HAMILTON CREEK

WATERSHED ANALYSIS

Version 1.0

March 20, 1995

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INTRODUCTION

With the April 1994 *Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl (SEIS/ROD),* the Bureau of Land Management has adopted an ecosystem approach to forest management. The goal of this approach is to protect and sustain forest ecosystems. As discussed in the SEIS/ROD and *A Federal Agency Guide for Pilot Watershed Analysis* (January 1994), Watershed Analysis is designed to develop and document a scientifically based understanding of the processes and interactions occurring within a watershed for the purposes of making sound management decisions. The Salem District Proposed Resource Management Plan/Final Environmental Impact Statement (PRMP/FEIS) describes Watershed Analysis (pages S-6 and 2-11 through 2-16) as one of the principal means to be used to meet ecosystem management objectives identified in the PRMP.

Watershed analysis is an ongoing, iterative and evolving process. The Hamilton Creek Watershed Analysis has been prepared as a dynamic document, with the intention to periodically revise and update the analysis as new information becomes available. This analysis, in its current version, has been developed to conform with direction for watershed analysis during initial year (1994-1996) implementation, as specifically stated in the SEIS/ROD, page 56.

The Interdisciplinary Team assigned to analyze the Hamilton Creek Watershed Analysis Area (WAA) adopted the following process to comply with the intent of watershed analysis in initial year SEIS/ROD implementation. This process allows for a timely completion of an initial phase of watershed analysis, and provides sufficient information to ensure that management decisions will be consistent with the PRMP/FEIS and Aquatic Conservation Strategy Standards and Guidelines.

1. Identify Key Questions relating to known or suspected significant resource management concerns within the WAA.

2. Identify legal mandates and management objectives, standards and guidelines for federal lands and for the various private landowners within the WAA.

3. Examine the historic and current resource conditions, processes, and uses within the WAA, as necessary to address Key Questions. Identify additional questions and information gaps resulting from this examination.

4. Identify Expected and Desired Future Conditions (DFC) and trends within the WAA. Expected Future Conditions are generally those conditions and trends that may be expected either as a result of, or in spite of, current management influences and resource conditions. DFCs are designed to describe desired resource conditions based on estimated historic conditions, scientifically based assessments of healthy, functioning ecological relationships and processes, and as influenced by management objectives.

5. Identify opportunities and potential short and intermediate term targets for achieving DFCs.

This document summarizes a large quantity of information and detailed analysis of complex issues and interrelationships. Additional information contributing to this analysis is included in Appendix B, Watershed Analysis Team Technical Reports, and the Hamilton Creek Watershed Analysis file, maintained in the Santiam Resource Area Office.

MANAGEMENT DIRECTION

Lands within the Hamilton Creek WAA are managed by many landowners under a variety of management objectives.

Private Lands

Primary non-federal landowners are private industrial forest land managing firms. Management objectives for most industrial forest landowners have been sustained yield forest management and achievement of economic objectives of the respective management firm. Assumptions made in this analysis regarding activities on private industrial forest lands are based on observed past and current management practices, verified by local contacts and other information as available. Unless otherwise stated or indicated by new information, assumptions in the Hamilton Creek Watershed Analysis are that industrial forest lands will continue to be managed for timber commodities on a sustained yield basis, in compliance with provisions of the Oregon Forest Practices Act (FPA), with a rotation age averaging 50 to 60 years.

An estimated 475 acres, primarily concentrated along the western portion of the WAA, is managed for agricultural commodity production and smaller residential parcels. Management objectives for nonindustrial lands vary widely, and include intensive short-rotation forestry, Christmas tree farming, agriculture, and residential use. A basic assumption of management of these lands is that current residential land use will continue, and that non-residential forest and agricultural lands will be managed to meet current market conditions with intensive, short-rotation (4 to 10 year) forest product or annual agricultural crop production.

The BLM will attempt to integrate management efforts of interested private land holders to help conserve and restore natural ecosystems. Local landowners of record were notified of BLM's watershed analysis effort in the Hamilton Creek area. The BLM will use any information received as a result of these contacts where appropriate in developing and implementing projects identified in the WAA. A record of all public comments received is included in the Hamilton Creek Watershed Analysis file.

State of Oregon Administered Lands

State of Oregon lands are managed to provide a continued source of revenue to counties, state general fund, and common school fund, manage forests on a sustained yield basis, and to comply with state and federal endangered species laws.

BLM-Administered Lands

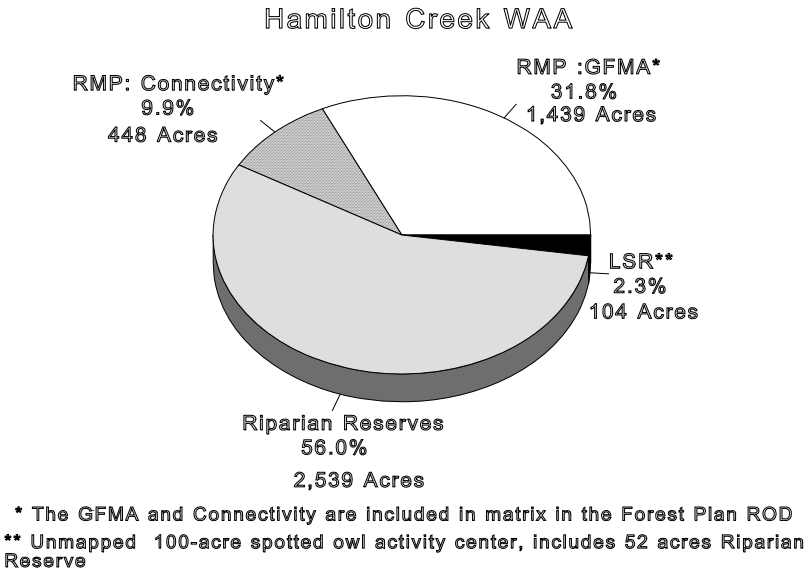
The SEIS/ROD specifies general management objectives, standards and guidelines for federal lands designated under various land allocations. Of the seven land allocations identified (SEIS/ROD pp. 6-7), three allocations -- Matrix, Riparian Reserve, and Late-Successional Reserve (LSR) -- are represented within the Hamilton Creek WAA.

In addition to land allocations, the SEIS/ROD designates federally administered lands into one of three watershed categories: Tier 1 Key Watersheds, Tier 2 Key Watersheds, and non-Key Watersheds (SEIS/ROD, p. A-5). The Hamilton Creek WAA is located entirely within lands designated as non-Key Watershed.

The SEIS/ROD further stipulates that standards and guidelines identified in individual land use plans will apply when they are more restraining than those included in the SEIS/ROD. The Record of Decision implementing the PRMP/FEIS is anticipated early in 1995. The PRMP/FEIS allocates BLM-administered land to specific purposes and establishes management actions/direction for each allocation under specific

program guidance throughout Chapter 2. (See MAP 1: Land Use Allocations, and PRMP/FEIS Map 2-2a, and 2-2b, District Planning Strategy). The PRMP/FEIS incorporates all of the appropriate decisions and land allocations made in the SEIS/ROD. Figure 1 shows the area of BLM-administered lands within the Hamilton Creek WAA by land allocation.

FIGURE 1: BLM Land Allocations



Land allocations and management actions/direction in the PRMP/FEIS provide the basic management guidance for this WAA. All recommendations and opportunities identified through the Hamilton Creek Watershed Analysis will comply with standards and guidelines specified in the SEIS/ROD and with management actions/directions specified in the PRMP/FEIS for the relevant land allocation.

Objectives and management actions/direction for these land allocations are discussed on pages 2-32 to 2-33 of the PRMP/FEIS. Standards and guidelines for Matrix lands are discussed in the SEIS/ROD, pages C-39 through C-48. One of the primary management objectives of the Matrix land allocation is to produce a sustainable supply of timber and other forest commodities.

The General Forest Management Area (GFMA) land allocation is generally subject to standards and guidelines described for Matrix lands, with additional management actions/direction as specified in the PRMP on page 2-60. The most significant management direction affecting Matrix/GFMA lands in the Hamilton Creek WAA is the retention of late-successional forest patches within "fifth field" (20 to 200 square mile) watersheds (PRMP/FEIS p. 2-33). Hamilton Creek WAA is considered to be a fifth field watershed.

In accordance with the SEIS/ROD, all late-successional forests are to be retained in watersheds which are currently comprised of 15 percent or less late-successional forest stands (all land allocations are to be considered as contributing to the 15 percent). In Hamilton Creek, 15 percent of the 4,530 acres of federal ownership would be 680 acres. Currently, approximately 280 acres (6 percent) of the federal ownership in

all land allocations within Hamilton Creek appear to exhibit late-successional characteristics. An estimated 68 acres is older than 200 years old.
The PRMP/FEIS designates Connectivity/Diversity (C/D) blocks to provide habitat connectivity and diversity throughout the Matrix. Approximately 700 acres of Matrix lands are designated as C/D within the Hamilton Creek WAA. These lands contribute to two discrete C/D blocks which include lands outside of the boundaries of the WAA. Additional management guidelines for C/D blocks, as specified in the PRMP, page 2-61, include retention of 25 to 30 percent of each of these blocks in late-successional forest condition. Neither of the C/D blocks including lands from within the Hamilton Creek WAA are currently comprised of 25 percent late-successional forest.

Riparian Reserves are designated to provide an area along all streams, wetlands, ponds, lakes and unstable areas where maintenance of riparian-dependant resources receives primary emphasis. Riparian Reserves are measured in terms of multiples of the "site-potential tree" of an area. In the Hamilton Creek WAA, an average site class III was estimated, with a site potential tree height of 210 feet. Riparian Reserves will be managed to meet the objectives of the Aquatic Conservation Strategy. Specific standards and guidelines governing activities within the Riparian Reserves are found in the SEIS/ROD pages C-30 through C-38 and the PRMP/FEIS, pages 2-21 through 2-27.

The PRMP/FEIS specifies that an area comprising one hundred acres of the best owl habitat is to be retained as close to the nest site or owl activity center as possible (p. 2-33). An area containing approximately 104 acres of late-successional forest suitable for spotted owl nesting and foraging habitat has been identified in the vicinity of a known spotted owl activity center in the Hamilton Creek WAA. Management of this area should comply with the standards and guidelines for Late-Successional Reserves as discussed in the SEIS/ROD pages C-10 through C-19, and the PRMP/FEIS, pages 2-27 through 2-30.

Other land allocation designations identified in the SEIS/ROD include Congressionally Reserved Areas, Mapped Late-Successional Reserves, Administratively Withdrawn Areas, and Adaptive Management Areas. No part of the Hamilton Creek WAA falls within any of these land allocations.

KEY QUESTIONS AND ANALYSIS SUMMARY

This section describes Key Questions identified by the Watershed Analysis Team, and summarizes information and findings of the analysis.

Management Influences and Human Use

Timber Management

What timber harvest, stand improvement, and protection practices are appropriate in implementing the PRMP within the WAA?

In compliance with PRMP management objectives, 15 percent of BLM-administered lands in the WAA should be retained in late-successional forest. Currently, an estimated 280 acres (6%) of BLM-administered lands are in a late-successional condition. To attain 15 percent, an additional 400 acres of mid-successional stands should be managed to develop late-successional forest characteristics. Regeneration harvest should be postponed until 15 percent late-successional forest is attained.

Approximately 640 acres of commercial thinning and 70 acres of post and pole removal have been identified within the GFMA. Once 15 percent late-successional retention is achieved (estimated in 10 to 30 years), regeneration harvest within GFMA land allocations should be implemented to maintain timber harvest levels based on Probable Sale Quantity estimates identified in the PRMP.

Approximately 475 acres have been identified for density management treatments in Connectivity/ Diversity land allocations. Because of the young average stand ages occurring throughout the Connectivity/Diversity, regeneration harvests would not be expected before the year 2074. Once implemented, regeneration harvest should maintain a 150 year, area controlled rotation. Harvest scheduling should contribute to maintaining 25 percent late-successional forest within identified Connectivity/Diversity blocks that extend beyond the WAA boundaries.

Land parcels including sections 9, 10, and 15 of T. 12 S., R. 1 E., were being considered for land exchange. These parcels have received some of the most intensive management of BLM lands in the WAA. Alternative parcels with lower management investments should be considered for exchange.

Fuels Management

What is the role of prescribed fire and fuels management in meeting management objectives specified in the Salem District PRMP/FEIS and SEIS/ROD?

The use of broadcast burning will be lower than historic levels because of the limited opportunities for regeneration harvest within the next decade. Use of prescribed fire will be limited to understory burning to achieve stand development and fuels management objectives. Understory burning must be conducted under more precise fuel and weather conditions than broadcast burning. This could reduce understory burning opportunities because of smoke management restrictions due to the proximity of the Willamette Valley Designated Area.

Rural Interface

Where are the predominant rural residential and agricultural land uses in the WAA? How do land management activities on BLM lands influence nearby residential and agricultural land uses?

Human habitation and agricultural uses have developed along the western reaches of the WAA. Information received through public contact efforts does not indicate highly sensitive rural interface concerns at present.

Roads and Transportation

What is the current condition of the transportation system within the Hamilton Creek WAA? What roads are essential to meet the access and resource management objectives of BLM and other landowners? To what degree are roads contributing to resource degradation? What management actions would be most effective in meeting resource management objectives within the WAA?

There are approximately 116 miles of road on all ownerships within the WAA. BLM controls 35 miles of road, approximately 5.1 miles of which are located on private lands. Approximately 7 percent of roads are gated or otherwise not driveable. Three Reciprocal Right-of-Way Agreements between BLM and private land owners influence BLM management discretion on roads within the WAA.

Road densities within the WAA are considered to be high for wildlife habitat effectiveness and moderate for water quality evaluation. Approximately 7 miles of road have been identified for potential closure or obliteration within the Hamilton Creek WAA, consistent with existing road use agreements.

Several culverts have been identified as potentially contributing to water quality degradation within the WAA. None of these drainage structures are considered adequate to meet streamflows resulting from a 100-year precipitation event.

A comprehensive transportation management plan is recommended to identify road management objectives and criteria for identifying priorities for maintenance, rehabilitation, access control, or obliteration, and to help determine water quality and riparian habitat condition thresholds for allowing road construction within Riparian Reserves. The plan should include a public involvement strategy to identify public concerns and expectations regarding transportation and access objectives on federal lands.

Lands/Minerals

What is the current status of and potential for mineral development? What is the existing status and future potential for utility corridors and other right-of-way or use agreements on BLM lands?

There are no known mineral claims or oil and gas leases on BLM lands within the WAA. The potential for locatable minerals and geothermal resources is low. There are no utility corridors, communication sites, land withdrawals, or rights-of-way other than roads, involving public use of BLM lands within the WAA.

Recreation and Scenic Quality

What types and intensity of recreation use currently occur in the WAA? What uses are projected in the vicinity of the WAA? What special, unique, or sensitive features, scenic areas or concentrated recreation activity areas occur within the WAA?

There are no developed recreation facilities on BLM-administered or private lands within the WAA. The closest developed site is McDowell Creek Park. Current visitation to the WAA is estimated to be low to moderate. Activities believed to occur in the vicinity of the WAA include off-highway, 4-wheel drive, and motorcycle vehicle use, bicycle riding, hunting, fishing, nature observation, and tent and vehicle camping. There are no projections to suggest significant changes in the current use level in the vicinity of the WAA.

The majority of the BLM-administered lands are classified as VRM Class 4. No unique visual features or areas of high sensitivity were identified on BLM-administered lands.

Socio Economic/Human Use

What natural resources have been historically available for human use in the WAA?

How do land use objectives and management guidelines in the SEIS/ROD, the Salem District PRMP/FEIS, and on privately managed lands influence the availability of natural resources, including timber and special forest products, in the WAA? How will this contribute to the economy of Linn County and rural communities?

Timber harvest on BLM-administered lands within the Hamilton Creek WAA has totalled approximately 34 million board feet with receipts close to $4 million over the past 20 years. Special forest products, such as ferns, moss, boughs, and mushrooms, are available, although there is little historic record of high demand for such products in the general vicinity of the WAA.

Approximately 32 percent of BLM-administered lands are designated as GFMA, and 10 percent are designated Connectivity/Diversity. Retention of late-successional forest required under the PRMP will limit opportunities for regeneration harvest for the next decade. Approximately 1175 acres of potential commercial thinning and post and pole removal have been identified in these land allocations for the next decade. Estimates of timber volume resulting from these treatments range from 5 million to 12 million board feet, depending on treatment prescriptions and resource management objectives. This volume, sold and removed in several timber sales within the decade, would contribute to direct and secondary wood product industry employment opportunities.

Approximately 58 percent of BLM-administered lands fall within Riparian Reserves. Although management treatments in this land allocation would not normally result in saleable volume through advertised timber sales, density management and other stand and habitat improvement projects could contribute to local employment opportunities through identified "Jobs-in-the-Woods" and other service contracts.

Management objectives for industrial forest landowners within the WAA historically have been sustained yield forest management. This analysis assumes that industrial forest lands will continue to be managed for timber commodities on a sustained yield basis, in compliance with provisions of the Oregon Forest Practices Act, with a regeneration harvest rotation age averaging 50 to 60 years.

Natural and Managed Disturbance Processes

What management practices and natural disturbance processes occur within the WAA and what effect do they have on vegetation patterns? How do current processes compare to historic conditions? What management practices are appropriate to maintain the health and vigor of managed stands?

Forest management has strongly influenced vegetation patterns within the WAA. Virtually all private and federal forest lands within the WAA have been logged since 1920. Residential settlement along the western portion of the WAA has resulted in extensive road and utility systems and stream diversions to provide water for domestic and agricultural use.

Although wildfire is recognized as an important natural disturbance agent in the Oregon Cascades, prescribed burning and other fuel management treatments on BLM-administered and private lands, combined with fire suppression efforts, have essentially eliminated wildfire as a significant disturbance agent in the area in the recent past.

Laminated root rot, *Phellinus weirii*, is common throughout the Hamilton Creek WAA. Several infected stands have been identified through inventory and stand exams and through BLM's Timber Production Capability Classification (TPCC) system (See PRMP/FEIS page 3-9, 3-71, and Appendix G). Heavily infected areas, classified as TPCC RP, are recommended for treatment to reduce the risk of catastrophic stand disturbance from high winds or insect epidemics.

Soil

What are the major soil characteristics within the WAA? How do geomorphologic processes and soil characteristics influence vegetative patterns and water quality values within the WAA? How does this influence management practices within the WAA?

Soils in Hamilton Creek are among the most highly productive soils in the Cascades. An estimated 75 percent of the WAA is composed of soils which are capable of supporting site class I and 2.

Slumping and earthflow mass movement are naturally occurring processes in parent materials which are easily weathered, although this type of parent material does not occupy a large portion of Hamilton Creek.

High levels of compaction contribute to erosion in the WAA. Over 75 percent of the WAA is comprised of soils that are highly sensitive to compaction. More than 60 percent of BLM-administered lands a high level of existing compaction and displacement. Implementation of best management practices to reduce compaction, and rehabilitation of existing compacted areas, are recommended to reduce erosion.

Moderate road densities contribute to erosion by increasing surface runoff. Administrative access needs and requirements of road use agreements will limit the short term opportunity to reduce road densities. Transportation management and planning measures to minimize increases in road densities and reduce exposed areas are recommended to help reduce erosion from this source in the long term.

Hydrology

What are the channel conditions and water quality characteristics within the WAA? How do these conditions influence water quality within and downstream from the WAA? How do management practices within the WAA influence these conditions?

What water quality-dependent resources and uses occur within and downstream from the WAA? How are these uses influenced by water quality within the WAA?

The BLM GIS Western Oregon Digital Database (WODDB) for hydrology was revised for this analysis. This revision increased the estimated stream miles within the WAA by nearly 100 percent, suggesting that additional review be considered when using the WODDB hydrology in future watershed analysis and other planning efforts.

The 1988 Oregon Assessment of Nonpoint Sources of Water Pollution identified low streamflow, low dissolved oxygen, streambank erosion, sedimentation, and turbidity as pollution sources within the WAA. Management activities within the WAA are not believed to contribute to reduced streamflow. It is assumed that reduced dissolved oxygen levels are attributable to activities on agricultural and residential lands downstream from the WAA, although there is insufficient data to confirm the major sources of this impact.

A 1994 riparian habitat survey identified a deficiency in long-term potential for large woody debris. This condition suggests a potential risk of stream channel and bank instability, although the survey did not identify channel stability as a problem at the current time. There is currently insufficient information on the condition of stream channels and water quality within the WAA to justify modifying the interim Riparian Reserve widths designated in the SEIS/ROD.

Surface erosion resulting from a combination of soil compaction, road density, and area in hydrologically unrecovered condition influencing rain-on-snow events, contributes to stream sedimentation. A large percentage of Hamilton Creek is comprised of soils that are highly sensitive to compaction. Implementation of best management practices is recommended to reduce compaction and erosion.

High percentages of area in transient snow zone and in unrecovered openings represent a moderate risk of sedimentation from runoff during rain-on-snow events. Potential harvest on private lands may increase the area in unrecovered openings to as much as 67 percent within the next decade. Few opportunities exist to substantially reduce sediment levels from road density or rain-on-snow potential in the short term.

Water uses in the WAA include fisheries, irrigation, livestock, fire protection, and domestic supply. Municipal water use occurs on the South Santiam River. The Oregon Water Resources Department rated water quality as moderate for fish and aquatic species, and as "no data available" for domestic use.

Vegetation

What is the present seral stage distribution and vegetation pattern within the WAA? How do the vegetation patterns within the WAA contribute to adjacent and larger ecosystems in the region? What is the current condition of forest stands on BLM-administered lands?

How will land use objectives and management guidelines in the SEIS/ROD, the Salem District PRMP/FEIS, and on privately managed lands influence future vegetation seral stage patterns within the WAA and stand conditions on BLM-administered lands?

The Hamilton Creek WAA exhibits vegetative characteristics of both the Willamette Valley and the Western Oregon Cascade Physiographic Provinces. The majority of low elevation lands adjacent to the WAA have been developed for agricultural and rural residential use, and no longer exhibit historical

vegetation associations of the Willamette Valley. Because of this development, low elevation late-successional and old-growth forest remnants within the WAA represent important ecological niches along the Cascade foothills. Middle and high elevation plant associations within the WAA are representative of those occurring throughout much of the Western Oregon Cascades to the east of the WAA.

The predominate vegetative component across all ownerships in the Hamilton Creek WAA consists of closed sapling stands between 35 and 74 years of age, with a significant secondary matrix of open sapling pole stands 15 to 34 years of age. Patch elements consist of early successional stands resulting from timber harvest during the last 20 years. Approximately 5 percent of the WAA is composed of scattered patches of mature and old-growth conifer. Approximately 580 acres of roads and adjacent non-forest area create a dispersed network of corridors segregating the vegetative patterns within the WAA.

The majority of forest stands are conifer, with Douglas-fir and Western hemlock the most common species. Approximately 7 percent of managed stands on BLM lands are hardwood dominated. Less that 1 percent are classified as nonforest. With no management, stands in this age class are expected to stagnate, becoming dense, single story stands which could be susceptible to naturally occurring forest health problems such as windthrow and insect epidemics. The predominance of stands in this age class is a significant rationale for implementing density management treatments to maintain stand vigor and forest health in all land allocations.

Implementation of PRMP management objectives for all land allocations is expected to increase the late-successional forest component within the WAA. With Riparian Reserves on federal lands and Oregon FPA buffers on private and state lands, the WAA has the potential to achieve 15 to 20 percent late-successional forest across all ownerships as soon as the year 2044. Assuming FPA and private forest management objectives remain unchanged, the predominant vegetative matrix across all ownerships in the WAA will continue to be the 15 to 74 year conifer component exhibited under current conditions. However, with 56 percent of BLM-administered lands included in Riparian Reserves, late-successional forest is expected to increase substantially into a well defined matrix and corridor component in the long term. Retention of 15 percent late-successional forest within the fifth field watershed, and 25 to 30 percent late-successional forest within Connectivity/Diversity blocks, should be achieved with retention of the Riparian Reserves.

The National Bureau of Science (NBS) has been developing a proposal for a 200 acre Density Management Study in the WAA as part of a cooperative study with BLM to evaluate alternative silvicultural systems to accelerate the development of old-growth characteristics in young forest stands. Implementation of the project is scheduled for June 1996. Other opportunities to develop study areas are being considered within the WAA in T. 12 S., R. 2 E., Sec. 29.

What is current status of noxious weeds and other non-native vegetative species within the WAA? What prevention and control measures are appropriate for noxious weed and non-native species management?

There are no known sites of Priority I or II noxious weed species (potential new invaders or eradication of new invaders) within the WAA. Sightings of two Priority III species (established infestations) have been reported. In addition to noxious weeds, there are several non-native species known to occur within the WAA which have the potential of competing with native vegetation and having adverse ecological effects.

Wildlife

How do current vegetation patterns and management activities influence the amount, distribution, and quality of wildlife habitat in the WAA? What habitat types are of concern because of scarcity or ecological function? How does quality of habitat in the WAA influence adjacent ecosystems?

How will management objectives and guidelines in the SEIS/ROD, the Salem District PRMP/FEIS, and on private lands influence future wildlife habitat amount, distribution, and quality?

Connectivity corridors for wildlife movement to adjacent areas are provided by riparian/streamside vegetation. Generally, travel corridors connect the northeast higher elevations in the WAA to the Willamette Valley to the southwest. High elevation ridge top areas also serve as flow corridors for larger mammals.

Approximately 5 percent of the WAA in late-successional forest stands. Less than 1 percent is in old-growth stands over 200 years of age. Based on the scarcity, fragmentation and location of late-successional habitat, this is considered to be a habitat of concern in the Hamilton Creek WAA.

Riparian habitat surveys indicate that approximately 67 percent of surveyed habitat is deficient in long-term potential for large woody material, which contributes to a variety of riparian habitat characteristics including standing dead and down logs and late-successional forest. These habitat components, which have been identified as habitats of concern within the WAA, are especially important in riparian areas. There is currently insufficient information on riparian habitat condition to justify modifying the interim Riparian Reserve widths designated in the SEIS/ROD.

Implementation of PRMP management objectives is expected to increase the late-successional forest and riparian habitat components within the WAA. Retention of Riparian Reserves, with appropriate stand management treatments, should substantially improve riparian habitat conditions including potential recruitment of standing dead and down log components, by the year 2044. The distribution of late-successional habitat would generally follow Riparian Reserve buffers on BLM lands. Development of late-successional corridors within Oregon FPA protected stream buffers on private lands should contribute to connectivity of the larger patches on BLM-administered lands in the long term.

Large standing dead and down log habitat is considered a habitat of concern in the WAA, based on available riparian survey and stand exam information. The amount of standing dead and down log material is expected to decline in the short term as material in more advanced stages of decay continues to decompose. Over the long term, the standing dead and down log component on BLM lands should improve substantially as older forest develops in Riparian Reserves and green tree retention guidelines are implemented in other land allocations. The Oregon FPA requirements for standing dead, down logs and buffers would contribute to standing green, snag, and down log habitat on private and State of Oregon lands.

The estimated average road density of 4.25 miles per square mile across all ownerships within the WAA is considered to be high, and has been identified as a critical issue. Road densities are expected to increase across the WAA, particularly on private ownership. Ideally, open road densities on BLM lands should be maintained below 3 miles per square mile. Because of management restrictions under existing reciprocal road use agreements, opportunities to significantly reduce road densities in the short to intermediate term are limited. However, a transportation management plan is recommended to identify criteria for identifying priorities for access control, which could reduce open road densities in the short term.

Of the several parcels of BLM-administered lands being considered for exchange, the highest priority lands for retention in federal ownership should include lands with high wildlife values. These lands include T.12S., R.1E., Sections 1 (Green Mountain meadows) and 3 (Round Mountain LSR); T.12S., R.2E., Section 29 (Black Peter wetlands).

Fisheries

What SEIS/ROD "stocks at risk" and Oregon Department of Fish and Wildlife (ODF&W) "stocks of concern " occur within the WAA?

What is the current condition of fisheries habitat in the WAA? How does this condition influence fisheries habitat downstream from the WAA?

How will management objectives and guidelines in the SEIS/ROD, the Salem District PRMP/FEIS, and on private lands influence fisheries habitat condition within and downstream from the WAA?

The distribution of anadromous fish is limited by known barrier waterfalls; however, the total extent of resident fish occurrence in the WAA is not well documented. Based on an assumption that all third order and larger streams are fish bearing, there are approximately 49 miles of fish bearing streams within the WAA, of which anadromous fish occupy 3.2 miles. No anadromous fish habitat is found on BLM lands.

Most of the Hamilton Creek WAA has the potential to be good fish habitat, although the majority of the better fish habitat is in private ownership. Approximately 10 percent of the potentially "good" spawning and winter rearing habitat, and 14 percent of the potentially "good" summer rearing habitat is on BLM lands.

Riparian habitat surveys have indicated a lack of large woody debris in surveyed portions of riparian areas. High water temperatures, loss of riparian vegetation, and streambank erosion were identified in the "Oregon Rivers" database as impacts to fish habitat in Hamilton and McDowell Creeks.

Using PRMP and Washington Watershed Analysis habitat analysis procedures, the current large woody debris component in riparian areas is evaluated as poor, but the potential for LWD development in the long term is good. Retention of Riparian Reserves and implementation of silvicultural practices to enhance tree size and species composition should improve riparian habitat in areas presently composed of small diameter conifers or dominated by hardwoods. Impacts of bank erosion and water temperatures are expected to decline with the retention of Riparian Reserves and FPA buffers on private lands, although the degree to which management activities in the WAA influence these impacts is not known.

Two species of anadromous fish--spring and fall runs of chinook salmon and winter and summer runs of steelhead trout--are found in the WAA. The ODF&W has classified the native Willamette stock of spring chinook salmon as a "stock of concern" because of the low numbers of natural fish and the genetic influence of the large hatchery program. The spring chinook run in the South Santiam is almost exclusively a hatchery run. There are no records of spring chinook spawning in Hamilton or McDowell Creeks.

ODF&W has classified the winter steelhead in the South Santiam River as a "stock of concern" because of loss of habitat associated with Foster and Green Peter Dams. The National Marine Fisheries Service is currently reviewing the status to determine if listing of Willamette River winter steelhead, including the South Santiam population, is warranted. Small runs of winter and summer steelhead are found in Hamilton and McDowell Creeks, and spawning activity by summer steelhead has been recorded in both streams.

Cutthroat trout is the only resident salmonid in the WAA, and is assumed to be present in all third order and larger streams. ODF&W has classified the cutthroat in the Willamette Valley as a "stock of concern" due to insufficient information on their status. Populations sampled by BLM personnel in South Fork of Scott Creek in 1984 were slightly higher than the average cutthroat density in other Santiam Basin streams.

The sand-roller, another "stock of concern", is found in low gradient reaches in the lower portions of Hamilton Creek, downstream of the WAA.

Special Status/Special Attention Species and Special Habitat Areas

What BLM special status and SEIS Special Attention plant and animal species are known or suspected to occur within the WAA?

How do present vegetation patterns within the WAA influence vegetative resources and habitats of special concern, BLM special status and SEIS Special Attention plant and animal species?

How will land use objectives and management guidelines in the SEIS/ROD, the Salem District PRMP/FEIS, and on privately managed lands affect vegetative resources of special concern within the WAA and across their range?

There are no historical or currently known or suspected BLM special status plant species populations in the Hamilton Creek WAA. The only SEIS Special Attention plant species known to occur in the Hamilton Creek WAA is western hemlock dwarf mistletoe, listed in the Survey and Manage Standard and Guidelines of the SEIS/ROD. The BLM is required to manage known sites of this species beginning in January 1995. Because of the common occurrence of this species throughout the Pacific Northwest, there is little concern for the viability of dwarf mistletoe. Efforts are currently underway to remove dwarf mistletoe from the survey and manage species list.

Forty-five animal species known or suspected to occur within the WAA were associated with scarce habitat types. Ten of the forty-five species are included on the 1994 BLM special status species list. Seven of these ten have been confirmed within the WAA. Four of the species of concern are listed as Survey and Manage species in the SEIS/ROD. There have been no confirmed sightings of survey and manage species within the WAA.

The Round Mountain Known Owl Site is the only mapped spotted owl core area in the WAA. In compliance with SEIS/ROD guidance, a 100-acre core area has been identified on BLM lands around the 1991 site center. No spotted owls have been observed in the core area since 1992.

Special habitat areas identified within the WAA based on scarce or unique function or structure include several wet meadows, grassy areas, rock outcrops, and all late-successional forest patches. The most significant special habitats in the Hamilton Creek watershed include Green Mountain meadows, Keel Mountain, Green Peter, and Black Peter wetlands. Special protection measures including additional buffers have been recommended for Black Peter wetlands and Green Mountain meadows.

EXISTING WATERSHED ANALYSIS AREA CONDITION

Location, Physical Setting, and Scale

The Hamilton Creek WAA encompasses approximately 17,500 acres along the lower western slopes and foothills of the Cascade Mountains in Linn County, Oregon. The two closest incorporated cities are Lebanon, approximately 15 miles west of the WAA and Sweet Home, located approximately 10 miles south of the WAA. (Refer to MAP 2: Location). The Analysis Area includes the upper reaches of the 15,400 acre McDowell Creek and the 23,900-acre Hamilton Creek drainages. Both of these drainages are tributary to the South Fork of the Santiam River.

The WAA has been divided for administrative purposes into four sub-watershed basins, delineated on the basis of topographic features and natural drainage patterns. (Refer to MAP 3: Subwatershed Basins). These sub-watershed basins were established to maintain permanent resource data and management records for use in future cumulative effects and site-specific project analysis.

> Hamilton Creek: 3445 acres. That portion of the Hamilton Creek from its confluence with Scott Creek in Sec. 17, T. 12 S. R. 1 E., downstream to its confluence with Jack Creek in Sec. 20, T. 12 S. R. 1 E., and including the Jack Creek drainage.
>
> Upper Hamilton Creek: 5012 acres. The upper portion of Hamilton Creek drainage from its headwaters, including Deer Creek, downstream to its confluence with Scott Creek in Sec. 17, T. 12 S. R. 1 E.
>
> Scott Creek: 5165 acres. The entire Scott Creek drainage, including the South Fork of Scott Creek, down to its confluence with Hamilton Creek.
>
> McDowell Creek: 3878 acres. The upper portion of the McDowell Creek drainage from its headwaters downstream to its confluence with Cedar Creek in Sec. 3, T. 13 S. R. 1 E. For the purposes of analysis and resource data records, the Hamilton Creek WAA boundary is truncated along the Township line common to Township 12 S., and Township 13 S.

The WAA is located within the Western Oregon Cascades Physiographic Province as described in the *Report of the Forest Ecosystem Management Assessment Team* (*FEMAT*) *(July 1993)*, page IV-6, and the PRMP/FEIS page 3-4. The Willamette Valley Province lies immediately to the west of the WAA. As a result of its proximity to the Willamette Valley, the Hamilton Creek WAA exhibits ecological characteristics of both the Willamette Valley and the Western Oregon Cascade Provinces. The crest of the Cascade Mountains is approximately 40 miles east of the WAA.

Large blocks of mature forest, much of which has been formally designated as Late-Successional Reserve in the *SEIS/ROD*, are located to the east of Hamilton Creek in the Crabtree and Quartzville WAA's. These blocks start two to three miles east of Bald Peter (east boundary of the WAA) and extend to U.S. Forest Service-administered lands (See PRMP/FEIS Map 2-2b).

To the north, scattered BLM ownership similar to Hamilton Creek is located in the Crabtree Creek, Neal Creek and Thomas Creek WAA's. Lower McDowell Creek and frontal tributaries to Foster Reservoir and the Middle Santiam River are located on mixed private ownerships to the south of the WAA. There are no BLM lands between Hamilton Creek WAA and the middle Santiam River.

Elevations range from 600 feet above sea level in the lower, western portions of the drainage close to the Willamette Valley, to approximately 4000 feet on ridge peaks along the eastern boundary of the WAA. Prominent topographic features include Keel Mountain (3040 feet), Bald Peter (4079 feet), Green Peter (3977 feet), Green Mountain (2560 feet), Round Mountain (2120 feet), and Sanka Peak (2209 feet).

The climate within the watershed is characterized by warm, dry summers and cool, wet winters. Annual precipitation ranges between 60 and 120 inches, predominantly in the form of winter rain in the lower elevations, transient or intermittent snow at mid-elevations, and rain with persistent winter snow in the upper reaches of the WAA.

Ownership

Lands within the Hamilton Creek WAA are managed by several landowners (See Figure 2 and MAP 4: Ownership). Federal lands total approximately 4530 acres of the WAA, all administered by the BLM. Most BLM-administered lands are revested Oregon and California (O&C) Railroad grant lands. Approximately 40 acres are public domain. Federal ownership is scattered in an alternating section or "checkerboard" pattern typical of much of the O&C lands administered by the BLM in Western Oregon.

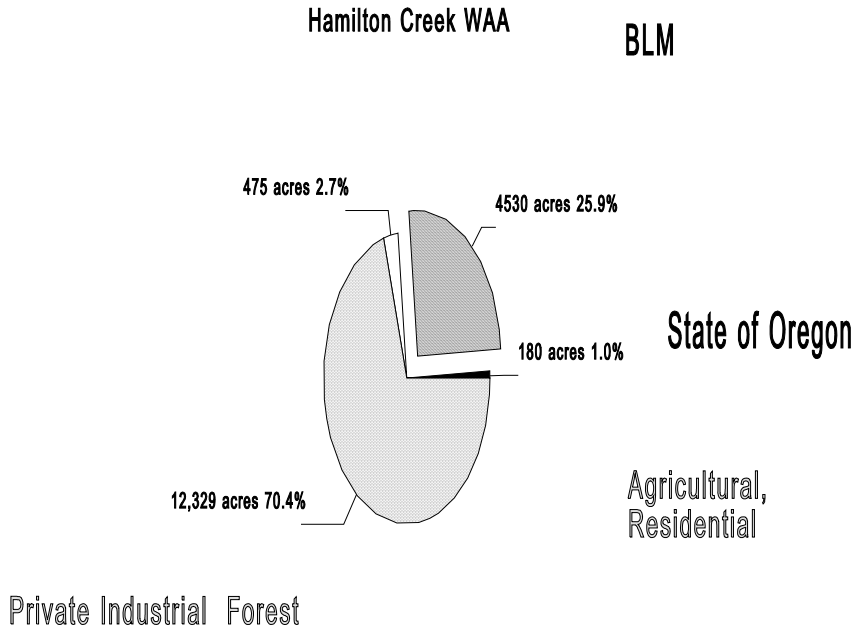


FIGURE 2: Land Ownership

Management Influences and Human Use

Timber Management

Most ecosystem change in the Hamilton Creek WAA in recent history has been the result of forest management activities. Harvest activities on private and federal lands have strongly influenced the current vegetation patterns, seral stage distribution, and condition of upland and riparian habitat within the WAA.

Virtually all private forest lands within the WAA have been logged. Timber harvest on private lands in the area began in the 1920's and increased dramatically with modern logging methods and increased road building to supply wood products during World War II and the post war years. The driving influences during this period were increases in need (demand) and opportunity (supply). Timber products were necessary to support the war effort and to supply housing during the post war years. New technology provided increased opportunities for harvesting timber that previously would have been uneconomical or impossible. Machines like bulldozers, chainsaws and cable yarders opened up new areas of the forest for logging.

Today, supply and demand, as well as other economic factors, continue to be the dominant influences behind management of private industrial forest lands. These economic forces manifest themselves on the timing of planned and future harvests. Forest land owners determine rotation ages based upon their own economic conditions. Different corporations will establish different rotation ages based upon the parameters specific to that corporation. Changes in the market or the corporation may effect major changes in when a company decides to harvest it's lands. Corporate buyouts and takeovers have been known to result in harvest increases to help finance the buyout. Another factor that plays a role in the industrial forest lands is the Oregon State FPA. This law governs what landowners may do on their forest lands. It affects such things as stream buffers, reforestation and size of harvest units.

All but approximately 160 acres of BLM-administered lands in the Hamilton Creek WAA have been harvested in the past. Remnants of natural stands were left because they contained low volume compared to surrounding areas, or were difficult logging settings. Remnant natural stands may not be typical of the original stand conditions before forest management activities, but they are the closest existing examples.

BLM Forest Operations Inventory (FOI) records indicate that approximately 52 percent of BLM-administered lands in the Hamilton Creek WAA have received some degree of forest management within the past 25 years. Approximately 596 acres (13 percent) have been clearcut harvested, 172 acres (4 percent) have been commercially thinned, and 1,585 acres (35 percent) have been pre-commercially thinned.

Fuels Management/Air Quality/Smoke Management

The accumulation of fuel from management activity has influenced local fire regime characteristics. Fuel treatments of clearcut harvests on BLM lands have been accomplished through broadcast burning, hand or machine piling and burning. Treatments on private lands have been consistent with those on BLM lands.

Precommercial thinning slash poses the greatest risk of increased fire hazard but should continue to diminish as the process of decomposition of the fine fuels continue. Accumulation of commercial and pre-commercial thinning slash has been mitigated, to some extent, by fuel free buffers adjacent to major roads. Fuel treatments of harvest units and small block pre-commercial and commercial thinnings have maintained fuel loading at acceptable levels.

Burning in the Willamette Valley by Native Americans has been well documented in records of early European explorers entering the Oregon Territory. To what extent this burning extended into the Cascade Province or locally, within the Hamilton Creek watershed, is not specifically known. It can be assumed, based on historical records, that this burning extended into the foothills of the western Cascades.
The Hamilton Creek WAA is located within 6 miles of the Willamette Valley Designated Area (DA) (See PRMP/FEIS Map 3-1 Sensitive Air Quality Areas). Compliance with Oregon Smoke Management instructions reduces the risk of smoke from prescribed burning intruding into the Willamette Valley DA. All prescribed burning that would be done in the Hamilton Creek Watershed Area will comply with Oregon Smoke Management Plan and BLM prescribed fire plans. Broadcast burn prescriptions are written with broad fuel and weather parameters to insure adequate flexibility allowing broadcast burns to be accomplished within constraints imposed by smoke management instructions. Prescription parameters and adherence to smoke management instructions will mitigate visibility impacts (from prescribed burning in the Hamilton Creek Watershed Area) to Class I Areas.

Refer to the PRMP/FEIS, pages 3-5 through 3-9, for a general discussion of air quality and smoke management as influenced by fuels management.

Residential and Agricultural Development

Although commercial forest management is the primary use of private lands in Hamilton Creek, human habitation and agricultural uses have developed along the western reaches of the WAA. Residential settlement of the area expanded near the rural community of Berlin as agricultural development of surrounding low elevation valley bottoms increased in conjunction with the growth of Lebanon and Sweet Home. Effects of development have included extensive road and utility systems and stream diversions to provide water for domestic and agricultural use.

Agricultural land, utility corridors, and rural homesites surrounded by agricultural or small forested areas have been continually disturbed and not allowed to recover under natural processes. Some plants expected to occur in these patches and possibly influencing adjacent patches and corridors include introduced non-native grasses, noxious weeds, off-site ornamental deciduous and conifer tree species and species introduced as a result of agriculture or gardening. Domesticated animals such as dogs and cats prey on native wildlife species and could occur around the areas lower in the drainage where the homesites are associated with these patches. Livestock such as horses, cattle, chickens, llamas, and others are also present in the watershed. The presence of humans and some of the exotic species inhibits the presence of species that prefer solitude such as cougars, bobcats, pine martins and badgers.

Rural Interface

Residential occupancy of forest lands and intensive forest management practices near homes have created concerns for both the BLM and residential property owners (PRMP/FEIS pp. 3-87 through 3-88). In an effort to address this issue early in the planning process, areas with a potential for high sensitivity were identified in the PRMP/FEIS as Rural Interface Areas (RIA's) (pp. 2-52 through 2-54). One RIA was identified in the WAA . This area includes approximately 75 acres of BLM-administered lands in the SW1/4, Section 21, T.12 S., R.1E. (See PRMP/FEIS Map 2-11, Rural Interface Areas), designated as GFMA allocation. Harvest and other intensive forest management practices are suitable management activities on this tract.

The privately owned portion of the RIA, located in the SE1/4 of Section 20, is zoned by Linn County as Farm/Forest and Exclusive Farm Use. At the time the RIA was identified, the minimum lot size for both of these classifications was 20 acres. Since that time, the minimum lot size has been increased to 80 acres. The residential concentration in this RIA is low, and the majority of the surrounding private land is being used for commercial forest management.

Public access to Section 21 does not pass through the privately owned portion of the RIA, so there should be no concerns within the RIA about logging traffic or public access or trespass by the public.

Information received from property owners adjacent to BLM-administered lands does not indicate rural interface concerns are highly sensitive at this time. No complaints or concerns from property owners have been recorded in this area. There have been no recent modification projects proposed on the adjacent BLM-administered lands. The closest dwelling appears to be at least one-quarter mile from BLM-administered lands, with a buffer of private commercial forest land lying between. Most dwellings have a buffer of close to one-half mile. Residential property owner concerns would likely be focused on the management practices of adjacent private commercial forest lands, rather than on the BLM-administered lands in the RIA. If the private commercial lands are harvested, BLM management practices may become more important to property owners.

Roads and Transportation

In addition to timber harvest, road construction is one of the most pronounced influences of forest management. There are approximately 116 miles of road on all ownerships within the Hamilton Creek WAA (Refer to MAP 5: Roads). The BLM controls 35 miles of road, approximately 5.1 miles of which is located on private lands. Approximately 0.75 miles of road on BLM lands are privately controlled.

Road densities within the WAA range from 2 to 6.5 miles per square mile. Currently, the average total road density is estimated to be 4.25 miles per square mile. Open (accessible) road densities are currently estimated at 3.95 miles per square mile. Open road densities are highest in the center, west and southwest portions of the WAA, especially in the rural residential areas on private lands. Road densities are also high in the southeast portion, in the Green/Bald Peter areas. Open road densities are the lowest in the northeast portion, in the vicinity of Green Mountain and Keel Mountain. Approximately 7 percent of roads are effectively gated or otherwise undrivable. Four locked gates block access to approximately 1.9 miles of BLM controlled road segments. A one-quarter mile BLM-controlled road segment has been physically blocked (tank-trapped), preventing four-wheel vehicle travel. In addition, approximately 5.7 miles the road are over-grown, which also limits access.

There are three Reciprocal Right-of-Way Agreements between BLM and private land owners in the Hamilton Creek WAA. These agreements establish access and road construction rights, and may restrict the types of actions that BLM can take on road segments that currently access or have the potential to access private lands included under the Agreements.

Lands and Minerals

There are two aggregate rock quarries located on BLM lands. The quarry located in Section 29, T. 12 S., R. 2 E. is exhausted and has been closed. The BLM portion of the quarry in Section 15, T. 12 S., R. 1 E. is nearly exhausted, although the portion of this quarry located on private property has a large reserve and continues to be used for rock for road surfacing. There are no known locatable mineral mining claims or oil and gas leases on BLM lands within the WAA. The potential for locatable minerals and geothermal resources within the WAA is low. (See PRMP/FEIS Maps 3-10 and 3-11)

There are no known utility corridors, communication sites, land withdrawals, or rights-of-way other than roads, involving public use of BLM-administered lands within the WAA.

Recreation Use and Amenities

All BLM-administered land in the WAA is classified as an extensive recreation management area. No lands within the WAA are included in any potential Special Recreation Management Area or developed recreation site (PRMP/FEIS pp. 3-63 through 3-69 and Map 2-7). There are no developed recreation

facilities on private lands within the WAA. The closest developed site is McDowell Creek Park, a day-use area managed by Linn County, located one mile south of the WAA.

The BLM's Recreation Opportunity Spectrum (ROS) classification system was used to classify recreation resources on private and BLM lands in the Hamilton Creek WAA. All BLM-administered lands are classified as Roaded Natural (RN). Some BLM lands exhibit attributes of Semi-primitive Motorized and Roaded Modified classes, although these areas were not large enough to warrant segregation from the RN setting. On private lands, 12,279 acres are classified as RN and 941 acres as rural (R), primarily in agricultural or rural residential areas. Those lands classified as RN are in a predominately forested environment. Most of the modifications made by humans are associated with timber harvest and road construction activities.

Primary recreation activities occurring in the WAA are dispersed in nature. There is currently no data to support estimates of recreation visitation for the Hamilton Creek WAA. Field observation and use indicators (dispersed campsites, trash, road traffic levels) suggest that visitation to this WAA is low to moderate.

Regional use estimates obtained from the Statewide Comprehensive Outdoor Recreation Plan (SCORP) provide visitation projections for the region by recreation activity. Activities believed to occur in the vicinity of this WAA include off-highway, 4-wheel drive, and motorcycle vehicle use, bicycle riding on roads, hunting, freshwater bank fishing, nature observation, and tent and vehicle camping.

The only special feature noted is a waterfall on Scott Creek (see Scenic Quality narrative). Currently, the waterfall is relatively undiscovered by the public and receives little visitation.

Scenic Quality

BLM-administered lands in the WAA were classified according to relative visual resource management (VRM) value during the development of the Salem District PRMP. (See PRMP/FEIS pp. 2-50 and 3-60 and PRMP Map 2-4).

The majority of the BLM-administered lands (4332 acres) in the Hamilton Creek WAA are classified as VRM Class 4. No unique visual features or areas of high sensitivity were identified in the Class 4 lands.

Three areas totalling 196 acres of VRM Class 3 were identified. None of these areas were found to have any significant or unique features that would warrant an upgrade to a Class 2 rating, or that would present an issue at this time. However, site specific issues may occur in the future with the development of proposed projects.

The most sensitive of the three Class 3 areas is 122 acres in Section 21 of T. 12 S., R. 1 E. which has also been identified as a Rural Interface Area. The sensitivity of the site is based on its proximity to residential areas in Section 20. Due to roadside vegetation buffering, this area was not currently observable in the foreground while driving along Berlin Road, which extends through Section 20.

The second most sensitive area is 23 acres in Section 3 of T. 12 S., R. 1 E. located along the east half of Round Mountain. This area could be seen in several places while driving within the WAA. However, it was not observable along any major travel routes leading to or adjacent to the WAA. The west side of the Round Mountain Area, which is also Class 3 but falls out of the WAA boundary, is very visible from many routes traveling east towards the watershed from the Willamette Valley. Projects proposed in this area should be reviewed on a site specific basis with mitigation recommended as necessary.

The third area is approximately 51 acres in Section 29, T. 12 S., R. 2 E. This area was not observable from any major travel routes, critical viewpoints or residential areas. Additionally, a small area less than 2

acres in size and not observable from any major travel routes, critical viewpoints or residential area, was noted in the district inventory of VRM Class 3 areas.

There are no lands currently identified in the Hamilton Creek WAA that were classified as VRM Class 1 or Class 2. A field review of the WAA did not reveal any uninventoried sensitive or unique visual features. An attractive waterfall was identified along Scott Creek in Section 21 of T. 12 S. R. 1 E. The waterfall is not observable from any roads or critical viewpoints.

Cultural Resources

Cultural resources information based on field checks and consultation with the Salem District Archeologist, cultural resource maps and records, and past project files, is on file in the Hamilton Creek analysis file. No significant cultural features are known to exist in the WAA.

Socioeconomic Conditions

The Hamilton Creek WAA is located in Linn County. The two closest incorporated cities are Lebanon, approximately 15 miles west, and Sweet Home, located approximately 10 miles south of the WAA .

Linn County's economy and employment historically have been dominated by wood products, agricultural, and rare metals industries. The county has relied on BLM timber sale receipts for O&C payments and other payments in lieu of taxes for a significant portion of its budget (PRMP/FEIS pp. 3-83 through 3-86). Over the past 20 years, twelve advertised timber sale contracts for approximately 34 million board feet have been sold on BLM-administered lands within the Hamilton Creek WAA , with receipts at close to $4 million. O&C payments are made on a proportionate basis of the amount of O&C land within each county, regardless of revenues from specific timber sale activity.

Recent decreases in federal timber supplies and increases in wood manufacturing automation have resulted in a reduction in wood products industry employment in Linn County. The 1993 Region 4 Economic Profile, completed by the State of Oregon Employment Department, showed that in the 1970"s, one in four Linn County jobs was wood products related. By 1992 only one in nine jobs was wood products related. This reduction could conceivably be more pronounced in the communities of Sweet Home and Lebanon, which historically have had a higher reliance on the wood products industry.

This shift in employment and economic emphasis has presented a challenge to Linn County and many communities to individually and collectively begin to actively seek methods to diversify their economies. One of the strategies being considered within the wood products industry is expanding to specialized wood processing and more labor-intensive value-added products. Another is supporting the establishment of a locally-based business associated with the collection and marketing of special forest products.

Special forest products, such as ferns, moss, boughs, and mushrooms, are potentially available (PRMP/ FEIS pp. 3-32). However, there has been little historic record of demand for such products in the vicinity of the Hamilton Creek WAA. There has been some local demand in the past for cedar for shake bolts, fence posts, and firewood, primarily within recently logged areas. Although large, down cedar that would be suitable material for shake bolts can usually be found scattered along creeks and riparian areas, large logs have been reserved in recent years on federal lands as large woody material for enhancement of riparian habitat condition.

With some of the lowest tourism-related revenues in the state, Linn County is increasing attention to its recreation and tourism industry. The county is aggressively marketing outdoor recreation opportunities, including Foster and Green Peter Reservoirs, Quartzville Creek, and the South Santiam River. Recreation opportunities and amenities available within the Hamilton Creek WAA are discussed under Recreation and Visual Resources.

Refer to the Salem District PRMP/FEIS pp. 3-79 through 3-86 for additional information regarding socioeconomic conditions and trends in the Salem District planning area.

Natural Disturbance Processes

Fire

Fire plays a major role as a natural agent of disturbance in the distribution, abundance and dominance of major plant communities of the Oregon Cascade Province. Plant communities are largely affected by the frequency, intensity, and the extent of wildfire events. These effects, both direct and indirect, depend on individual forest plant community conditions and composition. Refer to the Salem District PRMP/SEIS pages 3-88 through 3-90, for a general discussion of the role of fire as a process in the ecosystem.

Agee (1981) describes fire regimes of the Pacific Northwest in three broad artificially grouped categories. The Oregon Cascade Province is included in the high-severity fire regime. Teensma (1987) estimated a natural fire occurrence of 100+ years in the Cascade Province over the last five centuries. Discounting fire of moderate severity from his analysis, a stand replacement fire would occur at an interval of 130 to 150 years, inferring that intensive fires are a significant part of the natural fire regime in this area. Natural wildfire events did not always result in complete mortality of stands. Surviving trees became important elements of remnant multiple-storied old-growth stands.

The use of prescribed fire to reduce accumulations of fuel following management activities, combined with increased fire control and detection efforts since the early 20th century, has reduced the occurrence of wildfire in managed portions of the Cascade Province, including Hamilton Creek. One instance of a natural fire occurrence in recent history in the WAA is indicated on the State of Oregon Forest Type Map (1936). In a telephone interview, a longtime local resident of the area recounted his knowledge of the fire. The fire burned in Douglas-fir old growth timber. It was primarily an understory burn consuming mostly surface fuel (woody debris and vegetation). The overstory sustained only minor damage. The exact date of this fire is not known but is estimated to have occurred in about 1920.

Disease and Insects

Laminated root rot, *Phellinus weirii*, is common throughout the WAA. The majority of stands probably have some infected trees. In most instances these are small infection centers of a few trees. In some instances there are numerous infection centers in sufficiently close proximity that regeneration and planting of immune or resistant species may be the best strategy. Some management practices may increase the risk or spread of Laminated root rot (PRMP/FEIS p. 4-74). Stands infected with laminated root rot will remain infected and the infection will spread unless treated. *Phellinus* is the disease of most concern.

Western hemlock dwarf mistletoe, *Arceuthobium tsugense*, occurs within the WAA. A couple of stands in T. 12S., R. 2 E., Section 29 are severely infected. Dwarf mistletoe grows upwards in the live crown of individual host trees and infects other host trees. The parasite weakens host trees and lowers wood quality. As it grows upwards, it causes the growth of broom of small branches. These brooms are used for nests by some bird species. Harvest of all infected host trees and regeneration is the best means of control. Dwarf mistletoe will become more serious in western hemlock dominated stands. Thinnings usually accelerate the development of dwarf mistletoe, unless infected trees are targeted for removal.

Western hemlock dwarf mistletoe is a species listed in the Survey and Manage Standard and Guidelines of the SEIS/ROD(p. C-60). Because of the common occurrence of this species throughout the Pacific Northwest, there is little concern for the viability of dwarf mistletoe. In September 1994, a letter and maps documenting the common occurrence of this species were sent to the BLM Oregon State Office. Pathologists in the US Forest Service's Natural Resource Department at the Region 6 office were also

contacted. Efforts are currently underway to remove *Arceuthobium tsugense* from the survey and manage species list.

Other diseases that may be encountered in Hamilton Creek are Armellaria (*Armellaria ostiyea)* and black stain *(Ceratocystis wageneri)* fungi. Both are of low concern.

Insects are not considered a major forest health threat in Hamilton Creek at this time. Very minor Douglas-fir beetle mortality was observed. It could become significant in the future if a major wind storm event occurred because many stands are predominately Douglas-fir in overstocked conditions. The majority of these stands are overstocked with competition induced mortality the only stocking control. Insects are prone to attack trees under stress. If stands are maintained in a vigorous condition and are composed of several species they are less likely to suffer insect caused mortality.

Wind

Significant winds affecting the WAA are generally southwesterly, in association with winter storms. Major wind events, such as the 1962 Columbus Day storm, have caused local areas of extensive windthrow, although these events do not appear to have been a more prominent influence in the Hamilton Creek watershed than in other areas along the west slope of the Cascades. Strong easterly winds occur with pressure gradients and gravity in summer, and can become severe in locally exposed areas. Effects of east winds in Hamilton Creek have not been notably pronounced.

Stands that are heavily infected with Laminated root rot may become more susceptible to windthrow with increased root deterioration as the disease progresses.

Landslides and Earth Movement

Slump-earthflow mass movement is a naturally occurring process in parent materials which are easily weathered, such as pyroclastic tuff and breccia (refer to Geologic Development discussion under Soils). Although this parent material does not occupy a large portion of Hamilton Creek, it does influence slope stability in certain areas. Pyroclastic rock overlying andesite/basalt material may create unstable conditions as ground water infiltrates through the porous pyroclastic material and moves along the contact zone between the two layers. Andesite /basalt overlying pyroclastic rock can also create unstable slope conditions, as water infiltrates and causes the softer pyroclastic rock to shift, removing the base of support for the material above.

Soil characteristics and factors influencing soil movement and productivity have been classified using the BLM's TPCC system. TPCC classifications for the Hamilton Creek WAA are included in Appendix A-1. The TPCC identifies areas inherently susceptible to mass soil movement, or landsliding, (PRMP/FEIS Appendix S-2). Ground truthing in these areas indicates that the mapping is generally accurate, and can be used in analysis. Approximately 310 acres of BLM lands are classified as TPCC 'FP', indicating susceptibility to slump-earthflow mass movement.

Soil

Geologic Development

The western portion of the Cascades (and Hamilton Creek) are composed of layers of igneous (volcanic) rocks, which form the basic parent materials that make up a majority of the soils in the Hamilton Creek WAA. The igneous rocks which occur in Hamilton Creek can be classified into two main groups: hard, weather resistant rock such as basalt and andesite, and softer, easily weathered pyroclastic rocks. Volcanic ash, tuff, and breccia are also present throughout the Hamilton Creek WAA. Sedimentary rock

and marine deposits occur in minor amounts. As discussed above, alternating layers of basalt/andesite and pyroclastic rocks can contribute to slope stability problems.

The Hamilton Creek WAA is composed of two general geomorphic surfaces: The Eola surface and the Looney unit. The Eola surface is found in the eastern areas of Hamilton Creek in the crests and saddles of low foothills. This surface occurs as remnants of the oldest stable geomorphic surfaces in this area. Silty clay loams occur throughout the elevation range of 600 to 2,800 feet. These soils are some of the most productive forest soils in the WAA.

The Looney unit, found in the western half of Hamilton Creek, is characterized by deeply dissected, steep slopes. Erosion is active on most of the unit and mass soil movement is also evident. The soils were formed in glacial till and colluvium and derived from andesite and basalt mixed with volcanic ash. Significant breaks within the Looney unit: include stable, metastable, and active slopes. Depending on annual precipitation amounts, soils on stable surfaces consist of silty clay loams, silt loams, and clay loams. On the steeper metastable and active slopes, cobbly/stony/gravelly loams have developed.

Soils within the Hamilton Creek WAA can be grouped into three general units based on temperature/moisture regimes. Some important soil characteristics correlate with these regimes, as shown in Table 1: Soils Within the Hamilton Creek WAA.

TABLE 1: Soils Characteristics in the Hamilton Creek WAA

TEMPERATURE-MOISTURE ZONES	SOIL TEXTURE	ACRES/ PERCENT OF WAA		NUTRIENT STATUS	SITE CLASS	TENDENCY TO ERODE	BROADCAST BURNING TOLERANCE	TENDENCY TO COMPACT
Cryic/Udic	Gravelly loams, gravelly silt loams	1,417	8	Low	III/IV/V	Low	Moderate - Low	Low
Mesic/Udic	Silty clay, silty clay loams	11,827	68	High	I/II	Medium - High	High	High
	Gravelly, cobbly, stony loams	2,300	13	Moderate - High	II/III	Medium	Moderate - High	Low
Mesic/Xeric	Silty clay, silty clay loams	1,310	7	Moderate - High	II/III	Medium - High	Moderate - High	High
	Hydric soils	644	4		No site class	Medium - High	Low	High

The following discussion addresses soil characteristics and potential influences from management activities, specifically relevant to the Hamilton Creek WAA. Refer to PRMP/FEIS pages 4-11 through 4-13 and Appendix S for a general discussion of soil compaction, displacement, erosion, and nutrient status.

Soil Displacement and Erosional Processes

Geologic Influences and Mass Soil Movement

Mass soil movement has occurred over time in the absence of human activity. (Refer to discussion under Natural Disturbance Processes). Management practices such as timber harvest and road construction can increase the size and frequency of debris flows and slides by influencing water flow characteristics through the soil. However, no significant increases in mass soil movement events resulting from management activity have been identified within the WAA. Soil productivity loss due to unstable soils does not comprise a large percentage of the WAA, and is a relatively minor concern. The most serious impacts of mass movement are sedimentation in streams and subsequent impacts to aquatic life.

Surface Erosion

In general, soil erosion is not a major problem in Hamilton Creek. In the TPCC mapping, the areas classified as susceptible to erosion make up a relatively negligible portion of Hamilton Creek. Increased erosion rates may be caused by natural and human-generated activities. The Oregon DEQ rated sedimentation as a moderate problem in Hamilton Creek, with soil erosion identified as one of the sources of pollution.

Soils with highly erodible surface horizons on slopes greater than 70 percent are more susceptible to dry-ravelling. These areas, mapped as 'FM' in the TPCC classification, comprise about 50 acres of BLM ownership in the vicinity of Green Peter and Keel Mountains.

Soil compaction can significantly increase surface erosion by reducing infiltration of surface water and increasing surface flow. Over 75 percent of Hamilton Creek is comprised of soils that are highly sensitive to compaction and would therefore be more susceptible to erosion. (Table 1). More than 60 percent of BLM-administered lands in the Hamilton Creek WAA are classified as FSR2, which indicates existing soil compaction and displacement on over 12 percent of a given area (Powers, 1987).

Roads intercept rainfall, snow, and subsurface flow, which can cause surface erosion. A risk rating for surface water interception rates was assessed using road densities for the WAA (measured in miles per square mile). The average road density of 4.25 miles/ square mile, with ranges from 2 to 6.5 miles per square mile, is considered to be a medium risk. The two major road related erosion and sediment sources in Hamilton Creek are non-rock surfaced, non-maintained roads and culverts (both boxed wooden culverts in various stages of decay and other at-risk culverts).

Recently harvested areas are most susceptible to surface erosion for up to the first five years of age, after which time revegetation generally reduces bare ground exposed to precipitation and surface flow. In Hamilton Creek, approximately 229 acres of BLM-administered lands, and an estimated 704 acres of private lands, have been harvested within the last five years (Table 4 under Vegetation). The combined total comprises approximately 5.3 percent of the WAA.

Areas of vegetation younger than 20 years old (up to 30 - 40 years in transient snow and snow dominated zones) experience rain on snow events which can contribute to erosion hazard. While this process is more significant in influencing water quantity and peak flow timing (see discussion under hydrology), rain on snow events are expected to be a moderate contribution to erosion by increasing the amount of surface flow during rapid snow melt.

Long-Term Soil Productivity

Soil Nutrient Status

The soils in Hamilton Creek are among the most highly productive soils in the Cascades. An estimated 75 percent of the WAA is composed of soils (silty clays and silty clay loams) which are capable of supporting site classes of I and 2. Soil nutrient status is not a significant problem for long-term soil productivity for most of the WAA. The one exception to this are soils located in the Cryic soil temperature zones, where

soil nutrient status is significantly lower than in the rest of the watershed. Approximately 200 acres of the Hamilton Creek WAA (4.5 percent of BLM ownership) are classified as TPCC 'FN', inherently limited in nutrients.

In Hamilton Creek, as in the whole of the Pacific Northwest and British Columbia, nitrogen is the primary limiting nutrient (Edmonds et al. 1989). There is a direct correlation between nitrogen status and potential productivity. The greatest demand for nitrogen occurs during the first 15 to 20 years of plantation establishment. Removal of nitrogen in soils in the Cryic zone would further deplete soils already below optimum levels for growth. Soil nutrients lost as a result of management activities can be replaced over 80 to 100 years with inputs from precipitation. However, nitrogen levels in deficient soils may not be sufficient to provide nutrients at levels necessary for optimum productivity during the period of maximum need by newly planted seedlings.

Plant Available Water

Adequate soil moisture is essential for seedling survival and seedling growth. There are two standard measures of soil moisture: Available Water Holding Capacity (AWHC), a function of soil depth, soil texture, and rock content; and Plant Available Water (PAW), the water holding capacity in the top 20 inches of the profile that would be available to a planted seedling.

Conifer survival is expected to be very low on soils with less than two inches AWHC. These soils are found in the Cryic/Udic soil temperature/moisture regimes, generally on steeper slopes at high elevations within the WAA. Soils in other temperature/moisture regimes usually do not present significant limitations for seedling survival and establishment.

Maximum productivity for conifer seedlings would be expected on soils with more than four inches of PAW. Soils that contain less than 1 1/2 to 2 inches of PAW can be expected to have very low conifer survival. (Powers, 1987). Poorly drained soils can also result in low seedling survival. These soils, classified as TPCC 'FW' on BLM lands, and soils on private lands identified as hydric in Table 1, are estimated to comprise 644 acres or approximately 4 percent of the WAA.

Soil Compaction

Despite the fact that most soils in the watershed are inherently capable of maintaining adequate water for conifer growth, TPCC data indicates that an estimated 2,875 acres of BLM ownership in the WAA are classified as 'FS', indicating fragile soil conditions due to soil moisture concerns. The majority of this total (2,770 acres) has been classified as TPCC FSR2, exhibiting reduced soil productivity as a result of compaction or topsoil displacement. In addition to contributing to surface erosion, as discussed above, compaction may result in reduced moisture availability to plants by restricting water percolation and infiltration rates.

Surface Erosion Effects to Soil Productivity

The majority of soil nutrients are located in the surface horizons of the soil. Therefore, surface erosion will result in the removal of nutrients, and could significantly reduce soil productivity. As discussed under soil nutrient status, the most significant impacts to productivity would occur on soils already inherently limited in nutrient levels, and in areas more highly susceptible to surface erosion, such as the steeper slopes of Round Mountain, Green Mountain, and Keel Mountain.

Hydrology

Physical Characteristics

Basic information on stream characteristics (locations, length of reaches, orders, flow characteristics, and fisheries) maintained in the Western Oregon Digital Database (WODDB) hydrology GIS theme was reviewed and updated for the Hamilton Creek WAA using information derived from stand exams, culvert inventories, field reconnaissance, and historic timber type maps. This revision increased the estimated miles of stream within the WAA by nearly 100 percent, suggesting that additional review be considered when using the WODDB hydrology in future watershed analysis and other planning efforts. MAP 6: Streams shows streams in the Hamilton Creek WAA based on this update.

It is noteworthy that even with updates and additional data sources, precise information on many stream reaches was not available. Based on prevailing observations and a limited amount of field verification available at the time of this analysis, resource area specialists agreed to employ the basic assumption that all second order and larger streams exhibit perennial flow.

Table 2 summarizes the miles of stream by flow characteristics within the Hamilton Creek WAA, based on this assumption.

TABLE 2: Streams in Hamilton Creek WAA

Stream Order	Miles	Percent of Total
First	105	54
Second	40	21
Third and above	48	25
Total	193	100

Water Quality

Information on water quality conditions in the main branch of Hamilton Creek was included in the 1988 Oregon Statewide Assessment of Nonpoint Sources of Water Pollution (DEQ 1988) Overall water quality was recognized as moderate for fish and aquatic species and as "no problem" for domestic and recreation use. Five different pollution types were identified as being a moderate problem in Hamilton Creek: decreased streamflow, low dissolved oxygen, streambank erosion, sedimentation, and turbidity.

Streamflow

Decreased streamflow is generally attributed to drought conditions and reduced winter snowpack in recent years, and to diversions under existing water rights on lower stream reaches below the WAA. No current or anticipated management activities within the WAA are believed to contribute to decreased streamflow.

Dissolved Oxygen

Decreased dissolved oxygen levels are usually associated with removal of streamside vegetation and resultant increased water temperatures, and with introduction of organic pollutants, including fertilizers, which reduce oxygen levels by increasing biological activity and associated biological oxygen demand. Using estimates of riparian buffer age class and cover conditions as an indication of streamside vegetative conditions (see Table 8 under fisheries discussion), it could be inferred that removal of approximately 29 percent of the streamside vegetation on all ownerships within the past 34 years may have contributed to overall decreases in dissolved oxygen levels. Fertilization of regenerated forest stands may also have contributed to reduced dissolved oxygen, although there are no records of fertilization on BLM-administered lands, and the level of fertilization use on private forest lands is unknown.

Although the three subbasins in the WAA tributary to Hamilton Creek comprise approximately 57 percent of the entire Hamilton Creek watershed, it is generally assumed that management activities on downstream agricultural and residential lands represent a greater influence to dissolved oxygen levels than activities on forest lands within the WAA. The primary factors considered in this assumption are intensive agricultural practices including regular fertilization and livestock grazing, unregulated retention of streamside vegetation, and continual streamside disturbance resulting from more intensive management practices on these lands. There is currently insufficient data to confirm the precise sources of this impact.

Stream Bank Stability

Data on streambank erosion is limited. However, information collected in a 1994 riparian habitat survey indicated that approximately 67 percent (330 acres) of the surveyed riparian habitat was functioning "at risk". This assessment was primarily attributed to a deficiency in long-term potential for large woody debris, which contributes to a variety of riparian habitat characteristics including dissipation of streamflow energy. This condition suggests a potential future risk for stream channel stability, although observations made during the survey did not identify a stream channel or bank stability problem at the current time.

Sedimentation

Sedimentation and turbidity are considered collectively in assessing water quality for this report. Sedimentation is the water quality element most significantly affected by management practices within the WAA. A variety of factors contribute to sediment delivery.

Mass soil movement may increase sediment levels as debris flows reach stream channels. As discussed under soils, the influence of landslides and debris flow is relatively minor within the WAA. Streambank and channel stability may increase sediment levels, particularly during peak flows. As discussed above, streambank and channel stability is not currently believed to be a problem within the WAA, although the potential for future concerns has been suggested.

Surface erosion created by overland flow or surface runoff is a significant potential source of stream sedimentation. Surface runoff is influenced, in turn, by compaction, road densities, the extent of recently harvested or unvegetated areas, and the occurrence of significant hydrologic events such as rapid snow melt resulting from a rain-on-snow event.

Surface runoff is strongly influenced by soil compaction. As discussed under soils, soils within the WAA are generally susceptible to compaction. A large portion (60 percent) of BLM-administered lands, with a presumed proportionate area of private lands, are currently considered to be compacted. Roads influence surface runoff by contributing to the extent of compacted area, and to the amount of unvegetated or exposed bare soil included within the road surface, ditches, and disturbed cut and fill slopes. As discussed under management influences, there are approximately 116 miles of road within the WAA, which result in an estimated 580 acres (3.3 percent) of permanently unvegetated area across all ownerships. Approximately 200 acres of this area is included in permanently compacted road surface.

Rain on Snow Influence on Sedimentation

Methods adapted from the Handbook of Standard Methodology for Conducting Watershed Analysis (Washington Forest Practices Board 1992) were used to assess the risk of increased runoff (and potential erosion and sedimentation) resulting from rain-on-snow events. The influence of rain-on-snow on increased surface runoff is determined by two factors: 1) the extent of unrecovered openings, ie., non-vegetated and hydrologically unrecovered (recently harvested, agriculture) areas, as expressed in equivalent clearcut area (ECA), and 2) the percentage of area included in transient snow zone (TSZ), one of three precipitation zones used to estimate the potential for rain on snow events.

Areas in roads, agricultural lands, and other non-forested lands are considered to be in a permanently unvegetated or hydrologically unrecovered condition for the purposes of determining ECA. These areas comprise an estimated 1,125 acres (6 percent) of the WAA. (See Figure 3 under Vegetation)

Hydrologic recovery for forested areas is determined by crown closure and stand composition. Vegetation in recently cut areas has not developed crown closure which can intercept snow and rain and allow it to reach the ground in a less erosive pathway (by streamflow, etc.). Additionally, the vegetative biomass has not developed the capability to transpire soil moisture out of the ground to the same extent as revegetated areas (Washington Forest Practices Board 1992). See Table 3 for the age at which hydrological maturity is assumed to be reached within the three precipitation zones.

Forest plantations in younger age classes contribute an additional 3665 acres to unrecovered openings, increasing the total ECA within the watershed to approximately 27 percent (4790 acres), which represents a high risk of increased runoff using the Washington Analysis Methodology. (See Table 3)

The TSZ is the precipitation zone in which snowpack is generally ephemeral, and is frequently subject to rapid melting from winter rain-on-snow events. In the northern extent of the Cascade Range, the TSZ encompasses the elevation range from approximately 1,500 feet above sea level, up to the lower extent of the cryic soil temperature zone (approximately 3000 feet). The acreage of precipitation zones within the Hamilton Creek WAA is shown in Table 3. Approximately 45 percent (7,880 acres) of the WAA falls within the transient snow zone. This percentage represents a high potential risk of increased runoff due to rain-on-snow events according to the Washington Watershed Analysis Methodology.

An evaluation of the area in ECA within each precipitation zone provides an indication of hydrologic condition (Table 3).

TABLE 3: Vegetative Recovery Status within Precipitation Zones [1/]

Precipitation Zone	Recovery Status	Acres	Percent of WAA
RAIN DOMINATED	>20 yrs (Recovered)	6168	35
	0-20 yrs (Unrecovered)	2031	12
TSZ DOMINATED	> 30 yrs (Recovered)	6530	37
	0-30 yrs (Unrecovered)	1342	8
SNOW DOMINATED	>40 yrs (Recovered)	580	3

	0-40 yrs (Unrecovered)	837	5
	TOTAL UNRECOVERED (ECA)	4210[1/]	24[1/]

[1/] Does not include acres in roads. An additional 580 acres of road surface and permanently disturbed road clearing and cut/fill slopes increases the estimated not mature ECA to 4790 acres or 27 percent of the WAA.

For those watersheds, such as Hamilton Creek, which exhibit a high risk for both ECA and area in TSZ, a rain-on-snow enhancement analysis is suggested (methods adapted from the 1992 Washington Watershed Analysis Methodology). The results of this analysis showed the Hamilton Creek WAA to be at the low range of the medium risk category for rain-on-snow enhancement.

Downstream and Adjacent Water Uses

The most sensitive water use is for fisheries habitat. Other beneficial uses include non-fisheries associated uses for which water right permits are required. A database maintained by the Oregon Department of Water Resources lists the predominant uses as irrigation, livestock, fire protection, and domestic water supply. (Water Resources Department 1994). Municipal water supply and industrial uses are included among downstream uses on the South Santiam River. Water rights on Hamilton Creek downstream to its confluence with the South Santiam River are included in Appendix A-2. The Water Resources Department database does not include uses which do not require water right permits, such as wildlife, habitat for aquatic organisms, recreation, and aesthetics.

Vegetation

Natural Communities

The Hamilton Creek WAA is in the western hemlock zone, characterized by forests with western hemlock dominating the overstory in the climax seral stage and Douglas-fir prevailing as the sub-climax dominant species. The range of the western hemlock zone extends into British Columbia in the north and to the division between the North and South Umpqua Rivers in the Oregon Cascades and the Klamath Mountains in the Coast Range. The Willamette Valley and other interior valleys separate the coastal and cascade segments of the western hemlock zone in Oregon. (See PRMP/FEIS p. 3-29 and Map 3-4, Seral Stages and Major Plant Groupings).

Major upland plant grouping in the foothills of the WAA is the Douglas-fir/ocean spray/herbs and grasses (D/OS/H). At approximate elevations between 1500 and 2500 feet are forests in the Douglas-fir/Mixed Brush/Salal (D/B/SA) major plant grouping. A partial list of additional species found in the D/OS/H and D/B/SA major plant grouping is maintained in the Santiam Resource Area botanical files.

Vegetative Patterns

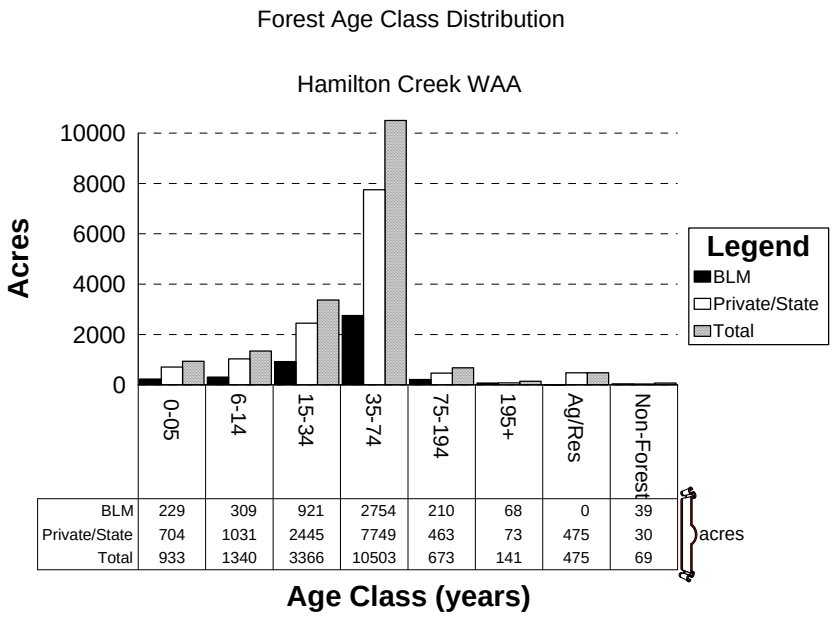
Information on vegetative conditions was derived from a variety of sources. BLM FOI records (1993) were used to depict vegetative conditions on BLM lands. Vegetative condition on private lands was determined from aerial photograph interpretation using 1988 and 1993 coverage, and from Oregon Department of Revenue forest cover maps. This information was developed solely for evaluation of seral stage distribution and habitat conditions across the WAA. All estimates of vegetative cover and stand conditions

are expressed as existing in the summer of 1993. Harvest and other management activities conducted since that time have not been evaluated in this analysis.

Age class distribution in the Hamilton Creek WAA has been categorized into age class bands corresponding to vegetative seral stage development (MAP 7: Forest Cover Conditions on BLM Lands, MAP 8: Forest Cover Conditions on Private Lands, and Figure 3: Forest Age Class Distribution, below. Refer to also to PRMP/FEIS pp. 3-29 -- 3-30 for a general discussion of seral stages).

Excluding lands classified as non-forested types, approximately 90 percent are conifer types consisting mostly of Douglas-fir and western hemlock. Approximately 10 percent are hardwood types consisting of red alder and big-leaf maple.

FIGURE 3: Forest Age Class Distribution in Hamilton Creek WAA 1/



1/ Acres in roads and non-forest areas within road clearing limits are not shown.

Age class distribution is an important component in describing the overall structure of the WAA as an ecosystem. To describe the structure and pattern of vegetation or habitats within an ecosystem, a given area, such as the WAA, can be characterized in terms of patches, corridors and a background matrix. The patterning of patches and corridors across the landscape strongly influences the ecological characteristics, processes and energy flows (Forman and Gordon 1986).

The landscape matrix is defined as the most connected portion of the landscape in terms of vegetative cover and plays a dominant role in landscape function. (The term Landscape matrix should be distinguished from the Matrix Land Allocation described in the SEIS/ROD and Salem District PRMP). The predominate matrix (62 percent) across all ownerships in the Hamilton Creek WAA consists of closed sapling pole stands between 35 and 74 years of age. Open to closed sapling pole stands 15 to 34 years of age comprise a significant secondary matrix (20 percent).

Patches are basically definable habitat types which differ in appearance from their surroundings. Patches vary in size, shape, type, heterogeneity (how uniform they are) and the types of edge that surround them. The basic idea is to group like habitats into a class of patches. The patch elements of the Hamilton Creek WAA consist predominantly of early successional stands, referred to as Grass/Shrub seral stage, resulting from timber harvest during the last 20 years (13 percent).

There are some patches of mature (75 to 194 year old) forest. Currently, about 5 percent of the WAA is considered to be in late-successional forest stands over 75 years of age. The largest existing patch of mature forest (550 acres) is south of Round Mountain and in Hamilton Creek. About three-fourths of this block is located on private lands. The other patches of mature forest are highly fragmented and relatively small in size, but are well connected by the matrix of 35 to 74 year old stands. These patches are located mostly on BLM lands in the center of the WAA (Sections 15 and 23), around Green Mountain meadows in the northeast corner (Section 1) and around Bald Peter in the southeast corner of the landscape (Section 29). Less than 1 percent is in old-growth stands over 200 years of age.

Approximately 3 percent (544 acres) of the WAA consists of patches classified as non-forest types, including rural residential and agricultural lands. These areas are concentrated in the western lowland portion of the WAA. These are habitats that are disturbed repeatedly and not allowed to recover under natural processes. Some plants expected to occur in these patches and possibly influencing adjacent patches and corridors include introduced non-native grasses, noxious weeds, off-site deciduous and conifer tree species and species introduced as a result of agriculture or gardening.

An estimated 3 percent (580 acres) of the WAA consists of road surface and permanently disturbed cut and fill slopes. Roads create a dispersed network of non-forest corridors that segregates the existing matrix and contributes to isolation of patches across the landscape.

Forest Stand Conditions

Approximately 4,170 acres (92 percent) of BLM-administered lands and 11,211 acres (86 percent) of privately managed forest lands in Hamilton Creek are conifer (See Maps 7 and 8). Douglas-fir is the most common overstory conifer present. Western hemlock, the most common understory species in the WAA, occurs in the overstory of several stands in Section 29, T. 12 S., R. 2 E. Western redcedar and grand fir are present but not common in the understory throughout the WAA.

Approximately 318 acres (7 percent) of BLM-administered lands and 1,242 acres (10 percent) of privately managed forest lands are hardwood dominated. Most of the BLM lands are located in Sections 3, 11, and 21, T.12 S., R. 1 E. Upland and riparian communities are represented. Red alder and bigleaf maple are the most common species; black cottonwood and bitter cherry are also present.

Less that 1 percent (39 acres) of BLM-administered lands are classified as nonforest.

Noxious Weeds and Non-Native Species

There are no known sites of Priority I (Potential New Invaders) or Priority II (Eradication of New Invaders) noxious weed species in the Hamilton Creek WAA. (Priority species definitions are discussed in the Salem District 1992-1997 Noxious Weed Control Program Environmental Assessment).

There have been sightings of Canadian thistle and St. Johnswort, which are Priority III (Established Infestations) species. Established infestations are widespread throughout the landscape. Additional Priority III species are expected to be found in the analysis area as a result of scheduled botanical clearances.

Biological control agents have been released to contain infestations throughout the state for Priority III species and to prevent further spread. Biological control agents will reduce, but not eradicate thistle, Scotch broom, and St. Johnswort populations in the WAA. Increased amounts of roads and disturbed ground on private lands will increase the amount of suitable habitats for noxious weeds.

In addition to noxious weeds, there are several non-native species known to be in the WAA. Although these species are not classified as noxious, they have the potential of competing with the native vegetation and having negative ecological impacts. In areas where the soil has been disturbed, such as road cuts, gravel pits, and clearcuts, nonnative species have become common. Non-native species are found in almost every type of habitat throughout western Oregon.

Wildlife

Habitat Age Class, Amounts and Distributions

Reforestation and subsequent intensive forest management practices have essentially maintained most forest lands in a closed sapling/pole seral stage development. Figure 4 illustrates the current seral stage condition resulting from harvest and reforestation activities within the WAA. (also see Figure 3 under Vegetation).

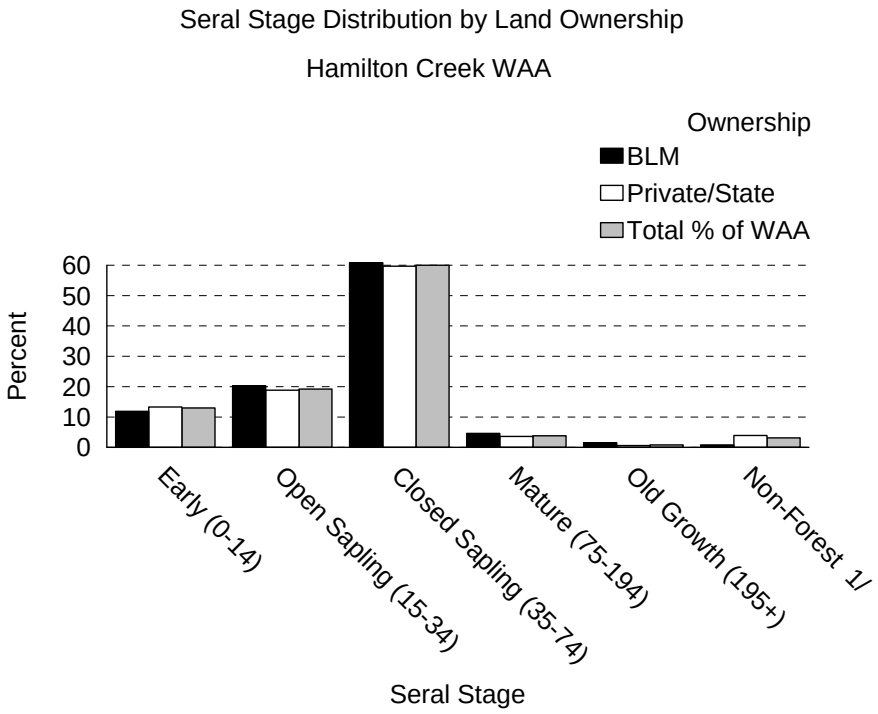


FIGURE 4: Seral Stage Distribution [1/]

[1/] Does not illustrate area in road surface, cut and fill

The drainages and their associated riparian/streamside vegetation provide corridors for wildlife movement to other WAA's. Generally, they flow from the northeast higher elevations in the Hamilton Creek WAA to the Willamette Valley to the southwest. The higher elevation ridge top areas connecting Round Mountain, Green Mountain, Keel Mountain, and Green and Bald Peters also serve as flow corridors for larger mammals. Generally the flow of more mobile species of wildlife through the landscape is from higher elevation to lower elevation in the fall/winter and to higher elevation in the spring. This corresponds to a general northeast/southwest flow across the WAA, presumably along drainages and ridgetops.

Age class amounts, distributions, and patterns across the WAA, as discussed under Vegetation, are important components of wildlife habitat. It is noteworthy that a large portion of BLM and private forest area is in the 40 to 70 year age class, in what would be considered a closed pole seral stage condition. Inputs from the age class analysis were used to calculate the habitat effectiveness for cover (HEc) using the Wisdom model (Wisdom et. al.). Presently, there is an estimated 5 percent optimal cover, 60 percent thermal and 25 percent hiding cover in the WAA. The HEc is currently .4, which is a threshold value between marginal (limiting) and viable for elk. The habitat effectiveness for forage (HEF) quality is estimated to be .3, which is limiting for elk. The habitat effectiveness for size and spacing (HEs) was not calculated due to data limitations. A habitat effectiveness index derived from open road densities (HEr) was also calculated and included under the discussion on roads.

Less than 5 percent of the WAA (6 percent of BLM-administered lands) is currently in the mature and old-growth stage of development. Due to the edge effect, there is little interior mature forest present in this landscape. Based on the scarcity, fragmentation and location of late-successional habitat, this is a habitat of concern in the Hamilton Creek WAA.

Road Densities

The existence of roads in the landscape has physical effects on wildlife and its habitat. The land area in roads does not contribute to forest or non-forest wildlife habitats. Run off from roads can cause changes in water quality that effect aquatic and semi-aquatic wildlife. The existence of roads causes edge effects and micro climatic changes that can also effect wildlife habitat. Roads and traffic can sever travel corridors and kill wildlife, especially smaller, less mobile terrestrial species, such as salamanders and snakes. In addition, open roads can have disturbance effects through traffic and increased human intrusion.

As part of the Hamilton Creek watershed analysis, road densities across the WAA were calculated (refer to Management Influences and Human Use, Roads and Transportation). Inputs from the road density analysis were used to derive a habitat effectiveness index from open road densities (HEr) using the Wisdom model (Wisdom et. al.).

The estimated average total road density of 4.25 miles per square mile across all ownerships is considered to be high. Road densities range from 2 to 6 1/2 miles per section. There are several gates in the WAA which limit access and thus reduce disturbance to wildlife. In addition, some of the roads are over grown or blocked which also limits access. Approximately 7 percent of the total road miles in the WAA are effectively gated or otherwise undrivable. Open (accessible) road densities across the WAA are presently estimated at 3.95 miles per section, which is considered to be high. The HEr derived from open road densities for the WAA is currently .30, which, according to the Wisdom model, is limiting for elk.

Average total road density on BLM lands is estimated at 4.22 miles per section. Open (accessible) road densities on BLM lands average 3.11 miles per section, which is still considered to be high. The HEr derived from open road densities for BLM lands is currently at or near .35, which is still limiting for elk.

Based on the road density analysis, high road densities in the Hamilton Creek watershed has been identified as a critical issue.

Standing Dead and down Logs

Estimates of the amount and condition of standing dead across the landscape were correlated to estimate existing percent of potential cavity-nesting bird populations. Estimates show that the Hamilton Creek WAA is between 30 to 40 percent of potential level, which approaches PRMP/FEIS standards (p. 2-33). The standing dead component was found to consist mostly of smaller material in advanced stages of decay.

Estimates of the amount and condition of down logs were compared with PRMP/FEIS standards (p. 2-33). It is estimated that there is an average of about 50 percent of the PRMP/FEIS standard. Most of the large material is in more advanced stages of decay.

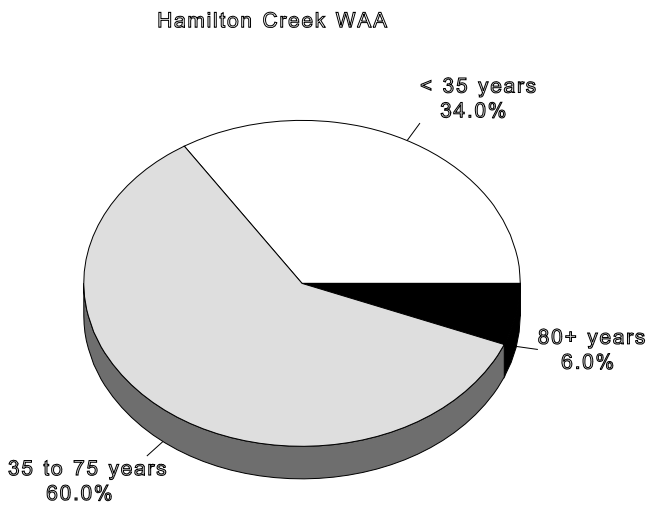
The standing dead and down log components were found to be lacking in large material in the early stages of decay. This large, harder material will persist longer than the existing softer material in advanced stages of decay. This material is important for future habitat and nutrient capital. Based on available information, standing dead and down log habitat are considered habitats of concern in the Hamilton Creek WAA, particularly larger, harder material.

Riparian/Streamside Habitat

Streams and their associated riparian/streamside habitats were analyzed as part of the Hamilton Creek Watershed Analysis. Interim Riparian Reserves as defined in the SEIS/ROD, were applied to stream reaches on BLM lands, (MAP 9: Forest Cover Inside Riparian Reserves) and age classes and percent of landscape in Riparian Reserves on BLM was calculated. Tentative stream protection buffers (approximated at 30 meters for this analysis) identified in the Oregon Forest Practices Act were assumed for private lands. (MAP 10: Forest Cover Inside FPA Retention Buffers)

Of the 193 estimated stream miles in the landscape, 51 miles (26 percent) are managed by BLM. Approximately 56 percent of the BLM ownership in the Hamilton Creek WAA falls within Riparian Reserves. Age class distribution within the Riparian Reserve buffers is similar to the age class distribution on BLM across the WAA. Currently, about 6 percent of the Riparian Reserve buffers are in age classes over 80 years of age and approximate late successional forest conditions. The majority (60 percent) of the Riparian Reserve buffers are in closed sapling pole seral stage between 35 and 75 years of age. About 34 percent are in stands under 35 years of age (Figure 5). Hardwood forest types on both BLM and other ownerships comprise a much larger proportion of the streamside types than the average across the WAA.

FIGURE 5: Age Class Distribution in Riparian Reserves (BLM Ownership)



Approximately 57% of the BLM ownership in the Hamilton Creek WAA falls within Riparian Reserves.

The larger, better developed riparian areas typical of the larger order streams are located in the western portions of the WAA, on private lands. The majority of streams on BLM -administered lands are smaller order streams with limited riparian zones.

Standing dead and down logs have already been identified as habitats of concern within the WAA. These elements are especially important in streamside areas. Late-successional habitat has also been identified as a habitat of concern. Late-successional habitat adjacent to streams and in the vicinity of special habitats is particularly important. Refer to Fisheries for additional analysis of these components within riparian areas.

A riparian habitat survey was completed on approximately 10.8 miles of stream and over 500 acres of riparian habitat on BLM lands in the Upper Hamilton Creek subwatershed during the summer of 1994. The survey rated riparian habitat function using an assessment of the ability of structural elements including large woody debris, vegetation, landform and slope stability, to contribute to a variety of aquatic and streamside habitat characteristics. Qualitative definitions for associated riparian habitat condition can be found in BLM Manual 1737-9, Riparian Area Management. Riparian habitat conditions were rated as "Properly Functioning" on 95 acres (18 percent), functioning "at risk" on 330 acres (67 percent), and "Non functioning" or poor on 75 acres (15 percent).

The primary deficiency noted in function was the current and long term potential for large woody debris recruitment, especially in fish-bearing streams. Large woody debris contributes to riparian health by increasing stream friction, reducing stream energy, trapping sediment, creating pools, and providing habitat for aquatic species. The primary criteria for down woody material recruitment is size, which is a function of age and species of recruitment trees. Conifers are the preferred species, especially in hardwood dominated riparian areas, because they usually will grow to a larger size and are more enduring than hardwoods.

Fisheries

The Hamilton Creek WAA includes the headwater portions of Hamilton Creek and McDowell Creek, both of which are tributary streams of the South Santiam River. Hamilton Creek is approximately 15 miles long. There are three named tributary streams to Hamilton Creek within the WAA: Jack Creek, Scott Creek, and Deer Creek. McDowell Creek is approximately 11 miles long and contains no named tributary streams within the analysis area.

The distribution of fish within the Hamilton Creek WAA is not well documented. The distribution of anadromous fish is limited by known barrier waterfalls; however, the total extent of resident fish occurrence is unknown. Based on Boehne and House (1983), the assumption was made that all third order and larger streams are fish bearing. Based on this assumption, there are approximately 49 miles of fish bearing streams within the WAA, of which anadromous fish occupy 3.2 miles (See Table 4: Miles of Fish-Bearing Streams, and MAP 11: Fisheries).

Two species of anadromous fish are found in the Hamilton Creek WAA. These are spring and fall runs of chinook salmon (*Oncorhynchus tshawytscha*) and winter and summer runs of steelhead trout (*Oncorhynchus mykiss*). The cutthroat trout (*Oncorhynchus clarki*) is the only resident salmonid present. Other resident fish species present include: sand rollers (*Percopsis transmontana*), shiners, sculpins (*Cottus* spp.) and dace (*Rhinichthys* spp.).

TABLE 4: Miles of Fish-Bearing Streams in the Hamilton Creek WAA.

Stream	Anadromous miles	Resident miles[1]
Hamilton Creek	3.2	6.6
Jack Creek	0	2.1
Scott Creek	0	4.7
S. Fk. Scott Creek	0	5
Deer Creek	0	0.7
McDowell Creek	0	3.5
Misc. tribs[2]	0	25.4
Total	3.2	49

[1] Anadromous miles are included in the resident miles
[2] Includes all tributary streams to the identified mainstem streams

Anadromous Fish

Hamilton Creek has approximately 12 miles of available anadromous fish habitat, all of which is on the mainstem of Hamilton Creek. There is about 3 miles of anadromous habitat within the analysis area *(above the confluence with Jack Creek)*. The upstream limit of anadromous fish is an 8 ft. high falls on Hamilton Creek approximately 0.3 miles above Deer Creek. No anadromous fish habitat is found on BLM-administered lands.

McDowell Creek has about 7 miles of anadromous fish habitat, all of which is downstream from the analysis area. The upstream limit of anadromous fish is a 35 foot falls. No anadromous fish habitat is found on BLM lands.

Spring chinook salmon are the only native salmon in the Santiam Basin. Oregon Department of Fish and Wildlife has classified the native Willamette stock of spring chinook salmon as a "stock of concern" because of the low numbers of natural fish and the genetic influence of the large hatchery program. The spring chinook salmon run in the South Santiam is almost exclusively a hatchery run. There are no records of spring chinook spawning in Hamilton Creek or McDowell Creek (ODF&W 1992).

Fall chinook salmon have been introduced into the Santiam Basin. These fish are known to spawn in the South Santiam River in the vicinity of Hamilton Creek, but they do not spawn in Hamilton Creek itself .

Both winter and summer runs of steelhead trout are present in the South Santiam River. Only the winter run is native to the Santiam Basin, the summer run is an introduced hatchery stock. Willamette River winter steelhead, including the South Santiam population, were petitioned for listing in February, 1994 (Oregon Natural Resources Council et al. 1994). The petition was accepted, and the National Marine Fisheries Service is currently conducting a status review to determine if listing is warranted. ODF&W has classified the winter steelhead in the South Santiam River as a "stock of concern" because of the loss of habitat associated with Foster and Green Peter Dams. Presently no hatchery winter steelhead are released into the South Santiam.

Summer steelhead were introduced into the South Santiam as mitigation for Foster and Green Peter dams in 1969. The summer fish are managed for harvest purposes only and naturally reproducing populations are considered undesirable due to their competition with the native winter steelhead. Small runs of winter and summer steelhead trout are likely to be found in Hamilton Creek and McDowell Creek, and spawning activity by summer steelhead has been recorded in both streams (ODF&W 1992).

Resident Fish

Cutthroat trout are assumed to be present in all third order and larger streams in the WAA . All populations are native and no hatchery stocking has occurred. ODF&W has classified the cutthroat trout in the Willamette Valley as a "stock of concern" due to insufficient information on their status (ODF&W 1992). Fish populations were sampled in S. Fork of Scott Creek by BLM personnel in 1984. Cutthroat trout density was slightly higher than the average density in other Santiam Basin streams (ODF&W 1992).

The sand-roller, another "stock of concern", is found in the lower portions of Hamilton Creek, downstream of the WAA. The sand-roller is found in low gradient reaches with sandy substrate (ODF&W 1992). Other resident fish known to occur in the mainstem of Hamilton Creek, downstream of the barrier falls, are shiners, sculpins, and dace.

Fish Habitat

Most of the fish habitat in the Hamilton Creek and McDowell Creek watersheds is in private ownership. Public ownership is limited to scattered parcels of land in the headwaters portions of the drainages. The entire length of Hamilton Creek which supports anadromous fish is in private ownership; the primary land use along Hamilton Creek is agriculture and rural residential. There is no fish habitat inventory data available for any of the private lands within the watershed analysis unit or for private lands downstream from the analysis area. The "Oregon Rivers" database has identified high water temperature, loss of riparian vegetation, and streambank erosion as impacts to fish habitat in the portions of Hamilton Creek and McDowell Creek below the analysis area and for the anadromous portion of Hamilton Creek and the mainstem of Jack Creek within the analysis area.

A limited amount of fish habitat inventory data is available for the streams in the WAA. These surveys were done on the BLM portions of the mainstems of Hamilton Creek, Scott Creek, and S. Fork Scott Creek

in 1979. These inventories provide only summary data for stream reaches, and much of the information is based on the observer's subjective assessment of the reach. A summary of this information is found in Table 5.

TABLE 5: Summary of 1979 Fish Habitat Information for Inventoried Streams in Hamilton Creek WAA

Miles Surveyed	Gradient (percent)	Average Channel Width	Average Wetted Width	Pool/ Riffle Ratio	Max. Pool Depth	Average Pool Depth	Dom. Substrate	Water Temp.F
Hamilton Creek								
0.9	4-12	22'	6'	55/45	30"	10"	Bedrock	52
Scott Creek								
1	8	15'	9'	70/30	18"	6"	-	55
South Fork Scott Creek								
2.1	1-8	16'	11'	35/65	24"	10"	Rubble	54

In general, the survey information appears to be representative of fair to good resident trout habitat in streams of moderate gradient. Surveyors noted siltation may be a problem in both Scott Creek and S. F. Scott Creek It is not known if siltation is still a problem.

Riparian surveys completed in 1994 within the Hamilton Creek WAA include data on the amount of large woody debris (LWD) in the channels (refer to Riparian Habitat discussion under Wildlife). This data has not been fully analyzed, although some conclusions regarding LWD and stream channel condition have been developed (see water quality discussion). It is assumed that because of past timber harvest practices and because of the relatively young age of the standing timber in the WAA, that LWD is generally lacking in the stream channels. LWD is recognized as an important functional element of forested stream channels. LWD retains gravel, diversifies habitat for fish and other aquatic organisms, dissipates stream energy, slows down the nutrient cycling process, and alters the stream's longitudinal profile. Generally, smaller streams with low levels of LWD tend to have an increased amount of riffle habitat.

The Washington Forest Practices Board Watershed Analysis Manual (1993) provides a method for assessing potential fish habitat quality based on stream gradient and confinement. Gradient and confinement are two geomorphic factors that influence stream energy and velocity, which in turn, influence fish habitat. For resident trout, the rating system tends to be more sensitive to gradient. Stream confinement data is not available for the Hamilton Creek WAA and was not considered for this analysis.

Estimates of stream gradient have been made for 24.4 miles of streams within the WAA (Table 6: Estimated Miles of Streams by Stream Gradient). The smaller, steeper tributary streams were excluded. While 71 percent (17.4 miles) of the measured stream miles have a gradient of less than 8 percent, about 80 percent of the BLM stream miles (measured) have a gradient of 8 percent or greater.

TABLE 6: Estimated Miles of Streams by Stream Gradient Classes for Selected Streams in Hamilton Creek WAA.

Stream	Gradient (percent) by Ownership							
	0-3		4-7		8-11		>12	
	Total	BLM	Total	BLM	Total	BLM	Total	BLM
Hamilton Cr.	5.1	0.4	1.9	<0.2	1.2	0.7	<0.2	<0.2
Scott Cr.	1.7	<0.1	5	1.3	1.3	0.8	0.9	0.8
Deer Cr.	0	0	0.5	0	0.1	0	0.1	0
Jack Cr.	1.1	0	0.5	0	<0.1	0	0.4	0
McDowell Cr.	0.4	0	1.2	0	1.5	0.2	0.4	0.2
Total miles	8.3	0.5	9.1	1.3	4.2	1.7	2.8	1.1
Percentage of Total	34	2	37	5	17	7	11	4
percentage BLM in class		6		14		40		39

Assumptions used for modifying the Washington ratings were 1) for spawning and rearing habitat, that the streams in the Hamilton Creek WAA with a gradient over 8 percent were likely to be confined and 2) the gradient classes of 12-20 percent and >20 percent were combined because of the small amount of >20 percent channels (of the measured channels).

The Washington Forest Practices manual ratings for a) spawning and winter habitat and b) summer rearing habitat for resident trout were modified as follows:

Spawning and winter habitat:

Good Habitat	0-7% gradient
Fair Habitat	8-11% gradient
Poor Habitat	>12% gradient

Summer rearing habitat:

Good Habitat	0-12% gradient
Fair Habitat	>12% gradient

TABLE 7: Potential Fish Habitat Ratings, Based on Stream Gradient, for Selected Streams in the Hamilton Creek WAA.

Habitat	Rating Class	Total Miles	Percent of Total Miles	BLM Miles	Percent of BLM in Rating Class
Spawning and Winter Rearing Habitat	Good	17.4	71	1.8	10
	Fair	4.2	17	1.7	33
	Poor	2.8	11	1.1	39
Summer Rearing Habitat	Good	21.6	88	3.5	14
	Fair	2.8	11	1.1	39

It is important to emphasize that Tables 6 and 7 summarize only those streams for which gradients were estimated. These streams represent an estimated 50 percent of the fish-bearing stream miles in the WAA.

These streams (generally, fourth order and higher) are the larger, lower gradient streams. There is probably a much higher proportion of potentially fair and poor habitat, based on stream gradient, when smaller tributaries are considered within the entire WAA.

Considering the streams analyzed in Tables 6 and 7, it is apparent that the majority of the Hamilton Creek WAA, from a geomorphic consideration, has the potential to be good fish habitat in the long term. It is also apparent that the majority of the better fish habitat is in private ownership. Only 10 percent of the potentially "good" spawning and winter rearing habitat is in BLM ownership and only 14 percent of the potentially "good" summer rearing habitat is BLM managed.

Although gradient and confinement are important indicators of fish habitat condition, other parameters, such as large woody debris, quality pool habitat, sediment, bank stability, and width/depth ratio, should be considered in determining fish habitat condition. Quantitative data on these other parameters is lacking.

Large Woody Debris and Riparian Condition

As previously stated, it is assumed that LWD levels may be at less than optimum levels in the WAA. The following analysis of LWD potential recruitment uses the best available riparian vegetation data available. However, it is acknowledged that the riparian information is inadequate. This is because the riparian vegetation data is taken from the forest inventory which generally lumps the riparian area in with the adjacent upland stand. Therefore the forest inventory data is more representative of the upslope conditions than it is of the riparian zone.

An analysis of forest cover types along streams was made using representative Riparian Reserve buffers on BLM lands (Map 9), and FPA full protection stream buffers on private lands, estimated at 10 meters. Map 10, which approximates the FPA basal area retention buffers (approximately 30 meters), illustrates the current condition inside the 10 meter buffer in this analysis.

The riparian vegetation is dominated by relatively young, thrifty conifer stands. Only 20 percent of the riparian acreage in the Hamilton Creek WAA is dominated by conifers over 80 years of age (Table 8: Riparian Acres by Forest Cover Type).

TABLE 8: Riparian Acres by Forest Cover Type and Stand Age in the Hamilton Creek WAA.

Stand Age (yrs)	Conifer	Conifer/ Hardwood Mix	Hardwood	Percent of Total
0-9	220	0	0	6
10-19	259	0	0	7
20-39	505	0	100	16
40-79	1146	245	500	51
80-195	650	9	0	18
196+	41	32	0	2
Total	**2822**	**286**	**600**	
Percent of Total	**76**	**8**	**16**	

[1] Table does not include 59 acres of non-forest land or 580 acres in road surface, cut and fill

Table 9, Potential for Recruitment of LWD presents the acres of high, moderate and low potential for future LWD recruitment based on the Washington Watershed Analysis handbook. This analysis is based on the following assumptions: 1) all trees over 12 inches DBH provide acceptable LWD, and 2) dense, young conifer stands (<40 yrs) will have only a moderate impact on future recruitment. A total of 56 percent (2,123 acres) of the WAA rates as having high potential, 39 percent (1,484 acres) has a moderate potential, and only 4 percent (159 acres) has a low potential for future LWD recruitment.

Many of the stands rated as having a high or moderate potential for future LWD recruitment are not likely to be able to provide much LWD in the short-term. Stands under 20 years of age won't have acceptable sized trees for several decades. Stands under 80 years of age, while they may contain adequate sized trees, generally have low mortality and therefore few trees which will fall into nearby streams. Stochastic events, such as blowdown and fire, are the primary cause of LWD input into streams from these younger, healthy forest stands. Fully 80 percent of the riparian buffers in the analysis area are made up of stands less than 80 years old (Table 8).

TABLE 9: Long-Term Potential for Future LWD Recruitment in Hamilton Creek WAA Using the Washington Watershed Analysis Method.

Dominant Tree Type	Age/Size Class[1]		
	Young, <40 Years	Mature, 40-120 Years	Old, >120 Years
Conifer	984 acres Moderate impact	1740 acres High potential	97 acres High potential
Mixed	0 acres Low potential	254 acres High potential	32 acres High potential
Hardwood	159 acres Low potential	500 acres Moderate impact	0 acres Moderate impact

[1] Assumes all stands are dense

The Salem District PRMP/FEIS rates stream habitat using, in part, the size of the tree in the riparian zone (PRMP/FEIS p. 3-40). With this method trees larger than 21 inches DBH are considered good/optimal, 11 to 21 inches DBH are fair, and trees under 11 inches DBH rate minimal. Using these conditions, 4 percent (160 acres) of the riparian zones would be rated as having a good potential, 65 percent (2464 acres) would be rated as having a fair potential, and 30 percent (1,143 acres) would be rated as having a minimal or poor potential for contributing to LWD.

It is noteworthy that the Salem District PRMP/FEIS methodology using current tree size emphasizes current potential LWD recruitment, while the Washington Watershed Analysis assessment rates the long term or future potential for current stands to contribute to LWD capital. Using these two analyses, it may be summarized that the current riparian LWD condition is poor, but the potential for LWD development for the long term is good.

Special Status/SEIS Special Attention Species and Special Habitat Areas

Special Status/SEIS Survey and Manage Animal Species

A list of animal species known or suspected to occur in the Hamilton Creek WAA was correlated with scarce habitat types to identify species of concern within the WAA. Forty-five species (eight species of

amphibians, nineteen species of birds and eighteen mammals) were identified (refer to Appendix A-3). No reptile species of concern were identified as a result of this analysis.

Ten of the forty-five species of concern have state and/or federal status, and are included in the BLM special status species list. Seven of the Ten SSS have been confirmed sightings within the WAA. Four of the species of concern are listed as "Survey and Manage" species in the SEIS/ROD. There are no confirmed sites for SEIS survey and manage species within the WAA. Table 10 lists BLM special status and SEIS/ROD "Survey and Manage" species known or suspected to occur in the Hamilton Creek WAA.

TABLE 10: BLM Special Status and SEIS/ROD "Survey and Manage" Animal Species Known or Suspected to Occur in the Hamilton Creek WAA

SPECIES	FEDERAL	STATE	BUREAU
AMPHIBIANS			
Cascade torrent salamander		SV	
Clouded salamander		SU	AS
Oregon slender salamander		SV	BS
Tailed frog		SV	AS
Red-legged frog	C2	SU	C2
BIRDS			
Mountain Quail	C2		C2
Northern goshawk	C2	SC	C2
Northern spotted owl	FT	ST	FT
Pileated woodpecker		SV	AS
Western Bluebird		SV	AS
MAMMALS			
Silver-haired bat	SM		
Long-eared myotis	SM		
Long-legged myotis	SM		
Pacific western big-eared bat	C2	SC	C2
Red tree vole	SM		

FT: Federal Threatened
C2: Federal Candidate Category 2
SM: SEIS/ROD Survey & Manage

BS: BLM SSS Policy Sensitive
AS: BLM SSS Policy Assessment

ST: State Threatened
SC: State Sensitive Critical
SV: State Sensitive Vulnerable
SU: State Sensitive Uncertain

Invertebrates listed in Oregon Natural Heritage Program, August 1993, that are listed as BLM special status species were evaluated for possible occurrence in the WAA. Nine species of invertebrates were identified that could occur in the WAA (Appendix A-4). Invertebrate species of concern within the WAA were not identified due to lack of information and knowledge of these species' life history, distribution, and habitat. None of the survey and manage invertebrate species or groups listed in the SEIS/ROD table C-3 are known or suspected to occur in the Hamilton Creek WAA.

Species/Habitat Correlations

Species of concern within the Hamilton Creek WAA were correlated with scarce habitats that were identified as a result of the other analyses. Of the 45 priority species that were identified, 34 species are included on the list of species associated with late-successional stage forest habitats. Seven of the ten special status species are late-successional associates. Thirty-three species find their primary habitat in down logs and/or standing dead, six of which are special status species. Fifteen species are potentially associated with Green Mountain meadows (refer to special habitat discussion, below). Three of these species are special status species. Fifteen species are potentially associated with Black Peter wetlands, four of which are special status species. The results of habitat correlations are summarized in Table 11.

TABLE 11: Habitat Correlations of Hamilton Creek WAA Species of Concern

	Standing Dead and Down Logs	Late Successional	Green Mountain Meadows	Black Peter Wetland
	NUMBER OF SPECIES ASSOCIATED WITH EACH HABITAT			
AMPHIBIANS **8 Species - 5 SSS**	6	7	0	6
BIRDS **19 Species - 4 SSS**	15	11	9	6
MAMMALS **18 Species - 1 SSS**	13	15	6	9
TOTALS:	**33**	**34**	**15**	**15**

SSS - species with Federal and/or State status.

Threatened and Endangered Species

There are no federal endangered species known or likely to occur in the WAA. Bald eagles and peregrine falcons could occur as rare migrants in the Hamilton Creek watershed. Due to their unconfirmed presence as migrants, and lack of suitable habitat in the watershed, habitat for these species was not analyzed.

Spotted owls

Of the 10 special status species that are known or suspected to occur in the Hamilton Creek watershed, one, the Northern spotted owl is listed as a federal threatened species. The overall habitat conditions for Northern spotted owls was analyzed across the entire WAA. Age classes and forest types were classified as suitable for nesting, foraging and roosting; dispersal; or non-suitable habitat for the spotted owl. The results are displayed in Figure 6.

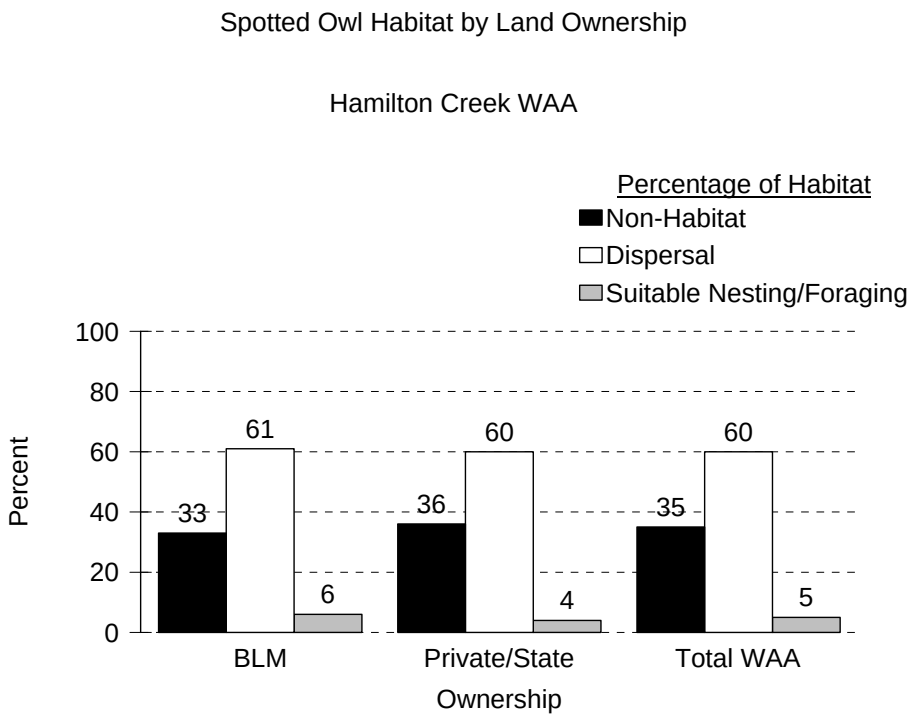


FIGURE 6: Spotted Owl Habitat

Currently, approximately 5 percent of the total WAA is considered to be suitable habitat for nesting, foraging and roosting, 60 percent is dispersal and 35 percent is non-suitable habitat. The Hamilton Creek WAA provides limited dispersal habitat between the known owl sites south and east and between the known owl sites north and east. Dispersal of spotted owls is severely limited by the Willamette Valley to the west of the WAA . Due to its location on the fringe of the Willamette Valley, Hamilton Creek WAA is not an area of concern for dispersal habitat for spotted owls.

All of the quarter townships within the WAA exceed "50-11-40 " standards for dispersal habitat on federal lands (refer to the Conservation Strategy for the Northern Spotted Owl, a report by the Interagency Scientific Committee, 1990). However, federal ownership is scattered and comprises only from 8 to 37 percent of the quarter townships within the WAA. The closest Late Successional Reserve (LSR) is located 2 miles to the east of the WAA in Whitcomb Creek. The Quartzville-Crabtree LSR is located 7 miles to the east. All of the quarter townships between the Hamilton Creek WAA and the LSRs to the east exceed 50-11-40 standards for dispersal habitat on federal lands. There is no designated Critical Habitat for the northern spotted owl within the Hamilton Creek WAA .

There are two active known owl site (KOS) centers located within the WAA.

The Round Mountain KOS is the only mapped spotted owl core area in the WAA . This KOS has two site centers: An historic 1991 site center located on BLM, and an alternate 1994 site center located on adjacent private land. Approximately 80 percent of the Round Mountain KOS is located within the Hamilton Creek WAA . About a third of the KOS is in BLM land ownership. The remaining two thirds, including the core area and site center, is located on adjacent private land. This site is considered viable at the present time, although it is not expected to remain viable in the long term. In compliance with SEIS/ROD guidance for Known Spotted Owl Activity Centers (pp. C-10 -- C-11), a 100-acre core area has

been identified on BLM lands around the 1991 site center. No spotted owls have been observed in this core area since 1992.

The Jack Creek KOS site center and core area are located on private lands. Approximately 85 percent of this KOS falls within the Hamilton Creek WAA . Only 14 percent of the KOS is in BLM ownership. The remaining 86 percent is located on adjacent private land. As a result of analysis, this site is not considered viable and is expected to remain non-viable in the long term.

In addition to the two active known owl site centers, there is one inactive known owl site center, the Hamilton Creek KOS, within the WAA . Spotted owls have not been observed there since 1990. This site is currently considered non-viable and is expected to remain non-viable in the long term.

The site center of the Fords Mill KOS is located just outside of the Hamilton Creek WAA. The exact site center is unknown; however, it is believed that the site center and core area are located outside the Hamilton Creek WAA on private lands. Less than 5 percent of the KOS falls within the Hamilton Creek WAA . This site is considered non-viable.

Special Status/SEIS Survey and Manage Plant Species

There are no historical or currently known BLM special status plant species populations in the Hamilton Creek WAA. Based on a literature review of the habitat requirements of the special status species known to occur in the province, a list of potential species has been identified for the Hamilton Creek WAA and its special habitats (Appendix A-5). This list includes one Federal Endangered, one Federal Threatened, three Federal Candidate 1 species, six Federal Candidate 2 species and two Bureau Sensitive species.

The only SEIS Special Attention plant or fungi species known to occur in the Hamilton Creek WAA is western hemlock dwarf mistletoe, *Arcuethobium tsugense*. Under the ROD the BLM is required to manage known sites of this species beginning in January 1995. This species, which occurs primarily on western hemlock, provides nesting structure for spotted owls, squirrels, and other wildlife species by creating a "witches brooms" in the canopy of older forests.

The forest health concerns associated with western hemlock dwarf mistletoe are discussed in the Natural Disturbance Processes section of the analysis.

Special Habitat Areas

Special habitats are defined as areas which provide special function not provided by prevailing plant communities and successional stages (Brown et. al. 1985). Special habitats in this analysis area are generally non-forested areas, such as meadows, wetlands, cliffs, and talus slopes, which provide natural gaps and edge habitat within the more prevailing forested areas. The most significant special habitats in the WAA include Green Mountain meadows, Keel Mountain, Green Peter, and Black Peter wetlands.

Green Mountain Meadows

Green Mountain meadows is located on a south-facing slope at an elevation of 2000 feet. The main portion of the meadow is located on BLM lands. The west edge and several small openings are on adjacent private land. Terrain within the meadow includes steep slopes, nearly flat areas, rock faces and shallow drainage channels.

This meadow provides a unique botanical habitat due to its position in the Cascade foothills and having relatively little human disturbance. The varied topography in the meadow and the presence of the shrub patches provide a variety of micro-habitats which support different combinations of plant species. Because of its location in the Cascade foothills and its warm, dry environment, the meadow contains

species typical of both the Cascades and the Willamette Valley. This "mixing", known as the "mass effect", is partially responsible for the diversity of plant species at the site.

Vegetation is dominated by grasses and herbs but includes several patches of shrubs. Depressions and drainage channels support a variety of species, including thick camas populations, Lomatium, western ladies-tresses and monkey-flower. Dry areas have populations of Camas, slim-leaved onion, Menzie's larkspur, Oregon sunshine and indian paintbrush. The partial shade under shrub patches and on the fringes of the meadow provides habitat for fawn lilies, pinks, and several other species. Rock outcrops have larkspur, selaginella, and parsley fern on them.

The grassy meadow, rock outcrops, associated natural edge, adjacent streams and mature forest offer a diverse habitat complex for wildlife, as well. The area is not accessible via road and is therefore isolated and relatively undisturbed. The habitat complex provides forage, water and thermal cover on warm south facing slopes for deer and elk.

Keel Mountain

Keel Mountain, at an elevation of 3040 feet, is a prominent feature of the landscape. At the top are dry meadows and rock outcrops that provide talus and cliff/crevice habitats. Keel Mountain is relatively isolated and is generally not accessible via roads. The southwest quarter of Keel Mountain is located on BLM lands. Most of Keel Mountain is located on adjacent private lands. No wildlife or botanical surveys have been conducted to date.

Green Peter and Bald Peter

Green Peter and Bald Peter are located on the southeastern extreme of the WAA. They represent the highest elevation lands in the WAA at 3977 and 4079 feet respectively. The top of Bald Peter is forested with mature forest habitat on private lands. The area adjacent to Green Peter consists of dry meadows, rock outcrops, cliffs and talus. It is accessible via roads and has a utility tower located near the top. Green Peter is located on State lands with BLM land to the north and private lands to the south. There has been harvest activity in the past and stands in the immediate vicinity are a mixture of mature and younger age classes. No wildlife or botanical surveys have been conducted in the area.

Black Peter Wetlands

Black Peter wetlands consist of a series of wetlands located mostly on BLM lands in T.12S., R.2E., Section 29. Two of the wetlands straddle property boundaries and portions are on adjacent private land in Section 30. For the most part, the wetlands are accessible via existing roads. There has been past harvest activity in and around the wetlands within the last 15 to 40 years. A pumpchance has been constructed downstream from the main wetland. Some wildlife surveys have been conducted in portions of the wetlands. Surveys indicate an unusual diversity of amphibian species in and around the main wetland. No botanical surveys have been conducted to date.

Other smaller special habitats occur across the WAA (Table 12: Known Non-forest Areas/Special Habitats). These areas include a number of small oak/madrone openings at lower elevations , Deer wetlands and Sanka wetland. Deer wetlands are a series of high water areas created by beaver activity in Deer and Hamilton Creeks mostly on private lands in Sections 4 and 9. Sanka wetland is located on private lands in Section 26 . There are high water areas downstream in Section 35 on tributaries of McDowell Creek.

TABLE 12: Known Non-forest Areas Providing Potential Special Habitat in Hamilton Creek WAA

KIND	NUMBER OF STANDS	AREA IN ACRES

Moist Meadow	8	17
Wet Meadow	2	1
Shrubland	5	11
Pond	2	3
Rock	3	12

Standing dead trees and down logs, and riparian/streamside habitats are also considered special habitats, but are discussed in separate sections.

Special habitats contribute to landscape diversity by supporting diverse plant and animal communities. Depending on their size and topographic location, special habitats can affect environmental parameters such as light, humidity, temperature, and plant and animal communities for several hundred feet into adjacent habitats. There are numerous special habitats within the WAA that are too small to be identified without field reconnaissance. Even these smaller areas provide important habitats for plant species in the ecosystem. Networks of smaller habitats provide opportunities for viable populations and genetic mixing between populations of species dependent on them. Without maintaining the networks of smaller habitats, the large areas, such as Green Mountain Meadows, could become disjunct and may not be adequate to support genetically viable populations of the species dependent on them.

EXPECTED AND DESIRED FUTURE CONDITIONS AND TRENDS

The following discussions describe resource conditions and trends that are expected to result from current or projected management actions on private lands, and from implementation of the PRMP/FEIS on BLM-administered lands. DFCs are identified where a realistic potential exists to achieve a desired resource condition under the expected management actions.

Management Influences and Human Use

Timber Management

Timber management practices on BLM-administered lands should comply with objectives and management actions/directions specified for timber resources under the applicable land allocation in the PRMP, pages 2-59 through 2-62.

Manage stands on a rotation to culmination of mean annual increment (CMAI. See PRMP/FEIS page 6-3), which is approximately age 70 within the Hamilton Creek WAA. Management practices should contribute to the general DFC discussed for Vegetative Patterns. Specifically, regeneration harvest should be postponed in the short term until the 15 percent late-successional forest habitat objective is attained within the Hamilton Creek WAA.

Once the 15 percent late-successional retention is achieved (estimated between the years 2004 to 2024), regeneration harvest within GFMA land allocations should be implemented to maintain timber harvest levels based on Probable Sale Quantity (PSQ) projections and assumptions (PRMP/FEIS pp. 4-70 through 4-72) for a rotation at CMAI .

Regeneration harvest within Connectivity/Diversity land allocations should be postponed in the short term to achieve the 15 percent late-successional reserve target. In the long term, regeneration harvests should be planned on a 150-year rotation, using area control to determine decadal harvest area allocations. Harvest levels and areas should be planned to contribute to 25 percent late-successional retention objective for the appropriate C/D management block.

Intermediate harvest and silvicultural practices implemented within the Matrix land allocation should contribute in the long term to sustainable timber supply as expressed in PSQ projections and assumptions. In the short term, harvest practices should address forest health conditions discussed under Forest Stand DFCs, with the goal of maintaining long term sustainable timber production capacity within Matrix lands.

Intermediate harvest practices and other silvicultural treatments applied specifically to C/D land allocations should contribute to late-successional forest habitat conditions where necessary to help achieve the 25 percent late-successional retention objective within the respective C/D blocks in the long term.

Fuels Management/Air Quality/Smoke Management

Fuels management actions should comply in the long term with objectives and management actions/direction specified for Prescribed Fire and Fuels Management in the PRMP, page 2-80, and for Air Quality, page 2-34. Effects of fuels management activities in the Hamilton Creek WAA should conform to projected general effects on air quality discussed in the PRMP, pages 4-8 through 4-11, in the long term.

Prescribed understory burning should be conducted in the short term where necessary to achieve stand management objectives, and where required, to maintain fuel loadings at or below levels that will achieve forest health objectives and acceptable wildfire risk. Understory burning will have to be conducted under more precise fuel and weather parameters than broadcast burning. More precise burning prescriptions will reduce the number of opportunities for understory burning because compliance with smoke management instructions will be more restrictive. The close proximity of the Hamilton Creek WAA to the Willamette Valley Designated Area will make it more difficult to accomplish understory burning than broadcast burning.

Rural Interface Areas

Comply with objectives and management actions/direction specified for RIA's in the PRMP, pages 2-52 through 2-54. No site-specific short term RIA conditions have been identified for the Hamilton Creek WAA.

Roads and Transportation

Comply with objectives and management actions/directions for Roads specified in the PRMP, pages 2-75 through 2-76.

In the short term, road densities should not be increased above current levels. Roads identified as contributing to substantial water quality degradation should be reconditioned or rehabilitated to reduce detrimental effects. In the long term, currently existing high road density should be reduced to the extent practicable. This will meet resource management objectives while providing for access needs for resource management and as required under existing road use agreements with other landowners within the WAA.

Road and transportation development and maintenance should be planned through a comprehensive management strategy using Aquatic Conservation and PRMP/FEIS guidelines (PRMP/FEIS page 2-76).

Recreation Use and Amenities

Provide dispersed recreation activities in a Roaded Natural ROS classification on BLM-administered lands, consistent with PRMP/FEIS objectives for Recreation, pages 2-54 through 2-55, in the long term. Based on the current characteristics and projected trends of BLM-administered RN lands within the WAA, the activities most suited include tent and vehicle camping, freshwater bank fishing, hunting, bicycle riding and a variety of motorized all terrain vehicle use, within guidelines established to meet other management objectives for other resources (soil, watershed, and wildlife).

Scenic Quality

Comply with PRMP/FEIS objectives and management actions/direction specified on pages 2-88 through 2-89. Specifically for VRM Class III areas, the existing character of the landscape should be retained in the long term, while still allowing for a moderate level of management modification. In the short term, activities within VRM III designations should be evaluated case-by-case to determine potential site specific and cumulative effects on landscape character. For the majority of the WAA (VRM Class IV), management activities which may require substantial modification to the existing character of the landscape would be acceptable, although impacts of these activities should be minimized as practicable in the short term.

Socioeconomic Conditions

As opportunities are presented, comply with PRMP/FEIS objectives and management actions/directions for Socioeconomic Conditions specified on page 2-54. Recommendations discussed under timber management and under vegetative distributions and stand management which provide for timber product supplies consistent with PRMP/FEIS PSQ projections would generally meet these objectives in the long term. In the short term, opportunities should be pursued to develop sources for Special Forest Products, when consistent with land allocation and other resource management program objectives.

Natural Disturbance Processes

Fire

Maintain the risk of catastrophic wildfire occurrence at levels consistent with the natural accumulation of understory vegetation and down woody debris in the long term. In the short term, wildfire suppression actions should conform to Fire/Fuels Management objectives and management actions/directions as specified in the PRMP, pages 2-78 through 2-80. Stands most at risk of catastrophic wildfires within the WAA in the short to intermediate term would be large commercial and precommercial intermediate harvests with no slash treatment. In the long term, high risk stands could include old growth in which excessive amounts of natural and activity generated (logging slash) fuels are allowed to accumulate.

Disease and Insects

Maintain laminated root rot infection centers at levels sufficiently low to allow successful implementation of density management treatments. This would achieve resource management objectives for forest health and stand condition in all land allocations in the long term. Regeneration harvest and planting with immune species would be the most effective treatments in the short term, and is a PRMP/FEIS designated management action/direction for Matrix lands (PRMP/FEIS p. 2-60). Less effective are regeneration or patch cutting and planting of resistant species, resulting in *Phellinus* remaining on the site but limiting its spread. In unusual situations, campgrounds for instance, roots could be ripped out by heavy equipment. Density management treatments in C/D blocks, Riparian Reserves, and LSR's could be continued where appropriate to achieve management objectives, provided infection centers are small or infrequent.

Contingent on the removal of western hemlock dwarf mistletoe from the SEIS special attention species list, dwarf mistletoe should be eradicated from managed stands in the GFMA land allocation in the long term. Dwarf mistletoe infections should be confined to stands within the Riparian Reserve and LSR land allocations, and to stands being managed for late-successional forest retention in C/D blocks. There is a risk that Infected stands in C/D land allocations dominated by western hemlock may not achieve the desired late-successional structure in the short term. This is because the disease will cause hemlock mortality within the 150 year rotation.

Maintain forest stand densities and vigor at levels necessary to prevent epidemic levels of insect populations in all land allocations. Management practices including density management and salvage harvesting, consistent with land allocation management actions/directions, should be implemented.

Wind

Maintain or reduce the current levels of risk of catastrophic blowdown occurrences in the long term. Management practices designed to minimize or restrict laminated root rot infection pockets, and those designed to maintain tree and stand vigor, should maintain current risk levels in the short term.

Landslides and Earth Movement

Management activities should not contribute to mass soil movement activity that would not be expected to occur under natural conditions in the long term. In the short term, activities should generally comply with objectives and management actions/directions for Soil (PRMP/FEIS pp. 2-34 through 2-37). Management practices that could change the size or frequency of landslides should be avoided in areas identified as inherently susceptible to mass soil movement. Activities should be evaluated and designed to minimize the risk of increasing mass soil movement rates.

Soil

Soil Displacement and Erosional Processes

Maintain long term soil loss due to soil mass movement and erosional processes at or below current levels on BLM-administered lands. In general, comply with PRMP/FEIS objectives and management actions/direction specified on pages 2-34 through 2-37. The presence of roads, harvest activities, and other current non-forest land uses will prevent returning erosion levels and mass movement rates to those occurring under natural conditions in the long term. Current management activities do not appear to have significantly increased mass movement processes within the WAA.

Adoption of best management practices to reduce compaction (PRMP/FEIS Appendix G) will provide the most significant influence to reducing erosion in the short term. Preventative measures implemented under new projects, and rehabilitation of existing highly compacted areas would be appropriate.

Public and administrative access needs and requirements of existing road use agreements, as discussed under roads and transportation, will limit the short term opportunity to reduce road densities and the related influence on erosion rates. Transportation management and planning measures to minimize increases in road densities on BLM-administered lands should minimize erosion contributing influences from this source in the long term.

The risk of erosion resulting from rain-on-snow in hydrologically unrecovered areas should improve on BLM-administered lands in the long term as the age class distribution shifts toward an older, more hydrologically recovered average age class. However, anticipated logging by private landowners as large portions of privately owned forests approach merchantable age in the short term could substantially increase the rain-on-snow enhancement index and the associated risk of erosion from rain-on-snow events. Maintenance of erosion rates at current levels may be difficult to achieve across all ownerships in the short term.

Long Term Soil Productivity

Maintain soil productivity at or above current levels in the long term. In general, soil nutrient capital within the WAA is currently high, except for soils at higher elevations. The lower productive soils would be more susceptible to additional long term productivity loss from topsoil loss due to erosion, which can be accelerated by soil compaction. Additionally, compaction can result in reduced plant available water, which could reduce long term productivity in soils at all elevations. Management practices designed to reduce compaction as discussed above would be applicable for maintaining long term productivity in these soils.

Hydrology

Water Quality

Maintain water quality in compliance with PRMP/FEIS objectives and management actions/directions specified on pages 2-34 through 2-35. In the short term, maintain stream temperatures in accordance with State Water Quality standards and the Aquatic Conservation Strategy standards and guidelines specified for managing riparian and upland forested lands. Maintain streams on BLM-administered lands within standards for sedimentation.

In the short term, maintain sedimentation from all sources at or near current levels. Maintain all stream channels and associated riparian zones on BLM-administered lands in either a properly functioning condition or functioning at risk with an upward trend. Identify restoration opportunities that would contribute to long term bank and channel stability and to reduced surface runoff.

In the long term, reduce sediment levels within the WAA resulting from increased peak flows and surface runoff. Reduce sediment delivery from BLM-administered lands to levels close to those that could be expected under natural conditions. The DFC for water quality maintenance is based on limiting sediment levels. The ability to achieve this long term condition is dependant on control of sediment delivery from several sources, as discussed below.

Stream Bank Stability

Measures designed to promote stream bank and channel stability should be implemented to avoid potential increases in sediment levels from this source.

Timber harvest activities will usually increase water flows (peak and otherwise) in the short term. Higher peak flows within bank full channel widths result in higher velocities and increased channel erosion and sedimentation unless floodplains and stream structures (large woody debris/boulders) exist to reduce energy. Depending on rates of revegetation following harvest activities, water flows could decrease to near preharvest conditions although may still be higher than the preharvest flows for several decades.

Logging activities can influence the riparian area adjacent to the stream to a significant degree. Recruitment of down, dead woody material for the stream depends on what is left after timber harvest. Stream buffers of 25 to 50 feet which were left during harvests through the last decade may provide adequate protection for water temperature but may be insufficient to supply LWD in the long term.

Development of forest stand structure that would help ensure properly functioning streamside and riparian conditions. As discussed under wildlife and fisheries, this should be actively pursued in the short term to contribute to these conditions in the intermediate term. The long term condition trend for stream and bank stability is expected to improve with Riparian Reserve buffers on BLM-administered lands, provided stand health and composition are maintained with density management treatments. Streambank and channel conditions should generally improve across the WAA with the maintenance of buffers on private streams as required under the Oregon FPA.

Sedimentation

As discussed under existing water quality condition, the most significant source of stream sedimentation within the WAA is surface erosion resulting from compaction, roads, and the extent of area in hydrologically immature condition, compounded by rain-on-snow events. DFCs discussed under soils to limit soil compaction, displacement and erosion processes are directly appropriate for limiting sediment levels. Specific measures to limit compaction resulting from new projects in the short term, and rehabilitation efforts to reduce the extent of existing compacted area in the long term, should be implemented to reduce sedimentation from erosion on compacted soil.

Strategies to manage road densities as discussed under roads and transportation and soils should be implemented to maintain sedimentation from roads at or below current levels. In the short to intermediate term, road bank and ditch stabilization measures should be implemented to prevent increases in road

runoff related sedimentation. Sediment from road and ditch runoff should be reduced in the long term, although levels of sedimentation from this source would need to be established through a road and transportation management and monitoring program within the WAA. Management considerations as discussed under roads and transportation may limit the degree to which sedimentation from road runoff could be reduced.

The Washington Watershed Analysis Methodology rain-on-snow enhancement analysis discussed under existing water quality condition can be used to project future trends given various scenarios. Projections of future age class distributions on private land were made based on the assumption that most private forest stands 60 years of age or older would be logged over the next ten years. Using this assumption, the total ECA could increase to as high as 67 percent of the total WAA (Table 13), resulting in an increase in the rain-on-snow enhancement index to a medium risk range.

TABLE 13: Projected Vegetative Recovery Status within Precipitation Zones: Year 2003 [1/]

PRECIPITATION ZONE	RECOVERY STATUS	ACRES	PERCENT OF WAA
RAIN DOMINATED	>20 yrs (Recovered)	2497	14
	0-20 yrs (Unrecovered)	5702	32
TSZ DOMINATED	> 30 yrs (Recovered)	3148	18
	0-30 yrs (Unrecovered)	4724	27
SNOW DOMINATED	>40 yrs (Recovered)	631	4
	0-40 yrs (Unrecovered)	786	4
	TOTAL Unrecovered (ECA)	11212	64

[1/] Does not include acres in roads. An additional 580 acres of road surface and permanently disturbed road clearing and cut/fill slopes increases the estimated unrecovered ECA to 11792 acres or 67 percent of the WAA.

Development of vegetative patterns that would maintain the percentage of the WAA in hydrologically recovered stands at or above current levels should be investigated. Predicted harvest on BLM-administered lands suggest a strong trend towards developing this condition. This should be maintained in the long term with harvest levels determined through PRMP/FEIS estimated sale quantity projections.

An ideal long term future condition would be the development of vegetative conditions that would maintain 80 percent or more of the WAA in a hydrologically recovered state and a low (<3) rain-on-snow enhancement index as determined by the Washington Watershed Analysis Methodology. This condition would minimize the risk of substantial levels of sediment resulting from erosion in unrecovered openings, and as increased by the occurrence of rain-on-snow events.

This condition would appear to be achievable as 75 percent of the WAA is currently in a hydrologically recovered condition. However, hydrologic recovery is in a downward trend. Approximately 8,000 acres of private forest land are currently at age 60 or older. With the assumption that private harvest plans generally target age 60 as full rotation for regeneration harvest, the area in hydrologically recovered vegetation could fall to as low as 33 percent across all ownerships within the next 10 years (See MAP 12: Projected Forest Cover Conditions, Year 2003). The Washington rain-on-snow enhancement rating would increase to a medium rating (>6.3), which indicates an increased risk of sediment from rain-on-snow events.

Vegetative patterns are difficult to predict in the intermediate term (50 years) and beyond. Assuming little planned harvest within Oregon FPA buffers on private lands and Riparian Reserves on BLM-administered lands, stream-adjacent areas should exhibit a significant recovery (MAP 13: Projected Stream Buffer Conditions, Year 2043). Scattered land ownership patterns across the WAA, combined with assumptions regarding harvest plans on private lands, suggest a long term harvest and reforestation pattern that would perpetuate a cyclical vegetative recovery condition and corresponding risk of sediment from unrecovered openings in upland areas.

Downstream Beneficial Uses

Maintain water quality and quantity necessary to protect identified downstream beneficial uses. Implement practices to maintain and improve water quality, and coordinate with the Oregon DEQ to identify potential sources of upstream water quality degradation that could affect water quality for downstream uses.

Vegetation

Vegetative Patterns

Existing late-successional stands should be retained in the short term consistent with PRMP/FEIS objectives (p. 2-33) for 15 percent late-successional forest retention in fifth field watersheds. Currently, an estimated 280 acres (6 percent) of BLM-administered lands in the WAA are in a late-successional condition. To attain 15 percent, an additional 400 acres of early to mid-successional stands should be identified and managed to develop late-successional forest characteristics in the long term.

Lands allocated as C/D within the Hamilton Creek WAA contribute to two separately designated C/D blocks. Vegetation patterns within C/D land allocations should be managed to contribute to 25 to 30 percent late-successional forest retention in their respective C/D blocks (PRMP/FEIS p. 2-33). Riparian Reserves and late-successional stands reserved for Connectivity/Diversity may contribute to the 15 percent late-successional in the Matrix land allocation. With 56 percent of BLM-administered lands included in Riparian Reserves, the 15 percent Matrix late-successional forest retention and the 25 to 30 percent C/D retention should be represented entirely within Riparian Reserves in the long term.

With Riparian Reserves and the LSR on federal lands and Oregon FPA buffers on private and state lands, the entire WAA has the potential to achieve 15 to 20 percent late-successional forest across all ownerships by the year 2044 under current management objectives. Assuming timber management objectives for GFMA and for Connectivity/Diversity lands will achieve regulated harvest rotations of 70 and 150 years respectively, and private forest lands maintain 50 to 60 year regulated harvest rotations, the predominant vegetative matrix would be similar to the 15 to 74 year open and closed sapling pole conifer existing under current conditions, especially on private lands. Late-successional patch components and corridors would be substantially increased from current conditions to form a secondary matrix, markedly along streams within BLM Riparian Reserves, and to some extent within FPA buffers on private lands. (Map 13).

Forest Stand Condition

Maintain forest stand health conditions in the long term through vegetation modification, including density management treatments and salvage operations consistent with resource management objectives and land allocations (refer to discussion on Ecological Health, PRMP/FEIS p. 4-25). Management practices designed to minimize or restrict laminated root rot infection pockets, and those designed to maintain tree and stand vigor, should be used in the short term to reduce the risk of epidemic population levels of forest insects.

With no density management Douglas-fir dominated stands are expected to stagnate. The stands will become dense single story stands composed of tall thin trees that are prone to windfall. All of the naturally occurring forest stand health problems discussed under Natural Disturbance Processes can lead to stand replacement events as stands progress in age. The threat of Douglas-fir beetle may become serious as these stands mature if there is catastrophic blowdown in the area.

General stocking control guidelines have been developed to project the long term results of DFC's for each land allocation. Growth projections were developed to predict potential future stand conditions using the most intensive silvicultural treatments allowed under SEIS/ROD standards and guidelines and PRMP/FEIS management actions/directions for each land allocation. A graphic presentation illustrates predicted stand development by size class with no management, followed by a projection of desired stand development using intensive management practices. An average site class 3 was assumed for these projections.

GFMA

The health and vigor of managed stands within the GFMA should be maintained through density management and stocking control treatments. In the short term, stocking control by means of thinnings would allow individual trees sufficient growing space to maintain health and vigor. Vigorous trees would be more resistant to insects, as cambial feeding insects can be "pitched out". Without stocking control, growth rates could be significantly reduced in the short to long term, depending on current stand age and density. Stands currently in size classes 1 through 3 would eventually grow to size class 4. There would be poor distribution of size classes, with a high proportion of stands in size class 4. (Figure 7a).

On sites that are fully occupied by trees, intense competition would occur. Usually, tree species diversity would be reduced because each species has it's own height growth characteristics. In the short term, one species would out grow another and, given sufficient density, could cause it to die out completely in the long term. When trees of the same species compete to the point they are causing mortality, they often have formed a single story. In these situations trees are very tall in relation to their diameter; which causes them to be structurally weak, and are more susceptible to wind damage. Existing laminated root rot infection centers would enlarge, and infection centers could coalesce where they are numerous. Dwarf mistletoe could become serious in western hemlock dominated stands in the long term.

Treatments appropriate within the GFMA land allocation include a wide range of regeneration and intermediate harvest treatments, site preparation, artificial regeneration, fertilization, and animal damage control treatments. Trees growth rates would increase under these intensive management regimes. Provided an optimum range of treatments are available, trees under 5 inches dbh would grow into the 5 to 11 inches size class in approximately 10 years. A similar size class increase would be expected in the 5 to 11 inches dbh group (Figure 7b).

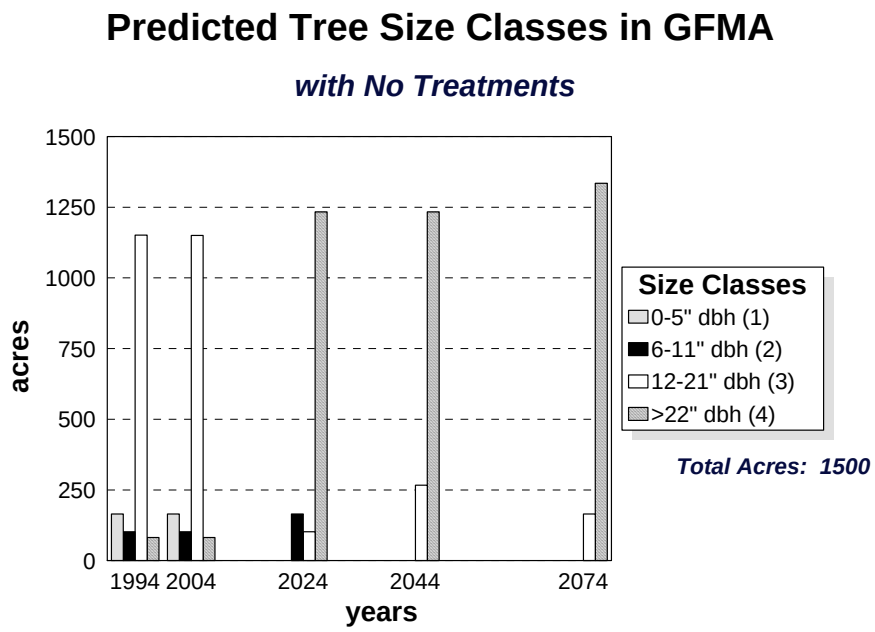


FIGURE 7a: GFMA Size Classes with No Treatment

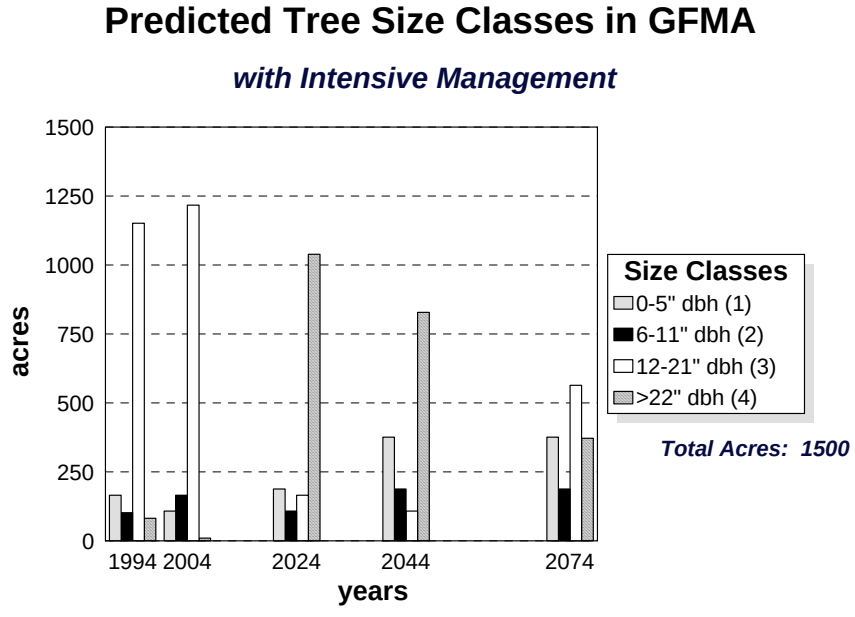


FIGURE 7b: GFMA Size Classes with Intensive Management

An assumption was that sometime in the short to intermediate term (between the years 2004 and 2024), growth and structure would develop to the point that 15 percent of the Hamilton Creek BLM ownership would be in a late-successional forest condition. This would be achieved primarily within Riparian Reserve, C/D, and LSR land allocations. Much of this increase would be from intensive management practices for density management and size class enhancement.

Another assumption is that all of the larger hardwood stands now in Matrix would be converted to conifer dominated stands in the short to intermediate term. This would be two stands (36 acres) of what is currently size class 3, and four stands (72 acres) of size class 4 (See Opportunities and Recommendations). Laminated root rot infection pockets in Matrix would also be treated in this period.

By the year 2024, GFMA allocation lands should be able to support regeneration harvests at Culmination of Mean Annual Increment (CMAI), approximately age 70 in the Hamilton Creek WAA. In the long term (year 2074), the stands planted in 2004 will be approaching maturity, and the total area in Matrix will be almost evenly distributed across the four size classes.

Connectivity/Diversity

Connectivity/Diversity is a PRMP/FEIS land allocation in which timber management is allowed but late-successional forest habitat is to be maintained. Intensive management practices are permitted. Even aged management is the preferred regeneration method on a 150-year area controlled rotation (PRMP/FEIS page 2-33).

Without density management treatments, existing laminated root rot infection centers would enlarge, and infection centers could coalesce where they are numerous. Dwarf mistletoe would become more serious in western hemlock dominated stands. In the long term, infected stands dominated by western hemlock may not achieve the desired late-successional forest structure, since the disease would cause hemlock mortality before the 150-year rotation is reached.

Reforestation, precommercial thinnings, post and pole removals, fertilization and commercial thinnings would be appropriate. Commercial thinnings could be implemented beyond CMAI. Tree growth projections for C/D with intensive management practices are similar to those developed for the GFMA in the long term. Growth increases would occur at a slower rate if intensive treatments were not applied. Intensive management would enable the most rapid attainment of tree size for stand structure and other characteristics of late-successional forests. (Compare Figure 8a with 8b)

Because of the young average stand ages generally occurring throughout Hamilton Creek's C/D land allocations, regeneration harvests would not be expected in the short to intermediate term (before the year 2074), except in extraordinary situations, such as major forest health degradation and stand replacement events. Dwarf mistletoe infested western hemlock dominated stands in T. 12 S., R. 2 E., Section 29 would need to be regenerated before 150 years.

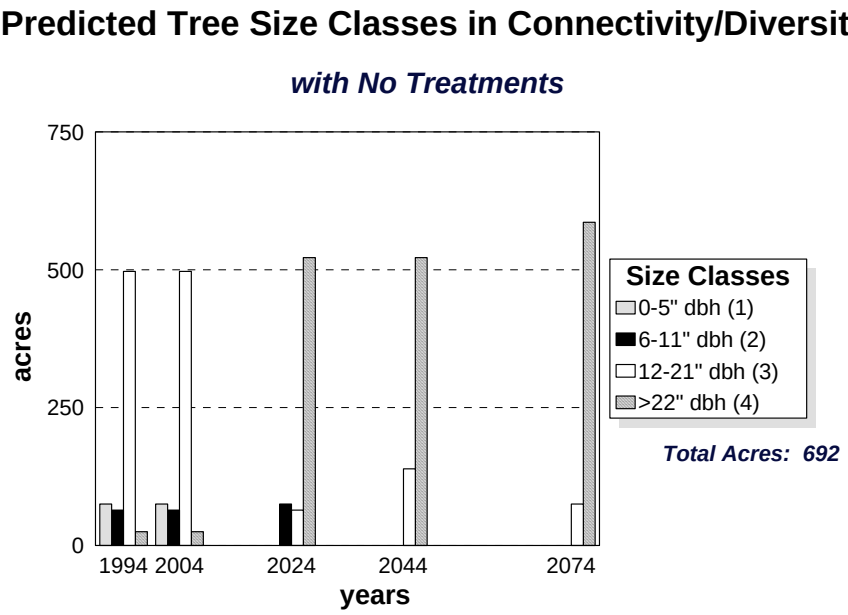


FIGURE 8a: Connectivity/Diversity Size Classes with No Treatment

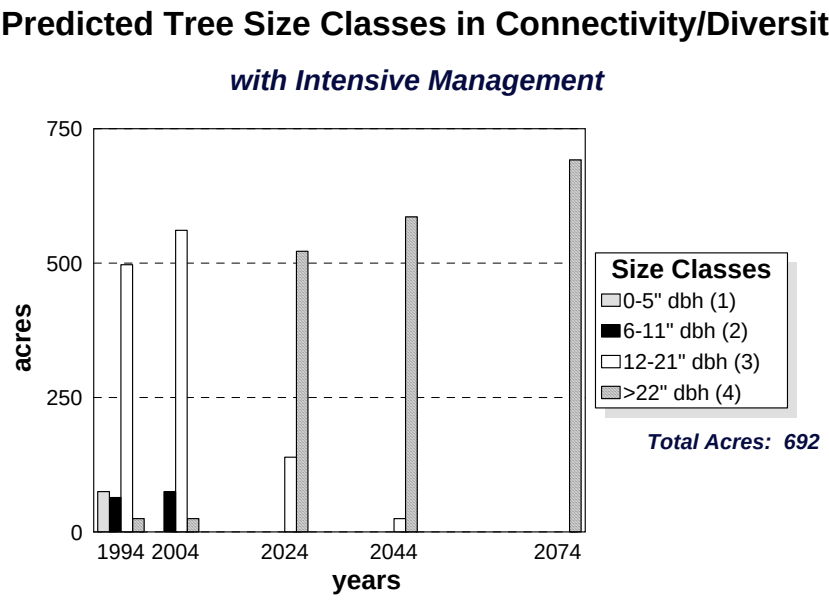


FIGURE 8b: Connectivity/Diversity Size Classes with Intensive Management

Riparian Reserves

Intensive practices should be used in Riparian Reserves to meet the Aquatic Conservation Strategy objective to supply amounts and distribution of coarse woody debris sufficient to maintain physical complexity and stability in the long term (Figure 9a vs. 9b)(PRMP/FEIS page 2-22).

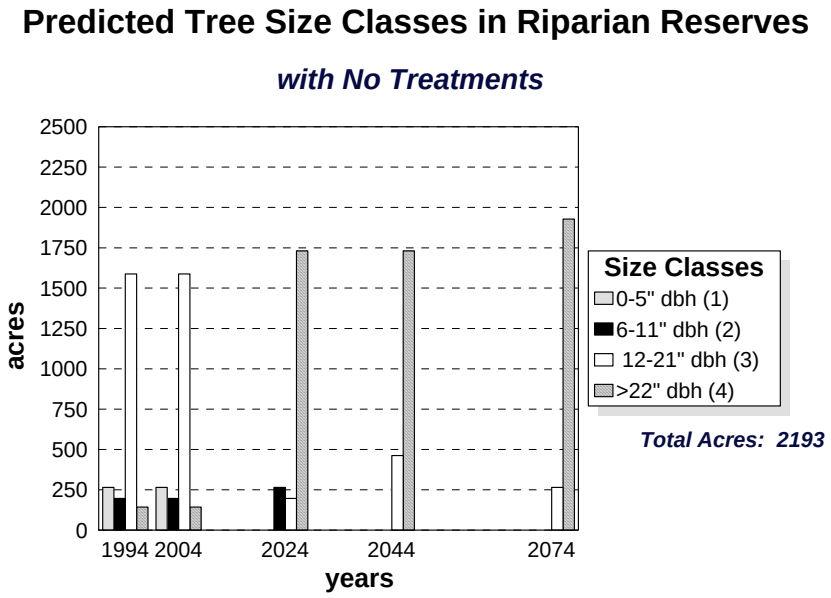
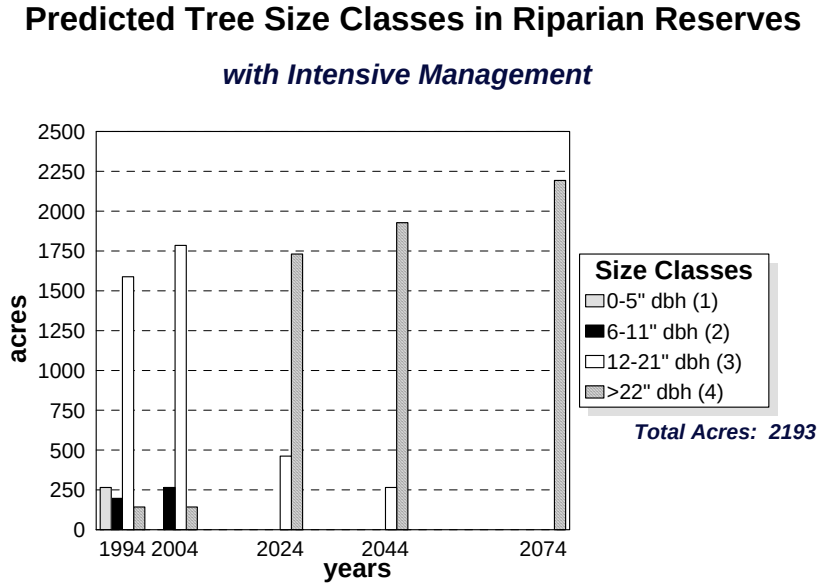


FIGURE 9a: Riparian Reserve Size Classes with No Treatment
FIGURE 9b: Riparian Reserve Size Classes with Intensive Management



In the short to intermediate term, precommercial thinning and density management treatments on older stands could accelerate growth and stand development. Post and pole removals and commercial thinnings would be appropriate where large standing and down wood retention targets were exceeded. Commercial thinnings could continue beyond CMAI . Intensive management treatments would enable the most rapid attainment of tree size for LWD recruitment. Fertilization would be unlikely to be applied because of water quality concerns. Portions of Riparian Reserve stands currently predominated by hardwood overstories should be reestablished with conifer species that would contribute to LWD capital in the long term.

In the long term, stands within the Riparian Reserve would need regenerating in order to continue to supply LWD on a long term basis. The preferred method of regeneration would be group selections in small (less than 5 acre) openings. Regeneration treatments would probably begin after the year 2074.

Late-Successional Reserves

Density management treatments should be conducted in stands up to 80 years of age to hasten late-successional characteristics and to enable most rapid attainment of tree size for late-successional forest conditions (PRMP/FEIS pp. 2-27 -- 2-28). Because of the limited amount of age class under age 80 in LSR in Hamilton Creek, there would be little change in size class with intensive management.

Noxious Weeds and Non-native species

Manage noxious weed species as directed by the Salem District Environmental Assessment and Decision Record for the Noxious Weed Control Program 1992-1997(Salem District BLM May 1992) and the Noxious Weed Strategy for Oregon/Washington (Oregon State Office BLM August 1994).

Maintain established noxious weed populations (Priority III) below levels that would cause additional environmental degradation or impair productivity or use of BLM or adjacent lands. Eradicate new invading species of noxious weeds (Priorities I and II) as identified before they become established on BLM-managed lands or develop potential to invade adjacent lands. Species in these categories are the most important to eradicate since they would be new to the watershed and would be the easiest to control or eradicate.

Wildlife

Habitat Age Class, Amounts and Distributions

The development of vegetative patterns in compliance with PRMP/FEIS objectives as discussed under vegetation should create a predominate matrix across all ownerships in the WAA of closed sapling pole stands between 40 and 60 years of age in the long term (by the year 2044). Open to closed sapling pole stands 20 to 40 years of age would likely comprise a significant secondary matrix.

Harvest activity would develop a patch element of early successional stands 0 to 20 years. Late-successional forest patches would be located primarily on BLM lands. The distribution of late-successional habitat would generally follow Riparian Reserves on BLM lands, and would include the LSR and the 25 percent late-successional forest in C/D blocks. Distribution and connectivity of late-successional habitat could be disrupted by harvest levels on private forest lands, although the development of corridors along Oregon FPA protected stream buffers would provide some degree of connectivity in the long term.

The Wisdom Habitat effectiveness for cover (HEc) for all ownerships within the WAA would increase slightly over time and be viable. HEc on BLM lands would increase substantially and become highly viable for elk. Habitat Effectiveness for forage quality (HEF) would remain limiting for elk. Management opportunities exist to help attain higher forage quality forage within the WAA. (See Opportunities and Recommendations).

Road Densities

Road densities are expected to increase across the WAA, particularly on private ownership. The habitat effectiveness index derived from open road densities (HEr) for all lands in the WAA is expected to become more limiting as additional roads are constructed and private/state lands are harvested. HEr is already currently at or near .30, which is limiting for elk.

Open road densities on BLM lands should be reduced and maintained at or below the 3 miles per section threshold for high road densities. PRMP/FEIS management actions/direction for Roosevelt elk habitat suggest a target road density of 1.5 miles per square mile (page 2-39). This density would probably not be achievable in the Hamilton Creek WAA because of requirements under existing BLM road use agreements with private forest land owners (See discussion under Management Influences and Human Use).

Standing Dead and Down Logs

Implement PRMP/FEIS objectives and management actions/direction specified for retention of green trees, snags, down logs in the Matrix (pages 2-32 -- 2-33) and for wildlife habitat (pages 2-37 -- 2-38).

The amount of standing dead and down log material is expected to decline in the short term as material in more advanced stages of decay decomposes. Over the long term, the amount of standing dead on BLM lands could approach levels sufficient to support cavity nesting bird species at 60 to 70 percent of potential population densities as older forest develops in Riparian Reserves and green tree retention guidelines are implemented. Similarly, the amount of down log material on BLM lands should increase. The Oregon FPA requirements for standing dead, down logs and buffers would contribute to standing green, snag, and down log habitat on private and State of Oregon lands.

Riparian/Streamside Habitat

Age class distribution withn Riparian Reserves and FPA protection buffers is expected to improve in the short to intermediate term (Map 13). As discussed above, the large standing dead and down log component is expected to decline in the short term, until late-successional forest conditions and size classes develop. Density management treatments inside Riparian Reserves could enhance the development of large trees, with some potential for increasing large dead standing and down logs.

Fisheries

Maintain conifer dominated riparian zones with trees greater than 24 inches DBH in the long term. Conifers should consist of a mix of Douglas-fir, hemlock and cedar, with components of mixed minor species including Pacific yew and grand fir.

Maintain large woody debris in the long term at levels specified in the draft Anadramous Salmonid Habitat Management Guide (USDI BLM 1993). LWD levels of greater than 80 pieces per mile; greater than 24 inch diameter; and greater than 50 feet in length would meet or exceed specified levels.

Pool frequency will vary with the wetted width of the channel and should meet the following standard:

Wetted Width (ft.):	5	10	15	20
Pools/Mile:	184	96	70	56

Maintain stable, self-sustaining stocks of all native fishes.

Special Status/Special Attention Species and Special Habitat Areas

Special Status/SEIS Survey and Manage Species

Implement PRMP/FEIS objectives and management actions/direction specified for the following land allocations and resource programs:

-Riparian Reserves (pp. 2-21 -- 2-26)

-LSR (pp. 2-27 -- 2-30)

-Wildlife habitat (pp. 2-37 -- 2-38)

-Fish habitat (p. 2-40)

-Matrix retention of green trees, snags, down logs, and late-successional forest (pp. 2-32 -- 3-33)

-SS/Special Attention Species (pp. 2-19 -- 2-20) and their habitat (pp. 2-41 -- 2-46).

Assuming full implementation of these management actions/directions, habitat conditions for late-successional forest habitat dependent species should improve in the long term with the development of SEIS/ROD Riparian Reserves, with retention of the 15 percent late-successional forest, and with the LSR.

Several of the SEIS Special Attention fungi species that could potentially exist in the Hamilton Creek WAA are fungi which inhabit standing dead and large logs. Increasing the amount and distribution of these structures would provide more potential habitat for these wood decay fungal species. Habitat for species that utilize standing dead and/or down logs is expected to decrease in the short term. It would increase in the long term with increased green tree/snag/down log retention requirements and development of the Riparian Reserves.

Management of special habitat areas should further contribute to overall habitat quality for special status species. Habitat for some species associated with Green Mountain meadows could be adversely affected due to harvest on adjacent private lands to the south and west of the meadows. Road construction could open up this isolated area and increase disturbance to wildlife. Habitat conditions for species potentially associated with Black Peter wetlands is expected to improve with the development of Riparian Reserve buffers and the retention of the best 25 percent late-successional forest in the C/D Block (section 29).

Threatened and Endangered Species (Spotted Owls)

Of the two active and one inactive known owl sites in the Hamilton Creek WAA, only the Round Mountain KOS is currently considered to be viable. Due to the lack of suitable spotted owl habitat and mixed ownership, neither of the known owl sites is expected to be viable in the long term. The 104-acre core area designated as LSR for the Round Mountain KOS should be managed in conformance with PRMP/FEIS Management Actions/Direction (p. 2-45), regardless of occupancy.

Overall habitat condition for the northern spotted owl is expected to decline in the short term, then stabilize in the long term. The Hamilton Creek WAA should continue to function as habitat for spotted owl dispersal between the known owl sites south and east and the known owl sites north and east. The distribution of

suitable and dispersal habitat would generally follow Riparian Reserve buffers on BLM lands, and would include the LSR and the 15 percent late-successional Matrix forest retention and best 25 percent late-successional forest retention in the C/D blocks. The WAA should continue to meet the "50-11-40" standards for federal lands. Distribution and connectivity could be disrupted by harvest activities on privately managed forest lands in the WAA.

Special Habitat Areas

Green Mountain meadows and Black Peter wetlands have been identified as special habitat areas. Protection and management of these areas should be in conformance with PRMP/FEIS objectives, management actions and direction for areas potentially providing habitat for SEIS special attention species (pages 2-43 -- 2-44) and for wildlife special habitats (page 2-39). Not enough is known about Keel Mountain to identify it as a priority habitat at this time. Identifying these priority habitats does not diminish the importance of all special habitats across the landscape.

Black Peter wetlands would be adequately protected by Riparian Reserve buffers and late-successional development adjacent to the wetlands.

Some species potentially associated with Green Mountain meadows could be adversely impacted by harvest on adjacent private land to the south and west of the meadows.

OPPORTUNITIES AND RECOMMENDATIONS

This section discusses opportunities to achieve identified Desired Future Conditions, and projects and other recommendations that could potentially contribute to opportunities. A list of potential projects considered by the Watershed Analysis Team is included in Appendix A-6. Generally, management actions specifically required for compliance with the PMRP/FEIS are not repeated in this discussion.

Management Influences and Human Use

Timber Management

Manage stands within the GFMA land allocation on a rotation to CMAI in conformance with the PRMP. Because of late-successional forest retention targets in the WAA, the only stands within the GFMA available for regeneration harvest within the next decade would be those with concentrations of laminated root rot and poorly stocked hardwood dominated stands. An estimated 30 acres within the GFMA are identified for regeneration harvest for these objectives. There is little opportunity to contribute to probable sale quantities identified in the PRMP/FEIS through regeneration harvest in the Hamilton Creek WAA within the next decade.

Approximately 640 acres of commercial thinning and 70 acres of post and pole removal (2 to 8 inches dbh) have been identified within the GFMA (Refer to Table 15 under vegetation, stand conditions discussion). High priority density management areas have been identified in T. 12 S., R. 1 E., Sec. 15. The primary objectives of these treatments would be to harvest timber that would otherwise be lost to mortality through natural thinning, and to enhance stand quality for timber management objectives. An additional 465 acres have been identified for these treatments in the C/D. Although timber management objectives are secondary in this land allocation, harvest of commercial products and some contribution to probable sale quantity totals would be expected within the next decade.

Intensive management treatments such as precommercial thinning, fertilization, and pruning should be implemented in those stands where management emphasis is primarily timber production and wood quality enhancement. Opportunities for pruning and other timber stand improvement have been identified in T. 12 S., R. 1 E., Secs. 1, 10, 11, 15, 25, and 27.

Land Tenure

Sections 9, 10, and 15 of T. 12 S., R. 1 E. were being considered for land exchange at the time of this analysis. The degree of past timber management investment should be a consideration in this exchange. Section 15 has received the most intensive management of any BLM land parcel in Hamilton Creek within the last 20 years. Transportation systems are well developed. Precommercial and commercial thinnings have been accomplished. Most of the recent reforestation in Hamilton Creek is here. Young age classes that are not common elsewhere in Hamilton Creek are present.

An alternative land exchange consideration should be considered where few investments have been made. T. 12 S., R. 1 E., sections 9, 11, 21 and 25 have had little management investment. Another consideration would be the presence of old growth structure or special forest habitats (nonforest). These sections have the least amounts of old growth in Hamilton Creek. Sections 9, 11, and 21 contain special habitat areas.

Fuels Management/Air Quality/Smoke Management

Opportunities to utilize fire for fuels management treatments will generally be limited to prescribed understory burning and pile burning in conjunction with commercial thinning and density management activities.

Broadcast burning could be utilized where heavy accumulations of fuels are generated during regeneration harvest, although this condition is not expected to occur because of the limited opportunities identified for regeneration harvest within the next decade.

All prescribed burning operations will be conducted in compliance with the Oregon Smoke Management Plan. This is expected to limit opportunities for burning due to the proximity of the WAA to the Willamette Valley DA. Opportunities to reduce the need for prescribed burning, including innovative utilization practices and careful evaluation of fuel accumulation and disposal processes, should be considered with individual project development.

Rural Interface Areas

Investigate opportunities to develop cooperative arrangements with rural fire protection districts in the vicinity of the WAA.

Individual projects close to the managed RIA should be evaluated to determine potential effects to adjacent and nearby residential uses. A consistent public notification process should be pursued for projects planned in areas determined to have potential impacts within the RIA.

Site-specific mitigation measures should be addressed in project proposals determined to have impact within the managed RIA. Some general opportunities may include:

- In areas of high sensitivity (no specific areas were identified in this analysis), consider a select cutting method rather than a regeneration harvest method.

- Use wildlife trees to provide a visual buffer between residents and regeneration harvest units.

- Work with private landowners to address specific areas with trespass problems related to public access and use of BLM-administered lands (no areas were identified in this analysis).

Roads and Transportation

Identify and replace failing and underdesigned drainage structures that represent a high risk of adverse impacts to water quality and aquatic and riparian habitat conditions. The principle hazards for sedimentation from stream bank erosion in the short term are the wooden culverts which are collapsing and destabilizing the roads, and, over time, could result in major sluice outs. Several culverts have been identified in the WAA. None of these drainage structures are considered adequate for a 100-year precipitation event..

T. 12 S., R. 1 E., Sec 13: Three log culverts located in headwater tributaries of Hamilton Creek. These culverts are located on roads that need to remain opened and maintained. Potential for failure of these culverts is estimated to be low to moderate under normal winter precipitation levels. Removal of these culverts is being considered as restoration opportunities under the 1994 Jobs in the Woods program. Additional opportunities would be identified as a result of the ongoing riparian surveys in the WAA.

T. 12 S., R. 1 E., Sec 25: Two log culverts located on the main branch of Scott Creek. Both of these culverts are located on road segments that are identified for possible closure or obliteration. Stream flow at the lower of these culverts is significant. The potential for road failure given existing drainage is estimated to be moderate, particularly for the lower culvert. These culverts could be replaced, or the need for access could be evaluated and the culverts removed and channels rehabilitated if the roads were determined appropriate for abandonment.

Also in Section 25: Several log drainage structures are located along road segments in the headwater tributaries of McDowell Creek. These road segments are heavily overgrown and would require renovation in order to provide equipment access to the culvert sites for removal. All of these road segments have been identified as possible road closure or obliteration opportunities. The potential for road failure given existing drainage is estimated to be low to moderate. Access needs should be evaluated and drainage conditions at individual locations assessed before deciding to remove or replace these structures.

Identify opportunities for road rehabilitation, closure, or obliteration to meet wildlife and watershed resource objectives to the extent allowable under existing road use agreements. Portions of the following road segments have been identified for potential closure or obliteration within the Hamilton Creek WAA:

12-1E-1.2	12-1E-3.2	12-1E-15.1	12-1E-16.1	12-1E-21.1	12-1E-21.2
12-1E-15	12-1E-23	12-1E-23.1	12-1E-25	12-1E-25.1	12-1E-25.2
12-1E-25.3	12-1E -27.1	12-1E-35.1	12-2E-29.1	12-2E-29.2	12-2E-30
12-2E-30.2					

Develop a comprehensive transportation management plan to address access needs within and transcending WAA boundaries (See PRMP/FEIS page 2-76). A transportation management plan should establish management objectives for road segments that include provisions for inspection and maintenance schedules and criteria for identifying priorities for rehabilitation, access control, or obliteration. Additionally, since there is insufficient information on the condition of water quality or riparian habitat within the WAA to justify modification of interim Riparian Reserve widths specified in the SEIS/ROD, the plan should address criteria for threshold conditions for these resources to allow for road construction within the Riparian Reserves. The plan should include an effective public involvement strategy to identify public concerns and expectations regarding access, in order to reduce the risk of conflict in establishing road and transportation management objectives consistent with the Aquatic Conservation Strategy.

Recreation Use and Amenities, and Scenic Quality

Evaluate projects in the vicinity of Scott Creek waterfall for potential impacts to scenic and recreation values of the area. Develop mitigation measures to maintain the vegetation character in the vicinity of the falls, and investigate measures to improve public access to the site.

Socioeconomic Conditions

Implement commercial thinning and post and pole harvest opportunities identified under timber management to contribute to local forest products industry employment. Depending on treatment prescriptions and resource management objectives, potential timber volumes from these treatments could range from 5 million to as much as 12 to 15 million board feet in several advertised sales within the decade.

Continue to provide traditional wood products when possible and identify opportunities for selling non-traditional wood products such as debris from precommercial thinning.

Identify opportunities to cooperate with private land owners in the WAA to support, and if possible, expand the local special forest products industry.

Target local providers in the awarding of service contracts (i.e. reforestation and stream survey and enhancement projects). In some instances, thinning treatments that would not result in saleable volume and advertised timber sales, such as density management in riparian reserves, could nonetheless contribute to local employment opportunities through identified "Jobs-in-the-Woods" contracts.

Natural Disturbance Processes

Fire

Fire management specialist should make appropriate suppression responses to all wildfires. In most cases, that response will be aggressive initial attack which will extinguish the fire at the smallest size possible. The goal of fire suppression is to minimize the combined cost of suppression plus resource value loss, commensurate with other resource management objectives.

Prescriptions for fuels treatments and amounts of woody debris exceeding acceptable levels should be coordinated between fuels management and other resource specialists to insure that risk of large catastrophic wildfires are maintained at an acceptable level. Stands most at risk of catastrophic wildfires would be large commercial and precommercial thinnings with no slash treatment, and old growth stands in which excessive amounts of natural and project generated (logging/thinning slash) fuels are allowed to accumulate.

Uncontrolled wildfires should not be used to meet resource management objectives. However, naturally ignited fires may be managed as prescribed fires following site-specific agency direction on a case by case basis.

Disease and Insects

Timber stands in the GFMA land allocation heavily infected with laminated root rot should be treated with regeneration patch cuts within the decade in order to eliminate infection centers. Infected stands in C/D land allocations should be evaluated for potential to contain the infected areas and prevent significant spread of the disease through selective harvest and underplanting resistant species. Several infected stands have been identified through inventory and stand exam notes and through TPCC classification. Treatment of heavily infected areas will contribute to stand health and could help reduce the risk of catastrophic stand damage from high wind events.

The preferred method for control of *Phellinus weirii* is to patch cut a 50 foot buffer beyond all infected conifers, and plant resistant hardwood species. Treated stands should be inspected biannually until hardwoods achieve crown closure. After that time stands should be visited every ten years until about 50 years of age. Roguing of conifers could be scheduled or done concurrently if any were found. If density management treatments occurred the sites would have to be monitored more frequently, since conifers might become established with increased growing space.

Provided western hemlock dwarf mistletoe is removed from the SEIS/ROD Survey and Manage species list, stands with significant components of western hemlock located in the GFMA land allocation should be surveyed for dwarf mistletoe infection. Stands with heavy dwarf mistletoe infections should be identified as high priority for density management treatment, targeting hemlock for removal.

Soil

Soil Displacement and Erosional Processes

Mass Soil Movement

No restoration opportunities exist for areas prone to slope instability which have not experienced mass movement. In these areas, limiting management activities and/or use of appropriate Best Management Practices (PRMP/FEIS Appendix G) offer the best opportunities for avoiding slope instability.

Those areas which have already experienced mass movement or have a high probability of failure are mainly located on already identified road segments and wooden culverts which are rotting out. These culverts have been identified for potential replacement (refer to recommendations under water quality).

Surface Erosion

Natural surface non-maintained roads have been identified for possible closure or erosion/sedimentation mitigation (refer to roads and transportation recommendations).

Compaction

Subsoil compacted areas identified in TPCC and as verified with field reconnaissance. More than 60 percent of the Hamilton Creek WAA is classified as TPCC FSR2, indicating soil compaction over a large area. Many of the compacted areas occur in forest stands that are now 10 to 40 years of age. The most effective mitigating measure appears to be tilling with a winged subsoiler. There has been a great deal of opposition to tilling in established forest stands because of possible damage to roots of adjacent trees. Thus, the opportunity to reduce compacted areas in the short term is significantly less than the 60 percent of the BLM land identified as FSR2. The common practice is to subsoil the entire extent of compacted area upon regeneration harvest.

Long Term Soil Productivity

Soil Nutrient Status

Design forest management practices on soils at high elevations to reduce ground disturbance and displacement of the A horizon. In general, soil nutrient capital is not a major problem in Hamilton Creek. In the TPCC mapping, soil nutrient problems made up about 200 acres of the Hamilton Creek watershed (or about 4.5 percent of BLM ownership). This is all located in the Cryic soil temperature zone at elevations greater than 2,800 feet..

Identify plantations classified as TPCC FN as high priority stands for fertilization to replenish lost nutrient capital. Even though lost nutrients are eventually replaced through precipitation, the first twenty years of a plantation is the time when there is a major need for nutrients. An application of fertilizer would supply this extra nutrient capital at a critical time. The other traditional application times are in conjunction with precommercial and commercial thinning treatments.

Plant Available Water

Design forest management practices on soils identified with shallow A horizons to reduce ground disturbance which could result in increased erosion and would decrease already low available water

holding capacity. Soils with inherent low AWHC usually occur on steeper slopes, and at higher elevations in the Cryic soil temperature zone.

There is little restoration potential for soils with inherent low soil moisture availability. Reforestation practices such as planting drought tolerant species, spacing control, controlling competing vegetation, and longer harvest rotations would be appropriate for soils classified in this regime. Management practices such as ground based yarding and site preparation, wet season yarding, and broadcast burning, that would adversely impact soil structure in the A horizon should be avoided.

Hydrology

Water Quality

Stream Bank Stability

Implement measures including road obliteration, rehabilitation, and culvert replacement identified under Roads and Transportation on a priority basis. Locations identified as having the greatest potential for significantly affecting stream channel stability should be emphasized for project implementation within the next year.

Implement opportunities identified under Stand Condition for density management and hardwood stand replacement in Riparian Reserves that would contribute to conifer stand development and increased tree size within the decade. Rapid development of LWD to contribute to bank and channel structure, especially in areas currently dominated by hardwoods and younger conifer stands, is important for accelerating replacement structure for existing LWD in the intermediate to long term. There is currently insufficient information on the condition of stream channels and water quality within the WAA to justify modifying the interim Riparian Reserve widths designated in the SEIS/ROD.

Sedimentation

Maintain Riparian Reserve buffers and design management activities to maintain water quality within State Water Quality guidelines. Proposed actions should create a turbidity increase no greater than 10 percent over preexisting natural turbidity levels.

As discussed in opportunities under soils, rehabilitation of compacted areas will reduce surface runoff and subsequent erosion, which would help reduce potential sources of sedimentation and water quality degradation.

There are few opportunities to substantially influence sediment levels resulting from road density, or rain-on-snow potential. Implement road management strategies as discussed under Streambank Stability and Roads and Transportation. Implementation of stand density management treatments for all areas with less than 75 percent conifer canopy closure would contribute to increased hydrologic maturity in the long term. Utilize cumulative impact analysis to Identify areas where harvest activities have increased ECA levels to thresholds that indicate high risks for increased erosion and peak flows. Assess the potential for increased sediment delivery to streams, and plan harvest strategies on BLM lands to retain ECA targets for hydrologic maturity to offset or avoid compounding the effects of harvest levels on private lands.

Downstream Beneficial Uses

Implement measures identified to decrease sedimentation and to improve bank and channel stability and riparian habitat condition. The chief downstream beneficial use in Hamilton Creek is fisheries and aquatic resources. Increased temperature and sedimentation could significantly affect fisheries as well as exceed State Water Quality standards.

Retain Riparian Reserve buffers to maintain adequate water quality for other downstream uses. Other beneficial uses include irrigation, livestock, fire protection, and domestic and municipal water supplies downstream from Hamilton and McDowell Creeks confluence with the South Santiam River. Although these uses occur much farther downstream from the WAA boundaries and generally are not considered to be directly affected by activities within the WAA, the cumulative contribution of sediment and increased temperatures would be minimized with Riparian Reserve buffer retention.

Vegetation

Vegetative Patterns

Retain all late-successional forest patches within the WAA until the PRMP/FEIS target of 15 percent late-successional forests within the watershed is attained (PRMP/FEIS page 2-33). BLM ownership in Hamilton Creek WAA totals 4530 acres, 15 percent of which would be 680 acres.

Currently, about 6 percent or 280 acres of BLM lands are in late-successional forest condition. To maintain 15 percent, an additional 400 acres of early/mid successional stands would need to be identified. Table 14 lists candidates for the best available areas to attain 15 percent late-successional forest stands. Stands exhibiting late-successional characteristics were chosen first, after which stands were chosen on the basis of age, the oldest first.

TABLE 14: Best 15 percent Late Successional Stands in Hamilton Creek WAA

TOWNSHIP 12 SOUTH											
Range	1 E.									2 E.	
Section	1	3	9	11	1	15	23	25	27	29	total
Area	46	114	6	282	21	108	57	3	4	41	682

For wildlife and botanical resources, the following criteria are important when identifying stands for development into late-successional:

Age class

Generally, oldest forest first. Using this criteria, the additional 400 acres would come from the 60-year age class. The 15 percent late-successional on federal lands in the WAA would be achieved within 20 to 30 years.

Connectivity/Diversity Blocks

The 25 percent older forest in C/D blocks can contribute to the 15 percent late-successional.

In T.12S., R.1E., Section 3, there are 58 acres of late-successional in the C/D land allocation. The best opportunity for development of late-successional is in the vicinity of the mapped core area (LSR) in OI #050 which is in the 50 year age class.

In T.12S., R.2E., Section 29, there are 34 acres of late-successional in the C/D land allocation. The best opportunity for development of late-successional is adjacent to Black Peter wetlands in OI #050 which is in the 50-year age class.

Forest Stand Conditions

All stands in the Hamilton Creek WAA were considered for silvicultural treatment opportunities. All nonforest special habitats were designated No Treatment. Stands identified as late-successional or old growth are designated No Treatment status in the short term, since these stands are the best candidates for 15 percent late-successional stand retention in conformance with the PRMP. Stand treatment opportunities are summarized in Table 15 and discussed individually by land allocation.

Many of the stands suitable for commercial thinning may also have post and pole removal opportunities. Most of the stands that had a precommercial thinning will not have post and pole opportunities because this treatment tends to accelerate the growth of trees to the point few trees in a 2 to 8 inch diameter class are present.

Approximately 1,850 acres have been identified as having potential for commercial thinning. These treatment opportunities are estimates based upon aerial photo interpretation and to reconnaissance.

TABLE 15: Treatment Opportunities in Hamilton Creek WAA [1/]

TREATMENT	MATRIX		RIPARIAN RESERVE	TOTALS
	GFMA	C/D		
CommercialThin/Density Management	640	435	775	1850
Post and Pole Removal/density management (2 to 8 " dbh)	70	30	155	255
PrecommercialThin	5	40	30	75
Group Selection	125	0	200	325
Regeneration	30	0	45	75
TOTALS	870	505	1205	2580

[1/] *The density management area in T 12 S., R 1 E., Sec 13 is not included in the opportunities. Potential density management areas in T. 12 S., R. 1 E. Sec. 25 and T. 12 S., 1., R. 2 E., Sec. 29 are included.*

[2/] *The only stands to be regenerated in this entry would be those with concentrations of Phellinus weirii and poorly stocked hardwood dominated stands.*

GFMA

Implement intensive management treatments such as precommercial thinning, post and pole removal, fertilization, pruning, commercial thinning where management emphasis is primarily timber production. These same intensive treatments should be done in other areas such as Riparian Reserves and C/D areas, however, the emphasis will be for nontimber values. Specific opportunities for timber harvest and stand improvement are discussed under timber management.

Connectivity/Diversity

Use density management to attain late-successional structure within stands by variable density thinnings. Harvest stands on a 150-year rotation in the long term. C/D density management opportunities have been identified in T. 12 S., R. 1 E., Sec. 3, and T. 12 S., R. 2 E., Sec. 29.

Riparian Reserves

Implement density management partial cut treatments in overstocked early and mid successional stands, maintaining at least 70 percent canopy cover. This treatment will increase amounts and distributions of LWD in the intermediate to long term to sustain physical complexity and stability according to the Aquatic Conservation Strategy objectives. The chief mechanism is acceleration of growth resulting from density management. Retaining 70 percent canopy will maintain the stands in a hydrologically recovered state and will retain stand structure to improve riparian habitat conditions. Riparian Reserve density management opportunities have been identified in T. 12 S., R. 1 E., Section 15, and T. 12 S., R. 2 E., Sec. 29.

Apply group selection or patch cut treatment in stands identified as poorly stocked and hardwood dominated. These could be regenerated while maintaining some cover. Sites in T. 12 S., R. 1 E., Sections 10, 11, and 13 have been identified for potential hardwood conversion. Many of these stands are hardwood dominated and are unlikely to meet Aquatic Conservation Strategy objectives because they cannot supply coarse woody debris in sufficient sizes and amounts.

Additional locations for riparian habitat restoration should be identified through riparian inventories.

Late-Successional Reserves

Implement density management treatments in stands allocated to LSR (Owl site core area) to accelerate creation of "old growth" structure. Opportunities for LSR density management in the short term should be targeted to stands with residual old-growth, but composed predominantly of trees 80 years or younger.

Special Research and Adaptive Management Opportunities

The National Bureau of Science (NBS) has been developing a proposal for a Density Management Study in cooperation with BLM within the Hamilton Creek WAA . The study area, comprising approximately 200 acres in T. 12 S., R. 1 E., Sec. 13, would be part of several density management study regimes located on western Oregon BLM-administered lands. The study is designed to evaluate how alternative silvicultural systems may be used to accelerate the development of old-growth characteristics in young forest stands. Upland and riparian stand management prescriptions would be integrated in an attempt to achieve multiple species and stand structure objectives. Monitoring results to be obtained are hoped to demonstrate the effectiveness of these density management prescriptions for creating late-successional forest habitat. Implementation of the project is scheduled for June 1996.

Other opportunities to develop study areas to contribute to this research effort are being considered within the WAA in T. 12 S., R. 2 E., Sec. 29.

Noxious Weeds and Non-Native Species

Emphasize education of BLM employees and other public land users of potential invading (Priority I) noxious weed species in the Salem District. As infestations are detected they should be subject to manual control (hand pulling) without further analysis. Biological and chemical methods may also be used. Sites should be monitored. Once noxious weeds are identified and Oregon State Department of Agriculture notified, Priority II status should be assigned.

Use transplants and seed collected from populations of native species within the WAA for revegetation projects in order to insure that the native plant communities are favored within the WAA.

Wildlife

Habitat Age Class, Amounts and Distributions

Create and maintain 15 percent of the federal lands in the WAA in late-successional forest condition over time. To maintain 15 percent, an additional 400 acres of early/mid successional stands would need to be identified, as discussed under Vegetative Patterns.

Road Densities

Close approximately 7 1/2 miles of BLM-controlled roads. The roads can be rehabilitated or blocked and allowed to over grow. When constructing new roads on BLM lands, construct temporary roads and close upon project completion. If these recommendations are followed, road densities on BLM lands could be maintained at 2.9 miles per section, which is below the 3 miles per section threshold for high road densities.

Pursue a road management program with ODF&W and major private landowners to identify additional opportunities to reduce or limit increases in open road density within the WAA.

Forage seed to improve forage quality. Road rehabilitation affords an excellent opportunity for forage seeding. Forage seeding in small (<2 acres) openings can be planned in areas identified for density management and commercial thinning.

Standing Dead and Down Logs

Create standing dead habitat in stands that lack large, hard material. Target stands should be 40 to 90 years of age that lack large hard standing dead. When implementing projects in younger stands (<50 years), leave enough green trees as capital for future development of the standing dead resource. Stands should be identified through stand exams. First priority would be stands in the C/D blocks, especially stands in or adjacent to the mapped core area and special habitats. Second would be stands adjacent to special habitats and FEMAT buffers in the General Forest Matrix.

Riparian/Streamside Habitat

Implement projects within Riparian Reserves with the objective of improving riparian habitat and accelerating late-successional conditions in young stands. Criteria for identifying projects include stocking and species composition control, down log and standing dead recruitment. Stands should be identified through stream and riparian inventories. Stands identified under Vegetative Stand Condition should be

first priority for treatment. There is currently insufficient information on the condition of riparian habitat within the WAA to justify modifying the interim Riparian Reserve widths designated in the SEIS/ROD.

Land Tenure

The highest priority lands in Hamilton Creek WAA for retention in federal ownership include BLM lands with high wildlife values. These lands are considered to be in Zone 1 according to PRMP/FEIS page 2-16. These lands include T.12S., R.1E., Sections 1 (Green Mountain meadows) and 3 (Round Mountain LSR); T.12S., R.2E., Section 29 (Black Peter wetlands). From a wildlife standpoint, the remaining lands in the WAA are in Zone 2 according to PRMP. There are no BLM lands in the WAA that meet the definition of Zone 3, high priority to exchange out of federal ownership.

Fisheries

Improve the tree size and species mix in riparian areas which presently have small diameter conifers or are dominated by hardwood species. Silvicultural practices that could be considered include thinnings in conifer stands, underplanting of conifers in hardwood stands, and creating small openings in hardwood stands and planting with conifer species. Priority areas would be along moderate gradient reaches of Hamilton Creek and S. Fork Scott Creek in T. 12 S., R. 1 E.:

Hamilton Creek	NE 1/4, NE 1/4 Sec. 9 NW 1/4, NW 1/4 Sec. 10 SW 1/4 Sec. 11
S. Fork Scott Creek	NE 1/4 Sec. 21 SW 1/4 Sec. 23

Locate and replace culverts that do not meet FEIS/ROD standards and guidelines. Highest priority culvert replacement are those identified as having moderate to high risk of impacts to water quality and channel stability, as discussed under Roads and Transportation.

Special Status/Special Attention Species and Special Habitat Areas

Special Status/SEIS Survey and Manage Species

Develop late-successional forest areas in the vicinity of special habitats, particularly Green Mountain meadows, Black Peter wetlands and, to a lesser extent, Keel Mountain. All age classes adjacent to Green Mountain meadows should be developed into late-successional forest. Portions of T.12S., R.2E., Section 29 OI # 050 that surround Black Peter wetlands have been identified as potential for development of late-successional in a C/D block. Portions of T.12S., R.1E., Section 13 OI # 030 and 050 adjacent to Keel Mountain are good opportunities for late-successional development. Closure of road 12-1E-1.2 would limit access to the vicinity of Green Mountain Meadows, providing further protection to the area's habitat value.

Spotted Owls

Maintain existing late-successional habitat and implement density management prescriptions to develop late-successional stand characteristics in younger age classes within the Round Mountain spotted owl core area.

Special Habitat Areas

Buffers around Green Mountain Meadows that would result from retention of Riparian Reserves would leave small, unprotected areas in the vicinity of the meadows that could be impacted. These impacts would be inconsistent with managing the meadows as an ecosystem. The meadow area should be further protected by areas including stands identified as FOI units #020 and 030 in T.12S., R.1E., section 1. The west edge of the meadow located on private lands would be managed under the FPA.

Black Peter wetlands should be protected with Riparian Reserve buffers. These buffers should provide adequate protection to preserve special habitat values associated with the wetlands. In addition, Black Peter wetlands is located in a C/D Block, which should contribute to 15 percent late-successional forest habitat. The portions of Black Peter wetlands located on private lands in Section 30 would be managed under the FPA.

MONITORING AND DATA NEEDS

This section summarizes significant data gaps and recommended monitoring needs identified through the watershed analysis process for Hamilton Creek. Details relating to these recommendations are included in individual reports in Appendix B, Watershed Analysis Team Technical Reports.

These data and monitoring needs were specifically identified for the Hamilton Creek WAA as a result of analysis of key questions. These recommendations should be considered in addition to monitoring requirements determined necessary through implementation of the PRMP/FEIS and SEIS/ROD.

Hydrology

There is currently insufficient information on the condition of riparian habitat, stream channels and water quality within the WAA to justify modifying the interim Riparian Reserve widths designated in the SEIS/ROD. Riparian surveys were conducted in selected areas in the summer of 1994. Data compiled as a result of that survey should be analyzed, and need for additional data needs, if any, should be documented in updates of this Watershed Analysis.

There is insufficient data on dissolved oxygen levels to validate assumptions that reduced oxygen levels are influenced by agricultural and residential uses downstream from the WAA. Monitoring of water quality, including temperature and dissolved oxygen, are recommended to determine more precisely the major sources of this impact, and its effect to downstream beneficial uses.

The percentage of all ownerships in hydrologically unrecovered condition should be monitored to determine the potential for increased risk of rain-on-snow influenced runoff and sedimentation. Projected harvest on private lands could substantially increase hydrologically unrecovered area in the transient snow zone within the next decade, which could increase the risk of significant sedimentation and peak streamflows to high levels. Potential for increased cumulative impacts resulting from additional harvest on BLM-administered lands should be evaluated for each project as high risk rain-on-snow conditions are identified.

Vegetation

Once 15 percent of the federal lands in the WAA has been identified for development and maintenance of late-successional conditions, stand exams and inventories should be conducted to assist ID Teams in identifying potential density management projects. At decadal intervals the 15% late-successional status by "fifth field" watershed should be reevaluated. Stand exams should be done to assess the conditions of these stands and to help evaluate the success of silvicultural treatments. A good time to schedule this monitoring would either be a year before or after the 5 point inventories. The monitoring plan should be geared toward serial stage changes rather than age class changes over time. Incorporated in the objectives would be to substantiate projections and assumptions regarding serial stage changes over time. For example, in any future density management treatments, are we achieving late successional conditions at earlier ages? Are natural disturbance factors such as blowdown and fire affecting projections and assumptions over time?

Lands allocated as Connectivity/Diversity within the Hamilton Creek WAA contribute to two separately designated C/D blocks. Vegetation patterns within each C/D block should be analyzed to determine which stands would be best managed to contribute to 25 to 30 percent late-successional forest retention in their respective C/D blocks. Details of this analysis should be kept on permanent file in this and adjacent Watershed Analysis background files for periodic review and modification to project plans.

Conduct a systematic inventory to identify established (Priority III) roadside noxious weed populations and potential road segments which do not require ditching or brushing. Minimizing disturbance to these road segments will reduce the amount of available habitat for the spread of many noxious weed species while favoring the development of native species in roadside plant communities.

Wildlife

Changes in closed, open and total road densities in the WAA should be monitored over time to determine changes in effects to the wildlife resource from existing (baseline) conditions and changes in access for mapping and management purposes. Information compiled as a result of this monitoring would be used in developing cooperation with adjacent private landowners and with ODF&W regarding the need for new road closures, gates/keys, activity, and right-of-way requests and tracking changes on maps.

Fisheries

The WODDB database for hydrology and fisheries should continue to be updated over the next several years to fill data gaps in fisheries population and habitat information. Fisheries surveys, either systematically or in conjunction with associated management projects, should be conducted to increase on-the-ground knowledge. No instream projects should be proposed until survey data is available for further analysis.

Special Status/Special Attention Species and Special Habitat Areas

For BLM special status and SEIS survey and manage invertebrate animal species, the greatest information gap is lack information and methods as they relate to "survey and manage" species listed in table C-3 of the FEIS ROD. These species require some level of protection in all WAA's. According to the ROD, surveys for "survey and manage" species will commence in 1996.

For BLM special status plant species, the greatest information gap is the lack of data on the occurrence and distribution of nonvascular plants and fungi. In an effort to close this gap non-vascular species have been included in botanical clearance species lists since the spring of 1994. Lichens and bryophytes should be included in the resources studied in the Density Management Study in T.12S., R.1E., section 13.

There is no detailed information on species in special habitats. Special habitats identified in this analysis should be surveyed prior to management actions or decisions affecting their status. For wildlife, the highest priority would be placed on Green Mountain meadows and Keel Mountain. Additional surveys should be conducted in Black Peter wetlands. Keel Mountain, Black Peter wetlands, and Green Mountain meadows should be surveyed for botanical purposes. Private lands to the west and south of Green Mountain Meadows should be surveyed and evaluated for their suitability for acquisition for protection of special habitat values.

WATERSHED ANALYSIS TEAM MEMBERS

Phyllis Barney	Technical Editing and GIS Assistance
Wayne Barney	Team Lead, GIS Coordination
John Depuy	Soils, Hydrology
Jim England	Wildlife, Sensitive Animal Species, Special Habitats
Terry Fennell	Roads, Transportation
Floyd Freeman	Silviculture, Vegetation
Laura Graves	Recreation, Visual Resources, Socio-Economic
Pete Hazen	Cultural Resources
Randy Herrin	RMP/SEIS Conformance, Timber Management
Claire Hibler	Botany, Sensitive Plant Species, Special Habitats, Vegetation
Marty Hunter	Fuels Management, Fire Ecology
Bob Ruediger	Fisheries

ACRONYMS

The following list of acronyms are used in this report.

AWHC	Available Water Holding Capacity
BLM	Bureau of Land Management
C/D	Connectivity/Diversity
CMAI	Culmination of Mean Annual Increment
DA	Designated Area
DBH	Diameter at Breast Height
DEQ	Department of Environmental Quality
DFC	Desired Future Condition
ECA	Equivalent Clearcut Acres
FEMAT	Report of the Forest Ecosystem Management Assessment Team
FOI	Forest Operations Inventory
FPA	Forest Practices Act (State of Oregon)
GFMA	General Forest Management Area
GIS	Geographic Information System
HEc	Habitat Effectiveness for cover quality
HEF	Habitat Effectiveness for forage quality
HEr	Habitat Effectiveness from open road densities
HEs	Habitat Effectiveness for size and spacing
KOS	Known Owl Site
LSR	Late Successional Reserve
LWD	Large Woody Debris
OI	BLM Operations Inventory: Forest Cover Stand Condition and Management History
O&C	Oregon and California Railroad grant lands
ODF&W	Oregon Department of Fish and Wildlife
PCT	Precommercial Thinning
PAW	Plant Available Water

ACRONYMS Continued

PRMP/FEIS	Salem District Proposed Resource Management Plan/Final Environmental Impact Statement
PSQ	Probable Sale Quantity
RIA	Rural Interface Area
RN	Roaded Natural
ROD	Record of Decision
ROS	Recreation Opportunity Spectrum
SEIS/ROD	Supplemental Environmental Impact Statement/Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl
SSS	Special Status Species
TPCC	Timber Production Capability Classification
TSZ	Transient Snow Zone
VRM	Visual Resource Management
WAA	Watershed Analysis Area
WODDB	Western Oregon Digital Database
SEIS/ROD	Supplemental Environmental Impact Statement/Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl
TPCC	Timber Production Capability Classification
WAA	Watershed Analysis Area

APPENDIX A

A-1 Hamilton Creek WAA Timber Production Capability Classification
A-2 Downstream Beneficial Uses in Hamilton Creek WAA
A-3 Animal Species Known or Suspected to Occur in the Hamilton Creek WAA
A-4 Possible Special Status Invertebrate Species in the Hamilton Creek WAA
A-5 Possible Special Status Plant Species in the Hamilton Creek WAA
A-6 Hamilton Creek WAA Proposed Projects

A-1 Hamilton Creek WAA Timber Production Capability Classification

Code	Explanation of Code	Acres	% WAA
FGNW	Well to excessively drained. Found mostly in headwalls & stream adjacent slopes.	6	.1
FMR1	Typically excessively drained. Occurs on steep convex hillslopes in excess of 70%.	50	1.0
FNR1	Well to excessively drained, on ridges & ridge noses or convex hillslopes >70% above 2800'.	191	4.0
FP:	**Consist of deep seated slump or earth flow types of mass movement with undulating topography.**		
FPNW	Have active deep-seated, slump-earthflow mass movements. Vegetation is water-tolerant.	2	
FPR1	Well to poorly drained in undulating topography with depressions & sag ponds. Average slope <60%.	306	6.8
FS	**: Typically moisture deficient due to soil characteristics.**		
FSNW	Excessively drained, with low AWHC & subject to being dry for long periods.	20	.4
FSR1	Well to excessively drained, on ridges & convex hillslopes. Low AWHC & dry during summer months.	85	1.9
FSR2	Soils subjected to compaction damage. Scarified sites or units having a dense network of tractor logging trails where more than 12% of the area has been compacted.	2,770	61.1
FW:	**Contain water at the surface for periods long enough to affect vegetation survival & growth.**		
FWNW	Poorly to very poorly drained, water at the surface much of the year, located in wet depressions, etc.	8	.2
FWR1	Moderately well to poorly drained, occurring primarily in depressions, adjacent to streams & sag-ponds.	6	.1
RAR2	**Sites having less than normal stocking due to animal damage.**	**91**	**2.0**
RL:	**Reforestation Problem due to competition from hardwoods & brush that restrict available light for seedlings.**		
RLR1	Competition can be treated using operational practices & stocking will meet minimum standards.	1,115	24.6
RLR2	Contains less that minimum stocking levels due to shading by competing species.	334	7.4
RLW	Occurs primarily adjacent to streams, on unstable areas, & where water table is near the surface.	258	5.7
RP:	**Reforestation Problem due to Disease**		
RPR1	Have pockets or concentrations of disease which can impact survival/growth of commercial species.	2,328	51.4
RS:	**Reforestation Problem due to surface gravel or rocks limiting planting spots & reducing survival.**		
RSR1	Surface fragment layer that can be managed to create planting spots & allow minimum stocking.	69	1.5
RSW	More than 40% of the area is covered by surface rock of at least 6", less than minimum stocking.	3	
Non-forest Classifications:			
NB	Brushland.	3	
NH	Roads and highways.	8	.2
NR	Rock	29	.6
NW	Water	36	.8
NP	**No identified fragile conditions.**	**40**	**.9**

A-2 Downstream Beneficial Uses in Hamilton Creek WAA

Location	Beneficial Use	# of Water Rights
T. 12 S., R. 1 E., SECTION 21	FIRE PROTECTION	4
	IRRIGATION	4
T. 12 S., R 1 E., SECTION 20	IRRIGATION	2
T. 12 S., R 1 E., SECTION 19	IRRIGATION	4
T. 12 S., R. 1 E., SECTION 29	IRRIGATION	3
	FISH	4
T. 12 S., R. 1 E., SECTION 30	IRRIGATION	7
T. 12 S., R. 2 E., SECTION 30	DOMESTIC	1
T. 12 S., R. 2 E., SECTION 31	DOMESTIC	1
T. 12 S., R. 1 W., SECTION 19	IRRIGATION	4
T. 12 S., R. 1 W., SECTION 20	IRRIGATION	9
T. 12 S., R. 1 W., SECTION 21	IRRIGATION	6
T. 12 S., R. 1 W., SECTION 22	IRRIGATION	4
T. 12 S., R. 1 W., SECTION 23	IRRIGATION	2
T. 12 S., R. 1 W., SECTION 25	IRRIGATION	9
	LIVESTOCK	1
T. 12 S., R. 1 W., SECTION 26	IRRIGATION	8
T. 13 S., R. 1 E., SECTION 2	IRRIGATION	1
T. 13 S., R. 1 E., SECTION 3	IRRIGATION	5

A-3 Animal Species Known or Suspected to Occur in the Hamilton Creek WAA

Species	Species Code	Status		
		Federal	State	Bureau
AMPHIBIANS				
Northwestern Salamander	AMGR			
Pacific giant salamander	DIEN			
Cascade torrent salamander	RHCA		SV	
Clouded salamander	ANFE		SU	AS
Oregon slender salamander	BAWR		SV	BS
Dunn's Salamander	PLDU			
Tailed frog	ASTR		SV	AS
Red-legged frog	RAAU	C2	SU	C2
BIRDS				
Northern goshawk	ACGE	C2	SC	C2
Band-tailed pigeon	COFA			
Northern pygmy owl	GLGN			
Northern spotted owl	STOC	LT	ST	LT
Northern saw-whet owl	AEAC			
Vaux's swift-S	CHVA			
Red-breasted sapsucker	SPRU			
Downy woodpecker	PIPU			
Hairy woodpecker	PIVI			
Northern flicker	COAU			
Pileated woodpecker	DRPI		SV	AS
Tree Swallow-S	TABI			
Violet-green swallow-S	TATH			
Chestnut-backed chickadee	PARU			
Red-breasted nuthatch	STICA			
Brown creeper	CEAM			
Western Bluebird	SIME		SV	AS
Townsend's warbler-S	DETO			
Hermit warbler-S	DEOC			

Status Code Key

FE: Federal Endangered
FT: Federal Threatened
C1: Federal Candidate Category 1
C2: Federal Candidate Category 2
BS: BLM SSS Policy Sensitive
AS: BLM SSS Policy Assessment
TS: BLM SSS Policy Tracking
SM: SEIS/ROD Survey & Manage
ST: State Threatened
SC: State Sensitive Critical
SV: State Sensitive Vulnerable
SU: State Sensitive Uncertain

A-3 Animal Species Known or Suspected to Occur in the Hamilton Creek WAA
...Continued

SPECIES	Species Code	Status		
		Federal	State	Bureau
MAMMALS				
Pacific shrew	SOPAC			
Shrew-mole	NEGI			
Silver-haired bat	LANO			
Hoary bat	LACI			
California myotis	MYOCA			
Long-eared myotis	MYEV			
Long-legged myotis	MTVO			
Yuma myotis	MYYU			
Pacific western big-eared bat	PLTO	C2	SC	C2
Elk	CEEL			
Northern flying squirrel	GLSA			
Townsend's chipmunk	TATO			
Douglas Squirrel	TADO			
Beaver	CASCAN			
Bushy-tailed woodrat	NECI			
Dusty-footed woodrat-V	NEFU			
Red tree vole	ARLO			
Western red-backed vole	CLCA			

A-4 Possible Special Status Invertebrate Species in the Hamilton Creek WAA

Species	Species Code	Status		
		Federal	State	Bureau
Beer's false water penny beetle	ACBE	C2		C2
California floater	ANCA	C2		C2
Vertree's ceraclean caddis	CEVE	C2		C2
Siskiyou chloealtis grasshopper	CHAS	C2		C2
Potentilla root borer beetle	CHPO			AS
Oregon giant earthworm	MEMA	C2		C2
Alsea ochrotrichian micro caddis	OCAL	3C		3C
Fender's rhyacophilian caddis	RHFE	3C		3C
Siskiyou caddis	TISI	C2		C2

A-5 Possible Special Status Plant Species in the Hamilton Creek WAA

Species	Status	Habitat	Elevation	Best I.D. Season
Wet Area Species @ 510 -1200 Ft.Elevation				
LOMATIUM BRADSHAWII Bradshaw's lomatium	FE	WILLAMETTE VALLEY, WET MEADOWS GRAVELLY STREAMBEDS	<750	APRIL-MAY
CASTILLEJA LEVISECTA golden paintbrush	FC1	Willamette Valley Wet or Vernally Wet Meadows	<1000	APRIL-AUGUST
MONTIA HOWELLII Howell's montia	FC2	Rocky River Banks Esp. In Disturbed Sites	<2500	APRIL-EARLY MAY
CICENDIA QUADRANGULARIS (Microcala quadrangularis) timwort	AS	WILLAMETTE VALLEY MARSHY MEADOWS	300-1700	MAY-JUNE
MIMULUS TRICOLOR AS three-colored monkeyflower	AS	VERNAL POOLS FLOODPLAINS	<1000	MAY - JUNE
OPHIOGLOSSUM PUSSILUM (O. vulgatum) adder's tongue	AS	WET MEADOWS BOGS	2000	
TAYLORIA SERRATA moss	AS	WILLAMETTE VALLEY, CASCADES, WETLANDS		
LYCOPODIUM ANNOTINUM stiff club-moss	TS	SPHAGNUM MUMMOCKS IN MOIST SHADY BOGS	MID	JULY-AUGUST
MIMULUS PULSIFERAE candelabrum monkeyflower	TS	BARS ALONG STREAMS		APRIL-JUNE
VACCINIUM OXYCOCCUS wild cranberry	TS	SPHAGNUM BOGS	LOW-MID	MAY-JULY
Cliff/Talus Species @ 1800 - 3977 Ft. Elevation				
ROMANZOFFIA THOMPSONII Thompson's mistmaiden	BS	SEEPY ROCK WALLS WITH FULL SUNLIGHT	>2600	APRIL-EARLY MAY
POLYSTICHUM CALIFORNICUM California sword-fern	AS	BASE OF CLIFFS & OUTCROPS IN SHADE	MID	
ALLIUM CAMPANULATUM Sierra onion	TS	DRY SOILS	HIGH	JUNE-JULY
ARABIS FURCATA cascade rockcress	TS	CLIFFS, TALUS, ALPINE & SUBALPINE MEADOWS	MID-HIGH	MAY-JULY
CASTILLEJA RUPICOLA cliff paintbrush	TS	CREVICES IN ROCKS	>500	JUNE-AUGUST
CYPRIPEDIUM MONTANUM mountain lady's-slipper	TS	DRY TO FAIRLY MOIST, OPEN TO SHRUB- OR FOREST-COVERED VALLEYS OR MOUNTAIN SIDES.	LOW-MID	MAY-AUGUST
DOUGLASIA LAEVIGATA TS smooth-leaved douglasia	TS	ROCK CREVICES ON WET CLIFFS	MID-HIGH	JUNE-JULY
ELMERA RACEMOSA VAR. PUBERULENTA hairy elmera	TS	ROCKY PLACES	>5000	AUGUST

A-5 Possible Special Status Plant Species in the Hamilton Creek WAA
...Continued

Species	Status	Habitat	Elevation	Best I.D. Season
Dry meadow species @ 1800 -2940 ft. Elevation				
SIDALCEA NELSONIANA Nelson's sidalcea	FT	WILLAMETTE VALLEY	<2000	JUNE-JULY
DELPHINIUM PAVONACEUM peacock larkspur	FC1	WILLAMETTE VALLEY	<1500	MAY-JUNE
ERIGERON DECUMBENS VAR. DECUMBENS Willamette daisy	FC1	WILLAMETTE VALLEY GRASSLANDS	<1000	JUNE-EARLY JULY
DELPHINIUM LEUCAPHAEUM white rock larkspur	FC2	WILLAMETTE VALLEY	<1000	MAY-EARLY JUNE
HORKELIA CONGESTA SSP. CONGESTA shaggy horkelia	FC2	WILLAMETTE VALLEY, OPEN SANDY OR ROCKY FLATS TO OPEN WOODS	LOW	APRIL-JUNE
LUPINUS SULPHUREUS VAR. KINKAIDII Kincaid's lupine	FC2	WILLAMETTE VALLEY	<1500	MAY-JULY
DELPHINIUM OREGANUM Willamette Valley larkspur	BS		LOW	
ALLIUM CAMPANULATUM Sierra onion	TS	DRY SOILS	HIGH	JUNE-JULY
ARABIS FURCATA cascade rockcress	TS	CLIFFS, TALUS, ALPINE & SUBALPINE MEADOWS	MID-HIGH	MAY-JULY
CASTILLEJA RUPICOLA cliff paintbrush	TS	CREVICES IN ROCKS	>500	JUNE-AUGUST
CYPRIPEDIUM MONTANUM mountain lady's-slipper	TS	DRY TO FAIRLY MOIST, OPEN TO SHRUB- OR FOREST-COVERED VALLEYS OR MOUNTAIN SIDES.	LOW-MID	MAY-AUGUST
DOUGLASIA LAEVIGATA smooth-leaved douglasia	TS	ROCK CREVICES ON WET CLIFFS	MID-HIGH	JUNE-JULY
ELMERA RACEMOSA VAR. PUBERULENTA hairy elmera	TS	ROCKY PLACES	>5000	AUGUST
PILOPHORUS NIGRICAULIS lichen	TS	TALUS		
SIDALCEA CAMPESTRIS meadow sidalcea	TS	WILLAMETTE VALLEY FENCEROWS & ROADSIDES	<1000	LATE JUNE-JULY
SIDALCEA CUSICKII Cusick's checker-mallow	TS	WILLAMETTE VALLEY	<4000	MAY-JULY

A-5 Possible Special Status Plant Species in the Hamilton Creek WAA
...Continued

Species	Status	Habitat	Elevation	Best I.D. Season
Mid to Late Seral Forested Environments				
CIMICIFUGA ELATA tall bugbane	FC2	MOIST WOODS	<2000	JUNE-MID JULY
CORYDALIS AQUAE-GELIDAE cold-water corydalis	FC2	COLD SPRINGS & STREAMS	>1000	MID JUNE-JULY
ROMANZOFFIA THOMPSONII Thompson's mistmaiden	BS	SEEPY ROCK WALLS WITH FULL SUNLIGHT	>2600	APRIL-EARLY MAY
HUPERZIA OCCIDENTALIS (Lycopodium selago) fir club-moss	AS	DENSE MOIST WOODS HUMID AREAS EXPOSED CLIFFS & TALUS	>1000	JULY-AUGUST
LOPHOZIA LAXA liverwort	AS	CASCADES		
LYCOPODIELLA INUNDATA (Lycopodium inundatum) bog club-moss	AS	SPHAGNUM BOGS MUDDY ELK WALLOWS	>3000	
LYCOPODIUM COMPLANATUM ground cedar	AS	MOIST FORESTS	>3000	
MIMULUS TRICOLOR three-colored monkeyflower	AS	VERNAL POOLS, FLOODPLAINS	<1000	MAY - JUNE
POLYSTICHUM CALIFORNICUM California sword-fern	AS	BASE OF CLIFFS & OUTCROPS IN SHADE	MID	
LECIDEA DOLODES lichen	TS	CASCADES		
LYCOPODIUM ANNOTINUM stiff club-moss	TS	SPHAGNUM MUMMOCKS IN MOIST SHADY BOGS	MID	JULY-AUGUST
MONTIA DIFFUSA branching montia	TS	MOIST WOODSRECENTLY BURNED AREAS	<3500	APRIL-JULY

A-6 Hamilton Creek WAA Proposed Projects

PROJECT	Contribute to PSQ (0-1)	Inter-discilplinary (0-2)	Critical Issue (0-1)	Contribute to DFC (0-1)	ROD/RMP Required (0-2)	Timing (0-2)	Ongoing Project (0-2)	Urgent/ Deteriorating (0-2)	Total Priority	RMARKS [1/]
Keel Mtn Density Mgt	1	2	1	1	0	2	2	0	9	
Black Peter Density Mgt	1	2	1	1	0	2	0	0	7	
Round Mtn DWD/ Habitat Enhancement	0	1	1	1	0	0	0	0	3	
Road Closure	0	2	1	1	1	2	0	2	9	J
Scott Ck Culvert Replacement	0	2	1	1	2	2	2	2	12	J Need for access to Density Mgt Study Area
Riparian Inventory	0	2	1	1	1	2	1	1	9	J, D
Riparian Restoration	0	2	1	1	2	2	0	0	8	J Upper Hamilton CK: DePuy to map
Road Hydromulching	0	1	1	1	1	0	0	1	5	
Fish Habitat Inventory	0	1	1	1	2	2	0	1	8	J, D
Phellinus underplanting	1	0	1	1	0	0	0	1	4	1/10 to 1/4 ac in Matrix
Regen understocked hardwood stands	0	1	1	1	0	0	0	0	3	
CT Pruned Matrix	1	0	1	1	0	2	2	0	7	
CT Matrix	1	0	1	1	0	1	0	0	4	
CT Riparian Reserve	0	2	1	1	1	0	0	0	5	
CT Connectivity	1	1	1	1	1	0	0	0	5	Black Peter area
PCT Density Mgt	0	1	0	1	1	2	0	0	5	in Connectivity & Riparian Reserves
Log Culvert Replacement	0	2	1	1	2	2	2	2	12	Culverts downstream from existing replacement areas
Log Culvert Replacement	0	2	1	1	2	2	2	0	10	18: Some related to road closure areas
Noxious Weed Survey	0	1	0	1	1	0	0	0	3	
FORAGE SEEDING	DETAIL OF OTHER PROJECTS: ROAD CLOSURE OR DENSITY MGT									
SUBSOIL RIPPING	DETAIL STUDY COULD BE COMBINED W/ DENSITY MGT									
SPECIAL HABITAT SVY	INVENTORY: NOT A PROJECT									D

[1/] D: DATA GAP/NEED IDENTIFIED IN WAA. J: JOBS IN THE WOODS IDENTIFIED PROJECT

A-6 Hamilton Creek WAA Proposed Projects
Continued

Proposed projects for the Hamilton Creek Watershed Analysis Area were reviewed by the Analysis Team and rated on a priority scale based on the following rating criteria developed for this analysis:

Contribute to PSQ: (0 to 1 point)	Does the propose project contribute volume to the potential sale quantity identified in the PRMP/FEIS?
Interdisciplinary: (0 to 2 points)	Does the propose project benefit two or more resources values or conditions within the WAA?
Critical Issue: (0 to 1 point)	Does the propose project Address a critical issue or key question identified in the analysis?
Contribute to DFC: (0 to 1 point)	Does the propose project contribute to a desired future condition or trend identified in the analysis?
ROD/PRMP Required: (0-2 points)	Does the propose project meet a management action/ direction or objective of the SEIS/ROD or PRMP/FEIS?
Timing: (0-2 points)	Is time of the essence in implementing the project?
Ongoing Project: (0-2)	Is the project part of an ongoing or imminently planned proposal?
Urgent/Deteriorating: (0-2)	Is the project associated with restoration of a critical or deteriorating resource condition?