane County zoning codes (16.210-16.231) for further details.

### Reasonable Foreseeable Uses of the Land and Water Which Would Be Affected By Designation

Appendix 2-G of this Draft RMP/EIS provides a general description of land uses and management practices appropriate for Wild, Scenic, and Recreational river areas.

#### Uses That Would Be Enhanced By Designation (Including Outstandingly Remarkable Values)

The basic objective of designation is to maintain the river's existing condition and protect the identified Outstandingly Remarkable Value. With designation, BLM management would be similar in most respects to management without designation. Designation would ensure the continued availability of recreation opportunities occurring in this river segment, including swimming, camping, hunting and fishing, and would help promote recreational mining. Other recreation uses occurring in the area, such as driving for pleasure, picnicking, wildlife observation, and nature photography, would also continue to be available. Designation would also ensure that the river segment would remain free flowing (see Appendix 2-G).

#### Uses That Would Be Foreclosed By Designation

Designation would foreclose any uses of the area for dams or diversions. Currently, there is no Federal Energy Regulatory Commission (FERC) application, irrigation, or other proposals for dams or diversions on file for this river segment. Therefore, there is no conflict regarding this issue. The theoretical hydroelectric power potential for this river is estimated to be:

$$P = (0.08475) (128) (560) (1.0) = 6,078 \text{ kilowatts}$$

BLM could not sell or otherwise dispose of public lands (see Appendix 2-G).

#### Uses That Would Be Curtailed By Designation

Designation would lead to application of a higher water quality standard, requiring more careful timing of BLM timber sales in the upstream watershed, which could also diminish the rate of timber harvest. New mining claims would be allowed but under certain regulations (see Appendix 2-G).

#### How the River Segment (and Outstandingly Remarkable Values) Would Be Managed if It Were Not Designated

If the river were not added to the National Wild and Scenic Rivers System, the BLM would manage land under its jurisdiction for protection of the riparian values, and for continuation of existing levels of use

within the corridor. Basically, river management would be similar to that, if it were not designated. The Outstandingly Remarkable Value of recreation would still be enhanced by the proposed Sharps Creek SRMA, if approved by the RMP. Lands outside the riparian zone would be subject to timber harvest, and would be managed under VRM Class II (BLM lands within the SRMA boundary). Increased public use, due to its higher visibility, could require more management of recreational use due to possible crowding, littering, vandalism, and environmental damage. The Outstandingly Remarkable Value of recreation would not be diminished or lost under the Preferred Alternative management. BLM would be able to dispose of public land within the half-mile river study corridor if disposal were consistent with the Preferred Alternative.

#### **Administering Agency**

If Sharps Creek were added to the National Wild and Scenic Rivers System, the BLM would continue to manage the land and resources unless Congress designates some other agency.

#### **Costs Shared**

It is not anticipated that any costs would be shared among other government agencies for this river segment.

#### **Cost to the United States**

The estimated cost of preparing a required river management plan for this stream segment would be \$70,800. Annual river management and protection costs for the identified Outstandingly Remarkable Value are estimated to be \$6,000.

### **Finding and Rationale**

#### **Finding**

The 11-mile segment of Sharps Creek from Clarks Creek to the confluence with Row River is found not suitable for Federal designation under the Wild and Scenic Rivers System.

#### **Rationale, Characteristics Which Do Not Make the Area a Worthy Addition to the System**

The low comparative rating of the river's one Outstandingly Remarkable Value makes it a marginal potential addition to the National Wild and Scenic Rivers System. The Outstandingly Remarkable Value of recreation (except for recreational mining) is rather common in the region. BLM's intent in the Preferred Alternative of this Draft RMP/EIS is to protect this Outstandingly Remarkable Value on BLM administered land. Designation is not needed to protect this value.

The Outstandingly Remarkable Value is not threatened by dam construction or irrigation development, as there are no current or foreseeable proposals for the river corridor. On private land not subdivided or eligible for subdivision, the requirements of the Oregon Forest Practices Act should protect the Outstandingly Remarkable Value from impacts associated with timber management.

Considering all the factors, BLM believes the river segment's Outstandingly Remarkable Value can best be protected by a combination of the actions set forth in the Preferred Alternative of this Draft RMP/EIS, and by management of private land consistent with County zoning and State law.

### **Siuslaw River, Segment B**

#### **Summary**

The 46-mile segment of Siuslaw River, Segment B, from the confluence with Smith Creek to the confluence with Esmond Creek is found suitable for designation under the National Wild and Scenic Rivers System. The highest potential classification is recreational.

#### **Background**

#### **Description of the River**

The Eugene District identified as eligible a 46 river mile segment between the confluences of Smith Creek and Esmond Creek (see two-part Map 2-WSR-7a and 2-WSR-7b at the end of Appendix 2-H). The Siuslaw River, Segment B, originates within the Coast Range and passes through two BLM Resource Areas, Coast Range and South Valley. The Siuslaw River itself is a major coastal river and eventually flows into the Pacific Ocean at Florence. The identified river segment averages between 20 and 70 feet in width. Clay Creek Recreation Site, an existing BLM campground, also borders the riverbank. Within the one-half mile wide river study corridor, there are two proposed potential trails, Siuslaw River Trail and Haskins Trail, and five proposed potential recreational sites: Doe Creek, Oxbow, Siuslaw Bend, Frying Pan, and Slog. The river segment lies within the proposed BLM Siuslaw River Special Recreation Management Area (SRMA). There is also a County park, Siuslaw Falls, within the segment.

Much of the corridor has been logged in the past, and there are some recent cuts visible from the river. The riparian vegetation is variable but consists mostly of larger alders and bigleaf maples intermixed with some larger conifers.

BLM Road Number 18-8-34 (Siuslaw Access Road), a paved route, parallels the segment for its entire length, providing public access to the river. There are other BLM and private roads branching off from this mainline that lie within the half-mile boundary. This segment is bridged at 12 locations. A more detailed discussion of roads and bridges can be found in the Classification Determination section.

The Siuslaw River, Segment B, has good water quality and is rated "B" (moderate nonpoint source pollution problems) by the Statewide water assessment report. Limited monitoring has shown high summer water temperatures to be a concern and State water quality standards (Chapter 340) may not be met. Some turbidity and sediment problems have been noted. Many downstream water rights exist on the Siuslaw River for domestic and irrigation use. Summer flows are usually adequate to meet these allocations. The primary beneficial use of the Siuslaw River waters is salmonoid fish passage.

#### Eligibility

Siuslaw River, Segment B, is free-flowing within the 46-mile river segment. There are two identified Outstandingly Remarkable Values: fish and wildlife. The Siuslaw has remnant runs of summer steelhead and chinook, as well as coho, sea run and resident cut-throat trout and nongame species, the most abundant being sculpins. Out-of-State tourists visit the campgrounds, and fish the river. Canoeing is an activity that can be enjoyed during periods of safe and adequate flows. The spotted owl, an endangered species, also inhabits the area.

#### Classification

The river's highest potential classification is recreational, as shown in the table below. The river is free of any impoundments, diversions, or stream bank modifications. Water quality and quantity is relatively good, and supports the river corridor's Outstandingly Remarkable Values.

The river is accessible by the Siuslaw Access Road (19-7-25) and County road 3490. These roads parallel the river for its entire length, and have numerous side roads branching from them within the one-half mile

boundary. They are visible some of the time from the river, and traffic can be heard from the river from logging activity and recreationists. The side roads are usually not heavily traveled and are also used for recreational and logging activities. Classification criteria can be found in Table-3-WSR-3 of Chapter 3.

### Siuslaw River, Segment B, Potential Classification Summary

Activity	Wild	Scenic	Recreational
Water resources development	M	M	M
Shoreline development	DNM	M	M
Water quality	DNM	M	M
Accessibility	DNM	DNM	M

M = Meets criteria

DNM = Does not meet criteria

### Suitability Factors

#### Ranking of Outstandingly Remarkable Values

This river segment was not listed on the Outstandingly Remarkable Value rating Table 2-WSR-1 of the Introduction, yet it has outstanding values recognized by the Nationwide Rivers Inventory; American Rivers, Inc.; Oregon State Parks and Recreation 1987 Report; and Oregon's 1988 SCORP report. The Eugene District concurs that the values of fish and wildlife are outstanding, and do make the area worthy of inclusion in the National System.

#### Current Land Ownership

The Eugene District administers 15.6 stream frontage miles (both sides included), which are 34 percent of the river segment, and 36 percent of the land base, as shown below. These acreages are based upon GIS interim boundaries, pending finalization through the development of a river management plan. Boundaries and acreages, as identified, are subject to revision through that planning process and may change.



## Siuslaw River, Segment B, Ownership and Status Within the River Corridor

Ownership	Acres	Percent	River Miles	Percent
BLM Public Domain	—	—		
O&C lands	4,390	36	15.6 (BLM)	34
International Paper Co.	5,806	48		
Weyerhaeuser Co.	1,763	15		
Lane County	55	<1		
Private individuals (7)	154	1		
Warham	114	<1	30.7 (All Private)	66
<b>Total</b>	<b>12,281</b>	<b>100</b>	<b>46.7</b>	<b>100</b>

### Current Land Use

Private land use within the one-half mile river corridor is primarily timber related. On private lands within the last five years (1987-1991), approximately 305 acres have been clear cut. The clear cut units have ranged in size from 5 to 70 acres. Timber harvesting on Federal lands within this corridor has been limited. Within the last ten years (1981-1991), seven timber sale units ranging from 8 to 56 acres have been sold. Livestock grazing and agricultural activities occur within this river corridor on intermingled private lands.

There are seven private individual ownerships within the river corridor. Sixty-three acres of the individual ownerships are under the Lane County zoning code of F-2, which is designed to conserve forestland for forest uses, and residential construction is not allowed except for replacement of existing residences. The rest of the corridor acres fall within Zone F-1, which is designed to conserve forestland for forest use. See Lane County zoning codes (16.210-16.231) for further details.

There are no known mining claims located within the river corridor, and no Federal mineral leases are in effect.

### Reasonable Foreseeable Uses of the Land and Water Which Would be Affected by Designation

Appendix 2-G of this Draft RMP/EIS provides a general description of land uses and management practices appropriate for Wild, Scenic, and Recreational river areas.

### Uses That Would Be Enhanced By Designation (Including Outstandingly Remarkable Values)

The basic objective of wild and scenic river designation is to maintain the river's existing condition and protect the identified Outstandingly Remarkable Values. With designation, BLM's management would be similar in most respects to management without designation, but BLM's management presence would enhance the river segment's Outstandingly Remarkable Values of fish and wildlife. This segment is within the proposed Siuslaw River Special Recreation Management Area (SRMA). Designation of the river segment would coincide with the intensity of recreational management already proposed for the area. Planning for trails, boat ramps, and other facilities would compliment designation, and would ensure the continued availability of recreation opportunities occurring such as swimming, fishing, drift boating, and canoeing. Other recreation uses in the area such as driving for pleasure, picnicking, hiking, wildlife observation, nature photography, and camping would also continue to be available. A Back Country Byway is also proposed along this segment. Designation would enhance wildlife by helping to preserve its habitat. Spotted owl habitat and nesting areas would continue to be protected under the Endangered Species Act further enhanced by the National System protection. Management of riparian areas would provide appropriate protection of fisheries habitat. Increased public use due to the rivers higher visibility could require more management of recreational use, thus enhancing recreation (see Appendix 2-G).

### Uses That Would Be Foreclosed By Designation

Designation would foreclose any uses of the area for dams or diversions. Currently, there is no Federal Energy Regulatory Commission (FERC) application, irrigation, or other proposal for dams or diversions on file for this river segment. Therefore, there is no conflict regarding this issue. The potential hydroelectric power available within this segment is:

$$P = \frac{c}{8.8} \frac{Q}{10.8} \frac{H}{3.3} \frac{e}{10.8} = (0.08475) (473) (273) (1.0) = 10,949 \text{ kilowatts}$$

BLM could not sell or otherwise dispose of public lands (see Appendix 2-G).

### Uses That Would Be Curtailed By Designation

Designation would lead to application of a higher water quality standard, requiring more careful timing of BLM timber sales in the upstream watershed, which could also diminish the rate of timber harvest. New mining claims would be allowed but under strict regulations (see Appendix 2-G).

### How the River Segment (and Outstandingly Remarkable Values) Would Be Managed If Not Designated

BLM would continue to manage and protect the Outstandingly Remarkable Values and riparian values along the river area. The Outstandingly Remarkable Values of wildlife and fish would be protected by such management and would not be diminished or lost. Public lands outside the riparian zone would be subject to timber harvest, excluding protective wildlife areas, and would be managed under VRM Class IV standards. BLM lands within a viewshed area of an existing or proposed recreational facility would be managed by Class II standards. BLM would be able to dispose of public land within the one-half mile river study corridor, if disposal were consistent with the Preferred Alternative. BLM would, however, continue to seek acquisition of certain undeveloped private lands through exchange or other methods from willing owners.

#### Administering Agency

If the Siuslaw River, Segment B, were added to the National Wild and Scenic Rivers System, the BLM would manage the land and resources, unless Congress designates another agency.

#### Shared Costs

No State or local agency has come forward, as of this writing, and stated they would be willing to share in the cost of administering this river segment should it become part of the system.

#### Cost of Administration

The basic objective of wild and scenic river designation is to maintain the river's existing condition. The estimated cost of preparing a required river management plan for this stream segment would be \$61,000. Annual river management and protection costs for Outstandingly Remarkable Values are estimated to be \$3,000.

### Finding and Rationale

#### Finding

The 46-mile segment of the Siuslaw River from Smith Creek to Esmond Creek is found suitable for Federal designation as a recreational river under the Wild and Scenic Rivers System.

#### Rationale, Characteristics Which Do Make the Area a Worthy Addition to the System

The Outstandingly Remarkable Values of fish and wildlife, along with the opportunities of recreation, make this segment a worthy addition to the National Wild and Scenic Rivers System. The recognition of this river by various organizations and agencies offers strong support to this finding. The Eugene District currently manages 36 percent of the land base within the corridor and 34 percent along the river itself. Both historical and anticipated uses of private land would not materially affect BLM's ability to manage the river as a component of the National System. The management direction for the river area prescribed under the Preferred Alternative of this plan is consistent with management of the river as a component of the Wild and Scenic Rivers System.

## Siuslaw River, Segment C

### Summary

The 13-mile segment of Siuslaw River, Segment C, from the confluence with Esmond Creek to the confluence with Wildcat Creek, is found suitable for designation under the National Wild and Scenic Rivers System. The highest potential classification is recreational.

## Background

### Description of the River

The Eugene District identified as eligible a 13 river mile segment between the confluences of Esmond Creek and Wildcat Creek (see Map 2-WSR-8 at the end of Appendix 2-H). The Siuslaw River, Segment C, originates within the Coast Range. The Siuslaw River itself is a major coastal river and eventually flows into the Pacific Ocean at Florence. The identified river segment averages 30 to 70 feet in width. This segment has one BLM boat landing and several unimproved private landings along its banks. Whittaker Creek Recreation Site, an existing BLM campground, also borders the riverbank. Within the one-half mile river corridor, there is one established trail, Whittaker Creek Ridge Trail (starting from the BLM campsite), and one proposed potential trail, Big Canyon Trail. The river segment also lies within the proposed Siuslaw River Special Recreation Management Area (SRMA).

Much of the corridor has been logged in the past, and there are some recent cuts visible from the river. The riparian vegetation is variable but consists mostly of larger alders and bigleaf maples intermixed with some larger conifers.

BLM Road Number 18-8-34 (Siuslaw Access Road), a paved route, parallels the segment for its entire length, providing public access to the river. There are other BLM and private roads branching off from this mainline that lie within the half-mile boundary. This segment is bridged at the confluences of Whittaker and Wildcat Creeks. A more detailed discussion of roads and bridges can be found in the Classification Determination section.

The Siuslaw River, Segment C, has good water quality and is rated "B" (moderate nonpoint source pollution problems) by the Statewide water assessment report. Limited monitoring has shown high summer water temperatures to be a concern and State water quality standards (Chapter 340) may not be met. Some turbidity and sediment problems have been noted. Many downstream water rights exist on the Siuslaw River for domestic and irrigation use. Summer flows are usually adequate to meet these allocations. The primary beneficial use of the Siuslaw River waters is salmonid fish passage.

#### Eligibility

Siuslaw River, Segment C, is free-flowing within the 13-mile river segment. There are two identified Outstandingly Remarkable Values: recreation and wildlife. Recreational activities include fishing, watchable wildlife, nature photography, drift boating, and some rafting and canoeing. Fishing for coho, chinook, steelhead and cutthroat trout is very popular between Whittaker and Wildcat Creeks. Out-of-State tourists visit the campgrounds and fish the river. Canoeing is an activity that can be enjoyed during periods of safe and adequate flows. In 1991, a marbled murrelet nest site was confirmed along this segment. The marbled murrelet, at this writing, is a proposed threatened species. This segment is also identified as a recovery site for the bald eagle. The spotted owl also inhabits the area.

#### Classification

The river's highest potential classification is recreational, as shown below. The river is free of any impoundments, diversions, or stream bank modifications. Water quality and quantity is relatively good, and supports the river corridor's Outstandingly Remarkable Values.

The river is accessible by the Siuslaw Access Road (18-8-34). This road parallels the river for its entire length, and has numerous side roads branching from it within the one-half mile boundary. These side roads are usually not heavily traveled, and are used for

recreational and logging activities. The road is visible some of the time from the river, and traffic can be heard from the river. Classification criteria can be found in Table 3-WSR-3 of chapter 3.

### Siuslaw River, Segment C, Potential Classification Summary

Activity	Wild	Scenic	Recreational
Water resources development	M	M	M
Shoreline development	DNM	M	M
Water quality	DNM	M	M
Accessibility	DNM	DNM	M

M = Meets criteria

DNM = Does not meet criteria

### Suitability Factors

#### Ranking of Outstandingly Remarkable Values

This river segment was not listed on the Outstandingly Remarkable Value rating Table 2-WSR-1 of the Introduction, yet it has outstanding values recognized by the Nationwide Rivers Inventory; American Rivers, Inc.; Oregon State Parks and Recreation 1987 Report; and Oregon's 1988 SCORP report. The Eugene District concurs that values of recreation, fish and wildlife are outstanding, and do make the area worthy of inclusion in the National System.

#### Current Land Ownership

The Eugene BLM District administers 3.5 stream frontage miles (both sides included), which are 26 percent of the river segment and 33 percent of the land base within the corridor, as shown below. These acreages are based upon GIS interim boundaries, pending finalization through the development of a river management plan. Boundaries and acreages, as identified, are subject to revision through that planning process and may change.

## Siuslaw River, Segment C, Segment Ownership and Status Within the River Corridor

Ownership	Acres	Percent	River Miles	Percent
BLM Public Domain	62	2		
O&C lands	1,089	31	3.5 (BLM)	26
International Paper Co.	2,218	63		
Private individual	160	4	9.9 (All Private)	74
<b>Total</b>	<b>3,665</b>	<b>100</b>	<b>13.4</b>	<b>100</b>

### Current Land Use

Private Land use within the one-half mile river corridor is primarily timber related. On private land, within the last five years (1987-1991), approximately 265 acres have been clear cut. The clear cut units have ranged in size from 35 to 80 acres. Timber harvesting on Federal lands within this corridor has been limited. Within the last ten years (1981-1991), one timber sale unit of 45 acres has been sold. The lower half of this segment is within a spotted owl designation of HCA 1 and 3, which has curtailed Federal timber sales. Livestock grazing and agricultural activities do not occur within this river segment.

There is one private individual ownership with no residential developments within the river corridor. Under the Lane County zoning code of F-1 for this segment, which is designed to conserve forestland for forest uses, residential construction is not allowed except for replacement of existing residences.

There are no known mining claims located within the river corridor and no Federal mineral leases are in effect.

### Reasonable Foreseeable Uses of the Land and Water Which Would Be Affected By Designation

Appendix 2-G of this Draft RMP/EIS provides a general description of land uses and management practices appropriate for Wild, Scenic, and Recreational river areas.

### Uses That Would Be Enhanced By Designation (Including Outstandingly Remarkable Values)

The basic objectives of wild and scenic river designation is to maintain the river's existing condition, and protect the identified Outstandingly Remarkable Values. With designation, BLM's management would be similar in most respects to management without

designation, but BLM's management presence would enhance the river segment's Outstandingly Remarkable Values of wildlife and recreation. Since this segment is within the proposed Siuslaw River Special Recreation Management Area (SRMA), designation of the river segment would coincide with the intensity of recreational management already proposed for the area. Planning for trails, boat ramps, and other facilities would complement designation, and would ensure the continued availability of recreation opportunities occurring in this river segment, including swimming, fishing, drift boating, and canoeing. Other recreation uses occurring in the area such as driving for pleasure, picnicking, hiking, wildlife observation, nature photography, and camping would also continue to be available. A Back Country Byway is also proposed along this segment. Designation would enhance wildlife populations by helping to preserve existing habitat. Bald Eagle and spotted owl habitat and nesting areas would continue to be protected under the Endangered Species Act and further enhanced by the National System (see Appendix 2-G).

### Uses That Would Be Foreclosed By Designation

Designation would foreclose any uses of the area for dams or diversions. Currently, there is no Federal Energy Regulatory Commission (FERC) application, irrigation, or other proposal for dams or diversions on file for this river segment. Therefore, there is no conflict regarding this issue. The potential hydroelectric power available within this segment is:

$$P = \frac{c}{3.6} Q H e$$

$$P = (0.08475) (922) (50) (1.0) = 3909 \text{ kilowatts}$$

BLM could not sell or otherwise dispose of public lands (see Appendix 2-G).

### Uses That Would Be Curtailed By Designation

Designation would lead to application of a higher water quality standard, requiring more careful timing of BLM timber sales in the upstream watershed, which could also diminish the rate of timber harvest (see Appendix 2-G).

### How the River Segment (and Outstandingly Remarkable Values) Would Be Managed if It Were Not Designated

If the river were not added to the National Wild and Scenic Rivers System, BLM would continue to manage and protect land under its jurisdiction for the riparian and Outstandingly Remarkable Value values along the river area. The Outstandingly Remarkable Values of wildlife and recreation would not be diminished or lost by such management. Public lands outside the riparian

zone would be subject to timber harvest, excluding protective wildlife areas, and would be managed under VRM Class IV standards. BLM lands within a viewshed area of an existing or proposed recreational facility would be managed under Class II standards. BLM would be able to dispose of public land within the one-half mile study corridor, if disposal were consistent with the Preferred Alternative. BLM would also continue to be able to pursue acquisition of certain undeveloped private lands from willing owners through exchange or other methods.

#### **Administering Agency**

If the Siuslaw River, Segment C, were added to the National Wild and Scenic Rivers System, the BLM would manage the land and resources, unless Congress designates another agency.

#### **Shared Costs**

It is not anticipated that any costs would be shared among other government agencies for this river segment.

#### **Cost of Administration**

The basic objective of Wild and Scenic River designation is to maintain the river's existing condition. The estimated cost of preparing a required river management plan for this stream segment would be \$57,400. Annual river management and protection costs for identified Outstandingly Remarkable Values are estimated to be \$6,000.

### **Finding and Rationale**

#### **Finding**

The 13- mile segment of the Siuslaw River from Esmond Creek to the confluence with Wildcat Creek is found suitable for Federal designation under the Wild and Scenic Rivers System. The highest classification would be recreational.

#### **Rational, Characteristics Which do Make the Area a Worthy Addition to the System**

The Outstandingly Remarkable Values of recreation and wildlife make this segment a worthy addition to the Rivers System. The recognition of this river by various organizations and agencies offers strong support to this finding. The Eugene District currently manages 33 percent of the land base within the corridor and 26 percent along the river itself. The homogeneity of both Federal and private land uses along the river (primarily timber production), and existing protection of the

riparian area provided under State law, combine to make this river segment readily manageable as a recreational component of the National Wild and Scenic River System.

## **Whittaker Creek**

### **Summary**

The six and one half mile segment of Whittaker Creek from its headwaters in T. 19 S., R. 9 W., Sec. 13 to the confluence with Siuslaw River is found not suitable for designation under the National Wild and Scenic Rivers System.

## **Background**

### **Description of the River**

The Eugene District identified as eligible a six and a half mile segment from its headwaters in T. 19 S., R. 9 W., Sec. 13, to the confluence with the Siuslaw River in T. 18 S., R. 9 W., Sec. 21 (see Map 2-WSR-9 at the end of Appendix 2-H).

Whittaker Creek is a tributary of the Siuslaw River and lies within the Siuslaw River Basin. Whittaker Creek is located within the Coast Range south of Highway 126 and between the communities of Mapleton and Walton. The creek segment generally flows in a northeasterly direction and averages between 10-40 feet in width.

BLM Road Number 18-8-21 parallels the river for approximately three miles and bridges the segment providing public access to the river. Public access to the upper portion of this segment is limited due to a gated private road. BLM Road Number 19-8-28 also bridges the segment about one mile from the Siuslaw River. BLM Road Number 19-8-7.1 also crosses the headwaters.

Parts of the one-half mile wide river study corridor (one-quarter mile each side of the river) have been clear cut while other parts have mature stands of Douglas-fir, red alders, and maples. (See the Land Use section for further timber discussion.)

Whittaker Creek Recreation Site, a BLM campground, attracts regional users (users from more than 25 miles away) as well as local residents. Fishing is a main attraction. The campground has a swimming area, horseshoe area and 29 campsites to choose from. The campground serves as a base camp for hunters in the fall and is a peaceful spot for any camper. Recently a

one and a half mile trail, Whittaker Creek Ridge Trail, starting within the campground, was constructed and is now in use. Another trail, Whittaker Creek Falls Trail, has been proposed within the river segment.

Whittaker Creek has good water quality that is sufficient to support the river corridor's Outstandingly Remarkable Value. The water quality has been rated "B" (moderate nonpoint source pollution problems) by the Statewide water assessment report. Limited monitoring has not shown any serious water quality problems and Oregon Chapter 340 standards are being met. The primary beneficial use of the Whittaker Creek waters is anadromous fish rearing.

#### Eligibility Determination

Whittaker Creek is free-flowing within the six and a half mile study segment. There is one identified Outstandingly Remarkable Value - fish. The river has a very large late run of chinook. BLM studies from 1984 through 1989 have shown chinook numbers fluctuating between 50 and 153 fish per river mile. Whittaker Creek's large flow, low gradient, and spawning gravel make the segment excellent chinook habitat. The segment also supports populations of coho, steelhead, cutthroat trout, sculpins and dace. Above the falls, approximately four miles from the mouth, a unique population of cutthroat trout has been found. Unique populations of cutthroat trout are currently known to occur in only three river segments within the District.

#### Classification Determination

The river's highest potential classification is recreational as shown below. The river is free of any impoundments, diversions, or stream bank modifications. The river is easily accessible in its lower regions by BLM Road Number 18-8-21 (Whittaker Creek Road). This road parallels the river for approximately three miles and eventually dead-ends. Whittaker Creek Road is heavily used at times for logging activities as the Roman Nose Road Number 18-8-28.1 connects to it. From the river, Whittaker Creek Road is visible and traffic can be heard. Classification criteria can be found in Table 3-WSR-3 of Chapter 3.

### Whittaker Creek Potential Classification Summary

Activity	Wild	Scenic	Recreational
Water resources development	M	M	M
Shoreline development	DNM	M	M
Water quality	DNM	M	M
Accessibility	DNM	DNM	M

M = Meets criteria

DNM = Does not meet criteria

### Suitability Factors

#### Ranking of Outstandingly Remarkable Values

This river segment did not make the Outstandingly Remarkable Values list shown in Table 2-WSR-1 of the Introduction. Compared to other rivers within SCORP Region 8, this river ranked relatively low for fish values.

#### Current Land Ownership

The Eugene BLM District administers 2.4 stream frontage miles (both sides included), which is 37 percent of the river segment, but 43 percent of the land base as shown below. These acreages are based upon GIS interim boundaries, pending finalization through the development of a river management plan. Boundaries and acreages, as identified, are subject to revision through that planning process and may change.

### Whittaker Creek Segment Ownership and Status Within the River Corridor

Ownership	Acres	Percent River Miles	Percent
BLM Public Domain	208	10	
O&C lands	650	33	2.4 (BLM) 37
International Paper Co.	404	20	
John Hancock Mutual Life Insurance Co.	718	37	4.1 (All Private) 63
<b>Total</b>	<b>1,980</b>	<b>100</b>	<b>6.5</b> 100

**Current Land Use**

Land use within the one-half mile river corridor is timber orientated. Timber harvest activities on private lands within the last five years, 1987-1991, have clear cut 180 acres. The individual units ranged in size from 20 to 160 acres. Timber activities on public lands within this corridor have been limited. Within the last ten years, 1981-1991, three timber sale units have been sold ranging in size from 19 to 36 acres, totaling 81 acres. There are no private residential developments within the river corridor.

Lane County has zoned the river corridor as F-1, which is designed to conserve forestland for forest use. See Lane County zoning codes (16.210-16.231) for further details.

There are no known mining claims located within the river corridor and no Federal mineral leases are in effect.

**Reasonable Foreseeable Uses of the Land and Water Which Would be Affected By Designation**

Appendix 2-G of this Draft RMP/EIS provides a general description of land uses and management practices appropriate for Wild, Scenic, and Recreational river areas.

**Uses That Would Be Enhanced By Designation (Including Outstandingly Remarkable Values)**

The basic objective of wild and scenic river designation is to maintain the river's existing condition and protect the identified Outstandingly Remarkable Value. With designation, BLM management would be similar in most respects to management without designation, but BLM's management presence would enhance the river segment's Outstandingly Remarkable Value, in this case, fish. Designation would ensure the continued management of riparian areas providing appropriate protection of the fisheries habitat. Increased public use due to its higher visibility could require more management of recreational use, thus enhancing recreation (see Appendix 2-G).

**Uses That Would Be Foreclosed By Designation**

Designation would foreclose any uses of the area for dams or diversions. Currently there is no Federal Energy Regulatory Commission (FERC) application, irrigation, or other proposals for dams or diversions on file for this river segment. Therefore, there is no conflict regarding this issue. The theoretical hydroelectric power potential for this river is estimated to be:

c Q H e

$$P = (0.08475) (32.32) (1320) (1.0) = 3,617 \text{ kilowatts}$$

BLM could not sell or otherwise dispose of public lands (see Appendix 2-G).

**Uses That Would Be Curtailed By Designation**

Designation as recreational would lead to application of a higher water quality standard, requiring more careful timing of BLM timber sales in the upstream watershed which could also diminish the rate of timber harvest. New mining claims would be allowed but under strict regulations (see Appendix 2-G).

**How the River Segment (and Outstandingly Remarkable Values) Would Be Managed if It Were Not Designated**

BLM would continue to manage and protect riparian areas along the river area. The Outstandingly Remarkable Value of fish would be protected by such management and would not be diminished or lost under the Preferred Alternative management options. Lands outside the riparian zone would be subject to timber harvest excluding wildlife protective areas, and would be managed under VRM Class IV standards. Areas within a view shed of a recreation facility would be managed under Class II standards. BLM would continue to manage any recreational use opportunities and developments along the segment. The potential would exist for hydroelectric power developments or other projects requiring dams or diversions. The potential would exist, therefore, for substantial alteration to the river's free flowing character. The BLM would be able to dispose of public land within the one-half mile river study corridor, if disposal were consistent with the Preferred Alternative.

**Administering Agency**

If Whittaker Creek were added to the National Wild and Scenic Rivers System, the BLM would continue to manage the land and resources unless Congress designates some other agency.

**Costs Shared**

It is not anticipated that any costs would be shared among other government agencies for this river segment.

**Cost to the United States**

The estimated cost of preparing a required river management plan for this stream segment would be \$32,000. Annual river management and protection costs for the identified Outstandingly Remarkable Value are estimated to be \$3,000.

## Finding and Rationale

### Finding

The six and one-half mile segment of Whittaker Creek from its headwaters in T. 19 S., R. 9 W., Sec. 13 to the confluence with the Siuslaw River is found not suitable for Federal designation under the Wild and Scenic Rivers System.

### Rationale, Characteristics Which Do Not Make the Area a Worthy Addition to the System

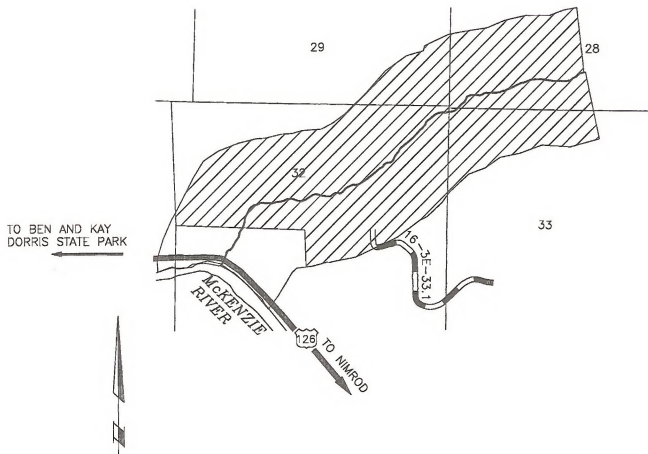
The low comparative rating of the river's one Outstandingly Remarkable Value (see Table 2- WSR-1 - Introduction) makes it a marginal potential addition to the National Wild and Scenic Rivers System. The

Outstandingly Remarkable Value of fish, while significant, is not threatened. There are no current or foreseeable proposals for dam construction or irrigation development for the river corridor. BLM's intent in the Preferred Alternative of this Draft RMP/EIS is to protect this Outstandingly Remarkable Value on BLM administered land. BLM feels that designation is not needed for this protection. On private forestland, the requirements of the Oregon Forest Practices Act should protect the Outstandingly Remarkable Value from impacts associated with timber management.

Considering all the factors, BLM believes the river segment's Outstandingly Remarkable Value can best be protected by a combination of the actions set forth in the Preferred Alternative of this Draft RMP/EIS and by management of private land consistent with County zoning and State law.



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BUREAU OF LAND MANAGEMENT



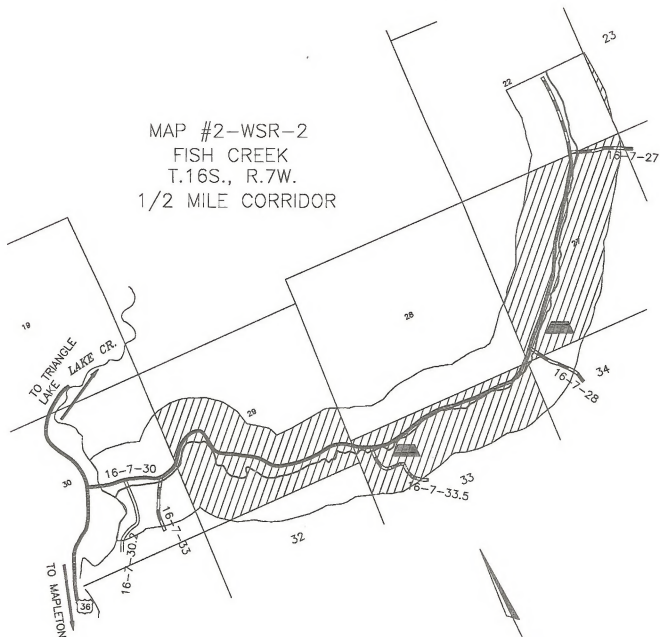
MAP #2-WSR-1  
BEAR CREEK  
T.16S., R.3E.  
1/2 MILE CORRIDOR








BLM Lands	
Pvt. Lands	
Paved Roads	
Rocked Roads	
BLM Roads	16-3E-33.1

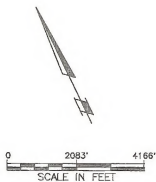
Note: District generated map through non-cartographic methods.

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MAP #2-WSR-2  
FISH CREEK  
T.16S., R.7W.  
1/2 MILE CORRIDOR



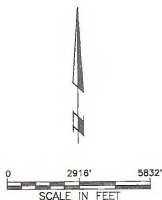
OC Lands	
Pvt. Lands	
Stockpile	
Paved Roads	
Rocked Roads	
Dirt Road	
BLM Roads	



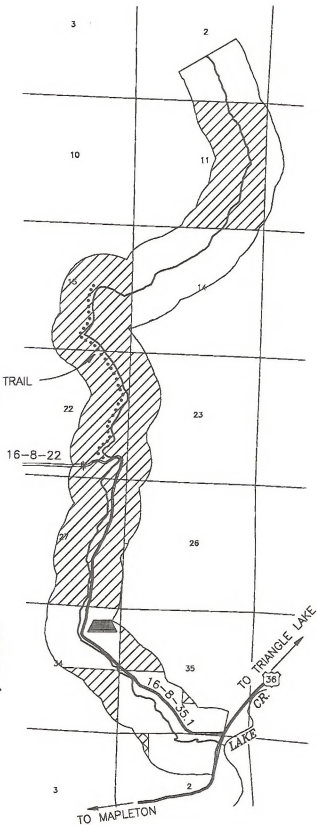
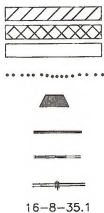
Note: District generated map through non-cartographic methods.

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BUREAU OF LAND MANAGEMENT

MAP #2-WSR-3  
GREENLEAF CREEK  
T.16 & 17S., R.8W.  
1/2 MILE CORRIDOR

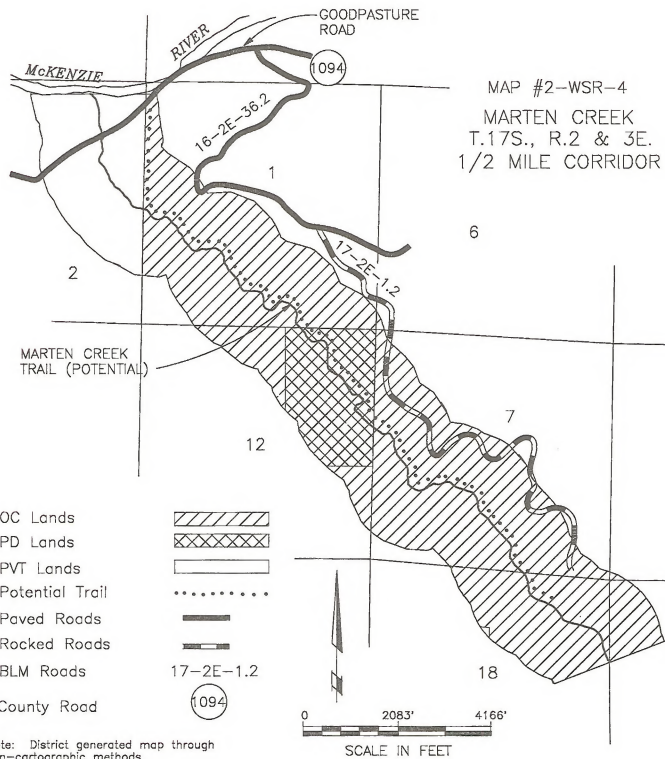


BLM OC Lands  
BLM PD Lands  
Pvt. Lands  
Potential Trail  
Stockpile  
Paved Road  
Rocked Road  
Impassable Road  
BLM Road

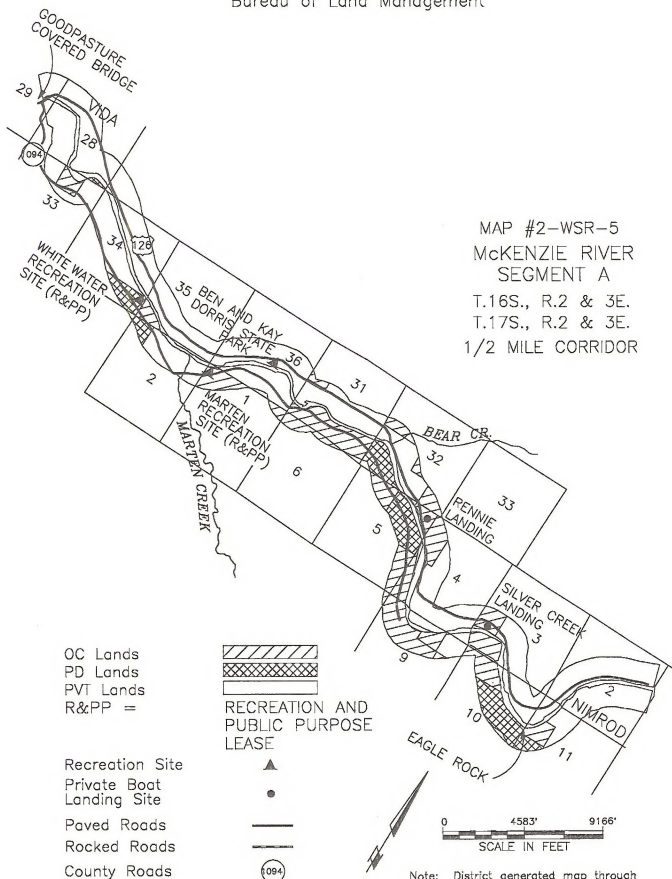


Note: District generated map through non-cartographic methods.

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BUREAU OF LAND MANAGEMENT

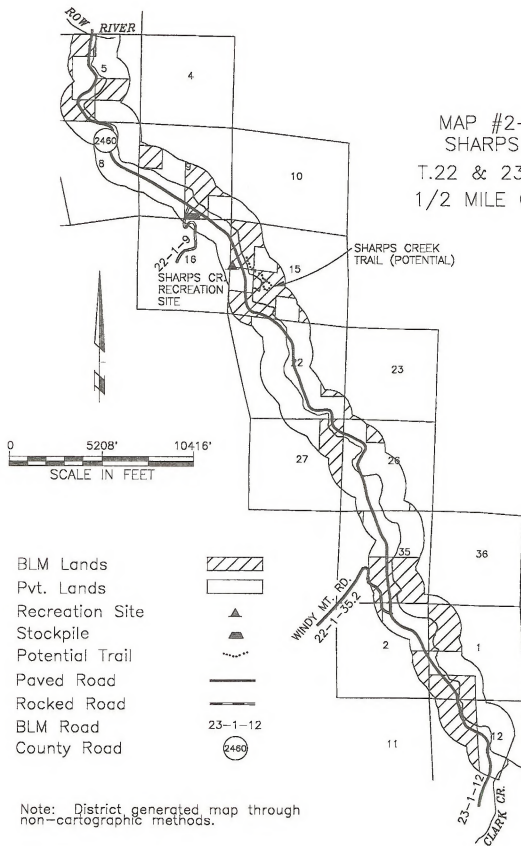


U. S. DEPARTMENT OF THE INTERIOR  
Bureau of Land Management

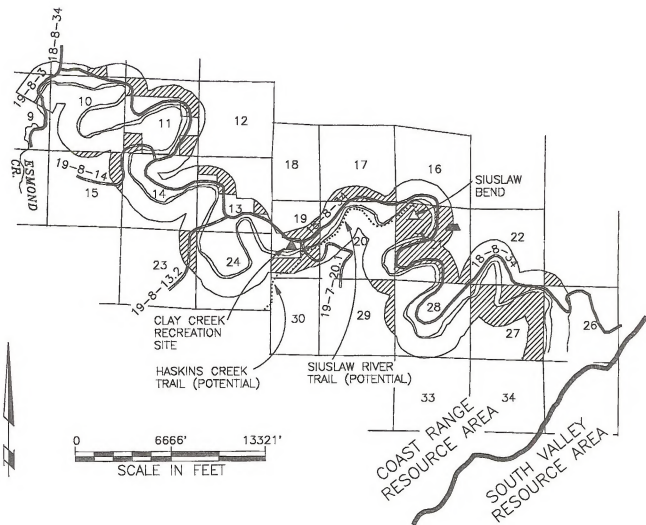












U. S. DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT

MAP #2-WSR-6  
SHARPS CREEK  
T.22 & 23S., R.1W.  
1/2 MILE CORRIDOR



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BUREAU OF LAND MANAGEMENT



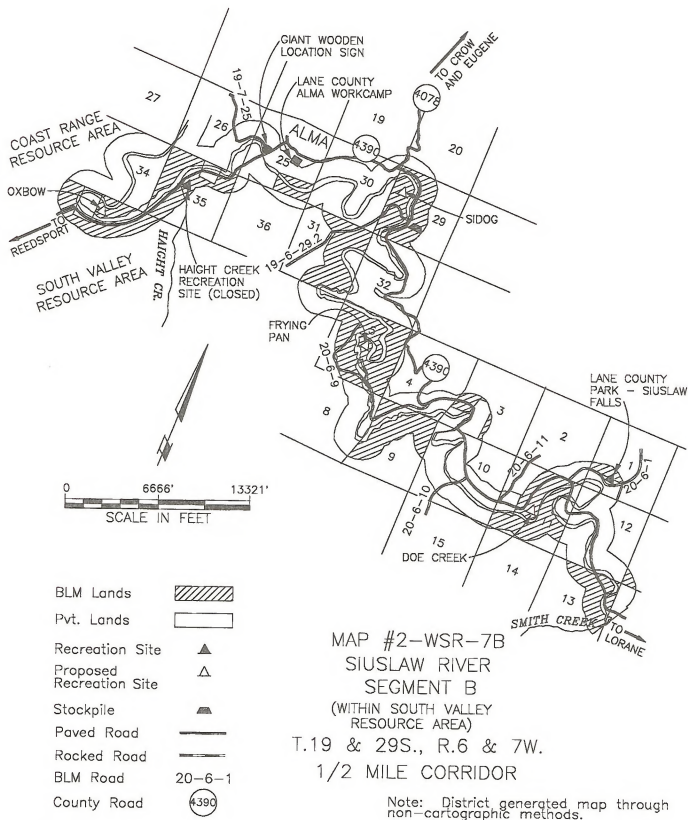
BLM Lands	
Pvt. Lands	
Recreation Site	
Proposed Recreation Site	
Stockpile Site	
Potential Trail	
Bridge	
Paved Road	
Rocked Road	
Resource Area Boundary	

MAP #2-WSR-7A  
SIUSLAW RIVER  
SEGMENT B  
(WITHIN COAST RANGE  
RESOURCE AREA)

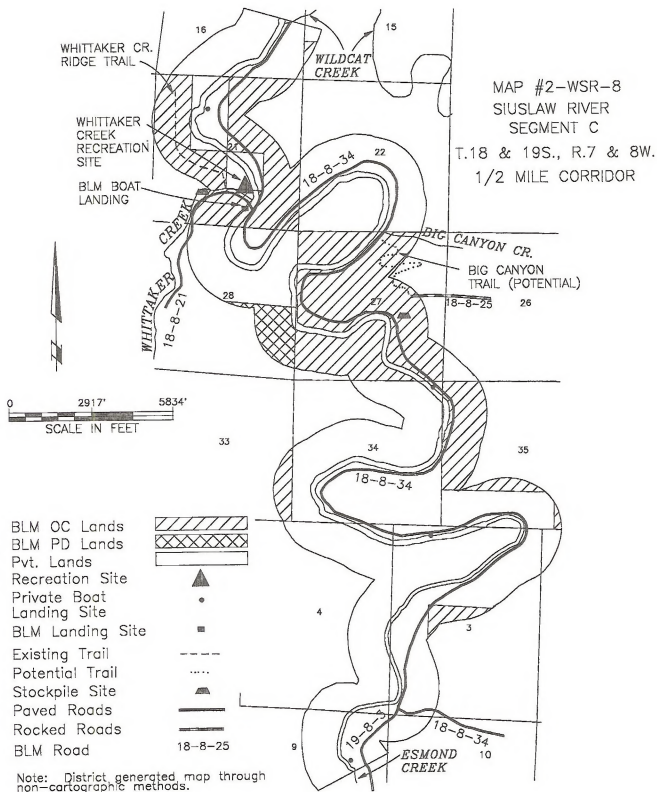
T.19 & 20S., R.7 & 8W.  
1/2 MILE CORRIDOR

Note: District generated map through  
non-cartographic methods.

U. S. DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT

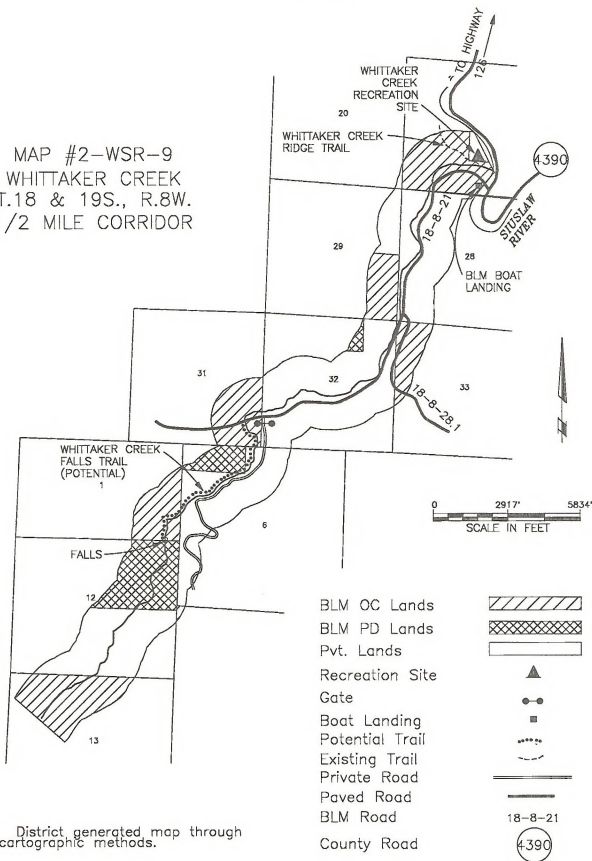




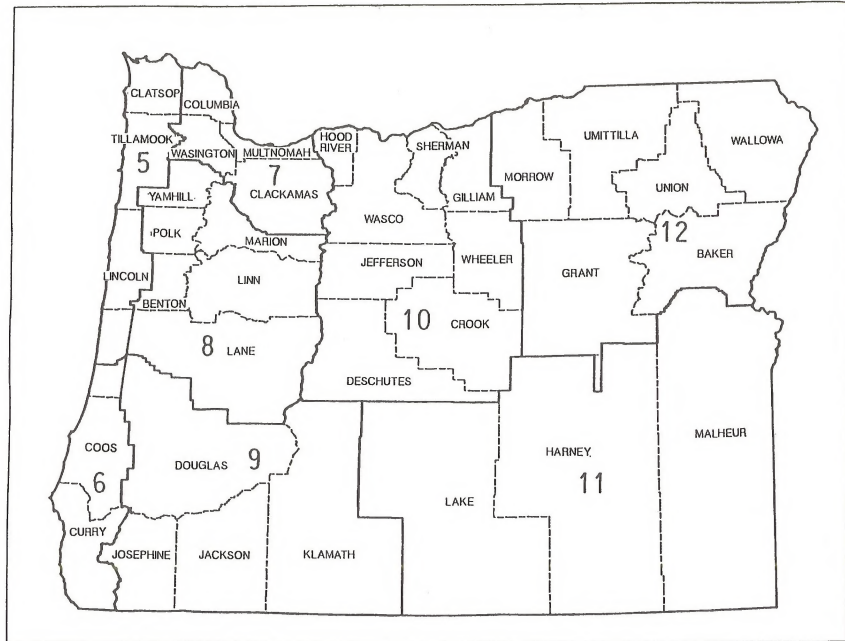
U. S. DEPARTMENT OF THE INTERIOR  
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BUREAU OF LAND MANAGEMENT

MAP #2-WSR-9  
WHITTAKER CREEK  
T.18 & 19S., R.8W.  
1/2 MILE CORRIDOR



Note: District generated map through non-cartographic methods.



SCORP Geographic Regions for Oregon.



# Appendix 2-1

## Land Ownership Adjustment Criteria

### Adjustment Evaluation Factors

In accordance with FLPMA and other laws, Executive Orders, and Departmental and Bureau policy, the following factors will be considered in evaluating opportunities for disposal or acquisition. This list is not considered all inclusive, but represents the major factors to be considered. They include:

- Threatened or Endangered or sensitive plant and animal species habitat
- Riparian areas and wetlands
- Fish habitat
- Nesting/breeding habitat for game and non-game animals
- Key big game seasonal habitat
- Contribution to biodiversity
- Developed recreation sites and recreation use areas
- High quality scenery
- Timber production potential
- Energy and mineral potential
- Land adjacent to rivers eligible for designation under the National Wild and Scenic Rivers Act
- Significant cultural resources and sites eligible for inclusion on the National Register of Historic Places
- Accessibility of the land for public recreation and other uses
- Amount of public investments in facilities or improvements and the potential for recovering those investments
- Difficulty or cost of administration (manageability)
- Suitability of the land for management by another Federal agency
- Significance of the decision in stabilizing business, social and economic conditions, and/or lifestyles
- Whether private sites exist for the proposed use
- Encumbrances, including but not limited to, withdrawals or existing leases or permits

- Consistency with cooperative agreements and plans or policies of other agencies
- Suitability (need for change in land ownership or use) for purposes including but not limited to community expansion or economic development, such as industrial, residential, or agricultural (other than grazing) development

### Acquisition Criteria

#### General Criteria for Acquisition

1. Facilitate access to public land and resources retained for long-term public use.
2. Maintain or enhance important public values and uses.
3. Facilitate National, State and local BLM priorities or mission statement needs.
4. Facilitate implementation of other aspects of the approved Resource Management Plan.
5. Maintain or enhance local social and economic values in public ownership.
6. Meet long-term public land management goals as opposed to short-term.
7. Be of sufficient size to improve use of adjoining public lands or, if isolated, large enough to allow identified potential public land use.
8. Enhance the opportunity for new or emerging public land uses or values.
9. Contribute to a wide spectrum of uses or large number of public land users.
10. Facilitate management practices, uses, scales of operation or degrees of management intensity that are viable under economic program efficiency standards.
11. Secure for the public significant water related land interest. These interests will include islands, lake shore, river or stream frontage, or ponds.
12. Contribute to increased biodiversity at the local or regional level.

13. Riparian areas.
14. Important wetland areas.

### Program Specific Acquisition Criteria

**Forestry:** Focus acquisition priority on areas which are:

1. Site Class IV or above unless the area will enhance the management of adjacent forestlands.
2. Contiguous to, or which facilitate access to and management of, public forestland.
3. Contain enough existing harvestable volume for a commercial logging unit after physical, biological or other land use constraints are considered.
4. Have minimum conflicts with other resource programs and rural residences.
5. Parcels with existing, well-maintained road systems have higher priority than unroaded parcels or parcels with roads in poor condition. Parcels with existing surveys have a higher priority than parcels requiring large amounts of surveying per acre of commercial forestland.

**Minerals:** Focus acquisition priority on areas which:

1. Consolidate Federal mineral estate to create economic mineral development units.
2. Reunite split surface and mineral estates.

**Cultural Resources:** Any cultural site to be acquired should meet the following standards: high research value, moderate scarcity, possess some unique values such as association with an important historic person or high aesthetic value, or contribute significantly to interpretive potential of cultural resources already in public ownership.

**Wildlife Habitat Management:** Areas for acquisition will be lands with significant wildlife values as defined below. These areas may be of any size.

1. Special Status Species.
  - a. Federally listed Threatened or Endangered species.
  - b. Federal Candidate species.
  - c. State listed species of special concern.

### 2. Fisheries.

- a. Riparian lands with potential to protect or enhance anadromous fisheries.
  - b. Lakes, ponds or other impoundments important for anadromous or non-anadromous fisheries.
3. Big game: Important habitat such as crucial winter areas, fawning/calving areas, mineral licks and security/cover areas.
  4. Upland Game Birds, Migratory Birds and Waterfowl: Crucial breeding, nesting, roosting, feeding and wintering habitat areas or complexes.
  5. Raptors: Existing and potential nesting areas for sensitive species or significant nesting complexes for nonsensitive species.
  6. Nongame: Crucial habitat complexes; buffers to enhance management of special habitat features and crucial wildlife habitats, including critical habitats for threatened and endangered species.
  7. Biodiversity: Contributes to increased connectivity of important wildlife habitats.

**Botanical and Special Area Management:** Areas for acquisition will be lands with significant botanical or other biological values as defined below. These areas may be of any size.

1. Special Status Species.
    - a. Federally listed Threatened or Endangered species.
    - b. Federal Candidate species.
    - c. State listed species of special concern.
  2. Unique or rare biological communities.
  3. Buffers for protection of existing special areas.
- Recreation:** Acquire land with the following significant values:
1. National values that enhance Congressionally designated areas, rivers or trails.
  2. State values that enhance recreation trails and waterways for interstate, State and multi-county use.
  3. Local values for extensive use, such as hunting, fishing and ORV use.
  4. Lands that expand, protect or buffer existing or potential developed recreation sites.

## **Disposal Criteria**

Parcels of BLM land are identified for disposal through exchange under the authority of section 206 of FLPMA. The management objective is to use the disposal parcels to meet the acquisition goals for each alternative. The following criteria will be used to identify parcels in Land Tenure Zones 2 and 3 for disposal by exchange:

1. Lands of limited public value.
2. Widely scattered parcels that are difficult for BLM to manage and have no significant resource values warranting retention.
3. Lands with high public values proper for management by other Federal agencies or State or local government.

4. Lands that would aid in aggregating or repositioning other public lands or public land resource values in retention areas to facilitate National, State and local objectives where the public values to be acquired outweigh the values to be exchanged.

Each parcel used in an exchange is subject to certain reviews before disposal can be approved: State and local government clearinghouse consultations, hazardous waste surveys, wildlife and threatened/endangered species evaluations, cultural and mineral clearances and reports. The results of the evaluations and reports are included in an environmental assessment. Parcels are removed from disposal consideration if the consultations, clearances, reports or environmental assessment show any resource values worthy of permanent Federal retention.





## Appendix 2-J

### Land Tenure Zone 3 Lands

Township	Range	Section	Subdivision	Status	County	Public Acres
14S	2W	13	Lots 4-5 (part) <sup>2</sup>	O&C	Linn	2.00 <sup>1</sup>
16S	5W	33	Lots 4-8	O&C	Lane	6.57
17S	1W	3	NW <sup>1</sup> SW <sup>1</sup> (part)	O&C	Lane	1.00 <sup>1</sup>
18S	1W	5	Lot 8 (part)	O&C	Lane	0.50 <sup>1</sup>
18S	1W	26	Unsurveyed hiatus	PD	Lane	2.76 <sup>1</sup>
18S	7W	11	NE <sup>1</sup> SE <sup>1</sup> (part)	O&C	Lane	3.00 <sup>1</sup>
18S	10W	11	Lot 9	PD	Lane	6.24
19S	3W	35	Lot 3 <sup>2</sup>	O&C	Lane	2.79
19S	4W	29	NE <sup>1</sup> SW <sup>1</sup> (part)	O&C	Lane	0.36 <sup>1</sup>
21S	1W	31	Tract 37, Lot 6 (part)	O&C	Lane	9.94 <sup>1</sup>
21S	1W	35	SW <sup>1</sup> NE <sup>1</sup> (part)	O&C	Lane	0.28 <sup>1</sup>

<sup>1</sup>Acresage is approximate until cadastral survey is completed.

<sup>2</sup>Tract may be sold only to current R&PP lessee so long as lease is in effect.

All tracts specified meet the sale criteria at 43 CFR 2710.0-3(a)(3) that "Such tract, because of its location or other characteristics, is difficult or uneconomical to manage as part of the public lands and is not suitable for management by another Federal department or agency."

In addition, all O&C tracts specified are not "... more suitable for management and administration for permanent forest protection and other purposes as provided for in the Acts of August 28, 1937 (50 Stat. 874; 43 U.S.C. 1181(a); May 24, 1939 (53 Stat. 753); and Section 701(b) of the ... " Federal Land Policy and Management Act of 1976, and are thus not excepted from sale eligibility by 43 CFR 2710.0-8(a)(1).



# Appendix 2-K

## Proposed Restrictions on Mineral and Energy Exploration and Development Activity

### Introduction

This appendix discusses the leasing stipulations as they would be applied to BLM managed lands in the planning area under each alternative. Operating standards pertinent to the locatable and salable minerals program are also described. Mineral exploration and development on Federal lands must also comply with laws and regulations administered by several agencies of the State of Oregon; however, these requirements are not discussed in this document.

### Leasable Mineral Resources

#### Oil and Gas Leasing

The Mineral Leasing Act of 1920 (as amended) provides that all publicly owned oil and gas resources be open to leasing, unless a specific land order has been issued to close the area. Through the land use planning process, the availability of these resources for leasing is analyzed, taking into consideration development potential and surface resources. Constraints on oil and gas operations are identified and placed in the leases as notices and stipulations. Oil and gas leases are then issued from the BLM Oregon State Office in Portland. Specific proposed notices and stipulations are listed by alternative later in this appendix.

The issuance of a lease conveys to the lessee an authorization to actively explore and/or develop the lease, in accordance with the attached stipulations and the standard terms outlined in the Federal Onshore Oil and Gas Leasing Reform Act (FOOGLRA). Restrictions on oil and gas activities in the planning area will take the form of timing limitations, controlled surface use, or no surface occupancy stipulations used at the discretion of the Authorized Officer to protect identified surface resources of special concern.

Stipulations will be attached to each lease before it is offered for bid, by the field office, which reviews the lease tract. The review will be conducted by consulting the direction given in this Resource Management Plan. In addition, all lands administered by BLM within the planning area will be subject to the lease notices as shown on the following pages. All Federal lessees or

operators are required to follow procedures set forth by: Onshore Oil and Gas Orders, Notices to Lessee (NTLs), The Federal Oil and Gas Royalty Management Act (as amended), The Federal Onshore Oil and Gas Leasing Reform Act and Title 43 Code of Federal Regulations, Part 3100.

### Oil and Gas Operations

#### Geophysical Exploration

Geophysical operations may be conducted regardless of whether or not the land is leased. Notices to conduct geophysical operations on BLM surface are received by the Resource Area. Administration and surface protection are accomplished through close cooperation of the operator and the BLM. Seasonal restrictions may be imposed to reduce fire hazards, conflicts with wildlife, watershed damage, etc. An operator is required to file a "Notice of Intent to Conduct Oil and Gas Exploration Operations" for all geophysical activities on public land administered by BLM. The notice should adequately show the location and access routes, anticipated surface damages, and time frame. The operator is required to comply with written instructions and orders given by the Authorized Officer, and must be bonded. Signing of the Notice of Intent by the operator signifies agreement to comply with the terms and conditions of the notice, regulations, and other requirements prescribed by the Authorized Officer. A prework conference and/or site inspection may be required. Periodic checks during and upon completion of the operations will be conducted to ensure compliance with the terms of Notice of Intent, including reclamation.

#### Drilling Permit Process

The Federal lessee or operating company selects a drill site based on spacing requirements, subsurface and surface geology, geophysics, topography, and economic considerations. Well spacing is determined by the Authorized Officer after considering topography, reservoir characteristics, protection of correlative rights, potential for well interference, interference with multiple use of lands, and protection of the surface and subsurface environments. Close coordination with the State

would take place. Written field spacing orders are issued for each field. Exceptions to spacing requirements involving Federal lands may be granted after joint State and BLM review.

### Notice of Staking

Once the company makes the decision to drill, it must decide whether to submit a Notice of Staking (NOS) or apply directly for a permit to drill. The NOS is an outline of what the company intends to do, including a location map and sketched site plan. The NOS is used to review any conflicts with known critical resource values and to identify the need for associated rights-of-way and special use permits. The BLM utilizes information contained in the NOS and obtained from the on-site inspection to develop conditions of approval to be incorporated into the application for permit to drill. Upon receipt of the NOS, the BLM posts the document and pertinent information about the proposed well in the District Office for a minimum of 30 days prior to approval, for review and comment by the public.

### Application for Permit to Drill (APD)

The operator may or may not choose to submit a NOS; in either case, an Application for Permit to Drill (APD) must be submitted prior to drilling. An APD consists of two main parts: a 12-point surface plan that describes any surface disturbances and is reviewed by resource specialists for adequacy with regard to lease stipulations designed to mitigate impacts to identified resource conflicts with the specific proposal, and a 8-point subsurface plan that details the drilling program and is reviewed by the staff petroleum engineer and geologist. This plan includes provisions for casing, cementing, well control, and other safety requirements. For the APD option, the on-site inspection is used to assess possible impacts and develop provisions to minimize these impacts. If the NOS option is not utilized, the 30-day posting period begins with the filing of the APD. Private surface owner input is actively solicited during the APD stage.

### Geothermal Leasing

The Geothermal Steam Act of 1970 (as amended) provides for the issuance of leases for the development and utilization of geothermal steam and associated geothermal resources. Geothermal leasing and operational regulations are contained in Title 43 Code of Federal Regulations, Part 3200. Through the land use planning process the availability of the geothermal resources for leasing is analyzed, taking into consideration development potential and surface and subsur-

face resources. Constraints on geothermal operations are identified and placed in the leases as stipulations. Geothermal leases are then issued by the BLM Oregon State Office in Portland.

Geothermal resources within a Known Geothermal Resource Area (KGRA) are offered by competitive sale. Outside of KGRAs, leases can be issued noncompetitively (over-the-counter). Prior to a competitive lease sale, or the issuance of a noncompetitive lease, each tract will be reviewed, and appropriate lease stipulations will be included. The review will be conducted by consulting the direction given in this Resource Management Plan. The issuance of a lease conveys to the lessee authorization to actively explore and/or develop the lease in accordance with regulations and lease terms and attached stipulations. Subsequent lease operations must be conducted in accordance with the regulations, Geothermal Resources Operational Orders, and any Conditions of Approval developed as a result of site-specific NEPA analysis. In the planning area, restrictions in some areas will include timing limitations, controlled surface use, or no surface occupancy stipulations used at the discretion of the Authorized Officer to protect identified surface resources of special concern.

In addition to restrictions related to the protection of surface resources, the various stipulations and conditions could contain requirements related to protection of subsurface resources. These may involve drainage protection of geothermal zones, protection of aquifers from contamination, or assumption of responsibility for any unplugged wells on the lease.

Development of geothermal resources can be done only on approved leases. Orderly development of a geothermal resource, from exploration to production, involves several major phases that must be approved separately. Each phase must undergo the appropriate level of NEPA compliance before it is approved and subsequent authorization(s) is (are) issued.

### Leasing Notice and Stipulation Summary

On the following pages, the mineral leasing notices and stipulations are shown by planning alternative. The tracts of land to which these apply will, in many cases, differ by alternative. Those notices and stipulations shown as common for all alternatives are considered to be the minimum necessary in order to issue leases in the operating area. Under all alternatives, the standard leasing stipulations (Form 3100-11) alone would be utilized on most lands. The powersite stipulation (Form

3730-1) would be utilized on lands within powersite reservations. Lands under the jurisdiction of the Department of the Army Corps of Engineers would be leased subject to the stipulation on Form 3109-2.

Stipulations also include waiver, exception, and modification criteria defined below. If the Authorized Officer determines that a stipulation involves an issue of major concern, waivers, exceptions, or modifications of the stipulation will be subject to at least a 30-day advance public review (43 CFR 3101.1-4). Waiver, exception, and modification are defined as follows:

**Waiver** - The lifting of a stipulation from a lease that constitutes a permanent revocation of the stipulation from that time forward. The stipulation no longer applies anywhere within the leasehold.

**Exception** - This is a one-time lifting of the stipulation to allow an activity for a specific proposal. This is a case-by-case exemption. The stipulation continues to apply to all other sites within the leasehold to which the restrictive criteria apply. It has no permanent effect on the lease stipulation.

**Modification** - This is a change to a stipulation that either temporarily suspends the stipulation requirement or permanently lifts the application of the stipulation on a given portion of the lease. Depending on the specific modification, the stipulation may or may not apply to all other sites within the leasehold to which the restrictive criteria apply.

Throughout the alternatives, the No Surface Occupancy (NSO) stipulation is used rather than not leasing, because leasable minerals, if present, can be produced from most, if not all, of each of the parcels that are subject to this stipulation without impacting the value(s) needing protection.

Whenever a special stipulation, such as No Surface Occupancy, Timing, or Controlled Surface Use (CSU) is used, the need for the special stipulation is described in the "Objective" that follows the stipulation. By imposing these special stipulations, it has been concluded that less restrictive stipulations would not be adequate to meet the stated objective.

## Leasing Notices

The following Notices are to be included in each lease for all lands administered by BLM within the planning area where the pertinent resource potential exists. The lease notice for the marbled murrelet would be issued on lands within 50 miles of the Pacific Ocean. Lease

notices are attached to leases in the same manner as stipulations; however, there is an important distinction between lease notices and stipulations. Lease notices do not involve new restrictions or requirements. Any requirements contained in a lease notice must be fully supported in either laws, regulations, policy, onshore oil and gas orders, or geothermal resources operational orders.

## Leasing Notices Common to All Alternatives

### Notice

**Wildlife** - Northern Spotted Owl Nest and Roost Sites and Associated Habitat

The leased lands are in an area suitable for the habitat of the Northern Spotted Owl, (*Strix occidentalis caurina*), an animal species that is officially listed (Federal) as a Threatened species.

All viable habitat will be identified for the lessee/operator by the Authorized Officer of the BLM during the preliminary environmental review of the proposed surface use plan. If the field examination indicates that the proposed activity may affect the species, then consultation will be conducted with the U.S. Fish & Wildlife Service pursuant to Sec. 7 of the Endangered Species Act of 1973, as amended. The consultation will determine whether or not the proposed activity would jeopardize the continued existence of the species and, if so, the extent, if any, the proposed activity will be allowed.

Authority: The Endangered Species Act of 1973.

### Notice

**Wildlife** - American Peregrine Falcon Nest Sites and Nesting Habitat

The leased lands are in an area suitable for the habitat of the American Peregrine Falcon (*Falco peregrinus anatum*), an animal species that is officially listed as an Endangered species.

All viable habitat will be identified for the lessee/operator by the Authorized Officer of the BLM during the preliminary environmental review of the proposed surface use plan. If the field examination indicates that the proposed activity may affect the species, then

## Leasing Notices and Stipulations by Alternative

	NA	A	B	C	D	E	PA
<b>Notices</b>							
Northern spotted owl nest and roost sites and associated habitat	x	x	x	x	x	x	x
American peregrine falcon nest sites and nesting habitat	x	x	x	x	x	x	x
Bald eagle nest and roost sites and associated habitat	x	x	x	x	x	x	x
Marbled murrelet nest sites and nesting habitat	x	x	x	x	x	x	x
Other threatened & endangered animal species	x	x	x	x	x	x	x
Threatened & endangered plant species	x	x	x	x	x	x	x
Cultural resources	x	x	x	x	x	x	x
Special status fish species	x	x	x	x	x	x	x
Special status plant species (on all BLM land)	x			x	x	x	x
Special status animal species (on all BLM land)	x			x	x	x	x
Special status animal species (PD land only)			x				
Special status plant species (PD land only)			x				
<b>Special Stipulations</b>							
NSO - Land Use Authorizations	x	x	x	x	x	x	x
NSO - Recreation Sites	x	x	x	x	x	x	x
NSO - Regional Forest Nutritional Research Study Installations	x	x	x	x	x	x	x
NSO - Special Areas (ACEC (including RNA & ONA), EEA)	x	x	x	x	x	x	x
NSO - Progeny Test Sites	x	x	x	x	x	x	x
NSO - Tyrrell and Dorena Seed Orchards	x	x	x	x	x	x	x
NSO - VRM Class I	x	x	x	x	x	x	x
NSO - Bald Eagle Nest and Roost Sites and Associated Habitat	x	x	x	x	x	x	x
NSO - Marbled Murrelet Nest Sites	x	x	x	x	x	x	x
NSO - Great Blue Heron Rookeries	x			x	x	x	x
NSO - Osprey Nest Sites	x			x	x	x	x
Timing - Elk Concentration Areas	x						
Timing - Mineral Springs Utilized by the Band-tailed Pigeon	x			x	x	x	x
CSU - Soils	x	x	x	x	x	x	x
CSU - VRM Class II	x	x	x	x	x	x	x
CSU - Designated Mature and Old Growth Forest Blocks			x				
CSU - Riparian Management Areas		x	x	x	x	x	x
CSU - Special Recreation Management Areas	x			x	x	x	x
CSU - Old Growth Restoration and Retention Blocks			x				

## Leasing Notices and Stipulations by Alternative (cont.)

	NA	A	B	C	D	E	PA
CSU - Old Growth Emphasis Areas and Connectivity Areas							x
CSU - Habitat Conservation Areas for the Northern Spotted Owl					x		
CSU - Forest Stands older than 150 years						x	

consultation will be conducted with the U.S. Fish & Wildlife Service pursuant to Sec. 7 of the Endangered Species Act of 1973, as amended. The consultation will determine whether or not the proposed activity would jeopardize the continued existence of the species and, if so, the extent, if any, the proposed activity will be allowed.

Authority: The Endangered Species Act of 1973, Peregrine Falcon Recovery Plan.

#### Notice

Wildlife - Bald Eagle Nest and Roost Sites and Associated Habitat

The leased lands are in an area suitable for the habitat of the Bald Eagle (*Haliaeetus leucocephalus*), an animal species that is officially listed (Federal) as a Threatened species.

All viable habitat will be identified for the lessee/operator by the Authorized Officer of the BLM during the preliminary environmental review of the proposed surface use plan. If the field examination indicates that the proposed activity may affect the species, then consultation will be conducted with the U.S. Fish & Wildlife Service pursuant to Sec. 7 of the Endangered Species Act of 1973, as amended. The consultation will determine whether or not the proposed activity would jeopardize the continued existence of the species and, if so, the extent, if any, the proposed activity will be allowed.

Authority: The Endangered Species Act of 1973, Pacific Bald Eagle Recovery Plan.

#### Notice

Wildlife - Marbled Murrelet Nest Sites and Nesting Habitat

The leased lands are in an area suitable for the habitat of the Marbled Murrelet (*Brachyramphus marmoratus*), an animal species that is proposed (Federal) as a Threatened species.

All viable habitat will be identified for the lessee/operator by the Authorized Officer of the BLM during the preliminary environmental review of the proposed surface use plan. If the field examination indicates that the proposed activity may affect the species, then consultation will be conducted with the U.S. Fish & Wildlife Service pursuant to Sec. 7 of the Endangered Species Act of 1973, as amended. The consultation will determine whether or not the proposed activity would jeopardize the continued existence of the species and, if so, the extent, if any, the proposed activity will be allowed.

Authority: The Endangered Species Act of 1973.

#### Notice

Wildlife - Other Threatened and Endangered Animal Species

The leased lands are in an area suitable for the habitat of the (*common name*), (*scientific name*), an animal species that is (officially listed/proposed for listing) as a (Threatened/Endangered) species.

All viable habitat will be identified for the lessee/operator by the Authorized Officer of the BLM during the preliminary environmental review of the proposed surface use plan. If the field examination indicates that the proposed activity may affect the species, then (consultation/conferencing) will be conducted with the U.S. Fish & Wildlife Service pursuant to Sec. 7 of the Endangered Species Act of 1973, as amended. The (consultation/conference) will determine whether or not the proposed activity would jeopardize the continued existence of the species and, if so, the extent, if any, the proposed activity will be allowed.

Authority: The Endangered Species Act of 1973.

## Notice

### Threatened and Endangered Plant Species

The leased lands are in an area suitable for the habitat of (*common name*), (*scientific name*) a plant species that is (officially listed/proposed for listing) as a(n) (Threatened/Endangered) species.

All viable habitat will be identified for the lessee/operator by the Authorized Officer of the BLM during the preliminary environmental review of the proposed surface use plan. If the field examination indicates that the proposed activity may affect the (officially listed/proposed for listing) species, then (consultation/conferencing) will be conducted with the U.S. Fish & Wildlife Service pursuant to Sec. 7 of the Endangered Species Act of 1973, as amended. The (consultation/conference) will determine whether or not the proposed activity would jeopardize the continued existence of the species and, if so, the extent, if any, the proposed activity will be allowed.

Authority: The Endangered Species Act of 1973

## Notice

Cultural Resources: An inventory of the leased lands may be required prior to surface disturbance to determine if cultural resources are present and to identify needed mitigation measures. Prior to undertaking any surface-disturbing activities on the lands covered by this lease, the lessee or operator shall:

1. Contact the Bureau of Land Management (BLM) to determine if a cultural resource inventory is required. If an inventory is required, then;
2. The BLM will complete the required inventory; or the lessee or operator, at their option, may engage the services of a cultural resource consultant acceptable to the BLM to conduct a cultural resource inventory of the area of proposed surface disturbance. The operator may elect to inventory an area larger than the standard ten-acre minimum to cover possible site relocation, which may result from environmental or other considerations. An acceptable inventory report is to be submitted to the BLM for review and approval no later than that time when an otherwise complete application for approval of drilling or subsequent surface-disturbing operation is submitted.
3. Implement mitigation measures required by the BLM. Mitigation may include the relocation of proposed lease-related activities or other protective measures such as data recovery and extensive recordation. Where impacts to cultural resources

cannot be mitigated to the satisfaction of the BLM, surface occupancy on that area must be prohibited. The lessee or operator shall immediately bring to the attention of the BLM any cultural resources discovered as a result of approved operations under this lease, and shall not disturb such discoveries until directed to proceed by the BLM.

Authorities: Compliance with Section 106 of the National Historic Preservation Act is required for all actions that may affect cultural properties eligible to the National Register of Historic Places. Section 6 of the Oil and Gas Lease Terms (Form 3100-11) requires that operations be conducted in a manner that minimizes adverse impacts to cultural and other resources.

## Notice

Wildlife-Special Status Fish Species on All BLM Administered Lands in Planning Area

The leased lands are in an area suitable for the habitat of (*common name*), (*scientific name*) fish species, which is considered as a (Federal candidate/Bureau sensitive) species.

All viable habitat will be identified for the lessee/operator by the Authorized Officer of the BLM during the preliminary environmental review of the proposed surface use plan. If the field examination indicated that the proposed activity may affect the species, then BLM policy directs that Technical Assistance be obtained from the U.S. Fish & Wildlife Service to insure that actions will not increase the need to list the species as threatened or endangered species.

Authority: BLM Manual 6840; I.M. No. OR-91-57

## Additional Leasing Notices Under the No Action Alternative

### Notice

Special Status Plant Species on All BLM Administered Lands in Planning Area

The leased lands are in an area suitable for the habitat of (*common name*), (*scientific name*) plant species, which is considered as a (Federal candidate/Bureau sensitive) species.

All viable habitat will be identified for the lessee/operator by the Authorized Officer of the BLM during the preliminary environmental review of the proposed surface use plan. If the field examination indicated that



the proposed activity may adversely impact the species, then BLM policy directs that Technical Assistance be obtained from the U.S. Fish & Wildlife Service to insure that actions will not increase the need to list the species as threatened or endangered species.

Authority: BLM Manual 6840; I.M. No. OR-91-57

### Notice

Wildlife-Special Status Animal Species on All BLM Administered Lands in Planning Area

The leased lands are in an area suitable for the habitat of (*common name*), (*scientific name*) animal species, which is considered as a (Federal candidate/Bureau sensitive) species.

All viable habitat will be identified for the lessee/operator by the Authorized Officer of the BLM during the preliminary environmental review of the proposed surface use plan. If the field examination indicated that the proposed activity may affect the species, then BLM policy directs that Technical Assistance be obtained from the U.S. Fish & Wildlife Service to insure that actions will not increase the need to list the species as threatened or endangered species.

Authority: BLM Manual 6840; I.M. No. OR-91-57

### Additional Leasing Notices Under Alternative B

#### Notice

Special Status Plant Species on Public Domain Lands

The leased lands are in an area suitable for the habitat of (*common name*), (*scientific name*) plant species, which is considered as a (Federal candidate/Bureau sensitive) species.

All viable habitat will be identified for the lessee/operator by the Authorized Officer of the BLM during the preliminary environmental review of the proposed surface use plan. If the field examination indicated that the proposed activity may adversely impact the species, then BLM policy directs that Technical Assistance be obtained from the U.S. Fish & Wildlife Service to insure that actions will not increase the need to list the species as threatened or endangered species.

Authority: BLM Manual 6840; I.M. No. OR-91-57

### Notice

Wildlife-Special Status Animal Species on Public Domain Lands

The leased lands are in an area suitable for the habitat of (*common name*), (*scientific name*) animal species, which is considered as a (Federal candidate/Bureau sensitive) species.

All viable habitat will be identified for the lessee/operator by the Authorized Officer of the BLM during the preliminary environmental review of the proposed surface use plan. If the field examination indicated that the proposed activity may affect the species, then BLM policy directs that Technical Assistance be obtained from the U.S. Fish & Wildlife Service to insure that actions will not increase the need to list the species as threatened or endangered species.

Authority: BLM Manual 6840; I.M. No. OR-91-57

### Additional Leasing Notices Under Alternatives C, D and E

#### Notice

Special Status Plant Species on All BLM Administered Lands in Planning Area

The leased lands are in an area suitable for the habitat of (*common name*), (*scientific name*) plant species, which is considered as a (Federal candidate/Bureau sensitive) species.

All viable habitat will be identified for the lessee/operator by the Authorized Officer of the BLM during the preliminary environmental review of the proposed surface use plan. If the field examination indicated that the proposed activity may adversely impact the species, then BLM policy directs that Technical Assistance be obtained from the U.S. Fish & Wildlife Service to insure that actions will not increase the need to list the species as threatened or endangered species.

Authority: BLM Manual 6840; I.M. No. OR-91-57

#### Notice

Wildlife-Special Status Animal Species on All BLM Administered Lands in Planning Area

The leased lands are in an area suitable for the habitat of (*common name*), (*scientific name*) animal species, which is considered as a (Federal candidate/Bureau sensitive) species.

All viable habitat will be identified for the lessee/operator by the Authorized Officer of the BLM during the preliminary environmental review of the proposed surface use plan. If the field examination indicated that the proposed activity may affect the species, then BLM policy directs that Technical Assistance be obtained from the U.S. Fish & Wildlife Service to insure that actions will not increase the need to list the species as threatened or endangered species.

Authority: BLM Manual 6840; I.M. No. OR-91-57

## Additional Leasing Notices Under the Preferred Alternative

### Notice

Special Status Plant Species on All BLM Administered Lands in Planning Area

The leased lands are in an area suitable for the habitat of (*common name*), (*scientific name*) plant species, which is considered as a (Federal candidate/Bureau sensitive) species.

All viable habitat will be identified for the lessee/operator by the Authorized Officer of the BLM during the preliminary environmental review of the proposed surface use plan. If the field examination indicated that the proposed activity may adversely impact the species, then BLM policy directs that Technical Assistance be obtained from the U.S. Fish & Wildlife Service to insure that actions will not increase the need to list the species as threatened or endangered species.

Authority: BLM Manual 6840; I.M. No. OR-91-57

### Notice

Wildlife-Special Status Animal Species on All BLM Administered Lands in Planning Area

The leased lands are in an area suitable for the habitat of (*common name*), (*scientific name*) animal species, which is considered as a (Federal candidate/Bureau sensitive) species.

All viable habitat will be identified for the lessee/operator by the Authorized Officer of the BLM during the preliminary environmental review of the proposed surface use plan. If the field examination indicated that the proposed activity may affect the species, then BLM policy directs that Technical Assistance be obtained from the U.S. Fish & Wildlife Service to insure that actions will not increase the need to list the species as threatened or endangered species.

Authority: BLM Manual 6840; I.M. No. OR-91-57

## Standard Lease Terms

Standard lease terms for oil and gas are listed in Section 6 of "Offer to Lease and Lease for Oil and Gas" Form 3100-11. They are:

Lessee shall conduct operations in a manner that minimizes adverse impacts to the land, air and water; to cultural, biological, visual and other resources; and to other land uses or users. Lessee shall take reasonable measures deemed necessary by lessor to accomplish the intent of this section. To the extent consistent with lease rights granted, such measures may include, but are not limited to, modification to siting or design of facilities; timing of operations; and specification of interim and final reclamation measures. Lessor reserves the right to continue existing uses and to authorized future uses upon or in the leased lands, including the approval of easements or rights-of-way. Such uses shall be conditioned so as to prevent unnecessary or unreasonable interference with rights of lessee.

Prior to disturbing the surface of the leased lands, lessee shall contact BLM to be apprised of procedures to be followed and modifications or reclamation measures that may be necessary. Areas to be disturbed may require inventories or special studies to determine the extent of impacts to other resources. Lessee may be required to complete minor inventories or short-term special studies under guidelines provided by lessor. If in the conduct of operations, threatened or endangered species, objects of historic or scientific interest, or substantial unanticipated environmental effects are observed, lessee shall immediately contact lessor. Lessee shall cease any operations that would result in the destruction of such species or objects until appropriate steps have been taken to protect the site or recover the resources as determined by BLM in consultation with other appropriate agencies.

Standard lease terms for geothermal leasing can be found on Offer to Lease and Lease for Geothermal Resources (Form 3200-24), Section 6, and are very similar to those described above for oil and gas leasing.

**Powersite Stipulation (Form No. 3730-1)** (to be used on all lands within powersite reservations.)

**Stipulation for Lands Under Jurisdiction of Department of the Army, Corps of Engineers (Form No. 3109-2)**

All areas within 2,000 feet of any major structure, including but not limited to dams, spillways, or embankments, are restricted areas. The lessee, his operators, agents, or employees shall not disturb the surface or subsurface estates of the restricted areas. If the Commander or the authorized representative discovers an imminent danger to safety or security that allows no time to consult the BLM, that person may order such activities stopped immediately. The Authorized Officer of the BLM shall review the order and determine the need for further remedial action. Platform drilling over water areas (flood pool/drawdown zone) is prohibited; the method of drilling shall be directional from an off-site base. This restriction is required because occupancy would negatively affect or interfere with authorized project purposes and/or operational needs as listed below:

- Fish and Wildlife Habitat — Power Production
- Flood Control — Recreation
- Irrigation — Water Quality
- Navigation — Water Supply
- Other Legislative Authorities

Land surface occupancy may be permitted within lease area; however, directional drilling from an off-site base may be required. The Secretary of the Army or designee reserves the right to require cessation of operations, if a National emergency arises. Upon request of approval from higher authority, the Commander will give the lessee written notice or, if time permits, request the BLM to give notice of the required cessation.

## Special Leasing Stipulations

The following special stipulations are to be utilized on specifically designated tracts of land as described under the various alternatives.

## Leasing Stipulations Common to All Alternatives

### No Surface Occupancy

Resource: Land Use Authorizations

Stipulation: Surface occupancy and use is prohibited on Recreation and Public Purposes (R&PP) and FLPMA leases.

Objective: To protect uses on existing R&PP and FLPMA leases.

Exception: An exception to this stipulation may be granted by the Authorized Officer, if the operator submits a plan demonstrating that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: The area affected by this stipulation may be modified by the Authorized Officer, if the land use authorization boundaries are modified.

Waiver: This stipulation may be waived by the Authorized Officer, if all land use authorizations within the leasehold have been terminated, canceled, or relinquished.

### No Surface Occupancy

Resource: Recreation Sites

Stipulation: Surface occupancy and use are prohibited within developed recreation areas.

Objective: To protect developed recreation areas.

Exception: An exception to this stipulation may be granted by the Authorized Officer, if the operator submits a plan demonstrating that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: The boundaries of the stipulated area may be modified by the Authorized Officer, if the recreation area boundaries are changed.

Waiver: This stipulation may be waived, if the Authorized Officer determines that the entire leasehold no longer contains developed recreation areas.

### No Surface Occupancy

Resource: Regional Forest Nutritional Research Study Installations

## Appendix 2

**Stipulation:** Surface occupancy and use is prohibited within regional forest nutritional research study installations.

**Objective:** To protect regional forest nutritional research study installations.

**Exception:** An exception to this stipulation may be granted by the Authorized Officer, if the operator submits a plan demonstrating that impacts from the proposed action are acceptable or can be adequately mitigated.

**Modification:** The boundaries of the stipulated area may be modified by the Authorized Officer, if the regional forest nutritional research study installation boundaries are changed.

**Waiver:** This stipulation may be waived, if the Authorized Officer determines that the entire leasehold no longer contains regional forest nutritional research study installations.

### No Surface Occupancy

**A 30-day public notice period will be required prior to modification or waiver of this stipulation.**

**Resource:** Special Areas

**Stipulation:** Surface occupancy and use are prohibited within Areas of Critical Environmental Concern (ACECs) and Environmental Education Areas (EEAs).

**Objective:** To protect important historic, cultural, scenic values, natural resources, natural systems or processes, threatened and endangered plant species, and/or natural hazard areas of the ACEC or EEA.

**Exception:** An exception to this stipulation may be granted by the Authorized Officer, if the operator submits a plan demonstrating that impacts from the proposed action are acceptable or can be adequately mitigated.

**Modification:** The boundaries of the stipulated area may be modified by the Authorized Officer, if the ACEC or EEA boundaries are changed.

**Waiver:** This stipulation may be waived, if the Authorized Officer determines that the entire leasehold no longer contains designated ACECs or EEAs.

### No Surface Occupancy

**Resource:** Progeny test sites.

**Stipulation:** Surface occupancy and use are prohibited within progeny test sites.

**Objective:** To protect progeny test sites.

**Exception:** None.

**Modification:** The boundaries of the stipulated area may be modified by the Authorized Officer, if the progeny test site boundaries are changed.

**Waiver:** This stipulation may be waived, if the Authorized Officer determines that the entire leasehold no longer contains progeny test sites.

### No Surface Occupancy

**Resource:** Tyrrell and Dorena Seed Orchards.

**Stipulation:** Surface occupancy and use are prohibited within the Tyrrell and Dorena Seed Orchards.

**Objective:** To protect the Tyrrell and Dorena Seed Orchards.

**Exception:** An exception to this stipulation may be granted by the Authorized Officer, if the operator submits a plan demonstrating that impacts from the proposed action are acceptable or can be adequately mitigated.

**Modification:** The boundaries of the stipulated area may be modified by the Authorized Officer, if the Tyrrell and Dorena Seed Orchard site boundaries are changed.

**Waiver:** This stipulation may be waived, if the Authorized Officer determines that the entire leasehold no longer contains a developed seed orchard.

### No Surface Occupancy

**A 30-day public notice period will be required prior to modification or waiver of this stipulation.**

**Resource:** Visual Resource Management (VRM) Class

**Stipulation:** Surface occupancy and use are prohibited in VRM Class I areas.

**Objective:** To preserve the existing character of the landscape.

**Exception:** An exception to this stipulation may be granted by the Authorized Officer, if the operator submits a plan demonstrating that impacts from the proposed action are acceptable or can be adequately mitigated.

**Modification:** The boundaries of the stipulated area may be modified by the Authorized Officer, if the boundaries of the VRM Class I area are changed.

**Waiver:** This stipulation may be waived by the Authorized Officer, if all VRM Class I areas within the leasehold are reduced to a lower VRM class. Areas reduced to VRM Class II will be subject to the Controlled Surface Use stipulation for visual resources, and areas reduced to VRM Class III will be subject to standard lease stipulations.

### **No Surface Occupancy**

**Resource:** Wildlife - Bald Eagle Nest and Roost Sites and Associated Habitat

**Stipulation:** Surface occupancy and use are prohibited within a quarter mile of known bald eagle nest and roost sites, which have been active within the past seven years and within associated habitat.

**Objective:** To protect bald eagle nesting and roost sites and/or associated habitat in accordance with the Endangered Species Act (ESA), and the Pacific Bald Eagle Recovery Plan.

**Exception:** An exception may be granted by the Authorized Officer, if the operator submits a plan which demonstrates that the proposed action will not affect the bald eagle or its habitat. If the Authorized Officer determines that the action may or will have an adverse effect on the species, the operator may submit a plan demonstrating that the impacts can be adequately mitigated. This plan must be approved by BLM in consultation with the U.S. Fish and Wildlife Service (USFWS).

**Modification:** The boundaries of the stipulated area may be modified, if the Authorized Officer, in consultation with USFWS, determines that portion of the area can be occupied without adversely affecting bald eagle nest and roost sites or associated habitat.

**Waiver:** This stipulation may be waived if the Authorized Officer, in consultation with USFWS, determines that the entire leasehold can be occupied without adversely affecting bald eagle nest or roost sites, associated habitat, or if the bald eagle is declared recovered and is no longer protected under the ESA.

### **No Surface Occupancy**

**Resource:** Wildlife - Marbled Murrelet Nest Sites

**Stipulation:** Surface occupancy and use are prohibited within a quarter mile of known marbled murrelet nest sites, which have been active within the past seven years.

**Objective:** To protect marbled murrelet nesting sites.

**Exception:** An exception may be granted by the Authorized Officer, if the operator submits a plan which demonstrates that the proposed action will not affect the marbled murrelet or its nest site. If the Authorized Officer determines that the action may or will have an adverse effect on the species, the operator may submit a plan demonstrating that the impacts can be adequately mitigated. This plan must be approved by BLM.

**Modification:** The boundaries of the stipulated area may be modified if the Authorized Officer, in consultation with USFWS, determines that portion of the area can be occupied without adversely affecting marbled murrelet nest sites.

**Waiver:** This stipulation may be waived, if the Authorized Officer determines that the entire leasehold can be occupied without adversely affecting marbled murrelet nest sites.

### **Controlled Surface Use**

**Resource:** Soils

**Stipulation:** Prior to disturbance of any suspected unstable slopes or slopes over 60 percent, an engineering/reclamation plan must be approved by the Authorized Officer. Such plan must demonstrate how the following will be accomplished:

- Site productivity will be restored.
- Surface runoff will be adequately controlled.
- Off-site areas will be protected from accelerated erosion, such as rilling, gullying, piping, and mass wasting.
- Water quality and quantity will be in conformance with state and federal water quality laws.
- Surface-disturbing activities will not be conducted during extended wet periods.
- Construction will not be allowed when soils are frozen.

**Objective:** To maintain soil productivity, provide necessary protection to prevent excessive soil erosion on steep slopes, and to avoid areas subject to slope failure, mass wasting, piping, or having excessive reclamation problems.

**Exception:** An exception to this stipulation may be granted by the Authorized Officer, if the operator submits a plan, which demonstrates that the impacts from the proposed action are acceptable or can be adequately mitigated.

**Modification:** The area affected by this stipulation may be modified by the Authorized Officer, if it is determined that portions of the area do not include suspected unstable slopes or slopes over 60 percent.

**Waiver:** This stipulation may be waived by the Authorized Officer, if it is determined that the entire leasehold does not include any suspected unstable slopes or slopes over 60 percent.

### **Controlled Surface Use**

**A 30-day public notice period will be required prior to modification or waiver of this stipulation.**

**Resource:** Visual Resource Management (VRM) Class II.

**Stipulation:** All surface-disturbing activities, semipermanent and permanent facilities in VRM Class II areas may require special design including location, painting and camouflage to blend with the natural surroundings, and meet the visual quality objectives for the area.

**Objective:** To control the visual impacts of activities and facilities within acceptable levels.

**Exception:** None.

**Modification:** None.

**Waiver:** This stipulation may be waived, if the Authorized Officer determines that there are no longer any VRM Class II areas in the leasehold.

### **Additional Leasing Stipulations for the No Action Alternative**

#### **No Surface Occupancy**

**Resource:** Wildlife - Great Blue Heron Rookery

**Stipulation:** Surface occupancy and use are prohibited within known great blue heron rookeries.

**Objective:** To protect great blue heron rookeries.

**Exception:** An exception may be granted by the Authorized Officer, if the operator submits a plan which demonstrates that the proposed action will not affect the great blue heron or its habitat. If the Authorized Officer determines that the action may or will have an adverse effect on the species, the operator may submit a plan demonstrating that the impacts can be adequately mitigated. This plan must be approved by BLM.

**Modification:** The boundaries of the stipulated area may be modified, if the Authorized Officer determines that portion of the area can be occupied without adversely affecting the great blue heron or its habitat.

**Waiver:** This stipulation may be waived, if the Authorized Officer determines that the entire leasehold can be occupied without adversely affecting great blue heron rookeries.

#### **No Surface Occupancy**

**Resource:** Wildlife - Osprey Nest Sites

**Stipulation:** Surface occupancy and use is prohibited within a quarter mile of known osprey nest sites, which have been active within the past seven years.

**Objective:** To protect osprey nest sites.

**Exception:** An exception may be granted by the Authorized Officer, if the operator submits a plan which demonstrates that the proposed action will not affect the osprey or its nest site. If the Authorized Officer determines that the action may or will have an adverse effect on the species, the operator may submit a plan demonstrating that the impacts can be adequately mitigated. This plan must be approved by BLM.

**Modification:** The boundaries of the stipulated area may be modified, if the Authorized Officer determines that portion of the area can be occupied without adversely affecting the osprey or its nest site.

**Waiver:** This stipulation may be waived, if the Authorized Officer determines that the entire leasehold can be occupied without adversely affecting osprey or osprey nest sites.

#### **Timing Limitation**

**Resource:** Wildlife - Elk Concentration Area

**Stipulation:** Surface occupancy and use are prohibited between March 1 and June 30, within designated elk concentration areas.

**Objective:** To protect designated elk concentration areas.

**Exception:** An exception may be granted by the Authorized Officer, if the operator submits a plan which demonstrates that the proposed action will not affect the elk concentration areas. If the Authorized Officer determines that the action may or will have an adverse effect on the species or habitat, the operator may submit a plan demonstrating that the impacts can be adequately mitigated. This plan must be approved by BLM.

**Modification:** The boundaries of the stipulated area may be modified, if the Authorized Officer determines that portions of the area can be occupied without adversely affecting the elk or the elk concentration area. The dates for the timing restriction may be modified if new information indicates that the March 1 to June 30 dates are not valid for the leasehold.

**Waiver:** This stipulation may be waived, if the Authorized Officer determines that the entire leasehold can be occupied without adversely affecting the elk concentration area.

### **Timing Limitation**

**Resource:** Wildlife - Mineral Springs Utilized by the Band-tailed Pigeon

**Stipulation:** Surface occupancy and use are prohibited between March 1 and August 1, within designated mineral springs utilized by the band-tailed pigeon.

**Objective:** To protect designated mineral springs used by the band-tailed pigeon.

**Exception:** An exception may be granted by the Authorized Officer, if the operator submits a plan which demonstrates that the proposed action will not affect the mineral springs or the band-tailed pigeon using those springs. If the Authorized Officer determines that the action may or will have an adverse effect on the species or habitat, the operator may submit a plan demonstrating that the impacts can be adequately mitigated. This plan must be approved by BLM.

**Modification:** The boundaries of the stipulated area may be modified, if the Authorized Officer determines that portions of the area can be occupied without adversely affecting the mineral springs or the band-tailed pigeon. The dates for the timing restriction may be modified if new information indicates that the March 1 to August 1 dates are not valid for the leasehold.

**Waiver:** This stipulation may be waived, if the Authorized Officer determines that the entire leasehold can be occupied without adversely affecting the mineral springs or the band-tailed pigeon.

### **Controlled Surface Use**

**Resource:** Special Recreation Management Area (SRMA).

**Stipulation:** Unless otherwise authorized, drill site construction and access through special recreation management areas within this leasehold will be limited to established roadways.

**Objective:** To protect recreational qualities of the lands involved and recreational facilities, as well as enhance recreational opportunities within the designated boundary of the SRMA.

**Exception:** An exception to this stipulation may be granted by the Authorized Officer, if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated.

**Modification:** The area affected by this stipulation may be modified by the Authorized officer, if it is determined that portions of the area do not include Special Recreation Management Areas.

**Waiver:** This stipulation may be waived by the Authorized Officer, if it is determined that the entire leasehold no longer includes Special Recreational Management Areas.

### **Additional Leasing Stipulation for Alternative A**

#### **Controlled Surface Use**

**Resource:** Riparian Management Areas.

**Stipulation:** Unless otherwise authorized, drill site construction and access through riparian management areas within this leasehold will be limited to established roadways.

**Objective:** To protect riparian vegetation and reduce sedimentation.

**Exception:** An exception to this stipulation may be granted by the Authorized Officer, if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated.

**Modification:** The area affected by this stipulation may be modified by the Authorized Officer, if it is determined that portions of the area do not include riparian areas, flood plains, or water bodies.

**Waiver:** This stipulation may be waived by the Authorized Officer, if it is determined that the entire leasehold no longer includes riparian management areas.

## **Additional Leasing Stipulations for Alternative B**

### **Controlled Surface Use**

**Resource:** Designated Mature and Old Growth Forest Blocks

**Stipulation:** Unless otherwise authorized, drill site construction and access through designated mature and old growth forest blocks within this leasehold will be limited to established roadways.

**Objective:** To protect vegetation to retain and/or restore older forests for seral stage diversity.

**Exception:** An exception to this stipulation may be granted by the Authorized Officer, if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated.

**Modification:** The area affected by this stipulation may be modified by the Authorized Officer, if it is determined that portions of the area do not include designated mature and old growth forest blocks.

**Waiver:** This stipulation may be waived by the Authorized Officer, if it is determined that the entire leasehold no longer includes designated mature and old growth forest blocks.

### **Controlled Surface Use**

**Resource:** Riparian Management Areas.

**Stipulation:** Unless otherwise authorized, drill site construction and access through riparian management areas within this leasehold will be limited to established roadways.

**Objective:** To protect riparian vegetation and reduce sedimentation.

**Exception:** An exception to this stipulation may be granted by the Authorized Officer, if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated.

**Modification:** The area affected by this stipulation may be modified by the Authorized Officer, if it is determined that portions of the area do not include riparian areas, flood plains, or water bodies.

**Waiver:** This stipulation may be waived by the Authorized Officer, if it is determined that the entire leasehold no longer includes riparian management areas.

## **Additional Leasing Stipulations for Alternatives C, D and E**

### **No Surface Occupancy**

**Resource:** Wildlife - Great Blue Heron Rookery

**Stipulation:** Surface occupancy and use is prohibited within known great blue heron rookeries.

**Objective:** To protect great blue heron rookeries.

**Exception:** An exception may be granted by the Authorized Officer, if the operator submits a plan which demonstrates that the proposed action will not affect the great blue heron or its habitat. If the Authorized Officer determines that the action may or will have an adverse effect on the species, the operator may submit a plan demonstrating that the impacts can be adequately mitigated. This plan must be approved by BLM.

**Modification:** The boundaries of the stipulated area may be modified, if the Authorized Officer determines that portion of the area can be occupied without adversely affecting the great blue heron or its habitat.

**Waiver:** This stipulation may be waived, if the Authorized Officer determines that the entire leasehold can be occupied without adversely affecting great blue heron rookeries.

### **No Surface Occupancy**

**Resource:** Wildlife - Osprey Nest Sites

**Stipulation:** Surface occupancy and use is prohibited within a quarter mile of known osprey nest sites, which have been active within the past seven years.



**Objective:** To protect osprey nest sites.

**Exception:** An exception may be granted by the Authorized Officer, if the operator submits a plan which demonstrates that the proposed action will not affect the osprey or its nest site. If the Authorized Officer determines that the action may or will have an adverse effect on the species, the operator may submit a plan demonstrating that the impacts can be adequately mitigated. This plan must be approved by BLM.

**Modification:** The boundaries of the stipulated area may be modified, if the Authorized Officer determines that portion of the area can be occupied without adversely affecting the osprey or its nest site.

**Waiver:** This stipulation may be waived, if the Authorized Officer determines that the entire leasehold can be occupied without adversely affecting osprey or osprey nest sites.

### Timing Limitation

**Resource:** Wildlife - Mineral Springs Utilized by the Band-tailed Pigeon

**Stipulation:** Surface occupancy and use are prohibited between March 1 and August 1, within an area with mineral springs utilized by the band-tailed pigeon.

**Objective:** To protect lands utilized by the band-tailed pigeon.

**Exception:** An exception may be granted by the Authorized Officer, if the operator submits a plan which demonstrates that the proposed action will not affect the mineral springs or the band-tailed pigeon using those springs. If the Authorized Officer determines that the action may or will have an adverse effect on the species or habitat, the operator may submit a plan demonstrating that the impacts can be adequately mitigated. This plan must be approved by BLM.

**Modification:** The boundaries of the stipulated area may be modified, if the Authorized Officer determines that portions of the area can be occupied without adversely affecting the mineral springs or the band-tailed pigeon. The dates for the timing restriction may be modified, if new information indicates that the March 1 to August 1 dates are not valid for the leasehold.

**Waiver:** This stipulation may be waived, if the Authorized Officer determines that the entire leasehold can be occupied without adversely affecting the mineral springs or the band-tailed pigeon.

### Controlled Surface Use

**Resource:** Riparian Management Areas.

**Stipulation:** Unless otherwise authorized, drill site construction and access through riparian management areas within this leasehold will be limited to established roadways.

**Objective:** To protect riparian vegetation and reduce sedimentation.

**Exception:** An exception to this stipulation may be granted by the Authorized Officer, if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated.

**Modification:** The area affected by this stipulation may be modified by the Authorized Officer, if it is determined that portions of the area do not include riparian areas, flood plains, or water bodies.

**Waiver:** This stipulation may be waived by the Authorized Officer, if it is determined that the entire leasehold no longer includes riparian management areas.

### Controlled Surface Use

**Resource:** Special Recreation Management Area (SRMA).

**Stipulation:** Unless otherwise authorized, drill site construction and access through special recreation management areas within this leasehold will be limited to established roadways.

**Objective:** To protect recreational qualities of the lands involved and recreational facilities, as well as enhance recreational opportunities within the designated boundary of the SRMA.

**Exception:** An exception to this stipulation may be granted by the Authorized Officer, if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated.

**Modification:** The area affected by this stipulation may be modified by the Authorized officer, if it is determined that portions of the area do not include Special Recreation Management Areas.

**Waiver:** This stipulation may be waived by the Authorized Officer, if it is determined that the entire leasehold no longer includes Special Recreational Management Areas.

## **Additional Leasing Stipulation for Alternative C**

### **Controlled Surface Use**

**Resource:** Old Growth Restoration and Retention Blocks

**Stipulation:** Unless otherwise authorized, drill site construction and access through old growth restoration and retention blocks within this leasehold will be limited to established roadways.

**Objective:** To protect vegetation, to retain and/or restore old growth forest.

**Exception:** An exception to this stipulation may be granted by the Authorized Officer, if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated.

**Modification:** The area affected by this stipulation may be modified by the Authorized Officer, if it is determined that portions of the area do not include old growth restoration and retention blocks.

**Waiver:** This stipulation may be waived by the Authorized Officer, if it is determined that the entire leasehold no longer includes old growth restoration and retention blocks.

## **Additional Leasing Stipulation for Alternative D**

### **Controlled Surface Use**

**Resource:** Habitat Conservation Areas for the Northern Spotted Owl.

**Stipulation:** Unless otherwise authorized, drill site construction and access through habitat conservation areas within this leasehold will be limited to established roadways.

**Objective:** To protect habitat of the northern spotted owl.

**Exception:** An exception to this stipulation may be granted by the Authorized Officer, if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated.

**Modification:** The area affected by this stipulation may be modified by the Authorized Officer, if it is determined that portions of the area do not include habitat conservation areas.

**Waiver:** This stipulation may be waived by the Authorized Officer, if it is determined that the entire leasehold no longer includes habitat conservation areas, after consultation with the U.S. Fish and Wildlife Service.

## **Additional Leasing Stipulation for Alternative E**

### **Controlled Surface Use**

**Resource:** Forest stands older than 150 years.

**Stipulation:** Unless otherwise authorized, drill site construction and access through forest stands older than 150 years within this leasehold will be limited to established roadways.

**Objective:** To protect older forest stands.

**Exception:** An exception to this stipulation may be granted by the Authorized Officer, if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated.

**Modification:** The area affected by this stipulation may be modified by the Authorized Officer, if it is determined that portions of the area do not include old forest stands.

**Waiver:** This stipulation may be waived by the Authorized Officer, if it is determined that the entire leasehold no longer includes old forest stands.

## **Additional Leasing Stipulations for the Preferred Alternative**

### **No Surface Occupancy**

**Resource:** Wildlife - Great Blue Heron Rookery

**Stipulation:** Surface occupancy and use are prohibited within known great blue heron rookeries.

**Objective:** To protect great blue heron rookeries.

**Exception:** An exception may be granted by the Authorized Officer, if the operator submits a plan which demonstrates that the proposed action will not affect the great blue heron or its habitat. If the Authorized Officer determines that the action may or will have an

adverse effect on the species, the operator may submit a plan demonstrating that the impacts can be adequately mitigated. This plan must be approved by BLM.

**Modification:** The boundaries of the stipulated area may be modified, if the Authorized Officer determines that portion of the area can be occupied without adversely affecting the great blue heron or its habitat.

**Waiver:** This stipulation may be waived, if the Authorized Officer determines that the entire leasehold can be occupied without adversely affecting great blue heron rookeries.

### **No Surface Occupancy**

**Resource:** Wildlife - Osprey Nest Sites

**Stipulation:** Surface occupancy and use is prohibited within a quarter mile of known osprey nest sites, which have been active within the past seven years.

**Objective:** To protect osprey nest sites.

**Exception:** An exception may be granted by the Authorized Officer, if the operator submits a plan which demonstrates that the proposed action will not affect the osprey or its nest site. If the Authorized Officer determines that the action may or will have an adverse effect on the species, the operator may submit a plan demonstrating that the impacts can be adequately mitigated. This plan must be approved by BLM.

**Modification:** The boundaries of the stipulated area may be modified, if the Authorized Officer determines that portion of the area can be occupied without adversely affecting the osprey or its nest site.

**Waiver:** This stipulation may be waived, if the Authorized Officer determines that the entire leasehold can be occupied without adversely affecting osprey or osprey nest sites.

### **Timing Limitation**

**Resource:** Wildlife - Mineral Springs Utilized by the Band-tailed Pigeon

**Stipulation:** Surface occupancy and use are prohibited between March 1 and August 1, within an area with mineral springs utilized by the band-tailed pigeon.

**Objective:** To protect lands utilized by the band-tailed pigeon.

**Exception:** An exception may be granted by the Authorized Officer, if the operator submits a plan which demonstrates that the proposed action will not affect the mineral springs or the band-tailed pigeon using those springs. If the Authorized Officer determines that the action may or will have an adverse effect on the species or habitat, the operator may submit a plan demonstrating that the impacts can be adequately mitigated. This plan must be approved by BLM.

**Modification:** The boundaries of the stipulated area may be modified, if the Authorized Officer determines that portions of the area can be occupied without adversely affecting the mineral springs or the band-tailed pigeon. The dates for the timing restriction may be modified, if new information indicates that the March 1 to August 1 dates are not valid for the leasehold.

**Waiver:** This stipulation may be waived, if the Authorized Officer determines that the entire leasehold can be occupied without adversely affecting the mineral springs or the band-tailed pigeon.

### **Controlled Surface Use**

**Resource:** Riparian Management Areas.

**Stipulation:** Unless otherwise authorized, drill site construction and access through riparian management areas within this leasehold will be limited to established roadways.

**Objective:** To protect riparian vegetation and reduce sedimentation.

**Exception:** An exception to this stipulation may be granted by the Authorized Officer, if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated.

**Modification:** The area affected by this stipulation may be modified by the Authorized Officer, if it is determined that portions of the area do not include riparian areas, flood plains, or water bodies.

**Waiver:** This stipulation may be waived by the Authorized Officer, if it is determined that the entire leasehold no longer includes riparian management areas.

### **Controlled Surface Use**

**Resource:** Special Recreation Management Area (SRMA).

**Stipulation:** Unless otherwise authorized, drill site construction and access through special recreation management areas within this leasehold will be limited to established roadways.

**Objective:** To protect recreational qualities of the lands involved and recreational facilities, as well as enhance recreational opportunities within the designated boundary of the SRMA.

**Exception:** An exception to this stipulation may be granted by the Authorized Officer, if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated.

**Modification:** The area affected by this stipulation may be modified by the Authorized officer, if it is determined that portions of the area do not include Special Recreation Management Areas.

**Waiver:** This stipulation may be waived by the Authorized Officer, if it is determined that the entire leasehold no longer includes Special Recreational Management Areas.

### **Controlled Surface Use**

**Resource:** Old Growth Emphasis Area and Connectivity Areas

**Stipulation:** Unless otherwise authorized, drill site construction and access through old growth emphasis area and connectivity areas within this leasehold will be limited to established roadways.

**Objective:** To protect vegetation, to retain and/or restore old growth forest.

**Exception:** An exception to this stipulation may be granted by the Authorized Officer, if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated.

**Modification:** The area affected by this stipulation may be modified by the Authorized Officer, if it is determined that portions of the area do not include old growth emphasis area and connectivity areas.

**Waiver:** This stipulation may be waived by the Authorized Officer, if it is determined that the entire leasehold no longer includes old growth emphasis area and connectivity areas.

## **Appendix Attachment 2-K.1**

### **Locatable Minerals Surface Management 43 CFR 3809 Standards for Exploration, Mining, and Reclamation on the Eugene District**

The following operational guidelines for mining activities have been compiled to assist the miner in complying with the 43 CFR 3809 regulations, which apply to all mining operations on BLM administered lands in the Eugene District. The manner in which the necessary work is to be done will be site specific and all of the following standards may not apply to each mining operation. It is the mining claimant's and operator's responsibility to avoid "unnecessary or undue degradation," and they must perform all necessary reclamation work. Refer to 43 CFR 3809 regulations for general requirements. The BLM will provide site specific guidelines for some mining proposals.

#### **Construction and Mining**

##### **Vegetation Removal**

Remove only that vegetation which is in the way of mining activities. An application must be submitted to the Authorized Officer pursuant to 43 CFR 3821.4 describing the proposed use of merchantable timber for mining purposes. Merchantable timber may not be used for firewood. The Eugene BLM office recommends that small trees (less than 6 inches dbh) and shrubs be lopped and scattered, or shredded for use as mulch. Trees over 12 inches breast height (dbh) are to be bucked and stacked in an accessible location unless they are needed for the mining operation.

##### **Firewood**

Firewood permits may be issued to the operator from designated firewood areas or from special request areas at the BLM's discretion.

##### **Topsoil**

All excavations should have all productive topsoil (usually the top 12 to 18 inches) first stripped, stockpiled and protected from erosion for use in future reclamation. This also includes removal of topsoil before the establishment of mining waste dumps and tailings ponds, if the waste material will be left in place during reclamation.

### **Roads**

Existing roads and trails should be used as much as possible. Temporary roads are to be constructed to a minimum width and with minimum cuts and fills. All roads shall be constructed so as not to negatively impact slope stability.

### **Wetlands**

When proposed mining activities will fill or alter wetland areas, the operator must contact the Department of the Army, Corps of Engineers for the appropriate permit. A copy of the permit must be submitted to the BLM geologist in conjunction with a Notice or Plan of Operations.

### **Water Quality**

When mining will be in or near bodies of water, or sediment (or other pollutants) will be discharged, contact the Department of Environmental Quality. It is the operator's responsibility to obtain any needed suction dredging, stream bed alteration, or water discharge permits required by the DEQ or other State agencies. Copies of such permits shall be provided to the BLM geologist when a Notice or Plan of Operations is filed.

### **Claim Monuments**

Due to a new State law, plastic pipe is no longer allowed for claim staking in Oregon. It is BLM policy that mining claims with existing plastic pipe monuments should have all openings permanently closed. Upon loss or abandonment of the claim, all plastic pipe must be removed from the public lands and, when old markers are replaced during normal claim maintenance, they are to be either wood posts or stone or earth mounds, consistent with State law.

### **Drill Sites**

Exploratory drill sites should be located next to or on existing roads when possible without blocking public access. When drill sites must be constructed, the size of the disturbance shall be as small as possible in order to conduct drilling operations.

### **Dust and Erosion Control**

While in operation, and during periods of temporary shut-down, exposed ground surfaces susceptible to erosion will need to be protected. This can be accomplished with seeding, mulching, installation of water diversions, and routine watering of dust producing surfaces.

### **Fire Safety**

All State fire regulations must be followed, including obtaining a campfire permit or blasting permit, if needed. All internal combustion engines must be equipped with approved spark arresters.

### **Safety and Public Exclusion**

Under Public Law 167, the Government has the right to dispose and manage surface resources (including timber) on mining claims located after July 23, 1955. These rights are limited to the extent that they do not endanger or materially interfere with any phase of an active mining operation or uses reasonably incident thereto.

The general public may not be excluded from the mining claim. In the interest of safety, the general public can be restricted only from specific dangerous areas (underground mines, open pits or heavy equipment) by erecting fences, gates and warning signs. It is the operator's responsibility to protect the public from mining hazards. Gates or road blocks may be installed on existing or proposed roads only with BLM approval.

### **Sewage**

Self-contained or chemical toilets are to be used at active mining operations and their contents disposed of at approved dump stations. Outhouses and uncontained pit toilets are not allowed.

### **Occupancy**

Occupancy or camping on public land, in excess of 14 days per calendar year, must be reasonably incident to and required for actual continuous mining or diligent exploration operations and will require either a Notice or Plan of Operations.

Only those persons actively involved in the mining operation or exploration work will be allowed to stay on the claim beyond the 14-day camping limit. Active operations are defined as a 40-hour work week (between 9 a.m. and 5 p.m., Monday through Friday). If operations cannot be actively pursued due to high fire danger in forested areas, then occupancy of the mine site will not be permitted.

Due to high water levels in streams and creeks during the fall and winter months, placer mining with hand tools and suction dredges historically have been too sporadic to warrant full time occupancy at mine sites. Therefore, mining claim occupancy for such operations

is only permitted between May 15 to November 15. Other out-of-stream mining ventures may warrant occupancy beyond November 15, and will be evaluated on a case-by-case basis.

#### **Structures**

Structures including, but not limited to, plastic covered shelters, wooden or metal shacks or buildings will not be allowed for exploratory operations or for suction dredge mining operations. For other types of commercial operations, the need for structures will be evaluated on a case-by-case basis and, if they are found necessary for the mining operation, they should be temporary in nature.

#### **Pets**

If the operator proposes to have dogs or other pets at the site, all animals must be leashed. Under no circumstances are pets to be allowed to run free at mining sites or associated camp sites.

#### **Suction Dredging**

Filing either Notice or Plan of Operations is required on all suction dredge operations regardless of the size of the equipment. The operator must have the applicable Department of Environmental Quality suction dredge permit prior to starting work, and a copy should be submitted to the District Geologist.

#### **Tailings Ponds**

Settling ponds must be used to contain sediment and any discharge into creeks must meet the Department of Environmental Quality standards.

#### **Gates**

Gates restricting public access onto a mine site will only be considered in such cases where there is a large area safety hazard created by the mining activity. Fences (rather than gates) shall be utilized to protect the public from hazards related to small excavations, tunnels, and shafts.

#### **Trash & Garbage**

Trash, garbage, used oil, etc. must be removed from public land and disposed of properly. Do not bury any trash, garbage or hazardous wastes on public lands. Accumulations of trash, debris, or inoperable equipment on public lands is viewed as unnecessary degradation and will not be tolerated.

#### **Cultural and Paleontological Resources**

Operators shall not knowingly alter, injure, or destroy any scientifically important paleontological (fossil) remains or any historical or archaeological site, structure, or object on federal lands. The operator shall immediately bring to the attention of the Authorized Officer, any paleontological (fossil) remains or any historical or archaeological site, structure, or object that might be altered or destroyed by exploration or mining operations, and shall leave such discovery intact until told to proceed by the Authorized Officer. The Authorized Officer shall evaluate the discovery, take action to protect or remove the resource, and allow operations to proceed within 10 working days.

#### **Threatened and Endangered Species of Plants and Animals**

Operators shall take such action as may be needed to prevent adverse impacts to threatened or endangered species of plants and animals and their habitat that may be affected by operations, as stipulated in guidelines developed through consultation with the U.S. Fish and Wildlife Service. Special status species (Federal Candidate/Bureau Sensitive) plants and animals, and their habitat will be identified by the Authorized Officer, and shall be avoided wherever possible.

#### **Reclamation**

Reclamation of all disturbed areas must be performed concurrently or as soon as possible after mining permanently ceases. Reclamation shall include, but shall not be limited to: 1) saving topsoil for final application after reshaping disturbed areas; 2) measures to control erosion, landslides, and water runoff; 3) measures to isolate, remove or control toxic materials; 4) reshaping the area disturbed, applying topsoil, and revegetating disturbed areas where reasonably practicable; and 5) rehabilitation of fisheries and wildlife habitat. When reclamation of the disturbed area has been completed, except to the extent necessary to preserve evidence of mineralization, the BLM must be notified so that an inspection of the area can be made.

#### **Equipment and Debris**

All mining equipment, vehicles, structures, debris and trash must be removed from the public lands during periods of nonoperation and/or at the conclusion of mining, unless authorization from BLM is given to the operator or claimant in writing.

### **Backfilling and Recontouring**

The first steps in reclaiming a disturbed site are backfilling excavations and reducing high walls, if feasible. Coarse rock material should be replaced first, followed by medium sized material, with fine materials to be placed on top. Recontouring means shaping the disturbed area so that it will blend in with the surrounding lands and minimize the possibility of erosion, and facilitate revegetation.

### **Seedbed Preparation**

Recontouring should include preparation of an adequate seedbed. This is accomplished by ripping or disking compacted soils to a depth of at least 6 inches in rocky areas and at least 12 inches in less rocky areas. This should be done following the contour of the land to limit erosion. All stockpiled settling pond fines, and then topsoil, are spread evenly over the disturbed areas. Further details are provided in BLM 3042 Manual and Reclamation Handbook.

### **Fertilizer**

Due to the poor nutrient value of mined soils, it is important to use fertilizer to ensure maximum yield from the seeding mixture. The fertilizer (16-16-16) should be spread at the rate of 200 lbs/acre, but not allowed to enter streams or bodies of water.

### **Seeding**

BLM approved seeding prescription must be used to provide adequate revegetation for erosion control, wildlife habitat, and productive secondary uses of public lands. Seeding must be done in September or October to ensure that seed is in the ground prior to the first significant winter rains.

Broadcast seeding is preferable on smaller sites. When using a whirlybird type seed spreader, it is important to keep the different seeds well mixed to achieve even seed distribution. For the best results, a drag harrow should be pulled over the seeded area to cover the seed before mulching. Hydroseeding can be used on critical sites for rapid cover and erosion control on cut banks, fill slopes and any other disturbed areas.

### **Tree Replacement**

Replacement of destroyed trees may be necessary with the planting of seedlings or container stock.

### **Mulch**

As directed by the BLM, during review of the Notice of Plan of Operations, the disturbed area may require mulching during interim or final reclamation procedures. Depending on site conditions, the mulch may

need to be punched, netted, or blown on with a tackifier to hold it in place. In some cases, erosion control blankets may be cost effective for use.

### **Roads**

After mining is completed, all new roads shall be reclaimed, unless otherwise specified by the BLM. High walls and cutbanks are to be knocked down or backfilled to blend with the surrounding landscape. Remove all culverts from drainage crossings and cut back the fill to the original channel. The roadbed should be ripped to a minimum depth of 12 inches to reduce compaction and provide a good seedbed. The road must then be fertilized, seeded and mulched if necessary. When necessary, water bars are to be used to block access and provide drainage.

### **Tailings Ponds**

The ponds should be allowed to dry out and the sediments removed and spread with the topsoil, unless the sediments contain toxic materials. If the ponds contain toxic materials, a plan will be developed to identify, dispose, and mitigate effects of the toxic materials. If necessary, a monitoring plan will also be implemented. The ponds should then be backfilled and reclaimed.

## Appendix Attachment 2-K.2

### Guidelines for Development of Salable Mineral Resources in the Eugene District

#### Proposed Operations

All proposed salable mineral developments, and any exploration that involves surface disturbance, should have operation and reclamation plans approved by the Authorized Officer. All proposals will undergo the appropriate level of review and compliance with the National Environmental Policy Act.

#### Quarry Design

Due to steep terrain in the operating area, most quarry developments would require a series of benches to effectively maximize the amount of mineral materials to be removed in a safe manner. In most cases, bench height should not exceed 40 feet. If the bench would be used by bulldozers to access other parts of the quarry, the width of the bench should be at least 25 feet. If the bench will not be used by equipment, then this width can be reduced to approximately 10 feet.

Clearing of timber and brush should be planned at least 10 feet beyond the edge of the excavation limit. Most often the brush would be piled and burned at the site, or scattered nearby.

If at all possible, all topsoil and overburden should be stockpiled and saved for eventual quarry site reclamation. These piles may need to be stabilized by mulching or seeding in order to minimize erosion during the winter months.

As a standard procedure, the excavation of the quarry floor should be designed with an outslope of approximately two percent in order to provide for adequate drainage of the floor. Compliance with this design should be made a requirement of all operators at the site.

#### Operating Procedures

Where practicable, the following requirements should be made a part of every contract or permit providing for the use of mineral material sites on the District:

- Oversized boulders shall not be wasted, but shall be broken and utilized concurrently with the excavated material.
- The operator shall comply with local and State safety codes covering quarry operations, warning signs and traffic control. All necessary permits must be obtained from State and County agencies.
- Use of the site for equipment storage and stockpiling rock material is allowed for the duration of the contract or permit. Use of the site beyond that time would be authorized under a temporary use permit.
- All topsoil shall be stockpiled or windrowed as appropriate for use in reclamation.
- Prior to abandonment, all material sites will be graded to conform with the surrounding topography. Topsoil will be utilized to create a medium for revegetation. Reseeding and tree planting, if necessary, will be done as prescribed by the Authorized Officer. Access roads no longer needed by the BLM will be abandoned and reclaimed as directed by the Authorized Officer.



# Appendix 2-L

## Timber Harvest and Management Details, Preferred Alternative

**Table 2-T-1 - Preferred Alternative Harvest by Sustained Yield Unit (SYU)  
(mmcf/Decade and bd. ft./cu. ft. Ratio)**

SYU	Decade									
	1st. MMCF	BF/CF Ratio	2nd. MMBF	BF/CF Ratio	3rd. MMCF	BF/CF Ratio	5th. MMCF	BF/CF Ratio	10th. MMCF	BF/CF Ratio
Upper Willamette	123.1	6.02	123.1	5.95	123.1	5.82	123.1	5.79	124.9	6.13
Siuslaw	75.6	6.00	74.8	5.91	75.6	5.90	75.7	5.79	76.3	6.28

**Table 2-T-2 - Expected Preferred Alternative Harvest by Sustained Yield Unit (SYU)  
(Acres and mmcf/decade)**

SYU	Decade									
	1st.		2nd.		3rd.		5th.		10th.	
	Acres	Vol.	Acres	Vol.	Acres	Vol.	Acres	Vol.	Acres	Vol.
Upper Willamette:										
Old Growth Emphasis Areas										
Regeneration harvest	774	5.6	1,244	9.7	1,466	11.5	1,036	10.8	1,562	18.4
Density management	3,722	8.8	4,833	11.6	7,471	18.1	12,806	35.9	8,990	27.3
Connectivity Areas - There are no connectivity acres in the Upper Willamette SYU										
General Forest Mgmt. Areas										
Regeneration harvest	10,913	101.7	10,586	93.9	11,803	85.2	6,017	70.1	4,498	56.6
Commercial thinning	3,900	6.6	4,651	7.8	5,180	8.3	3,715	6.2	12,198	20.3
Siuslaw SYU:										
Old Growth Emphasis Areas										
Regeneration harvest*	643	5.6	1,150	11.1	816	7.4	316	2.5	1,044	11.1
Density management	8,049	17.7	2,861	6.7	9,591	21.2	11,380	29.3	7,099	21.4
Connectivity Areas										
Regeneration harvest	1,618	9.2	1,684	12.9	2,186	17.2	460	2.2	987	8.3
Density management	4,492	9.7	1,927	4.2	5,478	11.8	3,867	9.8	2,204	5.6
General Forest Mgmt. Areas										
Regeneration harvest	3,172	29.7	3,771	37.9	1,823	15.5	2,367	29.5	1,354	23.0
Commercial thinning	1,956	3.3	1,183	1.9	1,576	2.6	1,597	2.5	3,830	6.1

\* Regeneration harvest includes hardwood conversion acres.

Table 2-T-3 - Preferred Alternative Assumed Stand Treatments by Decade (Acres)

Treatment	Decade				
	1st.	2nd.	3rd.	5th.	10th.
Plant Genetic Stock	16,672	18,489	17,924	10,237	9,529
Competing Vegetation/ Control	9,253	10,261	9,948	5,682	5,289
Precommercial Thinning	27,572	29,042	8,522	15,844	8,519
Fertilization	52,420	59,484	62,312	41,535	22,235

# Appendix 2-M

## Resource Management Plan Monitoring

### Introduction

The BLM planning regulations (43 CFR 1610.4-9) call for monitoring and evaluating Resource Management Plans (RMPs) at appropriate intervals. The purposes of monitoring and evaluating the RMP are to:

1. Track progress of RMP implementation and assure that activities are occurring in conformance with the plan (Implementation Monitoring).
2. Determine if activities are producing the expected results and meeting stated objectives (Effectiveness Monitoring).
3. Determine if activities are causing the effects identified in the EIS (Validation).

The implementation of the Eugene District RMP will be monitored to ensure that management actions are being implemented and are meeting their intended purposes. Specific management actions arising from proposed activity plan decisions will be compared with RMP objectives to ensure consistency with the intent of the plan. Activity plan decisions may also, however, include monitoring plans of their own. Such plans are addressed in this RMP monitoring plan only where RMP monitoring and activity plan monitoring overlap.

Some effectiveness monitoring and most validation can only be accomplished by formal research. RMP related research is discussed in Chapter 2 of the RMP/EIS.

Monitoring will be conducted as specified in the following sections of this Appendix. Monitoring results will be reported in an "Annual Program Summary," which will be published starting the second year following initial implementation of this RMP. The annual program summary will serve as a report to the public, track and assess the progress of plan implementation, and state the findings made through monitoring as we determine it:

- management actions are resulting in satisfactory progress toward achieving RMP objectives;
- actions are consistent with current policy;
- original assumptions are valid and impacts are within the range predicted, given the reliability of the predictions;

- mitigation and corrective measures are satisfactory and serving their purposes;
- the RMP is still consistent with the plans and policies of State or local government, other Federal agencies, and Indian tribes;
- new data is available that could result in alteration or amendment of the plan;
- NEPA requirements are being met; and,
- compliance is being achieved on actions authorized by BLM.

The District is responsible for the collection, compilation and analysis of the data gained through monitoring activities. Resource Areas will assist the District by reporting their findings and recommendations for consolidation and publication in the "Annual Program Summary."

Representative areas, such as a watershed, may be selected and established as a monitoring area. Intensive monitoring and data collection efforts for certain resources may be made in these areas as opposed to collecting general data over the entire geographic area, which is often very expensive and provides less useful information. Attempts would be made to select representative areas that coincide for several resources.

All monitoring will follow written standards for the following, where relevant: sampling design, parameters to be monitored, analytical techniques, statistical methods for data analysis, and reporting units.

Involvement of other interested parties, including State agencies, in monitoring of plan implementation will be encouraged. This may entail coordinated monitoring efforts with parties who are able to fund their own participation in such efforts.

The monitoring plan is not static. During the life of the RMP, the monitoring plan itself will be periodically evaluated to ascertain that the monitoring questions and standards remain relevant, and fine-tuned as appropriate. BLM cooperation in the U.S. Environmental Protection Agency's Environmental Monitoring and Assessment Program (still under development) may specifically lead to revision of some elements of this plan.

## Air Quality

### Expected Future Conditions and Outputs

Compliance with the Oregon Smoke Management Plan and the State Implementation Plan, to help meet established air quality standards in accordance with the Clean Air Act.

### Monitoring Questions

1. Are BLM prescribed fires contributing to intrusions into Class I areas? How frequently do intrusions occur?
2. Of intrusions that the BLM is reported to be responsible for, what was the cause and what can be done to minimize future occurrences in the future?

### Standards

1. Using the Oregon Smoke Management Annual Report and any BLM smoke surveillance reports, the number of intrusions BLM certainly or possibly contributed to will be determined annually. The percentage of total units burned that contributed (or might have) to such intrusions will be calculated.
2. Reported intrusions will be individually investigated to determine the most probable cause and establish possible corrective measures.

### Costs

An estimated \$3,000 to \$5,000 Districtwide annually.

## Soil Productivity

### Expected Future Conditions and Outputs

On forestland managed for timber production, soils will be managed to maintain long-term productivity by avoiding or minimizing compaction/displacement, erosion, and organic matter loss.

### Monitoring Question

Are management practices maintaining soil productivity to the extent expected in the EIS?

## Standards

There are three components of the soil resource that will be monitored to answer the above stated question.

1. Compaction
  - a. Whether practices established in the RMP to achieve insignificant compaction were implemented and effective will be determined for each unit that had a compaction concern.
  - b. Compaction is the primary concern when considering changes in soil physical properties. Monitoring of compaction should be accomplished on all units judged to be sensitive for compaction. Compaction should be assessed by establishing post treatment transect (Howes et al., 1983) and determining compacted areas. Results will be reported in percent of area compacted.
2. Erosion
  - a. Whether practices established in the RMP to avoid or minimize erosion were implemented and effective will be determined for each unit that had an erosion concern.
  - b. Annually two harvest units per Resource Area, judged to be the most sensitive for erosion (surface or mass wasting), will be monitored immediately after harvest or site preparation and again five years later. Initial information will be qualitative and obtained by visual, professional estimate. If the initial information indicates unacceptable erosion rates, the soil scientist should use a standard procedure to quantify the rate of erosion.
3. Organic Material/Nutrient Status
  - a. Whether practices established in the RMP to conserve site duff layers and organic material were implemented and effective will be determined for each unit that had a nutrition or plant available water concern.
  - b. Two harvest units per Resource Area, judged to be the most sensitive to organic matter removal, should be monitored for organic matter removal by a qualitative, visual, and professional estimate.

### Costs

An estimated \$12,000 Districtwide annually.

## Water Resources

### Expected Future Conditions and Outputs

Water resources would be managed to protect, maintain, or improve the quality of water resources, stream ecosystems, and watershed values. Water quality would be maintained or enhanced through design of site-specific Best Management Practices (BMPs) in accordance with the Oregon Nonpoint Source Management Plan and the Memorandum of Agreement with Oregon Department of Environmental Quality. BMPs would be implemented, evaluated, monitored and adjusted as necessary to comply with basin specific water quality criteria.

### Monitoring Questions

1. Are site-specific Best Management Practices (BMPs) incorporated in project design and correctly applied?
2. Are applied BMPs achieving water resource objectives?
3. Are applied BMPs effective in maintaining or improving water quality consistent with basin specific water quality criteria for protection of recognized beneficial uses?
4. Are watershed cumulative effects at or below the levels anticipated in the RMP/EIS and project specific Environmental Assessments (EAs)?
5. Are objectives for the biological, chemical, and physical functions of the stream ecosystem being met?

### Standards

1. All management activities utilizing BMPs would be monitored to determine whether BMPs are incorporated in the project design and correctly applied. This would be accomplished primarily through contract administration.
2. An average of two timber sales or other surface disturbing activities per Resource Area per year would be monitored to determine whether the BMP objectives for water resources are being met.

3. Monitoring to determine effectiveness of BMPs in meeting water quality criteria would be initiated on at least one timber sale or other surface/riparian disturbing activity per year and would continue for approximately four years.

All water bodies that are within or adjacent to an area treated with herbicides and support a beneficial use would be monitored to determine effectiveness of BMPs in meeting water quality criteria.

Effectiveness monitoring would be designed to achieve statistical validity and would incorporate established standard monitoring methods. Selection of locations and water quality parameters for BMP effectiveness monitoring would consider beneficial use(s) likely to be affected, BMPs being applied, and water quality criteria necessary to protect beneficial use(s). All new and untested BMPs would be monitored for effectiveness.

The three established baseline watersheds would continue to be monitored throughout the planning period. Activities would be restricted in other small watersheds when they are being used to provide baseline data.

4. The watershed condition index used in the RMP/EIS would be recalculated for representative watersheds in the third, fifth, and seventh year of this plan to determine if cumulative effect levels are within the predicted range. Cumulative effects for small watersheds that will be analyzed in each Environmental Assessment would be recalculated within four years. The recalculation may be done as part of another Environmental Assessment.
5. Six stream segments of approximately 1 mile in length would be monitored each year before and after management activities occurred to determine whether stream ecosystem objectives are being met. This would involve intensive monitoring to identify levels of biological, chemical, and physical stream functions.

### Costs

An estimated \$65,000 Districtwide annually, which includes 10-year amortization of \$50,000 in equipment.

## Biological Diversity

### Expected Future Conditions and Outputs

Contribute to maintenance of diversity of plant and animal species in western Oregon. The vegetative diversity of existing managed forest stands would increase as to species, canopy layers and dead components. Landscape level (spatial) diversity on BLM administered lands would be maintained or improved.

### Monitoring Questions

What are the effects of BLM management on:

1. Acres of all seral stages?
2. Size and spatial distribution of old growth blocks?
3. Retention of dead and down material?
4. Number of canopy layers?
5. Tree species composition in managed stands?

Monitoring for several other topics will also address elements of biological diversity: for example, special habitats, special status species, riparian zones, retention of wildlife trees.

### Standards

1. The baseline from BLM's 1988 inventory, as updated to 1992, will be identified. Using Timber Sale Information System records and records of losses due to natural disturbance, old growth forest reductions will be monitored at five-year intervals. Using the Operations Inventory update of approximately year 2000, acres of all seral stages will be recalculated.
2. Using the Operations Inventory update of approximately year 2000, size and spatial distribution of old growth blocks will be calculated and compared to analysis in the 1993 RMP/EIS.
3. Twenty percent of both regeneration harvest and density management timber sales will be examined within a year after harvest and site preparation to determine number of dead and down logs by diameter class, length, and distribution. Through the decadal forest inventory, the trends of dead and down material will be identified on both managed and unmanaged stands.

4. Acres of density management accomplished will be identified in annual work plan accomplishment reports. Through the decadal forest inventory, the number of canopy layers in established stands subject to management actions during the life of the plan will be identified.
5. First, third and fifth year stocking surveys will be used to identify tree species composition. Through the decadal forest reinventory, species composition changes in established stands subject to management actions during the life of the plan will be identified.

<b>Costs - Ten Year:</b>	Item 1 - \$ 2,000
	Item 2 - \$ 1,000
	Item 3 - \$60,000
	Item 5 - \$60,000

An estimated \$12,300 Districtwide annually

Item 1 costs estimated at \$1,000 Districtwide every five years. Item 2 costs estimated at \$1,000 Districtwide. Item 3 can be accomplished concurrent with similar monitoring for retention of wildlife trees, at an annual cost of \$2,000 per Resource Area; its second part would be included in decadal forest inventory costs and difficult to separate. Item 4 would negligibly affect normal data maintenance and inventory costs. Item 5 costs estimated at \$2,000 per Resource Area annually, in addition to traditional costs of stocking surveys.

## Riparian Zones

### Expected Future Conditions and Outputs

Maintenance of largely intact riparian management areas (RMAs) along each side of all perennial streams.

Maintenance or improvement of habitat conditions (i.e., numbers of green trees, snags, and downed logs) within riparian management areas that provide suitable habitat for long-term productivity of fish, wildlife, and priority plants.

### Monitoring Questions

1. What is the average width of RMAs established on the ground and retained following timber harvest and site preparation activities? How does it compare to the widths anticipated in the EIS?
2. Are sufficient numbers of mature conifers, snags, and downed trees retained within riparian buffers after harvest?

3. Are RMP approved disturbances (e.g., yarding corridors) within riparian areas no more than 25 percent of stream length with RMAs in a unit? Did the logging system achieve its objective where disturbance was allowed?

## Standards

- 1 and 2. Twenty percent of timber sales within each Resource Area will be examined prior to harvest and site preparation and re-examined following harvest to determine whether buffers were retained and their average widths. Timber sale units within watersheds identified for fish habitat or water quality monitoring will be given preference. Average widths will be determined by measurement at approximately equidistant points along the affected stream reach within each sale unit. Trees, snags and downed woody material retained within buffers will be counted before and after timber harvest and site preparation according to the species and size class. Ground cover of herbs and shrubs will be measured in transects or one-square-meter plots.
3. In conjunction with experimental drainage established for fish habitat monitoring, one undisturbed (or essentially so) riparian study site will be established within a representative watershed established within each resource area. The study site will be used as a baseline from which to compare riparian areas impacted by timber harvest related activities. The changes in habitat conditions will be monitored once during the life of the plan (or after a major land disturbance activity such as blow-down).
4. The extent of the disturbed area along the stream will be measured and compared to RMA length in the unit. The degree of disturbance will be compared to logging plan objectives.

## Costs

An estimated \$30,000 Districtwide annually.

## Retention of Wildlife Trees

### Expected Future Conditions and Outputs

Maintain 6 to 8 wildlife trees per acre, well distributed within harvested units, to provide habitat for cavity nesters. Wildlife trees should have a diameter of at least 20 inches (or, if 20-inch trees are unavailable, a

minimum diameter of 10 inches), and should be at least 15 feet high. Maintain habitat for cavity-nesting birds at 60 percent of potential dominant woodpecker population levels or higher.

## Monitoring Questions

Are suitable (numbers, heights and diameter classes) snags and replacement trees being left, suitably distributed, to achieve the habitat necessary to attain the 60 percent population level Districtwide?

## Standards

Every five years the population level of dominant woodpeckers sustainable by BLM habitat will be assessed using the analytical technique used in the RMP/EIS to assess the capability of the alternatives. In addition, 20 percent of regeneration harvest timber sales in each Resource Area will be examined by pre-harvest and post-harvest (and after site preparation) inventories to determine snag and green tree numbers, heights, average diameters and distribution within harvest units. The measure of distribution of wildlife trees will be the percent of this material in the upper, middle and lower thirds of the sale units monitored. Wildlife trees left following timber harvest activities (including site preparation for reforestation) will be compared to those that were marked prior to harvest.

## Costs

An estimated average of \$18,000 Districtwide annually.

## Roosevelt Elk

### Expected Future Conditions and Outputs

Maintain or develop as needed an elk habitat effectiveness index equal to, or exceeding, .50 HEC (as described by Wisdom et al., 1986) on BLM administered lands within each Old Growth Emphasis Area (OGEA).

## Monitoring Question

Is the HEC on BLM administered lands equal to, or higher than, .50?

## Standards

Elk habitat effectiveness indices for HEC and HEr will be calculated within ODFW elk emphasis areas every five years (using GIS).

## Costs

An estimated \$1,800 Districtwide annually

## Special Habitats

### Expected Future Conditions and Outputs

Maintenance of undisturbed conditions in each special habitat (i.e., meadows, wetlands, cliffs etc.), plus undisturbed conditions in buffers of at least 100-200 feet around all special habitats.

### Monitoring Questions

Is BLM protecting special habitats as provided in the RMP? Is the average width of undisturbed buffers retained following timber harvest and site preparation activities as specified in the RMP?

## Standards

Twenty percent of BLM actions on lands containing or near special habitats within each Resource Area will be examined to determine whether special habitats were protected as provided in the RMP. Determine average buffer widths by measurement at approximately equidistant points around the affected special habitat within each sale unit.

## Costs

An estimated \$39,000 Districtwide annually.

## Fish Habitat

### Expected Future Conditions and Outputs

Maintenance and enhancement of fish habitat with diversity and quality capable of maintaining or enhancing populations of anadromous and resident salmonoid game and priority nongame fish species.

Improvement of spawning and rearing habitat and increase of large woody debris levels.

### Monitoring Questions

1. Is fish habitat in terms of quantity and quality of rearing pools and over-wintering habitat, and smolt production, being maintained or improved as predicted?

2. Is large woody material being retained in the stream channel for fish habitat?

## Standards

1. At least one experimental drainage per Resource Area will be identified to monitor long-term riparian and instream habitat and fish populations (the drainage should be at least five square miles in size, contain at least 50 percent BLM land). Monitoring will include riparian and instream habitat inventories of all streams used by salmon and/or trout. Outmigrating fish population estimates will be determined for the Basin. Index areas will be established for adult spawning escapement. Habitat and summer fish surveys should be conducted using a micro-habitat system that is similar to or currently being used by Western Oregon Districts (Monitoring Western Oregon Records of Decision H-1734-1, 1986). This is comparable to ODFW research and Hankin and Reeves methodologies. Adult spawning ground counts will be conducted annually to procedures similar to ODFW index streams.
2. All streams supporting salmonids will be sampled once every ten years for changes in riparian and instream habitat conditions.

## Costs

An estimated \$39,000 Districtwide annually, plus initial costs for equipment of \$3,000.

## Special Status Species

### Expected Future Conditions and Outputs

Conservation or recovery of special status species and their habitats so that listing under the Endangered Species Act (ESA) is not needed.

### Monitoring Questions

1. Are BLM actions and BLM authorized actions designed and executed to protect or enhance special status species and/or their habitat to the extent required by the ESA, Bureau policy, or directed in the RMP?
2. Are the mitigation and protection measures employed effective?



## Standards

1. Annually, 20 percent of the files on each year's timber sales and other relevant actions (e.g., rights-of-way, instream structures) will be reviewed to evaluate documentation regarding special status species and related recommendations and decisions in light of ESA requirements, policy and RMP decisions. If mitigation were required, review will ascertain whether such mitigation was incorporated in the authorization document. The relevant actions will be reviewed on the ground after completion to ascertain whether the mitigation was carried out as planned.
2. a. Habitat conditions will be monitored at all or a representative sampling of all sites where listed, proposed, Candidate, State listed, and Bureau Sensitive plant and animal species are known or believed to occupy sites potentially affected by Bureau actions, both before and within a year after site disturbance and/or at intervals of at least five-years. Population trends of plants in those categories at such sites will also be monitored. Such monitoring will particularly evaluate effectiveness of mitigating measures.
2. b. Northern spotted owl monitoring will focus on population characteristics on BLM administered lands throughout the range and on habitat condition and trend relative to BLM's management strategy.

Population monitoring will be an adaptation of ongoing BLM efforts that would conform to recommendations in the final recovery plan, after it is adopted. The draft recovery plan released by the Fish and Wildlife Service recommended that monitoring should involve five initiatives under a comprehensive program. These are as follows:

- Roadside survey of territorial birds: Survey would provide census or index data on territorial owls relative to a spectrum of habitat abundance strata.
- Owl activity site monitoring: Specific surveys of known sites would provide information on occupancy, reproduction, turnover rates and survival.
- Transmitter studies of dispersing juveniles, and territorial and nonterritorial adults: The use of radiotelemetry systems would provide specific information on movements of dispersing juveniles and the habits of nonterritorial birds in relation to the territorial population.

- Other related studies: Additional work beyond that already described would explore elements such as age ratios of first-time breeders and the further development of landscape level computer models.

- Coordination and integration of the above initiatives: A specific effort will organize and interpret results from all aspects of the monitoring program to assemble information in a form that will permit evaluation of management and modification of the recovery plan, if necessary, along with data to support delisting, when appropriate.

Habitat monitoring will determine whether the BLM's land allocations and prescriptions are implemented as planned. Additional efforts will track whether habitat condition and trend patterns track those predicted and meet the expectations of the prescriptions employed to provide the desired habitat condition.

## Cost

\$95,000 - \$158,000 Districtwide annually.

## Areas of Critical Environmental Concern (ACECs)

### Expected Future Conditions and Outputs

Maintenance of ACECs in accordance with the objectives established for them, to protect the values for which they were designated.

### Monitoring Questions

1. Are BLM actions and BLM authorized actions consistent with RMP objectives for designated ACECs?
2. Are the special values of ACECs being maintained?

## Standards

1. All actions within and adjacent to ACECs will be reviewed to determine whether the possibility of impacts on ACEC values was considered, and whether any mitigation identified as important for maintenance of ACEC values was required and, if so, was actually implemented.

2. Each ACEC will be monitored annually to determine if unauthorized uses are occurring and whether ACEC values are being maintained.

### Costs

An estimated annual average of \$20,000 Districtwide.

### Visual Resources

#### Expected Future Conditions and Outputs

Preservation of existing visual qualities in all areas designated by Congress for exclusive management (i.e., VRM Class I areas) and conservation of visual qualities in areas within one quarter mile of recreation sites, highways, state scenic waterways, and wild and scenic rivers (i.e., VRM Class II and III areas).

#### Monitoring Question

Are management actions (primarily timber sales) in VRM Class II and III areas meeting or exceeding visual resource management class objectives?

### Standards

All timber sales and other selected projects in VRM Class II areas and 25 percent of sales or projects in Class III areas that have special design features or mitigating measures for visual resource protection will be monitored to evaluate the effectiveness of the practice used to conserve visual resources. The method will consist of a post timber harvest or project construction visit to evaluate success or failure based on professional judgement. In VRM Class II management areas, where two or more sales or actions have occurred, impacts will be monitored to determine total cumulative impacts at a minimum interval of five years.

### Costs

An estimated \$6,000 Districtwide annually.

## Reforestation and Timber Management Practices

### Expected Future Conditions and Outputs

Timber sales would proceed in accordance with the RMP/EIS with the number of acres and the volumes harvested that were proposed for each land use allocation, and for the desired age classes within the land use allocations. Reforestation efforts would achieve the desired stocking and species composition. All management practices necessary to promote expected growth and yield, and development of desired structural characteristics, would be implemented and effective.

### Monitoring Questions

1. Are timber sale volumes and harvest acres as projected in the RMP/EIS?
2. Has BLM been able to design and sell timber sales that meet the standards set forth in the RMP, on all categories of lands where sales were expected during the life of the plan?
3. Were the acres receiving management practices (e.g., planting with genetically selected stock, fertilization, release, and thinning) as projected in the RMP/EIS?
4. Is reforestation achieving desired stocking?
5. Are stands growing at a rate that will produce the predicted yields?

### Standards

- 1 & 3. Annual timber sale volumes and acres to be harvested will be identified in annual work plan accomplishment reports.
2. An annual Districtwide tabulation of sales will address whether the District was able to offer and sell timber sales that met RMP standards.
4. First, third, and fifth year stocking surveys will be used.
5. Managed stand inventory (as part of the decadal forest inventory) will provide actual growth data to be reported once every 10 years.

## Costs

An estimated \$63,000 Districtwide annually to conduct this level of monitoring.

## Rural Interface Areas

### Expected Future Conditions and Outputs

BLM land within a quarter mile of identified Rural Interface Areas (RIAs) zoned for 1 to 20-acre lots is managed in such a manner as to mitigate adjacent landowner. Forest management practices are altered when deemed necessary.

### Monitoring Question

Are we managing RIAs consistent with management practices identified for these areas in the RMP?

### Standards

All actions within a quarter mile of the identified Rural Interface Areas will be examined to determine if special project design features and mitigation measures are implemented as planned.

## Costs

An estimated \$4,000 Districtwide annually.

## Socioeconomic Conditions

### Expected Future Conditions and Outputs

Contribution to local employment and County revenues by providing outputs that support approximately 1,617 jobs and \$14,588,790 annually of payments to the O&C counties.

### Monitoring Questions

1. What level of local employment is supported by BLM timber sales and forest management practices?
2. What were O&C payments to counties?

### Standards

1. Using current multipliers, annual BLM timber sales and harvest volume will be related to supported employment. Similarly, labor-intensive management practices each year will be related to jobs.
2. Annual O&C payments will be reported.

## Costs

An estimated \$1,000 annually Districtwide.



# Appendix 2-N

## Goal and Objectives of the Preferred Alternative

<b>Goal</b>	<p>Manage lands to contribute to community stability consistent with maintenance of ecosystems and a diversity of species; contribute to long-term recovery of the northern spotted owl; and maintain fish and wildlife habitat, and recreation, scenic and other resources.</p>	<p>Provide for a wide range of developed and dispersed recreation opportunities, consistent with maintenance of ecosystems and a diversity of species, to minimize conflicts among recreation user groups.</p>
<b>Objectives</b>	<p>Produce a moderate sustained yield of timber.</p> <p>Manage biological diversity, provide regional and subregional connectivity, and contribute to recovery of the northern spotted owl, using a system that maintains and enhances old growth and mature forest in areas considered most important for recovery of the northern spotted owl and links those areas with lands managed to provide connectivity.</p> <p>Protect habitats of threatened and endangered species. Protect habitats of species with high potential for listing and species of related concern, to maintain their populations at a level that would avoid endangering the species.</p> <p>Retain existing RNAs and ACECs. Provide new ones from eligible areas where needed to maintain or protect important values.</p> <p>Manage scenic resources in selected high use areas, particularly emphasizing protection of corridors of the McKenzie River.</p> <p>Provide substantial protection for anadromous fish habitat, other perennial streams, and other water environments.</p>	<p>Find important and manageable river segments suitable for designation to the classification for which they are eligible, where such designation would contribute to the national wild and scenic river system and would cause no, or only limited, adverse economic impact.</p> <p>Make land tenure adjustments to benefit a variety of uses and values.</p> <p>Adopt appropriate special forest management practices on BLM administered lands close to Rural Interface Areas.</p> <p><b>Preferred Alternative</b> - This alternative would manage lands to contribute to community stability consistent with maintenance of ecosystems. It would manage biological diversity, provide regional and subregional connectivity, and contribute to long-term recovery of the northern spotted owl. Habitats of other threatened and endangered species would be protected. Species of related concern would be protected sufficiently to avoid endangering the species. Timber harvest would not be planned in or adjacent to riparian zones of important waters. All existing ACECs would be retained, and five new ones would be designated. Three river segments would be found suitable for designation as recreational. Scenic resources would be managed in selected special status and high use areas, with particular emphasis on protection of all ACECs and Shotgun Recreation site. Recreation management would provide for a wide range of recreation opportunities. Special timber harvest and forest management practices would be applied in Rural Interface Areas.</p>



# Appendix 2-O

## Proposed Research Topics

The following list of research topics would be modified based upon available funding and changing knowledge and priorities.

### Water

Refine/evaluate a cumulative impact analysis model to assess effects of various management activities (including identification of hydrologic recovery rates) in 3rd to 5th order watersheds.

Identify roles of 1st and 2nd order streams on the overall productive capability of the aquatic ecosystem, and the effect of different management prescriptions.

### Biological Diversity

Assess the effectiveness of silvicultural systems and silvicultural practices in the retention or enhancement of biological diversity within a forest environment managed for the production of timber and other commodity values.

Develop improved indices and methods for measuring and describing both the diversity of habitats and species on forest sites and in determining the effect of silvicultural systems on ecosystem processes, wildlife and plant populations, and species survival.

Evaluate the effectiveness of silvicultural practices and forest genetics programs in retaining the genetic diversity of managed forests, including both improved conifer species and other organisms.

Assess the effects of natural fire, prescribed fire, and fire exclusion on the structures and functions of western Oregon ecosystems and upon habitat connectivity.

Assess a variety of silvicultural practices, structural retention levels, density management regimes, and species mixes on the stability and health of forest ecosystems.

### Wildlife

Develop inventory methods for minor species.

Define habitat requirements and preferences of amphibians and reptiles (particularly those that are special status species).

Identify how management activities affect those species and what management prescriptions can minimize impacts on them.

Identify how spotted owls respond to alternative timber harvest prescriptions.

Identify how landscape-level habitat patterns in the checkerboard ownership pattern affect spotted owl occupancy, reproduction, survival and juvenile dispersal.

Identify the vegetation structure characteristics and histories of forest stands used by spotted owls as foraging habitat.

### Riparian Zones

Assess the effect of different buffer widths and compositions, and the influence of differing management of prescriptions on adjacent lands, on the plants and animals of the riparian zone.

### Fish

Assess the effectiveness of various riparian protection prescriptions for maintaining natural stream processes, especially as it relates to production of anadromous and resident fish.

Assess the effects of fish habitat improvement projects on aquatic invertebrate fish food sources, as well as fish populations, and the useful life of the projects.

### Forestry

Assess effects of managing stand structure to meet a variety of forest management objectives including the practicality of producing old growth forest features within shorter rotations.

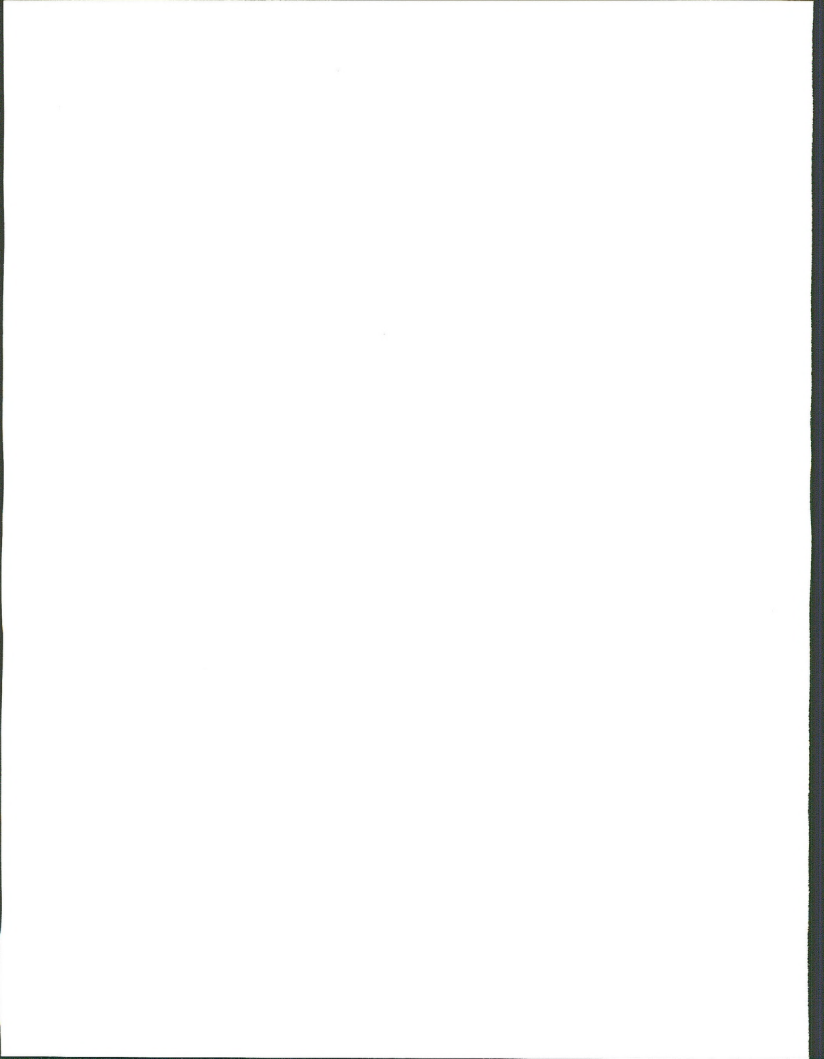
Determine and improve reforestation, species diversity, timber yield, and ecosystem process results associated with a variety of alternative silvicultural systems.

Develop nonconiferous vegetation in partial cut forest stands, the effect of such vegetation on conifer reforestation, and the development of effective, ecosystem-based strategies for the affordable management of such vegetation.





# Appendix 3



# Appendix 3-A Lands

**Table 3-L-3 - Existing Withdrawals and Classifications**

**Note:** Location description indicates sections within which withdrawn lands are located. Information on which portions of the cited sections are withdrawn is available at the District Office.

*Withdrawals*

Authority	Location	Acres	Purpose	Surface Management Agency	Segregative Effect
ORE 05555	T.15S., R.7W. Section 7	40.00	Air Navigation Site	FAA/BLM	General land laws including mining and mineral leasing
ORE 013117 (PLO 3610)	T.18S., R.1E. Section 31 T.19S., R.1E. Section 6	81.20	Fall Creek Reservoir	COE/BLM	General land laws including mining except mineral leasing
OR 19234 (PLO 497)	T.17S., R.5W. Section 27 Section 28	5.27	Fern Ridge Reservoir	COE	General land laws including mining and mineral leasing
OR 19240 (PLO 727)	T.19S., R.1E. Section 34	1.37	Lookout Point Reservoir	COE	General land laws including mining and mineral leasing
OR 711 (PLO 4395)	T.16S., R.12W. Section 33	1.00	Oregon Islands National Wildlife Refuge	USFWS	General land laws including mining except mineral leasing
OR 25306 (PLO 6287)	T.16S., R.12W. Section 33	1.00	Oregon Islands National Wildlife Refuge	USFWS	General land laws including mining except mineral leasing

**Abbreviation Key:**

PLO = Public Land Order

FAA = Federal Aviation Administration

COE = U.S. Army Corp of Engineers

USFWS = U.S. Fish and Wildlife Service

Table 3-L-3 - Existing Withdrawals and Classifications (cont.)

<i>Withdrawals</i>					
Authority	Location	Acres	Purpose	Surface Management Agency	Segregative Effect
ORE 016183A (PLO 3869)	T.16S., R.7W. Section 19 T.18S., R.8W. Section 21 T.18S., R.9W. Section 14 T.19S., R.7W. Section 19 Section 35  T.22S., R.1W. Section 15	440.12	Lake Creek Rec. Site Whittaker Creek Rec. Site Turner Creek Rec. Site Clay Creek Rec. Site Haight Creek Rec. Site Sharps Creek Rec. Site	BLM	General land laws including mining except mineral leasing
ORE 012093 (PLO 5490)	****	9000.52	Reserved for multiple use management	BLM	General land laws except R&PP, sales, exchanges, mining and mineral leasing
OR 8754 (PLO 5229)	T.15S., R.1W. Section 29 Section 30 Section 31 Section 32	260.00	Shotgun Creek Recreation Site	BLM	General land laws including mining except mineral leasing
OR 37548 (PLO 6662)	T.20S., R.5W. Section 9 Section 15 Section 21	832.50	Tyrrell Seed Orchard	BLM	General land laws including mining except mineral leasing
OR 19133' (PSC 41)	T.19S., R.7W. Section 21 Section 25 Section 35 T.20S., R.6W. Section 5	550.49	Protect water-power and reservoir development potential	BLM/FERC	General land laws except mining and mineral leasing

\* Withdrawals remaining to be reviewed through the FLPMA withdrawal review process or under authority of DM 603.

\*\*\*\* All public domain lands in and west of Range 8 East and all lands within the area which become public domain lands in the future.

Abbreviation Key:

PLO = Public Land Order

PSC = Power Site Classification

FERC = Federal Energy Regulatory Commission

Table 3-L-3 - Existing Withdrawals and Classifications (cont.)

<i>Withdrawals</i>					
Authority	Location	Acres	Purpose	Surface Management Agency	Segregative Effect
OR 19148* (PSC 180)	T.20S., R.2W. Section 31 T.21S., R.1W. Section 33 Section 35 T.21S., R.2W. Section 15	300.60	Protect water-power and reservoir development potential	BLM/FERC	General land laws except mining and mineral leasing
OR 19164 (PSC 287)	T.18S., R.6W. Section 5	120.00	Protect electric transmission line	BLM/FERC	General land laws except mining and mineral leasing
OR 19186* (PSC 426)	T.16S., R.2E. Section 23 Section 24 Section 27	276.64	Protect water-power and reservoir development potential	BLM/FERC	General land laws except mining and mineral leasing
OR 19040* (PSR 95)	T.16S., R.2E. Section 28** Section 34** T.17S., R.2E. Section 2** T.17S., R.3E. Section 4	152.28	Protect water-power and reservoir development potential	BLM/FERC	General land laws except mining and mineral leasing
OR 19059* (PSR 285)	T.16S., R.3E. Section 31** T.17S., R.3E. Section 4	163.56	Protect water-power and reservoir development potential	BLM/FERC	General land laws except mining and mineral leasing

\* Withdrawals remaining to be reviewed through the FLPMA withdrawal review process or under authority of DM 603.

\*\* Opened to entry subject to Sec. 24 of the Federal Power Act.

Abbreviation Key:

PSC = Power Site Classification

PSR = Power Site Reservation

FERC = Federal Energy Regulatory Commission

Table 3-L-3 - Existing Withdrawals and Classifications (cont.)

<i>Withdrawals</i>					
Authority	Location	Acres	Purpose	Surface Management Agency	Segregative Effect
OR 19113* (PSR 659)	T.15S., R.6W. Section 7 T.16S., R.7W. Section 19 T.17S., R.8W. Section 9** Section 17** T.18S., R.7W. Section 31 Section 33 T.18S., R.8W. Section 21 Section 27 Section 35 T.19S., R.6W. Section 7 Section 9 Section 29 Section 31 T.19S., R.7W. Section 1 Section 3 Section 5 Section 9 Section 19 Section 21 Section 27 Section 35 T.19S., R.8W. Section 3 Section 11 Section 13 T.20S., R.6W. Section 1 Section 3 Section 5 Section 9 Section 11 T.20S., R.7W. Section 3	6001.48	Protect water-power and reservoir development potential	BLM/FERC	General land laws except mining and mineral leasing

\* Withdrawals remaining to be reviewed through the FLPMA withdrawal review process or under authority of DM 603.

\*\* Opened to entry subject to Sec. 24 of the Federal Power Act.

Abbreviation Key:

PSR = Power Site Reservation

FERC = Federal Energy Regulatory Commission

Table 3-L-3 - Existing Withdrawals and Classifications (cont.)

*Withdrawals*

Authority	Location	Acres	Purpose	Surface Management Agency	Segregative Effect
OR 19115' (PSR 661)	T.16S., R.2E. Section 33" Section 35" T.17S., R.2E. Section 1" T.17S., R.3E. Section 3" Section 5" Section 9" T.20S., R.2W. Section 31 T.21S., R.1W. Section 31" Section 33 Section 35 T.21S., R.2W. Section 7 T.22S., R.2W. Section 5 Section 15 Section 23 T.23S., R.2W. Section 1	1103.60	Protect water-power and reservoir development potential	BLM/FERC	General land laws except mining and mineral leasing
OR 19116' (PSR 662)	T.18S., R.8W. Section 28	40.00	Protect water-power and reservoir development potential	BLM/FERC	General land laws except mining and mineral leasing
OR 19127' (PSR 730)	T.22S., R.1W. Section 5 Section 9 Section 15" Section 23 Section 27 Section 35 T.23S., R.1W. Section 1 Section 7	1249.16	Protect water-power and reservoir development potential	BLM/FERC	General land laws except mining and mineral leasing

\* Withdrawals remaining to be reviewed through the FLPMA withdrawal review process or under authority of DM603.

" Opened to entry subject to Sec. 24 of the Federal Power Act.

"" Opened to entry in part subject to Sec. 24 of the Federal Power Act.

Abbreviation Key:

PSR = Power Site Reservation

FERC = Federal Energy Regulatory Commission

Table 3-L-3 - Existing Withdrawals and Classifications (cont.)

<i>Withdrawals</i>					
Authority	Location	Acres	Purpose	Surface Management Agency	Segregative Effect
OR 19014' (WPD 14)	T.15S., R.6W. Section 7 T.16S., R.2E. Section 33" Section 35" T.16S., R.7W. Section 19 T.17S., R.2E. Section 1" T.17S., R.3E. Section 3" Section 5" Section 9" T.17S., R.8W. Section 9" Section 17" T.18S., R.7W. Section 31 Section 33 T.18S., R.8W. Section 21 Section 27 Section 35 T.19S., R.6W. Section 7 Section 9 Section 29 Section 31 T.19S., R.7W. Section 1 Section 3 Section 5 Section 9 Section 19 Section 21 Section 27 Section 35 T.19S., R.8W. Section 3 Section 11 Section 13 T.20S., R.2W. Section 31	8274.24	Protect water-power and reservoir development potential	BLM/FERC	General land laws except mining and mineral leasing

\* Withdrawals remaining to be reviewed through the FLPMA withdrawal review process or under authority of DM603.

" Opened to entry subject to Sec. 24 of the Federal Power Act.

Abbreviation Key:

WPD = Water Power Designation

FERC = Federal Energy Regulatory Commission



Table 3-L-3 - Existing Withdrawals and Classifications (cont.)

*Withdrawals*

Authority	Location	Acres	Purpose	Surface Management Agency	Segregative Effect
	T.20S., R.6W. Section 1 Section 3 Section 5 Section 9 Section 11				
	T.20S., R.7W. Section 3				
	T.21S., R.1W. Section 31 <sup>''</sup> Section 33 Section 35				
	T.21S., R.2W. Section 7 Section 31				
	T.22S., R.1W. Section 5 Section 9 Section 15 <sup>'''</sup> Section 23 Section 27 Section 35				
	T.22S., R.2W. Section 5 Section 15 Section 23				
	T.23S., R.1W. Section 1 Section 7				
	T.23S., R.2W. Section 1				
OR 19016' (WPD 16)	T.23S., R.1W. Section 1	80.00	Protect water-power and reservoir development potential	BLM/FERC	General land laws except mining and mineral leasing

Note: Table does not include lands that have been transferred out of Federal ownership subsequent to withdrawal or lands within National Forest boundaries.

<sup>'</sup>Withdrawals remaining to be reviewed through the FLPMA withdrawal review process or under authority of DM603.

<sup>''</sup>Opened to entry subject to Sec. 24 of the Federal Power Act.

<sup>'''</sup>Opened to entry in part subject to Sec. 24 of the Federal Power Act.

Abbreviation Key:

WPD = Water Power Designation

FERC = Federal Energy Regulatory Commission

Table 3-L-3 - Existing Withdrawals and Classifications (cont.)

*Classifications*

Authority	Location	Acres	Purpose	Surface Management Agency	Segregative Effect
OR 905 (R&PP)	T.14S., R.2W. Section 13	2.00	McKercher County Park	BLM/Linn County	General land laws including mining except mineral leasing
ORE 06095 (R&PP)	T.16S., R.2E. Section 34 Section 35	61.73	Whitewater County Park	BLM/Lane County	General land laws including mining except mineral leasing
ORE 011226 (R&PP)	T.17S., R.2E. Section 1	2.40	Martin Rapids County Park	BLM/Lane County	General land laws including mining except mineral leasing
ORE 012264 (R&PP)	T.16S., R.6W. Section 7	2.00	Solid waste transfer site	BLM/Lane County	General land laws including mining except mineral leasing
OR 37243 (R&PP)	T.19S., R.3W. Section 35	2.79	Willamette River Greenway	BLM/State of Oregon	General land laws including mineral leasing

## Abbreviation Key:

R&amp;PP = Recreation and Public Purposes Act

# Appendix 3-B Lands

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**Table 3-L-4 - Pending and Proposed Withdrawals, Relinquishments and Modifications**

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**OR 46473 Pending Cannery Dunes and Heceta Sand Dunes Withdrawal**

Federal Lands

T.18 S., R.12 W., W.M.

Sec. 03: Lots 1-4, S $\frac{1}{2}$  NE $\frac{1}{4}$

Sec. 15: SE $\frac{1}{4}$  NE $\frac{1}{4}$

The area described above contains 257.60 acres (title plat) in Lane County, Oregon.

A petition for a protective withdrawal of the lands described above was filed and subsequently approved on July 2, 1991 to allow for the filing of a withdrawal application. The application, when approved, will serve to withdraw the public lands from entry under the general land laws, including the mining laws, but not the mineral leasing laws. The lands have been segregated from entry under the mining laws since July 19, 1991. The purpose of the proposed withdrawal is to protect significant scenic, water quality, botanical, wildlife and recreational values. The land have been nominated for designation as an Area of Critical Environmental Concern and as an Outstanding Natural Area.

Scope: Alternatives B, C, D, E, Preferred

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**Proposed Sharps Creek Special Recreation Management Area Withdrawal**

Federal Lands

T.22 S., R.1 W., W.M.

Sec. 15: Lots 8, 11 and E $\frac{1}{2}$  of Lot 10

Sec. 27: NE $\frac{1}{4}$  NE $\frac{1}{4}$

Sec. 35: W $\frac{1}{2}$  SE $\frac{1}{4}$

T.23 S., R.1 W., W.M.

Sec. 01: Lot 4, SW $\frac{1}{4}$  NW $\frac{1}{4}$ , E $\frac{1}{2}$  SW $\frac{1}{4}$  SW $\frac{1}{4}$ , W $\frac{1}{2}$  SE $\frac{1}{4}$  SW $\frac{1}{4}$

Sec. 12: NE $\frac{1}{4}$  NW $\frac{1}{4}$ , N $\frac{1}{2}$  SE $\frac{1}{4}$  NW $\frac{1}{4}$

The area described above contains 403.54 acres (title plat) in Lane County, Oregon.

Private Lands

T.22 S., R.1 W., W.M.

Sec. 15: E $\frac{1}{2}$  of Lot 9, W $\frac{1}{2}$  of Lot 12

Sec. 22: Lots 3, 8, 9, 12, E $\frac{1}{2}$  of Lot 7, S $\frac{1}{2}$  SE $\frac{1}{4}$ , SW $\frac{1}{4}$  NW $\frac{1}{4}$  SE $\frac{1}{4}$

Sec. 26: S $\frac{1}{2}$  NW $\frac{1}{4}$  NW $\frac{1}{4}$ , SW $\frac{1}{4}$  NW $\frac{1}{4}$ , N $\frac{1}{2}$  NW $\frac{1}{4}$  SW $\frac{1}{4}$ , E $\frac{1}{2}$  SW $\frac{1}{4}$

Sec. 35: E $\frac{1}{2}$  NE $\frac{1}{4}$  NW $\frac{1}{4}$ , W $\frac{1}{2}$  NE $\frac{1}{4}$

T.23 S., R.1 W., W.M.

Sec. 01: NW $\frac{1}{4}$  SW $\frac{1}{4}$

Sec. 02: Lots 1, 2

The area described above contains 707.00 (title plat) acres in Lane County, Oregon.

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**Table 3-L-4 - Pending and Proposed Withdrawals, Relinquishments and Modifications (cont.)**


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The proposed withdrawal would withdraw the public lands and any of the private lands that may become public lands in the future from entry under the general land laws, including the mining laws, but not the mineral leasing laws, subject to valid existing rights. The purpose of the proposed withdrawal is to allow the establishment and development of a recreational mining area in an area with high recreational mining demand and potential.

Scope: Alternatives C, D, E, Preferred

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**ORE 05555 Proposed Partial Revocation of Horton Air Navigation Site Withdrawal**

Federal Lands

T.15 S., R.7 W., W.M.

Sec. 07: SW $\frac{1}{4}$  SE $\frac{1}{4}$

The area described above contains 40.00 acres (title plat) in Lane County, Oregon.

The land described above is part of a larger tract withdrawn by BLM Order of July 12, 1957 and reserved for use by the Federal Aviation Administration as an air navigation site. BLM retains jurisdiction over grazing and the management and disposal of forest resources. The withdrawal segregates the land from the operation of the public land laws, including the mining and mineral leasing laws. The only FAA improvement on the acreage described above is an access road. The withdrawal has been reviewed pursuant to FLPMA 204 (I) and it has been recommended that the withdrawal be revoked as to the subject acreage. FAA interest in the access road would be protected by issuance of a right-of-way reservation under the authority of FLPMA Sec. 507 prior to completion of the partial revocation action. The partial revocation would restore the land to entry under the public land laws, including the mining and mineral leasing laws, subject to valid existing rights. FAA has concurred in the recommended partial revocation.

Scope: All Alternatives

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**ORE 013117 Partial Relinquishment of Fall Creek Reservoir Withdrawal**

Federal Lands

T.18 S., R.1 E., W.M.

Sec. 31: All that portion of the following subdivisions lying north of the northerly right-of-way line of Lane County Road #409: S $\frac{1}{2}$  NE $\frac{1}{4}$  SW $\frac{1}{4}$ , W $\frac{1}{2}$  SW $\frac{1}{4}$ , S $\frac{1}{2}$  NE $\frac{1}{4}$  SE $\frac{1}{4}$ , S $\frac{1}{2}$  N $\frac{1}{2}$  NW $\frac{1}{4}$  SE $\frac{1}{4}$ , S $\frac{1}{2}$  NW $\frac{1}{4}$  SE $\frac{1}{4}$

The area described above contains 33.50 acres in Lane County, Oregon.

The land described above is part of a larger tract withdrawn by Public Land Order No. 3610 of April 8, 1965 and reserved for use by the U.S. Army Corps of Engineers for flood control purposes as part of the Fall Creek Reservoir Project. BLM retains jurisdiction over the land for all purposes other than flood control. The withdrawal does not alter the applicability of the public land laws governing the use of the lands under lease, license, or permit, or governing the disposal of their mineral and vegetative resources other than under the mining laws. The withdrawal has been reviewed pursuant to FLPMA 204 (L) and the Corps of Engineers has relinquished the withdrawal as to the lands described above since these lands are not needed or used for the purpose for which they were withdrawn. The only improvements on this acreage are BLM access roads. The lands have been examined and found to be suitable for return to full BLM jurisdiction. It has been recommended that the withdrawal be revoked as to the subject acreage. The partial revocation would restore the land to entry under the mining laws, subject to valid existing rights.

Scope: All Alternatives

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**Table 3-L-4 - Pending and Proposed Withdrawals, Relinquishments and Modifications (cont.)**


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**ORE 016183A Proposed Partial Revocation of Turner Creek Recreation Site Withdrawal**

Federal Lands

T.18 S., R.9 W., W.M.

Sec. 14: NE<sup>1</sup>/<sub>4</sub> SW<sup>1</sup>/<sub>4</sub>

The area described above contains 40.00 acres (title plat) in Lane County, Oregon.

The land described above is one of several tracts withdrawn by Public Land Order No.3869 of November12, 1965 and reserved for use as the Turner Creek Recreation Site. The withdrawal segregates the land from the operation of the public land laws, including the mining, but not the mineral leasing laws nor disposal of materials under the Act of July31, 1947 (61 Stat. 681; 30U.S.C. 601-604), as amended, or forest products under the Act of August28, 1937 (50Stat. 874; 43U.S.C. 1181a). The subject recreation site has been permanently closed and the improvements removed. The partial revocation would restore the land described above to entry under the public land laws, including the mining laws, subject to valid existing rights.

Scope: All alternatives

**OR 19164 Proposed Revocation of Power Site Classification 287**

Federal Lands

T.18 S., R.6 W., W.M.

Sec. 05: SE<sup>1</sup>/<sub>4</sub> NE<sup>1</sup>/<sub>4</sub>, E<sup>1</sup>/<sub>2</sub> SE<sup>1</sup>/<sub>4</sub>

The area described above contains 120.00 acres (title plat) in Lane County, Oregon.

The land described above was withdrawn by Secretarial Order of March23, 1935 and reserved as Power Site Classification 287. The land was withdrawn to authorize and protect the right-of-way for an electric transmission line. The withdrawal segregated the land from the operation of the non-discretionary public land laws, including the mining laws but not the mineral leasing laws. The land was subsequently opened to entry under the mining laws subject to the provisions of Public Law 359. The Federal Energy Regulatory Commission has jurisdiction over this land for hydropower generation and electric transmission purposes. BLM retains jurisdiction over mineral leasing, grazing, the management and disposal of mineral materials and forest resources and land use authorizations by lease, license or permit, subject to the concurrence of FERC. The electric transmission line was removed several years ago and the land is no longer needed for the purpose for which it was withdrawn. The withdrawal has been reviewed pursuant to FLPMA 204 (L) and it has been recommended that the withdrawal be revoked. Revocation would restore the land to full operation of the public land laws and to full BLM jurisdiction. Mineral entry would no longer be subject to the provisions of P.L.359.

Scope: All Alternatives

**OR 19234 Modification of Fern Ridge Reservoir Withdrawal**

Federal Lands

T.17 S., R.5 W., W.M.

Sec. 27: Lots 2,3

Sec. 28: Lot 5

The area described above contains 5.27 acres (title plat) in Lane County, Oregon.

The land described above is withdrawn by Public Land Order No.497 of July13, 1948 and reserved for use by the U.S. Army Corps of Engineers for flood control purposes as part of the Fern Ridge Reservoir Project. The withdrawal segregates the land from entry under the public land laws, including the mining and mineral leasing laws. The withdrawal has been reviewed pursuant to FLPMA 204 (L) and found to be used and needed for the purpose

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**Table 3-L-4 - Pending and Proposed Withdrawals, Relinquishments and Modifications (cont.)**


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for which it was withdrawn. It has been recommended that the withdrawal be modified to open the land to operation of the mineral leasing laws. The modification would restore the land to operation of the mineral leasing laws, subject to the concurrence of the Corps of Engineers. The Corps of Engineers has concurred in the modification.

Scope: All Alternatives

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OR 19240 Modification of Lookout Point Reservoir Withdrawal

Federal Lands

T.19 S., R.1 E., W.M.

Sec. 34: Lot 4

The area described above contains 1.37 acres (title plat) in Lane County, Oregon.

The land described above is withdrawn by Public Land Order No. 727 of June 6, 1951 and reserved for use by the U.S. Army Corps of Engineers for flood control purposes as part of the Lookout Point Dam and Reservoir Project. The withdrawal segregates the land from entry under the public land laws, including the mining and mineral leasing laws. The withdrawal has not yet been reviewed pursuant to FLPMA 204 (L). The land is being used for the purpose for which it was withdrawn. It will be recommended that the withdrawal be modified to open the land to operation of the mineral leasing laws. The modification would restore the land to operation of the mineral leasing laws, subject to the concurrence of the Corps of Engineers.

Scope: All Alternatives

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Proposed Fox Hollow Research Natural Area Withdrawal

Federal Lands

T.19 S., R.4 W., W.M.

Sec. 09: E $\frac{1}{2}$  E $\frac{1}{2}$

The area described above contains 160.00 acres (title plat) in Lane County, Oregon.

In furtherance of the Management Plan for the Fox Hollow Research Natural Area, the proposed withdrawal would withdraw the public lands from entry under the general land laws, including the mining laws, but not the mineral leasing laws, subject to valid existing rights. The purpose of the proposed withdrawal is to protect the existing designated Fox Hollow Research Natural Area and Area of Critical Environmental Concern.

Scope: Alternatives B, C, D, E Preferred

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Proposed Camas Swale Research Natural Area Withdrawal

Federal Lands

T.19 S., R.4 W., W.M.

Sec. 25: NW $\frac{1}{4}$ , W $\frac{1}{2}$  SW $\frac{1}{4}$ , W $\frac{1}{2}$  E $\frac{1}{2}$  SW $\frac{1}{4}$ , NE $\frac{1}{4}$  NE $\frac{1}{4}$  SW $\frac{1}{4}$ , SW $\frac{1}{4}$  SE $\frac{1}{4}$  SE $\frac{1}{4}$  SW $\frac{1}{4}$ , and those portions of SE $\frac{1}{4}$  NE $\frac{1}{4}$  SW $\frac{1}{4}$ , NE $\frac{1}{4}$  SE $\frac{1}{4}$  SW $\frac{1}{4}$ , N $\frac{1}{2}$  SE $\frac{1}{4}$  SE $\frac{1}{4}$  SW $\frac{1}{4}$  and W $\frac{1}{2}$  NW $\frac{1}{4}$  SE $\frac{1}{4}$  lying west of BLM Road No. 19-4-26.

The area described above contains 313.91 acres, more or less, in Lane County, Oregon.

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**Table 3-L-4 - Pending and Proposed Withdrawals, Relinquishments and Modifications (cont.)**


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In furtherance of the Management Plan for the Camas Swale Research Natural Area, the proposed withdrawal would withdraw the public lands from entry under the general land laws, including the mining laws, but not the mineral leasing laws, subject to valid existing rights. The purpose of the proposed withdrawal is to protect the existing designated Camas Swale Research Natural Area and Area of Critical Environmental Concern, as modified, and proposed addition.

Scope: Alternatives B, C, D, E, Preferred

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**Proposed Mohawk Research Natural Area Withdrawal**

## Federal Lands

T.16 S., R.2 W., W.M.

Sec. 19: Lots 3,4, S $\frac{1}{2}$  N $\frac{1}{2}$  of Lot 2, S $\frac{1}{2}$  of Lot 2, S $\frac{1}{2}$  N $\frac{1}{2}$  SE $\frac{1}{4}$  NW $\frac{1}{4}$ , S $\frac{1}{2}$  SE $\frac{1}{4}$  NW $\frac{1}{4}$ , E $\frac{1}{2}$  SW $\frac{1}{4}$ , W $\frac{1}{2}$  E $\frac{1}{2}$  W $\frac{1}{2}$  SE $\frac{1}{4}$ , W $\frac{1}{2}$  W $\frac{1}{2}$  SE $\frac{1}{4}$

The area described above contains 292.67 acres (title plat) in Lane County, Oregon.

In furtherance of the Management Plan for the Mohawk Research Natural Area, the proposed withdrawal would withdraw the public lands from entry under the general land laws, including the mining laws, but not the mineral leasing laws, subject to valid existing rights. The purpose of the proposed withdrawal is to protect the existing designated Mohawk Research Natural Area and Area of Critical Environmental Concern.

Scope: Alternatives B, C, D, E, Preferred

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**Proposed Upper Elk Meadows Research Natural Area Withdrawal**

## Federal Lands

T.23 S., R.2 W., W.M.

Sec. 35: E $\frac{1}{2}$  E $\frac{1}{2}$  S $\frac{1}{2}$  S $\frac{1}{2}$  S $\frac{1}{2}$  SW $\frac{1}{4}$  NW $\frac{1}{4}$ ; W $\frac{1}{2}$  W $\frac{1}{2}$  S $\frac{1}{2}$  S $\frac{1}{2}$  S $\frac{1}{2}$  SE $\frac{1}{4}$  NW $\frac{1}{4}$ ; that portion of E $\frac{1}{2}$  NE $\frac{1}{4}$  SW $\frac{1}{4}$  lying south of BLM Road No. 23-2-35.1; W $\frac{1}{2}$  NE $\frac{1}{4}$  SW $\frac{1}{4}$ ; E $\frac{1}{2}$  E $\frac{1}{2}$  NW $\frac{1}{4}$  SW $\frac{1}{4}$ ; N $\frac{1}{2}$  SE $\frac{1}{4}$  SW $\frac{1}{4}$ ; E $\frac{1}{2}$  SW $\frac{1}{4}$  SE $\frac{1}{4}$  SW $\frac{1}{4}$ ; SE $\frac{1}{4}$  SE $\frac{1}{4}$  SW $\frac{1}{4}$ ; S $\frac{1}{2}$  NE $\frac{1}{4}$  NE $\frac{1}{4}$  SE $\frac{1}{4}$ ; those portions of NW $\frac{1}{4}$  NE $\frac{1}{4}$  SE $\frac{1}{4}$  and NW $\frac{1}{4}$  SE $\frac{1}{4}$  lying south of BLM Road No. 23-2-35.1; S $\frac{1}{2}$  NE $\frac{1}{4}$  SE $\frac{1}{4}$ ; S $\frac{1}{2}$  SE $\frac{1}{4}$

The area described above contains 242.00 acres, more or less, in Douglas County, Oregon.

In furtherance of the Management Plan for the Upper Elk Meadows ACEC, the proposed withdrawal would withdraw the public lands from entry under the general land laws, including the mining laws, but not the mineral leasing laws, subject to valid existing rights. The purpose of the proposed withdrawal is to protect the existing designated Upper Elk Meadows Research Natural Area and Area of Critical Environmental Concern and proposed addition.

Scope: Alternatives B, C, D, E, Preferred

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**Table 3-L-4 - Pending and Proposed Withdrawals, Relinquishments and Modifications (cont.)**

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**Proposed Long Tom Area of Critical Environmental Concern Withdrawal**

Federal Lands

T.16 S., R.5 W., W.M.

Sec. 33: Lot 3

The area described above contains 9.66 acres (title plat) in Lane County, Oregon.

Private Lands

T.16 S., R.5 W., W.M.

Sec. 28: SE $\frac{1}{4}$  SE $\frac{1}{4}$ , Lot 2 East of the center of the West branch of the Long Tom River

Sec. 33: N $\frac{1}{2}$  NE $\frac{1}{4}$  NE $\frac{1}{4}$

The area described above contains 79.64 acres in Lane County, Oregon.

In furtherance of the Management Plan for the Long Tom ACEC, the proposed withdrawal would withdraw the public lands and any of the private lands that may become public lands in the future from entry under the general land laws, including the mining laws, but not the mineral leasing laws, subject to valid existing rights. The purpose of the proposed withdrawal is to protect a remnant Willamette Valley native grassland containing a population of a Federally listed endangered plant species and several additional sensitive plant species.

Scope: Alternatives D, E, Preferred

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**Proposed Hult Marsh Area of Critical Environmental Concern Withdrawal**

Federal Lands

T.15 S., R.7 W., W.M.

Sec. 23: That portion of the E $\frac{1}{2}$  lying east of the centerline of BLM Road No.15-7-35

The area described above contains 181.22 acres, more or less, in Lane County, Oregon.

Private Lands

T.15 S., R.7 W., W.M.

Sec. 24: SW $\frac{1}{4}$

Sec. 26: NE $\frac{1}{4}$

The area described above contains 320.00 acres (title plat) in Lane County, Oregon.

The proposed withdrawal would withdraw the public lands and any of the private lands that may become public lands in the future from entry under the general land laws, including the mining laws, but not the mineral leasing laws, subject to valid existing rights. The purpose of the proposed withdrawal is to protect a wetland/aquatic/riparian habitat with significant botanical, wildlife and recreational values.

Scope: Alternatives B, C, D, E, Preferred

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**Proposed Horse Rock Ridge Research Natural Area Withdrawal**

Federal Lands

T.15 S., R.2 W., W.M.

Sec. 01: Lots 3,4; W $\frac{1}{2}$  and W $\frac{1}{2}$  E $\frac{1}{2}$  of Lot 2; W $\frac{1}{2}$  E $\frac{1}{2}$  SW $\frac{1}{4}$  NE $\frac{1}{4}$ ; W $\frac{1}{2}$  SW $\frac{1}{4}$  NE $\frac{1}{4}$ ; S $\frac{1}{2}$  NW $\frac{1}{4}$ ; N $\frac{1}{2}$  NE $\frac{1}{4}$  SW $\frac{1}{4}$ ; SE $\frac{1}{4}$  NW $\frac{1}{4}$  SW $\frac{1}{4}$ ; that portion of the SW $\frac{1}{4}$  NE $\frac{1}{4}$  SW $\frac{1}{4}$  lying north of BLM Road No. 15-2-1.1; that portion of the W $\frac{1}{2}$  SW $\frac{1}{4}$  lying north of BLM Road No. 15-2-



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**Table 3-L-4 - Pending and Proposed Withdrawals, Relinquishments and Modifications (cont.)**


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1.1;  $W\frac{1}{2} E\frac{1}{2} NW\frac{1}{4} SE\frac{1}{4}$ ;  $W\frac{1}{2} NW\frac{1}{4} SE\frac{1}{4}$ ; that portion of the  $E\frac{1}{2} E\frac{1}{2} NW\frac{1}{4} SE\frac{1}{4}$ ,  $E\frac{1}{2} SW\frac{1}{4} SE\frac{1}{4}$  and  $SE\frac{1}{4} SE\frac{1}{4}$  lying west of a line to be described by metes and bounds following completion of survey.

The area described above contains 378.08 acres, more or less, in Linn County, Oregon.

Private Lands

T.14 S., R.2 W., W.M.

Sec. 36:  $S\frac{1}{2} SW\frac{1}{4}$

T.15 S., R.2 W., W.M.

Sec. 02: Lot 1,  $SE\frac{1}{4} NE\frac{1}{4}$

The area described above contains 160.92 acres (title plat) in Linn County, Oregon.

The proposed withdrawal would withdraw the public lands and any of the private lands that may become public lands in the future from entry under the general land laws, including the mining laws, but not the mineral leasing laws, subject to valid existing rights. The purpose of the proposed withdrawal is to protect outstanding botanical, wildlife and scenic values and the best remaining example of a western Cascade margin grassy bald.

Scope: Alternatives B, C, D, E, Preferred

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**Proposed Cougar Mountain Ancient Yew Grove  
Area of Critical Environmental Concern Withdrawal**

Federal Lands

T.20 S., R.3 W., W.M.

Sec. 01:  $E\frac{1}{2} E\frac{1}{2} SE\frac{1}{4}$

The area described above contains 40.00 acres (title plat) in Lane County, Oregon.

The proposed withdrawal would withdraw the public lands from entry under the general land laws, including the mining laws, but not the mineral leasing laws, subject to valid existing rights. The purpose of the proposed withdrawal is to protect a rare stand of Pacific yew.

Scope: Alternatives C, D, E

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**Preferred Alternative:** Withdraw only NEGSEGSEG, containing 10.00 acres (title plat) in Lane County, Oregon

**Proposed Grassy Mountain Area of Critical Environmental Concern Withdrawal**

Federal Lands

T.15 S., R.1 W., W.M.

Sec. 11: Lot 4,  $SW\frac{1}{4} NE\frac{1}{4}$  of Lot 5,  $W\frac{1}{2}$  of Lot 5,  $W\frac{1}{2} SE\frac{1}{4}$  of Lot 5,  $SE\frac{1}{4} SE\frac{1}{4}$  of Lot 5

The area described above contains 73.53 acres (title plat), more or less, in Lane County, Oregon.

Private Lands

T.15 S., R.1 W., W.M.

Sec. 14: Portion of  $N\frac{1}{2} NW\frac{1}{4}$  lying north of Weyerhaeuser Road

The area described above contains 35.00 acres, more or less, in Lane County, Oregon.

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**Table 3-L-4 - Pending and Proposed Withdrawals, Relinquishments  
and Modifications (cont.)**

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The proposed withdrawal would withdraw the public lands and any of the private lands that may become public lands in the future from entry under the general land laws, including the mining laws, but not the mineral leasing laws, subject to valid existing rights. The purpose of the proposed withdrawal is to protect a rare natural system made up of a relatively undisturbed native grassy bald community.

Scope: All Alternatives

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**Proposed Whittaker Creek Recreation Site Addition Withdrawal**

Private Lands

T.18 S., R.8 W., W.M.

Sec. 21: NW $\frac{1}{4}$  SE $\frac{1}{4}$

The area described above contains 40.00 acres (title plat) in Lane County, Oregon.

The proposed withdrawal would withdraw any of the subject lands that may become public lands in the future from entry under the general land laws, including the mining laws, but not the mineral leasing laws, subject to valid existing rights. The purpose of the proposed withdrawal is to protect the natural park setting of the existing recreation development, which encroaches inadvertently onto the subject tract.

Scope: Alternatives C, D, E, Preferred

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**Proposed Clay Creek Recreation Site Addition Withdrawal**

Private Lands

T.19 S., R.7 W., W.M.

Sec. 19: Lots 2,3, NW $\frac{1}{4}$  SE $\frac{1}{4}$

The area described above contains 84.99 acres (title plat) in Lane County, Oregon.

The proposed withdrawal would withdraw any of the subject lands that may become public lands in the future from entry under the general land laws, including the mining laws, but not the mineral leasing laws, subject to valid existing rights. The purpose of the proposed withdrawal is to protect the natural visual quality of the existing recreation development and to allow for expansion of the campground, a portion of which currently encroaches inadvertently onto the subject tract.

Scope: Alternatives C, D, E, Preferred

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**Proposed Siuslaw Bend Recreation Site Withdrawal**

Federal Lands

T.19 S., R.7 W., W.M.

Sec. 21: Lot 5; those portions of Lots 2, 3 and 7 lying west of the centerline of the Upper Siuslaw Access Road; that portion of Lot 4 lying south of the centerline of the Upper Siuslaw Access Road; and those portions of Lots 6, 11 and 12 lying north of the centerline of the Upper Siuslaw Access Road.

The area described above contains 153 acres, more or less, in Lane County, Oregon.

Private Lands

T.19 S., R.7 W., W.M.

Sec. 16: Those portions of Lots 13 and 14 lying south of the centerline of the Upper Siuslaw Access Road.

**Table 3-L-4 - Pending and Proposed Withdrawals, Relinquishments and Modifications (cont.)**

The area described above contains 11 acres, more or less, in Lane County, Oregon.

The proposed withdrawal would withdraw the public lands and any of the private lands that may become public lands in the future from entry under the general land laws, including the mining laws, but not the mineral leasing laws, subject to valid existing rights. The purpose of the proposed withdrawal would be to protect campground and related recreational improvements to be constructed on the site as well as scenic and natural values that contribute to its value for recreation.

Scope: Alternatives C, D, E, Preferred

**Proposed McKenzie River Special Recreation Management Area Withdrawal**

Federal Lands

T.16 S., R.2 E., W.M.

Sec. 28: Lot 9

Sec. 33: Lot 2

Sec. 34: Lot 10

Sec. 35: Lot 6

T.16 S., R.3 E., W.M.

Sec. 31: Lots 7,8,10,14

Sec. 32: Lot 2, S $\frac{1}{2}$  of Lot 10, Lot 11, Lots 13 and 14 excluding Goodpasture County Road right-of-way

Sec. 33: W $\frac{1}{2}$  of Lot 1, SW $\frac{1}{4}$  NW $\frac{1}{4}$  SW $\frac{1}{4}$

T.17 S., R.1 E., W.M.

Sec. 19: N $\frac{1}{2}$  of Lot 10

T.17 S., R.2 E., W.M.

Sec. 1: Lot 4

T.17 S., R.3 E., W.M.

Sec. 3: Lot 4, Lot 2 excluding the north 700 feet

Sec. 4: Lots 5,6,7,9, NW $\frac{1}{4}$  NW $\frac{1}{4}$

Sec. 5: Lots 2,3 and SW $\frac{1}{4}$  NE $\frac{1}{4}$  excluding Goodpasture County Road right-of-way; Lot 4; Lot 5 north of the north right-of-way line of Bonneville Power Administration right-of-way Ore06100; SE $\frac{1}{4}$ .

Sec. 8: NE $\frac{1}{4}$  NE $\frac{1}{4}$

Sec. 9: Lots 3-5; S $\frac{1}{2}$  N $\frac{1}{2}$

Sec. 10: Lots 3-5; NW $\frac{1}{4}$  NW $\frac{1}{4}$ ; SE $\frac{1}{4}$  NW $\frac{1}{4}$ ; N $\frac{1}{2}$  SE $\frac{1}{4}$  north of Weyerhaeuser road right-of-way

Sec. 11: Lot 3; NW $\frac{1}{4}$  SW $\frac{1}{4}$  north of Weyerhaeuser road right-of-way

The area described above contains 1474.02 acres, more or less, in Lane County, Oregon.

**Table 3-L-4 - Pending and Proposed Withdrawals, Relinquishments and Modifications (cont.)**

Private Lands

T.16 S., R.2 E., W.M.

Sec. 36: Portion of Lot 6 (Tax lot 16-25-36-00-01100)

T.16 S., R.2 E., W.M.

Sec. 26: NE $\frac{1}{4}$  SW $\frac{1}{4}$ , portion of SE $\frac{1}{4}$  NW $\frac{1}{4}$

T.17 S., R.1 E., W.M.

Sec. 19: Portion of unnamed island

T.17 S., R.1 W., W.M.

Sec. 24: Rodman Island, portion of unnamed island

Sec. 27: McNutt Island

Sec. 28: McNutt Island

T.17 S., R.3 E., W.M.

Sec. 2: Lots 7-10; NE $\frac{1}{4}$  SE $\frac{1}{4}$ ; S $\frac{1}{2}$  SE $\frac{1}{4}$

Sec. 4: Lot 8

Sec. 9: Lot 6

Sec. 10: SW $\frac{1}{4}$  NW $\frac{1}{4}$

Sec. 11: Lot 2; E $\frac{1}{2}$  NW $\frac{1}{4}$

The area described above contains 703.94 acres, more or less, in Lane County, Oregon.

The proposed withdrawal would withdraw the public lands and any of the private lands that may become public lands in the future from entry under the general land laws, including the mining laws, but not the mineral leasing laws, subject to valid existing rights. The purpose of the proposed withdrawal would be to protect campground and related recreational improvements to be constructed as well as scenic and natural values along the McKenzie River.

Scope: Alternatives C, D, E, Preferred

**Proposed Glikey Creek Recreation Management Area Withdrawal**

Federal Lands

T.17 S., R.2 W., W.M.

Sec. 13: Lots 1-3,5,9, NW $\frac{1}{4}$  NW $\frac{1}{4}$ , NW $\frac{1}{4}$  SW $\frac{1}{4}$

Sec. 15: N $\frac{1}{2}$  NE $\frac{1}{4}$ , SE $\frac{1}{4}$  NE $\frac{1}{4}$

Sec. 23: NE $\frac{1}{4}$  NE $\frac{1}{4}$

The area described above contains 375.61 acres (title plat) in Lane County, Oregon.

Private Lands

T.17 S., R.2 W., W.M.

Sec. 13: Lots 4,6-8, NE $\frac{1}{4}$  NW $\frac{1}{4}$ , SW $\frac{1}{4}$  NW $\frac{1}{4}$ , portions of DLC 37, DLC 41 and DLC 42

Sec. 14: N $\frac{1}{2}$ , N $\frac{1}{2}$  SW $\frac{1}{4}$ , SE $\frac{1}{4}$

Sec. 23: Lot 3; NW $\frac{1}{4}$  NE $\frac{1}{4}$ ; NE $\frac{1}{4}$  SW $\frac{1}{4}$ ; portion of Lots 1,2 and DLC67

Sec. 24: Portion of DLC37 (tax lots 17-02-24-00-00403 and 17-02-24-00-00405)

The area described above contains 1196.03 acres, more or less, in Lane County, Oregon.

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**Table 3-L-4 - Pending and Proposed Withdrawals, Relinquishments and Modifications (cont.)**


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The proposed withdrawal would withdraw the public lands and any of the private lands that may become public lands in the future from entry under the general land laws, including the mining laws, but not the mineral leasing laws, subject to valid existing rights. The purpose of the proposed withdrawal would be to protect recreational improvements to be constructed as well as scenic and natural values within the Gilkey Creek Special Recreation Management Area.

Scope: Alternatives C, D, E, Preferred

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**Proposed McGowan Creek Environmental Education Area Withdrawal**
**Federal Lands**

T.16 S., R.2 W., W.M.

Sec. 19:  $W\frac{1}{2} E\frac{1}{2} W\frac{1}{2} NE\frac{1}{4}$ ,  $W\frac{1}{2} W\frac{1}{2} NE\frac{1}{4}$ ,  $E\frac{1}{2} NE\frac{1}{4} NW\frac{1}{4}$ ,  $E\frac{1}{2} N\frac{1}{2} N\frac{1}{2} NW\frac{1}{4}$ ,  $SE\frac{1}{4} NE\frac{1}{4}$  and  $E\frac{1}{2} E\frac{1}{2} SW\frac{1}{4} NE\frac{1}{4}$  lying north of McGowan Creek Road.

The area described above contains 124 acres, more or less, in Lane County, Oregon.

The proposed withdrawal would withdraw the public lands from entry under the general land laws, including the mining laws, but not the mineral leasing laws, subject to valid existing rights. The purpose of the proposed withdrawal is to protect the outstanding natural values of the existing environmental education area.

Scope: Alternatives B, C, D, E, Preferred

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**Proposed Stuslaw River Special Recreation Management Area Withdrawal**
**Federal Lands**

T.18 S., R.8 W., W.M.

Sec. 21:  $NE\frac{1}{4}$ ,  $W\frac{1}{2} NW\frac{1}{4}$ ,  $N\frac{1}{2} SW\frac{1}{4}$ ,  $SW\frac{1}{4} SW\frac{1}{4}$ ,  $E\frac{1}{2} SE\frac{1}{4}$

Sec. 27: ALL

Sec. 28:  $E\frac{1}{2} SE\frac{1}{4}$

Sec. 33:  $E\frac{1}{2} SE\frac{1}{4}$

Sec. 35:  $W\frac{1}{2} NW\frac{1}{4}$ ,  $NW\frac{1}{4} SW\frac{1}{4}$

T.19 S., R.6 W., W.M.

Sec. 29:  $W\frac{1}{2} NE\frac{1}{4}$ ,  $W\frac{1}{2}$ ,  $SE\frac{1}{4}$

Sec. 31:  $E\frac{1}{2}$ ,  $E\frac{1}{2} W\frac{1}{2}$

T.19 S., R.7 W., W.M.

Sec. 17:  $SE\frac{1}{4} SW\frac{1}{4}$ ,  $S\frac{1}{2} SE\frac{1}{4}$

Sec. 19: Lots 1,4,  $N\frac{1}{2} NE\frac{1}{4}$ ,  $SW\frac{1}{4} NE\frac{1}{4}$ ,  $S\frac{1}{2} SE\frac{1}{4}$

Sec. 21: ALL

Sec. 23:  $SW\frac{1}{4} SW\frac{1}{4}$

Sec. 25:  $S\frac{1}{2} SE\frac{1}{4}$

Sec. 27: ALL

Sec. 29:  $NE\frac{1}{4} NE\frac{1}{4}$

Sec. 30: Lots 1,2

Sec. 35: Lots 1,2-4,6,10-13

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**Table 3-L-4 - Pending and Proposed Withdrawals, Relinquishments and Modifications (cont.)**


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## T.19 S., R.8 W., W.M.

- Sec. 3: Lots 10,11, W $\frac{1}{2}$  SE $\frac{1}{4}$
- Sec. 11: N $\frac{1}{2}$  N $\frac{1}{2}$ , SE $\frac{1}{4}$  NE $\frac{1}{4}$ , SW $\frac{1}{4}$  SW $\frac{1}{4}$ , SE $\frac{1}{4}$  SE $\frac{1}{4}$
- Sec. 13: N $\frac{1}{2}$  NW $\frac{1}{4}$ , SE $\frac{1}{4}$  NW $\frac{1}{4}$ , NE $\frac{1}{4}$  SE $\frac{1}{4}$
- Sec. 15: E $\frac{1}{2}$  NE $\frac{1}{4}$  NE $\frac{1}{4}$
- Sec. 23: E $\frac{1}{2}$  NE $\frac{1}{4}$
- Sec. 24: SE $\frac{1}{4}$  SE $\frac{1}{4}$
- Sec. 25: ALL
- Sec. 35: E $\frac{1}{2}$  NE $\frac{1}{4}$ , NE $\frac{1}{4}$  SE $\frac{1}{4}$

## T.20 S., R.6 W., W.M.

- Sec. 1: N $\frac{1}{2}$  SW $\frac{1}{4}$ , W $\frac{1}{2}$  W $\frac{1}{2}$  SE $\frac{1}{4}$
- Sec. 3: Lots 5-17
- Sec. 4: SE $\frac{1}{4}$  NE $\frac{1}{4}$
- Sec. 5: ALL
- Sec. 9: ALL
- Sec. 11: N $\frac{1}{2}$  NE $\frac{1}{4}$ , SW $\frac{1}{4}$  NE $\frac{1}{4}$ , E $\frac{1}{2}$  NW $\frac{1}{4}$ , NE $\frac{1}{4}$  SW $\frac{1}{4}$ , S $\frac{1}{2}$  SW $\frac{1}{4}$ , SE $\frac{1}{4}$
- Sec. 13: N $\frac{1}{2}$  N $\frac{1}{2}$ , SE $\frac{1}{4}$  NE $\frac{1}{4}$ , NE $\frac{1}{4}$  SE $\frac{1}{4}$
- Sec. 15: Lots 1-7,10-12

## T.20 S., R.7 W., W.M.

- Sec. 3: Lots 1,2,4,5,7-12

The area described above contains 8,749.48 acres (title plat) in Lane County, Oregon and 780.00 acres (title plat) in Douglas County, Oregon.

## Private Lands

## T.18 S., R.8 W., W.M.

- Sec. 21: E $\frac{1}{2}$  NW $\frac{1}{4}$ , NW $\frac{1}{4}$  SE $\frac{1}{4}$
- Sec. 22: S $\frac{1}{2}$
- Sec. 28: N $\frac{1}{2}$
- Sec. 33: E $\frac{1}{2}$  NE $\frac{1}{4}$
- Sec. 34: ALL
- Sec. 35: S $\frac{1}{2}$  SW $\frac{1}{4}$ , SW $\frac{1}{4}$  SE $\frac{1}{4}$

## T.19 S., R.6 W., W.M.

- Sec. 30: Lots 2-4, E $\frac{1}{2}$ , SE $\frac{1}{4}$  NW $\frac{1}{4}$ , E $\frac{1}{2}$  SW $\frac{1}{4}$
- Sec. 32: ALL

**Table 3-L-4 - Pending and Proposed Withdrawals, Relinquishments and Modifications (cont.)**
**T.19 S., R.7 W., W.M.**

 Sec. 16: Lots 13,14, W $\frac{1}{2}$  of Lot 15

 Sec. 19: Lots 2,3, NW $\frac{1}{4}$  SE $\frac{1}{4}$ 

Sec. 20: ALL

 Sec. 22: S $\frac{1}{2}$ 

 Sec. 25: S $\frac{1}{2}$  SW $\frac{1}{4}$ , NE $\frac{1}{4}$  SE $\frac{1}{4}$ , portion of N $\frac{1}{2}$  SW $\frac{1}{4}$  and SW $\frac{1}{4}$  NW $\frac{1}{4}$ 

 Sec. 26: W $\frac{1}{2}$  NW $\frac{1}{4}$ , S $\frac{1}{2}$ , S $\frac{1}{2}$  SE $\frac{1}{4}$  NE $\frac{1}{4}$ 

Sec. 28: ALL

 Sec. 30: NE $\frac{1}{4}$ 

Sec. 34: ALL

 Sec. 35: NW $\frac{1}{4}$  NE $\frac{1}{4}$ 

 Sec. 36: N $\frac{1}{2}$  NW $\frac{1}{4}$ 
**T.19 S., R.8 W., W.M.**

 Sec. 3: Lots 1-9,12, SW $\frac{1}{4}$ , E $\frac{1}{2}$  SE $\frac{1}{4}$ 

Sec. 4: ALL

 Sec. 9: NE $\frac{1}{4}$ 

Sec. 10: ALL

 Sec. 11: SW $\frac{1}{4}$  NE $\frac{1}{4}$ , S $\frac{1}{2}$  NW $\frac{1}{4}$ , N $\frac{1}{2}$  SW $\frac{1}{4}$ , SE $\frac{1}{4}$  SW $\frac{1}{4}$ , N $\frac{1}{2}$  SE $\frac{1}{4}$ , SW $\frac{1}{4}$  SE $\frac{1}{4}$ 

 Sec. 13: SW $\frac{1}{4}$  NW $\frac{1}{4}$ , SW $\frac{1}{4}$ , NW $\frac{1}{4}$  SE $\frac{1}{4}$ , S $\frac{1}{2}$  SE $\frac{1}{4}$ 

 Sec. 14: N $\frac{1}{2}$ , N $\frac{1}{2}$  S $\frac{1}{2}$ , SE $\frac{1}{4}$  SE $\frac{1}{4}$ 

 Sec. 24: N $\frac{1}{2}$ , N $\frac{1}{2}$  S $\frac{1}{2}$ , S $\frac{1}{2}$  SW $\frac{1}{4}$ , SW $\frac{1}{4}$  SE $\frac{1}{4}$ 

 Sec. 26: E $\frac{1}{2}$  SE $\frac{1}{4}$  SE $\frac{1}{4}$ 

 Sec. 36: NW $\frac{1}{4}$ , N $\frac{1}{2}$  SW $\frac{1}{4}$ 
**T.20 S., R.6 W., W.M.**

 Sec. 1: S $\frac{1}{2}$  SW $\frac{1}{4}$ 

 Sec. 2: S $\frac{1}{2}$  east of Road No. 20-6-11

 Sec. 3: NE $\frac{1}{4}$  SW $\frac{1}{4}$ , S $\frac{1}{2}$  SW $\frac{1}{4}$ 

 Sec. 4: Lots 1-4, SW $\frac{1}{4}$  NE $\frac{1}{4}$ , S $\frac{1}{2}$  NW $\frac{1}{4}$ , S $\frac{1}{2}$ 

 Sec. 6: Lots 1,2, S $\frac{1}{2}$  NE $\frac{1}{4}$ , SE $\frac{1}{4}$ 

 Sec. 8: N $\frac{1}{2}$ , SE $\frac{1}{4}$ 

Sec. 10: ALL

 Sec. 11: SE $\frac{1}{4}$  NE $\frac{1}{4}$ , W $\frac{1}{2}$  NW $\frac{1}{4}$ , NW $\frac{1}{4}$  SW $\frac{1}{4}$ 

 Sec. 12: W $\frac{1}{2}$  W $\frac{1}{2}$  NE $\frac{1}{4}$ , W $\frac{1}{2}$ , SE $\frac{1}{4}$ 
**T.20 S., R.7 W., W.M.**

Sec. 2: Lots 3-5,12

Sec. 3: Lots 3,6

The area described above contains 13,461.15 acres, more or less, in Lane County, Oregon and 240.00 acre, more or less, in Douglas County, Oregon.

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**Table 3-L-4 - Pending and Proposed Withdrawals, Relinquishments and Modifications (cont.)**


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The proposed withdrawal would withdraw the public lands and any of the private lands that may become public lands in the future from entry under the general land laws, including the mining laws, but not the mineral leasing laws, subject to valid existing rights. The purpose of the proposed withdrawal would be to protect campground and related recreational improvements to be constructed as well as scenic and natural values along the Siuslaw River. This proposal includes all lands within the boundaries of the proposed Special Recreation Management Area.

Scope: Alternatives C, D, E

Preferred Alternative - See following pages

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**Proposed Siuslaw River Special Recreation Management Area Withdrawal**
**Federal Lands**
**T.18 S., R.8 W., W.M.**

- Sec. 21: N $\frac{1}{2}$  NW $\frac{1}{4}$  NE $\frac{1}{4}$ , SW $\frac{1}{4}$  NW $\frac{1}{4}$  NE $\frac{1}{4}$ , SW $\frac{1}{4}$  NE $\frac{1}{4}$ , SW $\frac{1}{4}$  SE $\frac{1}{4}$  NE $\frac{1}{4}$ , W $\frac{1}{2}$  NW $\frac{1}{4}$ , NE $\frac{1}{4}$  SW $\frac{1}{4}$ , NE $\frac{1}{4}$  NW $\frac{1}{4}$  SW $\frac{1}{4}$ , E $\frac{1}{2}$  NW $\frac{1}{4}$  NW $\frac{1}{4}$  SW $\frac{1}{4}$ , E $\frac{1}{2}$  SE $\frac{1}{4}$
- Sec. 27: W $\frac{1}{2}$  NE $\frac{1}{4}$ , SW $\frac{1}{4}$  SE $\frac{1}{4}$  NE $\frac{1}{4}$ , NW $\frac{1}{4}$ , N $\frac{1}{2}$  SW $\frac{1}{4}$ , N $\frac{1}{2}$  SW $\frac{1}{4}$  SW $\frac{1}{4}$ , N $\frac{1}{2}$  S $\frac{1}{2}$  SW $\frac{1}{4}$  SW $\frac{1}{4}$ , SE $\frac{1}{4}$  SW $\frac{1}{4}$ , W $\frac{1}{2}$  SE $\frac{1}{4}$ , W $\frac{1}{2}$  NE $\frac{1}{4}$  SE $\frac{1}{4}$ , S $\frac{1}{2}$  SE $\frac{1}{4}$  NE $\frac{1}{4}$  SE $\frac{1}{4}$ , SE $\frac{1}{4}$  SE $\frac{1}{4}$
- Sec. 33: E $\frac{1}{2}$  NE $\frac{1}{4}$  NE $\frac{1}{4}$  SE $\frac{1}{4}$ , SE $\frac{1}{4}$  NE $\frac{1}{4}$  SE $\frac{1}{4}$ , NE $\frac{1}{4}$  SE $\frac{1}{4}$  SE $\frac{1}{4}$ , E $\frac{1}{2}$  SE $\frac{1}{4}$  SE $\frac{1}{4}$  SE $\frac{1}{4}$
- Sec. 35: W $\frac{1}{2}$  NW $\frac{1}{4}$ , NW $\frac{1}{4}$  SW $\frac{1}{4}$

**T.19 S., R.6 W., W.M.**

- Sec. 29: W $\frac{1}{2}$  SW $\frac{1}{4}$  NW $\frac{1}{4}$  NE $\frac{1}{4}$ , W $\frac{1}{2}$  W $\frac{1}{2}$  SW $\frac{1}{4}$  NE $\frac{1}{4}$ , W $\frac{1}{2}$ , W $\frac{1}{2}$  NW $\frac{1}{4}$  NW $\frac{1}{4}$  SE $\frac{1}{4}$ , SW $\frac{1}{4}$  SE $\frac{1}{4}$ , SW $\frac{1}{4}$  SE $\frac{1}{4}$  SE $\frac{1}{4}$
- Sec. 31: NE $\frac{1}{4}$ , N $\frac{1}{2}$  NE $\frac{1}{4}$  NW $\frac{1}{4}$ , SE $\frac{1}{4}$  NE $\frac{1}{4}$  NW $\frac{1}{4}$ , E $\frac{1}{2}$  E $\frac{1}{2}$  SE $\frac{1}{4}$  NW $\frac{1}{4}$

**T.19 S., R.7 W., W.M.**

- Sec. 17: S $\frac{1}{2}$  N $\frac{1}{2}$  SE $\frac{1}{4}$  SW $\frac{1}{4}$ , S $\frac{1}{2}$  SE $\frac{1}{4}$  SW $\frac{1}{4}$ , S $\frac{1}{2}$  S $\frac{1}{2}$  SE $\frac{1}{4}$ , S $\frac{1}{2}$  NW $\frac{1}{4}$  SW $\frac{1}{4}$  SE $\frac{1}{4}$
- Sec. 19: N $\frac{1}{2}$  of Lot 4, N $\frac{1}{2}$  S $\frac{1}{2}$  of Lot 4, S $\frac{1}{2}$  SW $\frac{1}{4}$  NE $\frac{1}{4}$ , N $\frac{1}{2}$  S $\frac{1}{2}$  SE $\frac{1}{4}$ , N $\frac{1}{2}$  S $\frac{1}{2}$  SW $\frac{1}{4}$  SE $\frac{1}{4}$
- Sec. 21: Lots 2-7, S $\frac{1}{2}$  of Lot 9, Lots 10-16
- Sec. 23: S $\frac{1}{2}$  NW $\frac{1}{4}$  SW $\frac{1}{4}$  SW $\frac{1}{4}$ , S $\frac{1}{4}$  SW $\frac{1}{4}$  SW $\frac{1}{4}$
- Sec. 25: S $\frac{1}{2}$  SE $\frac{1}{4}$
- Sec. 27: N $\frac{1}{2}$ , N $\frac{1}{2}$  N $\frac{1}{2}$  N $\frac{1}{2}$  SW $\frac{1}{4}$ , E $\frac{1}{2}$  SE $\frac{1}{4}$
- Sec. 29: NE $\frac{1}{4}$  NE $\frac{1}{4}$
- Sec. 35: Lots 1-4, N $\frac{1}{2}$  of Lot 6, W $\frac{1}{2}$  SW $\frac{1}{4}$  of Lot 6, Lots 10-13

**T.19 S., R.8 W., W.M.**

- Sec. 3: N $\frac{1}{2}$  NW $\frac{1}{4}$  of Lot 10, N $\frac{1}{2}$  of Lot 11, S $\frac{1}{2}$  SW $\frac{1}{4}$  SE $\frac{1}{4}$
- Sec. 11: SW $\frac{1}{4}$  NE $\frac{1}{4}$  NE $\frac{1}{4}$ , S $\frac{1}{2}$  SE $\frac{1}{4}$  NE $\frac{1}{4}$  NE $\frac{1}{4}$ , S $\frac{1}{2}$  N $\frac{1}{2}$  NW $\frac{1}{4}$  NE $\frac{1}{4}$ , S $\frac{1}{2}$  NW $\frac{1}{4}$  NE $\frac{1}{4}$ , W $\frac{1}{2}$  NW $\frac{1}{4}$  NE $\frac{1}{4}$  NW $\frac{1}{4}$ , S $\frac{1}{2}$  NE $\frac{1}{4}$  NW $\frac{1}{4}$ , NW $\frac{1}{4}$  NW $\frac{1}{4}$ , SE $\frac{1}{4}$  NE $\frac{1}{4}$ , SW $\frac{1}{4}$  SW $\frac{1}{4}$ , SE $\frac{1}{4}$  SE $\frac{1}{4}$
- Sec. 13: SW $\frac{1}{4}$  NE $\frac{1}{4}$  NW $\frac{1}{4}$ , S $\frac{1}{2}$  NW $\frac{1}{4}$  NW $\frac{1}{4}$ , SE $\frac{1}{4}$  NW $\frac{1}{4}$ , S $\frac{1}{2}$  NW $\frac{1}{4}$  NE $\frac{1}{4}$  SE $\frac{1}{4}$ , S $\frac{1}{2}$  NE $\frac{1}{4}$  SE $\frac{1}{4}$
- Sec. 15: E $\frac{1}{2}$  NE $\frac{1}{4}$  NE $\frac{1}{4}$
- Sec. 23: E $\frac{1}{2}$  NE $\frac{1}{4}$
- Sec. 35: E $\frac{1}{2}$  NE $\frac{1}{4}$ , NE $\frac{1}{4}$  SE $\frac{1}{4}$

**T.20 S., R.6 W., W.M.**

- Sec. 1: S $\frac{1}{2}$  NW $\frac{1}{4}$  SW $\frac{1}{4}$ , SW $\frac{1}{4}$  NE $\frac{1}{4}$  SW $\frac{1}{4}$ , W $\frac{1}{2}$  SE $\frac{1}{4}$  NE $\frac{1}{4}$  SW $\frac{1}{4}$
- Sec. 3: S $\frac{1}{2}$  S $\frac{1}{2}$  of Lot 9, S $\frac{1}{2}$  SW $\frac{1}{4}$  of Lot 10, W $\frac{1}{2}$  SW $\frac{1}{4}$  of Lot 14, Lot 15, W $\frac{1}{2}$  W $\frac{1}{2}$  of Lot 16



**Table 3-L-4 - Pending and Proposed Withdrawals, Relinquishments and Modifications (cont.)**

Sec. 5:	Lots 1-4, S $\frac{1}{2}$ NE $\frac{1}{4}$ , E $\frac{1}{2}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$ , SE $\frac{1}{4}$ NW $\frac{1}{4}$ , E $\frac{1}{2}$ NW $\frac{1}{4}$ SW $\frac{1}{4}$ , NE $\frac{1}{4}$ SW $\frac{1}{4}$ , N $\frac{1}{2}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$ , SE $\frac{1}{4}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$ , SE $\frac{1}{4}$
Sec. 9:	Lots 1-8, W $\frac{1}{2}$ NW $\frac{1}{4}$ of Lot 11, Lot 12, N $\frac{1}{2}$ of Lot 13
Sec. 11:	N $\frac{1}{2}$ NE $\frac{1}{4}$ , SW $\frac{1}{4}$ NE $\frac{1}{4}$ , E $\frac{1}{2}$ NE $\frac{1}{4}$ NW $\frac{1}{4}$ , NE $\frac{1}{4}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$ , E $\frac{1}{2}$ NW $\frac{1}{4}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$ , S $\frac{1}{2}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$ , NE $\frac{1}{4}$ SW $\frac{1}{4}$ , S $\frac{1}{2}$ SW $\frac{1}{4}$ , N $\frac{1}{2}$ SE $\frac{1}{4}$ , SW $\frac{1}{4}$ SE $\frac{1}{4}$ , N $\frac{1}{2}$ N $\frac{1}{2}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$
Sec. 13:	N $\frac{1}{2}$ NE $\frac{1}{4}$ , SE $\frac{1}{4}$ NE $\frac{1}{4}$ , NE $\frac{1}{4}$ NW $\frac{1}{4}$ , NE $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ , NE $\frac{1}{4}$ SE $\frac{1}{4}$
Sec. 15:	N $\frac{1}{2}$ N $\frac{1}{2}$ of Lot 1
T.20 S., R.7 W., W.M.	
Sec. 3:	Lots 1,2,4,5,7,8, N $\frac{1}{2}$ N $\frac{1}{2}$ of Lot 9, N $\frac{1}{2}$ of Lot 10, N $\frac{1}{2}$ of Lot 11, NE $\frac{1}{4}$ of Lot 12
The area described above contains 5,516.89 acres (title plat) in Lane County, Oregon and 140.00 acres (title plat) in Douglas County, Oregon.	
Private Lands	
T.18 S., R.8 W., W.M.	
Sec. 21:	E $\frac{1}{2}$ NW $\frac{1}{4}$ , NW $\frac{1}{4}$ SE $\frac{1}{4}$
Sec. 22:	SW $\frac{1}{4}$ , W $\frac{1}{2}$ SE $\frac{1}{4}$ , W $\frac{1}{2}$ NW $\frac{1}{4}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$ , SW $\frac{1}{4}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$ , W $\frac{1}{2}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$
Sec. 28:	NE $\frac{1}{4}$ , NE $\frac{1}{4}$ NW $\frac{1}{4}$ , N $\frac{1}{2}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$ , SE $\frac{1}{4}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$ , NE $\frac{1}{4}$ SE $\frac{1}{4}$ , N $\frac{1}{2}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ , N $\frac{1}{2}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$
Sec. 34:	NE $\frac{1}{4}$ , NE $\frac{1}{4}$ NE $\frac{1}{4}$ NW $\frac{1}{4}$ , S $\frac{1}{2}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$ , SE $\frac{1}{4}$ NW $\frac{1}{4}$ , S $\frac{1}{2}$
Sec. 35:	S $\frac{1}{2}$ SW $\frac{1}{4}$ , SW $\frac{1}{4}$ SE $\frac{1}{4}$
T.19 S., R.6 W., W.M.	
Sec. 30:	Lots 2-4, E $\frac{1}{2}$ NE $\frac{1}{4}$ , S $\frac{1}{2}$ NE $\frac{1}{4}$ NW $\frac{1}{4}$ NE $\frac{1}{4}$ , SE $\frac{1}{4}$ NW $\frac{1}{4}$ NE $\frac{1}{4}$ , SW $\frac{1}{4}$ NE $\frac{1}{4}$ , E $\frac{1}{2}$ SW $\frac{1}{4}$ , SE $\frac{1}{4}$
Sec. 32:	SW $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ , W $\frac{1}{2}$ NE $\frac{1}{4}$ , W $\frac{1}{2}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$ , NW $\frac{1}{4}$
T.19 S., R.7 W., W.M.	
Sec. 16:	Lots 13,14, W $\frac{1}{2}$ of Lot 15
Sec. 19:	Lots 2,3, NW $\frac{1}{4}$ SE $\frac{1}{4}$
Sec. 20:	N $\frac{1}{2}$ , NW $\frac{1}{4}$ NE $\frac{1}{4}$ SW $\frac{1}{4}$ , NW $\frac{1}{4}$ SW $\frac{1}{4}$ , N $\frac{1}{2}$ NW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ , E $\frac{1}{2}$ SE $\frac{1}{4}$ , E $\frac{1}{2}$ W $\frac{1}{2}$ SE $\frac{1}{4}$ , E $\frac{1}{2}$ W $\frac{1}{2}$ W $\frac{1}{2}$ SE $\frac{1}{4}$
Sec. 22:	SW $\frac{1}{4}$ , W $\frac{1}{2}$ W $\frac{1}{2}$ SE $\frac{1}{4}$ , SE $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$ , S $\frac{1}{2}$ N $\frac{1}{2}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ , S $\frac{1}{2}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$
Sec. 25:	S $\frac{1}{2}$ SW $\frac{1}{4}$ , NE $\frac{1}{4}$ SE $\frac{1}{4}$ , portion of N $\frac{1}{2}$ SW $\frac{1}{4}$ and SW $\frac{1}{4}$ NW $\frac{1}{4}$
Sec. 26:	S $\frac{1}{2}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$ , W $\frac{1}{2}$ NW $\frac{1}{4}$ , W $\frac{1}{2}$ SW $\frac{1}{4}$ , W $\frac{1}{2}$ W $\frac{1}{2}$ NE $\frac{1}{4}$ SW $\frac{1}{4}$ , W $\frac{1}{2}$ NW $\frac{1}{4}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$ , S $\frac{1}{2}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$ , E $\frac{1}{2}$ SE $\frac{1}{4}$ , E $\frac{1}{2}$ NW $\frac{1}{4}$ SE $\frac{1}{4}$ , NE $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$ , S $\frac{1}{2}$ NW $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$ , S $\frac{1}{2}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$
Sec. 28:	Lots 1-12, N $\frac{1}{2}$ of Lot 13, SE $\frac{1}{4}$ of Lot 13, Lots 14-15, NW $\frac{1}{4}$ of Lot 16
Sec. 34:	NE $\frac{1}{4}$ , NE $\frac{1}{4}$ NE $\frac{1}{4}$ NW $\frac{1}{4}$ , S $\frac{1}{2}$ NE $\frac{1}{4}$ NW $\frac{1}{4}$ , E $\frac{1}{2}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$ , SE $\frac{1}{4}$ NW $\frac{1}{4}$ , S $\frac{1}{2}$
Sec. 35:	NW $\frac{1}{4}$ NE $\frac{1}{4}$
Sec. 36:	W $\frac{1}{2}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$
T.19 S., R.8 W., W.M.	
Sec. 3:	Lots 1-7, NW $\frac{1}{4}$ of Lot 8, Lot 12, W $\frac{1}{2}$ SW $\frac{1}{4}$ , SW $\frac{1}{4}$ NE $\frac{1}{4}$ SW $\frac{1}{4}$ , NW $\frac{1}{4}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$ , S $\frac{1}{2}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$ , S $\frac{1}{2}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$
Sec. 4:	Lots 1-2, N $\frac{1}{2}$ of Lot 3, N $\frac{1}{2}$ SE $\frac{1}{4}$ of Lot 3, Lots 8-9, NE $\frac{1}{4}$ SE $\frac{1}{4}$ , S $\frac{1}{2}$ SE $\frac{1}{4}$
Sec. 9:	NE $\frac{1}{4}$

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**Table 3-L-4 - Pending and Proposed Withdrawals, Relinquishments and Modifications (cont.)**


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- Sec. 10: E $\frac{1}{2}$ , E $\frac{1}{2}$  W $\frac{1}{2}$ , W $\frac{1}{2}$  NW $\frac{1}{4}$ , E $\frac{1}{2}$  NW $\frac{1}{4}$  SW $\frac{1}{4}$ , NE $\frac{1}{4}$  SW $\frac{1}{4}$  SW $\frac{1}{4}$
- Sec. 11: SW $\frac{1}{4}$  NE $\frac{1}{4}$ , S $\frac{1}{2}$  NW $\frac{1}{4}$ , N $\frac{1}{2}$  SW $\frac{1}{4}$ , SE $\frac{1}{4}$  SW $\frac{1}{4}$ , N $\frac{1}{2}$  SE $\frac{1}{4}$ , SW $\frac{1}{4}$  SE $\frac{1}{4}$
- Sec. 13: SW $\frac{1}{4}$  NW $\frac{1}{4}$ , SW $\frac{1}{4}$ , S $\frac{1}{2}$  N $\frac{1}{2}$  NW $\frac{1}{4}$  SE $\frac{1}{4}$ , S $\frac{1}{2}$  NW $\frac{1}{4}$  SE $\frac{1}{4}$ , S $\frac{1}{2}$  SE $\frac{1}{4}$
- Sec. 14: N $\frac{1}{2}$ , NE $\frac{1}{4}$  SW $\frac{1}{4}$ , N $\frac{1}{2}$  NW $\frac{1}{4}$  SW $\frac{1}{4}$ , SE $\frac{1}{4}$  NW $\frac{1}{4}$  SW $\frac{1}{4}$ , N $\frac{1}{2}$  SE $\frac{1}{4}$ , SE $\frac{1}{4}$  SE $\frac{1}{4}$
- Sec. 24: N $\frac{1}{2}$ , N $\frac{1}{2}$  NW $\frac{1}{4}$  SW $\frac{1}{4}$ , SE $\frac{1}{4}$  NW $\frac{1}{4}$  SW $\frac{1}{4}$ , NE $\frac{1}{4}$  SW $\frac{1}{4}$ , N $\frac{1}{2}$  NE $\frac{1}{4}$  SW $\frac{1}{4}$  SW $\frac{1}{4}$ , N $\frac{1}{2}$  SE $\frac{1}{4}$  SW $\frac{1}{4}$ , N $\frac{1}{2}$  NE $\frac{1}{4}$  SE $\frac{1}{4}$ , N $\frac{1}{2}$  SW $\frac{1}{4}$  NE $\frac{1}{4}$  SE $\frac{1}{4}$ , NW $\frac{1}{4}$  SE $\frac{1}{4}$ , N $\frac{1}{2}$  NW $\frac{1}{4}$  SW $\frac{1}{4}$  SE $\frac{1}{4}$
- Sec. 36: W $\frac{1}{2}$  E $\frac{1}{2}$  NW $\frac{1}{4}$ , W $\frac{1}{2}$  NW $\frac{1}{4}$ , W $\frac{1}{2}$  NE $\frac{1}{4}$  SW $\frac{1}{4}$ , NW $\frac{1}{4}$  SW $\frac{1}{4}$
- T.20 S., R.6 W., W.M.
- Sec. 1: S $\frac{1}{2}$  SW $\frac{1}{4}$
- Sec. 2: E $\frac{1}{2}$  SW $\frac{1}{4}$  NE $\frac{1}{4}$  SE $\frac{1}{4}$ , SE $\frac{1}{4}$  NE $\frac{1}{4}$  SE $\frac{1}{4}$ , NE $\frac{1}{4}$  SW $\frac{1}{4}$  SE $\frac{1}{4}$ , S $\frac{1}{2}$  SW $\frac{1}{4}$  SE $\frac{1}{4}$ , SE $\frac{1}{4}$  SE $\frac{1}{4}$
- Sec. 3: NE $\frac{1}{4}$  SW $\frac{1}{4}$ , S $\frac{1}{2}$  SW $\frac{1}{4}$
- Sec. 4: W $\frac{1}{2}$  W $\frac{1}{2}$  SW $\frac{1}{4}$  NW $\frac{1}{4}$ , W $\frac{1}{2}$  NW $\frac{1}{4}$  NW $\frac{1}{4}$  SW $\frac{1}{4}$ , S $\frac{1}{2}$  SW $\frac{1}{4}$  SW $\frac{1}{4}$ , NE $\frac{1}{4}$  SE $\frac{1}{4}$  SW $\frac{1}{4}$ , S $\frac{1}{2}$  NW $\frac{1}{4}$  SE $\frac{1}{4}$  SW $\frac{1}{4}$ , S $\frac{1}{2}$  SE $\frac{1}{4}$  SW $\frac{1}{4}$ , S $\frac{1}{2}$  N $\frac{1}{2}$  NE $\frac{1}{4}$  SE $\frac{1}{4}$ , S $\frac{1}{2}$  NE $\frac{1}{4}$  SE $\frac{1}{4}$ , SE $\frac{1}{4}$  NW $\frac{1}{4}$  SE $\frac{1}{4}$ , S $\frac{1}{2}$  SE $\frac{1}{4}$
- Sec. 6: Lots 1,2, N $\frac{1}{2}$  SW $\frac{1}{4}$  NE $\frac{1}{4}$ , N $\frac{1}{2}$  N $\frac{1}{2}$  SE $\frac{1}{4}$  NE $\frac{1}{4}$
- Sec. 8: E $\frac{1}{2}$  NE $\frac{1}{4}$ , N $\frac{1}{2}$  NW $\frac{1}{4}$  NE $\frac{1}{4}$ , N $\frac{1}{2}$  SW $\frac{1}{4}$  NW $\frac{1}{4}$  NE $\frac{1}{4}$ , SE $\frac{1}{4}$  NW $\frac{1}{4}$  NE $\frac{1}{4}$ , E $\frac{1}{2}$  SW $\frac{1}{4}$  NE $\frac{1}{4}$ , NE $\frac{1}{4}$  SE $\frac{1}{4}$ , E $\frac{1}{2}$  NW $\frac{1}{4}$  SE $\frac{1}{4}$ , NE $\frac{1}{2}$  SW $\frac{1}{4}$  NE $\frac{1}{4}$ , N $\frac{1}{2}$  SE $\frac{1}{4}$  SE $\frac{1}{4}$
- Sec. 10: W $\frac{1}{2}$  W $\frac{1}{2}$  NW $\frac{1}{4}$  NE $\frac{1}{4}$ , SW $\frac{1}{4}$  SW $\frac{1}{4}$  NE $\frac{1}{4}$ , S $\frac{1}{2}$  SE $\frac{1}{4}$  SW $\frac{1}{4}$  NE $\frac{1}{4}$ , NW $\frac{1}{4}$ , NE $\frac{1}{4}$  SW $\frac{1}{4}$ , N $\frac{1}{2}$  NW $\frac{1}{4}$  SW $\frac{1}{4}$ , SE $\frac{1}{4}$  NW $\frac{1}{4}$  SW $\frac{1}{4}$ , N $\frac{1}{2}$  NE $\frac{1}{4}$  SW $\frac{1}{4}$  SW $\frac{1}{4}$ , N $\frac{1}{2}$  SE $\frac{1}{4}$  SW $\frac{1}{4}$ , N $\frac{1}{2}$  SE $\frac{1}{4}$ , N $\frac{1}{2}$  SW $\frac{1}{4}$  SE $\frac{1}{4}$ , E $\frac{1}{2}$  SW $\frac{1}{4}$  SW $\frac{1}{4}$  SE $\frac{1}{4}$ , SE $\frac{1}{4}$  SW $\frac{1}{4}$  SE $\frac{1}{4}$ , SE $\frac{1}{4}$  SE $\frac{1}{4}$
- Sec. 11: SE $\frac{1}{4}$  NE $\frac{1}{4}$ , S $\frac{1}{2}$  S $\frac{1}{2}$  SW $\frac{1}{4}$  NW $\frac{1}{4}$ , NW $\frac{1}{4}$  SW $\frac{1}{4}$
- Sec. 12: SW $\frac{1}{4}$  NW $\frac{1}{4}$  NE $\frac{1}{4}$ , W $\frac{1}{2}$  SW $\frac{1}{4}$  NE $\frac{1}{4}$ , NW $\frac{1}{4}$ , N $\frac{1}{2}$  SW $\frac{1}{4}$ , E $\frac{1}{2}$  SW $\frac{1}{4}$  SW $\frac{1}{4}$ , N $\frac{1}{2}$  NW $\frac{1}{4}$  SW $\frac{1}{4}$  SW $\frac{1}{4}$ , SE $\frac{1}{4}$  SW $\frac{1}{4}$ , W $\frac{1}{2}$  NW $\frac{1}{4}$  SE $\frac{1}{4}$ , S $\frac{1}{2}$  SE $\frac{1}{4}$
- T.20 S., R.7 W., W.M.
- Sec. 2: Lots 2-5
- Sec. 3: Lots 3,6

The area described above contains 9,928.69 acres, more or less, in Lane County, Oregon and 180.00 acre, more or less, in Douglas County, Oregon.

The proposed withdrawal would withdraw the public lands and any of the private lands that may become public lands in the future from entry under the general land laws, including the mining laws, but not the mineral leasing laws, subject to valid existing rights. The purpose of the proposed withdrawal would be to protect campground and related recreational improvements to be constructed as well as scenic and natural values along the Siuslaw River. This withdrawal proposal includes that portion of the lands within the boundaries of the proposed Siuslaw River Special Recreation Management Area lying within one-quarter mile of the Siuslaw River and Esmond Lake.

Scope: Preferred Alternative

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**Table 3-L-4 - Pending and Proposed Withdrawals, Relinquishments and Modifications (cont.)**

**Proposed Coburg Hills Bald Eagle Habitat**

**Area of Critical Environmental Concern Withdrawal**

Federal Lands

T.14 S., R.2 W., W.M.

Sec. 15: Lots 1-5

Sec. 20: SE $\frac{1}{4}$  NE $\frac{1}{4}$ , N $\frac{1}{2}$  SE $\frac{1}{4}$

Sec. 21: Lot 3, SW $\frac{3}{4}$  NW $\frac{1}{4}$ , NW $\frac{1}{4}$  SE $\frac{1}{4}$ , S $\frac{1}{2}$  SE $\frac{1}{4}$

Sec. 22: SW $\frac{1}{4}$  SW $\frac{1}{4}$

T.15 S., R.2 W., W.M.

Sec. 16: S $\frac{1}{2}$  SW $\frac{1}{4}$

Sec. 20: Lots 4,5

Sec. 21: Those portions of the NE $\frac{1}{4}$ , SW $\frac{1}{4}$  and NW $\frac{1}{4}$  SE $\frac{1}{4}$  lying west of the centerline of BLM Road No. 15-2-16.

Sec. 29: Lots 1,2, N $\frac{1}{2}$  NE $\frac{1}{4}$ , SW $\frac{1}{4}$  NE $\frac{1}{4}$ , E $\frac{1}{2}$  NW $\frac{1}{4}$ ; that portion of the SE $\frac{1}{4}$  NE $\frac{1}{4}$  lying west of the centerline of BLM Road No. 15-2-16; and that portion of the N $\frac{1}{2}$  S $\frac{1}{2}$  lying west of the centerline of BLM Road No. 15-2-16 and north of a line to be described by metes and bounds.

The area described above contains 1,204 acres, more or less, in Linn County, Oregon.

Private Lands

T.15 S., R.2 W., W.M.

Sec. 17: Portion of Lot 5 and DLC 40

Sec. 20: SE $\frac{1}{4}$  SW $\frac{1}{4}$  and portion of DLC 40

The area described above contains 67.00 acres, more or less, in Linn County, Oregon.

The proposed withdrawal would withdraw the public lands and any of the private lands that may become public lands in the future from entry under the general land laws, including the mining laws, but not the mineral leasing laws, subject to valid existing rights. The purpose of the proposed withdrawal is to protect core bald eagle roosting areas and critical habitat.

Scope: Alternatives D and E

Preferred: Withdraw only the following lands:

Federal Lands

T.14 S., R.2 W., W.M.

Sec. 21: N $\frac{1}{2}$  NW $\frac{1}{4}$  SE $\frac{1}{4}$

T.15 S., R.2 W., W.M.

Sec. 20: Lots 2,3

The area described above contains 52.38 acres (title plat) in Linn County, Oregon.

Private Lands

T.15 S., R.2 W., W.M.

Sec. 17: Portion of Lot 5 and DLC 40

Sec. 20: SE $\frac{1}{4}$  SW $\frac{1}{4}$  and portion of DLC 40

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**Table 3-L-4 - Pending and Proposed Withdrawals, Relinquishments  
and Modifications (cont.)**


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The area described above contains 67.00 acres, more or less, in Linn County, Oregon.

Note: Final withdrawal description of lands described above as metes and bounds will utilize aliquot part descriptions down to five-acre parts. Final withdrawal acreage could thus differ slightly from that cited above.

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**Proposed Fall Creek Reservoir Bald Eagle Habitat  
Area of Critical Environmental Concern Withdrawal**
**Federal Lands**

T.18 S., R.1 E., W.M.

- Sec. 23: That portion of E $\frac{1}{2}$ SW $\frac{1}{4}$  and SE $\frac{1}{4}$  lying south and west of the centerline of BLM Road No.18-1E-25; That portion of the W $\frac{1}{2}$ SW $\frac{1}{4}$  lying south of a line to be described by metes and bounds.
- Sec. 31: S $\frac{1}{2}$ NE $\frac{1}{4}$ ; that portion of NW $\frac{1}{4}$  lying south of the centerline of BLM Road No. 18-1E-31; that portion of the N $\frac{1}{2}$ S $\frac{1}{2}$  lying north and west of the centerline of Lane County Road No. 409.

T.19 S., R.1 E., W.M.

- Sec. 03: That portion of Lots 5-12 lying north of the centerline of BLM RoadNo.19-1E-2 and north and west of the centerlines of BLM Road Nos.19-1E-3.1 and 19-1E-3.2.
- Sec. 26: N $\frac{1}{2}$ NE $\frac{1}{4}$ , NE $\frac{1}{4}$ NW $\frac{1}{4}$

The area described above contains 746 acres, more or less, in Lane County, Oregon.

The proposed withdrawal would withdraw the public lands from entry under the general land laws, including the mining laws, but not the mineral leasing laws, subject to valid existing rights. The purpose of the proposed withdrawal is to protect critical bald eagle habitat.

Scope: Alternatives D and E

Note: Final withdrawal description of lands described above as metes and bounds will utilize aliquot part descriptions down to five-acre parts. Final withdrawal acreage could thus differ slightly from that cited above.

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**Proposed McKenzie River Bald Eagle Habitat  
Area of Critical Environmental Concern Withdrawal**
**Federal Lands**

T.16 S., R.1 E., W.M.

- Sec. 25: That portion of the NW $\frac{1}{4}$  lying west of the centerline of BLM Road No.16-1E-25 and south of a line to be described by metes and bounds; that portion of SW $\frac{1}{4}$  lying west of the centerline of BLM Road No.16-1E-35.1 and south and west of the centerline of BLM Road No.16-1E-25.4.
- Sec. 35: Lots 1,2,4,5,8 and 12; that portion of Lot 3 lying north of the centerline of BLM Road No. 17-1E-1; that portion of Lots 6,7,9,10 and 16 lying east of the centerline of BLM Road No. 17-1E-1; that portion of Lots 6, 11, 13 and 14 lying west of the centerline of BLM Road No. 17-1E-1.

T.17 S., R.1 E., W.M.

- Sec. 15: SE $\frac{1}{4}$ SW $\frac{1}{4}$
- Sec. 19: Lots 10, 11, W $\frac{1}{2}$ SE $\frac{1}{4}$

**Table 3-L-4 - Pending and Proposed Withdrawals, Relinquishments and Modifications (cont.)**

- Sec. 21: Lot 1, NW<sup>1</sup>/<sub>4</sub> NE<sup>1</sup>/<sub>4</sub>
- T.17 S., R.2 E., W.M.
- Sec. 04: SW<sup>1</sup>/<sub>4</sub> SW<sup>1</sup>/<sub>4</sub>
- Sec. 05: S<sup>1</sup>/<sub>2</sub>
- Sec. 07: N<sup>1</sup>/<sub>2</sub> NE<sup>1</sup>/<sub>4</sub> NE<sup>1</sup>/<sub>4</sub> NE<sup>1</sup>/<sub>4</sub>, E<sup>1</sup>/<sub>2</sub> SE<sup>1</sup>/<sub>4</sub> NE<sup>1</sup>/<sub>4</sub> NE<sup>1</sup>/<sub>4</sub> lying east and south of the centerline of BLM Road No. 17-2E-7.
- Sec. 08: N<sup>1</sup>/<sub>2</sub> N<sup>1</sup>/<sub>2</sub> NE<sup>1</sup>/<sub>4</sub> NW<sup>1</sup>/<sub>4</sub>; SW<sup>1</sup>/<sub>4</sub> NW<sup>1</sup>/<sub>4</sub> NE<sup>1</sup>/<sub>4</sub> NW<sup>1</sup>/<sub>4</sub> and W<sup>1</sup>/<sub>2</sub> SW<sup>1</sup>/<sub>4</sub> NE<sup>1</sup>/<sub>4</sub> NW<sup>1</sup>/<sub>4</sub> lying north and west of the centerline of BLM Road Nos. 17-1E-10 and 17-2E-8.1; NW<sup>1</sup>/<sub>4</sub> NW<sup>1</sup>/<sub>4</sub> lying north and west of the centerline of BLM Road No.17-1E-10.
- Sec. 09: N<sup>1</sup>/<sub>2</sub> NW<sup>1</sup>/<sub>4</sub> NW<sup>1</sup>/<sub>4</sub> lying north of a line to be described by metes and bounds.
- T.17 S., R.3 E., W.M.
- Sec. 04: Lots 6,7
- Sec. 05: That portion of N<sup>1</sup>/<sub>2</sub> SE<sup>1</sup>/<sub>4</sub> lying south and east of the centerline of an unnamed creek; N<sup>1</sup>/<sub>2</sub> NE<sup>1</sup>/<sub>4</sub> SW<sup>1</sup>/<sub>4</sub> SE<sup>1</sup>/<sub>4</sub>; E<sup>1</sup>/<sub>2</sub> SE<sup>1</sup>/<sub>4</sub> SE<sup>1</sup>/<sub>4</sub>; N<sup>1</sup>/<sub>2</sub> NW<sup>1</sup>/<sub>4</sub> SE<sup>1</sup>/<sub>4</sub> SE<sup>1</sup>/<sub>4</sub>; SE<sup>1</sup>/<sub>4</sub> NW<sup>1</sup>/<sub>4</sub> SE<sup>1</sup>/<sub>4</sub> SE<sup>1</sup>/<sub>4</sub>; E<sup>1</sup>/<sub>2</sub> SW<sup>1</sup>/<sub>4</sub> SE<sup>1</sup>/<sub>4</sub> SE<sup>1</sup>/<sub>4</sub>.
- Sec. 08: NE<sup>1</sup>/<sub>4</sub> NE<sup>1</sup>/<sub>4</sub> NE<sup>1</sup>/<sub>4</sub>
- Sec. 09: Lots 3,4; S<sup>1</sup>/<sub>2</sub> NE<sup>1</sup>/<sub>4</sub>; N<sup>1</sup>/<sub>2</sub> SE<sup>1</sup>/<sub>4</sub> NW<sup>1</sup>/<sub>4</sub>; SE<sup>1</sup>/<sub>4</sub> SE<sup>1</sup>/<sub>4</sub> NW<sup>1</sup>/<sub>4</sub>; that portion of NE<sup>1</sup>/<sub>4</sub> NE<sup>1</sup>/<sub>4</sub> SW<sup>1</sup>/<sub>4</sub> lying east of the centerline of South Deer Creek; N<sup>1</sup>/<sub>2</sub> N<sup>1</sup>/<sub>2</sub> SE<sup>1</sup>/<sub>4</sub>; SE<sup>1</sup>/<sub>4</sub> NE<sup>1</sup>/<sub>4</sub> SE<sup>1</sup>/<sub>4</sub>; NE<sup>1</sup>/<sub>4</sub> SW<sup>1</sup>/<sub>4</sub> NE<sup>1</sup>/<sub>4</sub> SE<sup>1</sup>/<sub>4</sub>.
- Sec. 10: Lots 3-5, NW<sup>1</sup>/<sub>4</sub> NW<sup>1</sup>/<sub>4</sub>, SE<sup>1</sup>/<sub>4</sub> NW<sup>1</sup>/<sub>4</sub>; that portion of N<sup>1</sup>/<sub>2</sub> SE<sup>1</sup>/<sub>4</sub> lying north of Weyerhaeuser Road.
- Sec. 11: That portion of NW<sup>1</sup>/<sub>4</sub> SW<sup>1</sup>/<sub>4</sub> lying north of Weyerhaeuser Road.
- T.17 S., R.1 W., W.M.
- Sec. 35: That portion of W<sup>1</sup>/<sub>2</sub> W<sup>1</sup>/<sub>2</sub> of Lot 3 lying south of the centerline of BLM Road No. 17-1-34; that portion of Lot 4 lying South of the centerline of BLM Road No. 17-1-34 and east of the centerline of BLM Road No. 17-1-35.
- T. 18 S., R.1 W., W.M.
- Sec. 03: Lots 5-11

The area described above contains 2,037 acres, more or less, in Lane County, Oregon.

The proposed withdrawal would withdraw the public lands from entry under the general land laws, including the mining laws, but not the mineral leasing laws, subject to valid existing rights. The purpose of the proposed withdrawal is to protect critical bald eagle habitat.

Scope: Alternatives D and E

Note: Final withdrawal description of lands described above as metes and bounds will utilize aliquot part descriptions down to five-acre parts. Final withdrawal acreage could thus differ slightly from that cited above.

**Proposed Dorena Reservoir Bald Eagle Habitat**

**Area of Critical Environmental Concern Withdrawal**

Federal Lands

T.21 S., R.1 W., W.M.

Sec. 01: Lots 5-7, SE<sup>1</sup>/<sub>4</sub> SE<sup>1</sup>/<sub>4</sub> NE<sup>1</sup>/<sub>4</sub>

Sec. 09: N<sup>1</sup>/<sub>2</sub>, N<sup>1</sup>/<sub>2</sub> NE<sup>1</sup>/<sub>4</sub> SW<sup>1</sup>/<sub>4</sub>, SE<sup>1</sup>/<sub>4</sub> NE<sup>1</sup>/<sub>4</sub> SW<sup>1</sup>/<sub>4</sub>, N<sup>1</sup>/<sub>2</sub> SE<sup>1</sup>/<sub>4</sub>

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**Table 3-L-4 - Pending and Proposed Withdrawals, Relinquishments and Modifications (cont.)**


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**Sec. 13: Lot 1, E $\frac{1}{2}$ NE $\frac{1}{4}$** 

The area described above contains 654.28 acres, more or less, in Lane County, Oregon.

The proposed withdrawal would withdraw the public lands from entry under the general land laws, including the mining laws, but not the mineral leasing laws, subject to valid existing rights. The purpose of the proposed withdrawal is to protect critical bald eagle habitat.

Scope: Alternatives D and E

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**Proposed Siuslaw River Bald Eagle Habitat****Area of Critical Environmental Concern Withdrawal**

## Federal Lands

T.18 S., R.8 W., W.M.

Sec. 19: E $\frac{1}{2}$  of Lot 1, E $\frac{1}{2}$ NW $\frac{1}{4}$  of Lot 1, N $\frac{1}{2}$ NE $\frac{1}{4}$ , NE $\frac{1}{4}$ NW $\frac{1}{4}$ , NE $\frac{1}{4}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$ , N $\frac{1}{2}$ NW $\frac{1}{4}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$ , N $\frac{1}{2}$ S $\frac{1}{2}$ NE $\frac{1}{4}$ , NE $\frac{1}{4}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$ NE $\frac{1}{4}$ , N $\frac{1}{2}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$

Sec. 21: W $\frac{1}{2}$ NW $\frac{1}{4}$ , W $\frac{1}{2}$ NE $\frac{1}{4}$ SW $\frac{1}{4}$ , NW $\frac{1}{4}$ SW $\frac{1}{4}$ NE $\frac{1}{4}$ SW $\frac{1}{4}$ , NE $\frac{1}{4}$ NW $\frac{1}{4}$ SW $\frac{1}{4}$ , N $\frac{1}{2}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ SW $\frac{1}{4}$ , NE $\frac{1}{4}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$ SW $\frac{1}{4}$

The area described above contains 326.58 acres, more or less, in Lane County, Oregon.

The proposed withdrawal would withdraw the public lands from entry under the general land laws, including the mining laws, but not the mineral leasing laws, subject to valid existing rights. The purpose of the proposed withdrawal is to protect critical bald eagle habitat.

Scope: Alternatives D and E

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**Proposed Fern Ridge Bald Eagle Habitat Area of Critical Environmental Concern Withdrawal**

## Federal Lands

T.16 S., R.6 W., W.M.

Sec. 33: That portion of SW $\frac{1}{4}$ SW $\frac{1}{4}$  lying west of the centerline of BLM RoadNo.16-6-33.1 and north of the centerline of BLM RoadNo.16-6-33.3.

T.18 S., R.6 W., W.M.

Sec. 05: That portion of Lots 2-4, SW $\frac{1}{4}$ NE $\frac{1}{4}$  and S $\frac{1}{2}$ NW $\frac{1}{4}$  lying west of the centerline of BLM Road No. 18-6-5.3 and north of a line to be described by metes and bounds; that portion of Lot 1 and SE $\frac{1}{4}$ NE $\frac{1}{4}$  lying west of the centerline of BLM Road No. 18-6-5.3 and north of the centerline of BLM Road No. 18-6-5 and south of a line to be described by metes and bounds.

Sec. 11: Metes and bounds in SW $\frac{1}{4}$ .

The area described above contains 166 acres, more or less, in Lane County, Oregon.

The proposed withdrawal would withdraw the public lands from entry under the general land laws, including the mining laws, but not the mineral leasing laws, subject to valid existing rights. The purpose of the proposed withdrawal is to protect critical bald eagle habitat.

Scope: Alternatives D and E

Note: Final withdrawal description of lands described above as metes and bounds will utilize aliquot part descriptions down to five-acre parts. Final withdrawal acreage could thus differ slightly from that cited above.

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**Table 3-L-4 - Pending and Proposed Withdrawals, Relinquishments and Modifications (cont.)**

**Proposed Triangle Lake Bald Eagle Habitat**

**Area of Critical Environmental Concern Withdrawal**

**Federal Lands**

T.16 S., R.7 W., W.M.

Sec. 18: Lot 2

Sec. 19: N $\frac{1}{2}$  SE $\frac{1}{4}$ ; that portion of Lot 6 and NE $\frac{1}{4}$  SW $\frac{1}{4}$  lying east of the centerline of BLM Road No. 16-7-19.2 and a line to be described by metes and bounds.

Sec. 21: Lot 4; that portion of Lots 5 and 6 lying north of the centerline of BLM Road No. 16-7-29; that portion of Lot 3 lying west of the centerline of BLM Road No. 16-7-13 and a line to be described by metes and bounds; that portion of SE $\frac{1}{4}$  NW $\frac{1}{4}$  lying north of the centerline of BLM Road No. 16-7-29, south of the centerline of BLM Road No. 16-7-13 and west of a line to be described by metes and bounds.

T.16 S., R.8 W., W.M.

Sec. 13: Lots 1,2; metes and bounds in Lots 3 and 6-8.

The area described above contains 433 acres, more or less, in Lane County, Oregon.

The proposed withdrawal would withdraw the public lands from entry under the general land laws, including the mining laws, but not the mineral leasing laws, subject to valid existing rights. The purpose of the proposed withdrawal is to protect critical bald eagle habitat.

Scope: Alternatives D and E

Note: Final withdrawal description of lands described above as metes and bounds will utilize aliquot part descriptions down to five-acre parts. Final withdrawal acreage could thus differ slightly from that cited above.

**Proposed Triangle Lake Relict Forest Islands**

**Area of Critical Environmental Concern Withdrawal**

**Federal Lands**

T.15 S., R.7 W., W.M.

Sec. 25: Metes and bounds in Lots 5,6, SW $\frac{1}{4}$  NE $\frac{1}{4}$ , E $\frac{1}{2}$  NW $\frac{1}{4}$ , SW $\frac{1}{4}$  NW $\frac{1}{4}$  and SW $\frac{1}{4}$

Sec. 33: Lot 24; metes and bounds in Lots 16,17,23

Sec. 35: NE $\frac{1}{4}$  SE $\frac{1}{4}$ ; that portion of SE $\frac{1}{4}$  NE $\frac{1}{4}$  lying south of a line to be surveyed.

T.16 S., R.7 W., W.M.

Sec. 03: Metes and bounds in Lots 1,4, N $\frac{1}{2}$  SW $\frac{1}{4}$  and SE $\frac{1}{4}$ .

Sec. 05: Metes and bounds in Lots 1,2 N $\frac{1}{2}$  SE $\frac{1}{4}$  and SE $\frac{1}{4}$  SE $\frac{1}{4}$ .

Sec. 07: Metes and bounds in Lot 4, SE $\frac{1}{4}$  SW $\frac{1}{4}$  and SW $\frac{1}{4}$  SE $\frac{1}{4}$ .

Sec. 11: That portion of N $\frac{1}{2}$  NE $\frac{1}{4}$  lying west of the centerline of BLM Road No.16-7-11; metes and bounds in N $\frac{1}{2}$  SE $\frac{1}{4}$ .

Sec. 15: Metes and bounds in Lots 1-5 and 7-9.

Sec. 21: Metes and bounds in Lots 1-3, S $\frac{1}{2}$  NE $\frac{1}{4}$  and SE $\frac{1}{4}$  NW $\frac{1}{4}$ .

T.16 S., R.8 W., W.M.

Sec. 01: Metes and bounds in Lots 1-4.

The area described above contains 810 acres, more or less, in Lane County, Oregon.

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**Table 3-L-4 - Pending and Proposed Withdrawals, Relinquishments and Modifications (cont.)**


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The proposed withdrawal would withdraw the public lands from entry under the general land laws, including the mining laws, but not the mineral leasing laws, subject to valid existing rights. The purpose of the proposed withdrawal is to protect remnant islands of mature and old growth forest within a Key Raptor Area.

Scope: Alternatives D and E

Note: Final withdrawal description of lands described above as metes and bounds will utilize aliquot part descriptions down to five-acre parts. Final withdrawal acreage could thus differ slightly from that cited above.

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#### Proposed Coburg Hills Relict Forest Islands

##### Area of Critical Environmental Concern Withdrawal

###### Federal Lands

T.14 S., R.2 W., W.M.

Sec. 13: Lots 5-7

Sec. 28: Metes and bounds in E $\frac{1}{2}$

Sec. 29: Metes and bounds in SW $\frac{1}{4}$  NE $\frac{1}{4}$

Sec. 33: Metes and bounds in NW $\frac{1}{4}$

Sec. 35: Metes and bounds in N $\frac{1}{4}$  SE $\frac{1}{4}$  and SE $\frac{1}{4}$  SE $\frac{1}{4}$

T.15 S., R.2 W., W.M.

Sec. 03: Metes and bounds in S $\frac{1}{2}$  NE $\frac{1}{4}$ , N $\frac{1}{2}$  SE $\frac{1}{4}$  and SW $\frac{1}{4}$  SE $\frac{1}{4}$ .

Sec. 09: Metes and bounds in Lot 1, SW $\frac{1}{4}$  and S $\frac{1}{2}$  SE $\frac{1}{4}$ .

Sec. 31: Metes and bounds in Lots 1-4, NE $\frac{1}{4}$  NE $\frac{1}{4}$ , S $\frac{1}{2}$  NE $\frac{1}{4}$ , E $\frac{1}{2}$  NW $\frac{1}{4}$ , SW $\frac{1}{4}$  and W $\frac{1}{2}$  SE $\frac{1}{4}$ .

T.16 S., R.3 W., W.M.

Sec. 01: Metes and bounds in Lots 1-2, S $\frac{1}{2}$  NE $\frac{1}{4}$ , SE $\frac{1}{4}$  NW $\frac{1}{4}$  and SE $\frac{1}{4}$ .

The area described above contains 854 acres, more or less, in Linn County, Oregon.

The proposed withdrawal would withdraw the public lands from entry under the general land laws, including the mining laws, but not the mineral leasing laws, subject to valid existing rights. The purpose of the proposed withdrawal is to protect remnant islands of mature and old growth forest within a Key Raptor Area.

Scope: Alternatives D and E

Note: Final withdrawal description of lands described above as metes and bounds will utilize aliquot part descriptions down to five-acre parts. Final withdrawal acreage could thus differ slightly from that cited above.

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#### Proposed Cottage Grove Reservoir Relict Forest Islands

##### Area of Critical Environmental Concern Withdrawal

###### Federal Lands

T.21 S., R.3 W., W.M.

Sec. 27: Metes and bounds in NE $\frac{1}{4}$  NE $\frac{1}{4}$ , W $\frac{1}{2}$  SW $\frac{1}{4}$  and SE $\frac{1}{4}$ .

T.22 S., R.4 W., W.M.

Sec. 01: That portion of SW $\frac{1}{4}$  NE $\frac{1}{4}$  and NW $\frac{1}{4}$  lying north of the centerlines of Cedar Creek County Road and BLM Road No. 22-4-1 and lying east of the centerline of BLM Road No. 22-4-1.4.

The area described above contains 232 acres, more or less, in Lane County, Oregon.



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**Table 3-L-4 - Pending and Proposed Withdrawals, Relinquishments  
and Modifications (cont.)**


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The proposed withdrawal would withdraw the public lands from entry under the general land laws, including the mining laws, but not the mineral leasing laws, subject to valid existing rights. The purpose of the proposed withdrawal is to protect remnant islands of mature and old growth forest within a Key Raptor Area.

Scope: Alternatives D and E

Note: Final withdrawal description of lands described above as metes and bounds will utilize aliquot part descriptions down to five-acre parts. Final withdrawal acreage could thus differ slightly from that cited above.

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**Proposed Dorena Reservoir Relict Forest Islands  
Area of Critical Environmental Concern Withdrawal**
**Federal Lands**

T.20 S., R.2 W., W.M.

Sec. 21: Metes and bounds in SW<sup>1</sup>/<sub>4</sub> SW<sup>1</sup>/<sub>4</sub>.

Sec. 23: Metes and bounds in Lots 3-6.

Sec. 27: Metes and bounds in SE<sup>1</sup>/<sub>4</sub> NE<sup>1</sup>/<sub>4</sub>.

Sec. 31: Lot 6; metes and bounds in Lot 7, NE<sup>1</sup>/<sub>4</sub> SW<sup>1</sup>/<sub>4</sub> and W<sup>1</sup>/<sub>2</sub> SE<sup>1</sup>/<sub>4</sub>.

The area described above contains 209 acres, more or less, in Lane County, Oregon.

The proposed withdrawal would withdraw the public lands from entry under the general land laws, including the mining laws, but not the mineral leasing laws, subject to valid existing rights. The purpose of the proposed withdrawal is to protect remnant islands of mature and old growth forest within a Key Raptor Area.

Scope: Alternatives D and E

Note: Final withdrawal description of lands described above as metes and bounds will utilize aliquot part descriptions down to five-acre parts. Final withdrawal acreage could thus differ slightly from that cited above.

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**Proposed Upper Lake Creek Special Recreation Management Area Withdrawal**
**Federal Lands**

T.15 S., R.6 W., W.M.

Sec. 07: Lots 3,4, E<sup>1</sup>/<sub>2</sub> SW<sup>1</sup>/<sub>4</sub>, SE<sup>1</sup>/<sub>4</sub>

Sec. 17: All

Sec. 18: Lots 1-4, NE<sup>1</sup>/<sub>4</sub>, E<sup>1</sup>/<sub>2</sub> W<sup>1</sup>/<sub>2</sub>

Sec. 19: All

T.15 S., R.7 W., W.M.

Sec. 07: Lot 13, SW<sup>1</sup>/<sub>4</sub> SE<sup>1</sup>/<sub>4</sub>

Sec. 08: SW<sup>1</sup>/<sub>4</sub>, NE<sup>1</sup>/<sub>4</sub> SE<sup>1</sup>/<sub>4</sub>, S<sup>1</sup>/<sub>2</sub> SE<sup>1</sup>/<sub>4</sub>

Sec. 10: NW<sup>1</sup>/<sub>4</sub> NW<sup>1</sup>/<sub>4</sub>, S<sup>1</sup>/<sub>2</sub> N<sup>1</sup>/<sub>2</sub>, S<sup>1</sup>/<sub>2</sub>

Sec. 12: Lots 3,4, SW<sup>1</sup>/<sub>4</sub>, W<sup>1</sup>/<sub>2</sub> SE<sup>1</sup>/<sub>4</sub>

Sec. 13: All

Sec. 15: All

Sec. 16: All

Sec. 17: All

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**Table 3-L-4 - Pending and Proposed Withdrawals, Relinquishments and Modifications (cont.)**

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Sec. 18: All in Eugene District

Sec. 19: All in Eugene District

Sec. 20: All

Sec. 21: All

Sec. 23: All

Sec. 25: Lots 3-6, SW $\frac{1}{4}$ NE $\frac{1}{4}$ , W $\frac{1}{2}$ , W $\frac{1}{2}$ SE $\frac{1}{4}$

Sec. 27: All

Sec. 29: All

The area described above contains 10,293.54 acres (title plat) in Lane County, Oregon and 200.00 acres (title plat) in Benton County, Oregon.

Private Lands

T.15 S., R.6 W., W.M.

Sec. 18: SE $\frac{1}{4}$

T.15 S., R.7 W., W.M.

Sec. 08: S $\frac{1}{2}$ NE $\frac{1}{4}$ , NW $\frac{1}{4}$ SE $\frac{1}{4}$

Sec. 09: Lots 1-3, 5-16

Sec. 11: Lots 5,6, 8-11, SE $\frac{1}{4}$

Sec. 14: All

Sec. 22: All

Sec. 24: All

Sec. 25: Lot 2

Sec. 26: All

Sec. 28: All

The area described above contains 4,111.32 acres, more or less, in Lane County, Oregon and 466.47 acre, more or less, in Benton County, Oregon.

The proposed withdrawal would withdraw the public lands and any of the private lands that may become public lands in the future from entry under the general land laws, including the mining laws, but not the mineral leasing laws, subject to valid existing rights. The purpose of the proposed withdrawal would be to protect campground and related recreational improvements to be constructed as well as scenic and natural values in the upper Lake Creek drainage. This withdrawal proposal includes all lands within the boundaries of the proposed Upper Lake Creek Special Recreation Management Area.

Scope: Alternatives C,D,E

Preferred Alternative - See following pages

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**Table 3-L-4 - Pending and Proposed Withdrawals, Relinquishments and Modifications (cont.)**

**Proposed Upper Lake Creek Special Recreation Management Area Withdrawal**

Federal Lands

T.15 S., R.7 W., W.M.

- Sec. 15: S $\frac{1}{2}$  of Lot 3, S $\frac{1}{2}$  SW $\frac{1}{4}$  of Lot 4, NW $\frac{1}{4}$  NE $\frac{1}{4}$  SW $\frac{1}{4}$ , S $\frac{1}{2}$  NE $\frac{1}{4}$  SW $\frac{1}{4}$ , NW $\frac{1}{4}$  SW $\frac{1}{4}$ , S $\frac{1}{2}$  SW $\frac{1}{4}$ , S $\frac{1}{2}$  N $\frac{1}{2}$  NE $\frac{1}{4}$  SE $\frac{1}{4}$ , S $\frac{1}{2}$  NE $\frac{1}{4}$  SE $\frac{1}{4}$ , S $\frac{1}{2}$  NE $\frac{1}{4}$  NW $\frac{1}{4}$  SE $\frac{1}{4}$ , S $\frac{1}{2}$  NW $\frac{1}{4}$  SE $\frac{1}{4}$ , S $\frac{1}{2}$  SE $\frac{1}{4}$
- Sec. 16: S $\frac{1}{2}$  N $\frac{1}{2}$  S $\frac{1}{2}$  NE $\frac{1}{4}$ , S $\frac{1}{2}$  S $\frac{1}{2}$  NE $\frac{1}{4}$ , S $\frac{1}{2}$  NW $\frac{1}{4}$ , N $\frac{1}{2}$  SW $\frac{1}{4}$ , N $\frac{1}{2}$  N $\frac{1}{2}$  SE $\frac{1}{4}$  SW $\frac{1}{4}$ , N $\frac{1}{2}$  SE $\frac{1}{4}$ , N $\frac{1}{2}$  S $\frac{1}{2}$  SE $\frac{1}{4}$
- Sec. 17: S $\frac{1}{2}$  of Lot 1, S $\frac{1}{2}$  of Lot 2, Lots 6-9, N $\frac{1}{2}$  of Lot 10
- Sec. 20: S $\frac{1}{2}$  SW $\frac{1}{4}$ , W $\frac{1}{2}$  NW $\frac{1}{4}$  SW $\frac{1}{4}$  SE $\frac{1}{4}$ , S $\frac{1}{2}$  SW $\frac{1}{4}$  SE $\frac{1}{4}$ , S $\frac{1}{2}$  SE $\frac{1}{4}$  SE $\frac{1}{4}$
- Sec. 23: N $\frac{1}{2}$  NE $\frac{1}{4}$ , N $\frac{1}{2}$  SW $\frac{1}{4}$  NE $\frac{1}{4}$ , SE $\frac{1}{4}$  SW $\frac{1}{4}$  NE $\frac{1}{4}$ , E $\frac{1}{2}$  SW $\frac{1}{4}$  SW $\frac{1}{4}$  NE $\frac{1}{4}$ , SE $\frac{1}{4}$  NE $\frac{1}{4}$ , N $\frac{1}{2}$  NE $\frac{1}{4}$  NW $\frac{1}{4}$ , SE $\frac{1}{4}$  NE $\frac{1}{4}$  NW $\frac{1}{4}$ , NE $\frac{1}{4}$  NW $\frac{1}{4}$  NW $\frac{1}{4}$ , N $\frac{1}{2}$  NW $\frac{1}{4}$  NW $\frac{1}{4}$  NW $\frac{1}{4}$ , NE $\frac{1}{4}$  SE $\frac{1}{4}$ , E $\frac{1}{2}$  NW $\frac{1}{4}$  SE $\frac{1}{4}$ , E $\frac{1}{2}$  W $\frac{1}{2}$  NW $\frac{1}{4}$  SE $\frac{1}{4}$ , S $\frac{1}{2}$  SE $\frac{1}{4}$
- Sec. 25: W $\frac{1}{2}$  NW $\frac{1}{4}$
- Sec. 29: Lots 1-3, N $\frac{1}{2}$  of Lot 4, SE $\frac{1}{4}$  of Lot 4, N $\frac{1}{2}$  of Lot 6, N $\frac{1}{2}$  of Lot 7, Lot 8, NE $\frac{1}{4}$  of Lot 9

The area described above contains 1,651.29 acres (title plat) in Lane County, Oregon.

Private Lands

T.15 S., R.7 W., W.M.

- Sec. 14: S $\frac{1}{2}$  NE $\frac{1}{4}$  SW $\frac{1}{4}$ , S $\frac{1}{2}$  N $\frac{1}{2}$  NW $\frac{1}{4}$  SW $\frac{1}{4}$ , S $\frac{1}{2}$  NW $\frac{1}{4}$  SW $\frac{1}{4}$ , S $\frac{1}{2}$  SW $\frac{1}{4}$ , SW $\frac{1}{4}$  SE $\frac{1}{4}$ , SW $\frac{1}{4}$  SE $\frac{1}{4}$  SE $\frac{1}{4}$
- Sec. 22: N $\frac{1}{2}$  NE $\frac{1}{4}$  NE $\frac{1}{4}$  NE $\frac{1}{4}$ , NW $\frac{1}{4}$  NE $\frac{1}{4}$  NE $\frac{1}{4}$ , N $\frac{1}{2}$  NW $\frac{1}{4}$  NE $\frac{1}{4}$ , N $\frac{1}{2}$  NE $\frac{1}{4}$  NW $\frac{1}{4}$ , NE $\frac{1}{4}$  NW $\frac{1}{4}$  NW $\frac{1}{4}$
- Sec. 24: NW $\frac{1}{4}$  SW $\frac{1}{4}$  NW $\frac{1}{4}$ , S $\frac{1}{2}$  SW $\frac{1}{4}$  NW $\frac{1}{4}$ , W $\frac{1}{2}$  SW $\frac{1}{4}$
- Sec. 26: N $\frac{1}{2}$  NE $\frac{1}{4}$ , N $\frac{1}{2}$  SW $\frac{1}{4}$  NE $\frac{1}{4}$ , SE $\frac{1}{4}$  SW $\frac{1}{4}$  NE $\frac{1}{4}$ , SE $\frac{1}{4}$  NE $\frac{1}{4}$
- Sec. 28: NW $\frac{1}{4}$  NW $\frac{1}{4}$  NW $\frac{1}{4}$ , S $\frac{1}{2}$  NW $\frac{1}{4}$  NW $\frac{1}{4}$ , SW $\frac{1}{4}$  NW $\frac{1}{4}$ , W $\frac{1}{2}$  SE $\frac{1}{4}$  NW $\frac{1}{4}$ , N $\frac{1}{2}$  SW $\frac{1}{4}$ , N $\frac{1}{2}$  SW $\frac{1}{4}$  SW $\frac{1}{4}$ , SE $\frac{1}{4}$  SW $\frac{1}{4}$  SW $\frac{1}{4}$ , SE $\frac{1}{4}$  SW $\frac{1}{4}$ , S $\frac{1}{2}$  NW $\frac{1}{4}$  SE $\frac{1}{4}$ , SW $\frac{1}{4}$  SE $\frac{1}{4}$ , W $\frac{1}{2}$  SE $\frac{1}{4}$  SE $\frac{1}{4}$

The area described above contains 825.00 acres, more or less, in Lane County, Oregon.

The proposed withdrawal would withdraw the public lands and any of the private lands that may become public lands in the future from entry under the general land laws, including the mining laws, but not the mineral leasing laws, subject to valid existing rights. The purpose of the proposed withdrawal would be to protect campground and related recreational improvements to be constructed as well as scenic and natural values around Hult Reservoir and along upper Lake Creek and Congdon Creek. This withdrawal proposal includes that portion of the lands within the boundaries of the proposed Upper Lake Creek Special Recreation Management Area lying within one-quarter mile of Hult Reservoir, upper Lake Creek and Congdon Creek.

Scope: Preferred Alternative



# Appendix 3-C

## Water Resources

### Summary of Basic Principles

The beneficial uses of water resources of primary concern related to land management activities are rearing and spawning habitat for salmonoids, domestic water supply, fishing, and water contact recreation. In all of these uses, high quality water is important.

Forest hydrology is a collection of complex processes, which transform precipitation to streamflow or ground water.

### Water Quantity

#### Precipitation

Oregon's latitude, topography and location near the Pacific Ocean have a great influence upon its climate. The Coast Range and Cascade Range play a major role in rainfall patterns. As moisture-laden air travels inland from the ocean, it ascends to cross the mountains. As it rises, the moisture cools and condenses, falling as rain or snow. Large accumulations of snow occur during winter months in the higher elevations, generally above 4,000 feet.

Oregon's rainfall pattern gives the BLM Eugene District a plentiful water supply during October through May, when 92 percent of annual precipitation is received. June through September are generally dry months. This is because in winter the active Pacific storm systems move south, providing frequent rain, while in summer the storm track moves north into Canada. This gives the Eugene area lots of sunny, warm to hot summer days. The annual precipitation in the District ranges from a high of 100 inches to a low of 30 inches.

Precipitation is an important climatic variable that influences the productivity and management of forest lands. Estimates of precipitation are used for planning numerous forest management activities such as the location, design and maintenance of forest roads, and the selection and scheduling of harvesting and reforestation systems.

Interception occurs when rain or snow lands on vegetation rather than the ground. Some of this intercepted water evaporates and the remainder falls to the ground. Evaporation of water also occurs from surfaces of water bodies and soil surfaces. Under forested conditions, evaporation from soil surfaces is minimal. The process by which water is taken up by plants and discharged to the atmosphere is known as transpiration.

Infiltration is the movement of water into the soil surface. When the rainfall rate exceeds the rate of infiltration, water will travel over the ground surface to a channel. This is known as overland flow. Infiltration rates usually far exceed the maximum rates of rainfall in undisturbed forest soils in western Oregon, thus allowing most water that reaches the earth's surface to enter the soil.

Infiltration rates are reduced by soil disturbing activities such as road building and tractor logging. These activities tend to compact the soil surface causing some water to flow overland until it reaches nearby undisturbed soils or a stream channel. Removal of forest vegetation drastically reduces the amount of precipitation that returns to the atmosphere as a result of interception and transpiration. This allows more precipitation to reach the soil surface and drain into streams or become ground water. The return of vegetation results in annual streamflows decreasing to preharvest levels as both interception and transpiration increase. Evaporation from the soil surface is generally increased after timber harvest; however, this increase is much less than the reduction in transpiration.

#### Streamflow

The amount of water draining from a given area in a year is referred to as the annual water yield and is usually expressed in acre-feet (43,560 cubic feet) or the average depth over an area in inches. The annual yield of an area can be converted to the average annual flow (in cubic feet per second (CFS)) of the stream draining the area.

Streamflow is the water that reaches the stream channel. Total streamflow is a product of all the other processes in the hydrologic cycle. Distribution of annual streamflow in western Oregon is closely related to the distribution of annual precipitation; thus high flows are observed during the winter and low flows are predominant in the summer.

The effect of timber management activities (road construction, timber harvest, and slash disposal) on streamflow in small headwater Basins is primarily related to removal of forest vegetation and disturbance of the natural soil surface. Removing forest vegetation reduces evapotranspiration, thereby increasing the amount of rainfall available for streamflow. Studies of small watersheds in western Oregon showed that annual water yields from clear cut areas increased 26 to 43 percent following harvest (Harris, 1977; Rothacher, 1970; Harr et al., 1979).

The amount of increase in streamflow resulting from removal of forest vegetation is proportional to the type of harvest, the area harvested within a specific watershed, and the time since harvest. Streamflow increases are most noticeable in small watersheds that have large areas of vegetation removed over a short time period. Streamflow increases in large Basins tend to be masked because the nonvegetated area is small relative to the size of the Basin.

The duration of increased water yield is not easily predicted; however, Harr (1983) found that 27 years would be required for water yield increases to disappear. Increases in streamflow due to vegetation removal are not distributed evenly throughout the year. Increases in summer flows appear large when compared to the naturally low levels of streamflow during the summer months. The increases in summer streamflow result from greatly reduced transpiration allowing more water to drain through the soil to the streams. Summer increases are relatively short-lived because of the rapid growth of vegetation along stream channels.

Increases in streamflow following timber removal are greatest in fall because soil moisture content on the harvested areas is higher than it was under forested conditions. Therefore, a smaller amount of fall rains is used for soil moisture recharge and a larger proportion becomes streamflow. Timber removal has little effect on the size of large peak flows, which cause extensive downstream flooding. Large peak flows are caused by such great amounts of precipitation that differences in soil moisture content between harvested and forested areas become insignificant and both areas respond nearly the same.

Soil disturbance influences the frequency and magnitude of small and large peak flows. The degree of influence depends upon the amount of area compacted by roads and tractor skid roads, and the proximity of the compacted area to stream channels.

Recent watershed studies have shown that timber harvest in the transient snow zone has increased the magnitude of peak flows. The transient snow zone is located at elevations where the snow level fluctuates throughout the winter in response to alternating warm and cold fronts. In the Eugene District, the transient snow zone has been observed between elevations of 1,500 and 5,000 feet. Snow accumulation is greater in clear cut openings than in undisturbed forest. Rain-on-snow events result in rapid melting of these shallow snowpacks. More snowmelt is generated from clear cut openings than from forested areas, resulting in larger peak flows (Ingwersen, 1985).

Streamflow does not always increase following the removal of vegetation. In some areas, reduced fog interception and drip following logging apparently reduces annual precipitation enough to offset expected reductions in transpiration. In coastal areas, fog drip may account for as much as 30 percent of the total water reaching the forest floor; thus, removal of forest vegetation may actually decrease annual streamflow (Christner, 1981).

## Water Quality

Stream temperature, turbidity, sediment, dissolved oxygen, and chemical water quality are important water quality parameters to observe, since they indicate the ability to protect those beneficial uses listed in the OAR, Chapter 340-41.

Streams flowing from undisturbed forests generally have excellent quality. This characteristic makes streams valuable for domestic water supply, fish production and recreation. Natural processes such as surface erosion, landslides and flood events can increase sediments in stream channels, causing a detrimental effect on water quality.

Sediment and water temperature are the two water quality factors influenced most by timber harvest and road construction.

## Units of Measurement

Water temperature is measured in degrees Fahrenheit (°F) or degrees Celsius (°C); turbidity is measured in Jackson or Nephelometric Turbidity Units (JTUs or NTUs); conductivity is measured in microseimens (µS);

and bacteria are measured in number of organisms per 100 milliliters (MI). Most chemical parameters of interest, as well as most sediment data, are reported in terms of concentrations, discharge, or yield. Water quality data is usually reported as concentrations or weight per unit volume (usually milligrams per liter (mg/l) or micrograms per liter (ug/l)). In the dilute waters of western Oregon, mg/l equals parts per million (ppm), and micrograms per liter equals parts per billion (ppb). Frequently, in the case of sediment and occasionally in the case of chemicals, data is expressed in terms of discharge (i.e., weight or volume per unit time as tons per day or cubic feet (cf) per year). Occasionally sediment or chemical data is also expressed as yield (i.e., weight or volume per unit area of the watershed as tons per acre or acre-feet per square mile or kilograms per hectare).

## Stream Temperature

Timber harvest affects stream temperature by removing shading vegetation from streambanks. Stream temperature increases of 10\_ F or more have been recorded following removal of streamside vegetation by clear cutting and burning in both the Oregon Cascades and Coast Range (Brown and Krygier, 1970; Levno and Rothacher, 1969). Because downstream shading does not significantly lower temperatures of streams warmed by upstream exposure (Brown, 1970), water temperatures of larger streams can also increase when small tributaries are exposed by clear cutting. The magnitude of this effect is dependent on the temperature and quantity of ground water inflow, as well as inflow from other well-shaded tributaries. The primary concern with water temperature increases is the potential for detrimental effects on fish and other aquatic organisms.

Chapter 340 of the OAR sets standards for water temperature in streams. These standards require no measurable increases when stream temperatures are 58- F or greater in the Willamette Basin or 64- F in the Mid Coast Basin, and in no case may the increase in water temperature be more than 2- F. For application of the standards, maximum summer stream temperatures may be estimated with an equation developed by Schloss (1985), and temperature increases from removal of shading vegetation may be estimated from an equation developed by Brown (1970). Recent computer models, such as the one developed by Beschta (1984), may be used to estimate both ambient stream temperatures and changes resulting from management, for both individual stream reaches and networks of streams.

## Sediment

The larger peak flows described above have a direct relationship to increases in the amount of sediment transported downstream. Peak flows may result in streambank erosion and scouring of channel beds. Forestry practices may also influence the sediment entering streams by surface erosion or landslides. Landslide prone areas are avoided if possible in timber harvest and road construction. Roads contribute sediment directly from the road surface, cutbanks and fill slopes; and indirectly by altering the routing of water which can lead to landslides and other mass soil movement events. Roads continue to be a major source of stream sedimentation, although improved methods for design, location, construction and resurfacing of dirt roads with rock over the past 10 years have greatly reduced the amount of sediment contributed to the streams by roads.

Sediment clouds water, chokes fish gills, blankets fish spawning areas and smothers bottom aquatic habitats. Sediment also increases the cost of treating drinking water. Chemicals such as pesticides and nutrients, often bind to sediment particles. Soil erosion is the main source of sediment in water. Some soil is eroded naturally through weathering processes of rain and wind. But the main causes of soil loss are agricultural practices, timber harvesting, road and building site construction, and mining activities.

Timber management (road construction, timber harvest, and slash disposal) and other ground disturbing activities can affect sediment levels in District streams by increasing the capacity of the streams to entrain and transport sediment and by increasing the supply of sediment available for transport. Forestry related sediment problems can be reduced by avoiding landslide prone areas, carefully constructing logging roads and stream crossings, installing culverts to carry runoff, and providing wide setbacks (buffer zones) from streams when timber is harvested.

Instream sediment levels are both transport (flow) and supply dependent. Paustian and Beschta (1979), VanSickle and Beschta (1983), and Jackson and Beschta (1982) described bedload transport in terms of supply of material available for transport at various levels of flow. They found that most bedload transport occurred during short periods of high water, when flows were sufficient to entrain coarse, armoring riffle sediments, and access supplies of finer material within the riffle. Subsequent studies (Jackson and Beschta, 1984) have demonstrated that increased amounts of sand in transport can cause previously stable, coarse riffle sediments to undergo scour.

This data reveals that the effects of management activities on sediment transport is directly related to the effects on high flow events. The result of increased high flow events would be increased sediment concentrations and more frequent episodes of erosion and deposition.

The effect of management activities on the supply of sediment available for transport depends on the average slope of the contributing area and the type of erosion processes dominant in the area of the activity. On gently sloping topography (generally less than 60 percent slopes) with competent bedrock little, if any, increased erosion would be expected (Fredriksen and Harr, 1979). On steeper slopes, surface erosion (known as dry ravel) occurs, especially after slash burning. It is not known how much of this eroded material reaches streams and becomes sediment. In areas where debris avalanches are the dominant erosion process, clear cutting has increased the natural rate of avalanches two to four times, and road building can increase the natural rate of erosion as much as 25 to 340 times (Fredriksen and Harr, 1979). Roads sometimes contribute to increased sediment concentrations because of erosion from the road surface, cut slopes, and fill material. Road construction can increase erosion as much as 250 times in the first storms after construction, but concentrations usually drop off within a few months to two years (Brown, 1983). More extended periods of sediment increase may be associated with heavy truck road use during very wet weather, on poorly surfaced roads, or with unauthorized off-road vehicles (ORV) use. Compacted soils from roads, skid trails, or heavy equipment use can cause gully erosion and, locally, large increases of sediment. Roads generally contribute the majority of the sediment from a logging operation.

## Nutrients

Nutrients enter water mainly from treated municipal sewage discharges, failing septic tank systems, and from fertilizers washed into the water by rain or irrigation. Excessive amounts of nutrients released into slow moving waters during spring and summer can result in growths of algae and aquatic weeds. Algae blooms reduce the amount of oxygen available to fish, which can result in fish kills.

To address this problem of algae growth, the Oregon Environmental Quality Commission (EQC) adopted a chlorophyll standard. The amount of chlorophyll in water indicates the amount of aquatic plant growth. Waters violating this standard will be studied to determine the nutrient sources and options for controlling the problem. Maintaining or restoring the quality of the Eugene District's more heavily used lakes is also an

important issue. Lakes undergo a natural aging process, which can be accelerated by human activities. Improper agricultural, forestry, and other land use practices cause soil erosion that can introduce sediment and nutrients into the lake.

Sediment from soil erosion can rapidly fill a lake or reservoir, while nutrients increase the frequency of algal blooms and accelerate aquatic weed growth.

## Timber Harvest and Slash Disposal

Timber harvest and slash disposal can affect the chemical quality of surface water. Following slash burning in one watershed in the Oregon Cascades, instream concentrations of ammonia-nitrogen and manganese reached peak levels of 7.6 and 0.44 mg/l respectively (Fredriksen, 1971). Fredriksen attributed the high concentrations of ammonia-nitrogen and manganese to burned slash in stream channels.

The aerial application of herbicides is another management activity that can affect the chemical water quality of streams in the District. A detailed discussion of potential water quality impacts of herbicides proposed for use by the BLM is beyond the scope of this analysis, but the reader is referred to the Final Environmental Impact Statement (FEIS) for the Western Oregon Program for the Management of Competing Vegetation (USDI, BLM, OSO, 1989).

Application of nitrogen fertilizers may also affect the chemical water quality of streams in the District. Nitrogen is usually added to the soil by aerial application of urea pellets. Since direct fertilizer application is the major pathway for urea entry to streams, urea concentrations usually peak within one to two days following fertilizer treatment. Ammonia nitrogen, a hydrolysis product of urea, also usually peaks shortly after treatment, since it is derived from urea entering the stream.

Ammonia nitrogen in the soil is held very tightly. Only nitrate nitrogen is readily leached from the soil, and this usually occurs after the ammonia is oxidized to nitrate during the warm growing season. For this reason, peak nitrate concentrations are often recorded one to two years after fertilization. On the other hand, if nitrogen fertilizer is applied shortly after an area has burned, the warm soil temperatures may enhance nitrification and subsequent leaching of nitrate to the stream. Moore (1975) summarized several water quality monitoring studies of forest fertilization with urea throughout the Pacific Northwest and found maximum recorded nitrate values were usually less than one mg/l and in all cases were less than 5 mg/l compared to the standard of 10 mg/l.



## Stream Categorization

Streams are characterized by their "order" (Strahler, 1957). Headwater stream channels are designated 1st order; two 1st order streams combine to form a 2nd order stream. Two 2nd order streams combine to form a 3rd order, and so forth.

In western Oregon, 1st and 2nd order streams constitute 79 percent of the total stream mileage (Boehne and House, 1983). Such streams rise in very small watersheds with limited water storage capacity. These streams may have only scanty or intermittent flow during the dry season, but during high flows they may move large amounts of sediment and woody debris. Headwater streams mainly determine the type and quality of downstream fish habitat.

First and 2nd order streams are influenced by the geomorphology, soils, and vegetation of their channels. Large woody debris is common, covering as much as 50 percent of the channel (Anderson and Sedell, 1979; Swanson and Lienkaemper, 1978; Triska et al., 1982). The stream is continuously shaded by vegetation. Flow energy in the channel is continually dissipated by woody material and vegetation that slow erosion and foster deposition of organic and inorganic materials. The average gradient of these streams often exceeds 10 percent, but the channels usually have a stair step configuration of flat reaches connected by riffles and low falls. Salmonoid reproduction may be sufficient, even in some ephemeral streams, to furnish fry to larger waters downstream (Everest, 1973; Everest et al., 1985).

Third and 4th order streams usually flow continuously. Average gradient is less than 5 percent, but there may be intermittent stretches of rapids or falls. Woody debris usually covers less than 25 percent of the channel. High flows may flush woody material from the system or deposit it in debris jams. The vegetative canopy over 3rd and 4th order streams varies in density. These streams can transport large amounts of sediments, which are often deposited around channel obstructions, in narrow, winding areas, or in other areas of low velocity, such as accretion bars, estuaries, and the flood plain.

The direct influence of riparian areas is moderated in 5th order and larger streams but remains important. Canopies of large, old growth trees provide some shade, vegetated riparian zones keep the main channel confined, and the largest stems of down trees that remain in the stream provide important summer and winter salmonoid habitat. Flood plains of the larger streams contain complex arrays of side channels, overflow channels, and isolated pools. Side channels

are often created and maintained by large woody debris (Bisson et al., 1987; Sedell et al., 1984). The gradient in large streams is usually less than one percent, but rapids and falls may occur. Alluvial material and woody debris may be deposited in quiet areas, but accumulations are flushed and rearranged during high flows (Sedell et al., 1988).

## Riparian Areas

Riparian areas are critical to the regulation of stream flow and to water quality protection. Stream riparian areas have important geomorphic and hydrologic roles that support their high level of biological productivity. The most productive stream riparian areas are often associated with alluvial stream systems. That is, they are deposition zones and occur in fluvial sediments transported and reworked by the stream. A major role of the riparian area is to function as a flood plain and dissipate stream energies associated with high flows. This, in turn, permits sediments to deposit and continue development of the alluvial valley floor.

Alluvial riparian areas also function as shallow aquifers that recharge at high flows and drain at low flows. This interaction between surface flows and ground water storage results in moderated high flows and enhanced or prolonged base flows. The shallow aquifer condition also creates the moist soil conditions required for plant growth, which characterize riparian areas.

Thus, it is the geomorphic and hydrologic characteristics of riparian areas that establish the basic components of biological habitat, including wet soils and instream structural features such as pools, riffles, gravels and stream banks. The vegetation that thrives in riparian areas, in turn, contributes to their proper geomorphic and hydrologic functioning. Disruption of normal geomorphic or hydrologic function, or the vegetation on which it depends, usually results in impairment of overall riparian resource values.

Geomorphic structure, such as pools and flood plains, strongly influence stream and riparian ecosystems. This is particularly true in steep, mountain valley floors typical of the Coast Range and west slope of the Cascades where floods and debris flows can damage riparian vegetation and alter aquatic habitat on a frequency of years to decades.

The frequency and extent of disturbance, accessibility of riparian areas for wildlife, and magnitude of vegetation influence on stream ecosystems, varies as a function of drainage area and the associated variables of stream channel and valley floor widths. Another important source of structural variability along streams is exogenous (nonfluvial) factors such as bedrock

outcrops and large hill slope landslides. Areas of very narrow valley floors can occur along headwater channels in V-shaped valleys or in bedrock or landslide controlled gorges along larger channels. Such areas may have extensive topographic shading, little opportunity for resetting of riparian vegetation by floods, little riparian habitat, and the environmental gradients for terrestrial wildlife are abrupt. In wider valley floors, on the other hand, channels can move laterally, creating complex mosaics of vegetation and secondary channels, which are rich in aquatic and terrestrial habitat. Valley floor and channel widths are likely to increase uniformly in the downstream direction as long as only fluvial processes have formed valley floor landforms and there has been no significant influence of exogenous factors. Channel and valley floor conditions may vary greatly from one geologic terrain to another (Hansen et al., 1988).

A buffer zone of 2.5 to 3 tree heights (approximately 400-500 feet) is required to protect streamside riparian zones from changes in microclimate and wind damage that can threaten the integrity of vegetative structure and species composition. Microclimate impacts to riparian zones include not only increased water temperature, caused by solar radiation, but higher water temperatures due to elevated air temperature and water surface contact. Convection water temperature increases of up to 20 °F have been documented in western Oregon (Levno and Rothacher 1967). Another microclimate change is caused by reduced humidity, which can cause compositional changes in vegetative species. This can alter allochthonous sources for a food chain based on decaying leaves and benthic invertebrates. This has potential impacts to fisheries.

Subterranean invertebrates thrive in a maze of underground channels that flow among the gravels, sands and rock that underlie many streams and rivers. These underground waterways can be as deep as 30 feet and can extend sideways for miles from the stream channel.

In this understream area, called the hyporheic zone, many types of small blind shrimp, primitive worms, bacteria, algae and various kinds of immature insects live. These underground animals support a food chain that extends to the surface. The hyporheic zone serves as a refuge for creatures during times of drought or stress and, after floods, streams may rely on the life underground to assist in repopulation of aquatic invertebrates. The underground system is rich in bacteria that fix nitrogen, which is in great demand by surface organisms.

Timber management activities (road construction, timber harvest and slash disposal) can remove riparian vegetation, constrain natural stream channels and alter stream banks and channel structure at stream crossings.

Debris torrents, both natural and those caused by clear cut timber harvesting techniques and/or road construction, scour stream beds down to bedrock, damage riparian vegetation, and eliminate the ability of riparian areas to store water and function as shallow aquifers. While harvesting timber, it is sometimes necessary to yard logs through riparian areas; this can cause damage to riparian vegetation and stream banks. (See Riparian, Animals and Vegetation Sections for more details concerning riparian areas.)

## Ground Water

Water that infiltrates the soil surface is known as ground water. Most ground water eventually discharges into stream channels. Ground water is found in layers called aquifers, water bearing rocks or sediments that occur at depths from a few feet to several hundred feet below the surface. There are two types of aquifers: unconfined and confined. Unconfined aquifers are also known as water table aquifers. Unconfined aquifers are generally shallow with an impermeable layer of rock or soil defining the lower boundary resulting in the water table (saturated zone) being located between the impermeable layer and land surface. These shallow, unconfined aquifers are more prone to contamination from surface pollutants than confined aquifers. Confined aquifers (also known as artesian aquifers) are generally deeper and are separated from the surface by an impermeable layer of rock or soil known as an aquiclude. The quality of water in confined aquifers is generally excellent; however, in some cases, chemicals in the subsurface geologic formations can add undesirable contaminants, such as arsenic, boron, mercury or sodium.

Ground water is replenished by rain and snow, which filters through soil and geologic formations. This underground water generally moves slowly from mountains and uplands to lowlands and valleys, where it is discharged to creeks, rivers, and marshes. Ground water discharges to surface waters provide the base flow for streams throughout Oregon. This discharge may vary significantly in different areas, depending on the geologic conditions of the aquifer.

Water tables generally rise after removal of vegetation due to increased water (from reduced transpiration) recharging ground water areas. However, reductions in ground water may occur when subsurface flow is intercepted by road cuts and transformed into surface water through a ditch-culvert system. Some of this water is deposited on undisturbed soil areas where it returns to subsurface flow. The remainder is deposited into channels where it becomes streamflow.



## Appendix 3-D

# Beneficial Uses by Analytical Watershed

**Table 3-W-12 - Beneficial Uses by Analytical Watershed - Willamette Basin**

Beneficial Use	Willamette Basin	Big River	Row River	Coast Fork	Middle Fork	McKenzie River	Mohawk River	Calapooia River	Willamette River
Public Domestic Water Supply	X		X			X			X
Private Dom. Water Supply	X	X	X	X	X	X	X	X	X
Industrial Water Supply	X		X		X	X			X
Irrigation	X	X	X	X	X	X	X	X	X
Livestock	X		X	X	X	X	X	X	X
Anadromous Fish Rearing	X	X	X	X	X	X	X	X	X
Salmonoid Fish Passage	X	X	X	X	X	X	X	X	
Resident Fish & Aquatic Life	X	X	X	X	X	X	X	X	X
Wildlife & Hunting	X	X	X	X	X	X	X	X	X
Fishing	X	X	X	X	X	X	X	X	X
Boating	X		X	X	X	X			X
Water Contact Recreation	X	X	X	X	X	X	X	X	X
Aesthetic Quality	X		X	X	X	X	X	X	X
Hydro Power	X		X		X	X			
Commercial Navigation	X								

Table 3-W-13 - Beneficial Uses by Analytical Watershed - Mid Coast Basin

Beneficial Use	Mid Coast Basin	Lake Creek	Wildcat Creek	Upper Siuslaw	Middle Siuslaw	Wolf Creek
Public Domestic Water Supply	X					
Private Dom. Water Supply	X	X	X	X	X	X
Industrial Water Supply	X					
Irrigation	X	X	X	X	X	X
Livestock	X	X		X		
Anadromous Fish Rearing	X	X	X	X	X	X
Salmonoid Fish Passage	X	X	X	X	X	X
Resident Fish & Aquatic Life	X	X	X	X	X	X
Wildlife & Hunting	X	X	X	X	X	X
Fishing	X	X	X	X	X	
Boating	X	X			X	
Water Contact Recreation	X	X		X	X	
Aesthetic Quality	X	X	X	X	X	X
Hydro Power						
Commercial Navigation	X					

**Table 3-W-14 - Oregon State Department of Environmental Quality  
Non-Point Source Pollution Assessment Report**

	Turb	Low-DO	Temp	Nutr	Pest	Toxic	B/V	Solids	Sed	Eros	LowFlow	Debris	Struct	Plants	Other	Rating
<b>Mid Coast Basin</b>																
186 Siuslaw R.	M2	-	-	M2	-	-	-	-	M2	M2	-	-	M2	-	-	B
187 Siuslaw R.	M2	-	-	M2	-	-	-	-	-	M2	-	-	M2	-	-	B
188 Wildcat Cr.	M2	M2	-	M2	-	-	-	-	S1	M2	M2	-	M2	-	-	A2
190 Deadwood Cr.	M2	-	-	M2	-	-	-	-	M2	M2	-	-	M2	-	-	B
192 Lake Creek	M2	-	-	M2	-	-	-	-	M1	M2	-	-	M2	-	-	B
194 Congdon Cr.	M2	-	-	M1	-	-	-	-	-	M2	-	-	M2	M1	-	B
195 Nelson Cr.	-	M2	-	M2	-	-	-	-	-	M2	M2	-	M2	-	-	B
211 Knowles Cr.	M1	M1	-	M1	-	-	-	-	M1	M1	M1	-	M1	-	-	B
212 Knowles Cr.	-	-	-	M2	-	-	-	-	-	-	-	-	M2	-	-	B
213 Whittaker Cr.	-	-	-	-	-	-	-	-	M2	-	-	-	-	-	-	B
214 Esmond Cr.	-	-	M2	M2	-	-	-	-	M2	-	-	M2	M2	-	-	B
215 Wolf Creek	-	-	-	M2	-	-	-	-	-	-	-	-	M2	-	-	A2
216 Siuslaw River South Fork	M2	-	-	-	-	-	-	-	-	M2	-	-	-	-	-	B
217 Trail Creek	-	-	S2	-	-	-	-	-	-	-	-	S2	-	-	-	A1
<b>Willamette Basin</b>																
73 Calapooia R.	S2	-	-	-	-	-	-	-	-	S2	-	-	-	-	-	A1
74 Calapooia R.	-	-	M1	-	-	-	-	-	-	M1	-	-	-	-	-	B
99 Willamette R.	M2	M1	-	-	-	-	M1	M2	M2	M2	M1	-	-	-	-	B
100 Willamette R.	-	-	-	-	-	-	-	M2	M2	-	-	-	-	-	-	B
101 Willamette R.	-	-	-	-	-	-	M1	-	M2	-	-	-	-	-	-	B
112 McKenzie R.	M2	-	-	-	-	-	-	-	M1	M2	-	-	-	-	-	B
113 McKenzie R.	-	S1	-	-	-	-	-	-	M1	-	S1	-	-	-	-	A2
124 Little Fall Cr.	-	-	M2	-	-	-	-	M1	-	-	-	M2	-	-	A2	B
125 Fall Creek	-	M1	-	-	-	-	-	-	M2	-	M1	-	-	-	-	B
126 Fall Cr. Res.	-	-	-	-	-	-	-	-	M1	-	-	-	-	-	-	B
127 Fall Creek	-	M2	-	-	-	-	-	-	M2	-	M2	-	-	-	-	B
128 Winberry Cr.	-	-	-	-	-	-	-	-	M2	-	-	-	-	-	-	B
140 Lookout Point Reservoir	-	-	-	-	-	-	-	-	M2	-	-	-	-	-	-	A2
142 Willamette Middle Fork	-	M1	-	-	-	-	-	-	M2	-	M1	-	-	-	-	B
143 Lost Creek	M2	-	-	-	-	-	-	-	M2	M2	-	-	-	-	-	A2
144 Lost Creek	M2	-	-	-	-	-	-	-	M2	M2	-	-	-	-	-	A2
145 Lost Creek	M2	-	-	-	-	-	-	-	M2	M2	-	-	-	-	-	A2
148 Hills Creek	-	-	-	-	-	-	-	-	M2	-	-	-	-	-	-	A2
151 Mohawk River	S2	-	-	-	-	-	-	-	M2	S2	-	-	-	-	-	A1
152 Mohawk River	-	-	-	M2	-	-	-	-	M2	-	-	M2	-	-	-	B
153 McGowan Cr.	-	-	-	-	-	-	-	-	M2	-	-	-	-	-	-	A2
154 Parsons Cr.	-	-	-	-	-	-	-	-	M2	-	-	-	-	-	-	A2
155 Mill Creek	-	-	-	M2	-	-	-	-	M2	-	-	-	M2	-	-	A2
156 Shotgun Cr.	-	-	-	-	-	-	-	-	M2	-	-	-	-	-	-	A2
157 Camp Creek	M2	M2	-	-	-	-	-	-	M2	M2	M2	-	-	-	-	B

**Table 3-W-14 - Oregon State Department of Environmental Quality  
Non-Point Source Pollution Assessment Report (cont.)**

	Turb	Low-DO	Temp	Nutr	Pest	Toxic	B/V	Solids	Sed	Eros	LowFlow	Debris	Struct	Plants	Other	Rating
158 Gate Creek	-	-	-	-	-	-	-	-	M2	-	-	-	-	-	-	B
159 Deer Creek	-	-	-	-	-	-	-	-	M2	-	-	-	-	-	-	A2
164 Willamette Coast Fork	-	M1	-	-	-	S1	M1	-	M2	-	M2	-	-	-	S1	B
165 Willamette Coast Fork	-	-	-	-	-	-	-	-	M2	-	-	-	-	-	-	B
166 Big River	-	-	-	-	-	-	-	-	M2	-	-	-	-	-	-	B
167 Little River	-	-	-	-	-	-	-	-	M2	-	-	-	-	-	-	B
168 Cottage Grove Res.	-	-	-	-	-	-	-	M2	M2	-	-	-	-	-	-	B
169 Mosby Creek	-	-	-	M2	-	-	-	-	S2	-	-	-	M2	-	-	A2
170 Row River	-	M2	-	-	-	-	-	-	M2	-	M2	-	-	-	-	B
171 Row River	-	-	-	-	-	-	-	-	M2	-	-	-	-	-	-	B
172 Dorena Res.	-	-	-	-	-	-	-	M2	M2	-	-	-	-	-	-	B
173 Sharps Creek	M2	-	-	M2	-	-	-	-	M2	M2	-	-	M2	-	-	B
176 Carnas Swale Cr.	-	-	-	-	-	-	-	-	M2	-	-	-	-	-	-	B
177 Long Tom R.	M2	M2	-	M2	-	-	M1	-	M1	-	-	-	M1	M1	-	B
178 Fern Ridge Reservoir	-	-	-	M1	M1	-	M1	-	M1	-	-	-	M1	M1	-	B
179 Long Tom R.	M2	-	M2	-	-	-	-	-	M2	M2	-	M2	-	-	-	B
181 Amazon Cr.	-	-	S2	M1	S2	-	M1	S2	M1	-	-	S2	M1	S2	-	A1
182 Poodle Cr.	-	-	-	-	-	-	-	-	M2	-	-	-	-	-	-	B
183 Noti Creek	-	-	-	-	-	-	-	-	M2	-	-	-	-	-	-	B
200 Ferguson Cr.	M2	-	-	-	-	-	-	-	M2	M2	-	-	-	-	-	B
999 Coyote Cr.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	B

Turb	Turbidity	Sed	Sedimentation
Low-DO	Low Dissolved Oxygen	Eros	Streambank Erosion
Temp	Elevated or Depressed Water	LowFlow	Decreased streamflow
Nutr	Nutrients	Debris	Excessive Debris Accumulation
Pest	Pesticides	Struct	Insufficient Stream Structure
Toxic	Toxics	Plants	Excessive Plant Growths
Salt	Salt Water Intrusion	Other	Other (specified in comments)
B/V	Bacteria/Viruses		
Radio	Radionuclides		
Gases	Dissolved Gases		
Solids	Objectionable Discoloration, Scum, Oily Slick or Film, Floating Solids		

## Rating:

S1 = Severe problem, data

S2 = Severe problem, observation

S3 = Severe problem, perception

M1 = Moderate problem, data

M2 = Moderate problem, observation

M3 = Moderate problem, perception



# Appendix 3-E

## Analytical Methods

### Method 1

#### Watershed Condition Index

The Watershed Condition Index (WCI) is calculated using the formula:

$$WCI = SDI * VI * SI * RI * MI * KI * AI * DI * PI * FI * LI$$

where:

WCI = watershed condition index

SDI = soil disturbance index

VI = vegetation index

SI = silvicultural index

RI = riparian index

MI = mining index

KI = soils index

AI = slope/aspect index

DI = drainage density index

PI = precipitation index

FI = flow index

LI = landslide index

The individual indexes represent physiographic conditions (soil type) and land management activities (road building) that have some effect on the hydrology of a watershed. The individual indexes are each rated from 1 to 2; 1 represents a minimal effect on watershed condition and 2 the greatest effect expected on the District. In order to obtain an index number between 1 and 2 a constant is used in each individual index.

More than one element was used to calculate some of the individual indexes. For example the silvicultural index includes elements for tractor piling, burning, herbicides, and precommercial thinning. In cases where each element was expected to have a different effect on the index, a multiplier was assigned as a ranking. For example, since tractor piling is known to have a greater impact to the watershed condition than precommercial thinning, tractor piling was given a higher multiplier. Because there is no way to calculate the numerical difference of impacts between elements, these multipliers only act as rankings. It is very important, therefore, that the WCI be used for ranking watersheds and that the actual values and/or magnitude of the differences not be used in any analysis.

The product of the individual indexes was used to calculate the WCI instead of the sum in order to represent the synergistic relationship between many of the elements. For example, tractor piling has a far greater impact on steeper slopes than on flat ground. Multiplying individual indexes also tends to exaggerate differences making ranking easier.

The individual indexes were calculated using the following methods:

#### Soil Disturbance Index

$$SDI = 1 + [(P + 3R + 6D + 8S + 3O) / W] * X$$

Where:

P = paved roads (acres)

R = rock roads (acres)

D = dirt roads (acres)

S = skid trails (acres)

O = other disturbances, e.g., rock pits, large landings (acres)

W = watershed size (acres)

X = CONSTANT (-0.2)

The data for S and O was collected through the use of photo inventory. The data for P < R was collected through WOODDB (GIS) records.

#### Vegetation Index

$$VI = 1 + [96M + 3P + 10D + 7F_1 + 5F_2 + 3F_3 + F_4 + 3F_5 + 7C] / F_4 * X$$

Where:

VI = vegetation Index

M = meadow (grass) (acres)

P = pasture or permanent brush (acres)

D = disturbed (>20% bare soil) (acres)

F<sub>1</sub> = forest 0-3 years (acres)

F<sub>2</sub> = forest 4-8 years (acres)

F<sub>3</sub> = forest 9-12 years (acres)

F<sub>4</sub> = forest 13-20 years (acres)

F<sub>5</sub> = forest 3-20 years (acres)

W = watershed area (acres)

C = area to be harvested in the alternative (acres)

X = constant (\*0.3-0.23)

Vegetation elements on BLM lands were taken from the WODDB gross vegetation theme. Photo inventory was used for private lands. Because exact age classes could not be determined, age classes 3-20 years were lumped.

## Silvicultural Index

$$SI=1+[(10T+5B+3H+2F+P)/W*X]$$

Where:

- T = tractor piling (acres piled in the past 20 years)
- B = burning (acres burned in the past two years)
- H = herbicides (acres treated with herbicide in the past two years)
- P = PCT (acres precommercially thinned in the past five years)
- W = watershed area (acres)
- X = constant (0.5)

Silvicultural practices were taken from MICRO-STORMS records on BLM lands. On other lands the acres of each practice were obtained from each Oregon State Forest Protection District and proportioned to each watershed.

## Riparian Index

$$RI=1+[(8S+5P+3T+L)/R*X]$$

Where the riparian vegetation is dominated by:

- S = seedling or saplings
- P = pole size timber
- T = small saw timber
- L = large timber
- R = total acres of riparian zones
- X = constant (0.35-0.75)

The size classes were obtained from the photo inventory. The total riparian acres were obtained from WODDB.

## Mining Index

$$MI=1+[(N/M)*X]$$

Where:

- N = number of notices or permits
- M = miles of stream
- X = constant (100)

The number of placer mining notices was obtained from District records. The number of State permits for sand and gravel, gold and silver mining were obtained from the Oregon State Department of Geology and Mineral Industries.

## Soils Index

$$KI=[(S1*K1+S2*K2....)/W*X]$$

Where:

- S1 . . . Sn = acres of each soil series in the watershed.
- K1 . . . Kn = the k factor of each soil series.
- W = watershed area (acres)
- X = constant (3)

The k factor is an erosion rating used in the universal soil loss equation. The acres of each soil series and the k factor were obtained from soils maps stored in WODDB.

## Slope/Aspect Index

$$AI=1+[(S/W)+A/Wb]*X]$$

Where:

- S = acres >60% slope
- A = acres of critical slopes (aspect)
- W = watershed area (acres)
- Wb = BLM ownership within the watershed (acres)
- X = constant (16)

The slopes greater than 60 percent were calculated using GIS from USGS digitized topography maps at a scale of 1:250,000. This scale only identifies those areas with long slopes. The critical aspects were identified through TPCC mapping. Critical aspects included steep unstable slopes (FGNW) and slopes prone to unacceptable surface erosion (FMNW).

## Drainage Density Index

$$DI=1+(DD+X)$$

Where:

- DD = drainage density (Mi/Mi<sup>2</sup>)
- X = constant (0.16)

Miles of stream and area were both obtained from WODDB maps.

## Precipitation Index

$$PI=1+(P*X)$$

Where:

P = mean 2-year, 24-hour storm for the watershed (in.).

X = constant (0.18)

The storm sizes were obtained from NOAA atlas 2.

## Flow Index

$$FI=1+(Q*X)$$

Where:

Q = two-year return period flood (CFSM)

X = constant (0.013)

The flows were calculated using the method described in USGS Open-File Report 79-553.

## Landslide Index

$$LI=1+[(S+9U)/W*X]$$

Where:

S = acres of stable soils

U = acres of unstable soils

X = constant

Each soil series was rated as stable or unstable by local soil scientists.



# Appendix 3-F

## Stream Habitat Quality Rating

The rationale for using riparian tree size (dbh) to rate stream habitat quality is based on research (Sedell et al., 1988), inventory data, and field experience of BLM fishery biologists. Data from these sources indicate that vegetative conditions (size of trees) in adjacent riparian areas are directly related to stream habitat quality and fish populations. Trees in riparian areas fall into streams and create desirable habitat conditions.

A "related factors" analysis was done to determine if other factors should be considered in making a final habitat quality rating. There are many interrelated physical and biological factors that affect the quality of fish habitat and fish populations. In addition to tree size in riparian areas, other factors include amount of water diversion, amounts of sediment yield, availability of natural structure, presence of beaver dams or side channels, or presence of rehabilitation structures. Some of these factors are not inventoried for all BLM stream segments. Therefore, the District biologist determined which of the known factors were most important in making a final habitat rating.

It should be noted that, although useable as a reasonable estimate for cumulative values for fisheries, the following classification does not reflect all factors that influence riparian zone quality for terrestrial plant and animal communities. Stream habitat quality ratings were based on tree size information available in the BLM Operations Inventory (OI). Since riparian zones are not separated in the OI, localized management actions such as buffers, past hi-grading and incursions such as roads that created a riparian age different from the upslope areas, are not considered in estimating stream quality. Moisture and temperature regimes, for example, are greatly influenced by vegetative conditions on adjacent (upland) lands so that, even though a particular riparian zone is covered by 21+ inch trees, its microclimate is degraded by the removal of adjacent upland forests. Another example is a riparian zone that has regenerated tree cover following timber harvest. Although the tree cover may be "good/optimal," overall conditions may be lower due to the death of large snags, logs and tree species diversity.

The characteristics of the condition classes are as follows:

1. **POOR** - Major alterations in watershed or water quality and quantity conditions, natural stream habitat and riparian areas; few or no larger trees present in sand and silt or extensive areas of bedrock or larger rock; stream productivity for aquatic life drastically reduced; fish populations at only 10-25 percent of potential.
2. **FAIR** - Watershed moderately impacted by activities; riparian vegetation altered by past events or activities; few large trees present with most 11-21" dbh, dominated by red alder and bigleaf maple; physical stream conditions substantially altered from natural conditions because of past activities, e.g., limited amount of large woody debris and fine sediments in pools and riffles above natural amounts; some adverse changes in water quality and quantity; habitat either partly recovered or still decreasing in trend; stream moderately productive for aquatic life, but fish populations far below potential (approximately 50 percent).
3. **GOOD/OPTIMAL** - Watershed either not greatly impacted by activities or mostly recovered and in good condition; riparian areas in good condition with diverse vegetation including large trees over 21" predominantly of conifers; physical stream conditions only slightly altered with nearly complete recovery or virtually unchanged from natural conditions, for example; abundant and diverse instream structure including large woody debris, numerous deep pools, bottom substrates relatively free from fine sediments, adequate spawning gravels, and stable banks and channels; water quality and quantity generally unaltered from natural conditions; stream highly productive for aquatic life, i.e., producing near or at its potential for salmon, trout, and other native fishes.



# Appendix 3-G

## Candidate ACEC Screening Results

Table 3-SA-3 - Candidate ACEC Screening Results

Candidate ACEC	Nomination Source	Nomination Acres	Historic Cultural or Scenic Value	Fish Wildlife Habitat Value	Natural System Bot/Geol Value	Special Status Species	Meets Relevance Criteria	Meets Importance Criteria	Potential ACEC Acres
Cannery Dunes	BLM	40			X		Yes	Yes	40
Heceta Sand Dunes	BLM	218			X		Yes	Yes	218
Hult Marsh	BLM	167	X	X	X	X	Yes	Yes	167
Cougar Mtn. Ancient Yew Grove	ONRC	40			X		Yes	Yes	36
Grassy Mtn.	BLM	40			X		Yes	Yes	74*
Triangle Lake BEHA	BLM	525		X		X	Yes	Yes	538
Triangle Lake RFI	BLM	1,640		X	X		Yes	Yes	810
Coburg Hills BEHA	BLM	1,492		X		X	Yes	Yes	1,204
Coburg Hills RFI	BLM	1,445		X	X		Yes	Yes	854
Fern Ridge BEHA	BLM	166		X		X	Yes	Yes	166
Fall Creek Reservoir BEHA	BLM	1,120		X		X	Yes	Yes	746
McKenzie River BEHA	BLM	2,214		X		X	Yes	Yes	2,037
Dorena Reservoir BEHA	BLM	743		X		X	Yes	Yes	611
Dorena Reservoir RFI	BLM	1,233		X	X		Yes	Yes	209
Cottage Grove Reservoir RFI	BLM	206		X	X		Yes	Yes	232
Siuslaw River BEHA	BLM	400		X		X	Yes	Yes	282

Table 3-SA-3 - Candidate ACEC Screening Results (cont.)

Candidate ACEC	Nomination Source	Nomination Acres	Historic Cultural or Scenic Value	Fish Wildlife Habitat Value	Natural System Bot/Geol Value	Special Status Species	Meets Relevance Criteria	Meets Importance Criteria	Potential ACEC Acres
Fawn Creek	Public	100		X			No	No	N/A
Coburg Hills	Public	40	X				No	No	N/A
Bunker Hills	Friends of Bunker Hill	36	X		X		No	No	N/A
McKenzie River RFI	BLM	98		X	X		Yes	No	N/A

NA = Not applicable

\* Title Plat Acres



## Appendix 3-H

**Table 3-SA-4 - Present Condition of Existing and Potential Special Areas**

<b>Existing Special Areas</b>	<b>Present Condition</b>
Horse Rock Ridge ACEC	The site remains in good condition. Little disturbance has occurred. Infrequent ORV use has been documented.
Long Tom ACEC	The majority of the site remains in good condition. Woody plant invasion is being managed by prescribed burning. Vegetation has been affected along the right-of-way within the site; livestock have historically used the area. Fences have been established to prohibit this activity.
Lake Creek Falls ACEC	The site remains in good condition. Anadromous fish passage was constructed in 1989. Site is used for recreation purposes.
Mohawk ACEC/RNA	The site remains in good condition. Some Pacific yew bark theft has occurred within the ACEC boundary. Even though a grazing lease was issued for the area prior to ACEC/RNA designation, no use is evident. Some target shooting occurs on some of the boundary trees.
Camas Swale ACEC/RNA	The majority of this site remains in good condition. Some ORV use has occurred on the meadow. The site has been signed to discourage such use. The meadow will need to recover from this damage.
Fox Hollow ACEC/RNA	The site remains in good condition. No disturbance to the ACEC/RNA has been identified.
Upper Elk Meadows ACEC/RNA	The majority of this site remains in good condition. The south boundary of the site is experiencing windthrow damage. A path was found brushed into the ACEC/RNA in 1991. The area has been signed to discourage such use.
McGowan EEA	The site remains in good condition. No negative impacts have been identified at the site.
Vik Road EEA	The site remains in good condition. No negative impacts have been identified at the site.
Row River EEA	The site remains in good condition. No negative impacts have been identified at the site.
<b>Potential Special Areas</b>	<b>Present Condition</b>
Elk Meadows Expansion	The site remains in good condition. See Elk Meadows ACEC/RNA; existing Special Area, present condition.
Camas Swale Expansion	The site remains in good condition. See Camas Swale ACEC/RNA; existing Special Area, present condition.
Lake Creek Expansion	The site remains in good condition. Is used by the public. See Lake Creek ACEC; existing Special Area, present condition.

Table 3-SA-4 - Present Condition of Existing and Potential Special Areas (cont.)

Existing Special Areas	Present Condition
Horse Rock Ridge Expansion	The site remains in good condition. See Horse Rock Ridge ACEC; existing Special Area, present condition.
Cannery Dunes	The site remains in good condition. No damage has been documented in the area. A small seasonal wetland receives some ORV use.
Heceta Sand Dunes	The majority of this site remains in good condition. ORV use has impacted the natural succession of parts of the proposed ACEC. Plant collecting has also occurred.
Huit Marsh	Natural site restoration is presently occurring. The old mill pond was drained and refilled. Sensitive plants are still present. All terrestrial wildlife species have recolonized at or near their carrying capacity except for fish-eating mammals and birds. Populations of non-native game fish were lost and have not re-established. It is expected that native cutthroat will recolonize the lake.
Cougar Mtn. Ancient Yew Grove	The site is in good condition. No negative impacts have been identified at the site. Historical logging has occurred in the area.
Grassy Mountain	The site is in good condition and remains one of the District's best examples of native grass land.
Triangle Lake BEHA Triangle Lake RFI Fern Ridge BEHA Coburg Hills BEHA Coburg Hills RFI Fall Creek Reservoir BEHA McKenzie River BEHA Dorena Reservoir BEHA Dorena Reservoir RFI Cottage Grove Reservoir RFI Siuslaw River BEHA McKenzie River RFI	These BEHAs and RFIs remain in good condition and continue to provide essential elements of biotic diversity. The areas remain capable of supporting nesting by bald eagles and other raptors that require old growth habitat adjacent to large water bodies and a variety of open habitats.
Fawn Creek Coburg Hills Bunker Hill	These sites remain in good condition. No negative impacts have been identified at the site.

BEHA = Bald Eagle Habitat Area  
RFI = Relict Forest Island

# Appendix 3-I

## Cultural Resource Inventory Procedures

Three classes of inventory are included in the BLM standard, nationwide cultural resource program. Class I inventory consists of a review of existing data and compilation of this data into a Cultural Resource Overview document.

Class II inventories are field sampling strategies. They are designed to gather statistically valid data to provide objective estimates of the nature and distribution of cultural resources in a defined study area. Areas selected for a Class II inventory are surveyed at the same intensity as for a Class III inventory.

Class III inventories are intensive field inventories designed to identify and record, from surface and exposed subsurface and profile indications, all cultural resource sites within a specific location. Typically, Class III inventories are used in advance of projects such as logging that may cause disturbance or result in the destruction of sites, either by direct or indirect mechanisms. Heavily vegetated, steep, and highly dissected terrain commonly characterize BLM lands in western Oregon. These conditions make Class III inventories nearly useless for pre-project site identification. Therefore, a fourth class of inventory, the reconnaissance inventory, is used specifically in western Oregon in advance of projects with site-disturbing potential when heavy vegetation is present.

The reconnaissance inventory consists of trained individuals walking on landform features with potential for cultural resources to be present and viewing the ground surface and/or subsurface as possible, given the dense ground cover. The pedestrian survey techniques may be enhanced by using hand tools to create small openings in the duff layer exposing the mineral soil at selected intervals along the survey transect. The use of reconnaissance inventories in

western Oregon has been addressed in the Cooperative Agreement (as modified in 1983) between the Oregon State Historic Preservation Office and the Bureau of Land Management, Oregon State Office.

A Class I inventory of all Eugene District land was conducted in 1981 and published in the same year. The publication is entitled, *Prehistory and History of BLM Lands in West-Central Oregon: A Cultural Resource Overview* (Beckham, Minor and Toepel, 1981). The overview has not been updated.

A Class II inventory entailing 29,916 acres of BLM administered land in four townships in the western half of the District was conducted in 1980. A total of 4,800 acres (15 plus percent) of BLM administered land in the study area were intensively inventoried (Class III inventory standards).

In addition to the intensively inventoried acreage noted above, Class III inventories have been conducted on 11,962 acres of BLM administered land in the District; 9,664 acres in the eastern one-half and 2,298 acres in the western one-half; 3.78 percent of the District's 316,592 acres. This acreage was inventoried following the harvest of timber and the reduction of residual slash.

Reconnaissance surveys have been performed on timber sale harvest units and tracts identified for land exchange purposes. A total of 44,325 acres of BLM administered land has been inventoried using reconnaissance techniques.

The eligibility of some cultural resource sites for inclusion on the National Register of Historic Places has been assessed using criteria described in 36 CFR 60.6.



# Appendix 3-J

## Wild and Scenic River Eligibility and Classification Determinations

The first step in proposing additional rivers to the National System is to determine if the river is eligible. To qualify, a river must meet two criteria: (1) be free flowing, and (2) have at least one outstanding remarkable value (ORV). These values are stated in the Wild and Scenic Rivers Act as, "scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values." The Rivers Act did not specifically spell out the criteria to judge these values. The BLM Westside Oregon Bureau Districts developed criteria (Instruction Memorandum OR-89-632) that, in part, follows:

"A river's scenic, recreational, geologic, fish, wildlife, cultural, and/or historic value(s) are deemed 'outstandingly remarkable' if one or more of the following guidelines apply to the value(s) under consideration.

"Scenic - The landscape elements of landform, vegetation, water, color, influence of adjacent scenery, scarcity, and cultural modifications are unique and harmonious. The rating area must be scenic quality 'A' as defined in the Visual Resource Inventory Handbook, H-8410-1 (see Illustrations 1 and 2). When analyzing scenic values, additional factors such as seasonal variations in vegetation, scale of cultural modifications, and length of time negative intrusions are viewed may be considered. Scenery and visual attractions may be highly diverse over the majority of the river or river segment length and not common to other rivers in the geographic region.

"Recreational - Recreational opportunities are or have the potential to be unique enough to attract visitors from outside the geographic region. Visitors would be willing to travel long distances to use the river resources for recreational purposes. River-related opportunities could include, but not be limited to, sightseeing, wildlife observation, photography, hiking, fishing, hunting and boating.

"Interpretive opportunities may be exceptional and attract or have the potential to attract visitors from outside the geographic region.

"The river may provide or have the potential to provide settings for national or regional commercial usage or competitive events.

"Geologic - The river or the area within the river corridor contains an example(s) of a geologic feature, process, or phenomena that is rare, unusual, one-of-a-kind or unique to the geographic region. The feature(s) may be in an unusually active state of development, represent a 'textbook' example and/or represent a unique or rare combination of geologic features (erosional, volcanic, glacial and other geologic structures).

"Fish - Fish values may be judged on the relative merits of either fish populations or habitat - or a combination of these river-related conditions:

Populations - The river is nationally or regionally one of the top producers of resident and/or anadromous fish species. Of particular significance is the presence of wild or unique stocks, or populations of federally listed or candidate threatened and endangered species.

Habitat - The river provides exceptionally high quality habitat for fish species indigenous to the region. Of particular significance is habitat for Federally listed or Candidate threatened and endangered species.

"Wildlife - Wildlife values may be judged on the relative merits of either wildlife populations or habitat - or a combination of these conditions:

Populations - The river or river area within the river corridor contains nationally or regionally important populations of indigenous wildlife species dependent on the river environment. Of particular significance are species considered to be unique or populations or Federally listed or Candidate threatened and endangered species which are so dependent.

Habitat - The river or area within the river corridor provides a principal food source, unique habitation site, or migration route for wildlife of national or regional significance, or

for a federally listed or candidate threatened and endangered species. Contiguous habitat conditions are such that the biological needs of the species are met.

"Cultural - The river or area within the river corridor contains a site(s) where there is evidence of occupation or use by native Americans. Sites must be rare, one-of-a-kind, have unusual characteristics or exceptional human interest value(s). Sites may have national or regional importance for interpreting prehistory; may be rare and represent an area where a culture or cultural period was first identified and described; may have been used concurrently by two or more cultural groups; or may have been used by cultural groups for rare or sacred purposes.

"Historic - The river or area within the river corridor contains a site(s) or feature(s) associated with a significant event, an important person, or a cultural activity of the past that was rare, unusual or one-of-a-kind in the region. A historic site(s) and/or feature(s) in most cases is 50 years old or older. Of particular significance are sites or features listed in, or are eligible for inclusion in, the National Register of Historic Places.

"Other Similar Values - While no specific evaluation guidelines have been developed for the 'other similar values' category, it is assumed that districts will assess additional river-related values not covered in this attachment in a manner consistent with the foregoing guidance - including, but not limited to, hydrologic, ecologic/biologic diversity, paleontologic, botanic, and scientific study opportunities."

After determining if a river segment is eligible for inclusion in the National Wild and Scenic River System, the next step in reviewing a potential river is to determine the potential classification. This is based on the condition of the river and the adjacent lands as they exist at the time of the study. Section 2(b) of the Wild and Scenic Rivers Act provides three classifications. They are:

Wild - 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.

Scenic - Those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

Recreational - 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.

The Federal Register, Vol. 47, No. 174, September 7, 1982, gives guidance for classifying rivers. It states that water quality, water resources development, shoreline development and accessibility are the criteria to be considered when determining classification. Each criterion is important, but their collective intent is more important. The basis for classification is the degree of naturalness of the river. The most natural rivers will be classified wild while the least natural rivers will be recreational. The following table, Table 3-WSR-3 further defines the four criteria.

Table 3-WSR-3 - Classification Criteria for Wild, Scenic, and Recreational Rivers

Attribute	Wild	Scenic	Recreational
Water Resources Development	Free of impoundment	Free of impoundment	Some existing impoundments or diversion  The existence of low dams, diversions or other modifications of the waterway is acceptable, provided the waterway remains generally natural and riverine in appearance.
Shoreline Development	Essentially primitive; Little or no evidence of human activity.  The presence of a few inconspicuous structures, particularly those of historic or cultural values, is acceptable.  A limited amount of domestic livestock grazing or hay production is acceptable.  Little or no evidence of past timber harvest. No ongoing timber harvest.	Largely primitive and undeveloped. No substantial evidence of human activity.  The presence of small communities or dispersed dwellings or farm structures is acceptable.  The presence of grazing, hay production or row crops is acceptable.  Evidence of past or ongoing timber harvest is acceptable, provided the forest appears natural from the riverbank.	Some development. Substantial evidence of human activity.  The presence of extensive residential development and a few commercial structures is acceptable.  Lands may have been developed for the full range of agricultural and forestry uses.  May show evidence of past and ongoing timber harvest.
Water Quality	Meets or exceeds Federal criteria or federally approved State standards for aesthetics, for propagation of fish and wildlife normally adapted to the habitat of the river, and for primary contact recreation (swimming) except where exceeded by natural conditions.	No criteria prescribed by the Wild and Scenic Rivers Act. The Federal Water Pollution Control Act Amendments of 1972 have made it a national goal that all waters of the United States be made fishable and swimmable. Therefore, rivers will not be precluded from scenic or recreational classification because of poor water quality at the time of their study, provided a water quality improvement plan exists or is being developed in compliance with applicable Federal and State laws.	

Table 3-WSR-3 - Classification Criteria for Wild, Scenic, and Recreational Rivers (cont.)

Attribute	Wild	Scenic	Recreational
Access-ability	Generally inaccessible except by trail. No roads, railroads, or other provisions for vehicular travel within the river area. A few existing roads leading to the boundary of the river area is acceptable.	Accessible in places by road. Roads may occasionally reach or bridge the river. The existence of short stretches of conspicuous or longer stretches of inconspicuous roads or railroads is acceptable.	Readily accessible by road or railroad. The existence of parallel roads or railroads on one or both banks as well as bridge crossings and other river access points is acceptable.

Source: The Federal Register, Vol. 47, No. 174, September 7, 1982.



# Appendix 3-K

## Forest Inventory

Before alternative land use plans can be properly developed and considered for forested public lands, information about the land must be available. Some of the most important information is related to the ability of the land to grow trees, the location and condition of the trees and the growth rate and present volume of the trees. The BLM collects and manages this information primarily through three inventory systems:

### 1. Timber Production Capability Classification (TPCC)

The Timber Production Capability Classification (TPCC) is an intensive inventory process initiated in 1972 to categorize all public land administered by BLM in western Oregon based upon the land's physical and biological capacity to produce timber. TPCC was conducted in accordance with Oregon Manual Supplement 5250.

The 1977 TPCC identified commercial forestland that could be managed on a sustained yield basis. This land formed the potential timber production base for computation of the annual allowable harvest. Approximately 286,000 acres were identified in this category. About 22,000 acres of commercial forestland were determined to be incapable of undergoing harvest without significant site degradation. This land was left out of the potential timber production base. Sites were placed in this category only when it was judged that economically reasonable technology was not available to mitigate such degradation. The remainder of the District's 317,000 acres was determined to be non-forest or non-commercial forest.

In 1986, the Oregon State Office issued *Handbook 5251-1 - Timber Production Capability Classification*, which replaced the 1972 Manual Supplement utilized in 1977.

The land base used for computation of potential allowable sale quantities (ASQ) utilizing the two TPCC systems are not directly comparable. The 1986 system contains two woodland classifications, which did not exist in 1976. Each of the woodland categories could be components of the ASQ. By contrast, the 1977 system by definition withdrew from planned harvest lands classified as non-forest

land, low site and non-commercial species. In addition to the changes in the two systems, the District land base changed as a result of land exchanges.

The TPCC Handbook is available for inspection during normal working hours at the District Office, and provides a complete description of the classifications.

### 2. Operations Inventory

For BLM to carry out the timber management program effectively, specific information as to the location and current condition, e.g., age, species composition, density, past management, etc., of the various forest types within the land base, must be available to the managers. This is accomplished through the Operations Inventory (OI) in accordance with procedures contained in the Operations Inventory Handbook.

The OI is an intensive inventory that divides the forests into survey units sufficiently uniform in composition, condition, operability, productivity, or other characteristics to distinguish them from adjacent units. Information on each unit is maintained in the MICRO\*STORMS computer system. Each survey unit has information on location, acreage, stand condition, past management, silvicultural needs and opportunities for application of intensive management practices.

### 3. Extensive Inventory (5-point)

The purpose of the extensive inventory is to determine the existing volume in the District. A reinventory of commercial forestland was completed in 1988 employing procedures jointly developed by the USFS and BLM. The reinventory used the same basic inventory design used for preparation of the present management plan. The inventory is a stratified random sample of the commercial forest land base. Each plot is a cluster of five sample points. Each point is the center of both a fixed and variable radius plot.

The objective of the inventory is to estimate the total coniferous volume within plus or minus ten percent (at two standard deviations). Statistical analysis indicates that the total conifer volume estimates for

merchantable strata on the District is within 9.9 percent in the Upper Willamette sustained yield unit and 9.6 percent in the Siuslaw sustained yield unit, based on measurements of 220 plots.

The volume on present stands is derived from 233 permanent, continuous forest inventory plots. The majority of these plots were established in 1968 and were remeasured in 1978 and again in 1988. Additional plots were established in 1978 and 1988. Inventory plots are stratified based on site index, age and major TPCC type (Suitable Commercial Forest Land, Suitable Woodland, Non-Suitable Woodland and Non-forest and Recreation sites).

More detailed information about the forest inventory systems is available from the District office.

## Appendix 3-L

# Historical Perspective of Western Oregon Forests

The Douglas-fir ecosystem evolved in a region that was, and continues to be, geologically active with a climate strongly influenced by the adjoining Pacific Ocean. The ecosystem was subjected to periodic events such as major storms, floods, fires, and diseases. These events produced a mosaic of vegetative communities with a legacy of snags, downed logs, and accumulated organic matter that were important in the development of both the terrestrial and aquatic systems. These events seldom removed the vegetation from an entire area. Instead, they left undisturbed or partially disturbed vegetation in islands of varying sizes, shapes and distributions. These islands served as refugia for many plant and animal species that were later able to colonize the disturbed areas.

Following a disturbance, the vegetation went through a series of successional stages (seral stages), beginning with the early colonizers. Many of the plants that first established were highly adapted to harsh conditions, often prolific, and grew quickly. Many helped to stabilize soils and, in some cases, to improve fertility by adding nitrogen as well as organic debris to the soil. The legacies of downed trees and organic duff also were important features in revegetating disturbed areas and providing habitat for a variety of species. During these early seral stages the diversity of both plant and animal species was high.

The colonizers common to the earliest seral stages were gradually replaced by overstory trees, predominantly Douglas-fir. Closure of the overstory changed the light and moisture patterns, favoring a different mix of plant and animal species. Overall diversity of plant and animal species declined.

With continued maturation of the vegetation, trees became larger, and some died. The larger trees provided opportunities for cavity dwellers and other species. Spaces in the landscape created by the loss of large overstory trees created openings for other, more light-dependent species. The diversity of plant and animal species increased. Interspersed with this maturing forest were specialized communities such as wetlands, riparian areas, and meadows that developed where appropriate moisture and soil conditions existed.

Through time animal species became associated with the various plant communities and seral stages. Some animals required specialized habitats; others utilized a variety of habitats, but depended on specific habitat components for some life stages, such as reproduction. Although few species became totally dependent on a single successional stage, the entire community of animal species and its abundance changed as the vegetation changed.

As the landscape pattern changed so did the pattern of animal abundance and distribution. Animals varied in their abilities to migrate and colonize new areas. Mobile, highly adaptable species were frequently early colonizers. Because mature and old growth areas were frequently stable for long periods, animals that became associated with those habitats were often specialized and less mobile, and needed longer periods of time and more secure migration routes to recolonize new areas. Many of these mature and old growth associated species were territorial, but their territories ranged in size.

The natural forest was a mosaic of plant and animal communities, frequently with larger blocks of more uniform forest with smaller, interspersed, specialized communities or different seral stages. Through time, the interactive processes among the land form, vegetation, and water, produced and maintained the basic communities. Genetic diversity developed and was maintained by the constant process of change over the landscape. Distribution of plant and animal communities changed, but the basic forest components remained.

Archeological evidence indicates the first humans colonized the region about 10,000 years ago. They used a broad range of plant and animal resources, and used fire as a tool to improve the availability of game, acorns, and other food sources. Their fires were frequent, but impacts were mostly limited to lower elevation valleys, which probably increased the oak-grasslands of those valleys.

It has been estimated that prior to white settlement, 60 to 70 percent of western Oregon and Washington forests were old growth (Franklin and Spies, 1984). One subregional study shows that about 40 percent of the Oregon Coast Range was old growth in 1850 (Teensma et al., 1991). The remaining acreages were

a mixture of age classes with a succession of forest maturing to old growth to replace those areas lost to fire and other disturbances. The early seral stages that were produced by fires contained abundant amounts of standing and fallen woody debris.

Settlers of European origin began colonizing the area about 1850, although some outposts were established prior to that time. These settlers began clearing the land for farms and urban development, impacting the flatter valleys, which provided the best lands for agriculture. Many larger valleys were converted to nontimber activities. To facilitate settlement, larger rivers were channeled and woody debris was removed from channels, causing most low elevation riparian communities along larger rivers to decline and be lost during this time.

Hunting, predator control, trapping, and other commercial activities contributed to the decline of many animal species already stressed by the loss of their habitat. Introduction of livestock and crops brought both desired and undesired plants and animals, such as weed species, starlings and sparrows, and carp, and contributed to changes in the plant and animal communities.

Logging on the region's abundant timber resources began around 1870. Early logging did not remove all the trees. Because of the effort involved in cutting and moving trees, only the largest and best trees were harvested, while smaller trees and large decadent trees were left standing, as were trees upslope or those difficult to reach. As a result, the early logging left unharvested areas and considerable standing and downed woody debris.

During this period, large and small fires, related to human activities, became more common, raging over broad areas. As with fires of natural causes, they left behind a mosaic of vegetation and a legacy of woody debris. As a result of the early logging and increase in fires, the pattern of seral stage distribution began to change, with an increase in the amount of early seral stages and a decrease in older seral stages.

Due to increased demand for wood products and improved technology, particularly since World War II, logging has more efficiently and completely removed vegetation and woody material. Not only have standing green trees been removed, but also snags and woody debris left from previous logging or fires. Broadcast burns have customarily been used as a part of site preparation for planting. Following forest fires, the salvage material has been logged, which not only

removes the dead and damaged trees but frequently the islands of trees that survived the fire. As a result of these activities, the amount of woody debris remaining in the forest has been dramatically reduced.

Much of the early logging occurred along major streams and rivers, with much of the harvesting in riparian and adjacent upslope areas. Logs were moved to the stream, and then transported by water to the mills. Splash dams and log floats on the rivers were used to move the logs until the 1950s. The removal of large woody debris, was begun to facilitate log floats and the movement of boats on rivers, and to reduce flooding, was later extended to remove log jams blocking fish migrations, and eventually to removal of almost any large woody material. The periodic flushing of logs and water scoured stream channels and damaged the remaining riparian vegetation. The loss of woody debris was also severe in riparian and aquatic habitats. This was not only a result of harvesting activities and splash damming, but also of removing large logs from streams during stream cleaning.

Even after the cessation of log floats, riparian areas and stream channels were heavily impacted by timber management activities. Large trees in riparian areas that were the source of woody debris in the streams and of downed logs and snags in riparian areas were removed during logging operations so no new logs were available to replace those removed or lost naturally.

A century and a half after settlers of European origin began changing the landscape, few areas remain unaltered. The larger river valleys have essentially changed to domestic, agriculture and urban use, and native riparian communities from the large, low-lying areas have not returned.

Land management has been divided among Federal, state and private ownerships, each with its own objectives and regulations. Lands under Federal ownership have mainly been large blocks of high elevation forestlands or smaller blocks of mid and low elevation lands. State-owned lands in the planning area are scattered among the Federal and private lands. Private lands are concentrated in the valleys and lower elevation forestlands, the latter often intermingled with public lands.

Lower elevation forestlands are mostly in second or third rotation (the length of time trees are allowed to grow between harvest), with only limited intermingled mature and old growth stands. These mature and old growth stands are fragmented, primarily in smaller blocks, surrounded by younger seral stages. Because of current rotation ages on non-Federal forestlands, few or no blocks on these non-Federal lands are

expected to reach mature seral stages. Broad areas of Federal lands have also been harvested, especially at lower elevations, but blocks of mature trees are present, although predominantly at higher elevations.

Plant and animal communities throughout the planning area have changed in composition and distribution as a result of recent human activities. The forest remains a mosaic of seral stages, but has shifted to predominantly younger ages. The amount of forest in mature and old growth has declined, and is fragmented by broad areas of younger seral stages. The forest is further fragmented by conversion of lands to nonforest uses and the network of highways and roads. Many smaller, specialized habitats have been converted to other uses, or lost.

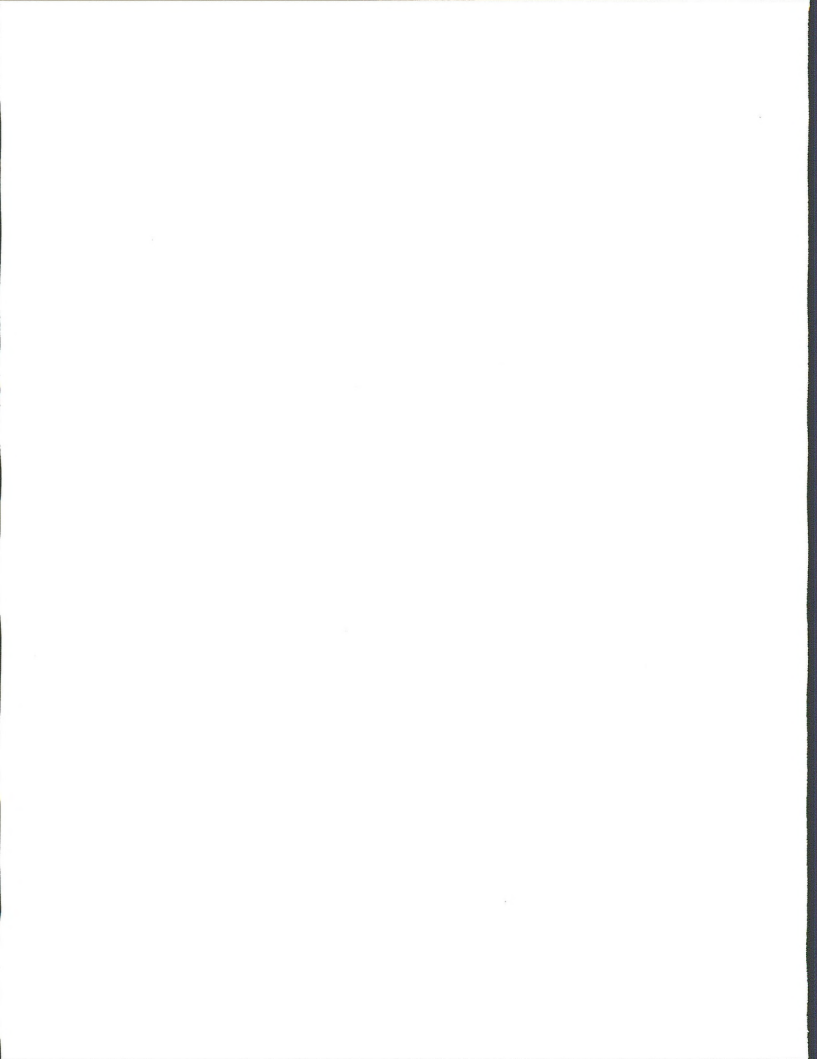
Very few streams or riparian areas along 4th order or larger streams remain intact. Early high-grade logging and splash damming contributed to the decline in habitat in most of these streams. Even in areas where the upslope forests are in mature and old growth seral stages, the riparian areas are in young or mixed seral stages. Other activities that have contributed to the decline and fragmentation of riparian areas are the construction of roads, recreational areas, and mining.

Human activities have resulted in a major alteration of the landscape, with the greatest changes in the broader valleys and stream systems. Younger seral stages are dominant, and many previously forested areas converted to other uses. Most components of the native plant and animal communities are still present, although their status is quite variable. Several species, such as wolves and grizzly bears, have been lost from the area, and many others reduced in abundance and distribution. Other species, including species introduced to the converted land or to the altered streams, particularly those adapted to younger seral stages, have prospered, increasing their range and numbers. The status of many species is unknown, because little recent information is available. The opportunity remains to maintain the basic biodiversity of the region, although in an altered condition that reflects over a century of human activities.



# Chapter 4

## Appendix





# Appendix 4-A

## Analytical Assumptions About Global Climate Change

Many scientists have predicted significant global warming within the next 60 years due to increasing levels of carbon dioxide and other gases in the atmosphere. Others have further hypothesized a climate change in western Oregon that would make it difficult or impossible to maintain, without change, the current ecosystems, including the major forest tree species. Among the relevant uncertainties, it is expected that warmer, drier weather would increase the incidence of wildfire, but warmer, wetter weather might reduce it. Rapid change may make the forest more susceptible to insect and disease attack because generational succession occurs much more quickly among pests than among trees. Other possible effects include rising soil temperatures and lengthening summer droughts. This could shift the range of Douglas-fir forest toward higher elevations, reduce the range for current high-elevation species, and increase the range for dryland species such as lodgepole and ponderosa pine. Thus, management practices, particularly stand establishment and manipulation, could be affected. Assuring adequate tree regeneration would probably be the most serious management problem in areas that become marginal. (Regens, Cubbage, and Hodges, 1989).

There is, however, no scientific consensus about the expected extent or rate of global warming or the probable effect on forest ecosystems in western Oregon. Neither the environmental record nor the limited capabilities of the climate models permit a reliable forecast of climate changes (National Academy of Sciences, 1991). Furthermore, available models

show marked differences in their predictions of change in western Oregon (Joyce, Fosberg, and Comanor, 1990). In addition, the most commonly predicted temperature changes are not expected to affect woody biomass production or the dominance of Douglas-fir in the region, although they could alter codominant species composition in older forests (Dale and Franklin, 1989). At the high end of the range of predicted changes, however, are temperature increases that could be great enough, by around the middle of the 21st century, to inadequately meet the winter "chilling requirement" for Douglas-fir to start growth again in the spring (Lavender, 1989).

The increasing carbon dioxide levels are generally thought to be beneficial to plant growth, but available information does not suggest which forest tree species may be most responsive to that increase, or how their responsiveness may also be affected by any changes in climate or by fertilization in managed forests.

Although climate change may occur and may, in a number of decades, affect the species composition of the forest, it is not considered likely to affect forestry practices during the ten-year life of the plan. Nonetheless, the draft plan incorporates a process of adaptive management (see Chapter 2, Management Direction Common to All Alternatives, Use of the Plan) permitting effective response to changing knowledge. Thus, should a scientific consensus emerge during the life of the plan indicating that forestry practices should be modified promptly in anticipation of the effects of global warming, BLM will be able to adjust.



## Appendix 4-B FORCYTE-11 Model

The FORCYTE-11 (FORest nutrient Cycling and Yield Trend Evaluator) Model was developed in the late 1980s by Dr. J.P. Kimmins and K.A. Scoullar under contract to Forestry Canada (Kimmins and Scoullar, 1990). It is a hybrid historical bioassay and ecological processes-based simulation computer model that predicts forest yields. FORCYTE-11 was developed to examine the effects of altering the nutrient status of a site.

The Eugene District has used FORCYTE-11 to estimate long-term soil productivity trends for various management practices. The trends are only used for relative comparisons because the model has not been verified with long-term experimental data.

Oregon State University's Department of Forest Science used a combination of literature and inventory data to calibrate FORCYTE-11 for Western Oregon Douglas-fir sites (Sachs, 1988). This data does not give a complete representation of all the ecosystem processes but is the best available at the present time. Research data indicate that nitrogen is the limiting nutrient for most sites growing Douglas-fir in Western Oregon. Therefore, nitrogen was the limiting nutrient used in the FORCYTE-11 simulations. Vegetative growth in FORCYTE-11 is influenced by available nitrogen.

FORCYTE-11 was used to estimate Douglas-fir total biomass production at an inherent, natural productivity level. This natural productivity level represents a baseline for comparisons of the various management prescriptions. The baseline (natural productivity level) is defined as Douglas-fir total biomass production estimated by FORCYTE-11 simulation over a 520-year time frame, with maintenance of site quality and each rotation spanning a 65-year period (culmination of mean annual increment). The baseline simulation was preceded by 900 years with no management practices and low intensity ground fires at 60-year intervals; stand replacement fires occurred at 180-year intervals. This procedure was assumed to approximate natural stand dynamics prior to timber harvest and forest management. Therefore, any changes caused by management practices would be calculated from this common base.

The following procedure was used for estimating nitrogen related growth effects due to various management prescriptions:

1. The estimate of total Douglas-fir biomass for the baseline (inherent productivity of a natural stand growing until culmination of mean annual increment) was converted to mean annual production.

Example: 10,430 metric tons/hectare produced over eight 65-year (culmination of mean annual increment) rotations (520 years = evaluation time frame).

$$\frac{10,430}{520} = 20 \text{ metric tons/hectare/year}$$

2. FORCYTE-11 was used to estimate Douglas-fir total biomass produced by various management prescriptions. These total biomass figures were reported as mean annual production.

Example: Management prescription of 70-year rotations with a low intensity, short duration prescribed burn, one fertilization, and precommercial thinning; 11,334 metric tons/hectare produced over eight 70-year rotations (560 years = evaluation time frame).

$$\frac{11,334}{560} = 20.2 \text{ metric tons/hectare/year}$$

3. The mean annual production estimates were used to calculate percent change from the baseline (inherent natural productivity level) for the various timber management prescription simulations.

Example:  $\frac{20.2 (\text{management prescription simulation}) - 20 (\text{baseline})}{20 (\text{baseline})} \times 100 = +1\%$

4. The direction of the productivity trend for each simulated management prescription was estimated by calculating the percent change of the mean annual production for the last rotation from the mean annual production for the entire evaluation time frame.

$$\text{Example: } \frac{17.4 (\text{annual prod. last rotation}) - 20.2 (\text{time frame production})}{20.2 (\text{time frame production})} \times 100 = -14\%$$

5. The percent change from the baseline level for each management prescription was categorized into the following trend classes:

Maintaining:	Change is + or - 10%
Increasing:	Change is + 11-20%
Decreasing:	Change is - 11-20%
Strongly Increasing:	Change is + >21%
Strongly Decreasing:	Change is - >21%

The following Table 4-S-2 display long-term productivity trend classes for various management practices that would be used under the various alternatives. There are eighteen sets of management prescriptions that have been simulated with two prescribed burn intensities (moderate and low) and no burning. Site quality used for the simulations was 121 (50-year base), which is the District average. Because the FORCYTE-11 Model has not been validated and its usefulness is in trends assessment, simulations of the various management prescriptions are reported in categories that have ranges of ten (Increasing and decreasing categories) to twenty (maintaining) percent.

Trends listed in Table 4-S-2 indicate:

1. For simulations (prescription #3) of precommercial thinning (PCT) and harvesting at culmination of mean annual increment (CMAI), productivity decreased when burning was used as a site preparation tool.
2. 150-year rotations (prescription #4) allow enough time for the system to maintain productivity and the nitrogen cycle, even with a moderate intensity prescribed burn.
3. One fertilization with a 70-year rotation (prescription #5) maintains productivity, but productivity gradually decreases over time with light and moderate prescribed burns. This gradual decrease is not evident when rotation length is increased from 70 years to 150 years (prescription #6).
4. Three fertilizations are needed to sustain the maintaining level of productivity under a moderate burn scenario with 70-year rotations (prescription #11). Three fertilizations do not sustain productivity with 60-year rotations (prescription #14).
5. For 40-year rotations with intensive management practices (prescription #13), productivity was sustainable only when prescribed burning was not used.
6. The only prescription (#15) that simulated a sustained productivity increase for moderate burn intensities contained intensive management practices and 115-year rotations.
7. Downed, large woody material retention scenarios (prescription #17 and 18) which simulated Alternatives D and E did not alter results from simulations (prescription #9 and 11) that contained ten percent less downed, large woody material.

Table 4-S-2 - Long-Term Soil Productivity Trend

Management Prescription	Rotation Length (Years)	Number of Rotations	Evaluation Time Frame (Years)	Productivity Trend For No Burn	Productivity Trend For Light Burn	Productivity Trend For Moderate Burn
				Mean Annual Production/Baseline	Last Rotation/ Mean Annual Production/ Baseline	Last Rotation/ Mean Annual Production/ Baseline
1. No Treatment/High Stocking	65	8	520	+	0	0
2. No Treatment/Low Stocking	65	8	520	-	-	-
3. PCT Only/CMAI	70	8	560	+	0	0
4. PCT Only/150 Yr Rotation	150	4	600	0	0	0
5. PCT/Fert/CMAI	70	8	560	+	0	0
6. PCT/Fert/150 Yr Rotation	150	4	600	0	0	0
7. PCT/1 CT/CMAI	70	8	560	+	0	-
8. PCT/1 CT/150 Yr Rotation	150	4	600	0	0	0
9. PCT/1 CT/2 Fert/CMAI	70	8	560	+	0	0
10. PCT/1 CT/2 Fert/150 Yr Rota.	150	4	600	+	0	0
11. PCT/1 CT/3 Fert/CMAI	70	8	560	++	0	0
12. PCT/1 CT/3 Fert/150 Yr Rota.	150	4	600	+	0	0
13. Max Tbr/12" dbh (40 Yr Rota.)	40	14	560	0	0	0
14. Max Tbr/16" dbh (60 Yr Rota.)	60	10	600	+	0	-
15. Max Tbr/20" dbh (115 Yr Rota.)	115	4	480	++	0	+
16. Max Tbr/24" dbh (170 Yr Rota.)	170	3	520	+	0	0
17. PCT/1 CT/2 Fert/Organic Retention/CMAI	70	8	560	+	0	0
18. PCT/1 CT/3 Fert/Organic Retention/CMAI	70	8	560	++	0	0

High Stocking: 1,600 trees/acre  
 Densities: 20, 20', or 24" dbh; Maximum Timber Prescription (PCT/2 CT/3 Fert) with rotation length necessary to produce desired dbh.  
 Organic Retention: Simulation for leaving on site 400 feet of large woody debris (Alternatives D and E).

Increasing = + (Change is + 11-20%)  
 Decreasing = - (Change is - 11-20%)  
 Maintaining = 0 (Change is + or - 10%)  
 Strongly Increasing = ++ (Change is + > 20%)  
 Strongly Decreasing = -- (Change is - > 20%)

PCT: Precommercial Thinning  
 CT: Commercial Thinning  
 Fert: Fertilization  
 CMAI: Commercial Thinning



# Appendix 4-C

## Soil Compaction, Erosion, and Nutrient Status

The District's soils differ in their degree of sensitivity to management activities. The type and condition under which activities occur determine the effects on soil productivity. Timber management practices, including road construction, are the dominant management activities that create disturbances (i.e., compaction/displacement, surface erosion, mass wasting, and alteration of organic material and nutrition levels), which could potentially impact productivity.

### Compaction/Displacement

Soil compaction is the process where soil pore space is reduced because of physical pressure and vibration exerted on the soil surface. Compaction results in reduced plant growth due to reduced water infiltration, and gaseous and nutrient exchange rates. Physical resistance to root growth can occur with high soil densities. Compaction may also affect populations of soil organisms, but resultant tree growth impact is unknown.

Soil displacement is a process where a portion or all of the surface soil is moved by mechanical action. This may affect plant growth, depending on distance moved, by removing nutrients and soil organisms, and by reducing available water and rooting depth.

Timber harvest and site preparation methods together with soil conditions during operation influence the degree of soil compaction and displacement. The yarding system utilized during harvest affects the amount of soil disturbed. Amount of compaction/displacement created by ground-based yarding primarily depends on areal extent of yarding trails, soil moisture during yarding, number of passes over each trail, and amelioration practices used. The more a log is suspended during yarding with a cable system, the less the soils are impacted; thus skyline systems generally disrupt less than highlead systems (Dymness, 1967). Cable yarding compaction growth effects are unknown. Amount of soil compaction/displacement and tree growth losses created by mechanical site preparation vary with differing conditions (amount of material to be piled, soil moisture, machine type and operation, depth of organic matter layers, number of machine passes, etc.). Timber harvesting and site preparation systems can be designed and implemented with only negligible impacts to soil productivity.

The areal extent of detrimental soil compaction/displacement created by ground-based yarding can be minimized by utilizing designated or preplanned skid trails that are restricted to a predetermined percentage of the harvest unit (Froehlich et al., 1981; Garland, 1982; BLM Compaction Guidelines, 1983). Detrimental soil compaction created by mechanical site preparation can be minimized or avoided by utilizing a tracked backhoe/excavator and/or limiting the number of passes to two (forward and back) when soils are dry and most resistant to compaction. Tillage can fracture and ameliorate compacted soil. The degree of fracturing varies with tillage equipment, machine operation, and soil and site conditions (texture, moisture, coarse fragment content, etc.). Andrus and Froehlich (1983) reported fracturing of approximately 80 percent for properly designed winged subsoilers. Davis (1990) reported bulk densities of compacted areas tilled with a self-drafting winged subsoiler were not significantly different than those in uncompacted areas. Although soil structure and pores are not returned to their natural condition by tillage, it is commonly accepted that tillage of compacted soils improves conditions for root growth. No research has been conducted that correlates the degree of fracturing and restoration of soil density with a similar degree of growth potential restoration.

### Soil Erosion and Mass Wasting (Landsliding)

Surface erosion and mass wasting are two types of soil erosion that affect long-term productivity of forest soils. Both are naturally occurring geologic processes involving gravity, soil water, precipitation events, etc.

Surface soil erosion, which includes sheet, rill, gully, and dry ravelling, is the detachment and movement of individual soil particles or aggregates downslope. It is caused either by the energy of rainfall and running water acting on bare soils, or by surface disturbance of steep slopes. In some of the higher elevation areas, freezing and thawing, especially on a daily basis, can cause considerable erosion on disturbed ground. This is particularly apparent in road cutbanks and areas with exposed soil.

Mass wasting (landsliding) is the downslope movement of soil and rock material. Volume of mass wasting events can range from a few cubic feet to thousands of cubic yards. Some of the more important factors that contribute to soil/slope instability are steep gradient, low soil strength, declining root strength, road construction, and high frequency, long duration, and intense precipitation events.

Several distinct types of mass movement are recognized. Debris avalanches and debris torrents are similar in that both occur on steep slopes, are fast moving, and are composed of soil, rock, water, and organic material. Torrents are water charged and occur in drainages, whereas avalanches lack the high water content and may or may not occur in drainages. These are the most dangerous types of landslides and usually produce the most dramatic on-site and off-site effects. Various slow moving types of mass movement such as shallow earth flows, rotational slumps, and deep-seated geologic events occur and are usually initiated by excessive water. Major concerns and impacts of mass wasting are public safety, private property, roads, bridges, water quality, and fisheries (see Chapter 4, Water Resources and Fish sections).

Reduction in root strength following timber harvest and site preparation activities is possibly a significant cause of landsliding in locations outside the area of road construction. These changes match the high frequency of landslides the first few years following timber harvest on slopes with high potential for failure in Western Oregon (Burroughs and Thomas, 1977). Areas most sensitive to loss of root strength and subsequent translational-type (slip surface is relatively shallow, planar and roughly parallel to the ground surface) landsliding usually are steep (70 percent plus) slopes in concave positions over hard bedrock in areas of high rainfall. Rotational-type (slip surface is relatively deep and circular) landslides are less sensitive to the root strength factor but are sensitive to disturbances to soil and ground water and natural slope configuration.

## Nutrient Status

Soil organic matter accumulation and cycling are related to site index. When compared to lower site indices, higher sites have more organic matter incorporated into the soil and a larger nitrogen pool. Therefore, productivity is usually more resilient on higher sites. For maintenance of long-term productivity, conservation of organic matter on low sites is more important than on high sites.

Harvest and site preparation intensities and frequencies influence the amount and composition of the surface organic layer. Conservation of small materials (needles, leaves, twigs) is important for site total nitrogen because these materials have the highest concentrations of nitrogen. When compared to needles and twigs, removal of large materials (stemwood and large branches) has less effect on site total nitrogen. However, the large materials are important for continuation of healthy symbiotic fungi populations (Maser et al., 1978).

## Soil Biology

Soil organisms interact with each other and their environment and have a fundamental role in many site processes. Soil organisms work continually in carbon cycling, nutrient transfer, water availability, vegetation vigor, and maintenance of soil structure (Powers, 1989). Mycorrhizal fungi enhance nutrient uptake of host plants by increasing the absorbing surface area of roots and through active physiological mechanisms (Amaranthus et al., 1989). When populations of soil organisms are healthy, few nutrients, such as nitrate, leach out of the system. The increased surface absorbing area also directly increases the total soil volume roots can explore for water.

Soil organisms are responsible for most biological fixation of nitrogen in ecosystems. Certain bacteria and actinomycetes form a mutually beneficial relationship with host plants and convert (symbiotic fixation) atmospheric nitrogen into ammonium nitrogen which is released into the host plant's roots (Amaranthus et al., 1989). Red alder is an important host plant occurring in the district operating area. Research literature has reported that the nitrogen content of sites growing red alder is greater than similar sites growing Douglas-fir. Also, certain organisms that are not associated with host plants can convert atmospheric nitrogen (asymbiotic fixation). Some of these organisms are associated with wood-rotting fungi and mycorrhizal fungi (Amaranthus et al., 1989).



Mycorrhizae and other microbes affect soil structure by helping bind soil particles into water-stable aggregates which create soil volume with stable and adequate pore space. Soil pores are essential for adequate movement of water and air required by plant roots and soil organisms.

Data are lacking for addressing what reduces populations of beneficial organisms and how do reduced populations affect soil productivity. But recent studies provide evidence for reasonable speculation. Long-term impacts to soil organisms can be minimized by implementing management practices that minimize soil disturbance severity, maintain organic matter levels, and emphasize revegetation by indigenous host species and associated soil organisms (Amaranthus et al., 1989).



# Appendix 4-D

## Dead and Down Woody Material Analysis Technique

### Assumptions

1. Old growth natural stands (unlogged), on the average represent maximum potential for species using downed logs. The average amount of downed log habitat is 45 tons/acre (range from 35 to 85 tons/acre).
2. Areas logged (clear cut) during the 1970s and 1980s represent minimal habitat values due to history of gross yarding, growth of the chip market, and development of increased fire management expertise.
3. Areas logged (clear cut) prior to 1970 should generally have started with more habitat than post-1970 logging.
4. Mortality salvage, commercial thinning, and partial cutting have less impact than clear cutting. These impacts also may vary by alternative.
5. Other than from management activities, areas have the highest rate of loss of down material immediately after regeneration harvesting (rates as high as 3 percent per year).

### Analytical Techniques

#### 1. Data development

Step 1 - Tally all old growth (acres of natural stands), mature; late, mid and early seral stages (stands clear cut since the 1970s), and all commercially thinned/density managed acres. Enter tallies in Tables 4-BD-3 and 4-BD-4 (Column 3).

Step 2 - Using the expertise of local reforestation, fire management and cruising personnel, etc., estimate tonnage of residual downed logs for each of the categories listed in Step 1. Enter estimates in Column 2. Estimate for other than seral stages (commercial thinned/density management) is in the form of value added.

Step 3 - Multiply acreage figures (Column 2) by factors (Column 3).

Step 4 - Sum results from Step 3 and divide by 302,000.

Table 4-BD-3 - Analysis of Dead and Down Wood Material<sup>1</sup>

Column 1 Stand Category	Column 2 (Index Factor)	Existing and Short-Term (10 years)							
		Column 3 (acres)							
		Existing	A	B	C	D	E	PA	
Old Growth	43.4 <sup>2</sup>	41,547	8,671	19,330	37,161	40,861	43,494	38,842	
Mature	23.2 <sup>2</sup>	27,775	22,573	16,685	31,280	29,933	31,824	28,574	
Late	25.7 <sup>2</sup>	70,076	94,746	95,519	92,321	85,461	83,074	85,362	
Mid	29.9 <sup>2</sup>	96,649	99,303	99,634	99,126	99,105	99,620	99,258	
Early	24.8 <sup>2</sup>	65,953	76,707	70,832	42,112	46,640	43,988	49,964	
Commercially Thinned/Density Managed	7.0					37,600	23,700	24,800	38,800

<sup>1</sup> No Action Values are assumed to be between Alternative A and Alternative B.

<sup>2</sup> Values from Table 3-BD-3

Table 4-BD-4 - Analysis of Dead and Down Wood Material<sup>1</sup>

Column 1 Stand Category	Column 2 (Index Factor)		Existing and Long-Term (100 years)						
	A&B	C&PA	D&E	A	B	Column 3 (Acres)		E	PA
						C	D		
Old Growth	43.4	43.4	43.4	11,256	26,820	56,258	57,851	69,319	54,675
Mature	23.2	35.0	23.2	15,825	24,690	169,202	94,797	134,429	132,442
Late	15.0	25.7	25.7	0	4,616	25,810	52,191	8,177	67,515
Mid	15.0	29.9	29.9	124,333	146,428	20,987	58,457	49,686	26,081
Early	24.8	36.4	36.4	150,586	99,446	29,743	38,704	40,389	21,287

<sup>1</sup> No Action Values are assumed to be between Alternative A and Alternative B.

# Appendix 4-E

## Methodology for Assessing Effects on Wildlife and Special Status Species (Wildlife)

### Elk

#### Assumptions

1. Evaluations are conducted on each of the 5 existing elk emphasis areas.
2. The primary analytical technique is the Wisdom, et al (1986) Model, which relates cover and forage conditions to existing seral stages of forest habitat, and estimates impacts due to existing road networks in elk areas.
3. Forest stands are classified, in general, into the following forage or cover types, based on the age of the stand. Some stands have been classified differently based on site specific conditions, which included canopy closure, stocking class, aspect, or tree size.
  - Forage areas - 0-20 years
  - Hiding cover - 21-50 years, with appropriate stocking class
  - Thermal cover - 51-150 years, with appropriate stocking class
  - Optimal cover - 151 + years, with appropriate stocking class
4. Cover quality indices (HEc) and forage quality indices (HEf) are calculated for only BLM lands within the 5 elk emphasis areas, whereas road mileage indices (HEr) are calculated for all roads within the elk emphasis areas, including roads not owned or controlled by BLM. While it is recognized that non-BLM lands contribute significantly to elk population management in the planning area due to the checkerboard ownership pattern, specific habitat conditions on these lands are not quantified, and so cannot be included in the model. This decision to not include non-BLM lands in the calculations for HEc and HEf has approval of the Oregon Department of Fish and Wildlife (ODFW).
5. A major divergence from the Wisdom Elk Model is the decision to not present a calculation for habitat spacing index (HEs). This decision is due, again, to the fact that checkerboard ownership patterns with non-BLM confounds the results of the model. Not including this index in the analysis has the effect of losing some of the quantitative aspects of cover and forage conditions, since HEc and HEf are primarily indicators of cover and forage quality, not quantity.
6. Total acres of cover and forage habitat in each of the elk emphasis areas is shown in the table 4-WL-6.

**Table 4-WL-6 - Acres of Cover/Forage Type Within Each Elk Management Area, With Percentages, Found on BLM Administered Lands.**

Elk Management Emphasis Area	Optimal Habitat		Thermal Habitat		Hiding Habitat		Foraging Habitat		Total Habitat Acres (BLM)
	Acres	%	Acres	%	Acres	%	Acres	%	
Lake Creek	1,511	6	4,075	17	10,475	42	8,547	35	24,608
Walker Creek	410	3	1,189	8	9,643	68	3,024	21	14,226
Wolf Creek	3,965	11	4,750	13	16,884	45	11,735	31	37,334
Siuslaw River	4,569	24	3,128	17	3,013	16	12,946	43	18,656
Mosby Creek	4,919	17	7,781	27	2,966	10	12,978	45	28,644
<b>Total Acres of Habitat</b>	<b>15,374</b>		<b>20,923</b>		<b>42,981</b>		<b>49,230</b>		<b>123,468</b>

7. For a complete description of the assumptions of the model, see page 11 of Wisdom, et al (1986).

## Analytical Techniques

### Cover Conditions (HEc)

1. Tally acres of cover, by cover type, as identified in District Map Overlay Statistical System (MOSS) database, in each of the elk emphasis areas.

Multiply acres in each cover type by the following scores (quality of the habitat):

0.1 - Hiding cover

0.5 - Thermal cover

1.0 - Optimal cover

This total is then divided by total acres of cover within each elk emphasis area, to obtain habitat effectiveness for cover (HEc).

2. Present HEc scores for each of the elk emphasis areas in tabular form, and compare these scores against ODFW benchmark scores of 0.4 to 0.5.
3. Discuss impacts of 10-Year Timber Harvest Scenario on future cover conditions.
4. Discuss probable short-term and long-term impacts of future land management activities, including timber harvest, on elk cover management goals on the District.
5. Discuss expected cumulative impacts of actions likely to occur on non-BLM lands, as they influence management of elk on BLM lands.

### Forage Conditions (HEf)

1. Tally acres of forage, by forage type, on BLM lands within each of the elk emphasis areas, as identified in MOSS. Multiply acres in each forage type by the following scores (quality of the forage):

0.10 - Shelterwood or commercial thinned

0.25 - Clear cut

0.50 - Clear cut and burned

0.75 - Clear cut, burned and seeded

1.00 - Clear cut, burned, seeded and fertilized

This total is then divided by total acres of forage within each elk emphasis area, to obtain habitat effectiveness for forage (HEf).

2. Present HEf scores for each of the elk emphasis areas in tabular form, and compare these scores against ODFW benchmark scores of 0.6 to 0.75.
3. Discuss impacts of 10-Year Timber Harvest Scenario on future forage conditions.
4. Discuss probable short-term and long-term impacts of future land management activities, including timber harvest, on elk forage management goals on the district.
5. Discuss expected cumulative impacts of actions likely to occur on non-BLM lands, as they influence management of elk on BLM lands.

### Road Mileage Conditions (HEr)

1. Determine miles of driveable roads on BLM and non-BLM lands in each elk emphasis area. Divide number of road miles in elk emphasis area with total acreage to obtain average road density on each elk area. Compare road density with ODFW benchmark of 1.5 miles per square mile recommended in the ODFW Forest Habitat Protection Criteria for BLM Lands (1990).
2. Discuss impacts of 10-Year Timber Harvest Scenario on future road conditions, including additional miles of road constructed under each alternative and proposals for road access management.

## Woodpeckers

### Assumptions

1. By managing habitat (snag and retention trees) for woodpeckers in the planning area in conditions to retain at least 60 percent of optimal population levels, requirements of other cavity users will be met at approximately the 60 percent level.
2. A direct correlation exists between snag densities and population densities of cavity users.
3. The following minimum guidelines have been established for most alternatives, except where retention of snags is voluntary.

Snags and retention trees will be greater than 15 inches diameter at breast height (dbh) and at least 20 feet in height.

Soft snags will be retained on-site except where unacceptable for logging safety or burning concerns.

Under some alternatives, snags and retention trees would be left so that snags are available to woodpeckers throughout the life of the stand after timber harvest.

Except where public safety is a concern, snags would be retained in areas reserved from timber harvest, such as riparian zones, nonsuitable woodland, Areas of Critical Environmental Concern (ACECs), bald eagle habitat, and spotted owl reserved pair areas.

4. For a complete description of the assumptions of the model used, see Neitro et al. (1985).

### Analytical Techniques

1. Existing snag levels for each forest seral stage are estimated, based on District 5-point inventory data. Average number of snags per acre are multiplied times the total number of acres, Districtwide, within the seral stage to estimate snag numbers in total.

Dividing by total forest acres provides a weighted estimate of the average snag density per acre on the District. Example calculations for the existing condition are presented in the Table 4-WL-7.

2. Average snag density is related to present woodpecker population levels, through relationship published in Neitro et al. (1985), page 145.
3. Conduct similar analysis for 10-Year Scenario by estimating snag loading in recently harvested units, based on snag retention criteria in each alternative, and estimate woodpecker population levels based on these projections.
4. Conduct similar analysis based on projected habitat levels at 100 year time interval from estimated seral stage distributions in each alternative, shown in Chapter 4 Timber, and estimate woodpecker population levels based on these projections.
5. In narrative form, discuss cumulative effects of the alternatives on woodpeckers and other cavity users.

Table 4-WL-7 - Sample Calculation of Woodpecker Populations, Existing Conditions

Age Class	Acres (Thousands)	Average Snags/Acre	Total Snags (Thousands)	% Cavity Excavators
0-15	65,509	0.37	24,238	22
16-45	96,079	0.48	46,118	21
46-95	69,605	1.62	112,760	43
96-195	27,508	3.79	104,255	100
196+	41,267	3.64	150,212	97
Totals	299,968		437,583	

Overall Snag Density =  $437,583/299,968 = 1.5$  snags/acre  
 Average Percent Cavity Nester Population = 44





# Appendix 4-F

## Methodology for Assessing Effects on Fish Habitat and Populations

### Assumptions

1. Stream data are available for developing criteria and as a check on assumptions.
2. Fish species distribution is accurate based on current ODFW and BLM surveys.
3. Fish density, survival and exploitation estimates are provided through consultation with ODFW.
4. Riparian tree size (from the Operations Inventory) is directly related to habitat quality and fish populations.
5. Streams are fully seeded (i.e., adequate number of adult fish) under short and long-term population estimates.
6. Food supply is directly linked to habitat quality rating.

### Analytical Techniques

The habitat quality model that rates stream reaches as minimal, fair and good/optimal requires estimation of species population carrying capacity. The following steps should be followed to develop the information for the fisheries portion of the RMP/EIS.

1. Identify all fish inhabited reaches and segregate by species.
2. Determine the expected short and long-term habitat quality rating for each reach.
3. Using the habitat quality rating, estimate the smolt production capacity for each anadromous species by reach. Summarize reach data by watershed, Resource Area, and District.
4. Develop population estimates in consultation with ODFW personnel for Basins within the planning area.
5. Using projected habitat changes, estimate a long-term and a short-term trend for both the habitat and the population.
6. When assessing the quality of habitat, base the primary rating upon the average tree size (dbh) in the riparian area. Age and size of trees in the riparian area is assumed to be the same as listed in the Timber Operations Inventory for adjoining upslope trees (see Table 3-R-1). However, a related factor analysis must be conducted to determine if other factors are affecting the quality of the reach. Examples: The withdrawal of water for irrigation, or heavy sediment in a watershed may lower a rating based on tree size. Rehabilitation/enhancement with structures may raise a rating based on small tree size. The availability of abundant natural structure, beaver dams, or side channels may also raise the rating of a reach.

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**Smolt Densities by Habitat Quality Ratings**


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Species	Stream Order/ Gradient	Smolts/sq. ft.		
		Good	Fair	Minimal
Coho Salmon	2-6/ 3%	0.00	0.00	0.00
	2-6/ under 3%	0.028	0.014	0.007
	7-9/ under 3%	0.003	0.002	0.001
Steelhead/	2-5/ 3%	0.003	0.002	0.001
Rainbow Trout	2-7/ under 3%	0.007	0.004	0.002
	6-9/ 3%	0.002	0.001	0.0005
Cutthroat	2-5/ 3% 0.015	0.001	0.0005	
	Trout	2-5/ under 3%	0.035	0.002
Chinook	6-9/ 3%	0.011	0.0005	0.0025
	All streams	0.004	0.002	0.001

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Smolt densities were determined collectively with the Oregon Department of Fish and Wildlife (ODFW). Considerable natural variability in fish production occurs between years and between streams.

In addition to the other habitat characteristics used to describe habitat quality for each stream reach, the amount of suitable spawning area that applies to each category is as follows:

Good - 25 percent or more

Fair - 10-24%

Minimal - Less than 10%

The average stream widths used in calculating available habitat, determined by habitat inventory data for District streams are:

3rd order - 6 feet

4th order - 11 feet

5th order - 21 feet

6th order and Larger - 38 feet

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The smolt survival and exploitation rates, as determined in cooperation with ODFW, are:

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**Percentage of Population Smolt Survival**


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Species	To Adult	Fishing Rate
Coho	7.5	69
Steelhead/Rainbow	10.0	30
Cutthroat	30.0	20
Spring Chinook	10.0	60
Fall Chinook	9.0	60

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# Appendix 4-G

## Probable Management Activities and Major Consequences in Existing and Potential Special Areas

### Existing Special Areas

Lake Creek  
Falls ACEC

Alternatives NA, A, B, C, D,  
E and Preferred Alternative

Lake Creek Falls would be designated through all Alternatives including the Preferred Alternative. No resource development activities would occur in the area. An additional 55 acres (Total ACEC and Outstanding Natural Area (ONA) acres = 58 acres) would be added to the ACEC in Alternatives A, B, C, D, E and the Preferred. The area would be designated as an ACEC/ONA to emphasize the recreational use of the area while also addressing the safety concerns at the site. Locatable mineral potential in the area is considered low. The area is presently withdrawn from locatable mineral entry and withdrawal would continue. The area would be closed to salable mineral development and would be subject to the no surface occupancy stipulation for mineral leasing. The area is presently withdrawn from commercial timber harvest because of unsuitable site conditions. The site is presently closed to Off-Road Vehicle (ORV) use and would remain so under all alternatives. A management plan would be prepared to identify site-specific actions necessary for addressing recreation and safety concerns at the site.

Long Tom  
ACEC

Alternatives A, B and C

The area would not be designated under Alternatives A, B and C, but the primary values at the site would be protected under the Endangered Species Act. The area would remain open for mining claim location. Locatable mineral exploration and development could occur to the extent allowed by the Endangered Species Act. However, locatable mineral potential is considered low, and such exploration and development would be unlikely. Surface disturbance may be allowed for leasable and salable mineral exploration or development, if it would not affect the primary values identified on the tract. The area would be closed to ORV use.

Alternatives NA, D, E,  
and Preferred Alternative

The area would be designated as an ACEC under Alternatives NA, D, E and the Preferred. The area is considered to have moderate potential for oil and gas and under these alternatives would be leased subject to the no surface occupancy stipulation. The area would be closed to locatable and salable mineral development. The area would be closed to ORV use. The area is presently withdrawn from commercial timber harvest because of unsuitable site conditions and would remain withdrawn

Horse Rock  
Ridge ACEC

Alternative A

under all alternatives. A management plan would be prepared to identify site-specific actions necessary for maintaining the sensitive values at the site.

The area would not be designated as an ACEC/RNA under Alternative A. The area would be open to timber harvest or other resource development activities. The area would be open for locatable and salable mineral exploration or development and subject to the standard lease terms for mineral leasing. The area would be open to ORV use. Portions of the site would be Timber Productivity Capability Classification (TPCC) withdrawn for rocky, grass meadows, but these special habitats are not given protective buffers in Alternative A. Failure to designate the area as an ACEC/RNA would adversely impact the site by not protecting the RNA cell (Grass bald on the western margin of the Oregon Cascades) and by allowing the primary ACEC values to degrade.

Alternatives NA, B, C, D, E  
and Preferred Alternative

The area would be designated as an ACEC/RNA under Alternatives NA, B, C, D, E, and the Preferred, and would increase in acreage to total 378 acres. The area would be closed to timber harvest and other resource development activities. The area would be withdrawn from locatable mineral entry and closed to salable mineral development. The ACEC would be subject to the no surface occupancy stipulation for mineral leasing. The area is presently closed to ORV use and would remain so under these alternatives. ACEC/RNA designation would serve to protect the sensitive values of the site and would fill an RNA cell need. A management plan would be prepared to identify site-specific actions necessary for maintaining the sensitive values at the site.

Mohawk  
ACEC/RNA

Alternative A

The area would not be designated as an ACEC/RNA under Alternative A. The area would be open to timber harvest or other resource development activities. The area would be open to locatable mineral entry and salable mineral development. With regard to mineral leasing, the area would be leased with the standard lease terms. The area will be open to ORV use. Portions of the site would be TPCC withdrawn for wet meadows, but these special habitats are not given protective buffers in Alternative A. Failure to designate the area as an ACEC/RNA would adversely impact the site by not protecting the RNA cell (Old growth Douglas-fir and Western Hemlock forest in Oregon's Willamette Valley foothills) and by allowing the sensitive ACEC values to degrade.

Alternatives NA, B, C, D, E  
and Preferred Alternative

The area would be designated as an ACEC/RNA under Alternatives NA, B, C, D, E and the Preferred. The area would be closed to timber harvest and other resource development activities. The area would be withdrawn from locatable mineral entry, and closed to salable mineral development. The ACEC would be subject to the no surface occupancy stipulation for mineral leasing. The area is presently closed to ORV use and would remain so under these alternatives. ACEC/RNA designation would serve to protect the sensitive values of the site and would fill a

*Probable Management Activities and Major Consequences in Existing and Potential Special Areas*

RNA cell need. A management plan would be prepared to identify site-specific actions necessary for maintaining the sensitive values at the site.

Upper Elk Meadows  
ACEC/RNA

Alternative A

The area would not be designated as an ACEC/RNA under Alternative A. The area would be open to timber harvest or other resource development activities. The area would be open to locatable mineral entry and salable mineral development. With regard to mineral leasing, the area would be leased with standard lease terms. The area would be open to ORV use. Portions of the site would be TPCC withdrawn for wet meadows, but these special habitats are not given protective buffers in Alternative A. Failure to designate the area as an ACEC would adversely impact the site by not protecting the RNA cell (Multiple plant communities including, old growth Douglas-fir and grand fir forest and wet meadow and shrub communities) and by allowing the primary ACEC values to degrade.

Alternatives NA, B, C, D, E  
and Preferred Alternative

The area would be designated as an ACEC/RNA under Alternatives NA, B, C, D, E and the Preferred, and would increase in acreage to total 242 acres. The area would be closed to timber harvest or other resource development activities. The area would be withdrawn from locatable mineral entry and closed to salable mineral development. The ACEC would be subject to the no surface occupancy stipulation for mineral leasing. The area is presently closed to ORV use and would remain so under these alternatives. ACEC/RNA designation would serve to protect the sensitive values of the site and would fill a RNA cell need. A management plan would be prepared to identify site-specific actions necessary for maintaining the sensitive values at the site.

Fox Hollow  
ACEC/RNA

Alternative A

The area would not be designated as an ACEC/RNA under Alternative A. The area would be open to timber harvest or other resource development activities. The area would be open to locatable and salable mineral exploration or development and subject to standard lease terms for mineral leasing. The area would be open to ORV use. Failure to designate the area as an ACEC/RNA would adversely impact the site by not protecting the RNA cell (Dry site, old growth Douglas-fir and Ponderosa pine forest in Oregon's Willamette Valley foothills) and by allowing the primary ACEC values to degrade.

Alternatives NA, B, C, D, E  
and Preferred Alternative

The area would be designated as an ACEC/RNA under Alternatives NA, B, C, D, E and the Preferred. The area would be closed to timber harvest or other resource development activities. The area would be withdrawn from locatable mineral entry and would be closed to salable mineral development. The ACEC would be subject to the no surface occupancy stipulation for mineral leasing. The area is presently closed to ORV use and would remain so under these alternatives. ACEC/RNA designation would serve to protect the sensitive values of the site and

would fill a RNA cell need. A management plan would be prepared to identify site-specific actions necessary for maintaining sensitive values at the site.

Camas Swale  
ACEC/RNA

Alternative A

The area would not be designated as an ACEC/RNA under Alternative A. The area would be open to timber harvest or other resource development activities. The area would be open for locatable and salable mineral exploration or development and subject to standard lease terms for mineral leasing. The area would be open to ORV use. Portions of the site would be withdrawn due to a rocky, grass meadow, but these special habitats are not given protective buffers under Alternative A. Failure to designate the area as an ACEC/RNA will adversely impact the site by not protecting the RNA cell (Dry site, mature Douglas-fir forest and dry meadow community in Oregon's Willamette Valley foothills) and by allowing the primary ACEC values to degrade.

Alternatives NA, B, C, D, E  
and Preferred Alternative

The area would be designated as an ACEC/RNA under Alternatives NA, B, C, D, E, and the Preferred, and would increase in acreage to total 314 acres. The area would be closed to timber harvest and other resource development activities. The area would be withdrawn from locatable mineral entry and closed to salable mineral development. The ACEC would be subject to the no surface occupancy stipulation for mineral leasing. The area is presently closed to ORV use and would remain so under these alternatives. ACEC/RNA designation would serve to protect the sensitive values of the site and would fill an RNA cell need. A management plan would be prepared to identify site-specific actions necessary for maintaining the sensitive values at the site.

McGowan Creek  
Environmental Area

Alternative A

The area would not be designated an EEA under Alternative A. The area would be open to timber harvest or other resource development activities. Some portions of the site may receive protection within a Riparian Management Area (RMA). The site would be open to locatable mineral entry and salable mineral development. With regard to mineral leasing, the area would be leased with standard lease terms. The area would be open to ORV use. Failure to designate the area as an EEA would preclude environmental educational opportunities for local schools and other interest groups. The area's old growth values could be degraded.

Alternatives NA, B, C, D, E  
and Preferred Alternative

The area would be designated under Alternatives NA, B, C, D, E and the Preferred. The area would be closed to timber harvest and other resource development activities. The area would be withdrawn from locatable mineral entry and would be closed to salable mineral development and would be subject to the no surface occupancy stipulation for mineral leasing. The area is presently closed to ORV use and would remain so in Alternatives B, C, D, E and the Preferred. In the Preferred Alternative the area would include a total of 79 acres to better identify the primary old growth values of the area.

Vik Road Environmental Area

Alternative A

The area would not be designated as an EEA under Alternative A. The area would be open to timber harvest or other resource development activities. Some portions of the site may receive protection within a RMA. The site would be open to locatable mineral entry and salable mineral development. With regard to mineral leasing, the area would be leased with standard lease terms. The area would be open to ORV use. Failure to designate the area as an EEA would preclude environmental educational opportunities for local schools and other interest groups and could allow the natural values in the area to degrade.

Alternatives NA, B, C, D, E and Preferred Alternative

The area would be designated as an EEA under Alternatives NA, B, C, D, E and the Preferred. The area would be closed to timber harvest and other resource development activities. The area would be withdrawn from locatable mineral entry. The area would be closed to salable mineral development and would be subject to the no surface occupancy for mineral leasing. The area is presently closed to ORV use and would remain so under Alternatives B, C, D, E and the Preferred. In the Preferred Alternative the boundary would change to 60 acres to better identify the primary riparian values of the area.

Row River Environmental Area

Alternative A and Preferred Alternative

The area would not be designated as an EEA under Alternative A and the Preferred Alternative. In Alternative A the area would not be designated as an EEA and would be available for timber harvest or other resource development activities. Some portions of the site may receive protection within a RMA. The area would be closed to locatable mineral entry because these lands have "acquired" status. The area would be open to salable mineral development and subject to standard lease terms for mineral leasing. The area would be open to ORV use. Failure to designate the area as an EEA could preclude environmental opportunities for local schools and other interest groups and could lead to the degradation of the natural values of the area. In the Preferred Alternative the area would not be designated as an EEA but would be retained as a recreation site (see Recreation, Chapter 3 for a description of the area). The area would be open to ORV use. Designating the area for recreation purposes would not preclude opportunities for environmental education and interpretation, but would serve to better identify and manage the present and future recreational uses in the area. The area would be closed to timber harvest and other resource development. The area would be closed to locatable mineral entry and salable mineral development and the recreation area would be subject to the no surface occupancy stipulation for mineral leasing.

Alternatives NA and B, C, D, and E

The area would be designated as an EEA under the NA, B, C, D and E Alternatives. The area would be closed to timber harvest or other resource development. The area would be closed to locatable mineral entry and salable mineral development. The ACEC

would be subject to the no surface occupancy stipulation for mineral leasing. The area is presently closed to ORV use and would remain so under Alternatives NA and B, C, D, and E.

## Potential Special Areas

### Cannery Dunes Alternatives NA and A

The area would not be designated as an ACEC/ONA under Alternatives NA and A. The entire tract is unsuitable for timber production, but would be open to other resource development activities. The area is considered to have high potential for uncommon variety silica sand. The area would be open to locatable mineral entry and salable mineral development. With regard to mineral leasing, the tract would be subject to standard lease terms. Failure to designate the site as an ACEC/ONA could result in an open pit silica mine as described in Appendix K-2. The tract would be open to ORV use. The site would be TPCC withdrawn due to the dune formation. Under the NA, the area could be considered for transfer out of Federal ownership.

### Alternatives B, C, D, E and Preferred Alternative

In Alternatives B, C, D, E and the Preferred, the area would be designated as an ACEC/ONA. The area would be withdrawn from locatable mineral entry and closed to salable mineral development. The ACEC would be subject to the no surface occupancy stipulation for mineral leasing. The area would be closed to ORV use. ACEC/ONA designation would serve to protect the recreational and ecological/geological values of the site. A management plan would be prepared to identify site-specific actions necessary for maintaining the sensitive values at the site.

### Heceta Sand Dunes Alternatives NA and A

The area would not be designated as an ACEC/ONA under Alternatives NA and A. The area would be open to timber harvest or other resource development activities. This tract is considered to have high potential for uncommon variety silica sand. The area would be open to locatable mineral entry and salable mineral development. With regard to mineral leasing, the tract would be subject to standard lease terms. The area would be open to ORV use. Portions of the site would be TPCC withdrawn due to the dune formation. Failure to designate the site as an ACEC/ONA could result in an open pit silica mine as described in Appendix K-2.

### Alternatives B, C, D, E and Preferred Alternative

The area would be designated as ACEC/ONA under Alternatives B, C, D, E and the Preferred. The area would be withdrawn from locatable mineral entry and would be closed to salable mineral development. The ACEC would be subject to the no surface occupancy stipulation for mineral leasing. The area would be closed to ORV use. ACEC/ONA designation would serve to protect the recreational and ecological/geological values of the site. A management plan would be prepared to identify site-specific actions necessary for maintaining the sensitive values at the site.



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Cougar Mountain  
Ancient Yew Grove

Alternatives NA, A and B

The area would not be designated as an ACEC under Alternatives NA, A and B. The area would be open to timber harvest or other resource development activities. The area would be open to locatable mineral entry and salable mineral development. With regard to mineral leasing, the tract would be leased subject to standard lease terms. The area will be open to ORV use. Failure to designate the area as an ACEC would adversely impact the site by not protecting the primary values and by allowing the ACEC to degrade. Under the NA and Alternatives A and B, the area could be considered for exchange out of Federal ownership.

Alternatives C, D, E and  
Preferred Alternative

The area would be designated as an ACEC under Alternatives C, D, E and the Preferred. The area would be withdrawn from locatable mineral entry and would be closed to salable mineral development. The ACEC would be subject to the no surface occupancy stipulation for mineral leasing. The area would be closed to ORV use. In the Preferred Alternative the acreage would be adjusted to ten acres to better define the primary values of the area. ACEC designation would protect the sensitive values of the site. A management plan would be prepared to identify site-specific actions necessary for maintaining the sensitive values at the site.

Hult Marsh  
Alternatives NA and A

The area would not be designated as an ACEC under Alternatives NA and A. The area would be open to timber harvest or other resource development activities. The area would be open to locatable mineral entry and salable mineral development. With regard to mineral leasing, the tract would be leased subject to standard lease terms. The area would be open to ORV use. Portions of the site would be TPCC withdrawn due to a fresh water pond. The pond would not be buffered in Alternative A but would be given a 100-foot buffer in the No Action Alternative. Failure to designate the area as an ACEC would adversely impact the site by not protecting the ACEC and allowing the primary ACEC values to degrade.

Alternatives B, C, D, E and  
Preferred Alternative

The area would be designated as an ACEC under Alternatives B, C, D, E and the Preferred. The area would be closed to timber harvest and other resource development activities. The area would be withdrawn from locatable mineral entry and closed to salable mineral development. The ACEC would be subject to the no surface occupancy stipulation for mineral leasing. The area would be closed to ORV use. ACEC designation would protect the sensitive values of the site while also addressing the recreational use of the area. A management plan would be prepared to identify site-specific actions necessary for maintaining the sensitive values at the site.

Grassy Mountain  
Alternative NA

The area would not be designated as an ACEC under the NA Alternative. The area would be open to timber harvest or other resource development activities. The area would be open to locatable mineral entry and salable mineral development. With regard to mineral leasing the tract would be leased subject to

Alternatives A, B, C, D, E  
and Preferred Alternative

standard lease terms. The area would be open to ORV use. Portions of the site would be TPCC withdrawn due to the rocky, grass meadow and a 100 foot buffer would be established around the site. Failure to designate the area as an ACEC would adversely impact the site by not managing the ACEC and allowing primary ACEC values to degrade.

The area would be designated as an ACEC under Alternatives A, B, C, D, E and the Preferred. The area would be closed to timber harvest or other resource development activities. The area would be withdrawn from locatable mineral entry and closed to salable mineral development. The ACEC would be subject to the no surface occupancy stipulation for mineral leasing. The area would be closed to ORV use. ACEC designation would protect the sensitive values of the site. A management plan would be prepared to identify site-specific actions necessary for maintaining the sensitive values at the site.

Bald Eagle Habitat Areas:  
Coburg Hills BEHA  
Fall Creek Reservoir BEHA  
McKenzie River BEHA  
Dorena Reservoir BEHA  
Fern Ridge BEHA  
Triangle Lake BEHA  
Siuslaw River BEHA

Alternatives NA, A, B, C  
and Preferred Alternative

The areas would not be designated as ACECs under Alternatives NA, A, B, C and the Preferred. All occupied bald eagle habitat and, with the exception of a tract along the McKenzie River near Eagle Rock, all designated suitable-but-occupied bald eagle habitat would be deferred from timber harvest, pending development of habitat management plans in accordance with the Endangered Species Act and the Bald Eagle Recovery Plan. The areas would not be withdrawn from locatable mineral entry; however, mining operations may be restricted by the existence of a threatened or endangered species. The areas would be open to salable mineral development and would be subject to standard lease terms for mineral leasing to the extent that mineral activities would not affect the sensitive species. The areas would be open to ORV use. In the Preferred Alternative, the areas would be within Old Growth Emphasis Areas (OGEAs) and deferred from timber harvest for eight decades. Failure to designate the areas as ACECs would exclude them from BLM requirements for special management plans and could impede essential land acquisition efforts such as in the use of Land and Water Conservation Funds. Failure to designate the area as an ACEC could have an adverse impact because the area could be disturbed by locatable mineral exploration or development. The areas would be subject to the controlled surface use leasing stipulation. The use of existing salable mineral sites would be allowed; however, site expansion could be restricted if the removal of old growth trees would be necessary.

Alternatives D and E

In Alternatives D and E, the areas would be designated as ACECs. The areas would be closed to timber harvest except for those activities that would enhance bald eagle habitat, such as management of second growth forest to develop buffers or to

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produce replacement stands. The areas would be withdrawn from locatable mineral entry and closed to salable mineral development. The ACECs would be subject to the no surface occupancy stipulation for mineral leasing. The areas would be closed to ORV use. ACEC designation could aid in obtaining assistance from land conservation groups, which would be needed to complete land acquisitions. Site-specific management plans would be prepared that would address the primary values in the areas.

Relict Forest Islands:  
Coburg Hills RFI  
Dorena Reservoir RFI  
Triangle Lake RFI  
Cottage Grove RFI

Alternatives NA, A, B  
and Preferred Alternative

The areas would not be designated as ACECs under Alternatives NA, A, B and the Preferred. The areas would be available for resource development activities under Alternatives NA, A and B. Under Alternatives NA, A and B, the areas would be open to locatable mineral entry and salable mineral development. With regard to leasable minerals, the tracts would be leased subject to standard lease terms.

Under the Preferred Alternative, the areas would be managed within OGEAs and would be deferred from timber harvest for several decades. The areas would be available for other resource development activities including salvage logging and harvesting of special forest products but only to the extent that these activities would not degrade the old growth values. The areas would be open to ORV use. The areas would be open to locatable mineral entry and subject to the controlled surface use leasing stipulation. The use of existing salable mineral sites would be allowed, however, site expansion could be restricted if the removal of old growth trees would be necessary. Failure to designate the areas as ACECs could have adverse impacts because the areas could be disturbed by locatable mineral exploration or development. Failure to designate the areas as ACECs would exclude them from the Bureau's requirements for site-specific management plans and essential inventories that would identify and close areas to activities which would be inconsistent with maintaining all the old growth values for which the areas were nominated.

Alternatives C, D, and E

The areas would be designated as ACECs under Alternatives C, D and E. The areas would be closed to timber harvest and ORV use. The areas would be withdrawn from locatable mineral entry and closed to salable mineral development. With regard to leasable minerals, the tracts would be leased subject to the no surface occupancy stipulations. Wildlife and other inventories would be performed to identify site-specific resource values. Subsequent site-specific management plans would exclude resource development activities inconsistent with maintaining the primary values for which the areas were nominated.



## Appendix 4-H

### VRM Analysis of Effects

No Action Class	Acres <sup>1</sup>	%	Mgt. P	%	Mgt. V	%	Acres Downgraded <sup>2</sup>
I	400	<1		<1		<1	720
II	0	-	-	0	-	0	40,828
III	300	<1	-	<1	-	<1	72,358
IV	314,008	100	37,500	100	45,100	100	-
<b>Total</b>	<b>314,352</b>	<b>100</b>	<b>37,500</b>	<b>100</b>	<b>45,100</b>	<b>100</b>	

Mgt. Total = 82,600 acres

Alternative A Class	Acres <sup>4</sup>	%	Mgt. I	%	Mgt. V	%	Acres Downgraded <sup>3</sup>
I	1,120	<1	-	<1	-	<1	0
II	3,071	1	440	1	140	1	37,757
III	6,705	2	880	2	280	2	65,953
IV	304,156	97	42,770	97	13,680	97	-
<b>Total</b>	<b>315,052</b>	<b>100</b>	<b>44,100</b>	<b>100</b>	<b>14,100</b>	<b>100</b>	

Mgt. Total = 58,200 acres

Alternative B Class	Acres <sup>4</sup>	%	Mgt. I	%	Mgt. V	%	Acres Downgraded <sup>3</sup>
I	1,120	<1	-	<1	-	<1	0
II	8,005	3	1,170	3	440	3	32,823
III	19,256	6	2,330	6	890	6	53,402
IV	286,671	91	35,400	91	13,470	91	-
<b>Total</b>	<b>315,052</b>	<b>100</b>	<b>38,900</b>	<b>100</b>	<b>14,800</b>	<b>100</b>	

Mgt. Total = 53,700 acres

Alternative C Class	Acres <sup>4</sup>	%	Mgt. II	%	Mgt. V	%	Acres Downgraded <sup>3</sup>
I	1,120	<1	-	<1	-	<1	0
II	16,434	6	670	6	1,580	6	24,394
III	31,798	10	1,120	10	2,640	10	40,860
IV	265,700	84	9,410	84	22,180	84	-
<b>Total</b>	<b>315,052</b>	<b>100</b>	<b>11,200</b>	<b>100</b>	<b>26,400</b>	<b>100</b>	

Mgt. Total = 37,600 acres

## VRM Analysis of Effects (cont.)

Alternative D (as inventoried <sup>1</sup> )							
Class	Acres <sup>4</sup>	%	Mgt. I	%	Mgt. V	%	Acres Downgraded <sup>2</sup>
I	1,120	<1	-	<1	-	<1	0
II	40,828	13	2,040	13	1,040	13	0
III	72,658	23	3,610	23	1,840	23	0
IV	200,446	64	10,050	64	5,120	64	-
<b>Total</b>	<b>315,052</b>	<b>100</b>	<b>15,700</b>	<b>100</b>	<b>8,000</b>	<b>100</b>	

Mgt. Total = 23,700 acres

Alternative E									
Class	Acres <sup>4</sup>	%	Mgt. I	%	Mgt. IV	%	Mgt. V	%	Acres Downgraded <sup>2</sup>
I	5,703	1	140	1	-	-	70	1	(upgraded 4,583)
II	74,444	24	3,580	24	200	100	1,900	24	(upgraded 33,616)
III	234,905	75	11,180	75	-	-	5,930	75	(upgraded 162,247)
IV	0	-	-	-	-	-	-	-	-
<b>Total</b>	<b>315,052</b>	<b>100</b>	<b>14,900</b>	<b>100</b>	<b>200</b>	<b>100</b>	<b>7,900</b>	<b>100</b>	

Mgt. Total = 23,000 acres

Preferred Alternative									
Class	Acres <sup>4</sup>	%	Mgt. I	%	Mgt. III	%	Mgt. V	%	Acres Downgraded <sup>2</sup>
I	1,390	<1	-	<1	-	<1	-	<1	(upgraded 270)
II	13,768	5	690	5	140	5	1,100	5	27,060
III	29,413	9	1,240	9	260	9	2,000	9	43,245
IV	270,481	86	11,870	86	2,500	86	19,000	86	-
<b>Total</b>	<b>315,052</b>	<b>100</b>	<b>13,800</b>	<b>100</b>	<b>2,900</b>	<b>100</b>	<b>22,100</b>	<b>100</b>	

Mgt. Total = 38,800 acres

<sup>1</sup> Numbers from 1983 MFP<sup>2</sup> Management Acres (decadal) from Timber Table 4-T-8<sup>3</sup> Mgt I = Even Aged (clear cuts)<sup>4</sup> Mgt II = Structural Retention (leaving 16+ trees/acre after harvest)<sup>5</sup> Mgt III = Structural Retention (Preferred Alternative only; small patch cuts leaving 6-8 trees/acre)<sup>6</sup> Mgt IV = Shelterwood Retention (for VRM II only; 20-25 trees/acre left after harvest)<sup>7</sup> Mgt V = Commercial Thinning, Density Management<sup>8</sup> Acres downgraded from 1983 MFP inventory<sup>9</sup> GIS WCDB generated acres from State Office for each alternative<sup>10</sup> In Alternative D, Rural Interface Areas are incorporated into VRM II acres

**Appendix 4-I**  
**Rationale Supporting Table 4-WSR-1**  
**Determinations of Condition Change**

Study River Name	Alternative	Probable Resource Uses <sup>a</sup> and Management Practices Within Half-Mile Wide Corridor (1/4 mile each side of study river from ordinary high water mark)	Major Consequences (to Values) of Probable Resource Uses and Management Practices
Beer Creek	No Action	<ul style="list-style-type: none"> <li>Riparian Management Area 100 ft. (4th order) and 140 ft. (5th order) buffer protected</li> <li>Remainder of corridor available for timber harvest</li> </ul>	<ul style="list-style-type: none"> <li>Fish value protected; classification of "wild" could be reduced</li> </ul>
	Alternative A	<ul style="list-style-type: none"> <li>River found not suitable</li> <li>Riparian Management Area, 75 ft. buffer protected</li> <li>306 acres outside riparian buffer available for harvest and 1.4 miles of new road</li> <li>VRM IV standards for corridor</li> </ul>	<ul style="list-style-type: none"> <li>Fish value adequately protected; 62 percent of corridor BLM lands available for harvest; classification of "wild" would be reduced</li> </ul>
	Alternative B	<ul style="list-style-type: none"> <li>River found not suitable</li> <li>306 acres outside riparian buffer available for harvest and 1.2 miles of new road</li> <li>VRM IV standards for corridor</li> </ul>	<ul style="list-style-type: none"> <li>Fish value adequately protected; 62 percent of corridor BLM lands available for harvest</li> </ul>
	Alternative C	<ul style="list-style-type: none"> <li>River found not suitable</li> <li>Riparian Management Area 150 ft. (4th order) and 210 ft. (5th order) buffer protected</li> <li>15 acres outside riparian buffer available for harvest; no new roads</li> <li>VRM IV standards for corridor</li> </ul>	<ul style="list-style-type: none"> <li>Fish value protected; 3 percent of river corridor BLM lands available for harvest; classification of "wild" could be reduced</li> </ul>
	Alternative D	<ul style="list-style-type: none"> <li>River found not suitable</li> <li>Riparian Management Area 200 ft. (4th order) and 280 ft. (5th order) buffer protected</li> <li>Riparian Management Area 60 ft. (2nd order)</li> <li>No harvest or new roads planned for the corridor</li> <li>VRM standards as inventoried</li> </ul>	<ul style="list-style-type: none"> <li>Fish value protected; no harvesting on BLM lands, leaving river corridor untouched</li> </ul>
	Alternative E	<ul style="list-style-type: none"> <li>River found not suitable</li> <li>No Outstandingly Remarkable Value protection for unsuitable rivers</li> <li>Riparian Management Area 200 ft. (4th order) and 280 ft. (5th order) buffer protected</li> <li>Riparian Management Area 50 ft. (1st order) and 60 ft. (2nd order) for tributaries</li> <li>No harvest planned for the corridor but .8 mile of new road could be constructed on outer edges</li> <li>VRM III standards for corridor</li> </ul>	<ul style="list-style-type: none"> <li>Fish value protected; no harvesting on BLM lands, leaving river corridor untouched</li> </ul>
Preferred Alternative	<ul style="list-style-type: none"> <li>River segment found not suitable for inclusion to the Wild and Scenic Rivers System</li> <li>Riparian Management Area 140 ft. (4th order) and 210 ft. (5th order) buffer protected</li> <li>91 acres outside riparian buffer available for harvest, 4 mile of new road</li> <li>VRM IV standards for corridor</li> </ul>	<ul style="list-style-type: none"> <li>Fish values protected; 19 percent of river corridor BLM lands available for harvest</li> </ul>	
Marten Creek	No Action	<ul style="list-style-type: none"> <li>Riparian Management Area 100 ft. (4th order) and 140 ft. (5th order) buffer protected</li> <li>Remainder of corridor available for timber harvest</li> </ul>	<ul style="list-style-type: none"> <li>Fish value protected; classification of "wild" could be reduced</li> </ul>
	Alternative A	<ul style="list-style-type: none"> <li>River found not suitable</li> <li>Riparian Management Area 75 ft. buffer protected</li> <li>463 acres outside riparian buffer available for harvest and .8 mile of new road</li> <li>VRM IV standards for corridor</li> </ul>	<ul style="list-style-type: none"> <li>Fish value adequately protected; 50 percent of corridor BLM lands available for harvest; "wild" classification would be reduced</li> </ul>
	Alternative B	<ul style="list-style-type: none"> <li>River found not suitable</li> <li>Riparian Management Area 100 ft. (4th order) and 140 ft. (5th order) buffer protected</li> <li>519 acres outside riparian buffer available for harvest and .2 mile of new road</li> <li>VRM IV standards for corridor</li> </ul>	<ul style="list-style-type: none"> <li>Fish value adequately protected; 55 percent of corridor BLM lands available for harvest; "wild" classification could be reduced</li> </ul>
	Alternative C	<ul style="list-style-type: none"> <li>River found not suitable</li> <li>Riparian Management Area 150 ft. (4th order) and 210 ft. (5th order) buffer protected</li> <li>69 acres outside riparian buffer available for harvest and .5 mile of new roads</li> <li>VRM IV standards for corridor</li> </ul>	<ul style="list-style-type: none"> <li>Fish value protected; 7 percent of corridor BLM lands available for harvest; "wild" classification could be reduced</li> </ul>
	Alternative D	<ul style="list-style-type: none"> <li>River found not suitable</li> <li>Riparian Management Area 200 ft. (4th order) and 280 ft. (5th order) buffer protected</li> <li>Riparian Management Area 60 ft. (2nd order)</li> <li>214 acres outside riparian buffer available for harvest and .8 mile of new roads</li> <li>VRM standards as inventoried; Marten Creek was inventoried as Class IV</li> </ul>	<ul style="list-style-type: none"> <li>Fish value protected; 23 percent of corridor BLM lands available for harvest; large riparian buffer protected fish values; "wild" classification would be reduced</li> </ul>



## Appendix 4-I (cont.)

Study River Name	Alternative	Probable Resource Uses <sup>a</sup> and Management Practices Within Half-Mile Wide Corridor (1/4 mile each side of study river from ordinary high water mark)	Major Consequences (to Values) of Probable Resource Uses and Management Practices
	Alternative E	<ul style="list-style-type: none"> <li>River found not suitable</li> <li>Riparian Management Area 200 ft. (4th order) and 280 ft. (5th order) buffer protected</li> <li>Riparian Management Area 50 ft. (1st order) and 60 ft. (2nd order)</li> <li>8 acres outside riparian buffer available for harvest and 4 mile of new roads</li> <li>VRM II standards for corridor</li> </ul>	<ul style="list-style-type: none"> <li>Fish value fully protected and enhanced; less than 1 percent of corridor BLM lands available for harvest; corridor would remain as potential "wild" classification</li> </ul>
	Preferred Alternative	<ul style="list-style-type: none"> <li>River segment found not suitable for inclusion to the Wild and Scenic Rivers System</li> <li>Riparian Management Area 140 ft. (4th order) and 210 ft. (5th order) buffer protected</li> <li>262 acres outside riparian buffer available for harvest and 1.2 miles of new road</li> <li>VRM IV standards for corridor</li> </ul>	<ul style="list-style-type: none"> <li>Fish values protected; 25 percent of river corridor BLM lands available for harvest</li> </ul>
Fish Creek	No Action	<ul style="list-style-type: none"> <li>Riparian Management Area 100 ft. (4th order) and 140 ft. (5th order) buffer protected</li> <li>Remainder of corridor available for timber harvest</li> </ul>	<ul style="list-style-type: none"> <li>Fish value protected</li> </ul>
	Alternative A	<ul style="list-style-type: none"> <li>River found not suitable</li> <li>Riparian Management Area 75 ft. buffer protected</li> <li>25 acres outside riparian buffer available for harvest and no miles of new road</li> <li>VRM IV standards for corridor</li> </ul>	<ul style="list-style-type: none"> <li>Fish value protected; 3 percent of corridor BLM lands available for harvest</li> </ul>
Value: fish	Alternative B	<ul style="list-style-type: none"> <li>River found not suitable</li> <li>Riparian Management Area 100 ft. (4th order) and 140 ft. (5th order) buffer protected</li> <li>72 acres outside riparian buffer available for harvest and no miles of new road</li> <li>VRM IV standards for corridor</li> </ul>	<ul style="list-style-type: none"> <li>Fish value protected; 8 percent of corridor BLM lands available for harvest</li> </ul>
Classification: Recreational	Alternative C	<ul style="list-style-type: none"> <li>River found not suitable</li> <li>Riparian Management Area 150 ft. (4th order) and 210 ft. (5th order) buffer protected</li> <li>19 acres outside riparian buffer available for harvest and no miles of new roads</li> <li>VRM IV standards for corridor</li> </ul>	<ul style="list-style-type: none"> <li>Fish value protected; 2 percent of corridor BLM lands available for harvest</li> </ul>
	Alternative D	<ul style="list-style-type: none"> <li>River found not suitable</li> <li>Riparian Management Area 200 ft. (4th order) and 280 ft. (5th order) buffer protected</li> <li>Riparian Management Area 60 ft. (2nd order)</li> <li>No harvesting or miles of new roads within river corridor</li> <li>VRM standards as inventoried; Fish Creek was inventoried as Class IV</li> </ul>	<ul style="list-style-type: none"> <li>Fish value protected; no corridor BLM lands available for harvest</li> </ul>
	Alternative E	<ul style="list-style-type: none"> <li>River found not suitable</li> <li>Riparian Management Area 200 ft. (4th order) and 280 ft. (5th order) buffer protected</li> <li>Riparian Management Area 50 ft. (1st order) and 60 ft. (2nd order)</li> <li>25 acres outside riparian buffer available for harvest and no miles of new roads</li> <li>VRM II standards for corridor</li> </ul>	<ul style="list-style-type: none"> <li>Fish value protected and enhanced; 3 percent of corridor BLM lands available for harvest</li> </ul>
	Preferred Alternative	<ul style="list-style-type: none"> <li>River segment found not suitable for inclusion to the Wild and Scenic Rivers System</li> <li>Riparian Management Area 140 ft. (4th order) and 210 ft. (5th order) buffer protected</li> <li>No harvesting or miles of new roads within river corridor</li> <li>VRM IV standards for corridor</li> </ul>	<ul style="list-style-type: none"> <li>Fish values would be adequately protected; 0 percent of river corridor BLM lands available for harvest</li> </ul>
Greenleaf Creek	No Action	<ul style="list-style-type: none"> <li>Riparian Management Area 100 ft. (4th order) and 140 ft. (5th order) buffer protected</li> <li>Remainder of corridor available for timber harvest</li> </ul>	<ul style="list-style-type: none"> <li>Fish value protected</li> </ul>
	Alternative A	<ul style="list-style-type: none"> <li>River found not suitable</li> <li>Riparian Management Area 75 ft. buffer protected</li> <li>185 acres outside riparian buffer available for harvest and 1 mile of new road</li> <li>VRM IV standards for corridor</li> </ul>	<ul style="list-style-type: none"> <li>Fish value adequately protected; 14 percent of corridor BLM lands available for harvest</li> </ul>
Value: fish	Alternative B	<ul style="list-style-type: none"> <li>River found not suitable</li> <li>Riparian Management Area 100 ft. (4th order) and 140 ft. (5th order) buffer protected</li> <li>327 acres outside riparian buffer available for harvest and .7 mile of new road</li> <li>VRM IV standards for corridor</li> </ul>	<ul style="list-style-type: none"> <li>Fish value protected; 24 percent of corridor BLM lands available for harvest</li> </ul>
Classification: Recreational			

## Appendix 4-I (cont.)

Study River Name	Alternative	Probable Resource Uses <sup>1</sup> and Management Practices Within Half-Mile Wide Corridor (1/4 mile each side of study river from ordinary high water mark)	Major Consequences (to Values) of Probable Resource Uses and Management Practices
McKenzie River Segment A	Alternative C	<ul style="list-style-type: none"> <li>• River found not suitable</li> <li>• Riparian Management Area 150 ft. (4th order) and 210 ft. (5th order) buffer protected</li> <li>• 80 acres outside riparian buffer available for harvest and .9 mile of new roads</li> <li>• VRM IV standards for corridor</li> </ul>	<ul style="list-style-type: none"> <li>• fish value protected; 6 percent of corridor BLM lands available for harvest</li> </ul>
	Alternative D	<ul style="list-style-type: none"> <li>• River found not suitable</li> <li>• Riparian Management Area 200 ft. (4th order) and 280 ft. (5th order) buffer protected</li> <li>• Riparian Management Area 60 ft. (2nd order)</li> <li>• 6 acres outside riparian buffer available for harvest and no miles of new roads</li> <li>• VRM standards as inventoried; Greenleaf Creek was inventoried as Class IV</li> </ul>	<ul style="list-style-type: none"> <li>• fish value protected; less than 1 percent of corridor BLM lands available for harvest</li> </ul>
	Alternative E	<ul style="list-style-type: none"> <li>• River found not suitable</li> <li>• Riparian Management Area 200 ft. (4th order) and 280 ft. (5th order) buffer protected</li> <li>• Riparian Management Area 50 ft. (1st order) and 60 ft. (2nd order)</li> <li>• 40 acres outside riparian buffer available for harvest and .6 mile of new roads</li> <li>• VRM II standards for corridor</li> </ul>	<ul style="list-style-type: none"> <li>• fish value protected and enhanced; 3 percent of corridor BLM lands available for harvest</li> </ul>
	Preferred Alternative	<ul style="list-style-type: none"> <li>• River segment found not suitable for inclusion to the Wild and Scenic Rivers System</li> <li>• Riparian Management Area 140 ft. (4th order) and 210 ft. (5th order) buffer protected</li> <li>• No harvest units available; .8 mile of new road</li> <li>• VRM IV standards for corridor</li> </ul>	<ul style="list-style-type: none"> <li>• fish values adequately protected; 0 percent of river corridor BLM lands available for harvest</li> </ul>
	No Action	<ul style="list-style-type: none"> <li>• Riparian Management Area 160 ft. (7th order) buffer protected</li> <li>• Remainder of corridor available for timber harvest</li> <li>• VRM III with 120 year rotation</li> </ul>	<ul style="list-style-type: none"> <li>• fish value protected; recreation values enhanced through McKenzie SRMA plan; wildlife values enhanced by low timber harvests; some scenic values could be diminished or lost</li> </ul>
	Alternative A	<ul style="list-style-type: none"> <li>• River found not suitable</li> <li>• Riparian Management Area 75 ft. buffer protected</li> <li>• 624 acres outside riparian buffer available for harvest and 2.5 miles of new road</li> <li>• VRM IV standards for river corridor</li> <li>• No development of new recreation facilities</li> </ul>	<ul style="list-style-type: none"> <li>• most values not adequately protected; 92 percent of corridor BLM lands available for harvest; no new developments for recreational facilities; loss of habitat for wildlife; scenic value diminished or lost</li> </ul>
Values: fish recreation scenic wildlife	Alternative B	<ul style="list-style-type: none"> <li>• River found suitable</li> <li>• Riparian Management Area 160 ft. (7th order) buffer protected</li> <li>• 763 acres outside riparian buffer available for harvest and 2.5 miles of new road</li> <li>• VRM II standards for visual corridor within 1/4 mile of State Highway 126, other available forestland would be VRM IV</li> <li>• No development of new recreation facilities</li> </ul>	<ul style="list-style-type: none"> <li>• most values not adequately protected; 64 percent of corridor BLM lands available for harvest; loss of wildlife habitat; proposed recreational facilities not developed; scenic value would be intensively managed and some scenic areas may be diminished, if they fall into Class IV areas</li> </ul>
Classification: Recreational	Alternative C	<ul style="list-style-type: none"> <li>• River found suitable</li> <li>• Riparian Management Area 240 ft. (7th order) buffer protected</li> <li>• 24 acres outside riparian buffer available for harvest no new roads</li> <li>• VRM II standards for visual corridor within 1/4 mile of State Highway 126, other available forestland would be VRM IV</li> <li>• River corridor would be within proposed McKenzie Special Recreation Management Area (intensive recreation planning and management)</li> </ul>	<ul style="list-style-type: none"> <li>• all values almost fully protected; 2 percent of corridor BLM lands available for harvest; little disturbance to all values; enhanced recreation experience opportunities due to McKenzie River Special Recreation Management Area plans developed within the corridor</li> </ul>
	Alternative D	<ul style="list-style-type: none"> <li>• River found suitable</li> <li>• Riparian Management Area 320 ft. (7th order) buffer protected</li> <li>• Riparian Management Area 60 ft. (2nd order)</li> <li>• 23 acres outside riparian buffer available for harvest and .5 mile of new road</li> <li>• VRM II standards for lands inventoried as such (this includes McKenzie River Corridor)</li> <li>• River corridor would be within proposed McKenzie Special Recreation Management Area (intensive recreation planning and management)</li> </ul>	<ul style="list-style-type: none"> <li>• all values fully protected; 3 percent of corridor BLM lands available for harvest; enhanced recreation experience opportunities due to Special Recreation Management Area plans developed within the corridor</li> </ul>

## Appendix 4-1 (cont.)

Study River Name	Alternative	Probable Resource Uses <sup>1</sup> and Management Practices Within Half-Mile Wide Corridor (1/4 mile each side of study river from ordinary high water mark)	Major Consequences (to Values) of Probable Resource Uses and Management Practices
	Alternative E	<ul style="list-style-type: none"> <li>River found suitable</li> <li>Riparian Management Area 320 ft. (7th order) buffer protected</li> <li>Riparian Management Area 50 ft. (1st order) and 60 ft. (2nd order)</li> <li>No harvest planned for the corridor but 1.2 miles of new road could be constructed on outer edges</li> <li>VRM II standards for lands inventoried as such (BIBs includes McKenzie River corridor)</li> </ul>	<ul style="list-style-type: none"> <li>all values fully protected and enhanced; no harvesting on BLM lands within corridor; enhanced recreation experience opportunities due to Special Recreation Management Area plans developed within the corridor; no loss of wildlife habitat; added protection of 1st and 2nd order tributaries within corridor for fish value</li> </ul>
	Preferred Alternative	<ul style="list-style-type: none"> <li>River segment found suitable for inclusion to the Wild and Scenic Rivers System</li> <li>Riparian Management Area 320 ft. (7th order) buffer protected</li> <li>28 acres outside riparian buffer available for harvest and 1 mile of new road</li> <li>VRM II management standards for visual corridor</li> <li>River corridor would be within proposed McKenzie Special Recreation Management Area (intensive recreation planning and management)</li> </ul>	<ul style="list-style-type: none"> <li>recreation value protected; 2 percent of river corridor BLM lands available for harvest; recreation experience opportunities enhanced due to Special Recreation Management Area Plans; scenic values enhanced with VRM II management</li> </ul>
Sharps Creek	No Action	<ul style="list-style-type: none"> <li>Riparian Management Area 160 ft. (6th order) buffer protected</li> <li>Remainder of corridor available for timber harvest</li> </ul>	<ul style="list-style-type: none"> <li>recreation value protected; development of new recreational facilities allowed in addition to existing Sharps Creek Site</li> </ul>
	Alternative A	<ul style="list-style-type: none"> <li>River found not suitable</li> <li>Riparian Management Area 75 ft. buffer protected</li> <li>389 acres outside riparian buffer available for harvest and 1.8 miles of new road</li> <li>No new recreational facilities developed</li> <li>VRM IV standards for river corridor</li> </ul>	<ul style="list-style-type: none"> <li>recreation value protected for existing site only (Sharps Creek). No new developments allowed; this could diminish value, which could in turn, cancel the eligibility status; 32 percent of corridor BLM lands available for harvest</li> </ul>
Value: recreation			
Classification Recreational	Alternative B	<ul style="list-style-type: none"> <li>River found not suitable</li> <li>Riparian Management Area 160 ft. (6th order) buffer protected</li> <li>287 acres outside riparian buffer available for harvest and .3 mile of new road</li> <li>No new recreational facilities developed</li> <li>VRM IV standards for river corridor</li> </ul>	<ul style="list-style-type: none"> <li>recreation value protected for existing site only; no new developments allowed. This could diminish value, which could cancel the eligibility status; 24 percent of corridor BLM lands available for harvest</li> </ul>
	Alternative C	<ul style="list-style-type: none"> <li>River found not suitable</li> <li>Riparian Management Area 240 ft. (6th order) buffer protected</li> <li>91 acres outside riparian buffer available for harvest and .5 mile of new roads</li> <li>VRM IV standards for river corridor</li> <li>Bench placer mining could occur on 8 acres within river corridor</li> <li>River corridor within proposed Sharps Creek Special Recreation Management Area (intensive recreational planning and management)</li> </ul>	<ul style="list-style-type: none"> <li>recreation value protected; 8 percent of corridor BLM lands available for harvest; possible enhanced recreation experience opportunities due to Special Recreation Management Area activities planned in area</li> </ul>
	Alternative D	<ul style="list-style-type: none"> <li>River found not suitable</li> <li>Riparian Management Area 320 ft. (6th order) buffer protected</li> <li>Riparian management 60 ft. (2nd order)</li> <li>13 acres outside riparian buffer available for harvest and .3 mile of new roads</li> <li>VRM standards as inventoried; Sharps Creek was inventoried as Class II, III and IV</li> <li>Bench placer mining could occur on 8 acres within river corridor</li> <li>River corridor within proposed Sharps Creek Special Recreation Management Area (intensive recreational planning and management)</li> </ul>	<ul style="list-style-type: none"> <li>recreation value protected; 1 percent of corridor BLM lands available for harvest; possible enhanced recreation experience opportunities due to Special Recreation Management Area activities planned in area</li> </ul>
	Alternative E	<ul style="list-style-type: none"> <li>River found not suitable</li> <li>Riparian Management Area 320 ft. (6th order) buffer protected</li> <li>Riparian Management Area 50 ft. (1st order) and 60 ft. (2nd order)</li> <li>21 acres outside riparian buffer available for harvest and no miles of new roads</li> <li>VRM III standards for river corridor</li> <li>Bench placer mining could occur on 8 acres within river corridor</li> <li>River corridor within proposed Sharps Creek Special Recreation Management Area (intensive recreational planning and management)</li> </ul>	<ul style="list-style-type: none"> <li>recreation value protected; 2 percent of corridor BLM lands available for harvest possible enhanced recreation experience opportunities due to Special Recreation Management Area activities planned in area</li> </ul>

## Appendix 4-I (cont.)

Study River Name	Alternative	Probable Resource Uses <sup>1</sup> and Management Practices Within Half-Mile Wide Corridor (1/4 mile each side of study river from ordinary high water mark)	Major Consequences (to Values) of Probable Resource Uses and Management Practices
	Preferred Alternative	<ul style="list-style-type: none"> <li>River segment found not suitable for inclusion to the Wild and Scenic Rivers System</li> <li>Riparian Management Area 320 ft. (6th order) buffer protected</li> <li>River corridor within proposed Sharps Creek Special Recreation Management Area (intensive recreational planning and management)</li> <li>101 acres outside riparian buffer available for harvest and 1.6 miles of new road</li> <li>VRM II standards for Sharps Creek SRMA, which includes river corridor</li> <li>Bench placer mining could occur on 8 acres within river corridor</li> </ul>	<ul style="list-style-type: none"> <li>Recreation values adequately protected and enhanced with the Sharps Creek SRMA plan; 8 percent of river corridor BLM lands available for harvest</li> </ul>
Suslaw River Segment B	No Action	<ul style="list-style-type: none"> <li>Riparian Management Area 190 ft. (6th order) buffer protected</li> <li>Remainder of corridor available for timber harvest</li> </ul>	<ul style="list-style-type: none"> <li>fish and wildlife values adequately protected</li> </ul>
Values: fish wildlife	Alternative A	<ul style="list-style-type: none"> <li>River found not suitable</li> <li>Riparian Management Area 75 ft. buffer protected</li> <li>No new developments of recreational facilities</li> <li>1,340 acres outside riparian buffer available for harvest and 5.5 miles of new road</li> <li>VRM IV standards for corridor</li> </ul>	<ul style="list-style-type: none"> <li>fish value adequately protected; 31 percent of corridor BLM lands available for harvest; possible loss of wildlife habitat</li> </ul>
	Alternative B	<ul style="list-style-type: none"> <li>River found not suitable</li> <li>Riparian Management Area 100 ft. (6th order) buffer protected</li> <li>1,029 acres outside riparian buffer available for harvest and 4.5 miles of new road</li> <li>VRM IV standards for corridor</li> </ul>	<ul style="list-style-type: none"> <li>fish value adequately protected; 23 percent of corridor BLM lands available for harvest; possible loss of wildlife habitat</li> </ul>
Classification			
Recreational	Alternative C	<ul style="list-style-type: none"> <li>River found not suitable</li> <li>Riparian Management Area 240 ft. (6th order) buffer protected</li> <li>491 acres outside riparian buffer available for harvest and 5.2 miles of new roads</li> <li>VRM IV standards for corridor</li> <li>River corridor within proposed Suslaw River Special Recreation Management Area (intensive recreation planning and management)</li> </ul>	<ul style="list-style-type: none"> <li>fish and wildlife values adequately protected; 11 percent of corridor BLM lands available for harvest</li> </ul>
	Alternative D	<ul style="list-style-type: none"> <li>River found not suitable</li> <li>Riparian Management Area 320 ft. (6th order) buffer protected</li> <li>Riparian Management Area 60 ft. (2nd order)</li> <li>No acres outside riparian buffer available for harvest and no miles of new roads</li> <li>VRM standards as inventoried; Suslaw River, Segment B, was inventoried as Class II, III and IV</li> <li>River corridor within proposed Suslaw River Special Recreation Management Area (intensive recreation planning and management)</li> </ul>	<ul style="list-style-type: none"> <li>fish and wildlife values protected; 8 percent of corridor BLM lands available for harvest; enhanced wildlife habitat areas</li> </ul>
	Alternative E	<ul style="list-style-type: none"> <li>River found suitable</li> <li>Riparian Management Area 320 ft. (6th order) buffer protected</li> <li>Riparian Management Area 50 ft. (1st order) and 60 ft. (2nd order)</li> <li>61 acres outside riparian buffer available for harvest and .1 mile of new roads</li> <li>VRM III standards for corridor</li> <li>River corridor within proposed Suslaw River Special Recreation Management Area (intensive recreation planning and management)</li> </ul>	<ul style="list-style-type: none"> <li>fish and wildlife values fully protected and enhanced; 1 percent of corridor BLM lands available for harvest; enhanced fish and wildlife habitat areas with 1st and 2nd order tributaries within corridor protection</li> </ul>
	Preferred Alternative	<ul style="list-style-type: none"> <li>River segment found suitable for inclusion to the Wild and Scenic Rivers System</li> <li>Riparian Management Area 320 ft. (6th order) buffer protected</li> <li>25 acres outside riparian buffer available for harvest and 1.8 miles of new road</li> <li>River corridor within proposed Suslaw River Special Recreation Management Area (intensive recreation planning and management); VRM III standards for SRMA with islands of VRM II within recreational site viewsheds</li> </ul>	<ul style="list-style-type: none"> <li>fish and wildlife values adequately protected; less than 1/2 percent of river corridor of BLM lands available for harvest</li> </ul>

## Appendix 4-I (cont.)

Study River Name	Alternative	Probable Resource Uses <sup>a</sup> and Management Practices Within Half-Mile Wide Corridor (1/4 mile each side of study river from ordinary high water mark)	Major Consequences (to Values) of Probable Resource Uses and Management Practices	
Suslaw River Segment C	No Action	<ul style="list-style-type: none"> <li>Riparian Management Area 160 ft. (7th order) buffer protected</li> <li>Remainder of corridor available for timber harvest</li> </ul>	<ul style="list-style-type: none"> <li>wildlife values protected; recreation value could be enhanced with development of new recreational facilities in addition to the existing Whitaker Creek Site and Whitaker Creek Ridge Trail</li> </ul>	
	Alternative A	<ul style="list-style-type: none"> <li>River found not suitable</li> <li>Riparian Management Area 75 ft. buffer protected</li> <li>416 acres outside riparian buffer available for harvest and .7 mile of new road</li> <li>No new developed recreational facilities</li> <li>VRM IV standards for corridor</li> </ul>	<ul style="list-style-type: none"> <li>wildlife value not adequately protected; 36 percent of corridor BLM lands available for harvest; possible loss of wildlife habitat; recreation value protected for existing facilities only, no new developments</li> </ul>	
	Alternative B	<ul style="list-style-type: none"> <li>River found not suitable</li> <li>Riparian Management Area 160 ft. (7th order) buffer protected</li> <li>375 acres outside riparian buffer available for harvest and .5 mile of new road</li> <li>No new developed recreational facilities</li> <li>VRM IV standards for corridor</li> </ul>	<ul style="list-style-type: none"> <li>wildlife values not adequately protected; 33 percent of corridor BLM lands available for harvest; possible loss of wildlife habitat; recreation value protected for existing facilities only, no new developments</li> </ul>	
	Classification Recreational	Alternative C	<ul style="list-style-type: none"> <li>River found not suitable</li> <li>Riparian Management Area 240 ft. (7th order) buffer protected</li> <li>28 acres outside riparian buffer available for harvest and no miles of new roads</li> <li>VRM IV standards for corridor</li> <li>River corridor within proposed Suslaw River Special Recreation Management Area (intensive planning and management area)</li> </ul>	<ul style="list-style-type: none"> <li>recreation and wildlife values almost fully protected; 2 percent of corridor BLM lands available for harvest; enhanced recreation experience opportunities due to Special Recreation Management Area Activities planned for the area</li> </ul>
	Alternative D	<ul style="list-style-type: none"> <li>River found not suitable</li> <li>Riparian Management Area 320 ft. (7th order) buffer protected</li> <li>Riparian Management Area 60 ft. (2nd order)</li> <li>5 acres outside riparian buffer available for harvest and no miles of new roads</li> <li>VRM standards as inventoried; Suslaw River, Segment C, was inventoried as Class II, III and IV</li> <li>River corridor within proposed Suslaw River Special Recreation Management Area (intensive planning and management area)</li> </ul>	<ul style="list-style-type: none"> <li>recreation and wildlife values fully protected; less than 1 percent of corridor BLM lands available for harvest; enhanced recreation experience opportunities due to Special Recreation Management Area activities planned for the area</li> </ul>	
	Alternative E	<ul style="list-style-type: none"> <li>River found not suitable</li> <li>Riparian Management Area 320 ft. (7th order) buffer protected</li> <li>Riparian Management Area 50 ft. (1st order) and 90 ft. (2nd order)</li> <li>No acres outside riparian buffer available for harvest and no miles of new roads</li> <li>VRM III standards for corridor</li> <li>River corridor within proposed Suslaw River Special Recreation Management Area (intensive planning and management area)</li> </ul>	<ul style="list-style-type: none"> <li>recreation and wildlife values fully protected; no percent of corridor BLM lands available for harvest; enhanced recreation experience opportunities due to Special Recreation Management Area activities planned for the area</li> </ul>	
Whitaker Creek	Preferred Alternative	<ul style="list-style-type: none"> <li>River segment found suitable for inclusion to the Wild and Scenic Rivers System</li> <li>Riparian Management Area 230 ft. (7th order) buffer protected</li> <li>No acres outside riparian buffer available for harvest or new roads</li> <li>VRM III standards with islands of VRM II within recreational site viewsheds</li> <li>River corridor within proposed Suslaw River Special Recreation Management Area (intensive planning and management area)</li> </ul>	<ul style="list-style-type: none"> <li>recreation and wildlife values would be adequately protected and enhanced; 0 percent of river corridor BLM lands available for harvest; enhanced recreation experience opportunities due to Special Recreation Management Area activities planned for the area</li> </ul>	
	No Action	<ul style="list-style-type: none"> <li>Riparian Management Area 60 ft. (3rd order) 100 ft. (4th order) and 140 ft. (5th order) buffer protected</li> <li>Remainder of corridor available for timber harvest</li> </ul>	<ul style="list-style-type: none"> <li>fish value protected</li> </ul>	
	Alternative A	<ul style="list-style-type: none"> <li>River found not suitable</li> <li>Riparian Management Area 75 ft. buffer protected</li> <li>270 acres outside riparian buffer available for harvest and .5 mile of new road</li> <li>VRM IV standards for corridor</li> </ul>	<ul style="list-style-type: none"> <li>fish value adequately protected; 32 percent of corridor BLM lands available for harvest</li> </ul>	
Value: <sup>b</sup> fish	Alternative B	<ul style="list-style-type: none"> <li>River found not suitable</li> <li>Riparian Management Area 75 ft. (3rd order) 100 ft. (4th order) and 140 ft. (5th order) buffer protected</li> </ul>	<ul style="list-style-type: none"> <li>fish value adequately protected; 38 percent of corridor BLM lands available for harvest</li> </ul>	

## Appendix 4-1 (cont.)

Study River Name	Alternative	Probable Resource Uses <sup>1</sup> and Management Practices Within Half-Mile Wide Corridor (1/4 mile each side of study river from ordinary high water mark)	Major Consequences (to Values) of Probable Resource Uses and Management Practices
Classification Recreational	Alternative C	<ul style="list-style-type: none"> <li>• 325 acres outside riparian buffer available for harvest and 1 mile of new road</li> <li>• WRM IV standards for corridor</li> <li>• River found not suitable</li> <li>• Riparian Management Area 105 ft. (3rd order) 150 ft. (4th order) and 210 ft. (5th order) buffer protected</li> <li>• Riparian Management Area 60 ft. (2nd order)</li> <li>• 79 acres outside riparian buffer available for harvest and .2 mile of new roads</li> <li>• WRM IV standards for corridor</li> </ul>	• fish value protected; 9 percent of corridor BLM lands available for harvest
	Alternative D	<ul style="list-style-type: none"> <li>• River found not suitable</li> <li>• Riparian Management Area 140 ft. (3rd order) 200 ft. (4th order) and 260 ft. (5th order) buffer protected</li> <li>• Riparian Management Area 60 ft. (2nd order)</li> <li>• No acres outside riparian buffer available for harvest and no miles of new roads</li> <li>• WRM standards as inventoried; Whittaker Creek was inventoried as Class IV</li> </ul>	• fish value enhanced; 0 percent of corridor BLM lands available for harvest
	Alternative E	<ul style="list-style-type: none"> <li>• River found not suitable</li> <li>• Riparian Management Area 140 ft. (3rd order), 200 ft. (4th order) and 280 ft. (5th order) buffer protected</li> <li>• Riparian Management Area 50 ft. (1st order) and 60 ft. (2nd order)</li> <li>• No acres outside riparian buffer available for harvest and no miles of new roads</li> <li>• WRM III standards for corridor</li> </ul>	• fish value fully protected and enhanced; 0 percent of corridor BLM lands available for harvest and added buffer protection to 1st and 2nd order tributaries within corridor
	Preferred Alternative	<ul style="list-style-type: none"> <li>• River segment found not suitable for inclusion to the Wild and Scenic Rivers System</li> <li>• Riparian Management Area 140 ft. (4th order) and 210 ft. (5th order) buffer protected</li> <li>• 44 acres outside riparian buffer available for harvest and .2 mile of new road</li> <li>• WRM IV standards for corridor</li> </ul>	• fish values adequately protected; 2 percent of river corridor BLM lands available for harvest
1	Opportunities for dispersed recreation activity would be available within the corridor under all alternatives.		
2	"Value(s)" means Identified Outstandingly Remarkable Values.		

## Appendix 4-J Timber Tables

**Table 4-T-5 - Average Age at Regeneration Harvest**

Upper Willamette SYU, average Douglas-fir = 121  
Age at CMAI = 80

Alternative	Decade					
	1st	2nd	3rd	5th	10th	20th
No Action	165	68	53	44	60	127
A	194	86	66	55	41	53
B	174	76	64	54	39	45
C	136	83	73	87	126	204
D	75	80	73	77	67	66
E	67	57	51	48	42	65
Preferred	89	79	64	62	94	168

Siuslaw SYU, average Douglas-fir = 121  
Age at CMAI = 80

Alternative	Decade					
	1st	2nd	3rd	5th	10th	20th
No Action	204	70	52	42	60	130
A	286	119	70	57	40	42
B	255	77	67	57	42	41
C	216	128	88	87	123	194
D	85	76	83	67	63	65
E	65	57	53	53	43	46
Preferred	131	91	90	75	126	224

**Table 4-T-6 - Volume (MMCF) Harvested by Age Class by Decade  
(Regeneration Harvest Unless Noted Otherwise)**

Alternative No Action		Decade				
		1st	2nd	3rd	5th	10th
Age 26-35	Regeneration	0	0	0	0	0
	Thinning	20.7	6.6	44.1	51.0	57.7
Age 36-45	Regeneration	0	0	23.8	191.5	0
	Thinning	17.4	22.6	7.4	6.3	69.0
Age 46-55	Regeneration	0	51.7	201.2	100.8	0
	Thinning	10.7	10.5	1.8	0	58.1
Age 56-65	Regeneration	0	122.6	71.4	0	139.2
	Thinning	4.5	0	0	0	25.7
Age 66-75	Regeneration	0	57.7	0	0	0
	Thinning	0	0	0	0	0
Age 76-85	Regeneration	0	24.5	0	0	0
	Thinning	0	0	0	0	0
Age 86-95	Regeneration	17.5	33.9	0	0	0
	Thinning	0	0	0	0	0
Age 96-195	Regeneration	137.2	19.7	0	0	0
	Thinning	0	0	0	0	0
Age 196+	Regeneration	144.5	2.7	2.7	2.7	2.7
Alternative A		Decade				
		1st	2nd	3rd	5th	10th
Age 26-35	Regeneration	0	0	0	0	6.1
	Thinning	0	0	0	0	0
Age 36-45	Regeneration	0	0	0	0	257.3
	Thinning	0	0	0	0	0
Age 46-55	Regeneration	0	0	0	195.5	261.1
	Thinning	21.4	29.0	29.8	37.9	3.6
Age 56-65	Regeneration	0	30.1	89.1	304.2	9.4
	Thinning	4.7	0	0	0	0
Age 66-75	Regeneration	0	117.4	417.0	0	0
	Thinning	0	0	0	0	0
Age 76-85	Regeneration	0	62.7	1.4	0	0
	Thinning	0	0	0	0	0
Age 86-95	Regeneration	0	42.6	0	0	0
	Thinning	0	0	0	0	0
Age 96-195	Regeneration	154.8	221.6	0	0	0
	Thinning	0	0	0	0	0
Age 196+	Regeneration	355.6	34.2	0	0	0



**Table 4-T-6 - Volume (MMCF) Harvested by Age Class by Decade  
 (Regeneration Harvest Unless Noted Otherwise) (cont.)**

Alternative B		Decade				
		1st	2nd	3rd	5th	10th
Age 26-35	Regeneration	0	0	0	0	10.0
	Thinning	0	0	0	0	433.7
Age 36-45	Regeneration	0	0	0	0	0
	Thinning	0	0	0	0	51.7
Age 46-55	Regeneration	0	0	0	216.2	2.1
	Thinning	21.2	23.3	24.7	30.7	0
Age 56-65	Regeneration	0	167.4	195.6	250.8	0
	Thinning	4.8	0	0	0	0
Age 66-75	Regeneration	0	119.0	277.3	0	0
	Thinning	0	0	0	0	0
Age 76-85	Regeneration	0	62.0	0	0	0
	Thinning	0	0	0	0	0.0
Age 86-95	Regeneration	0	30.4	0	0	0
	Thinning	0	0	0	0	0
Age 96-195	Regeneration	227.2	95.4	0	0	0
	Thinning	0	0	0	0	0
Age 196+	Regeneration	243.3	0	0	0	0
Alternative C		Decade				
		1st	2nd	3rd	5th	10th
Age 26-35	Regeneration	0	0	0	0	0
	Thinning	0	0	0	0	0
Age 36-45	Regeneration	0	0	0	0	0
	Thinning	0	0	0	0	0
Age 46-55	Regeneration	0	0	0	0	0
	Thinning	40.9	49.8	54.1	97.8	8.3
Age 56-65	Regeneration	18.1	38.1	23.2	1.0	1.3
	Thinning	0	3.8	7.5	17.9	0
Age 66-75	Regeneration	6.0	3.3	18.5	1.1	0.4
	Thinning	6.4	13.6	23.8	21.3	1.9
Age 76-85	Regeneration	3.5	5.5	5.4	3.9	0.8
	Thinning	0	0.2	0	0	7.6
Age 86-95	Regeneration	4.2	0.5	4.8	0.6	7.3
	Thinning	0	0	8.4	0	0
Age 96-195	Regeneration	23.5	18.2	6.4	5.0	105.4
	Thinning	11.6	9.2	2.4	8.8	17.3
Age 196+	Regeneration	39.2	13.1	0	0	4.4

Table 4-T-6 - Volume (MMCF) Harvested by Age Class by Decade  
(Regeneration Harvest Unless Noted Otherwise) (cont.)

Alternative D		Decade 1st	2nd	3rd	5th	10th
Age 26-35	Regeneration	0	0	0	0	0
	Thinning	0	0	0	0	0
Age 36-45	Regeneration	7.9	4.1	16.4	16.6	16.8
	Thinning	0	0	0	0	0
Age 46-55	Regeneration	49.0	25.1	34.1	31.3	31.8
	Thinning	10.7	0	0	0	0
Age 56-65	Regeneration	20.9	62.9	53.8	67.8	37.8
	Thinning	2.1	0	0	0	0
Age 66-75	Regeneration	2.9	15.8	64.6	34.0	38.8
	Thinning	0	0	0	0	0
Age 76-85	Regeneration	0.7	12.9	12.3	44.1	75.4
	Thinning	0	0	0	0	0
Age 86-95	Regeneration	10.9	1.5	8.7	48.5	30.7
	Thinning	0	0	0	0	0
Age 96-195	Regeneration	46.5	27.2	24.3	34.3	3.2
	Thinning	0	0	0	0	0
Age 196+	Regeneration	20.4	9.5	26.3	2.4	0.3

Acreeage of thinning after first decade unavailable.

Alternative E		Decade 1st	2nd	3rd	5th	10th
Age 26-35	Regeneration	0	0	0	1.4	64.5
	Thinning	0	0	0	0	0
Age 36-45	Regeneration	0	0	31.6	64.9	72.5
	Thinning	0	0	0	0	1.1
Age 46-55	Regeneration	66.1	73.9	76.2	69.9	0
	Thinning	12.4	14.0	13.4	9.4	0.2
Age 56-65	Regeneration	32.5	71.0	32.5	0	0
	Thinning	2.1	0	0	0	0
Age 66-75	Regeneration	15.2	2.6	9.9	0	0
	Thinning	0	0	0	0	0
Age 76-85	Regeneration	4.9	1.5	7.9	5.8	0
	Thinning	0	0	0	0	0
Age 86-95	Regeneration	11.3	0.8	0.1	20.9	0
	Thinning	0	0	0	0	0
Age 96-195	Regeneration	27.7	8.5	1.0	0	34.2
	Thinning	0	0	0	0	0
Age 196+	Regeneration	0	0	0	0	0

**Table 4-T-6 - Volume (MMCF) Harvested by Age Class by Decade  
(Regeneration Harvest Unless Noted Otherwise) (cont.)**

Alternative Preferred		Decade 1st	2nd	3rd	5th	10th
Age 26-35	Regeneration	0	0	0	0	0
	Thinning	0	0	0	0	0
Age 36-45	Regeneration	0	0	0	0	0
	Thinning	0	0	0	0	0
Age 46-55	Regeneration	11.0	7.8	4.9	2.9	0.4
	Thinning	32.7	31.9	35.5	55.5	21.6
Age 56-65	Regeneration	37.1	70.4	72.7	79.0	10.3
	Thinning	5.2	0	0	0	0
Age 66-75	Regeneration	11.8	13.6	35.9	2.2	5.0
	Thinning	4.3	0.3	22.7	28.2	3.3
Age 76-85	Regeneration	5.5	7.3	4.5	2.5	27.6
	Thinning	4.0	0	3.7	0	6.8
Age 86-95	Regeneration	12.0	6.1	4.5	25.9	18.4
	Thinning	0	0	0	0	0
Age 96-195	Regeneration	47.3	51.6	3.1	1.8	47.4
	Thinning	0	0	0	0	49.1
Age 196+	Regeneration	27.2	8.9	10.9	0.7	8.6

**Table 4-T-7 - Acres Harvested by Age Class by Decade  
(Regeneration Harvest Unless Noted Otherwise)**

Alternative No Action		Decade				
		1st	2nd	3rd	5th	10th
Age 26-35	Regeneration	0	0	0	0	0
	Thinning	17,652	2,027	36,360	38,760	42,663
Age 36-45	Regeneration	0	0	5,111	33,457	0
	Thinning	16,171	8,513	5,482	4,377	46,713
Age 46-55	Regeneration	0	12,228	33,641	13,997	0
	Thinning	8,970	7,200	1,539	0	45,660
Age 56-65	Regeneration	0	12,876	21,176	0	15,964
	Thinning	5,621	0	0	0	25,117
Age 66-75	Regeneration	0	6,619	0	0	0
	Thinning	0	0	0	0	0
Age 76-85	Regeneration	0	1,173	0	0	0
	Thinning	0	0	0	0	0
Age 86-95	Regeneration	3,026	4,074	0	0	0
	Thinning	0	0	0	0	0
Age 96-195	Regeneration	19,320	164	0	0	0
	Thinning	0	0	0	0	0
Age 196+	Regeneration	15,181	315	298	281	280
Alternative A		Decade				
		1st	2nd	3rd	5th	10th
Age 26-35	Regeneration	0	0	0	0	1,193
	Thinning	0	0	0	0	0
Age 36-45	Regeneration	0	0	0	0	24,883
	Thinning	0	0	0	0	0
Age 46-55	Regeneration	0	0	0	18,686	23,106
	Thinning	12,363	16,430	16,993	22,418	2,479
Age 56-65	Regeneration	0	2,729	9,856	27,674	1,395
	Thinning	1,689	0	0	0	0
Age 66-75	Regeneration	0	11,426	33,198	0	0
	Thinning	0	0	0	0	0
Age 76-85	Regeneration	0	5,524	113	0	0
	Thinning	0	0	0	0	0
Age 86-95	Regeneration	0	4,074	0	0	0
	Thinning	0	0	0	0	0
Age 96-195	Regeneration	11,396	17,234	0	0	0
	Thinning	0	0	0	0	0
Age 196+	Regeneration	32,718	2,360	0	0	0

**Table 4-T-7 - Acres Harvested by Age Class by Decade  
(Regeneration Harvest Unless Noted Otherwise) (cont.)**

Alternative B		Decade 1st	2nd	3rd	5th	10th
Age 26-35	Regeneration	0	0	0	0	1,695
	Thinning	0	0	0	0	0
Age 36-45	Regeneration	0	0	0	0	40,647
	Thinning	0	0	0	0	0
Age 46-55	Regeneration	0	0	0	19,706	4,273
	Thinning	12,902	13,378	14,002	17,768	1,197
Age 56-65	Regeneration	0	14,712	18,390	22,621	0
	Thinning	1,848	0	0	0	0
Age 66-75	Regeneration	0	11,361	19,691	0	0
	Thinning	0	0	0	0	0
Age 76-85	Regeneration	0	5,313	0	0	0
	Thinning	0	0	0	0	0
Age 86-95	Regeneration	0	2,844	0	0	0
	Thinning	0	0	0	0	0
Age 96-195	Regeneration	16,827	7,796	0	0	0
	Thinning	0	0	0	0	0
Age 196+	Regeneration	22,048	0	0	0	0
Alternative C		Decade 1st	2nd	3rd	5th	10th
Age 26-35	Regeneration	0	0	0	0	0
	Thinning	0	0	0	0	0
Age 36-45	Regeneration	0	0	0	0	0
	Thinning	0	0	0	0	0
Age 46-55	Regeneration	0	0	0	0	0
	Thinning	19,923	17,970	18,270	26,086	3,690
Age 56-65	Regeneration	2,563	5,788	3,534	145	187
	Thinning	14	1,257	2,484	5,936	5
Age 66-75	Regeneration	726	376	2,960	223	73
	Thinning	2,784	5,795	9,652	9,393	776
Age 76-85	Regeneration	444	799	740	609	96
	Thinning	0	0	0	0	3,885
Age 86-95	Regeneration	461	79	626	70	773
	Thinning	0	0	0	0	0
Age 96-195	Regeneration	2,223	1,878	973	719	13,064
	Thinning	3,731	2,977	2,090	4,114	10,919
Age 196+	Regeneration	4,777	1,505	271	0	443

**Table 4-T-7 - Acres Harvested by Age Class by Decade  
(Regeneration Harvest Unless Noted Otherwise) (cont.)**

Alternative D		Decade				
		1st	2nd	3rd	5th	10th
Age 26-35	Regeneration	0	0	0	0	0
	Thinning	0	0	0	0	0
Age 36-45	Regeneration	1,304	748	2,435	3,066	3,090
	Thinning	0	0	0	0	0
Age 46-55	Regeneration	5,454	2,873	4,424	4,051	4,104
	Thinning	7,165	0	0	0	0
Age 56-65	Regeneration	2,343	6,034	5,195	6,259	3,876
	Thinning	851	0	0	0	0
Age 66-75	Regeneration	276	1,460	4,951	3,016	3,383
	Thinning	0	0	0	0	0
Age 76-85	Regeneration	69	1,078	1,064	3,167	5,853
	Thinning	0	0	0	0	0
Age 86-95	Regeneration	932	140	662	3,349	2,181
	Thinning	0	0	0	0	0
Age 96-195	Regeneration	3,466	1,931	1,761	2,323	205
	Thinning	0	0	0	0	0
Age 196+	Regeneration	1,821	855	2,336	209	20

Estimates of thinning volume and acreage unavailable beyond 1st decade.

Regeneration harvest level is nondeclining and total yield is assumed to be also.

Alternative E		Decade				
		1st	2nd	3rd	5th	10th
Age 26-35	Regeneration	0	0	0	281	10,718
	Thinning	0	0	0	0	0
Age 36-45	Regeneration	0	0	3,623	6,868	7,044
	Thinning	0	0	0	0	527
Age 46-55	Regeneration	7,741	9,756	11,461	6,234	0
	Thinning	7,055	7,992	7,667	5,642	115
Age 56-65	Regeneration	3,914	6,385	2,791	0	0
	Thinning	821	0	0	0	0
Age 66-75	Regeneration	1,529	253	1,065	0	0
	Thinning	0	0	0	0	0
Age 76-85	Regeneration	535	131	575	546	0
	Thinning	0	0	0	0	0
Age 86-95	Regeneration	1,052	64	9	1,443	0
	Thinning	0	0	0	0	0
Age 96-195	Regeneration	2,183	600	59	0	1,990
	Thinning	0	0	0	0	0
Age 196+	Regeneration	0	0	0	0	0

Table 4-T-7 - Acres Harvested by Age Class by Decade  
(Regeneration Harvest Unless Noted Otherwise) (cont.)

Alternative Preferred		Decade				
		1st	2nd	3rd	5th	10th
Age 26-35	Regeneration	0	0	0	0	0
	Thinning	0	0	0	0	0
Age 36-45	Regeneration	0	0	0	0	0
	Thinning	0	0	0	0	0
Age 46-55	Regeneration	1,884	1,392	1,386	324	64
	Thinning	16,637	15,237	16,439	23,792	12,340
Age 56-65	Regeneration	4,894	9,316	9,786	7,690	1,267
	Thinning	2,153	0	0	0	0
Age 66-75	Regeneration	1,355	1,526	5,048	487	352
	Thinning	1,875	210	11,215	9,573	1,705
Age 76-85	Regeneration	720	698	569	344	2,126
	Thinning	1,456	0	1,642	0	4,199
Age 86-95	Regeneration	1,090	499	360	1,138	1,169
	Thinning	0	0	0	0	0
Age 96-195	Regeneration	3,891	4,076	318	169	3,946
	Thinning	0	0	0	0	16,077
Age 196+	Regeneration	2,998	928	709	44	521

Table 4-T-8 Average Annual Acres Treated by Alternative and Decade

Alternative No Action Practices	Decade			
	1st	2nd	3rd	5th
Harvest				
Regeneration Harvest	0	0	0	0
Even Aged	3,750	7,260	6,020	4,770
Shelterwood Retention	0	0	0	0
Structural Retention	0	0	0	0
Commercial Thinning/ Density Management	4,840	3,930	4,340	4,310
Conversion	0	0	0	0
Site Preparation	2,950	5,690	4,720	3,740
Planting				
Regular Stock	2,130	6,250	2,220	0
Genetic Stock	2,580	3,720	6,050	6,550
Plantation Maintenance	1,390	2,960	2,460	1,950
Stand Protection	3,050	6,470	5,360	4,250
Stand Release	1,390	2,980	2,470	1,960
Precommercial Thinning	3,640	3,760	3,880	5,810
Fertilization	13,010	8,180	8,440	12,640

Conversion for 2nd, 3rd, and 5th decades included in regeneration harvest acres.

Alternative A Practices	Decade			
	1st	2nd	3rd	5th
Harvest				
Regeneration Harvest	0	0	0	0
Even Aged	4,410	4,340	4,320	4,640
Shelterwood Retention	0	0	0	0
Structural Retention	0	0	0	0
Commercial Thinning/ Density Management	1,410	1,640	1,700	2,240
Conversion	100	0	0	0
Site Preparation	3,160	3,110	3,100	3,320
Planting				
Regular Stock	2,960	1,730	0	0
Genetic Stock	2,580	3,720	5,430	5,830
Plantation Maintenance	1,640	1,610	1,610	1,730
Stand Protection	3,590	3,530	3,520	3,780
Stand Release	1,640	1,610	1,610	1,730
Precommercial Thinning	2,530	2,500	1,980	4,410
Fertilization	9,040	8,840	7,820	7,580

Conversion for 2nd, 3rd, and 5th decades included in regeneration harvest acres.



Table 4-T-8 Average Annual Acres Treated by Alternative and Decade (cont.)

Alternative B Practices	Decade			
	1st	2nd	3rd	5th
Harvest				
Regeneration Harvest	0	0	0	0
Even Aged	3,890	4,200	3,810	4,230
Shelterwood Retention	0	0	0	0
Structural Retention	0	0	0	0
Commercial Thinning/ Density Management	1,480	1,340	1,400	1,780
Conversion	90	0	0	0
Site Preparation	2,800	3,020	2,740	3,040
Planting				
Regular Stock	2,310	1,560	0	0
Genetic Stock	2,580	3,720	4,790	5,320
Plantation Maintenance	1,430	1,540	1,400	1,550
Stand Protection	3,180	3,430	3,110	3,460
Stand Release	1,430	1,540	1,400	1,550
Precommercial Thinning	2,310	2,030	1,140	1,220
Fertilization	7,880	8,480	7,440	6,830

Conversion for 2nd, 3rd, and 5th decades included in regeneration harvest acres.

Alternative C Practices	Decade			
	1st	2nd	3rd	5th
Harvest				
Regeneration Harvest	0	0	0	0
Even Aged	0	0	0	0
Shelterwood Retention	0	0	0	0
Structural Retention	1,120	1,050	920	180
Commercial Thinning/ Density Management	2,640	2,720	2,670	4,080
Conversion	80	0	0	0
Site Preparation	910	850	750	150
Planting				
Regular Stock	0	0	0	0
Genetic Stock	1,530	1,430	1,260	250
Plantation Maintenance	600	560	490	100
Stand Protection	880	830	720	140
Stand Release	260	240	210	40
Precommercial Thinning	2,170	2,230	400	670
Fertilization	4,160	4,410	1,830	2,630

Conversion for 2nd, 3rd, and 5th decades included in regeneration harvest acres.

Table 4-T-8 Average Annual Acres Treated by Alternative and Decade (cont.)

Alternative D Practices	Decade			
	1st	2nd	3rd	5th
Harvest				
Regeneration Harvest	0	0	0	0
Even Aged	1,570	1,510	2,280	2,540
Shelterwood Retention	0	0	0	0
Structural Retention	0	0	0	0
Commercial Thinning/ Density Management	800	960	1,000	830
Conversion	60	0	0	0
Site Preparation	1,170	1,130	1,700	1,890
Planting				
Regular Stock	0	0	0	0
Genetic Stock	1,960	1,890	2,850	3,170
Plantation Maintenance	550	530	800	890
Stand Protection	1,320	1,270	1,920	2,140
Stand Release	530	510	770	860
Precommercial Thinning	1,580	1,520	2,290	2,560
Fertilization	3,030	2,910	4,400	4,900

Conversion for 2nd, 3rd, and 5th decades included in regeneration harvest acres.

Alternative E Practices	Decade			
	1st	2nd	3rd	5th
Harvest				
Regeneration Harvest	0	0	0	0
Even Aged	1,490	1,540	1,790	1,380
Shelterwood Retention	200	180	170	200
Structural Retention	0	0	0	0
Commercial Thinning/ Density Management	790	800	770	560
Conversion	20	0	0	0
Site Preparation	1,260	1,280	1,460	1,180
Planting				
Regular Stock	0	0	0	0
Genetic Stock	2,120	2,450	2,790	2,250
Plantation Maintenance	600	610	700	560
Stand Protection	1,420	1,450	1,650	1,330
Stand Release	580	590	670	540
Precommercial Thinning	960	770	490	710
Fertilization	2,650	2,810	1,980	2,580

Conversion for 2nd, 3rd, and 5th decades included in regeneration harvest acres.

Table 4-T-8 Average Annual Acres Treated by Alternative and Decade (cont.)

Preferred Alternative Practices	Decade 1st	2nd	3rd	5th
Harvest				
Regeneration Harvest	0	0	0	0
Even Aged	1,380	1,440	1,340	840
Shelterwood Retention	0	0	0	0
Structural Retention	290	390	430	180
Commercial Thinning/ Density Management	2,210	1,550	2,930	3,340
Conversion	50	0	0	0
Site Preparation	1,720	1,880	1,820	1,050
Planting				
Regular Stock	0	0	0	0
Genetic Stock	2,200	2,960	3,260	1,370
Plantation Maintenance	690	760	730	420
Stand Protection	2,360	2,590	2,500	1,440
Stand Release	420	460	450	260
Precommercial Thinning	2,760	2,900	850	1,580
Fertilization	5,240	5,950	6,230	4,150

Conversion for 2nd, 3rd, and 5th decades included in regeneration harvest acres.



# Appendix 4-K

## Ten-Year Mineral Development Scenarios

**Introduction:** This appendix describes the Reasonably Foreseeable Development (RFD) scenarios for development of leasable, locatable and salable mineral commodities. The purpose of the RFDs is to provide models that anticipate the level and type of future mineral activity in the planning area, and these scenarios will serve as a basis for cumulative impacts analysis. The RFD first describes the steps involved in developing a mineral deposit, with presentation of hypothetical exploration and mining operations. The current activity levels are discussed in Chapter 3 of this document. Future trends and assumptions affecting mineral activity are discussed here, followed by the prediction of the surface impacts of the anticipated mineral exploration and development.

**Scope:** The development scenario is limited in scope to BLM administered lands in the planning area. The RFD is based on the known or inferred mineral resource capabilities of the lands involved, and applies the conditions and assumptions discussed under Future Trends and Assumptions. Changes in available geologic data and/or economic conditions would alter the RFD, and some deviation is to be expected over time.

### Leasable Minerals

#### Reasonably Foreseeable Development of Oil and Gas Resources (Common to All Alternatives)

**Future Trends and Assumptions:** Based on the history of past drilling and foreseeable development potential in the operating area, activity over the next decade will continue to be sporadic. Because of the low potential for the development of hydrocarbons, it is not anticipated that there will be a discovery of economically feasible oil and gas fields in the Eugene District during the plan period. However, to comply with the Supplemental Program Guidance for Fluid Minerals (Manual Section 1624.2), the potential surface impacts associated with the discovery and development of a small gas field are outlined below. It is anticipated that oil and gas activity will consist of the issuance of

competitive and over-the-counter leases, a few geophysical surveys, and perhaps the drilling of three exploratory wells.

The supply of natural gas in the region has been plentiful and is forecasted to remain that way in the future. The price of natural gas has gone down recently, and it is predicted that future prices may stay at or close to the current price. Recent economic conditions within the oil industry resulted in a decline in the number of active exploratory wells being drilled in other parts of the nation. Continued low prices and depressed economic conditions would result in a nationwide decrease in domestic exploration and development. A turnaround in the oil industry, or an increase in the price of oil and gas purchased from other countries, would spur an increase in demand for domestic production, increasing the number of wells drilled.

#### Exploration and Development of Oil and Gas Resources

**Geophysical Exploration:** Geophysical exploration is conducted to determine the subsurface structure of an area. Three geophysical survey techniques are generally used to define subsurface characteristics through measurements of the gravitational field, magnetic field, and seismic reflections. A Notice of Intent authorizes geophysical exploration when there is no mineral lease on the tract.

Gravity and magnetic field surveys involve small portable measuring units that are easily transported via light off-road vehicles, such as four-wheel drive vehicles, or aircraft. Both off-road and on-road travel may be necessary in these two types of surveys. Usually a three-man crew transported by one or two vehicles is required. Sometimes small holes (approximately 1 inch by 2 inches by 2 inches) are hand dug for instrument placement at the survey measurement points. These two survey methods can make measurements along defined lines, but it is more common to have a grid of discrete measurement stations.

Seismic reflection surveys are the most common of the geophysical methods and produce the most detailed subsurface information. Seismic surveys are conducted by sending shock waves through the earth's

surface by generating a small explosion or through mechanically beating the ground surface with a thumping or vibrating platform. Usually four large trucks use the thumper and vibrator methods, each equipped with pads about 4-foot square. The pads are lowered to the ground, and the vibrators are electronically triggered from the recording truck. Once information is recorded, the trucks move forward a short distance and the process is repeated. Less than 50 square feet of surface area is required to operate the equipment at each recording site.

The small explosive method requires that charges be detonated on the surface or in a drill hole. Holes for the charges are drilled using truck-mounted or portable drills to drill small-diameter (2 to 6 inches) holes to depths of 100 to 200 feet. Generally 4 to 12 holes are drilled per mile of line and a 5 to 50-pound charge of explosives is placed in the hole, covered, and detonated. The reflected shock wave is recorded by geophones placed in a linear fashion on the surface. In rugged terrain, a portable drill carried by helicopter can sometimes be used. A typical drilling seismic operation may use 10 to 15 men operating 5 to 7 trucks. Under normal conditions, 3 to 5 miles of line can be surveyed daily using this method. The vehicles used for a drilling program may include heavy truck-mounted drill rigs, track-mounted air rigs, water trucks, a computer recording truck, and several light pickups for the surveyors, shot hole crew, geophone crew, permit expert, and party chief. The surface charge method uses 1 to 5-pound charges attached to wooden laths 3 to 8 feet above the ground. Placing the charges lower than 6 feet usually results in the destruction of vegetation, while placing the charges higher, or on the surface of deep snow, results in little visible surface disturbance.

Public and private roads and trails are used where possible. However, off-road cross-country travel is also necessary in some cases. Graders and dozers may be required to provide access to remote areas. Several trips a day are made along a seismograph line, usually resulting in a well defined two-track trail. Drilling water, when needed, is usually obtained from private landowners.

It is anticipated that one Notice of Intent, involving seismic reflection surveys will be filed during the life of this plan.

**Surface Impacts of Geophysical Exploration:** It is anticipated that the foreseeable geophysical explorations for oil and gas on the Eugene District will consist of seismic reflection surveys, using approximately ten miles of existing roads. Surface impacts would involve temporary blockage of the roads by

the four large trucks for the vibrating platforms, but no damage to the roads is expected using this type of equipment.

The small explosive method is also anticipated to be used on an additional ten miles of line. Surface disturbance for this type of geophysical exploration is expected to consist of drilling four holes per mile of line, totalling 40 drill holes. Each drill hole would impact about 200 square feet, but 36 of these holes would be drilled on existing landings, spur roads, or timber haul roads. Therefore, 7,200 square feet (approx. 0.2 acre) of existing road surface would temporarily be impacted by drilling activities and low power blasting. Blasting would not be powerful enough to impact any surface resources or improvements. It is anticipated that four drill holes would be made on areas currently undeveloped. The drill pads would impact approximately 200 square feet each with short spur roads (100 feet long and 25 feet wide) constructed to each drill hole location. Surface disturbance of these four drill holes would affect approximately 0.25 acre. The total surface disturbance using the drilling, blasting method is expected to impact 0.5 acre.

**Drilling Phase:** Three Notices of Staking are anticipated during the plan period. It is anticipated that companies would then also submit Applications to Drill (APDs) after the Notices of Staking are accepted. Private surface owner input would be actively solicited during this stage. Once an APD is approved, the operator may begin construction activities in accordance with stipulations and conditions. When a site is chosen that necessitates the construction of an access road, the length of road may vary, but usually the shortest feasible route is selected to reduce the haul distance and construction costs. Environmental factors or a landowner's wishes may dictate a longer route in some cases. Drilling activity in the planning area is predicted to be done using existing roads with constructed short (approximately one-quarter mile) roads to access each drill site location.

In addition to the drill pad, a reserve pit is constructed. The reserve pit is used to contain the drilling fluids and drill hole cuttings. It is usually square or oblong, but is sometimes constructed in other shapes to accommodate topography. Generally, the reserve pit is 6 to 12 feet deep, but may be deeper to compensate for smaller length or width dimensions. In some instances steel mud tanks are used, which reduce the need for large reserve pits.

Based on past oil and gas drilling in Oregon, it is projected that three exploratory "wildcat" wells will be drilled on BLM administered land in the planning area. The estimated success rate of finding hydrocarbons is

predicted to be no greater than 10 percent, based on the average U.S. wildcat well success rate. Drilling is expected to be in an area of "moderate" oil and gas potential, which is the highest level of potential for oil and gas on this District. There is approximately a 1 in 50 chance of new field discovery during the life of the plan, with a strong likelihood that any such discovery would be natural gas, because current western Oregon production to date has been natural gas.

**Surface Impacts of Drilling:** During the first phase of drilling, the operator will move construction equipment over existing maintained roads to the point where the new access road begins. No more than a quarter of a mile of moderate duty access road per well site is anticipated to be constructed. The surface disturbance for new road building will average 40 feet wide with ditches, cuts and fills for a quarter of a mile in length; therefore the acreage impacted by road building will approximately 1.25 acres for each well. For the three anticipated wells, a total of 3.75 acres would be needed for new road construction.

The second part of the drilling phase is the construction of the drilling pad and reserve (mud) pits, which is anticipated to involve approximately two acres per well site. Support facilities are anticipated to disturb about two acres per well site. The likely duration of well development, testing, and abandonment is predicted to be approximately six to nine months for each drill site. Therefore, the total disturbance for the three exploratory wells, reserve pits, support services, and new road construction is expected to be no more than a total of approximately 16 acres.

**Producing Phase:** One gas field of 50 to 60 Bcf could be discovered on BLM administered lands at a depth of 2,000 to 3,000 feet during the plan period. It is estimated that the productive life span of this field would be about ten years. The size of the field would be approximately 200 acres, and the well spacing would be about 160 acres (one well per quarter section). It is anticipated that the field would require four development wells in addition to the discovery well. All gas production would be carried by pipelines for a distance of approximately 40 miles. All well service requirements would be provided by established service companies.

#### **Surface Impacts of Field Development and**

**Production:** Each development well pad would be approximately 2 acres in size and, as a result, a total of 8 acres would be involved in drill pad construction. New roads leading to each of these drill pads would have to be constructed, and it is estimated that each of the new roads would be about 0.25 mile in length with a right-of-way width of 40 feet. There-

fore, approximately 1.25 acres would be involved for each newly constructed road, and the total surface disturbance attributed to new road construction would be 5 acres. A pipeline 40 miles long with a right-of-way of 30 feet would disturb about 145 acres. Due to the checkerboard public land ownership in this area, it is estimated that only about one-half of that acreage would be on public lands administered by the BLM. Therefore, it is estimated that about 73 acres would be impacted from pipeline construction.

The total surface disturbance of field development and production would be approximately 86 acres.

**Plugging and Abandonment:** Wells are plugged according to a plan designed specifically for the down hole conditions of each well. Plugging is accomplished by the placing of cement plugs at strategic locations downhole and up to the surface. Drilling mud is used as a spacer between plugs to prevent communication between fluid bearing zones. The casing is cut off at least 3 feet below ground level and capped by welding a steel plate on the casing stub. It is predicted that the gas wells would be plugged prior to abandonment. A hole marker would be placed at the surface or buried to identify each well location.

#### **Surface Impacts of Plugging and Abandonment:**

After plugging, all equipment and debris would be removed, and the drill site would be restored as near as reasonably possible to its original condition. If the new roads constructed for drilling are not needed for future access to the area, the roads would be reclaimed as required by the Authorized Officer.

## **Reasonably Foreseeable Development of Geothermal Resources (Common to All Alternatives)**

**Future Trends and Assumptions:** With environmental protection and enhancement being a major consideration in the Pacific Northwest, clean, low-impacting energy sources are becoming more important. The energy surplus in the region is expected to be gone near the end of the decade. The abundant geothermal resources thought to be present in the Northwest are essentially undeveloped. To encourage resource development, the Bonneville Power Administration is offering to participate in three geothermal pilot projects. One of the projects selected is in the Medicine Lake Highlands area in northern California. With this renewed interest in geothermal energy, it is anticipated

that areas exhibiting geothermal potential will experience an increase in geothermal exploration and possibly development.

## Exploration and Development of Geothermal Resources

**Geophysical/Geochemical Exploration:** As with oil and gas, geothermal geophysical operations can take place on leased or unleased public land. Depending upon the status of the land (leased/unleased), the status of the applicant (lessee/nonlessee), and the type of geophysical operation proposed, (drilling/non-drilling), several types of authorizations can be used if the proposed exploration exceeds "casual use", as defined in 43 CFR 3209.0-5(c). In all cases, the authorizations require compliance with the National Environmental Policy Act and approval by the Authorized Officer. As with oil and gas, the operator is required to comply with all terms and conditions of the permits, regulations, and other requirements, including reclamation, prescribed by the Authorized Officer. Monitoring for compliance with these requirements will be done during the execution of the operations and upon completion.

In addition to the geophysical methods discussed in the Oil and Gas section, the following exploration techniques are often employed in geothermal prospecting:

**Microseismic:** Small seismometers are buried at a shallow depth (hand-dug holes) and transmit signals from naturally-occurring, extremely minor seismic activity (micro-earthquakes) to an amplifier on the surface. Stations are located away from roads to avoid traffic "noise". These units are often back-packed into areas inaccessible to vehicles.

**Resistivity:** Induced polarization (IP) techniques are used to measure the resistance of subsurface rocks to the passage of an electric current. A vehicle-mounted transmitter sends pulses of electrical current into the ground through two widely spaced electrodes (usually about two miles apart). The behavior of these electrical pulses as they travel through underlying rocks is recorded by "pots" (potential electrodes), small ceramic devices that receive the current at different locations. The electrodes are either short (two to three feet) rods driven into the ground, or aluminum foil shallowly buried over an area of several square feet. Two or three small trucks transport the crew of three to five people to transmitting and receiving sites.

**Telluric:** A string of "pots" record the variations in the natural or induced electrical currents in the earth. Passive techniques require transmitters. Active methods use a vehicle mounted transmitter similar to that used for resistivity surveys. Small trucks are used to transport the crew and equipment.

**Radiometric:** Radioactive emissions (generally radon gas) associated with geothermal resources are usually measured using a hand-held scintillometer, often at hot spring locations. Another method used involves placing plastic cups containing small detector strips sensitive to alpha radiation either on the surface or in shallow hand-dug holes. If holes are dug, they are covered, and the cups left in place for three to four weeks. At the end of the sampling period, the cups are retrieved and all holes are backfilled. These surveys can be conducted on foot or with the aid of light vehicles.

**Geochemical Surveys:** Geochemical surveys are usually conducted at hot springs by taking water samples directly from the spring. Sampling for mercury associated with geothermal resources is often done by taking soil samples using hand tools. These surveys can be conducted on foot or with the aid of light vehicles.

### Temperature Gradient Drill Hole Surveys:

Temperature gradient holes are used to determine the rate of change of temperature with respect to depth. Temperature gradient holes usually vary in diameter from about 3.5 to 4.5 inches, and from a few hundred feet to about 5000 feet in depth. They are drilled using rotary or coring methods. Drilling mud and fluids would be contained in earthen pits or steel tanks. Water for drilling would be hauled in water trucks, or if suitable water sources are close, could be piped directly to the site. Water consumption could range from about 2,000 to 6,000 gallons per day, with as much as 20,000 gallons per day under extreme lost circulation conditions.

Depending upon the location and proposed depth of the drill hole, detailed plans of operation that cover drilling methods, casing and cementing programs, well control, and plugging and abandonment may be required.

Based upon past geothermal exploration in Oregon, and a projected increase in power demand in the Northwest by the end of the decade, it is anticipated that during the ten-year life of this plan, two Notices of Intent for surface geophysical surveys, and one Notice of Intent to drill two temperature gradient holes will be filed for lands in the operating area.



**Surface Impacts of Geophysical/Geochemical Exploration:** The surface impacts of geophysical surveys (microseismic, resistivity, telluric, radiometric and geochemical) are anticipated to be negligible, and would use existing roads for vehicle access to or near the exploration area. Exploration areas for the small seismometers, electrodes, and geochemical sampling areas are not anticipated to exceed 0.1 acre total.

The surface disturbance anticipated from two temperature gradient holes is anticipated to involve 0.2 acre per drill site, or 0.4 acre total. Each drill site could contain the drill rig, most likely truck mounted, water truck(s), fuel tank, supply trailer, and a small trailer for the workers. Drilling mud and fluids would be contained in earthen pits or steel tanks. Water for drilling would be hauled in water trucks, or if suitable water sources are nearby, could be piped directly to the site. Water consumption could range from about 2,000 to 6,000 gallons per day, with as much as 20,000 gallons per day under extreme lost circulation conditions. Existing roads would be used, but short spur trails (probably less than 500 feet long and 20 feet wide) would be constructed for both of these holes, affecting approximately 0.5 acre. Drill holes would be plugged and abandoned to protect both surface and subsurface resources, including aquifers. Reclamation of disturbed areas would be required, unless some benefit to the public could be gained, such as a water well or camping area.

**Drilling and Testing:** Drilling to determine the presence of geothermal resources or to test, develop, produce, or inject fluids can be done only on land covered by a geothermal lease. Close coordination with the State would occur. It is anticipated that the duration of well development, testing, and if dry, abandonment, would be four months.

Prior to abandonment, the operator would be required to plug the hole to prevent contamination of aquifers and any impacts to subsurface and surface resources. Plugging is accomplished by the placing of cement plugs at strategic locations downhole and up to the surface. Depending upon the formations encountered, drilling mud could be used as a spacer between plugs to prevent communication between fluid bearing zones. The casing is cut off at least 6 feet below ground level and capped by welding a steel plate on the casing stub.

It is estimated that one exploratory flow test well would be drilled during the ten-year life of this plan.

**Surface Impacts of Drilling:** The geothermal well drilling operation would require approximately three to four acres for a well pad, including reserve pit. It

is expected that existing roads would be used to access the drill site but about a half mile of moderate duty access road up to 40 feet wide with ditches, cuts, and fills, would also be necessary. Approximately 2.5 acres would be disturbed by this new road construction. Total surface disturbance for the well and new road construction is expected to be about 5.5 acres.

After plugging, all equipment and debris would be removed, and the site would be restored as near as reasonably possible to its original condition. A dry hole marker would be placed at the surface or buried to identify the well location. If the new road is not needed for other purposes, it would be reclaimed as directed by the Authorized Officer.

**Geothermal Power Plant Development:** It is projected that no power plants will be constructed on BLM lands in the operating area during the life of this plan.

**Direct Use of Geothermal Energy:** It is projected that no direct use of geothermal energy will occur on BLM lands in the operating area during the life of this plan.

## Locatable Minerals

### Reasonably Foreseeable Development of Locatable Mineral Resources (Common to All Alternatives)

**Future Trends and Assumptions:** The major mineral commodities of interest will continue to be the precious metals, gold and silver. This is based on a combination of price (especially gold) and the favorable geology for mineral occurrences. Reclamation methods will continue to advance due to experience and research.

The economics of mining in the planning area will be driven by the relationship between production costs and the market price of the commodity. While production costs can be controlled, or anticipated through management and technology, the price of the mineral commodities, especially gold, will be unknown. The overall profitability of an operation, and hence the level of activity at the prospecting, exploration, and mining phases, for development of ore bodies will be closely related to the price of the mineral commodity.

No chemical heap leaching operations are forecasted during the plan period. If such an operation is proposed during the life of the plan, it will be subjected to environmental review under a Plan of Operations pursuant to regulations found in 43 CFR 3809. All locatable

mineral operations will be monitored pursuant to these regulations and the policies shown in Appendix Attachment 2-K.1.

## Exploration and Development of Locatable Mineral Resources

### Exploration Phase

**Reconnaissance:** Reconnaissance level activity is the first stage in exploring for a mineral deposit. This involves the initial literature search of an area of interest, using available references such as publications, reports, maps, aerial photos, etc. The area of study can vary from hundreds to thousands of square miles. Activity that will normally take place includes large scale mapping, regional geochemical and geophysical studies, and remote sensing with aerial photography or satellite imagery. The type of surface disturbing activity associated with reconnaissance level mineral inventory is usually no more than occasional stream sediment, soil or rock sampling.

**Prospecting:** As the result of anomalous geochemical or geophysical readings, unique geologic structure or feature, occurrence of typical mineral bearing formations, or a historical reference to past mineral occurrence, the prospecting area of interest is identified. This area may range from a square mile or less to several hundred square miles.

Activity that will take place in an effort to locate a mineral prospect include more detailed mapping, sampling, geochemical and geophysical study programs. Also this is the time when property acquisition efforts usually begin and most mining claims are located in order to secure ground while trying to make a mineral discovery.

**Surface Impacts of Reconnaissance and Prospecting:** Types of surface disturbing activity associated with prospecting generally involve soil and rock chip sampling using mostly hand tools, possibly off-road vehicle use, and placement and maintenance of mining claim monuments. This activity is normally considered "casual use" (43 CFR 3809.1-2) and does not require BLM notification or approval. Surface disturbances by these activities are anticipated to be less than 0.01 acre for each prospecting venture.

**Exploration:** Upon location of a sufficiently anomalous mineral occurrence, or favorable occurrence indicator, a mineral prospect is established and is subjected to more intense evaluation through exploration techniques. Activities that take place during exploration

include those used during prospecting but at a more intense level in a smaller area. In addition, activities such as road building, trenching, and drilling are conducted. In later stages of exploration, an exploratory adit or shaft may be driven. If the prospect already has underground workings these may be sampled, drilled, or extended. Exploration activities utilize mechanized earth moving equipment and drill rigs, and may involve the use of explosives.

**Surface Impacts of Placer Exploration:** Placer exploration consists of test pit digging either by hand or with a backhoe or hydraulic excavator. It is predicted that six Notices will be filed during the plan period pertaining to placer deposit exploration. A typical Notice will describe minor road construction necessary for accessing test pit locations. The size of each test pit is predicted to be about 5 feet x 5 feet and 10 to 15 feet deep. It is anticipated that three temporary access roads approximately 200 feet long and 25 feet wide will be necessary to reach the test pit locations with the equipment, affecting roughly a total of 0.3 acre for new roads. Support facilities would use approximately one acre. Therefore, each Notice-level operation would utilize approximately 1.3 acres of land, and during the plan period the expected six operations would disturb a total of 8 acres of land.

If low mineral values are discovered, then the pits would be backfilled and the area seeded and fertilized. It is anticipated that one notice-level operation may find mineral values significant enough to warrant a plan-level of operation, described as a bench placer mine development later in this Appendix.

**Surface Impacts of Lode Exploration:** It is anticipated that four Notices will be filed during the plan period, pertaining to vein lode exploration. Exploration work including drilling, blasting, and bulk sampling will be the emphasis of these projected notice-level operations. Some road and trail construction is anticipated for the operator to access the exploration sites for sample collection.

For each Notice, it is anticipated that three temporary access roads, 200 feet long by 40 feet wide (including cuts, fills, and ditches), would be necessary for equipment to reach the exploration sites. Surface disturbance for roads therefore, would be approximately 0.5 acre per notice. Support facilities would most likely be needed and would involve the use of about one acre per notice. The mineral sample sites (including three drill sites and two bulk sample sites) would probably disturb about 0.5 acre. Therefore, for each notice, approximately two acres

would be affected by exploration of lode mineral deposits, and for the four Notices, a total of approximately 8 acres would be affected.

It is anticipated that one Plan of Operation would be filed during the plan period pursuant to 43 CFR 3809.1-4. The Plan of Operation is predicted to pertain to a disseminated gold exploration project, and approximately ten holes would be drilled using truck mounted drill rigs. Each drill site would disturb less than a tenth of an acre. Temporary access roads, would be constructed for about three of the drill holes, but in most cases existing roads would be used. Each of these temporary access roads would be approximately 300 feet long and 40 feet wide, including roadcuts, ditches, and fill slopes involving approximately 0.25 acre for each road (0.75 acre total). Support facilities may be necessary, affecting approximately one acre. Therefore, during the first phase of exploration, it is anticipated that 2.75 acres would be disturbed.

In the second phase of exploration, it is predicted that the operator would conduct drilling and sampling on a defined grid in order to better evaluate the amount of ore reserves within the project area. Additional equipment access roads would be necessary to complete this exploratory drilling and it is estimated that ten temporary access roads (of the length and width mentioned above) would be necessary in order to conduct this drilling, affecting about 2.5 acres. The ten new drill holes would disturb about a total of one acre. Therefore, the second phase of exploration would disturb an additional 3.5 acres. The total anticipated acreage involved in the plan-level lode exploration project would be approximately 6.25 acres.

## Mining Phase

**Mine Development:** If exploration results show that an economically viable mineral deposit is present, activity intensifies to obtain detailed knowledge regarding reserves, possible mining methods, and mineral processing requirements. This involves applying all the previously used exploration tools in a more intense effort. Once enough information is acquired, a feasibility study is made to decide whether to proceed with mine development and which mining and ore processing methods would be used. It is anticipated that one bench placer and one lode deposit would be developed during the duration of this resource management plan. Both operations would be monitored under approved Plans of Operation filed pursuant to 43 CFR 3809.1-4.

Once the decision to develop the property is made, the mine permitting process begins. Upon approval, work begins on development of the mine infrastructure. This includes construction of the mill, offices and laboratory; prestripping in preparation for open pit mining; building of access roads or haulage routes, and placement of utility services. During this time, additional refinement of ore reserves is made.

Once enough facilities are in place, actual mine production begins. Concurrent with production there often are "satellite" exploration efforts to expand the mine's reserve base and extend the project life. Reclamation of the property is conducted concurrently with, or upon completion of, the mining operation. Often subeconomic resources remain unmined and the property is dormant, waiting for changes in commodity price or production technology that would make these resources economic.

Activities that could occur on these lands include: actual mining, ore processing, tailings disposal, waste rock placement, solution processing, metal refining, and placement of support facilities such as repair shops, labs, and offices. Such activities involve the use of heavy earthmoving equipment and explosives for mining and materials handling, exploration equipment for refinement of the ore reserve base, hazardous or dangerous reagents for processing requirements, and general construction activities.

The size of mines varies greatly and not all mines would require all the previously mentioned facilities and equipment. Acreage involved can range from several acres to several hundred, with most projects disturbing 10 acres or less and requiring either a Notice or a Plan of Operations.

**Bench Placer Mine:** Bench placer operations can vary in size from one person to six persons operating excavators, backhoes, loaders, larger dozers, trommels, vibratory wash plants, draglines, and sluice boxes. Other associated equipment includes water pumps, generators, and conveyors. These operations vary in scope, processing between 10 to 500 loose cubic yards of gravel per day. The average operation of this type processes 50 cubic yards per day, operating 90 days per year.

The mining process could be generalized as follows: vegetation and overburden clearing, excavation of bench gravels, hauling mineral bearing gravels to processing plant, washing gravel in plant with water, concentration of heavy metal in sluice box, and placement of tailings back into the excavated area as part of the reclamation plan.

#### **Surface Impacts of Bench Placer Development:**

It is anticipated that the excavation area for mineral extraction would disturb approximately five acres. The finer material that washes over the sluice box is allowed to settle out in settling ponds to prevent siltation of adjacent streams. The water in the pond can be recycled through the wash plant to conserve water, and after the tailings are contoured for reclamation, the fine sediments can be spread over the gravels and reseeded. Other associated activities include the need for support facilities (0.75 acre), road construction for access and ore haul routes (approximately 0.75 acre), construction of settling ponds approximately 200' x 60' x 15' deep each (0.5 acre total), water diversion for a wash plant, and in extreme cases the streams might be diverted into alternate channels so that the stream channel can be mined following issuance of the necessary State permits. Approximately 0.5 acre would be needed for stockpiling overburden and topsoil to be used during site reclamation. Therefore, it is anticipated that the total disturbed area would involve approximately 7.5 acres for a bench placer mining operation.

**Lode Mine:** Open pit mining operations at a hydrothermal gold deposit in the planning area would involve stripping of large amounts of overburden comprised of soil and waste rock. Due to steep terrain encountered throughout the operating area, it is expected that the stockpile site for this material will be at a distance to where the overburden would have to be hauled by truck and unloaded rather than pushed aside by bulldozer. Drilling, blasting and crushing the gold ore would be conducted at the site.

**Surface Impacts of Lode Mine Development:** The mine excavation area is anticipated to involve the disturbance of about 10 acres. It is anticipated that approximately 2 acres would be needed to stockpile overburden and topsoil near the mined area. Approximately 2 acres would be needed for support facilities and a staging area, and new haul roads would be needed, involving the disturbance of about two acres. Therefore, approximately 16 acres would be impacted by this open pit lode mine development. Ore processing is anticipated to be conducted elsewhere due to the steep topography.

### **Recreational Mining**

Most recreational mining operations on BLM lands in the planning area are anticipated to use hand tools or portable suction dredges. Many of the recreational mining operations are expected to be conducted on mining claims in the Sharps Creek drainage. Some recreational mining may also occur at the Sharps

Creek Recreation Site or at other locations throughout the District where casual use-level mineral specimen collecting has occurred. In situations where either camping (in excess of 14 days) or the use of motorized equipment is proposed, a Notice will be required.

In-stream dredging is usually a one to two person operation using a floating suction dredge with a five to seven horsepower engine. The dredge pulls up gravels from the stream bottom that are then passed over a sluice box and are returned to the stream without the heavy sands and gold particles. This process does not require any chemicals. Most of the dredges have an intake nozzle opening of less than a 5 inch diameter. The average stream area disturbed in any year is less than 1,000 square feet per dredge operation, based on operations monitored in the past. Other activities associated with dredging include temporary occupancy and minor road and trail construction. It is predicted that 30 Notices will be filed for this type of mining activity.

#### **Surface Impacts of Suction Dredging Operations:**

It is anticipated that approximately 0.15 acre would be disturbed by each in-stream suction dredging operation, and for each operation a camping area approximately 0.10 acre in size would be used. Therefore, during the plan period, the 30 anticipated Notices expected to be filed pertaining to these operations would affect a total of 7.5 acres of land.

It is anticipated that hobby mineral collecting and rockhounding will take place on the BLM lands in the operating area. The surface impacts of those operations are presumed to be negligible since the mineral collectors most often use existing roads and look for surface geologic exposures. Any excavation of specimens is generally conducted with hand tools and is considered casual use. A Notice would be required for any mineral collection involving motorized equipment or explosives.

### **Reasonably Foreseeable Development of Locatable Mineral Resources (Alternatives NA, A)**

**Future Trends and Assumptions:** During 1989, a mining claim patent was issued on lands, located along the Oregon Coast to the south of the operating area, considered valuable for uncommon variety silica sand. Actual mining of such minerals has been conducted in the Coos Bay area for years. Under these alternatives, public lands on the Eugene District considered to have potential for such minerals, would be available for

exploration and development. It is anticipated that there would be interest by industry or the public in conducting these activities.

## Exploration and Development of Locatable Mineral Resources

### Exploration Phase

**Exploration:** Exploration for silica sand of an uncommon purity could occur on lands with sand dunes near the Pacific Ocean north of Florence, Oregon. Exploration activities could occur, provided that legal access to the parcels was acquired by the mining claimant or operator.

#### Surface Impacts of Uncommon Variety Silica Sand

**Exploration:** Exploration for silica sand would involve construction of approximately 3 miles of roads on dunal areas to provide access to the sample test sites by a truck mounted auger or drill. It is assumed that the width of the roads would be about 20 feet. Sampling would be conducted along the center line of the roads, so no additional site disturbance would be necessary in the construction of a drill pad. Therefore, it is anticipated that temporary road construction to conduct exploration activities would impact approximately 7 acres of land.

### Mining Phase

**Mine Development:** Silica sand operations could vary in size from three or four to twenty persons operating excavators, backhoes, dozers, draglines, magnetic separators, and trucks (or railroads) for taking the silica to the processing site. Other associated equipment could also include conveyors and support facilities. These operations could process up to 1,000 cubic yards of sand per day, operating year round.

The mining process could be generalized as follows: minimal vegetation removal, excavation of dunal sands, transportation of the sand to the magnetic separator, placement of heavy minerals at a waste stockpile site nearby, and transportation of refined silica to the processing plant. Controlling the seepage of groundwater into the mine site would also possibly be necessary.

#### Surface Impacts of Silica Sand Mine Development:

The mine excavation area is anticipated to involve the disturbance of about 20 acres. It is anticipated that approximately one acre would be needed to stockpile heavy minerals extracted from the deposit. Approximately a half acre would be

used for the disposal of any vegetation removed from within the mine development area. Approximately one acre would be used for the office site and magnetic separation facility. Therefore, approximately 22.5 acres would be impacted by the silica mine development.

Due to the proximity of the groundwater table to the surface, it might be possible that site reclamation could generate a lake or large pond and be revegetated to benefit wildlife in the area.

## Salable Minerals Reasonably Foreseeable Development of Salable Mineral Resources (Alternatives NA, A, B, C, and Preferred Alternative)

**Future Trends and Assumptions:** In the past, the primary demand for salable minerals has been directly related to road construction activities in the area. Under these alternatives, it is anticipated that the public, and government agencies (including BLM) would continue to use salable minerals from quarry sites located throughout the operating area. Where possible, existing sources would be used; however, new site development is not precluded under these alternatives. It is predicted that the quarry site located closest to the project area would be used in order to minimize haul costs.

## Exploration and Development of Salable Mineral Resources

**Exploration:** It is anticipated that under these alternatives, two new prospective rock quarry sites would be evaluated to determine the feasibility of new development. A reconnaissance of the surface geology and sampling of rock outcroppings would occur during the preliminary site investigation. Depending on site conditions, subsurface sampling may be necessary and could be conducted with drilling equipment. In some cases, portable drills could be used, which would eliminate the need for equipment access roads, but most of the time vehicle access roads would be necessary to adequately evaluate the salable mineral prospect.

Subsurface exploration may also be conducted before enlarging an existing quarry site. In some cases, there may be indications of complex geologic structures that could warrant further investigation prior to a planned development at the site. It is anticipated that there would be four subsurface investigations pertaining to quarry site expansions during the plan period.

#### **Surface Impacts of Salable Mineral Exploration:**

It is anticipated that the preliminary site investigations, consisting of mapping the surface geology and collecting rock samples for quality testing, would cause negligible surface disturbance. Rock samples would be collected by hand and taken to a testing laboratory.

During a more detailed subsurface investigation, it is anticipated that at each quarry site prospect, a series of dozer trails would be constructed to provide equipment access to each drill site. In some cases, the equipment might cross an area without completely removing all vegetation along its path. The equipment trails would be approximately 1,000 feet long and 20 feet wide for each site. Therefore, approximately 0.5 acre would be used for vehicle access at each prospective site and exploratory drilling would be conducted along these trails. The total surface disturbance from exploration of the two prospective quarry sites under these alternatives is anticipated to be approximately one acre.

Subsurface investigations for quarry site expansions would probably also consist primarily of access trail construction. At each of the four sites, trails totalling 1,500 feet long by 20 feet wide would be constructed in order to drill the necessary holes for sampling and evaluation. The surface disturbance at the four sites to be expanded would total about 3 acres.

**Quarry Site Use:** It is anticipated that some of the 75 existing rock quarry sites in the operating area would be used to produce crushed or "pit run" aggregate. Most of the time, salable minerals probably would be removed from within the current development areas at these quarries, and those excavations could be based on a site specific long range mining and reclamation plan. Some quarries may not be used at all during the plan period.

Probably about eight of the existing quarries would be enlarged to facilitate the excavation of additional reserves of salable minerals. Exploratory drilling would be conducted prior to development at four of these sites, as described in the previous section. To expand a quarry, topsoil and overburden from the new development area would be removed and stockpiled nearby for eventual use in site reclamation. Most likely, equipment access roads would also be developed into the new development area. Vegetation from the excavation area would be disposed of, as directed by the Authorized Officer.

One quarry site would probably become depleted of all good quality salable minerals during the plan period. Reclamation of this site would be conducted to return the acreage to a beneficial use.

**Surface Impacts of Quarry Site Use:** It is projected that the two prospective sites (described in the exploration section) would be developed. Each of these sites is expected to involve about 2 acres of land. This acreage would be developed for use as a rock crushing plant site, truck turnaround, access trails for bulldozers and drills, overburden and topsoil stockpile sites, and aggregate stockpile areas. To access each new quarry development, approximately 0.5 acre of land would be disturbed by new road construction. Therefore, it is anticipated that approximately 5 acres would be impacted by new quarry site development.

The surface impacts of rock excavation at existing quarry sites consists of altering the topography within the planned development limits. Site expansions at some quarries would most likely be less than 2 acres per site; therefore, it is anticipated that about 16 acres would be affected by this activity.

Reclamation of a depleted quarry could involve backfilling portions of the excavation area with soil and overburden stockpiled nearby for that purpose. Material excavated from nearby construction projects could also be used as fill. Once the area was backfilled and shaped to an acceptable contour, topsoil could be spread over the site. The area could then be revegetated with seed and/or trees and shrubs. Approximately 2 acres of land would be impacted by the reclamation work.

### **Salable Minerals Reasonably Foreseeable Development of Salable Mineral Resources (Alternatives D and E)**

**Future Trends and Assumptions:** Under these alternatives, there would be a reduction in new road construction within the operating area. It is anticipated that the public, and government agencies (including BLM) would use salable minerals from existing quarry sites located throughout the District. It is forecasted that no new quarry sites or quarry site expansions would occur under these alternatives due to the decreased demand for rock aggregate. Therefore, it is predicted that the supply of salable minerals at existing quarry sites would be sufficient to meet the demand.

## Development of Salable Mineral Resources

**Quarry Site Use:** It is anticipated that some of the 75 existing rock quarry sites in the operating area would be used to produce crushed or "pit run" aggregate. It is anticipated that salable minerals could be removed from within the current development areas at these quarries and excavations could be based on a site specific long range mining and reclamation plan. Some of the sites may not be used during the plan period, if the demand is low for salable minerals in the vicinity of those quarries.

**Surface Impacts of Quarry Site Use:** The surface impacts of rock excavation at existing quarry sites would consist of altering the topography within the planned development limits. Topsoil and overburden would be stockpiled near the sites for use in site reclamation.





# Appendix 4-L

## Sensitivity Analysis

Sensitivity analysis is a process of identifying specific trade-offs and opportunity costs associated with differing approaches to land-use allocations and other decision elements. It examines possible changes in single elements of an alternative. Such analyses can help design a Preferred Alternative that best reconciles potential conflicts and optimizes overall benefits.

Because of the number of land-use allocation issues and plan alternatives, BLM found it essential to limit and tightly focus the sensitivity analyses on the most sensitive or controversial issues and primarily on the mid-range alternatives. A number of sensitivity analyses considered early in the formulation of planning criteria were not conducted as the evolution of planning issues and alternatives diminished their relevance.

Some sensitivity analysis conclusions were reached by complex calculations using the detailed analytical tools available for analysis of effects of the full alternatives. Many other conclusions, however, were extrapolated and interpolated from analysis of impacts of the full alternatives. This approach, rather than direct calculation, was always taken where calculation of the impacts of the full alternatives was based on a ten-year timber management scenario developed for each alternative. The effort involved in developing and analyzing such a scenario for each sensitivity analysis was considered unwarranted, due to the time and cost involved.

The following sensitivity analyses were conducted:

- For Alternatives B, C and D, the changes in socioeconomic effects and the effects on anadromous fish populations of differing levels of riparian zone protection, including legally required protection (the Alternative A standard).
- For the Preferred Alternative, the effects of substituting the Alternative A and E levels, and the level of protection suggested in October, 1991 by the Scientific Panel on Late-Successional Forest Ecosystems in their watershed/fish emphasis option.

The estimated changes in Allowable Sale Quantity (ASQ) were based on calculations of changes in riparian acreages excluded from planned timber harvest. Employment effects are linked to ASQ only since no anadromous fish population changes are expected in the short-term.

- For Alternative A, the changes in socioeconomic effects and the effects on biological diversity and spotted owl habitat, if the timber management areas (Old Growth Emphasis Areas, etc.) and timber management prescriptions of the Preferred Alternative were incorporated.
- For Alternatives B, C, D and the Preferred, the changes in socioeconomic effects and the effects on biological diversity and spotted owl habitat of differing approaches to old growth and mature forest protection. These options include:
  - Managing the lands allocated for timber production in Alternative B on a 150-year rotation.
  - Managing all lands allocated for timber production in Alternatives B and C entirely under either of Alternative C's partial retention approaches.
  - Managing the lands allocated for timber production entirely for 15 to 20 percent partial retention, but in the first decades not harvesting in the oldest 20 percent of them.
  - Substituting the USF&WS proposed spotted owl recovery plan for the older forest or spotted owl protection approach in Alternatives B and D.
  - Substituting the 50-11-40 rule for provision of connectivity by special management in connectivity areas in the Preferred Alternative.
  - Allocating the restoration and retention blocks of Alternative C to 35+ percent partial retention management.
  - Accelerating density management in the restoration and retention blocks of Alternative C in the first decade to the extent practical.
  - A minimum harvest age constraint of 60 years in Alternative D.
  - Precluding all timber harvest in Old Growth Emphasis Areas (OGEAs) of the Preferred Alternative.
  - No regeneration harvest of stands younger than Cumulation of Mean Annual Increment (CMAI) in the Preferred Alternative.

- No constraint on minimum age of stands subject to regeneration harvest in timber management emphasis areas of the Preferred Alternative (letting the harvest model select the age that maximizes sustainable ASQ in the decade of the plan).
- Foregoing planting genetically selected stock, vegetation management for release and precommercial thinning, fertilization, and stand conversion in the Preferred Alternative. To be analyzed for each practice individually and for all combined.

The conclusions of all these analyses are displayed in Table 4-SAN-1.

In addition, some sensitivity analyses of previously prevalent timber management prescriptions were done for Alternative A, as part of the Analysis of the Management Situation. The analytical conclusions are displayed in Table 4-SAN-2. Two analyses assess the effects of changing minimum harvest age to the age of Culmination of Mean Annual Increment or to the age when trees reach specific minimum diameters (12 inch, 16 inch, and 24 inch). The last analysis assesses the effect of eliminating genetic selection, precommercial thinning, fertilization, hardwood conversion, and commercial thinning.

Also for the Analysis of the Management Situation, economic efficiency analyses were done for the following intensive management practices: precommercial thinning, commercial thinning, fertilization, and brush and hardwood conversion. These efficiency analyses were based on forestry practices of the 1980s and are less applicable to Alternative C and the Preferred Alternative, particularly since a primary emphasis of many practices in those alternatives is attainment of biological diversity objectives, which are not readily valued in economic terms. The measure of economic efficiency is change in Net Present Value (NPV). NPV is the sum of values of revenues less costs during the life of the stand, all values being discounted to the time of harvest of the previous stand. If the change in NPV from adding an intensive management practice is positive, it is considered economically efficient; that is, it adds more value than it costs.

All analysis, including discount rates, was based on values net of inflation. This is called using real prices instead of nominal prices. The basis of expected timber stumpage prices is the average BLM timber sale price for the 1984-1988 period. For the primary analyses, future real wood price increases were estimated at 1.2 percent annually, based on the U.S. Forest Service's 1989 Resources Planning Act assessment. A discount rate of four percent was used because it was consid-

ered to best represent the long-term outlook. Analyses of precommercial thinning, commercial thinning and fertilization for each site index were made of both understocked and well-stocked stands, assuming final harvest ages of 50, 60, 70 and 80 years. In general, fertilization or a combination of fertilization and commercial thinning results in a positive NPV for stands harvested at age 60.

For comparison and sensitivity testing, identical analyses were made using the following alternative assumptions: (1) zero real wood price increase and four percent discount rate, (2) 1.2 percent real wood price increase and seven percent discount rate, and (3) zero real wood price increase and seven percent discount rate. Under the first assumption, commercial thinning results in a positive NPV in all tests and fertilization results in a positive NPV in about one-half of the analyses. Precommercial thinning analyses indicate a negative NPV in most analyses. Under the second assumption, commercial thinning again results in a positive NPV for all analyses and fertilization and precommercial thinning indicate a negative NPV for all analyses. Under the third assumption, the results were similar to those for the second assumption.

Analysis of hardwood, brush or grass site conversion to conifers focused on estimating the maximum amount that could be spent on the practice while achieving a positive NPV. Generalized conclusions about economic efficiency of this practice were not reached, as the cost of conversion varies widely from site to site. Among the relevant factors in site-specific analysis would be the stumpage value of any trees on a site. At 1.2 percent real wood price increase, with a four percent discount rate, up to \$1,406 per acre could be spent if harvest at age 60 were expected. The maximum amount economically feasible for any site declines as harvest age lengthens. Under other economic assumptions tested, it is also lower.

Complete documentation of the Economic Efficiency Analysis is available in the District Analysis of the Management Situation.

Table 4-SAN-1 - Sensitivity Analysis of Land-Use Allocations

Allocation or Decision Element	Base Alternative	Changed Allocation	Base Alternative (Decadal ASQ MMACF)	Estimated Changes (Comparison to Base Alternative)				Anadromous Fish Populations (200 Years)	Spotted Owl Habitat (100 Years)	Biological Diversity (10 Years)		
				ASQ Change (Decadal MMACF)	Local Employment (Jobs) (short-term)	County Revenue (\$1,000) (short-term)	Change as Percent of Base			Structural Diversity	Old Growth (acres)	
Riparian Zone Protection	B	At. A	498	3.1	212	\$2,011	101%	+	-	+	+	
		At. C		-7.4	(510)	(\$4,838)	99%	No Change	+	-	+	
		At. A	148	3.7	283	\$2,799	103%	+	-	+	+	
	C	At. B		2.6	185	\$1,959	102%	No Change	-	-	-	
		At. D		-9.6	(678)	(\$7,165)	94%	No Change	+	-	-	
		At. A	172	20.6	1,466	\$15,365	112%	+	-	-	-	
	D	At. C		14.8	1,054	\$11,060	109%	No Change	-	-	-	
		At. E		-9.8	(697)	(\$7,319)	94%	No Change	0	-	-	
		At. A	199	14.1	1,032	\$10,547	107%	+	-	-	-	
Preferred	At. E		-6.7	(477)	(\$4,923)	97%	No Change	+	+	+		
	Old Growth and Mature Forest Protection	B	No Protection	498	40.0	2,763	\$26,222	106%	N/A	0	-	-
			150 Retention on Managed Lands		-207.0		(14,281)	56%	N/A	+	+	+
15-20% Partial Retention on Managed Lands				-87.1	(6,009)	(\$57,032)	63%	N/A	+	+	0	
C		35% Partial Retention on Managed Lands		-211.5	(14,592)	(\$138,507)	56%	N/A	+	+	+	
		Proposed Spotted Owl Recovery Plan		-271.6	(16,740)	(\$177,882)	45%	N/A	+	+	+	
		At. A	148	5.0	355	\$3,750	103%	N/A	-	-	0	
D		All 15-20% Partial Ret.		-60.1	(4,266)	(\$45,068)	59%	N/A	+	+	+	
		All 35+% Partial Retention		-25.6	(1,820)	(\$19,232)	83%	N/A	+	-	+	
		All 15-20% Part. Ret., But No Harvest of Old-growth		30.4	2,156	\$22,603	121%	N/A	-	-	-	
D	35+% Partial Retention in R&R Blocks		0.0	0	\$0	100%	N/A	-	+	0		
	Accelerate Density Management in R&R Blocks		-15.6	(1,105)	(\$11,597)	91%	N/A	0	+	+		
	Proposed Spotted Owl Recovery Plan 60 Yr. Min. Harvest Age		-69.8	(4,956)	(\$52,018)	59%	N/A	+	+	0		

Table 4-SAN-1 - Sensitivity Analysis of Land-Use Allocations (cont.)

Allocation or Decision Element	Base Alternative	Changed Allocation	Base Alternative (Decadal ASO MMCF)	Estimated Changes (Comparison to Base Alternative)				Anadromous Fish Populations (200 Years)	Spotted Owl Habitat (100 Years)	Biological Diversity (10 Years)	
				ASO Change (Decadal MMCF)	Local Employment (Jobs) (short-term)	County Revenue (\$1,000) (short-term)	Change as Percent of Base			Structural Diversity	Old Growth (acres)
Preferred	50-11-40 Rule	199	0.0	0	\$0	100%	N/A	0	0	0	
	No Harvest OGEAs		-53.0	(3,783)	(\$38,855)	73%	N/A	+	0	+	
	No Harvest Below CMAI		-64.5	(4,580)	(\$47,285)	68%	N/A	+	0	+	
	No Minimum Harvest Age in GFMA		21.1	1,498	\$15,469	111%	N/A	-	0	0	
	Watershed/Fish Emphasis		-22.4	(1,591)	(\$16,428)	89%	+	+	+	+	
	No Genetics		-6.3	(445)	(\$4,599)	97%	N/A	+	0	0	
	No Release and PC Thinning		3.1	223	\$2,300	102%	N/A	0	0	0	
	No Fertilization		-22.9	(1,629)	(\$16,821)	88%	N/A	0	0	0	
	No Stand Conversion		-1.4	(99)	(\$1,028)	99%	N/A	0	0	0	
	No Intensive Management Practices		-27.5	(1,952)	(\$20,160)	86%	N/A	-	+	+	

<sup>1</sup> Increased riparian zone protection also contributes to biological diversity; and the reverse is true.

<sup>2</sup> Substituting Alternative A level of riparian protection for that of Alternatives B, C or D would result in maintenance of current anadromous fish populations (to the extent that BLM actions influence that) rather than the long-term increases predicted under Alternatives B, C and D.

<sup>3</sup> Would provide better roosting and foraging habitat than baseline alternative, but no more nesting habitat.

+ = increasing

0 = maintaining

- = decreasing

Table 4-SAN-2 - Sensitivity Analysis of Timber Management Prescriptions, Alternative A.

Sensitivity Analysis	ASQ (MMCF)	First Decade (MMBF)	Long-Term Sustained Yield (MMCF)
1. Highest ASQ	538	3,424	586
2. CMAI <sup>1</sup>	353	2,249	N/A
3. 12" Min. Diameter	534	3,403	N/A
16" Min. Diameter	453	2,890	N/A
20" Min. Diameter	233	1,482	N/A
24" Min. Diameter	97	605	N/A
4. Base Program	307	1,977	N/A

<sup>1</sup> Culmination of Mean Annual Increment (CMAI)



# Appendix 4-M

## Consistency Tables

**Table 4-CA-1 - Consistency of the Proposed Action and Alternatives with State of Oregon Wildlife Plans**

State Plan/Statute	Objective	Consistency of Alternatives
Oregon Statutory Wildlife Policy, Revised Statute 496.012	<p>Maintain all species of wildlife at optimum levels and prevent the serious depletion of any indigenous species.</p> <p>Develop and manage the lands and waters of the State in a manner that will enhance the production and public enjoyment of wildlife.</p> <p>Develop and maintain public access to the lands and waters of the State and the wildlife resources thereon.</p> <p>Regulate wildlife populations and public enjoyment of wildlife in a manner that is compatible with primary uses of the lands and waters of the State and provide optimum public recreational benefits.</p>	<p>Alternatives NA, A and B could lead to substantial depletion of those populations of species heavily dependent on older forest habitat, that occupy BLM administered lands in the planning area. (See following discussions of threatened and endangered species and sensitive species). Several alternatives may maintain other populations at less than optimum (see later discussion of big game management objectives).</p> <p>Public access would be greatest in Alternatives NA, A and B and more limited by access management in Alternatives C, D, E and the Preferred.</p>
Oregon Threatened and Endangered Species Act	Protect and conserve wildlife species that are determined to be threatened or endangered.	All State listed species found within the Eugene District are also Federally listed under the Endangered Species Act. As such, these species will be protected under the requirements and provisions of the Act.
Oregon's Sensitive Species Rule	Help prevent species from qualifying for listing as threatened or endangered.	Most species on Oregon's sensitive species list would be protected well under Alternatives E and the Preferred Alternative but many would not be well protected under Alternatives NA, A, B, C and D. Also see later discussions of wild fish policy and fish plans.

**Table 4-CA-1 - Consistency of the Proposed Action and Alternatives with State of Oregon Wildlife Plans (cont.)**

State Plan/Statute	Objective	Consistency of Alternatives
Nongame Wildlife Plan	Maintain populations of naturally occurring Oregon nongame wildlife at self-sustaining levels within natural geographic ranges in a manner that provides for optimum recreational, scientific and cultural benefits and, where possible, is consistent with primary uses of lands and waters of the State.	See preceding discussions.
Big Game Population Management Objectives	Develop, restore and/or maintain big game (along with associated recreational, aesthetic and commercial opportunities and benefits) at the level identified in 1980 as the planning target level by game management unit. This is accomplished through hunting season regulation and management practices on public lands that tend to stabilize the cover-forage relationship in space and time, provide for a wildlife emphasis in management of sensitive wintering areas, and offer habitat improvement opportunities.	Under Alternatives NA, A and B cover on BLM administered lands would decline, while under Alternative C and the Preferred Alternative forage on BLM administered lands would decline. In the latter case, however, private lands are expected to provide adequate forage. Access management in Alternatives C, D, E and the Preferred would improve habitat for elk.
Wild Fish Policy	Protect and enhance wild stocks.	No alternative would change habitat conditions enough in the short-term to alter existing stocks. In the long-term, all alternatives would protect streams sufficiently to protect wild stocks and all but Alternative A would provide sufficient stream habitat protection to contribute to their enhancement.
Coho, Steelhead and Trout Plans	Maintain and enhance production.	Similar to wild stocks. See preceding.
Basin Fish Management Plans	Establish compatible objectives for management of all fish stocks in each Basin.	Similar to wild stocks. See preceding.
Oregon Forest Practices Act Rules	Establish minimum standards which encourage and enhance the growing and harvesting of trees while considering and protecting other environmental resources such as air, water, soil and wildlife.	See Table 4-CA-2, Item 2 in this Appendix.



**Table 4-CA-2 - Consistency of the Plan Alternatives with the Forestry Program for Oregon (FPFO)**

FPFO Objective	Consistency of Alternatives
<p>1. <b>Forest Land Use.</b> Preserve the forest land base of Oregon: Stabilize the present commercial forest land base. Manage habitat based on sound research data and the recognition that forests are dynamic and most forest uses are compatible over time.</p>	<p>All alternatives preserve most of the forestland administered by BLM, while allowing for some conversion of forest to accommodate expansion of transportation, power and communication facilities. All alternatives also allow for exchange and/or sale of some forestlands, which could lead to their conversion to nonforest uses if local land-use plans permit. Land that would be managed for commercial forest products ranges from a high of 274,000 acres under Alternative A to a low of 138,000 acres under Alternative E. Only Alternatives NA and A maintain at least the 265,000 acres currently allocated to commercial forest production. Alternatives C, D, E and the Preferred allocate substantial acreage to management of habitats to the exclusion of timber production. The allocation of such land in Alternative D is most explicitly based on current research data.</p>
<p>2. <b>Forest Practices.</b> Assure practical forest practices that conserve and protect soil productivity and air and water quality: Promote forest practices that maintain Oregon's forest values, including forest tree species, fish and wildlife, soil productivity, and air and water quality. The Forest Practices Act and rules are one vehicle for accomplishing this.</p>	<p>All alternatives provide for the use of practical forest practices that meet this goal and, with some exceptions, meet or exceed the requirements of the Oregon Forest Practices Act and rules and the Oregon Smoke Management Plan. Specific exceptions are: inconsistency of Alternative A with the snag/wildlife tree retention requirement and the scenic highway visual protection requirement of revised Section 5 of the Act; inconsistency of Alternatives NA, A, B and C with the rule requiring maintenance of 70 acres of suitable habitat encompassing each spotted owl nest site, and inconsistency of all alternatives except Alternatives D, E and the Preferred with the 1991 interim rule regarding protection of intermittent streams that have a direct confluence with a Class I stream. Since the 1991 interim rules are scheduled to be superseded by new rules by September 1, 1992, the Preferred Alternative for the proposed RMP/final EIS can be conformed to those new rules. The Preferred Alternative is believed to be consistent with the objectives of the Forest Practices Act.</p>

**Table 4-CA-2 - Consistency of the Plan Alternatives with the Forestry Program for Oregon (FPFO) (cont.)**

FPFO Objective	Consistency of Alternatives
<p>3. <b>Timber Growth and Harvest.</b> Promote the maximum level of sustainable timber growth and harvest on all forestlands available for timber production, consistent with applicable laws and regulations and taking into consideration landowner objectives.</p>	<p>Each alternative provides for the use of intensive forest management practices that are professionally and environmentally sound, to promote timber growth and harvest on all forestlands allocated as available for such intensive management, consistent with the alternatives' goals and objectives. Each alternative considers the application of such practices, even where they may be uneconomic, for the potential purpose of promoting timber growth and harvest.</p>
<p>4. <b>Recreation, Fish and Wildlife, Grazing and Other Forest Uses.</b> Encourage appropriate opportunities for other forest uses, such as fish and wildlife habitat, grazing, recreation and scenic values on all forestlands, consistent with landowner objectives: A full range of recreation opportunities is encouraged. Where needed to reduce harassment and/or overharvest of wildlife, road closure programs are supported.</p>	<p>Each alternative provides opportunities for other forest uses, consistent with the alternatives' goals and objectives. Although all alternatives provide a full range of recreational opportunities, the emphasis of the alternatives varies. Alternative A limits the number of developed recreation sites maintained. Alternatives D and E emphasize nonmotorized recreation opportunities. Access management to protect wildlife habitat and other values are emphasized in Alternatives C, D and E.</p>
<p>5. <b>Forest Protection.</b> Devise and use environmentally sound and economically efficient strategies to protect Oregon's forests from wildfire, insects, disease and other damaging agents: Use integrated pest management. Minimize total cost plus loss resulting from wildfire. Employ cost-effective fire management policies that emphasize planned ignition fires over natural ignition fires and that consider impacts to the State's forest fire protection program.</p>	<p>Under all alternatives, economically efficient protection strategies would be employed, and integrated pest management would be used. Minimizing total cost plus loss from wildfire would be integral. Planned-ignition prescribed fires would be emphasized over natural-ignition prescribed fires, but the latter could be used to achieve resource and fire management objectives. Cooperation with other fire suppression agencies, including State and local agencies, would help assure cost-effective fire protection and suppression by all parties.</p> <p>Alternatives D and E would provide less efficient protection from wildfire than the other alternatives, however, as their lower intensity of timber management in Rural Interface Areas (RIAs) would increase both the risk of wildfire and the cost of suppression.</p>

Table 4-CA-3 - Relationship of Alternatives to Statewide Planning Goals

Statewide Goal Number and Description	Consistency of Alternatives
<p>1. <b>Citizen Involvement</b> - To develop a citizen involvement program that ensures the opportunity for citizens to be involved in all phases of the planning process. Federal and other agencies shall coordinate their planning efforts with the affected government bodies and make use of existing local citizen involvement programs established by cities and counties.</p>	<p>BLM's land use planning process provides for public input at various stages. Public input was specifically requested in developing issues, planning criteria, and the Preferred Alternative. Public input will continue to be utilized in development of the final RMP. Coordination with affected government bodies, including the Governor's forest planning team, has also been ongoing and will continue. BLM has used County planning departments to provide linkage to local citizen involvement programs.</p>
<p>2. <b>Land Use Planning</b> - To establish a land use process and policy framework as a basis for all decisions related to use of land and to assure an adequate factual base for such decisions and actions.</p>	<p>The Preferred Alternative and other alternatives have been developed in accordance with the land use planning process authorized by the Federal Land Policy and Management Act of 1976, which provides a policy framework for all decisions and actions. The process includes issue identification, inventories and evaluation of alternative choices of action. Intergovernmental coordination in the planning process is discussed in Chapter 5 of the RMP/EIS.</p>
<p>3. <b>Agricultural Lands</b> - To preserve and maintain existing commercial agricultural lands for farm use, consistent with existing and future needs for agricultural products, forest and open space.</p>	<p>None of the alternatives exclude BLM administered grazing land from grazing use or affect the use of other lands for agriculture use.</p>
<p>4. <b>Forest Lands</b> - To conserve forestlands for forest uses. Growing and harvesting of forest tree species is the leading use on forestland consistent with the sound management of soil, air, water, and fish and wildlife resources and provision for recreational opportunities and agriculture.</p>	<p>BLM administered lands in the planning area are predominately forestland and woodlands. None of the alternatives would lead to substantial conversion of those lands to nonforest uses. Conversion areas such as new forest roads and utility rights-of-way would be limited to the minimum width necessary for management and safety, and the latter limited to existing corridors where practical. All alternatives are consistent with the State's forestland protection policies.</p>
<p>5. <b>Open Spaces, Scenic and Historic Areas, and Natural Resources</b> - To conserve open space and protect natural and scenic resources.</p>	<p>Natural, historic and visual resources were considered in the development of the alternatives. Availability of mineral, aggregate and energy sources</p>

Table 4-CA-3 - Relationship of Alternatives to Statewide Planning Goals (cont.)

Statewide Goal Number and Description	Consistency of Alternatives
<p>Programs shall be provided that will (1) insure open space, (2) protect scenic and historic areas and natural resources for future generations, and (3) promote healthy and visually attractive environments in harmony with the natural landscape character. The location, quality and quantity of the following resources shall be inventoried:</p>	<p>would be greatest under Alternatives A, B and NA. Timber management under the alternatives would impact natural and visual resources.</p>
<ul style="list-style-type: none"> <li>a. Land needed or desirable for open space;</li> <li>b. Mineral and aggregate resources;</li> <li>c. Energy sources;</li> <li>d. Fish and wildlife areas and habitats;</li> <li>e. Ecologically and scientifically significant natural areas, including desert areas;</li> <li>f. Outstanding scenic views and sites;</li> <li>g. Water areas, wetlands, watersheds and groundwater resources;</li> <li>h. Wilderness areas;</li> <li>i. Historic areas, sites, structures and objects;</li> <li>j. Cultural areas;</li> <li>k. Potential and approved Oregon recreation trails;</li> <li>l. Potential and approved Federal wild and scenic waterways and state scenic waterways.</li> </ul>	<p>Adverse impacts to visual resources, wildlife habitat, potential wild and scenic rivers and State waterways, and unique natural areas are greatest under Alternatives A, B and NA, and least under Alternative E. Water areas wetlands and watersheds would be protected under Alternatives D and E. See Chapter 4 for discussions. Also see Table 4-CA-2 for discussion of consistency with relevant sections of the Forest Practices Act and Rules The Preferred Alternative attempts to balance conflicting uses in light of their consequences.</p>
<p>Where no conflicting uses for such resources have been identified, such resources shall be managed so as to preserve their original character. Where conflicting uses have been identified, the economic, social, environmental and energy consequences of the conflicting uses shall be determined and programs developed to achieve the goal.</p>	<p>Under Alternatives A, B and NA conflicting resource uses are generally resolved by allowing the (non-Goal 5) uses fully with minimal limitations in order to meet economic and certain social needs, except where clearly prohibited by Federal or State law, in which case the non-Goal 5 use is limited only to the extent necessary. Under Alternatives D and E, conflicting resource uses are almost always resolved by protecting the (Goal 5) resource site or severely limiting conflicting uses to meet environmental and other social goals. Partial protection of (Goal 5) resources is most obvious in Alternative C and the Preferred Alternative.</p>
<p>Based on the analyses of economic, social, environmental and energy consequences to Goal 5 resources listed above, conflicting uses of (BLM managed) lands and resources may be resolved by selection of three management options: (1) protect the resource site, (2) allow conflicting</p>	<p>Even without any tradeoffs to enhance or maintain the existing commercial forest program, tradeoffs are necessary between Goal 5 resource values.</p>
	<p>For example, mineral and aggregate resource or energy source access and development frequently conflict with all other Goal 5 values, and strict guidelines for the management of designated or potential wilderness or Federal wild rivers may virtually</p>

Table 4-CA-3 - Relationship of Alternatives to Statewide Planning Goals (cont.)

Statewide Goal Number and Description	Consistency of Alternatives
<p>uses fully, or (3) limit conflicting uses. This is achieved by designating with certainty what uses and activities are allowed fully, what uses and activities are not allowed at all, and which uses are allowed conditionally, and what specific standards or limitations are placed on the permitted and conditional uses and activities for each resource site.</p>	<p>preclude development or active management to benefit other Goal 5 resource values.</p>
<p>6. <b>Air, Water and Land Resources Quality</b> - To maintain and improve the quality of the air, water and land resources of the State.</p>	<p>The Federal and State water quality standards would be met and water quality would be maintained and/or improved under all alternatives. See Chapter 4, Effects on Water Resources, for discussion. Burning of logging slash under all alternatives would have a slight temporary effect on air quality at upper atmospheric levels. All alternatives would comply with the Statewide Smoke Management Plan and the State Implementation Plan. See Chapter 4, Effects on Air Quality, for discussion. Also see Table 4-CA-2 for discussion of consistency with relevant sections of the Forest Practices Act and rules.</p>
<p>7. <b>Areas Subject to Natural Disasters and Hazards</b> - To protect life and property from natural disasters and hazards.</p>	<p>Natural hazard areas, particularly floodplains and areas with highly erosive soils have been identified. All alternatives provide for appropriate management of natural hazard areas. Bureau authorized developments within natural hazard areas would be minimal under all alternatives, with project construction engineering reflecting site-specific conditions and requirements.</p>
<p>8. <b>Recreational Needs</b> - To satisfy the recreational needs of the citizens of the State and visitors and, where appropriate to provide for the siting of necessary recreational facilities including destination resorts. Federal agency recreation plans shall be coordinated with local and regional recreational needs and plans.</p>	<p>The BLM actively coordinates its recreation and land use planning efforts with those of other agencies to establish integrated management objectives on a regional basis. Under all alternatives opportunities would be provided to meet recreation demand (identified in Oregon's SCORP) Projected demand for activities on BLM administered land would be met with the following exceptions: Alternatives D and E would not meet demand for off-road vehicle use; Alternatives NA, A and B would not meet demand for nonmotorized travel; and Alternatives A and B would not meet demand for camping, picnicking, studying nature, viewing wildlife, boating, swimming and other water play. See Chapter 4,</p>

Table 4-CA-3 - Relationship of Alternatives to Statewide Planning Goals (cont.)

Statewide Goal Number and Description	Consistency of Alternatives
9. <b>Economy of the State</b> - To diversify and improve the economy of the State.	Effects on Recreation, for further discussion. There has been no specific interest in development of destination resort sites on BLM administered lands.  Alternatives A, NA, and B would contribute to economic stability by supporting BLM resource dependent employment and payments to counties at levels near or above those of recent years. Alternatives C, D, E and the Preferred Alternative would support lower levels of such employment and payments to counties due to diminished timber production. Employment in rural areas would be most affected. See Chapter 4, Effects on Socioeconomic Conditions, for further discussion.
11. <b>Public Facilities and Services</b> - To plan, and develop a timely, orderly and efficient arrangement of public facilities and services to serve as a framework for urban and rural development.	Under all alternatives, BLM administered lands may be made available for development of public facilities or services by other parties, if the action would be permitted under the local government comprehensive plan and land use regulations, and relevant State siting requirements. Under Alternatives A and B, however, commercial timberland might not be made available for such uses.
12. <b>Transportation</b> - To provide and encourage a safe, convenient and economical transportation system.	All alternatives provide for accommodation of identified transportation needs, particularly for transportation of timber, but siting a major new transportation route (e.g., State highway) would require a plan amendment. Major utility corridors, were considered and would be designated under all alternatives. The alternatives support State policy objectives to restrict use of BLM roads for access to nonresource development that would be inconsistent with state planning goals.
13. <b>Energy Conservation</b> - To conserve energy.	Conservation and efficient use of energy sources are objectives in all BLM activities. Although all but Alternatives NA and A propose inclusion of some additional rivers in the National Wild and Scenic River System, which would restrict the possibility of development of their hydroelectric potential, there are no pending development proposals and those rivers are considered to have low potential for such use. Firewood sales would be permitted under all alternatives, but under Alternatives C, D, E and the Preferred

Table 4-CA-3 - Relationship of Alternatives to Statewide Planning Goals (cont.)

Statewide Goal Number and Description	Consistency of Alternatives
16. <b>Estuarine Resources</b> - To recognize and protect the unique environmental, economic and social values of each estuary and associated wetlands; and to protect, maintain, where appropriate develop, and, where appropriate restore the long-term environmental, economic and social values, diversity and benefits of Oregon's estuaries.	firewood availability would be limited by allocation of substantial acreage to limited or no timber harvest.  No measurable impacts on estuarine resources from BLM authorized activities are anticipated, under any alternative.
17. <b>Willamette Greenway</b> - To protect, conserve enhance and maintain the natural, scenic, historical, agricultural, economic and recreational qualities of lands along the Willamette River as the Willamette Greenway.	All alternatives would protect BLM administered land in the Greenway.
18. <b>Coastal Shorelands</b> - To conserve, protect, where appropriate, develop and where appropriate restore the resources and benefits of all coastal shorelands, recognizing their value for protection and maintenance of water quality, fish and wildlife habitat, water-dependent uses, economic resources and recreation aesthetics. The management of these shoreland areas shall be compatible with the characteristics of the adjacent coastal waters; reduce the hazard to human life and property, and the adverse effects upon water quality and fish and wildlife habitat, resulting from the use and enjoyment of Oregon's coastal shorelands.	All alternatives would preserve and protect BLM administered and other coastal shorelands delineated in acknowledged city and County comprehensive plans and land use regulations. Alternatives C, D, E and the Preferred would close some coastal lands to vehicle use for protection of wildlife habitat and other values.
19. <b>Beaches and Dunes</b> - To conserve, protect, where appropriate develop, and where appropriate restore the resources and benefits of coastal beach and dune areas; and To reduce the hazard to human life and property from natural or man-induced actions associated with these areas.	All alternatives would comply with this goal.

Footnote: Statewide Goals, 10; Housing, 14; Urbanization, 15; and Ocean Resources, 20 are not applicable.





## Appendix 4-N. Timber Supply Analysis For BLM Planning

The purpose of this analysis is to report regional stumpage price<sup>1</sup>, timber harvest on all ownerships, and log consumption within geographically defined subregions (figure 1) resulting from implementing each of the five common resource management plan alternatives, as well as the preferred alternatives, on all U. S. Department of the Interior Bureau of Land Management (BLM) Districts in western Oregon. The analysis covers a period of initial plan implementation (1993-2000)<sup>2</sup> and the period thereafter (2001-2010). The baseline period that provides a historical benchmark for comparison was 1984-1988.

The purposes of this appendix are to: summarize key concepts used to conduct the analysis, provide a description of the procedures used, and briefly compare the analysis results to the baseline period and an earlier outlook of western Oregon timber supply (Sessions 1990). Results appear in chapter 4 of the RMP/EIS describing the effects of alternatives. Specifically, the regional stumpage price results were used to calculate an index of BLM stumpage price changes (relative to the 1984-1988 baseline price). These price changes were then used in the assessment of personal income and employment effects. Harvest and log consumption results are presented in the timber supply tables of chapter 4.

### Key Concepts

Implemented on all Districts, each set of similar resource management plan alternatives represented a different timber supply policy, or alternative theme, for BLM administered lands in western Oregon. The question being addressed by this analysis is how do changes in BLM timber supply policy affect how much timber is harvested and consumed in subregions of western Oregon? The subregions in figure 1 were explicitly interdependent through the transfer of logs from one subregion to another. The importance of subregions was in their partitioning of western Oregon into areas that differed in ownership distribution, private timber availability, and silvicultural management, while at the same time serving as logical reporting areas for western Oregon BLM Districts (see table 1).

This analysis recognized that the BLM is just one timber supplier within western Oregon and that the impact of harvest changes is felt where the timber is actually consumed. Furthermore, any measure of the timber harvest and related consumption consequences of BLM actions must account for how the private land ownership reacts to changes in BLM timber supply policy. The amount of timber offered for sale by the BLM affects stumpage prices and these effects influence the decision of private forestland owners to harvest their timber. The result is an inverse relationship between the amount of BLM timber offered and the amount of private timber harvest.

The amount of timber demanded by processing mills is inversely related to stumpage prices. Timber demand is determined by factors outside the control of the BLM or any other forest land ownership category, such as end use consumption in the national economy (for example, the number of new homes being built) and other national economic variables like gross domestic product and the interest rate. Poor demand years result in low levels of consumption and low product prices; good years feature the same level of consumption under higher product prices. For the purpose of this analysis, year to year fluctuations in timber demand were averaged over a 10 year analysis period.

Timber supply is determined by ownership, subregional location, and stand condition. Ownership determines the policy specifying the conditions under which the timber may be harvested. Subregional location accounts for variations in species composition and the amount of timber available for harvest. Stand condition measures the amount of harvestable volume available on a per acre basis, as well as the growth rate and stage of development of this volume. Private timber supply is directly proportional to stumpage prices. This analysis accounted for changes in private timber supply by assessing inventory conditions at the beginning of each analysis period. For public agencies such as the USDA Forest Service and the BLM, timber supply is fixed at the planned allowable sale quantity; regardless of the stumpage price (down to a minimum acceptable bid), the same amount of timber would be harvested over the analysis period.

Market equilibrium defines a balance between timber supply and demand: the amount of timber harvested equals the amount of timber consumed and one stumpage price governs the exchange between suppliers and demanders. Implementing a new BLM timber policy will disrupt this balance and leads to

<sup>1</sup>Definitions for terms such as regional stumpage price can be found in the terminology section following the main text.

<sup>2</sup>Actual data was completed through the end of 1990. Analysis results covering the 1991-2000 period were converted to an annual basis and reported for the 1993-2000 period since the BLM resource management plan implementation was assumed not to commence prior to 1993.

#### Appendix 4

adjustments in the stumpage price such that a new timber supply and demand balance is created. In this analysis, market equilibrium is explicitly recognized for the Pacific Northwest - westside region, and this implies a local equilibrium within western Oregon subregions.

### Procedure

The procedures used for the 1991-2000 period were: solving regional market equilibrium, disaggregation of the regional private harvest, displaying the timber harvest by ownership, and reapportioning the timber harvest as log consumption by processing facilities. Log exports from private and other public lands to foreign destinations was treated as domestic log consumption at the port of export.

In contrast, the procedures used over the 2001-2010 period were not dependent on a regional market equilibrium solution; rather the private harvest projections reflected the same behavioral response to the implemented resource management plans determined for the 1991-2000 period. This allowed the analysis to focus on whether the private inventory would provide a lower, same, or higher harvest over 2001-2010 when compared to the estimated 1991-2000 harvest.

### Solving Regional Market Equilibrium; 1991-2000

This step determined the market adjustments, and associated regional stumpage price, that would result if a given set of resource management plan alternatives were implemented on BLM administered lands in western Oregon. The Timber Assessment Market Model (TAMM) (Adams and Haynes 1980, Haynes and Adams 1985, and Haynes 1990) was used to calculate the new regional stumpage price balancing timber supply and demand. The Timber Assessment Market Model was ideal for this kind of analysis since the model provided 50 year projections of consumption, production, and prices of forest products and stumpage under an array of externally specified conditions on policy and the economic environment surrounding the forest sector. The model is national in scope and is divided into 11 supply regions and 5 demand regions. Solution is in the form of a spatial supply and demand balance amongst regions. Therefore, the market equilibrium for the Pacific Northwest - westside region was dependent in part on what is happening in other regions of the U. S. Overall, the quantities produced and their distribution to demand regions is based on the maximization of producer profits net of transfer costs in each supply region.

The external policy condition that was changed for each TAMM run was the BLM sawtimber sale quantity resulting from holding each District in western Oregon at similar resource management plan alternatives. Four TAMM runs were made, each with a different resource management plan theme: current plans (i.e., no action), alternative A, alternative C, and the preferred alternative. Implementation of BLM resource management plans was assumed to commence in 1993. In order to reflect actual conditions since 1990, reported and estimated BLM sawtimber harvest quantities were used in 1991 and 1992 for all four runs. Similarly for 1991 National Forest harvest quantities. The National Forest sawtimber sale quantities for Pacific Northwest - westside forests in 1992 and beyond reflected planned offerings under the USDA Forest Service Spotted Owl Final Environmental Impact Statement, record of decision in March 1992 (U. S. Department of Agriculture 1992a and 1992b).

The key outputs for each TAMM run were the regional price and the total (hardwood and softwood) private growing stock removals for the Pacific Northwest - westside (PNWW) region. Growing stock removal was the relevant output because it represented the portion of total harvest that comes from the private inventory<sup>3</sup>. Annual removals from the industrial and other private ownership classes in TAMM (softwood and hardwood volume combined) were summed to estimate the total private removal over the 1991-2000 period. The western Oregon share of the 1991-2000 PNWW total harvest was taken to be 0.4466, the historical 1971-1990 average of western Oregon's proportion of the total Pacific Northwest - westside private harvest (figure 2).

In summary, the regional market equilibrium solution resulted in a Pacific Northwest - westside regional stumpage price and western Oregon's share of the corresponding private growing stock removals, given a set of similar resource management plan alternatives assumed implemented on BLM administered lands in western Oregon. Table 2 contains the results of the regional market equilibrium for each resource management plan theme. Results for alternatives B, D, and E were interpolations of the results of the TAMM runs for alternatives, A, C, current plans, and preferred.

### Disaggregation of the Private Harvest; 1991-2000

The disaggregation of the private harvest into western Oregon subregions used Connaughton and Campbell's

<sup>3</sup>Other harvest sources are from forestland conversions to other uses and dead and down large material.

(1991) probability of stand harvest model. Throughout most of western Oregon, the regeneration harvest type was clearcut, the exception being the Medford subregion where the harvest was either clear cut or partial cut depending on even-aged or uneven-aged stand management. Commercial thinning treatments, if appropriate, were applied to non-regeneration harvest acres. Volumes removed from thinning contributed to the disaggregation of western Oregon's share of the TAMM private harvest.

The application of Connaughton and Campbell's (1991) model required: an updated 1990 year-end inventory, stand growth and yield projections for all private lands, and calibration for changes in federal timber policy on National Forests that occurred subsequent to the 1976-1984 period of estimation for Connaughton and Campbell's model. The calibration procedure resulted in a mechanism for adjusting the probability of stand harvest for different BLM timber supply policies. Given the same stand conditions, the higher the regional stumpage price under the BLM policy, the greater the probability of stand harvest.

#### *Inventory and Growth Projections for Private Timberlands*

The growth and yield of western Oregon's private forests were simulated by projecting future stand conditions on each of 789 field plots measured by personnel from the Pacific Northwest Research Station in 1984 and 1985, and reported in Gedney and others (1986a), (1986b), and 1987). The plots are laid out over western Oregon in a systematic grid, and each represents a specific number of acres (plot expansion factor) determined by its subregional location and ownership. The sum of the expansion factors for all projected plots in western Oregon was 5,864,163 acres. All plots were capable of producing at least 20 cubic feet per acre per year of wood suitable for log consumption and were not reserved for purposes precluding timber harvest.

Most field plots are composed of five sample points distributed over five acres, with observations on tree species, diameter, and height recorded for each point. The stands on each point were separately projected and then summed to represent forest condition for the plot. Some plots had either very young stands with no measurable volume or were yet to be regenerated, and these were projected as if a uniform number of trees of a typical species mix and number of seedlings were present on each point.

Two stand simulators were used to project the stand conditions for each inventory plot: the Stand Projection System (SPS), Version 2.3a (revised 8/1/91; Arney

1985), and the Oregon Growth Analysis and Projection System (ORGANON), Version 3.0 (Hester et al 1989). The Stand Projection System was used for plots located in all subregions except Medford and Roseburg; ORGANON was used in the latter two subregions.

Silvicultural management regimes, which are a set of activities to be carried out as the stand develops, were assigned to each plot. The regimes varied by stage of stand development (young stands, established stands) and location. Table 3 lists and summarizes the regimes, and shows the total number of acres represented by the plots assigned to each regime. The 1991-2000 disaggregation, and the 2001-2010 projection, of the private timber harvest were not heavily influenced by any management activity other than harvesting itself. Commercial thinning and fertilization both had minor effects on the results: the former because it contributed to harvest and altered stand development; the latter because it accelerated growth.

Stand conditions were updated to 1990 for land use changes and harvesting that had occurred since the plots were measured in the mid-1980's. Photo-interpretation, field checks, and county tax assessment records were used to conduct the update. Growth between the mid-1980's and 1990 was projected using either SPS or ORGANON, depending on the subregion in which the plot was located.

#### *Calibration for Changes in Federal Timber Policies*

The variables determining Connaughton and Campbell's (1991) probability of stand harvest model are the anticipated compound growth rate for the stand and the stand's growing stock volume. Both of these variables are structured as a function of the time interval within which the probability of stand harvest applies. For example, Connaughton and Campbell's model was estimated using two successive inventories; the first representing 1976 conditions, the second 1985 conditions. The logic behind Connaughton and Campbell's model is to think of a private forest landowner viewing a stand in 1976 where the stand's growing stock volume is known. The 1976 to 1985 compound growth rate becomes a surrogate for the owner's anticipated growth rate for the stand over the next 10 years.

Since the model was actually estimated for a 9 year interval (1976-1984), the estimated probability of stand harvest represents the likelihood that the owner would harvest the stand sometime during the interval. Given that the plot represents numerous like stands; the estimated probability can be thought of the proportion

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of area represented by the plot that would actually be harvested within the next 9 years<sup>4</sup>. For each subregion, the total private harvest was computed as:

$$\text{Total Private Harvest} = \sum_k (P_k V_k A_k) \quad (1)$$

where:

$P_k$  is the estimated probability of stand harvest (a value between 0 and 1 inclusive) for the subregion's kth plot.

$V_k$  is the volume per acre of material available for harvest for the subregion's kth plot.

$A_k$  is the area expansion factor (acres) for the subregion's kth plot.

The private harvest was further distinguished by industrial versus non-industrial ownership.

In western Oregon, public timber supply levels are large enough that changes in offerings from National Forests or the BLM will influence stumpage price. Therefore, the estimated probabilities using the reported coefficients in Connaughton and Campbell's (1991) model imply private harvesting behavior consistent with the federal policies in effect over 1976-1984 period. Given that the model was to be applied using the 1990 growing stock and the anticipated growth rate for the 1991-2000 period<sup>5</sup>, their reported model coefficients had to be adjusted to reflect changes in National Forest timber supply policies since the 1976-1984 period. The simplest approach was to adjust the intercept term in Connaughton and Campbell's model for assumed changes in the private harvest behavior under different federal timber supply policies. This was done by iteratively solving for the new intercept term value for Connaughton and Campbell's model such that the computed probabilities, when applied to the total private harvest formula in (1) for all subregions, would result in western Oregon's share of the TAMM private harvest for the federal policy under investigation.

For example, western Oregon's share of the TAMM projected private timber harvest for the Pacific Northwest - westside region under a federal timber supply policy reflecting new National Forest plans (*circa* 1990) and the BLM under current plans adopted in the 1980's<sup>6</sup> is 668 million cubic feet per year (mmcf/year). In contrast, directly applying the estimated coefficients in Connaughton and Campbell's (1991) model to the updated 1990 inventory resulted in an independent 1991-2000 private harvest projection for western Oregon of 663 mmcf/year. The 663 mmcf/year projection represents an extrapolation of the 1976-1984 private harvest behavior to the 1991-2000 period. The question then becomes: What intercept term in Connaughton and Campbell's probability of stand harvest model, when applied to the 1990 stand conditions, would give probabilities that result in a private harvest calculation from the formula in 1 equal to the TAMM derived western Oregon private harvest of 668 mmcf/year?

Figure 3 summarizes the results of the calibration procedures. The regional stumpage price serves as an indicator of the regional market equilibrium for the federal timber supply policy assumed in effect over the 1991-2000 period. In general, the private harvest does not vary too much as a result of significant price differences associated with the various federal timber supply policies represented. Therefore, only minor adjustments to the intercept term in Connaughton and Campbell's (1991) model were necessary for the private harvest disaggregation. The closeness of the Connaughton and Campbell, and the TAMM National Forest (before new plans), results in figure 3 reflect that both projections assume a similar National Forest timber supply policy for the 1991-2000 period; namely timber sale offerings at the level existing over the 1976-1984 period.

#### Displaying the Timber Harvest by Ownership; 1991-2000

Five ownership groups were used to portray the timber harvest outlook, by subregion, for each BLM resource management plan theme considered: the BLM, National Forests, other public, non-industrial private, and industrial private. For all BLM alternatives, the National Forest harvest levels were held constant at the allowable sale quantity for the preferred alternative in the Final Environmental Impact Statement for the northern spotted owl (table 4). National Forest and BLM allowable sale quantities were pro-rated to western Oregon subregions using the administrative

<sup>6</sup>Timber Assessment Market Model (TAMM90), log run 529.

<sup>4</sup>In application, the 9 year area proportions were extrapolated to reflect harvested acreage over a 10 year period.

<sup>5</sup>The anticipated growth rate was calculated as the compound growth rate bringing the 1990 stand growing stock volume to its year-end 2000 counterpart in the absence of any scheduled thinning. The rationale applied here was that the owner's anticipated growth rate, for the purposes of identifying candidate stands for final harvest, would not be based on the stand being thinned over the period as well.

area harvest pro-rationing factors used in Greber and others (1990). The other public harvest was also held constant at the observed 1984-1988 annual average for all BLM resource management plan alternatives.

Changes in the harvest by BLM resource management plan theme were due to differing BLM allowable sale quantities across alternatives, and the unique private harvest response to each BLM resource management plan theme considered. As discussed above, the private harvest disaggregation, by subregion, was based on a 10 year accumulation of the annual TAMM projections over the 1991-2000 period and then converted to an annual harvest rate for the period. While only labelled as occurring over the 1993-2000 period, the annual private harvest actually reflects the 1991-2000 rate of harvest which included 2 years (1991 and 1992) of same BLM harvest quantity for all BLM alternatives considered since plan implementation was assumed to commence in 1993.

### Reapportioning the Harvest into Log Consumption; 1991-2000

The consumption of harvested timber by processing facilities within western Oregon was calculated using an average of the 1982 log flow information reported in Howard (1984a) and the 1988 log flow information reported in Howard and Ward (1991a). These two years contrasted periods of differing economic activity; the recession in 1982 and the recovery in 1988. Both the 1982 and 1988 log flows were adjusted for the amount of western Oregon timber processed out-of-state using Howard (1984b), Howard and Ward (1991b), Larsen and others (1983) and Larsen (1992). The data was expressed as fractions representing the proportion of timber harvested in one subregion processed in other subregions (including itself).

Log consumption was calculated as follows:

$$q = h \cdot \text{LOGFLOW} \quad (2)$$

where:

$q$  denotes a vector of log consumption, where  $q_i$  represents the amount of log consumption by processing facilities located in subregion  $i$ .

LOGFLOW denotes a matrix of log flow proportions containing elements  $\alpha_{ij}$  representing the proportion of timber harvested within subregion  $i$  processed in subregion  $j$ ; where  $\sum_j \alpha_{ij} = 1$ .

$h$  denotes a vector of timber harvest, where  $h_i$  represents the total harvest from all ownerships in subregion  $i$ .

### Updating the Private Inventory; Harvest and Log Consumption 2001-2010

Acres harvested for regeneration over the 1991-2000 period were removed from the inventory and unavailable for harvest during the 2001-2010 period. Thinned acres, plus non-harvested acres not scheduled for thinning, became the acres available for harvest over the 2001-2010 period. These acres were paired with year-end 2000 yields, mid-period 2005 harvest and thinning yields (if appropriate), and year-end 2010 yields (in the absence of thinning) for application of the Connaughton and Campbell (1991) probability of stand harvest model over the 2001-2010 period.

No further adjustments to the intercept term in Connaughton and Campbell's model were made for the 2001-2010 harvest projections. The rationale was a continuation of the resource management plans assumed implemented during the 1991-2000 period. Holding the intercept term constant indicated no further change in private harvesting behavior. What did change though was the available private harvest inventory that this behavior would apply to. That is, given the change in the composition of the private inventory resulting from growth and harvest removals over the 1991-2000 period, what quantity of private harvest would occur over the 2001-2010 period using the same intercept term in Connaughton and Campbell's model used in the 1991-2000 harvest projection? Differences in the private harvest projections for the 2001-2010 period, when compared to the 1991-2000 period, reflected harvest increases (or decreases) associated with the characteristics of the year-end 2000 inventory when compared to the year-end 1990 inventory.

The procedures used to display the timber harvest and log consumption for the 1991-2000 period were the same ones used for the 2000-2010 period. The harvest quantities for the BLM, National Forests, and other public ownerships were the same as reported for the 1991-2000 period. Therefore, the aggregate annual harvest total for 2001-2010, when compared to the 1991-2000 annual total, solely reflected differences in the private harvest.

### What About the Klamath Resource Area of the Lakeview District?

The Bureau of Land Management's Klamath Resource Area administered by the Lakeview District is located outside boundaries used for this analysis. Therefore, private harvest responses to differing BLM allowable sale quantities by resource management plan alternative in the vicinity of the Klamath Resource Area

(Klamath County) were not provided by this analysis. However, some effects attributable to the Klamath Resource Area were still captured by the analysis.

The TAMM regional market equilibriums did include the Klamath Resource Area allowable sale quantities as BLM harvest volume originating within the Pacific Northwest - westside region; though technically the Klamath Resource Area is located on the eastern slope of the Cascade Range. This is reasonable since there is observed log flow from Klamath County into western Oregon counties. From a regional perspective it made more sense to lump the Klamath Resource Area as part of the total BLM effect on the Pacific Northwest - westside region rather than splinter out its small allowable sale quantity and model its regional impact on TAMM's Pacific Northwest eastern supply region. Finally, how differing allowable sale quantities by resource management plan alternative on the Klamath Resource Area effected western Oregon log consumption was provided by the analysis.

## Results and Discussion

Table 5 summarizes the private harvest disaggregation for the 1991-2000 period and subsequent projections for the 2001-2010 period. Furthermore, table 5 compares these results to the 1984-1988 historical baseline, as well as earlier timber availability projections contained in Sessions (1990). There is little response in the western Oregon private harvest across BLM resource management plan themes since the stumpage price - private harvest response relationship in TAMM is inelastic (see table 2 and figure 3). For western Oregon as a whole, the private harvest projections vary across BLM resource management plan themes by 15-20 million cubic feet per year (table 5). This variation is even narrower (8-10 million cubic feet per year) for the 2001-2010 period.

When compared to the 1984-1988 baseline period, the 1991-2000 private harvest disaggregation, regardless of BLM resource management plan theme, exceed the 1984-1988 baseline harvest by 100 million cubic feet per year. The increase during the 1991-2000 period reflects a private harvest response to the regional stumpage price increase that occurred between the 1984-1988 period and the 1991-2000 projection period (table 2) as a result of the reduced timber supply offerings on National Forest lands. Furthermore, these harvest increases can be attributed to increases on the non-industrial private ownership since the 1991-2000 harvest disaggregation of the industrial ownership is lower than the 1984-1988 historical baseline (table 5). The proportion of private timberland harvested over the

1991-2000 period to the total private timberland acreage available at the end of 1990, ranged from 13 to 18 percent across subregions (higher percentages to the north) and was not substantially affected by the BLM resource management plan theme being considered. Thinned acres represented 2 to 9 percent of the area of private timberland existing in 1990.

Comparison of the 2001-2010 projections with the 1991-2000 harvest disaggregation shows a dramatic increase in the total private harvest, roughly 100 million cubic feet per year (table 5). This holds for all subregions except the South Coast and Medford. The increase reflects that young, fast-growing stands, not harvested over the 1991-2000 period become attractive for harvest (in the context of the landowner behavior in Connaughton and Campbell's (1991) probability of stand harvest model) in the 2001-2010 period. One important qualification for this harvest gain is that pre-1990 forest practice rules and related environmental constraints on the private timberlands remain unchanged through 2010. The proportion of private timberland harvested over the 2001-2010 period to the total private timberland acreage available at the end of 2000, ranged from 15 to 23 percent across subregions (higher percentage to the north). The proportion of private timberland area thinned ranged from 4 to 10 percent of the total private timberland acreage not harvested by 2000.

The timber availability projections in Sessions (1990), which contained no mechanism for adjusting private harvest quantities to stumpage prices, would underestimate the private harvest disaggregation for the 1991-2000 period. In addition, the Sessions' private harvest projections for periods subsequent to the year 2000 were constrained by an even flow condition. In contrast, the 2001-2010 harvest projections from this analysis reflect the flexibility of the private ownership to harvest within all available merchantable age classes without any restrictions regarding even flow. In all likelihood, the 2001-2010 harvest quantities in this analysis would exceed the Sessions' even flow requirement.

Table 6 summarizes the log consumption results by BLM resource management plan theme for the 1993-2000 and 2001-2010 reporting periods. For comparison purposes, the total western Oregon harvest from all ownerships is shown. Western Oregon was a net importer of logs over the 1984-1988 period as total consumption exceeds harvest (table 6). This pattern was not allowed to vary in this analysis. Since log consumption was a reapportioning of the timber harvest to where the volume is consumed, differences across BLM resource management plan alternatives

were minor and reflected the inelastic private timber harvest response to the different BLM allowable sale quantities.

For all BLM resource management plan themes, log consumption in western Oregon is projected to decrease when compared to the 1984-1988 baseline period. Most of this decrease is from reduced National Forest allowable timber sale quantities. The loss in consumption would have been greater had it not been for harvest increases on private lands; especially the non-industrial ownership (table 5). By the 2001-2010 period, further increases in both the industrial and non-industrial private harvest brings consumption close to historical levels. In addition, implementing alternatives A or B on all BLM administered lands in western Oregon would provide enough harvest to restore consumption to the 1984-88 historical level (table 6).

## Terminology

**Allowable Sale Quantity** — Planned timber sale offerings from federal lands. For the USDA Forest Service, refers to offered quantities of sawtimber convertible to lumber or plywood. For the BLM, includes sawtimber and a small component of sound chippable material.

**Analysis Period** — Computation periods for the analysis. Period 1 covers the period of plan implementation (1991-2000) and period 2 covers the first period thereafter (2001-2010). Results for the 1991-2000 period are converted to an annual basis and reported for the 1993-2000 period since BLM resource management plan implementation was assumed to commence in 1993.

**Baseline Period** — Historical period used as a reference point for comparison of projected harvests. The period chosen by the BLM was the 1984-1988 period (U. S. Department of the Interior 1988).

**BLM** — U. S. Department of the Interior, Bureau of Land Management, Districts of western Oregon: Coos Bay, Eugene, Medford, Roseburg, Salem, and the Klamath Falls Resource Area of the Lakeview District.

**Commercial Thinning** — Removal of industrial crop trees to reduce competition among remaining trees in the stand, and thereby increase growth and yield of remaining trees. For purposes of growth and yield projections, assumed to occur during the fourth decade of stand development on slopes less than 35% slope (40-45% in the Medford subregion). Minimum volume and basal area restrictions were also applied in the Medford subregion to more realistically portray commercial thinning.

**Fertilization** — Application of nitrogen fertilizer to forest land to increase the rate of tree growth. For the projection of growth and yield, fertilization was assumed to be applied at a rate of 200 lbs/acre for eligible plots. Eligible plots were those of medium site productivity on the industrial ownership in all subregions except Medford. Application was assumed to occur during the third decade of stand development when preceding commercial thinning, and the fifth decade of stand development when preceding clearcut.

**Log consumption** — Volume of timber processed by manufacturing and export facilities throughout western Oregon. Calculated as a reapportioning of the western Oregon timber harvest using log flow information in Howard (1984a) and Howard and Ward (1991a). Also includes timber processed from eastern Oregon and out-of-state origins. Manufacturing includes primary end-uses such as lumber, plywood, and other products using sound chippable material. Includes logs exported to foreign destinations from western Oregon ports.

**National Forests** — Western Oregon National Forests of the USDA Forest Service Pacific Northwest Region: Mt. Hood, Rogue River, Siskiyou, Siuslaw, Umpqua, and Willamette.

**Ownership, Owner Groups** — See definition of timber harvest below.

**Pacific Northwest - Westside (PNWW) Region** — That portion of Oregon and Washington west of the Cascade Range divide.

**Pre-commercial Thinning** — Removal of young trees with no commercial value to provide growing space for future crop trees. For the projection of growth and yield, pre-commercial thinning was assumed to occur early in second decade of stand development when 60% or more of the plot's points had a stocking of more than 350 conifers per acre; lower stocking levels were permissible for the Medford subregion. Approximately 275 trees per acre were projected to remain after pre-commercial thinning.

**Private Timberland** — Private forestland capable of producing 20 cubic feet per acre per year of wood suitable for log consumption and were not reserved for purposes precluding timber harvest.

**Probability of Stand Harvest** — Refers to the likelihood that a inventory plot (representing a stand), given its growing stock volume of harvestable material and anticipate growth, will be harvested within a 10 year period. These probabilities were estimated by adjust-

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ing Connaughton and Campbell's (1991) probability of stand harvest model for different federal timber supply policies. Each probability represents the proportion of plot's area expansion harvested over the 10 year period.

**Regional Market Equilibrium** - A balance between the quantity of timber supplied with the quantity of timber demanded (including volume exported for out-of-region consumption) for the Pacific Northwest - westside region. The quantity of timber supplied is reported as timber harvest, while the quantity of timber demanded is reported as log consumption.

**Regional Stumpage Price** — The market clearing regional stumpage price (in 1967 dollars per thousand board feet) that balances timber supply and demand for the Pacific Northwest - westside region. The average value of all species of timber harvested from USDA Forest Service National Forest lands in the Pacific Northwest - westside region was used as a proxy for the regional stumpage price. See Warren 1992; deflated to 1967 dollars per thousand board feet, Scribner, using the producer price index, all commodities (1967=100) reported in Ulrich (1988) and (1990).

**Resource Management Plan Theme** — Refers to the implementation of similar resource management plan alternatives on all BLM administered lands in western Oregon. The themes correspond to Alternatives A-E, current plans, and the Preferred alternative.

**Stand Conditions** — Refers to the per acre quantity (million cubic feet) of harvestable material on an inventory plot, or stand represented by an inventory plot. Also includes the compound rate growth over a specified 10 year period.

**Subregion** — Geographically defined reporting areas for timber supply and log consumption. They are defined to closely approximate the local areas proximate to BLM District boundaries. See figure 1 and table 1.

**Timber Assessment Market Model (TAMM)** — A supply and demand equilibrium model that provides 50 year projections of consumption, production, and prices of forest products and stumpage under an array of externally specified conditions on policy and the economic environment surrounding the forest sector (see Adams and Haynes 1980, Haynes and Adams 1985, and Haynes 1990).

**Timber Demand** — An inverse stumpage price - quantity relationship for logs. Timber demand is determined by factors outside the control of the BLM or any other forest land ownership category. This analy-

sis accounts for timber demand in the regional market equilibriums calculated using the Timber Assessment Market Model.

**Timber Harvest** — Timber harvest is distinct from timber supply in that harvest represents tree volume removed from growing stock inventory and converted into primary end uses such as lumber, plywood, and other products using sound chippable material. Reported on an annual basis. Definitions by ownership groups are as follows:

#### *Source of Change*

**BLM** - USDI Bureau of Land Management planned 10 year allowable sale quantity for the Coos Bay, Eugene, Medford, Roseburg, and Salem Districts; and the Klamath Resource Area of the Lakeview District. Varies by resource management plan theme. Includes sawtimber and sound chippable material.

#### *Estimated by the Analysis*

**Industrial** - Ownership class of private lands owned by companies or individuals operating wood using plants. Also includes large corporate owners who manage lands for timber production but do not own or operate wood using plants. Harvest refers to net merchantable growing stock removals.

**Non-Industrial Private** - Ownership of private lands that does not meet the industrial classification. Includes small woodland owners and farmers. Harvest refers to net merchantable growing stock removals.

#### *Held Constant Across all BLM Resource Management Plan Themes*

**National Forest** - USDA Forest Service planned 10 year allowable sale quantity for Oregon National Forests west of the Cascade Range Divide (see table 4). This quantity only includes sawtimber material suitable for lumber or plywood manufacture.

**Other Public** - Observed 1984-1988 timber harvest from local, state, and federal (excluding BLM and National Forest) timberlands.

**Timber Supply** — Timber supply is a schedule of what quantity of trees may be removed given ownership policies, available inventory, and stumpage price. Timber harvest is an observable consequence of timber supply. Public forest owners were assumed to



have an inelastic timber supply schedule not responsive to stumpage price.

**USDA Forest Service** — U. S. Department of Agriculture, Forest Service.

## Supporting Data

**Actual 1991 and 1992 BLM Harvest** — Used to initialize the TAMM projections for the actual level of BLM timber harvest for the first two years of the 1991-2000 analysis period. The 1992 harvest is an extrapolation of the observed harvest through March 1992. **Source:** USDI Bureau of Land Management, Portland, Oregon.

**BLM Allowable Sale Quantities** — Planned allowable sale quantities by western Oregon District for each resource management plan theme. **Source:** USDI Bureau of Land Management, Portland, Oregon.

**BLM Chip Proportions** — Proportion of BLM allowable sale quantity in sound chippable material. Used to convert reported BLM allowable sale quantities into sawtimber component since it is the sawtimber component that is necessary for input into TAMM. **Source:** USDI Bureau of Land Management, Portland, Oregon.

**Exogenous Consumption** — Logflow from the following county origins and processed within western Oregon subregions were held constant throughout the analysis: 1) Klamath county origin, 2) Other eastern Oregon counties, and 3) Out-of-State county origin. Annual volumes were the average of the 1982 and 1988 reported log flows from these origins into western Oregon. **Source:** Howard 1984a, Howard and Franklin 1991a.

**Log Flows** — Used to calculate log flow proportions used in log consumption calculations. **Source:** Larsen and others (1983), Howard (1984a), Howard (1984b), Howard and Ward (1991a), Howard and Ward (1991b), and Larsen (1992).

**National Forest Allowable Sale Quantities** — USDA Forest Service planned 10 year allowable sale quantity in million cubic feet per year. This quantity only includes sawtimber material suitable for lumber or plywood manufacture. This sale quantity assumes implementation of the Interagency Scientific Committee's conservation strategy for the northern spotted owl as indicated in the Final Environmental Impact Statement for the northern spotted owl (U. S. Department of Agriculture 1992a and 1992b). See table 4. **Source:** USDA Forest Service, Pacific Northwest Region, Portland, Oregon.

**National Forest and BLM District Administrative Area Harvest Pro-rationing Factors** — Represents the proportion of allowable sale quantity from an administrative unit (e.g., National Forest, BLM District) occurring within the boundaries of a particular subregion. **Source:** Adapted from supplemental information used in Greber and others (1990).

**Other Public Harvest** — Annual average for the 1984-1988 period as reported in the Oregon timber harvest reports (Oregon Forestry [1986], Oregon State Department of Forestry [1985, 1987], Oregon State Forestry Dept. [1988, 1989]). Converted to million cubic feet per year.

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**Table 1: Subregion definitions for western Oregon.**

SUBREGION	WESTERN OREGON COUNTIES	REPORTING AREA FOR BLM DISTRICT
North Coast	<i>Clatsop, Columbia, Tillamook, Washington.</i>	Salem District
Central Coast	<i>Benton, Lincoln, Polk, Yamhill.</i>	Salem District
North Willamette	<i>Clackamas, Multnomah, Hood River.</i>	Salem District
Mid-Willamette	<i>Linn, Marion.</i>	Salem District
Eugene	<i>Lane.</i>	Eugene District
Roseburg	<i>Interior Douglas<sup>(1)</sup>.</i>	Roseburg District
South Coast	<i>Coos, Curry, and Coastal Douglas.</i>	Coos Bay District
Medford	<i>Jackson, Josephine.</i>	Medford District

Notes:

(1)The division between Coastal and Interior Douglas County follows the Coos Bay District boundary in Douglas County.

Table 2: Regional market equilibrium results by BLM resource management plan theme.

Bureau of Land Management		TAMM Equilibrium Results	
Resource Management Plan Theme	Allowable Sawtimber Sale Quantity (mmcf/year)	1991-2000 Regional Stumpage Price (1967 \$/mbf)	1993-2000 Western Oregon Private Growing Stock Removals (million cubic feet per year)
1984-1988 Historical	197	\$37.56	602
NO ACTION <sup>(1)</sup>	186	\$74.22	689
A <sup>(2)</sup>	245	\$70.03	679
B	221	\$71.66	682
C <sup>(3)</sup>	66	\$82.07	704
D	77	\$81.54	703
E	55	\$82.87	706
PREFERRED <sup>(4)</sup>	94	\$80.18	700

mbf: thousand board feet, long log scale.  
mmcf/year - million cubic feet per year.

## Notes:

- (1) Timber Assessment Market Model (TAMM90), log run 562.  
 (2) Timber Assessment Market Model (TAMM90), log run 563.  
 (3) Timber Assessment Market Model (TAMM90), log run 564.  
 (4) Timber Assessment Market Model (TAMM90), log run 567.

**Table 3: Silvicultural management regimes used for projecting growth and yield for private lands in western Oregon.**

Name of Regime	Acres Assigned To Regime	Management Activities	Comments
RX1, RX1A	2,245,471	Clearcut.	Applied to established stands not eligible for or needing other activities; RX1A allows fertilizer on industrial land in decade prior to clearcut
RX2, RX2B	1,149,234	Commercial Thinning, Clearcut	Applied to established stands that have sufficient stocking to benefit from commercial thinning; RX2B allows fertilization on industrial land prior to both thinning and clearcut.
RX3, RX3A	471,345	Pre-commercial Thinning Clearcut.	Applied to young stands that would benefit from stocking control; generally on ground too steep for commercial thinning; RX3A allows fertilization prior to clearcut on industrial lands.
RX4, RX4B	544,904	Pre-commercial and Commercial Thinning, Clearcut.	Applied to young stands that would benefit from stocking control and then benefit from commercial thinning prior to clearcut; RX4B allows fertilization prior to commercial thinning and clearcut on industrial lands.
RRX1	30,641	Establish Stand, Clearcut.	Applies to bare land or newly regenerated stands, typically on low sites.
RRX3, RRR3A	177,794	Establish Stand, Pre-commercial Thinning, Clearcut.	Applies to bare land or newly regenerated stands typically on ground too steep for commercial thinning; RRR3A allows for fertilizer on industrial ownership prior to clearcut.
RRX4, RRR4B	558,221	Establish Stand, Pre-commercial and Commercial Thinning, Clearcut.	Applies to bare land or newly regenerated stands suitable for both pre-commercial and commercial thinning; RRR4B allows fertilizer on industrial ownership prior to commercial thinning and clearcut.
SWRX1	416,932	Clearcut/Partial Cut.	Applied only in Medford subregion; same as RX1 except allows for a partial cut or clearcut as the regeneration harvest.
SWRX2	78,202	Commercial Thinning, Clearcut/Partial Cut.	Applied only in Medford subregion; same as RX2 allows for a partial cut or clearcut as the except regeneration harvest.
SWRX3	50,320	Pre-commercial Thinning, Clearcut/Partial Cut.	Applied only in Medford subregion; same as RX3 allows for a except partial cut or clearcut as the regeneration harvest.
SWRX4	8,387	Pre-commercial and Commercial Thinning, Clearcut/Partial Cut.	Applied only in Medford subregion; same as RX4 except allows for a partial cut or clearcut as the regeneration harvest.
SWRX5	68,908	Brush Control Clearcut/Partial Cut.	Applied only in Medford subregion; calls for brush control whenever stand is ineligible for pre-commercial thinning and 25% or more of trees are hardwoods.
None	63,779	Not Projected.	Site not suitable for conifer growing stock or other factors precluding management.

Table 5: Results for the 1993-2000 private harvest disaggregation and 2001-2010 projection by BLM resource management plan theme.

BLM Resource Management Plan Theme	Private Harvest, Western Oregon (million cubic feet per year)					
	1993-2000			2001-2010		
	IND	NIPF	TOTAL	IND	NIPF	TOTAL
Preferred Alternative (BLM ASQ = 96)	507	193	700	580	226	806
Current Plans (BLM ASQ = 190)	499	190	689	576	223	799
Alternative A (BLM ASQ = 251)	492	187	679	574	220	794
Alternative B (BLM ASQ = 227)	495	187	682	574	223	797
Alternative C (BLM ASQ = 68)	510	194	704	581	226	807
Alternative D (BLM ASQ = 76)	509	194	703	581	226	807
Alternative E (BLM ASQ = 56)	511	195	706	582	226	808
Timber Availability <sup>(1)</sup> (BLM ASQ = 190)	544	125	669	557	125	682
	IND	NIPF	TOTAL			
1984-1988 Baseline (BLM Harvest = 202)	525	77	602			

Notes: IND - Private industrial ownership.  
 NIPF - Private non-industrial ownership.  
 BLM ASQ - Bureau of Land Management resource management plans cumulative allowable sale quantity for western Oregon (million cubic feet per year). Includes the Klamath Resource Area of the Lakeview District.  
 BLM Harvest - Bureau of Land Management actual harvest (million cubic feet per year).

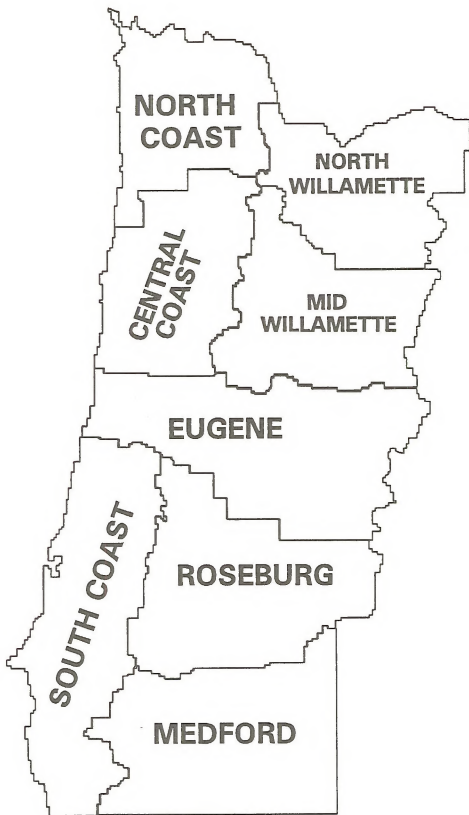
<sup>(1)</sup> Sessions (1990).

Table 6: Log consumption results by BLM resource management plan theme.

BLM Resource Management Plan Theme	Log Consumption by Western Oregon Processing Facilities (million cubic feet per year)							
	1993-2000				2001-2010			
	HARV	END CNSMP	EXOG CNSMP	TOTAL CNSMP	HARV CNSMP	END CNSMP	EXOG CNSMP	TOTAL
Preferred Alternative	1,034	990	169	1,159	1,139	1,086	169	1,255
Current Plans	1,114	1,069	172	1,241	1,225	1,170	172	1,342
Alternative A	1,166	1,118	171	1,289	1,281	1,224	171	1,395
Alternative B	1,144	1,098	171	1,269	1,258	1,203	170	1,373
Alternative C	1,009	966	169	1,135	1,113	1,061	168	1,229
Alternative D	1,015	972	170	1,142	1,120	1,067	170	1,237
Alternative E	1,000	956	168	1,124	1,102	1,050	168	1,218
1984-1988 Baseline	1,248	1,196	172	1,368				

Notes:

- HARV - Total harvest from all ownerships within western Oregon (million cubic feet per year).
- END CNSMP - Consumption of logs originating from ownerships within western Oregon (million cubic feet per year). The difference between HARV and END CNSMP represents the volume of timber originating in western Oregon, but processed by out-of-state or eastern Oregon mills.
- EXOG CNSMP - Consumption of logs originating from ownerships from eastern Oregon and out-of-state (million cubic feet per year). Differences reflect the effect of implementing different BLM resource management plan alternatives on Klamath Resource Area of the Lakeview District in eastern Oregon.
- TOTAL CNSMP - Total log consumption (all origins) by western Oregon processing facilities (million cubic feet per year).



**Figure 1: Western Oregon subregions.**



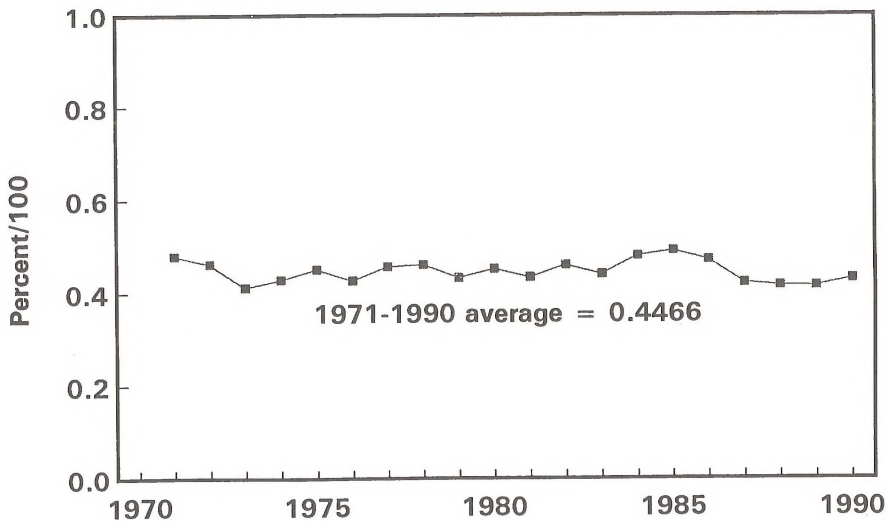


Figure 2: Western Oregon private timber harvest as a proportion of the Pacific Northwest - westside private harvest total.

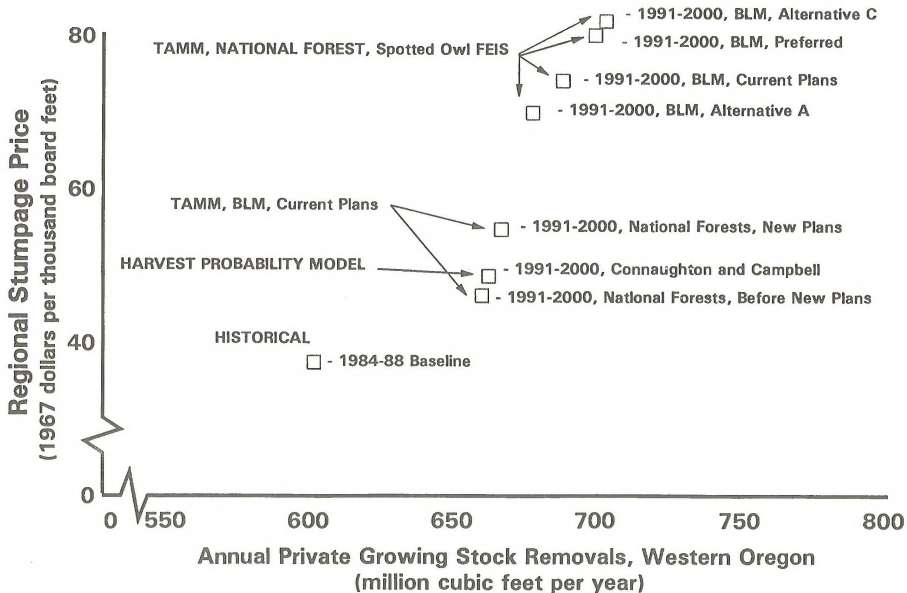
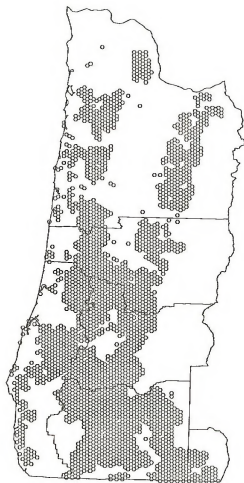


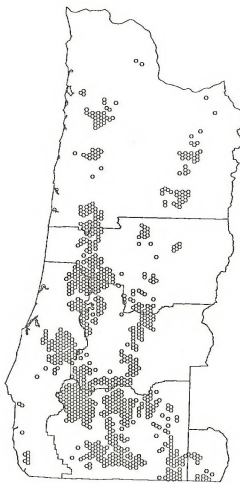
Figure 3: Private harvest calibration for changes in federal timber policy.

# Appendix 4-O Hexagon Plots for Western Oregon.

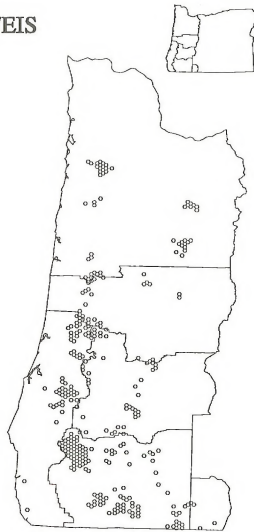
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0-100% BLM OWNERSHIP



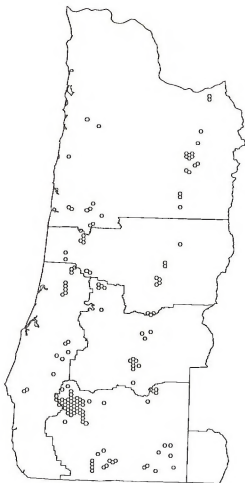
40-100% OWNERSHIP



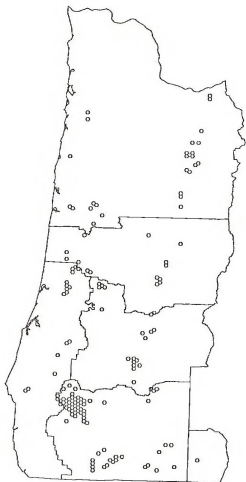
60-100% OWNERSHIP

Percent BLM Ownership within 2500 acre Hexagons

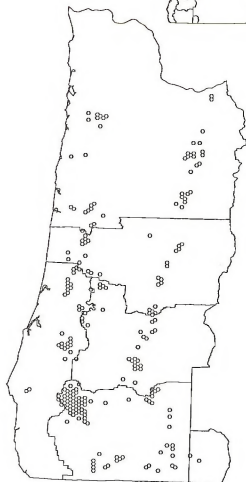
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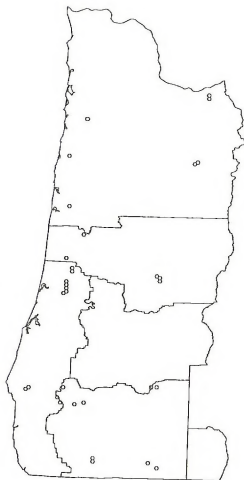
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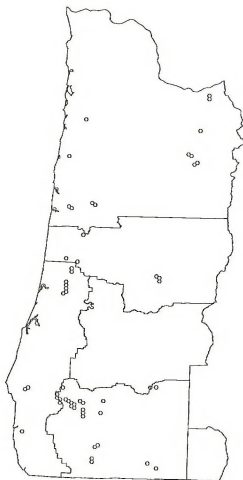
ALTERNATIVE C

2500 acre Hexagons with 40% Suitable Spotted Owl Habitat After 10 Years

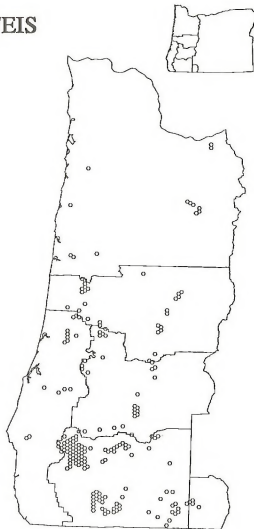
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ALTERNATIVE A



ALTERNATIVE B

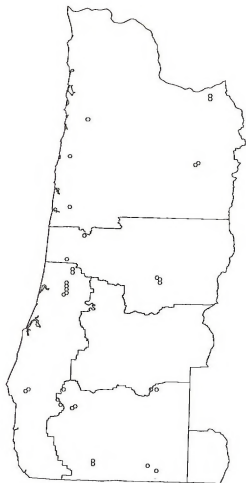


ALTERNATIVE C \*

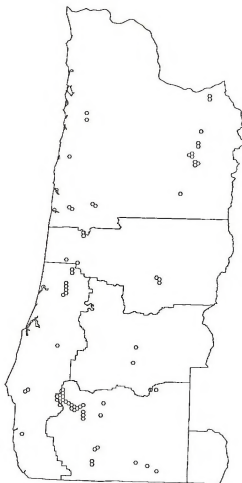
2500 acre Hexagons with 40% Suitable Spotted Owl Habitat After 50 Years

\* ALTERNATIVE C - AFTER 70 YEARS

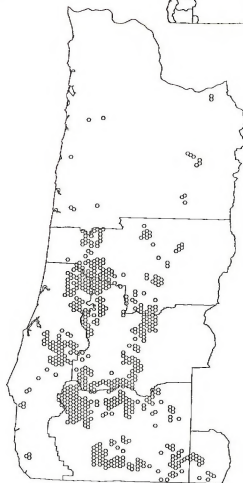
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ALTERNATIVE A



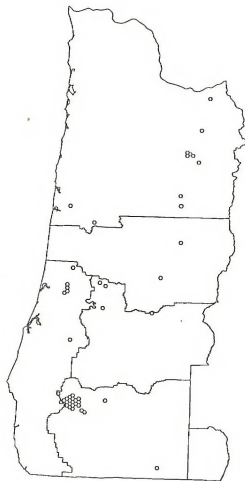
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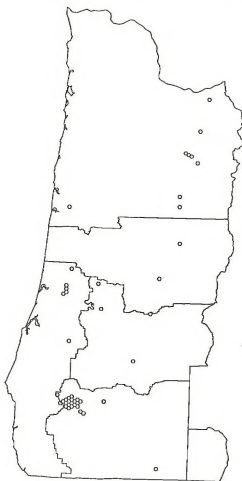
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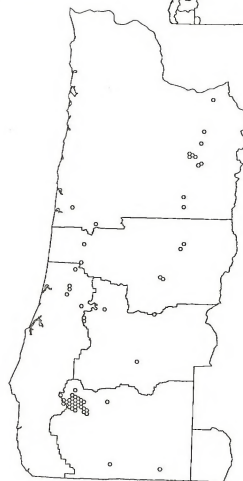
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ALTERNATIVE A



ALTERNATIVE B

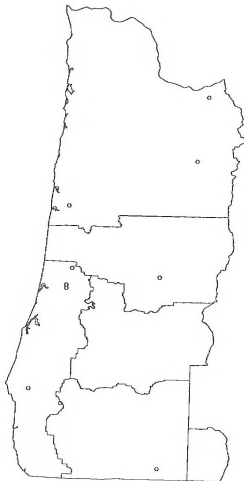


ALTERNATIVE C

2500 acre Hexagons with 60% Suitable Spotted Owl Habitat After 10 Years



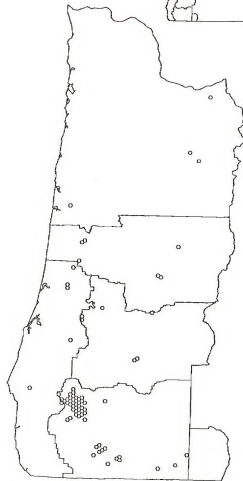
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ALTERNATIVE A



ALTERNATIVE B

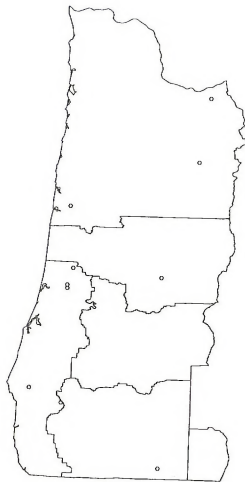


ALTERNATIVE C \*

2500 acre Hexagons with 60% Suitable Spotted Owl Habitat After 50 Years

\* ALTERNATIVE C - AFTER 70 YEARS

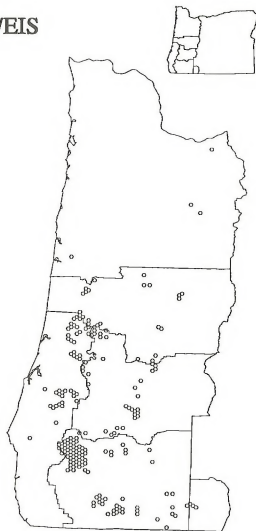
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ALTERNATIVE A



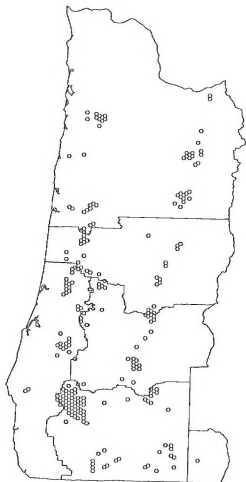
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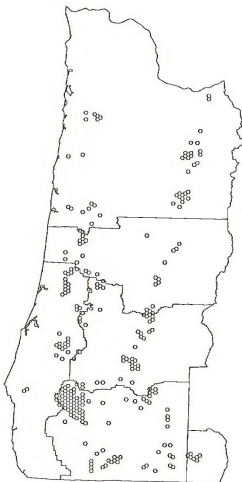
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2500 acre Hexagons with 60% Suitable Spotted Owl Habitat After 100 Years

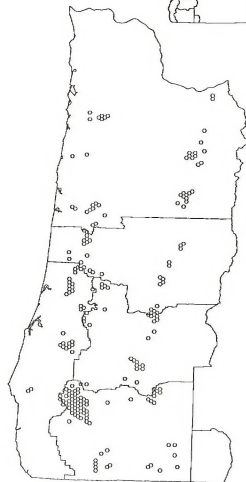
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ALTERNATIVE D



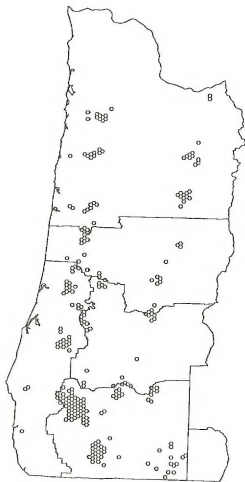
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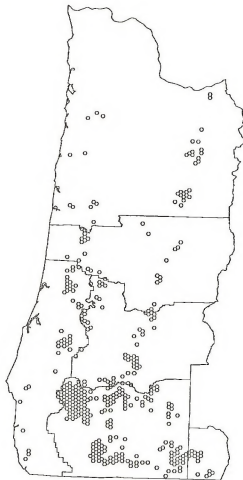
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2500 acre Hexagons with 40% Suitable Spotted Owl Habitat After 10 Years

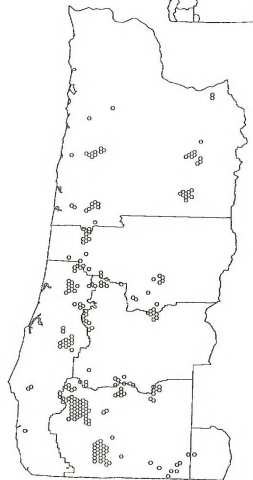
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ALTERNATIVE D



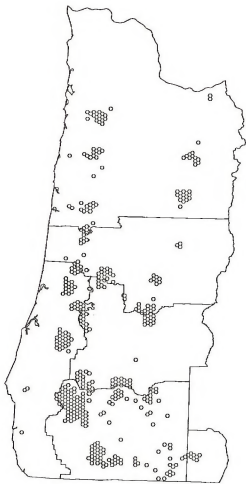
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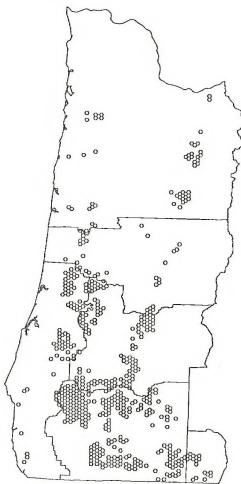
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2500 acre Hexagons with 40% Suitable Spotted Owl Habitat After 70 Years

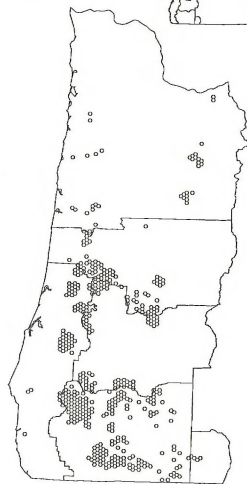
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ALTERNATIVE D



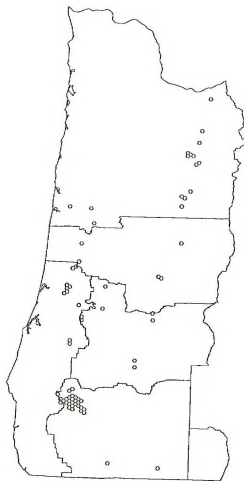
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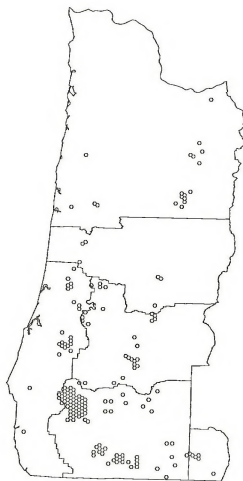
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2500 acre Hexagons with 40% Suitable Spotted Owl Habitat After 100 Years

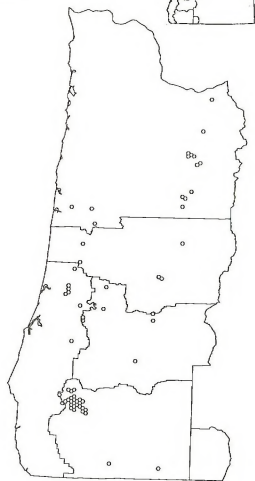
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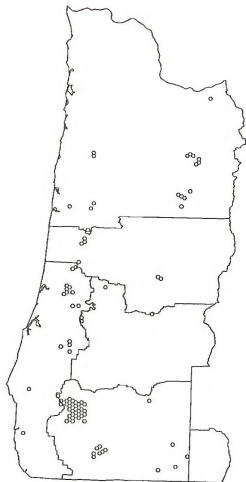
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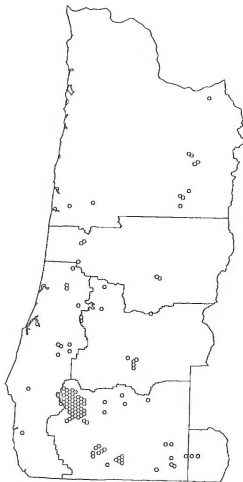
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**2500 acre Hexagons with 60% Suitable Spotted Owl Habitat After 10 Years**

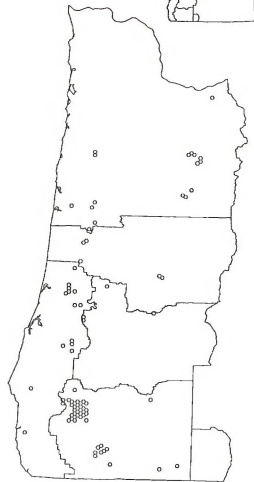
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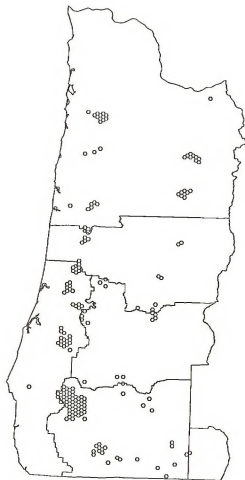
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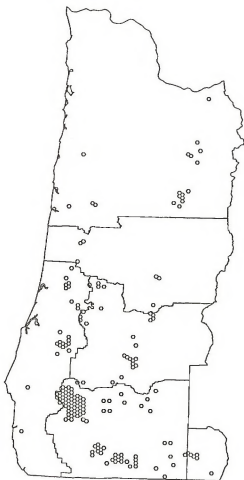
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2500 acre Hexagons with 60% Suitable Spotted Owl Habitat After 70 Years

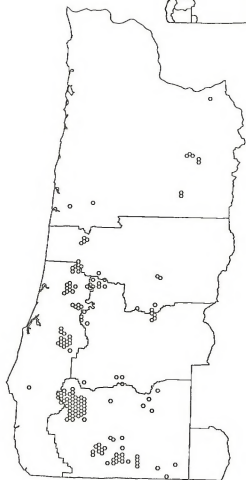
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ALTERNATIVE D



ALTERNATIVE E



PREFERRED ALTERNATIVE

2500 acre Hexagons with 60% Suitable Spotted Owl Habitat After 100 Years



# Appendix 4-P. A Spatially Explicit Life-History Simulator for the Northern Spotted Owl

Kevin McKelvey, *Wildlife Biologist, USDA Forest Service PSW*

June 16, 1992

## Introduction

The probability of an organism surviving a specified time interval is the product of the probabilities of surviving a series of discrete risks distributed across that interval: the risks include predation, starvation, exposure to the elements, and disease. Similarly, the probability of an organism successfully reproducing is linked to the ability to find a mate, the risks to the offspring, and the metabolic constraints imposed on the adults. The fundamentals of both birth and death processes are therefore based on the environmental properties of the area in which the organism exists and to its proximity to potential mates. To survive in a heterogeneous environment, an organism preferentially inhabits habitat favorable to its survival and avoids barren or dangerous areas. The animal's movement and response to environmental heterogeneity is therefore evolved to exploit the use of available resources so as to maximize lifetime reproductive output.

Habitat dependencies for survival and reproduction are fundamental to population ecology, and yet they are seldom incorporated into population models. In traditional modeling, these relationships are largely ignored. Mating efficiency, survival to first breeding and the metabolic status of the parents are all, for example, encompassed by two parameters: the observed birth rates and prereproductive survival rates. Given just these parameter estimates all of the complexities associated with the interface between the organism and the environment are lost. If the habitat remains constant, this is an acceptable simplification; however, management activities and disturbance events alter the habitat in which the organism exists, then the interface between the organism and its environment must be modeled explicitly. In forestry, for instance, management consists primarily of vegetative manipulation resulting in habitat change. Forest management, from a wildlife standpoint, is a vegetation treatment experiment in which wildlife population levels are important dependent variables.

To project the impacts of land management activities, models must relate population demographics explicitly

to the landscape in which the organism exists. Otherwise, there can be no assessment of the potential impact of a change in landscape pattern. In addition, if the pattern of manipulation leads to a fragmented system, then the spatial relationships between the various treatments must be explicit as well.

A spatially explicit model that directly links habitat variation to demographic variation is therefore essential to assess population viability. In addition, such a model allows the efficacy of various landscape patterns to be tested and provides a means to explore interactions between the distribution, amount and quality of habitat and population dynamics (Urban et al. 1988, Pulliam et al. unpublished). In this type of model, habitat quality is defined in terms of demographic parameters. Habitat is 'suitable' for an organism if organisms that utilize that type of habitat either have high survival rates, high birth rates or both. In particular, suitable habitat can be defined as habitat in which the combination of birth and death rates allows for a stable or increasing population.

The northern spotted owl (*Strix occidentalis caurina*), is a habitat specialist that utilizes late-seral-stage forests (Thomas et al. 1990). The acreage in these timber types has declined rapidly since the late 1940's, due primarily to high levels of timber harvest (Thomas et al. 1990), and the pattern of harvest on the landscape has led to a high degree of fragmentation in the remaining habitat. The spotted owl is a monogamous breeder, territorial, with large (>1000 ha) home ranges (Thomas et al. 1990, Appendix I), and obligate juvenile dispersal. Juvenile dispersal ability is limited; the longest published straight-line juvenile dispersal distance is 62 miles (100 km) (Thomas et al. 1990, Appendix P, Table P1). Given obligate dispersal and uncertainties associated with mate finding, it is likely that isolation and fragmentation on the scale of the home range will have an impact on the ability of dispersing owls to colonize new territories and form breeding pairs.

## The Model

A spatial model was created to simulate the impact of forest management on populations of the northern spotted owl. The basic premise of the model is that an

#### Appendix 4

organism's survival and reproduction can be linked explicitly to its immediate habitat and that habitat's context within the larger landscape. That is, a population's rates of survival and fecundity will vary based on map configuration. In addition, the model allows for habitat areas that are unsuitable or marginally suitable for nesting. Lastly, the model assumes that each organism must search the landscape to find a mate.

The model is a single-organism simulator. Each organism is born, moves, attempts to find a mate and breed, and dies. This format allows the behavior of each individual to be simulated by following a series of probabilistic rules rather than through the abstraction of an equation set. The model is flexible, allowing for the analyses of individual characteristics as well as population dynamics. The average distance moved by individual birds before death or pairing, for example, can be output, and thus compared with data from banding or telemetry studies to determine if the simulated movement produces a path-length similar in magnitude to the observed behavior.

### Model Details

#### Life History

The model partitions owls into classes based on age, sex, and breeding status. Because it is not possible to determine the age of adult ( $\geq 2$  years of age) owls in the field, a stage-structured modeling approach (Lefkovich, 1965, Caswell 1989, Thomas et al. 1990: Appendix L) has been adopted. Both sexes are modeled, with birds partitioned into three stage classes: first year birds (juveniles), second year birds (sub-adults), and birds older than two years (adults). Two classes of paired birds are recognized, sub-adults and adults (Fig. 1). A sub-adult pair is defined as a pair containing at least one sub-adult bird. The age of first breeding is at 1 year, with one-year-old birds given a lower fecundity rate than older birds.

#### Males

Males are born and disperse from the nest site looking for acceptable habitat to set up a territory. Determination of site suitability is a probabilistic process. As the site quality decreases, the probability that a male will decide that a site is suitable also decreases. The probability that a male becomes territorial on a site of a given quality is referred to here as the settling rate. If a suitable nest site is found, males stop moving and become territorial. Territorial males remain on this site

until they die or the site becomes unsuitable for nesting. If the site becomes unsuitable, then the males become non-territorial and reinitiate search (Fig. 2).

#### Females

Females are born and disperse from the nest site looking for territorial males. When they find a territorial male, they obligately pair (Fig. 3). Once paired, females remain on the site until they die or the site becomes unsuitable for nesting.

#### Pairs

Pairs split up only when one member of the pair dies, or the site becomes unsuitable for nesting. If the female dies, the male remains territorial and stays on the site. If the male dies the female has no fidelity to the site and will initiate searching for a new mate (Fig. 4). If the site becomes unsuitable for nesting, both members search for a new site independently.

#### Movement from one age-class to another

As owls age, they move from juveniles to sub-adults and finally to adults. Survival probabilities are evaluated at each movement step within the annual interval and remain constant throughout the year. At the end of the year all birds still alive move to the next stage. Years start at the birth pulse.

#### The impact of shifting vegetation patterns on life-histories

In the model, changes in habitat quality can be made at the start of any annual cycle. If these changes result in the previously suitable occupied sites becoming less suitable, then the territorial status of the owls occupying those areas may be changed. Territorial males, whether paired or not, become nonterritorial at a rate of ( $i$  - the specified settling rate) for the land classification. If the males are paired and remain territorial, then the pair remains intact. If not, the pair breaks up into a non-territorial male and a female, and both birds begin independent search for new habitats. All owls will immediately be subject to the probabilities of survival and fecundity associated with the altered landscape.

#### Survival

Mortality is assumed to result from either starvation or predation, and these factors are assumed to be additive. Both factors are linked to site. Total risk is simply ( $1$  - survival probability). Survival probability is

evaluated based on habitat quality of the site currently occupied. Because risks are assumed to be constant over the course of the year, if the year is broken up into  $l$  time-steps, the risk per step  $f$  or an owl in stage  $j$  occupying habitat type  $k$  is defined as:

$$R_{tj} = 1 - (1 - R_{jk})^{1/l}$$

where  $R_{tj}$  is the Risk per time step and  $R_{jk}$  is the yearly risk as defined for age class  $j$  and habitat class  $k$ . In pairs, the survival of each member is determined by their stage as well.

### Movement

The map is divided into a fixed array of grid cells, each cell representing one territory-sized unit. The grid is hexagonal to allow more realistic movement than is provided by a square grid (Pulliam et al. 1992, Lamberson and Voss, Personal communication). The rate of movement is dependent on the size of the grid cells and the number of time-steps per-year. Individual moves are restricted to adjacent cells. All of the mobile classes of owl (nonterritorial males and females) have the opportunity to move at each time-step. To ensure that certain birds or areas of the map are not given preferential access to open territories or mates, the order of movement is fully randomized at each time-step.

The model allows owls to search with 'intelligence'; that is, they may favor movement through good habitat and avoid bad habitat. Similarly, females move obligately to known territorial males and non-territorial males may be averse to crossing defended territories. This intelligent behavior is modeled by giving the owls absolute knowledge of the cell that they occupy and incomplete knowledge concerning the immediately adjacent cells. They have no knowledge concerning more distant habitat. This knowledge takes the form of a series of switches and weighing factors that condition the probability of movement (table 1).

The movement controls can be broken down into four types. The first is a simple switch. In this case, if the criteria are correct, behavior is obligate. The second is a probabilistic switch. In this case, switching is performed with a certain probability if the criteria are correct: the behavior is obligate but the knowledge is not absolute. The process of females finding mates in adjacent cells, for instance, is a probabilistic switch. The logic is to simulate events such as a female being attracted by the vocalizations of a neighboring, unmated male.

The third control type takes the form of weighing  $f$  actors. In this case, knowledge is assumed to be absolute, but the behavior is not obligate. Vegetation characteristics affect owl behavior by weighing the likelihood that an owl will move in a particular direction. Weighing factors work in the following manner. At each time step a dispersing owl can move into one of six adjacent cells or may remain in its current cell. The probability of movement into any cell is therefore initially  $1/7$ . This initial probability is then multiplied by each of the weighing elements. The product of all the cell probabilities times all the weighing factors is then scaled to sum to 1.0, and a cumulative distribution is created. A uniform random deviate is generated and its position in the cumulative distribution determines which choice is taken (table 2, Fig. 6).

Lastly, the model can simulate a variety of behaviors at the map edges. Three boundary conditions can be specified: absorbing, reflecting and wrap-around.

### Details of Movement Parameters

The following is a detailed description of the parameters listed in table 1.

1. Become territorial. This parameter specifies the probability that a male will choose a site having a specific habitat quality as an acceptable territory. If the male becomes territorial and is located by a female, pair formation is obligate. The model is very sensitive to this parameter because it effectively sets the carrying capacity of the landscape.
2. Aversion. A weighing parameter that determines the behavior of the owl when faced with a variety of potential habitat types in the adjacent cells. Higher quality sites therefore have a greater likelihood of being selected than lower quality sites.
3. Site fidelity. A weighing parameter that influences the owl's decision to remain in the existing cell rather than to moving into adjacent cells. This parameter is similar to aversion in intent, but aversion only has an influence if there is a choice. An owl completely surrounded by poor habitat will have no criteria by which to choose and the choice will be purely random. Setting a low site fidelity to poor habitat will, however, cause the bird to move through these areas more quickly.
4. Linear propensity. Sometimes called a straightening parameter, this weighing parameter works in the following manner: Each owl has a one-move memory; the direction that was taken in the last move will be multiplied times the directional

weighing parameter. A large value will, therefore, make the owl move in a straight line. It should be noted that if the owl's last move was to stay put, the directional parameter will tend to make it stay put. This tendency can be compensated for by shifting the values of the parameter controlling site fidelity.

5. Territorial aversion. It is assumed that non-territorial males will avoid existing territories. This weighing parameter sets the degree of aversion.
6. Female finds male.
  - a. Current cell. A switch - she obligately pairs.
  - b. Adjacent cell. This parameter sets the probability that the female will find a male that is territorial in an adjacent cell. It is a probabilistic switch. If the value = 0, she will never find him. If the value is 1 she will always find him.
7. Boundary condition. Boundaries are treated as consisting of cells having special properties. In the case of reflecting boundaries, an owl at the map edge will have totally unsuitable land in those directions that lead off the map. When choosing a direction to move, the bird will show total aversion to the boundary and will never enter it. This method ensures that an extra move is not necessary to explore the boundary. In the case of absorbing boundaries, birds that cross the boundary are considered to be dead. In this case, the boundary is defined in terms of the adjacent cells within the map. Wrap-around boundaries can be thought of as a proxy of an open system. A bird that exits one edge re-enters on the opposite side of the map. In this case the boundary is defined in terms of the habitats that the bird will enter on the opposite side of the map.

### Choosing a time-step

In this model, the probability of moving to an adjacent cell is a function of the condition of the local landscape and the biological propensities of the organism. Because transitions can occur at each time step, the number of time-steps per-year expresses an implicit rate of movement. Choosing the number of time-steps is not a casual process. Increasing the number of timesteps increases the velocity of travel. Choosing 40 steps rather than 20, for example, will double the potential number of territories that an owl can search. The critical question of scale involves the maximum possible dispersal distance before settling or death. The maximum recorded juvenile dispersal is 62 miles

(100 km) (Thomas et al. 1990). If each hexagonal cell is 1000 ha in size, the distance across the cell is 1.96 miles (3.15 km). This would suggest 32 time-steps (64 miles) as possible appropriate yearly search distance. The probability of moving 64 linear miles in 32 time steps is, however, rather unlikely. In fact, in a pure random search the probability of taking 32 steps in the same direction on a hexagonal grid is almost zero (9x10<sup>-28</sup>). The linear propensity (see above) would need to be set so high as to overwhelm all other movement considerations. The best way to determine whether a time-step is appropriate is to run the model using the desired movement parameters and compare the mean distance to death and distance to pairing produced by the model simulations to empirical data (Thomas et al. 1990:305, Table Pt).

### Fledging

Fledglings here refer to those that survive to disperse. It is assumed that there are good years and bad years for fledging. If it is a good year, then the pair produces fledglings according to a beta distribution ranging from zero to a specified maximum clutch size. There are therefore two levels at which variability can impact the number of fledglings. If the area of the beta distribution is concentrated close to the mean, then the population will pulse based on the frequency of good years. When a good year occurs, all of the pairs will produce about the mean number of fledglings. If the probability of a good year is set to 1.0, then variability in the number of fledglings will be on an individual nest basis and will be dependent on the shape of the beta distribution. The form of the beta distribution can potentially be unique for each land class and age class. Because this is a two-sex model, the sex ratio of fledglings is also adjustable.

### Random number generation

Because all of the model dynamics are controlled by the generation of pseudo-random numbers, it is important to test the randomness of the generator. The random number generator utilized in the model has passed a series of standard tests (Appendix).

### GIS interface

The model has a module that allows the user to generate maps for purposes of display and to analyze the effects of hypothetical landscape patterns on population dynamics. In addition, an automated link has been created between the model and vector-based Geographic Information Systems (GIS) to allow integration with actual vegetation maps. Using this

link, a hexagonal grid with size appropriate to the home range of the species being modeled is intersected with the map and the area of discrete vegetation types contained within each hexagonal grid-cell is analyzed to determine habitat quality. This allows for a rapid translation of vegetation data collected on a stand-level into habitat quality on scale of individual owl home ranges. Maps generated through the GIS interface can be modified at the home-range level using the mapping facilities included in the model. Maps created by the model can also be transformed into vector-based GIS maps. This ability to move information freely between the GIS and the model allows a dynamic interaction between land management decisions and the potential impact of those decisions on owl populations. A manager can manipulate vegetation at the stand level within a GIS and evaluate the impact of those changes on owl populations. Model output such as mean pair occupancy for each cell (output as a map), based on a large number of simulations, can then be overlaid over the stand-level map to determine which stands correlate with areas displaying either high or low occupancy rates.

## Results

The model was used to project population trends from five hypothetical landscapes with an identical number of suitable sites (Fig. 6-10). Other than habitat configuration, there were no differences in the initial values of any model parameters. The map boundaries were wrap-around so that the exact location of the habitat within the map frame was unimportant. The demographic parameters (Table 3) were set to yield a finite growth rate of 1.0 and were not modified by habitat quality. In these simulations only two habitat qualities were simulated: habitat suitable and habitat unsuitable for nesting. The movement parameters deviated only slightly from a random walk: birds were twice as likely to choose suitable habitat, males treated occupied habitats in a manner identical to unsuitable habitat, and birds were twice as likely to move in the same direction as to choose a different direction. These deviations from random behavior were chosen so as to improve search efficiencies on all maps. Extreme aversion to poor habitat will, for instance, be beneficial in highly grouped habitats since it will effectively confine the search to those areas that are acceptable for nesting. It is, however, detrimental in very dispersed systems since, in these systems, juveniles must cross poor habitat in order to explore the landscape. Weak selectivity will be beneficial in both systems. Strong habitat selectivity in juvenile dispersal is also not supported by dispersal studies (Gutierrez et al. 1985, Miller 1989) the literature. Similarly, a small increase in

the linear propensity has the primary impact of preventing useless searching caused by doubling-back.

### The effects of clustering

The model results support previous model results (Doak 1989, Thomas et al. 1990, Lamberson and Noon, unpublished) in showing that a clustered structure is both more efficient in terms of mean population level and more stable in terms of lowered extinction probabilities than is a random structure. A spatial analysis of mean pair occupancy demonstrated that the small degree of stability shown by the random system occurred in the upper left-hand portion of the map where the density of suitable territories, through random chance, was highest.

### The effects of shape

The shape of reserve areas also has an important impact on their stability properties. A cluster with a low edge-to-area ratio (Fig. 8) is more stable than continuous clusters with identical area but with varying degrees of irregularity. (Fig. 9-10) The population trend for the large, highly irregular cluster (Fig. 10) is similar to the system of three small clusters (Fig. 7).

### Source-sink relationships

The previous results demonstrate the impact of reserve configuration when each landscape cell is either suitable or unsuitable for breeding and the survival rates are constant for all sites. In actual landscapes, the habitat lies along a quality gradient, from ideal to totally unsuitable. Within this gradient, there will be source locations that, on average, produce an excess of individuals and sink locations into which some of these juveniles will settle. The choice of settling point may well be globally sub-optimal (Pulliam 1991). An organism has no means to ascertain the availability of habitat except through experience and exploration. In this model, this process is simulated by varying the settling parameter. This parameter, which only applies to males (see Fig. 2), defines the probability that a bird will settle and become territorial in the site that it currently occupies. To test the effects of a reserve design embedded in a landscape that is marginally suitable to one that exists in a completely unsuitable landscape, a small reserve system was created and simulations were performed using two rule sets (Tables 3,4). All parameters were the same except for the settling rate for areas exterior to the reserve.

The presence of marginal habitat adjacent to reserves can have a negative impact on the stability of the

reserve system (Fig. 11,12). Even though the mean population size is larger in the source-sink system, the mean occupancy of the reserve clusters is lower and the variability of the system increases with time, leading to increased risks of extinction.

## Discussion

### *An analysis of model behavior*

A great deal of the behavior of any model is dictated by its structure, and this model is no exception. It is, in essence the sequel to a series of models originating with Lande's non-spatial deterministic model (Lande 1987, 1988), followed by dynamic versions in Thomas et al. (1990) and expanded in Lamberson et al. (in press) and Lamberson and Noon (unpublished ms).

This model differs from traditional stage structured population models (Begon and Mortimer, 1981; Getz and Haight, 1989) in many ways including the modeling of both reproductive and nonreproductive life history stages. In comparing a simple stage structured model with the landscape model (compare Figs. 1 and 13) pair survival differs because, in the spatial model, both members need to survive in order for the pair to survive. The probability of a pair breaking up is therefore one minus the square of the adult or sub-adult survival rate (Fig. 1).

Flow rates between the reproductive and non-reproductive stages depend on survival rates, but movement from the nonreproductive states into the reproductive classes is mitigated by the probability of pair formation  $P(p)$  (Fig. 1). As  $P(p) \rightarrow 0$ , entry into the reproductive population also  $\rightarrow 0$ , and the population will decline. As  $P(p) \rightarrow 1$ , the non-reproductive vector empties and the model collapses into the reproductive classes.  $P(p)$  is the parameter through which spatial relationships impact the life history of the organism.

$P(p)$  is closely related to the probability of finding a suitable site. For males, a suitable site is defined by the cell's quality and occupancy status. For females, suitability is defined by the presence of a territorial male. Even though the criteria are different, the search process is similar.

In an unconstrained random walk, and allowing a fixed number of cells to be searched, the probability of searching a cell declines rapidly with distance from the point of origin (Fig. 14). If the total number of cells searched is increased, the probability of searching a cell increases slowly and asymptotically (Fig. 15). For this reason, distance dominates search probabilities (Fig. 15,16). The model is, therefore, reasonably

insensitive to changes in search velocity and extremely sensitive to the spatial positions of the reproductive pairs in the landscape.

In the model, birds search with a fixed survival probability, rather than searching a fixed number of times as has been the case in other models (Lande 1987, Thomas et al. 1990, Lamberson et al. in press, Lamberson and Noon unpublished). This difference, however, is unimportant to the model dynamics: equivalent search functions can be generated using either approach (Fig. 17).

$P(p)$  will decline if the population is high, because unoccupied sites will be scarce and will tend to lie in areas that are distant from large groups of reproductive pairs.  $P(p)$  will also decline if the population levels are low, because searching females will have difficulty finding territorial males.  $P(p)$  will decline as the population becomes more diffuse. As a result, any actions that cause the mean distance between reproductive pairs to increase will therefore always impact the finite rate of increase of the population.

Model behavior at high population levels is qualitatively similar to a logistic model. At low densities, however, the models diverge. The logistic model assumes that population response will be most robust (the ratio of birth/death will be largest) when the population is depressed. If search is explicitly modeled, there are positive benefits associated with density. When the density drops in the context of abundant habitat, territorial males may go unpaired due to the low density of females: females will not locate males and form pairs before they die. If, in addition, low population densities are associated with long distances between potential territories, as is the case when habitat is fragmented, then the ability of the males to find territories will be reduced as well. This model, and all of the models following Lande (1987) will therefore have threshold points defined by population density and degree of habitat fragmentation at which the population will collapse. Population instability has sometimes been introduced into traditional models by incorporating an 'Allee effect' (Allee 1931; Noy-Meir 1975), but the correct functional form and strength of this effect is not clear. In this model, the 'Allee effect' occurs naturally as a direct result of search.

### Fecundity

The population birth rate  $B$  is also affected by costs associated with search:

$$B = b * P(m) \quad (2)$$

$$P(m) + f(s,e,P(p)) \quad (3)$$

where

$B$  is the population birth rate,  
 $b$  is the measured birth rate for paired females,  
 $P(m)$  is the probability that a female has a mate, and  $s$   
 is the adult survival rate.

$P(m)$ , represents the balance between pair break-up and pair formation. Pair break-up is a function of the adult survival rate which is based on site quality, and is assumed to be density independent (the presence or absence of adults on the same site or in adjacent sites has no impact on the parameter value). The rate of pair formation is controlled by  $P(p)$ .

If  $b$  is constant, then  $B$  will simply follow  $P(p)$ . It is this decline in  $B$  that causes diffuse populations to collapse (Fig. 6) even when there are no decreases in survival probability associated with search.

### Questions of scale

Fragmentation has the impact of altering phenomenon which are dependent on contagion. Contagion can have effects that are either positive or negative. The success of females searching for territorial males is positively affected by contagion. The negative consequences associated with disease or the spread of fire are also dependent on contagion. Fragmentation is not, therefore, negative per-se. Its consequences, good or bad, are solely dependent on the extent to which it affects various contagion-related phenomena. Contagion phenomena will always be scale dependent - and these dependencies will be rooted in the biological and physical properties of the phenomenon. Fire, for instance, can be effectively stopped by a rather narrow fire break. This fire break may have absolutely no impact on the dispersal efficiency of a large raptor, but may represent an absolute barrier to a salamander. Similarly, a disease that depends on direct transmittal could easily be controlled by producing a fragmentation pattern that separated the members of the species in question. If, however, the disease were vectored through a prey item, then fragmenting the system would only be an effective method of disease control if it reduced the encounter rate between the predator and its infected prey.

When modeling spatial phenomenon, it is necessary to choose an explicit spatial scale at which to model. Smaller scales will need to be implicitly modeled through indices - and these indices may, themselves be scale dependent. In this model, each home-range-sized polygon is given a quality index, and this index is in turn linked to fitness values. For modeling the

spotted owl, the explicit scaling is very large (1000 ha) - based on the average size of individual owl home ranges. The fragmentation of vegetation on the landscape, however, is on the order the size of timber sale units (about 10 ha). If, for example, the quality index for a home range were based on the acreage of suitable habitat within the home range, all spatial patterning below the size of the home range would be ignored by the model. Any home range with 50% owl habitat will be modeled as being of equivalent quality (equal values for mortality, aversion, etc.) regardless of the pattern of the remaining habitat within the home range. If spatial patterns within the home range are thought to be important, then they must be incorporated into the home range quality index through the use of spatial statistics such as average patch size or fractal dimension. Because fragmentation is only explicitly modeled at the broadest scale, fragmentation at lower scales may have impacts both positive and negative that are not represented by model behavior.

### Territories as islands

Territories can be thought of as small islands, each having a maximum of one reproducing pair. Like islands, they have spatial dimension - they occupy a certain area of the map. And, like islands, when they experience local extinction (in this case one or both members of the pair either dies or emigrates), they must be recolonized through immigration from owls outside the territory or by an existing, non-territorial floater population within the territory.

The concept of territories as individual islands is key to the dynamics of clusters in the model. Larger reserves can be thought of as an archipelago in which all of the islands are very close to one another. Fragmenting the landscape has the effect of moving the islands further apart.

The loss of a reproducing pair is, in effect, a local extinction. The rate of recolonization of an individual territory will be dependent on the spatial arrangement of the habitats and the fecundity of the reproducing pairs; that is, how many individuals are looking for territories or mates and the likelihood they will find the site in question.

Typical yearly adult survival for spotted owl adults ranges between 0.81-0.92 (Thomas et al. 1990: 230-231). The pair survival rate (both members survive) will therefore range from 0.72 to 0.84. When the probability of search by dispersing juveniles falls below the pair survival rate, juvenile dispersal mechanisms will not be sufficient to maintain the population of pairs at their habitat-based carrying capacity. The system will

become dependent on recolonization by non-territorial adult floaters, that are already on-site. As pairs are lost due to local extinction, this will increase the distance between reproductive pairs, further increasing the disparity between extinction and colonization rates. In the absence of a balance between the rates of pair loss and reestablishment, the population will unavoidably tumble towards extinction.

### *The role of clusters*

From a modeling standpoint, a system of clusters is more stable than a diffuse system because the clusters produce regions where search efficiency is maximized. In a cluster of suitable territories, a population can recover from low levels because  $P(p)$  will remain high. That is, because all of the remaining members of the population remain close, the impacts on  $P(p)$  are minimized and the model behaves like a traditional population model, exhibiting positive growth rates when occupancy is reduced. Dispersing males have a high probability of finding habitats immediately adjacent to existing pairs. Dispersing females will more easily find the territorial males because of their adjacency. The key to successful clusters is clearly to make the clusters large enough to avoid high levels of extinction at the cluster level. In practice this means that each cluster's carrying capacity should be large enough that normal population declines driven by environmental and demographic stochasticity do not drive the population down to levels at which random extinction is likely. Looking only at demographic stochasticity, this would suggest a minimum cluster population size of approximately 20 breeding pairs (Richter-Dyn and Goel 1972).

### *The effect of shape*

The negative impacts caused by cluster irregularity are also due to habitat search. A circular cluster of suitable habitat minimizes the distance between clusters. All other geometric forms will have reduced  $P(p)$  when compared with the a circular cluster. The impact of cluster irregularity are, in fact, probably more pronounced than is indicated by figures 8-10. In these simulations, the risks associated with crossing poor quality habitat were identical to those encountered in suitable habitat. If greater risks were encountered in the poor habitat, the effects of irregular cluster shape would be accentuated.

### *Source-sink dynamics*

The increase in variance that is observed in systems containing marginal habitat for nesting (Fig. 12) is due primarily to the increased variance in adult survival

rates. If nesting is restricted to the clusters, the population will equilibrate with a relatively constant proportion of the adult population within the clusters and dispersing through the matrix. Changes in the population vital rates will, therefore, be bounded by the levels of environmental and demographic stochasticity, and population variability will remain reasonably constant over time.

When breeding occurs exterior to the clusters, the population becomes more dynamic. Both the vital rates and the spatial configuration of the population will be dependent on the proportion of the population that exists exterior to the reserve structure. If a large number of the breeding pairs lie exterior to the reserve, not only will the overall survival rates decline, but the system will also become diffuse, lowering  $P(p)$ . The bounds on the population growth rates will therefore be set by both the proportion of the breeding population found exterior to the reserve and the levels of environmental and demographic stochasticity. Because the model runs are begun with all of the birds within the reserve structure, variability increases over time (Fig. 12).

The decline in mean occupancy levels in the source-sink system is due to decreased interaction between clusters. Dispersing juveniles that settle exterior to the reserve would, if this option were not available, continue searching and some of them would become pairs within the clusters. This outcome suggests that a reserve design may be more stable if the boundaries between the reserve and the surrounding landscape are very distinct. Maintenance of sink areas exterior to the reserve system may lead to sub-optimal choices on the part of dispersing juveniles.

## **Summary**

A model containing explicit links to landscape vegetation patterns was created. Its results are consistent with previous models based on search efficiency (Lande 1987, 1988, Doak 1989, Thomas et al. 1990). An analysis of the model structure demonstrates that this model form will favor clumped reserve structures over diffuse structures due to the inherent geometric properties of the search function. The model results and subsequent analysis indicate that land management policies that increase fragmentation are extremely detrimental to territorial populations because the uncertainties of successful search cause the population dynamics in reduced populations to experience reduced rates of territory recolonization. Low population levels in fragmented systems will not, therefore, exhibit the strong upward population pressure inherent in traditional density-dependent models.



Recovery will be slow and difficult and, at a specific level of fragmentation, impossible.

Negative impacts associated with fragmentation can be mitigated by clustering reserves. Clusters will display greater search efficiencies and will be more stable than a random diffuse system with equal acreage in suitable habitat.

In addition to supporting these general conclusions, this model extends the capabilities of previous models through its ability to directly model the irregular and patchy habitat configurations found in real landscapes. It also allows for a gradient of habitat quality and ties risk and movement rules directly to that gradient. These properties allow owl demographics to be based directly on map information held in GIS systems, and allows the modeling of populations in spatially dynamic landscapes.

## Model Implementation: The BLM in Oregon

### Parameterizing the Model:

All of the landscapes used up to this point have been hypothetical. In order to link the model to actual landscapes, links must be made between the configuration of the landscape and its quality as owl habitat. Because this linkage is performed through the use of a GIS database, the landscape attributes must be chosen from those available within the GIS. In order to facilitate this process, Jon Bart, chairman of the Northern Spotted owl Recovery Team, looked to the available data to determine those habitat attributes that were linked to specific demographic information. The attribute that best correlated with survival, fecundity, and nest density of owls was the amount of mature forest within a region of the map surrounding the owl nest-site. For modeling purposes we translated this into the proportion of mature forest within a home-range-sized area, a hexagonal area 1000 ha in size.

Dr. Bart drew together the available data and constructed functions for survival and fecundity and the probability of nesting based on the amount of mature forest in a home-range-sized area. These relationships were discussed at a series of meetings with a group of biologists employed by the Forest Service, Bureau of Land Management, and private industry.

our purpose was to utilize these parameters, in conjunction with projected management plans, to look at

future forest conditions and to evaluate the efficacy of those plans in terms of the maintenance of owl populations. Our primary purpose was comparative: we wished to evaluate and ordinarily rank the management plans, not to attempt to predict the number of owls within the landscape in 100 years. There are enormous uncertainties concerning the reliability of the habitat relationships, the recovery time for stands that are cut, and patterns of land utilization on those lands not controlled by the *BIM*. The model results should therefore be interpreted conditionally: given that the tree growth rates, habitat relationships and owl behavior patterns occur exactly as specified, the plans produce the following number of owls in the following locations 100 years into the future.

Because of these uncertainties, we ran the model for each management alternative using 3 sets of parameters. Each was based on Dr. Bart's original parameters (Table 5, Fig. 18), but the parameters were shifted: In the second set, the parameters associated with >60% mature forest also were true for cells with 40-60%. In the third set, these parameters were true for stands having >30% suitable habitat. All other parameters were similarly shifted (Fig. 19). This shifting, in effect, changed the evaluation of the landscape, but did not change the behavior of the owls within habitat of a specific quality. Viewing the landscape as a system of sources and sinks, in Dr. Bart's rule set only homerange areas with > 60% mature forest are considered sources. In the second rule set Home range areas with >40% mature forest are sources, and in the third set home-range areas with >30% mature forest are sources. Dr. Bart's original rule set will therefore produce the lowest number of owls. The other two model runs are less pessimistic.

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## Appendix

1. Moments. The first, second and third moments for a uniform random distribution should be 1/2, 1/3, and 1/4 respectively. Typical output for  $n = 1,000,000$  are 0.5002, 0.3335, 0.2501 respectively.
2. Uniformity. In this test random numbers are generated and cast into a series of bins, based on their value. This test was run with 100 bins and a Chi-Square test was performed against the assumption that all bins would be equal in value. Typical values for  $n = 1,000,000$  are  $< 1.0$ ; The 0.05 critical value is approximately 120.
3. Pairs. This test looks at first order sequential correlation. Sequential pairs of random numbers are produced and binned based on their value. Ideally, all pairs should be produced with equal frequency. In this case the pairs were binned into a 10x10 matrix. A ChiSquare test was performed against the assumption that all matrix elements are equal in value. Typical values for  $n = 1,000,000$  were  $< 2.0$ . Again, the 0.05 critical value is approximately 120.
4. Runs. This test looks at the overall degree of sequential correlation between random numbers generated. In this test, random numbers between 0 and 1 are generated and are rounded to 0 or 1 based on their value. As these numbers are produced they are grouped into 'runs'. 00010, for instance would have a run of 3 and two runs of 1. The run lengths are collected and, after a large number of random numbers has been produced the question is asked: is the population of runs generated significantly different than would be expected based on the binomial distribution. Here again, a ChiSquare test of  $f$  it was used to test for runs  $\leq 30$  elements in length. Typical values for  $n = 1,000,000$  ranged from 15-20. The 0.05 critical value is 41.3.
5. Period. All random number generators produce pseudorandom numbers in a deterministic cycle of finite length. The period of a random number generator refers to the length of the cycle. To test for the period, the random number generator is 'seeded' with a value and then is looped to produce random deviates until the 'seed' value is reproduced. The maximum period for a generator is, therefore, determined by the number of bits set aside to hold the seed, but may be less if the generator is improperly constructed. For the generator used in the model, the number of bits = 32, and the observed period is  $2^{32} = 4.3$  billion. other tests can be run, but based on these results, there is no reason to assume that any non-random characteristics of the random number generator will have a significant effect on the model performance.

Table 1. A summary of factors that can affect an individual's movement in the model.

Factor	Based on	Sex	Form
Become Territorial	Habitat Quality/Occupancy	M	Probabilistic Switch
Aversion	Habitat Quality	M/F	Weighting
Site Fidelity	Habitat Quality	M/F	Weighting
Linear Propensity	Behavior	M/F	Weighting
Territorial Aversion	Occupancy	M	Weighting
Female Finds Male (Current Cell)	Occupancy	F	Absolute Switch
Female Finds Male (Adjacent Cell)	Occupancy	F	Probabilistic Switch
Global Boundary	—	M/F	—

Table 2. An example of the process used to determine movement in a heterogeneous landscape. If 0.448 were generated randomly, then direction 4 would be chosen. Direction 3 is never chosen.

Direction	The Initial vector	Weighing factor	Scaled vector	Cumulative Probability
1	0.143	0.900	0.143	0.143
2	0.143	0.600	0.095	0.238
3	0.143	0.000	0.000	0.238
4	0.143	1.000	0.159	0.397
5	0.143	1.000	0.159	0.556
6	0.143	1.900	0.302	0.857
7	0.143	0.900	0.129	1.000

**Table 3.** List of the parameter values used for the simulations. Parameters were chosen to produce as optimistic an estimate of owl survival as could be supported by these data. Parameters only varied with site quality where explicitly stated.

Parameter	Value	Source
Juvenile survival	0.29	Franklin et al. 1990
Sub-adult survival	0.935	Thomas et al. 1990
Adult Survival	0.935	Thomas et al. 1990
Birth rate	0.335	Franklin et al. 1990
Aversion	1.0, 0.5 <sup>1</sup>	
Boundary	Wrap-around	
Linear propensity	2.0	
Site fidelity	0.5	
Territorial aversion	0.5	
Female finds male	0.5	
Time-steps	40	
Runs	30	

<sup>1</sup>Only two habitat types were placed in the map, one representing the best habitat and the other representing the worst. This split corresponds to suitable/unsuitable designations found in past models.

**Table 4.** List of the parameter values used for the cells exterior to the habitat reserve (Fig. 11, 12). Parameters within the reserve, as well as general parameters that pertain to all cells are presented in Table 3. Parameters are those calculated for measured a demographic study, Roseburg, Oregon.

Parameter	Value	Source
Juvenile survival	0.219	Thomas et al. 1990
Sub-adult survival	0.588	Thomas et al. 1990
Adult Survival	0.812	Thomas et al. 1990
Birth rate	0.310	Thomas et al. 1990

Table 5. Rule set used for simulation of BLM management alternatives. Values for sub-adult and adult survival, and probabilities of pair formation are based on values derived by Dr. John Bart.

	Land Classification (percent)				
	<20	20-30	30-40	40-60	>60
<i>Survival</i>					
Juvenile	0.20	0.29	0.29	0.29	0.29
Sub-adult	0.38	0.38	0.41	0.45	0.50
Adult	0.75	0.76	0.82	0.90	0.96
<i>Fecundity</i>					
Adult	0.00	0.34	0.34	0.34	0.34
<i>Movement</i>					
Nesting prob.	0.13	0.40	0.55	0.83	1.00
Aversion	0.30	0.50	0.70	0.90	1.00
$\lambda$					
Non-breeding	0.75	0.76	0.82	0.90	0.96
Breeding	0.75	0.80	0.87	0.94	1.01

## LANDSCAPE MODEL

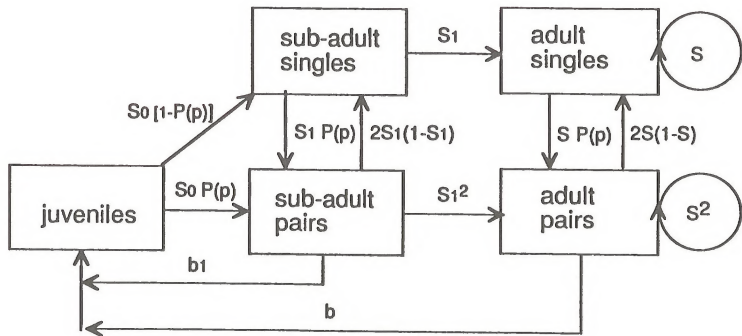


Figure 1. Flow diagram of the life history structure used in the landscape model.  $P(p)$  is the probability of pairing.

## MALE MOVEMENT

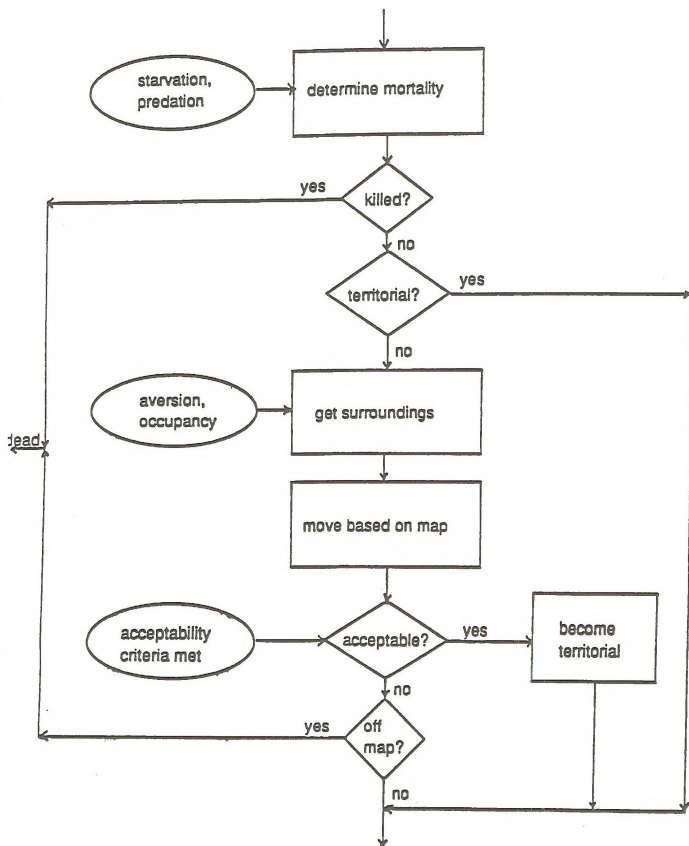


Figure 2. Flow diagram representing the process of determining male behavior at each time step in the model.



## FEMALE MOVEMENT

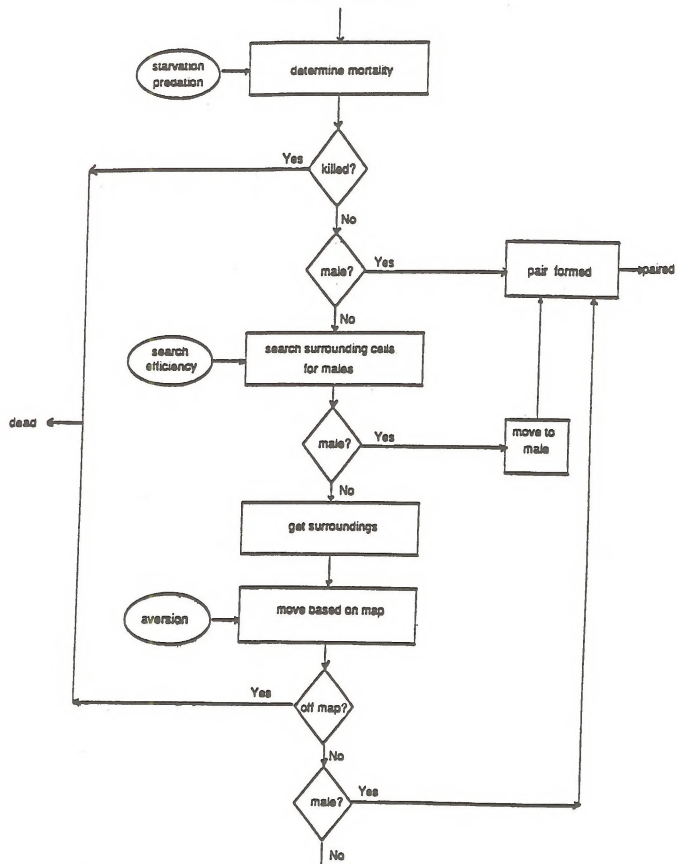


Figure 3. Flow diagram representing the process for determining female behavior at each time step in the model.

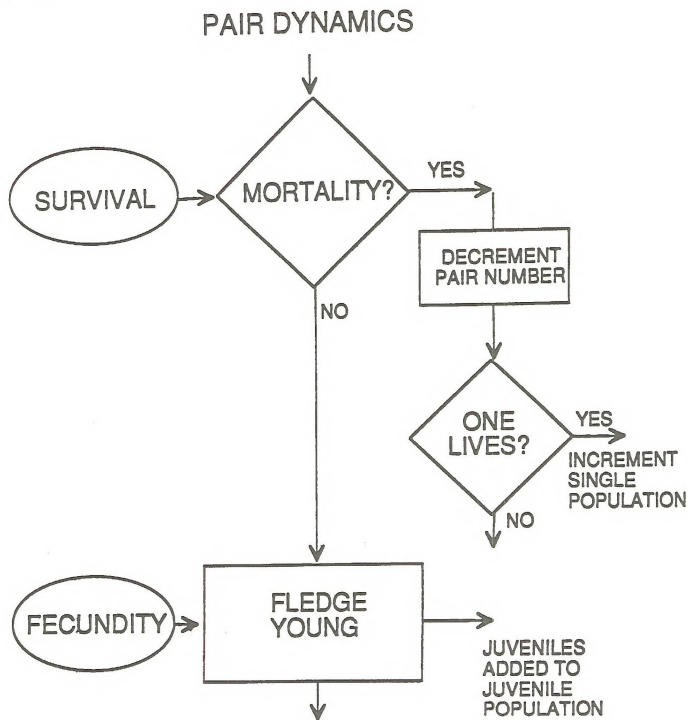


Figure 4. Flow diagram representing yearly pair dynamics. Pairs only remain reproductive if both members survive.

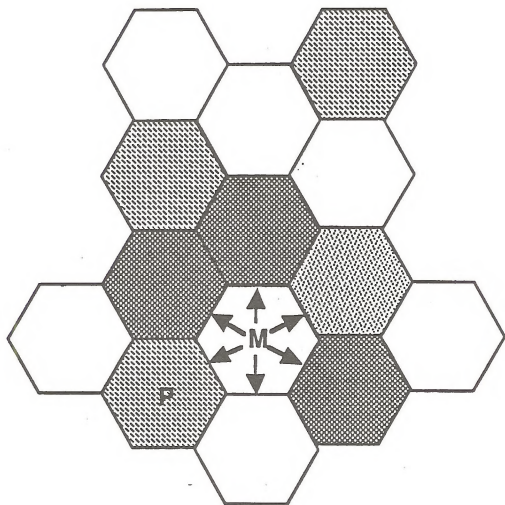


Figure 5. The arrows represent the potential choices for a male in a heterogeneous landscape. The move will be based on a probability vector conditioned by the different qualities of the choices.

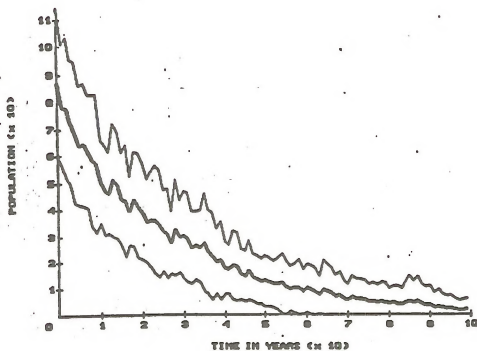
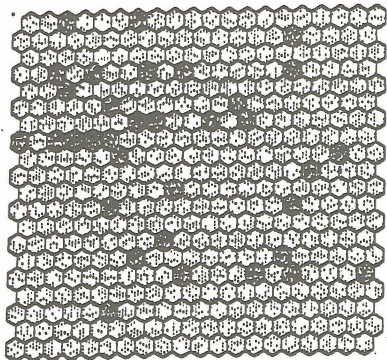


Figure 6. Model simulation showing a simulated landscape with suitable habitat randomly scattered. The results are based on 30 simulations. The heavy line represents the mean population, the thin lines are one standard deviation from the mean.

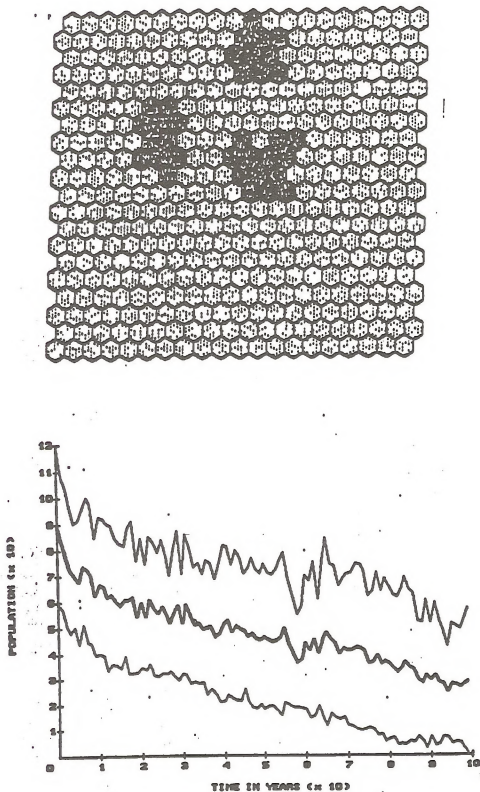


Figure 7. Model simulation showing a simulated landscape with suitable habitat arrayed in three small blocks. The results are based on 30 simulations. The heavy line represents the mean population, the thin lines are one standard deviation from the mean.

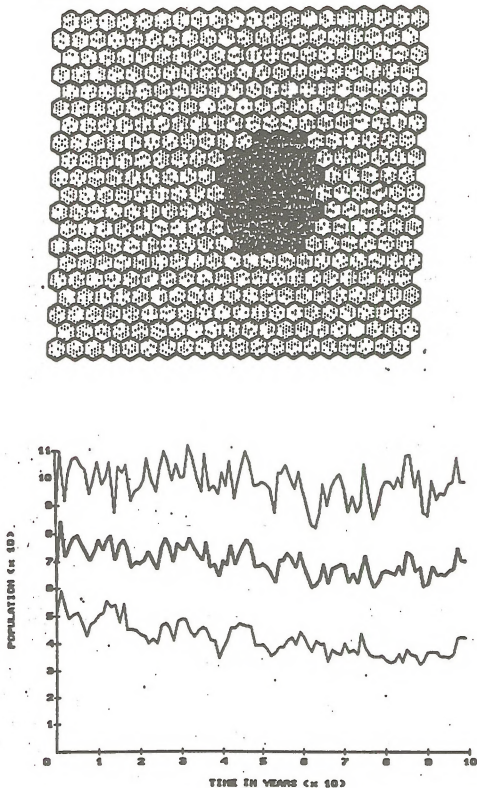


Figure 8. Model simulation showing a simulated landscape with suitable habitat arrayed in one large regular block. The results are based on 30 simulations. The heavy line represents the mean population, the thin lines are one standard deviation from the mean.

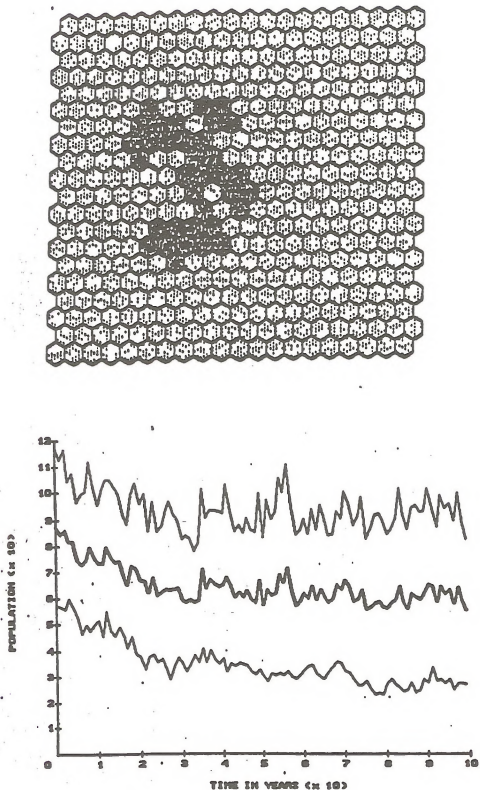


Figure 9. Model simulation showing a simulated landscape with suitable habitat arrayed in one large irregular block. The results are based on 30 simulations. The heavy line represents the mean population, the thin lines are one standard deviation from the mean.

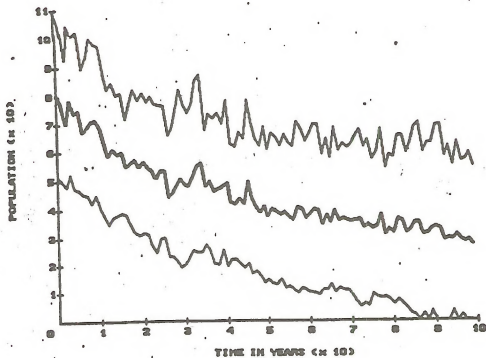
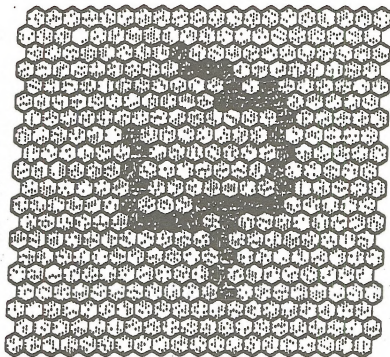


Figure 10. Model simulation showing a simulated landscape with suitable habitat arrayed in one very irregular block. This block is similar in form to reserves that consist of riparian corridors. The results are based on 30 simulations. The heavy line represents the mean population, the thin lines are one standard deviation from the mean.



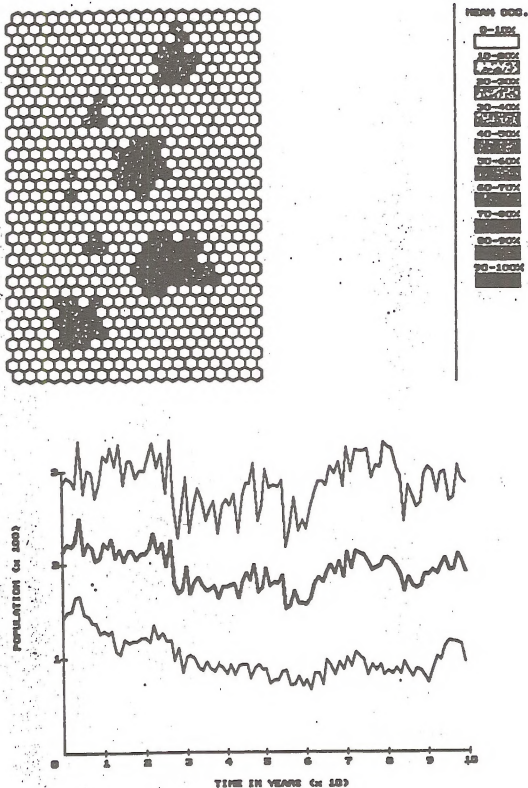


Figure 11. Model simulation showing a simulated landscape with suitable habitat with a reserve system consisting of clusters of suitable habitat surrounded by unsuitable habitat. The population was initialized results are based on 30 simulations. Mean occupancy is the proportion of the time that pairs occupied the site. The heavy line represents the mean population, the thin lines are one standard deviation from the mean.

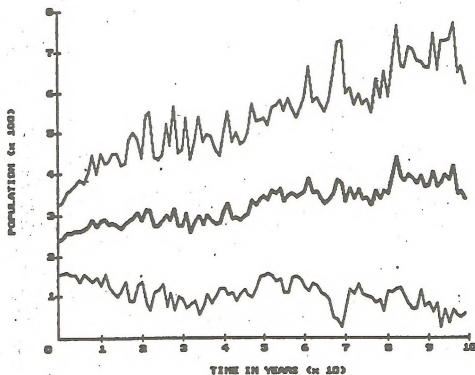
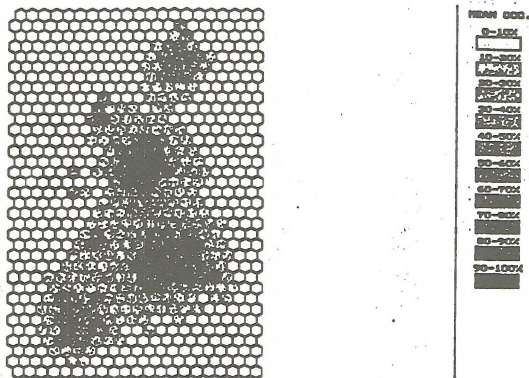


Figure 12. Model simulation showing a simulated landscape with suitable habitat with a reserve system consisting of clusters of suitable habitat surrounded by marginal habitat. The population was initialized results are based on 30 simulations. Mean occupancy is the proportion of the time that pairs occupied the site. The heavy line represents the mean population, the thin lines are one standard deviation from the mean.

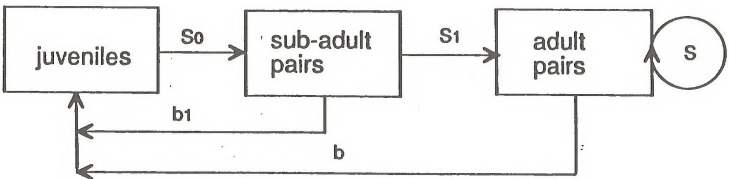
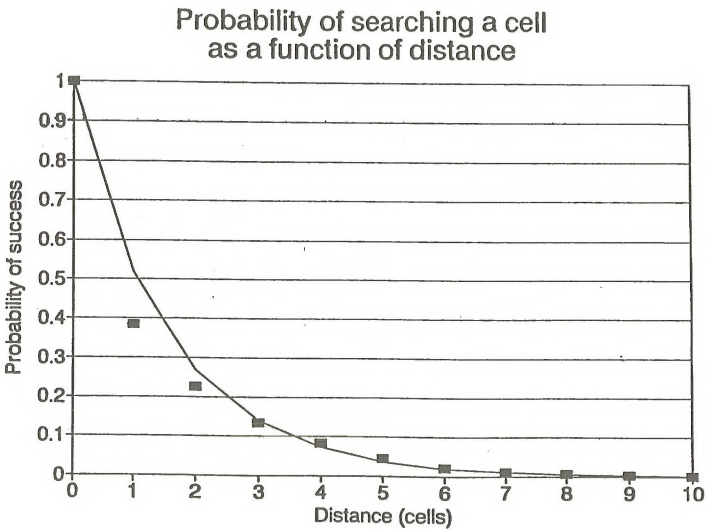


Figure 13. A flow diagram representing the life history structure used in  $s$  linear stage-structured matrix model.



*Figure 14. The probability that an organism searches a cell given 20 searches. The search pattern is a pure random walk. The line is a best-fit exponential function.*

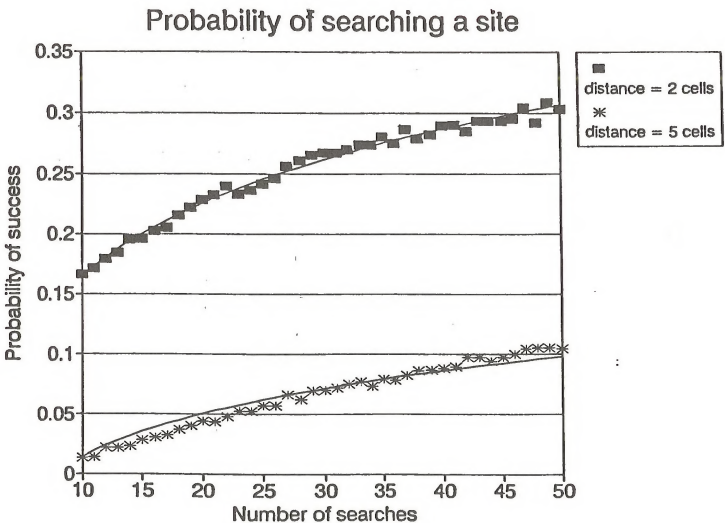


Figure 15. The probability of searching a site, changing the number of searches. The probability of searching a site 2 cells away is greater given 10 searches than the probability of searching a site 5 cells away is given 50 searches.

## PROBABILITY OF SEARCHING A CELL

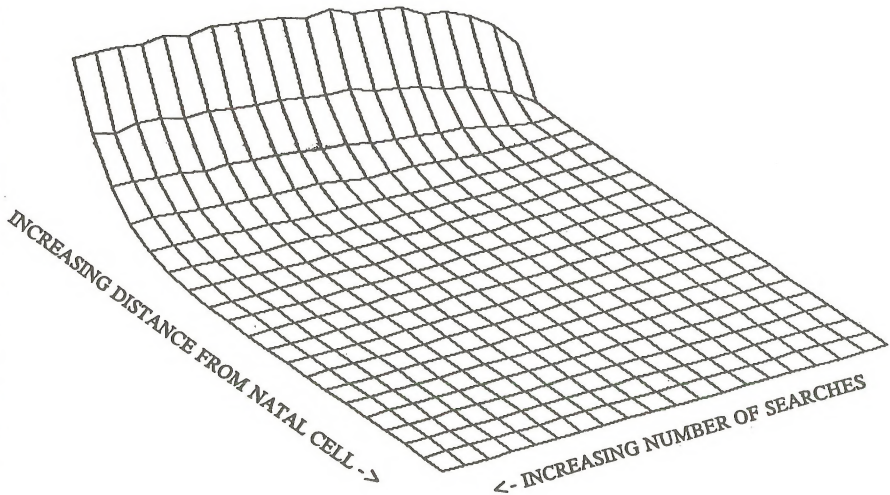


Figure 16. A three dimensional representation of the probability of searching a cell. Distance from the natal cell dominates the probability function.

Probability of searching a site  
distance = 2; yearly survival = 0.3

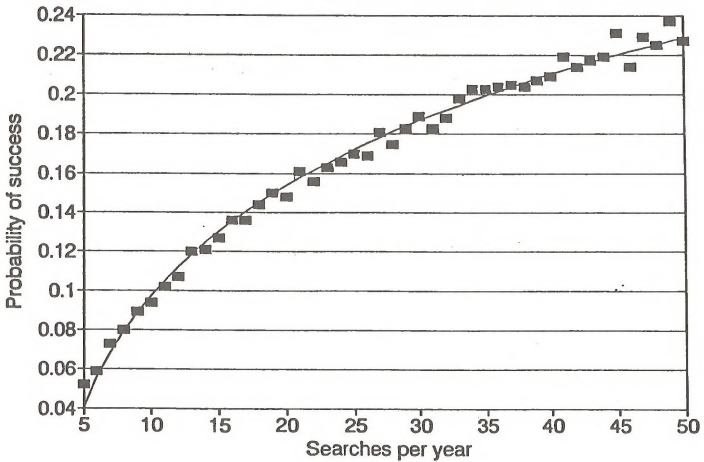


Figure 17. The probability of searching a site with constant mortality. Here, the yearly risk is pro-rated across the number of steps-per-year. The bird searches until the target call is found or the bird dies.

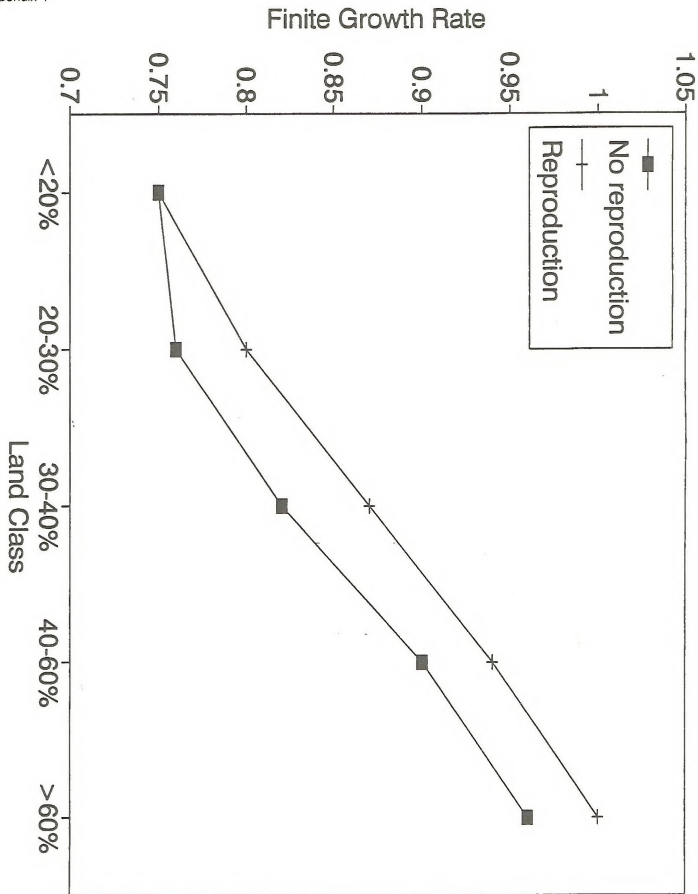


Figure 18. The modeled finite rate of increase ( $\lambda$ ) associated with a population of spotted owls occupying habitat having varying percentages of mature forest. Values derived from parameters presented in Table 5.



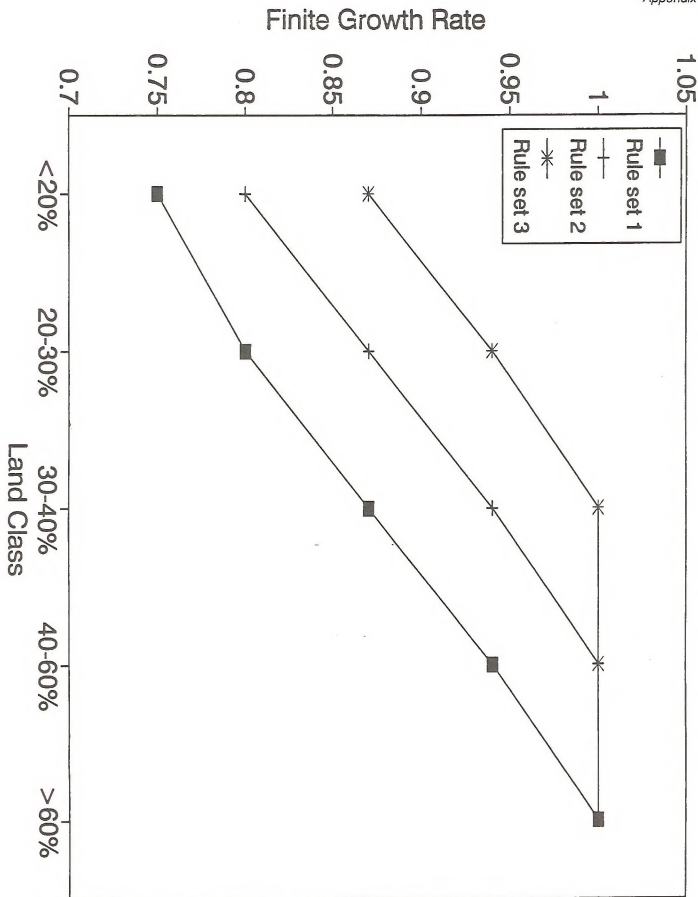


Figure 19. Modeled  $\lambda$  associated with habitat quality. Rule set 3 shows the least sensitivity to the quantity of suitable habitat on the landscape.

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