Olalla-Lookingglass Watershed Analysis

Roseburg District
South River Resource Area

Draft November 14, 1997

Revised April 2, 1998

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Executive Summary
Olalla-Lookingglass WAU

Characterization

The Olalla-Lookingglass WAU covers approximately 103,109 acres. The Bureau of Land Management (BLM) administers approximately 27,390 acres (27%) within the WAU. Bureau of Land Management administered lands are composed of Matrix, Late-Successional Reserve (LSR), Marbled Murrelet Reserve (MMR), and Riparian Reserve Land Use Allocations. Approximately 8,472 acres (31%) of BLM administered lands that are available for intensive forest management. This would be about 8% of the WAU.

Approximately 689 acres per decade are expected to be harvested on BLM administered lands within the Olalla-Lookingglass WAU. This would be about eight percent of the 8,472 acres considered available for harvesting within the WAU. Although, less than one percent of the Olalla-Lookingglass WAU would be harvested per decade.

Timber harvesting, agriculture, mining, and recreation have been the dominant human uses in the Olalla-Lookingglass WAU. The communities of Lookingglass, Reston, Olalla, Tenmile, and a small portion of Winston lie within the WAU.

The watershed analysis uses the format presented in the Ecosystem Analysis at the Watershed Scale, Federal Guide for Watershed Analysis. The Key Issues, Findings, and Recommendations and Restoration Opportunities are presented below.

Key Issues

The following issues and concerns were identified during the analysis.

•Management of the Late-Successional Reserve Land Use Allocation in the Olalla-Lookingglass WAU.

•The amount of timber harvesting in the past 30 years on BLM administered lands and fragmentation of suitable owl habitat.

•The amount of northern spotted owl dispersal habitat between the LSRs in the Olalla-Lookingglass WAU.

•Vegetation condition in the Riparian Reserves.

•Water quality.

•The impacts roads have on streams due to sediment and road encroachment.

Findings

Vegetation

•Sixty-nine percent of BLM Administered Land in the WAU is within the Reserved or Withdrawn areas. Thirty-one percent of the BLM Administered Land in the WAU is available for timber harvesting.

•Timber harvesting on BLM Administered Land would affect less than 1% (689 acres out of 103,109 acres) of the WAU per decade.

•Port-Orford Cedar is known to occur in seven sections within the Olalla-Lookingglass WAU. Three sections contain trees infected with Phytophthora lateralis.

Hydrology and Fisheries

•Main concerns are sediment in streams and water quality. High road densities, high stream crossing densities, and cumulative effects of harvesting in the past 30 years have probably increased peak flows and increased sediment in the streams.

•Current water quality concerns are high temperatures, low flows, low dissolved oxygen levels, and sedimentation levels that do not meet state water quality standards.

•Most of the Aquatic Habitat Inventory stream reaches surveyed were rated as fair.

Northern Spotted Owl

•There are 13,962 acres of BLM Administered Land in the Olalla-Lookingglass WAU considered to be suitable spotted owl habitat.

•There are 37 spotted owl sites within the WAU. Thirty-two spotted owl sites are on BLM Administered Land. Eighteen sites on BLM Administered Land were active sites in 1996. Seven spotted owl sites on BLM administered lands are protected with 100 acre activity centers (core areas).

•Five quarter townships currently have less than 50% in spotted owl dispersal habitat.

Elk

•There are portions of three Elk Management Areas identified in the PRMP and the RMP within the Olalla-Lookingglass WAU.

•ODFW is managing the Melrose unit, which includes the Olalla-Lookingglass WAU, to reduce elk numbers in order to reduce the amount of damage caused on private lands.

Recommendations and Restoration Opportunities

Vegetation

•Management activities within the range of Port-Orford cedar should conform to the BLM Port-Orford Cedar Management Guidelines to mitigate damage caused by Phytophthora lateralis.

•Density management within the MMRs in the northwest portion of the WAU could be considered to improve dispersal and late-successional habitat conditions in these areas.

•Treatments, such as density management or hardwood conversion, to restore large conifers to Riparian Reserves should be considered.

Soils

•Management activities on conglomerate soils should follow or adhere to Best Management Practices. On-site investigation by a soil scientist is recommended for any ground disturbing activity on conglomerate soils.

•Existing native forest vegetation is best suited for serpentine soils. Stand conversion to other commercial forest types should only be attempted if hard data exists to justify a forest type change.

•Best Management Practices (BMPs) should be applied during all ground and vegetation disturbing activities. Along with the BMPs, the Standards and Guidelines brought forth from the Record of Decision (USDA and USDI 1994) should be implemented in order to achieve proper soil management. Best Management Practices should be monitored for implementation and effectiveness in order to document if soil goals are being achieved.

Hydrology

•Consider continuing Proper Functioning Condition surveys.

•Identify road decommissioning and culvert replacement opportunities.

•Consider collecting data during all seasons of the year.

•Determine which culverts have the potential for failing.

•Identify roads to be closed.

•Determine if there are reference stream reaches in the WAU not influenced by management activities for comparing to stream reaches impacted by management activities.

•When installing new culverts or replacing culverts, consider construction designs (such as multiple culverts) which do not constrict stream flows.

•Consider classifying streams in the WAU using Rosgen stream classification.

Fisheries

•The priority for fisheries restoration in this WAU would be removing man-made barriers to fish passage (i.e. culverts) and replacing them with structures that provide fish passage (i.e. bridges or bottomless arch pipes).

•Subwatersheds rated fair or good for habitat condition, with high species diversity, and streams with low gradients and easily accessible habitat should be priority areas for watershed restoration. The Thompson Subwatershed is one subwatershed to consider for restoration activities.

•Consider conducting coho spawning surveys in Thompson and Olalla Creeks.

•Consider using existing roads when planning future land management activities. Avoid, as much as possible, constructing new stream crossings and roads within Riparian Reserves.

•Consider reducing road densities in subwatersheds where peak flows have negatively altered stream channel condition and have had negative impacts on the fisheries reaource. Areas to consider first for road decommissioning would be subwatersheds within the Transient Snow Zone and containing anadromous fish-bearing stream reaches. The most important roads for decommissioning would be valley bottom, then midslope, and finally ridgetop roads.

•Consider the amount of soil disturbance, timber falling, and yarding within late-successional or old-growth stands in Riparian Reserves when planning activities in these areas. Salvage activities within Riparian Reserves in late seral age stands should not retard or prevent attainment of ACS objectives.

Wildlife

Northern Spotted Owl

•Determine location of harvest areas to minimize fragmentation based on criteria developed using spotted owl data and table.

•Projects that modify or remove suitable owl habitat should be planned in areas outside of known territories first. If this is not possible then modification or removal of suitable habitat in the Olalla-Lookingglass WAU should consider the rankings in Table 31.

• Consider managing Spotted Owl Critical Habitat in the Olalla-Lookingglass WAU to minimize fragmentation.

Neotropical Birds

•Consider scheduling management activities, such as burning, brushing, PCT, commercial thinning, timber harvesting, and other activities that remove or modify neotropical bird habitat so they do not occur during the breeding season, between April 1 and July 30 of any given year.

I. Characterization of the Watershed

The Olalla-Lookingglass Watershed Analysis Unit (WAU) is located in the western portion of the South River Resource Area in the Roseburg District Bureau of Land Management (see Map 1). The WAU covers approximately 103,109 acres. Elevation ranges from about 524 feet near Winston to 3,527 feet at Nickel Mountain in the southeastern portion of the WAU. Towns within this WAU include Lookingglass, Tenmile, and some of the western portion of Winston.

This WAU is composed of ten subwatersheds. These ten subwatersheds are further divided into 28 drainages. The subwatersheds and their drainages are listed below and shown on Map 2.

Berry Creek Subwatershed - Drainages include Bear Creek, Ben Irving, Berry Creek, Coarse Gold, and Upper Berry.

Lookingglass Creek Subwatershed - Drainages include Lookingglass, Upper Lookingglass, and Winston.

Lower Tenmile Subwatershed - Drainages include Porter Creek, Siebold Canyon, and Tenmile.

Middle Olalla Subwatershed - Drainages include Bushnell Frontal and Byron Creek.

Mt. Shep Subwatershed - Drainages include Olalla Frontal, Upper Olalla Creek, Wildcat Creek, and Willingham Creek.

Olalla Subwatershed - Drainages include Olalla.

Reston Subwatershed - Drainages include Middle Tenmile, Reston, and Upper Tenmile.

Shields Subwatershed - Drainages include Lower Shields, Shields Creek, and Suicide Creek.

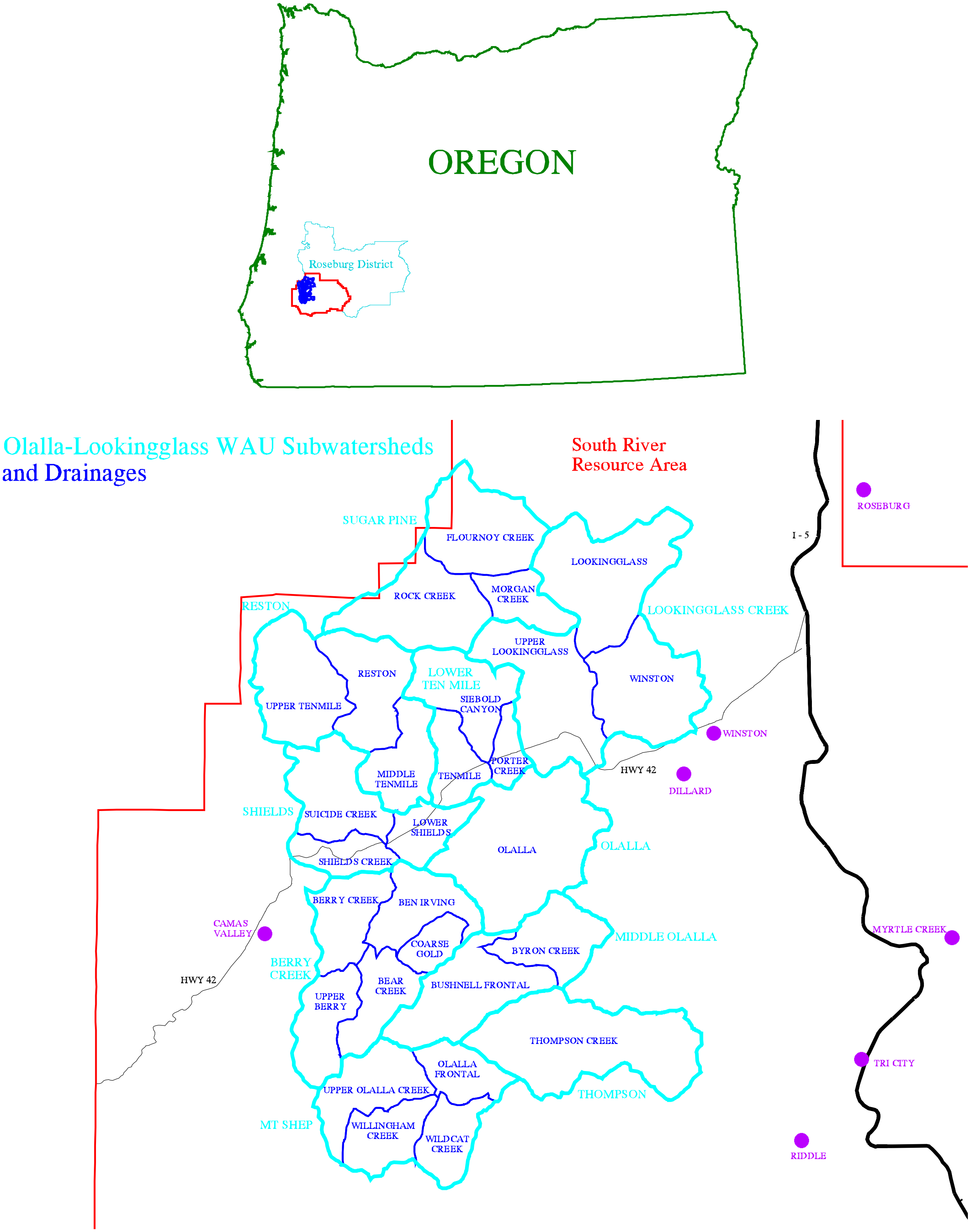
Sugar Pine Subwatershed - Drainages include Flournoy Creek, Morgan Creek, and Rock Creek.

Thompson Subwatershed - Drainages include Thompson Creek.

The Bureau of Land Management (BLM) administers approximately 27,390 acres (27%) within the Olalla-Lookingglass Watershed Analysis Unit. Bureau of Land Management lands are intermingled with private lands in a checkerboard pattern in the upland areas of the WAU. The lower valleys are mostly privately owned urban and agricultural lands. Privately owned lands cover approximately 75,719 acres (73%) of the WAU.

Bureau of Land Management administered lands are composed of Matrix, Late-Successional Reserve (LSR), Marbled Murrelet Reserve (MMR, which are treated the same as LSRs), and Riparian Reserve Land Use Allocations established in the Northwest Forest Plan (USDA and USDI 1994b) and the Roseburg District Resource Management Plan (USDI 1995). Matrix lands are further delineated into

Map 1. Vicinity Map



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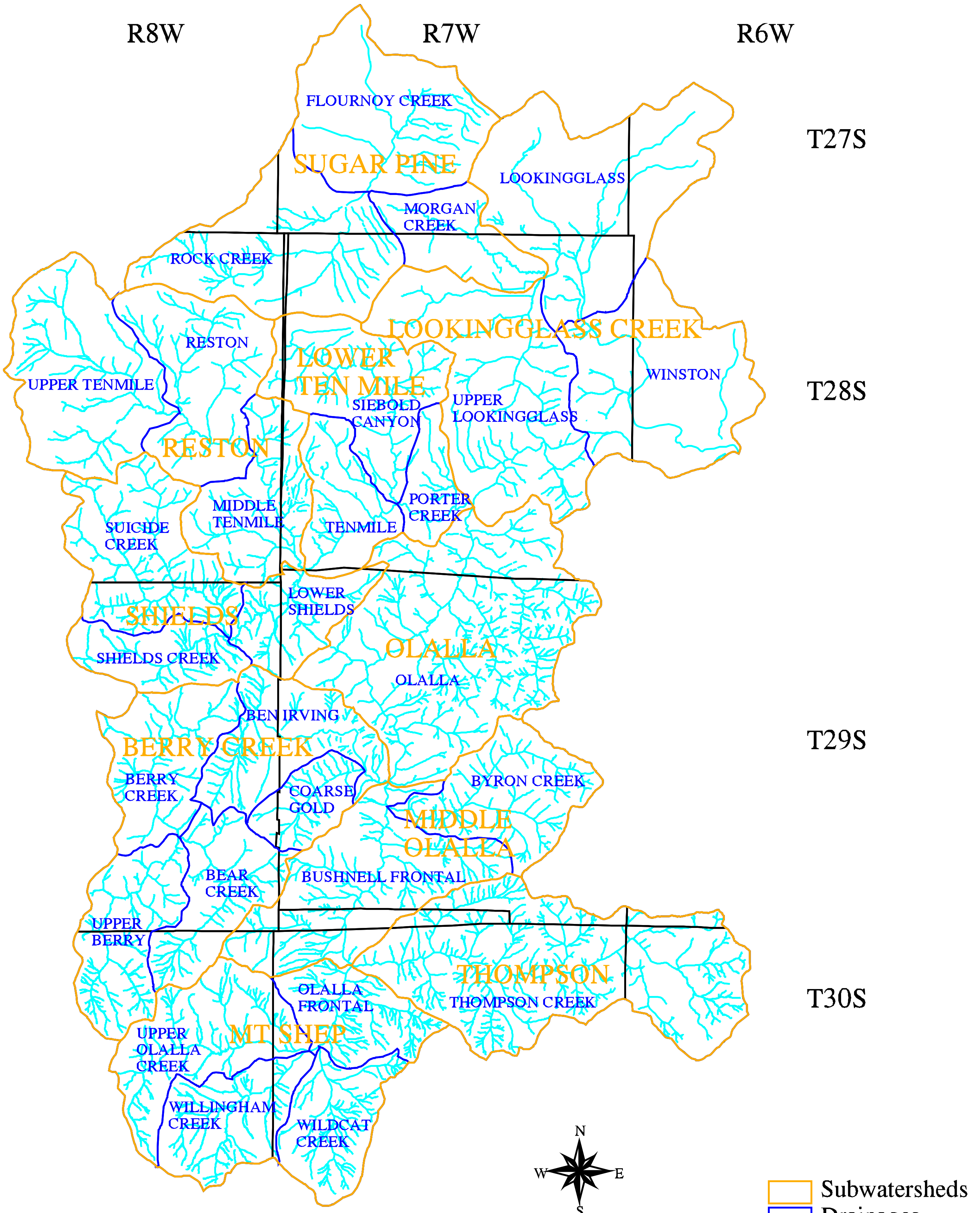
Map 2. Olalla-Lookingglass Watershed Analysis Unit
Subwatersheds and Drainages



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General Forest Management Areas (GFMA) and Connectivity. Map 3 and Chart 1 show the percentage of GFMA, Connectivity, LSR, and MMR in the WAU and how they are distributed. Table 1 and Chart 2 show the number of acres in each Land Use Allocation.

Chart 1. Olalla-Lookingglass WAU
Total Land Use

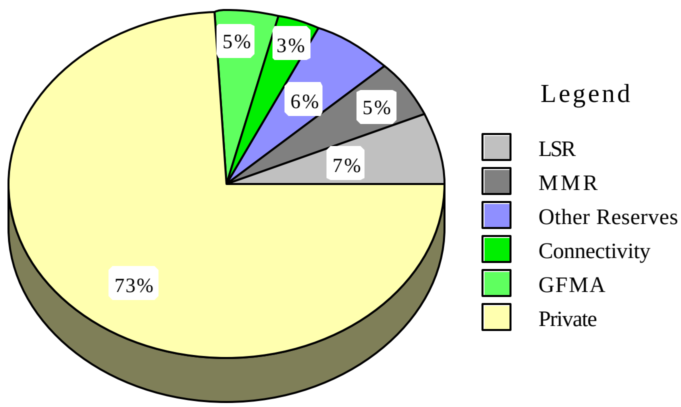


Table 1. Acres and Percentage of Federally Managed Lands by Land Use Allocation.

Land Use Allocation	Acres of Federally Managed Land	Percent of Federally Managed Land	Percent of Watershed Analysis Unit
Late-Successional Reserve	7,362	27	7
Marbled Murrelet Reserve	5,348	20	5
Riparian Reserves (outside of LSR and MMR)	4,504	16	4
Other Reserved Areas (Owl Core Areas and TPCC Withdrawn Areas)	1,649	6	2
Connectivity	3,086	11	3
General Forest Management Area (GFMA)	5,437	20	5
Total	27,390	100	27

Map 3. Olalla-Lookingglass Watershed Analysis Unit Land Use Allocations

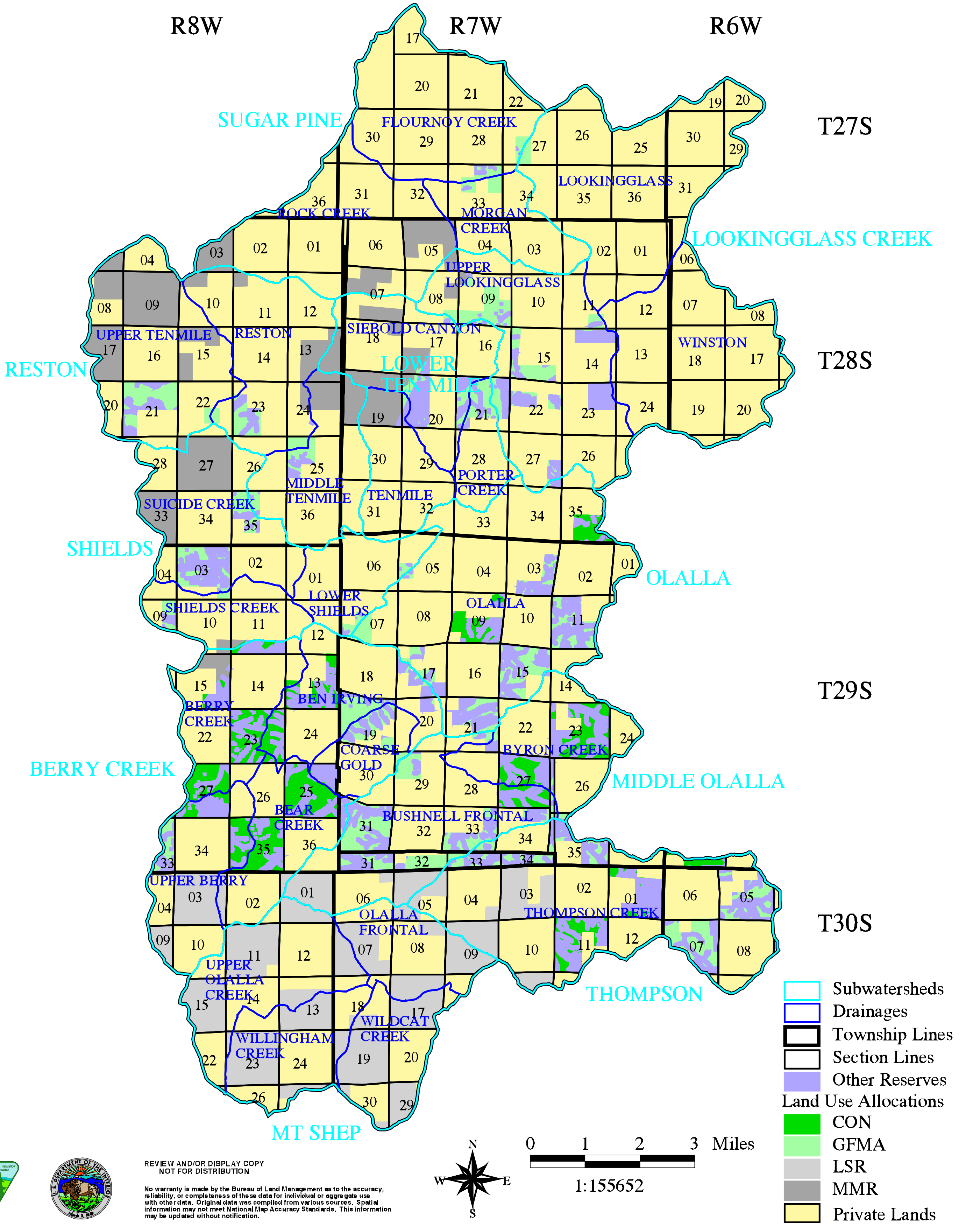
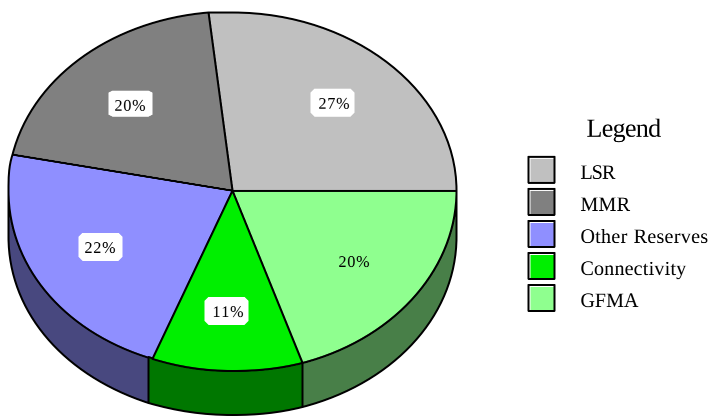


Chart 2. Olalla-Lookingglass WAU

Federal Land Use Allocations



II. Issues and Key Questions

The purpose of developing issues is to focus the analysis on the key elements of the ecosystem that are most relevant to the management questions, human values, or resource conditions within the WAU. Areas covered by this watershed analysis will receive more in-depth analysis during project development and the National Environmental Policy Act (NEPA) process. New information gathered during the Interdisciplinary (ID) team process will be appended back to the watershed analysis document as an update.

A. ISSUE 1 - Late-Successional Reserve

Late-Successional Reserves are to be managed to maintain a functional and interacting late-successional and old-growth forest ecosystem. A Late-Successional Reserve Assessment will guide the management of the LSR but should be coordinated with watershed analysis.

Key Questions

Vegetation Patterns

What are the natural and human causes of changes between historic and current vegetation conditions?

Where are the late-successional/old-growth stands within the WAU?

Where are the stands that may be treated to maintain or promote late-successional habitat within the LSR?

Where should risk reduction activities occur to protect late-successional/old-growth forests?

B. ISSUE 2 - Harvest Potential

Matrix lands are responsible for contributing to the Probable Sale Quantity (PSQ). Objectives in the Matrix include producing a sustainable supply of timber and other forest commodities, providing connectivity (along with other land use allocations such as Riparian Reserves) between Late-Successional Reserves, providing habitat for a variety of organisms associated with both late-successional and younger forests, providing for important ecological functions such as dispersal of organisms, carryover of some species from one stand to the next, and maintenance of ecologically valuable structural components such as down logs, snags, and large trees, and providing early-successional habitat.

Key Questions

a. Vegetation Patterns

What are the historic and current vegetation conditions?

Where are the stands of harvestable age within the Matrix?

How can the scale, timing, and spacing of harvest areas be adjusted to minimize fragmentation and maintain the function of large forest blocks?

What opportunities are there in the Elk Management Areas to improve elk habitat through vegetation manipulation?

b. Special Status Species

What is the distribution of species of concern that are important in the WAU (e.g., threatened or endangered species, special status species, or species emphasized in other plans)? What is the distribution and character of their habitats?

How can scheduling of potential harvest areas be prioritized to minimize impacts to wildlife and hydrologic processes while still meeting the objectives for Matrix lands established in the SEIS ROD and the Roseburg District RMP?

C. ISSUE 3 - Watershed Health and Restoration

The first component of a watershed restoration program involves road treatments (such as decommissioning or upgrading), which will result in reduced sedimentation, reduced erosion, and improved water quality. The second component deals with riparian vegetation. Silvicultural treatments such as planting unstable areas along streams, thinning densely-stocked young stands, releasing young conifers overtopped by hardwoods, and reforesting shrub and hardwood dominated stands with conifers, would improve bank stabilization, increase shade, and accelerate recruitment of large wood desirable for future in-stream structure. The third watershed restoration component involves the design and placement of in-stream habitat structure in an effort to increase channel complexity and the number of pools.

Key Questions

a. Vegetation Patterns

What is the array and landscape pattern of plant communities and seral stages in the WAU (riparian and non-riparian) and what processes caused these patterns?

How are Riparian Reserves functioning within the WAU?

b. Soils / Erosion

What are the dominant erosion processes within the WAU and where have they occurred or are likely to occur?

c. Hydrology / Channel Processes

What are the dominant hydrologic characteristics (e.g. total discharge, peak flows, and minimum flows) and other notable hydrologic features and processes in the WAU?

d. Water Quality

What are the limiting factors affecting water quality, and where are the priority opportunities to improve water quality and hydrologic conditions?

What beneficial uses dependant on aquatic resources occur in the WAU and which water quality parameters are critical to these uses?

e. Fisheries

Where are the locations of fish populations, historic and existing?

How have fish habitat and fish populations been affected by hydrologic processes and human activities?

What and where are the priority restoration opportunities to benefit fisheries?

III. / IV. Reference and Current Conditions

A. Human Uses

1. Reference Conditions

The Olalla-Lookingglass Watershed Analysis Unit has been used by humans probably for the last 8,000 years. Little knowledge exists of prehistoric use of the WAU prior to Euroamerican entry. Ten archaeological sites have been recorded in the Olalla-Lookingglass WAU, with the majority located on private land.

The area was occupied by the Upper Umpqua Indians. Although, the upper reaches of Olalla and Lookingglass Creeks may have been held by the Cow Creek Band of the Umpqua Indians. The Athapaskan speaking Upper Umpqua Indians followed a seasonal way of life utilizing a variety of plants and animals. They gathered nuts, berries, seeds, and roots, hunted deer and elk, and fished for salmon. The indigenous people changed the landscape very little, although they probably burned areas to control brush, aid in the hunting of large game animals, and improve forage. Early settlers commented they burned their own fields as the Indians had done in the past. Indian villages were located along lower Olalla and Lookingglass Creeks.

The 1800s marked the arrival of the fur trappers and settlers into the Olalla-Lookingglass area. Settlers transformed the life and landscape of the area and began the process of shaping the area into its current conditions. Exploration by fur trappers from the Northwest Fur Company and the Hudson Bay Company began around the 1820s. In September of 1826 Alexander McLeod lead a brigade of trappers of the Hudson Bay Company through the Lookingglass Valley to the Coquille River. David Douglas, a botanist, ventured into the Umpqua River Basin in 1826 to find stands of sugar pine and collect specimens. He visited several villages, one with two lodges inhabited by 25 people, another site with one lodge, and a third consisting of three lodges. The increase in settlers resulted in the United States attempting to purchase land from all of the western Oregon tribes and moving the native inhabitants to reservations.

Jesse and Lindsay Applegate, along with Levi Scott, established a new emigrant trail from the south into Oregon. This step, along with the passage of the Donation Land Claim Act in 1850, opened the region to settlers. Early donation land claims were established in the Flournoy Valley by H. B. Flournoy and in the Lookingglass Valley by Daniel Huntly. In 1852, others established claims and by the end of that year most of the valley was claimed under the Donation Land Act. The area was subdivided in 1855 and 1856 by surveyor Dennis Hathorn and in 1875 by W. S. Chapman. In their notes, they described the area as rolling prairies with hilly oak openings. The timber, located at mid elevations, was described as fir and cedar with a few scatterings of sugar pine.

Transportation, in the WAU, was briefly dominated by the Coos Bay Wagon Road. Completion of the Coos Bay Wagon Road in 1871 allowed stage travel and mail service between Roseburg and Coos Bay. The road passed through the communities of Lookingglass and Reston, offering transportation of people and goods to the port of Coos Bay and larger markets. The completion of the Coos Bay Wagon Road lead to the establishment of U.S. Postal Services at Lookingglass in 1871 and at Reston by 1890. The Eighteen Mile House in the Lookingglass Valley was a stage facility operated by the Weeklys. By 1876, a telegraph system was completed between Roseburg and Coos Bay, linking the area to the rest of the United States. In 1883, fifteen to twenty residents lived in Lookingglass. The town had a mercantile store, variety store, hotel, grist mill, wagon shop, blacksmith shop, and two livery stables.

Mining was a minor activity in the Olalla-Lookingglass WAU. Although, mining activity on Cow Creek and other tributaries of the South Umpqua River drew miners to the Umpqua River Basin. Robert Gurney had a interest in several coal deposits in the Lookingglass area. In the 1880s, workmen constructed a tunnel into a vein in T28S, R7W, Section 4. However, there is no record of commercial coal production from the deposits.

The early settlers maintained a subsistence lifestyle until markets were established for cereal crops and livestock. Agricultural products became the main source of income throughout the 1880s and 1890s. Local farmers would take their grain to a grist mill located in Olalla. A variety of grain and fruit crops were important agricultural products in the past. The products were transported to markets by pack animals or wagons and the cattle were driven to market.

The Oregon and California rail line was completed as far as Roseburg in 1872, providing a new means of transportation to the north. The railroad quickly became the main transportation route for people and products. In 1889, the rail line was completed from the south, opening access to markets in Southern Oregon and California. The railroad gave farmers a dependable means of transportation for any surplus farm products. In the early 1900s, agriculture was the major occupation in the Umpqua Valley with 46% of the population working in the field. Logging and lumber manufacturing accounted for only 3% of the population employed.

At the turn of the century, small lumber mills began to appear in the communities of Olalla, Lookingglass, Tenmile, and Reston. The 1940s saw a boom in the housing market and by the 1950s timber production and harvesting became major influences on the landscape. Timber harvesting grew from supplying local markets in the Umpqua Valley at the turn of the century to national and international markets.

2. Current Conditions

The primary human uses in the Olalla-Lookingglass Watershed Analysis Unit have included timber production, agriculture, mining, recreation, and transportation. There are no treaty rights or tribal uses in the WAU, although individual tribal members may utilize the area.

a. Timber

Timber harvesting has had the most influence on the area, with both private and federal land contributing to the timber harvest over the last 45 years. In the 1800s timber was supplied to local markets and used for railroad ties and trestles during the construction of the Oregon and California Railroad. Approximately 59% (60,985 acres) of the Olalla-Lookingglass WAU has been harvested. Timber production and harvesting constitute two of the most important economic human uses within the WAU. Forest products are important to the local economy, providing jobs and revenue to local inhabitants.

The checkerboard ownership and the limited amount of lands the BLM administers in the WAU limits the ability of the BLM to affect human use within the WAU. The main human use issue in the WAU is the amount of timber harvesting that will occur in the future. A diminished level of harvest has occurred on BLM administered lands and will probably persist into the future. Timber harvesting will probably continue to occur, depending on market conditions, on private land.

b. Agriculture

There are approximately 20,030 acres (19%) of agricultural/pasture lands within the WAU. Sheep, cattle, and hay are the primary agricultural commodities.

c. Mining and Minerals

Mining in the Olalla-Lookingglass WAU included small, independent hydraulic gold placer operations worked in the 1930s on Coarse Gold, Byron, and Bushnell Creeks. The Byron limestone quarry (85% $CaCO_3$) was exposed around the turn of the century about 3/4 mile northeast of Olalla in the Olalla Drainage. The Krogel coal prospect is located east of Camas Valley in the Berry Creek Drainage. In 1910, oil and gas exploration wells were drilled east of Lookingglass in the Lookingglass Creek Drainage and northwest of Lookingglass in the Flournoy Creek Drainage. No commercial quantities of oil or gas were found.

Nickel ore from Nickel Mountain was the most important mineral resource in Douglas County. Nickel was discovered in 1865 on Nickel Mountain west of Riddle. In 1882, the mining of nickel ore began but was very modest. It was not until 1947 that a major commercial operation began under the Hanna Company. The mine provided a major source of employment for Riddle and Myrtle Creek. Between 1954 and 1971 25,611,000 crude tons of nickel were mined. The main nickel mineral, garnierite, is an apple-green, hydrous magnesium nickel silicate that contains variable amounts of nickel and magnesium. Thompson Creek Drainage skirts the north part of this nickel deposit.

d. Recreation

Recreation use in the Watershed Analysis Unit is determined by the land ownership, topography, forest types and stand ages in the area. Special Use Permits are not required for recreation use in the WAU. Recreation is basically limited to dispersed forms. No improved sites or areas currently exist on BLM administered lands within the WAU. Trails, day use and overnight camping areas, and interpretive opportunities would require development of the sites or permits.

The Recreation Opportunity Spectrum (ROS) designates the vast majority of the Federally managed lands in the Olalla-Lookingglass WAU as Roaded Natural, characterized by predominantly natural appearing environments with moderate evidence of the sights and sounds of man. Resource modification and utilization practices are evident, but usually harmonize with the natural environment. Interaction between users may be low to moderate with evidence of other users prevalent. Rustic facilities are provided for user convenience as well as for safety and resource protection. Facilities are designed and constructed to provide for conventional motorized use. The North, Northeastern, and Central areas of the WAU have a strong Rural setting. However, the BLM has limited holdings in these areas.

The predominant Off Highway Vehicle (OHV) designation in the RMP for the Olalla-Lookingglass WAU is 'Limited' to existing roads and trails. Under this designation, existing roads and trails are open to motorized access unless otherwise identified (i.e. hiking trails). Licensed vehicles may use maintained roads and natural surface roads and trails. Registered OHVs such as All Terrain Vehicles (ATVs) and motorcycles not licensed for the public roads may only use existing roads and trails that are not maintained (graveled). Areas 'Closed' to OHV travel include the Bushnell-Irwin Rocks Research Natural Area (RNA) consisting of 958 acres in T28S, R7W, R7½W, and R8W, and five Douglas-fir progeny test sites, consisting of approximately 55 acres. New roads and trails may be constructed in limited areas following the NEPA process. Roads and trails may be closed on an emergency basis.

The Olalla-Lookingglass WAU contains Class II, III and IV Visual Resource Management (VRM) classifications. Under Class II, low levels of change to the characteristics of the landscape are allowed, a Class III classification allows for moderate levels of change, and a Class IV classification allows major modifications to occur. Class II lands are found along Highway 42, with some Class III lands. The area around Ben Irving Reservoir is classified as Class III. Except for a couple of small, isolated patches of Class III lands, the remainder of the WAU is classified as Class IV. The objective of Class IV lands is to provide for management activities which may dominate the view and be the major focus of the viewer's attention. However, every attempt should be made to minimize the impact of these activities through careful unit location, minimal disturbance, and repetition of the basic elements of form, line, and texture.

The WAU falls within the South River Extensive Recreation Management Area (ERMA). Within the ERMA, recreation is mainly unstructured and dispersed requiring minimal recreation investments. Chimney Rock and Olalla-Thompson are two areas listed in the RMP with opportunities for developing recreation sites. Ben Irving Reservoir and The Rock are two potential trail site areas. The ERMA, which constitutes the bulk of the public land in the Olalla-Lookingglass WAU, presents recreation visitors with few regulatory constraints.

Forms of recreation commonly observed in the Olalla-Lookingglass WAU include driving for pleasure, hunting, photography, picnicking, camping, target shooting, and gathering (berries, flowers, mushrooms, greens, and rocks). Some of the most popular recreation sites are listed in Table 2. Potential recreation developments currently under consideration or in the process of being implemented are included in Table 3.

Table 2. Existing Recreation Sites or Areas in the Olalla-Lookingglass WAU.

Recreation Site	Township	Range	Section
Turquoise Springs Pond	28	8	21
Chimney Rock Pond	29	8	35
Bushnell-Irwin Rocks ACEC/RNA	28	8	13 and 24
	28	7	19 and 20
Camas Mountain Overlook	29	8	15
Cow Creek to Camas Back Country Byway	Union Creek and Buck Springs Roads		

Table 3. Potential Recreation Sites or Areas for Development in the Olalla-Lookingglass WAU.

Recreation Site	Township	Range	Section
The Rock Trail	28	7	15, 21, and 22
Ben Irving Reservoir Trail	29	8	13
	29	7	17, 18, 19, and 20
Olalla-Thompson Day Use Area	30	7	5
Coos Bay Wagon Road Back Country Byway	County Roads 5 and 112		

The Olalla-Lookingglass WAU has some of the best recreation potential within the South River Resource Area. Its proximity to the most highly populated areas of the county is a prominent reason for the recreational demands within the WAU. Highway 42 and numerous county roads make the Olalla-Lookingglass WAU highly accessible to the recreating public. Plans and requests for Byways, Trails, and Day Use Areas demonstrate the recreational demand in the WAU. Generally, strong conflicts between Recreation and other resource uses in the WAU have been resolved by the land use classifications.

B. Vegetation

1. Historical Perspective and Reference Vegetation Conditions

The Klamath Mountain and Coast Range Physiographic Provinces meet in the Olalla-Lookingglass WAU (Franklin and Dyrness 1984). Vegetative communities reflect the differences between the wetter Coast Range Province north of Highway 42 and the drier Klamath Mountain Province south of the highway. Climax vegetation consists of Douglas-fir and conifer-hardwood temperate forest types (Franklin and Dyrness 1984).

A map in the Roseburg District BLM Geographic Information System (GIS) gives general forest type descriptions of vegetation in 1936 for Douglas County in terms of diameter class and species (see Map 4 and Table 4). Although the map scale is large and lacks detail, the type map may be used to compare vegetation conditions in 1936 with current vegetation conditions.

The 1936 diameter classes may be correlated to age classes used for the current vegetation conditions. The 0 to 6 inch diameter classes are correlated with stands between 0 and 30 years old. These classes are labeled Early Seral. Diameter classes 6 to 20 inches are correlated to stands between 30 and 80 years old. These classes are labeled Mid Seral. Diameter classes greater than 20 inches are correlated to stands greater than 80 years old. These classes are labeled Late Seral. Agricultural land was also identified in the 1936 vegetation type map. The agricultural land may be correlated with the nonforest lands used in the current vegetation type descriptions. Hardwood stands classified in the 1936 vegetation type map is not correlated with any specific age class in the 1997 vegetation classification.

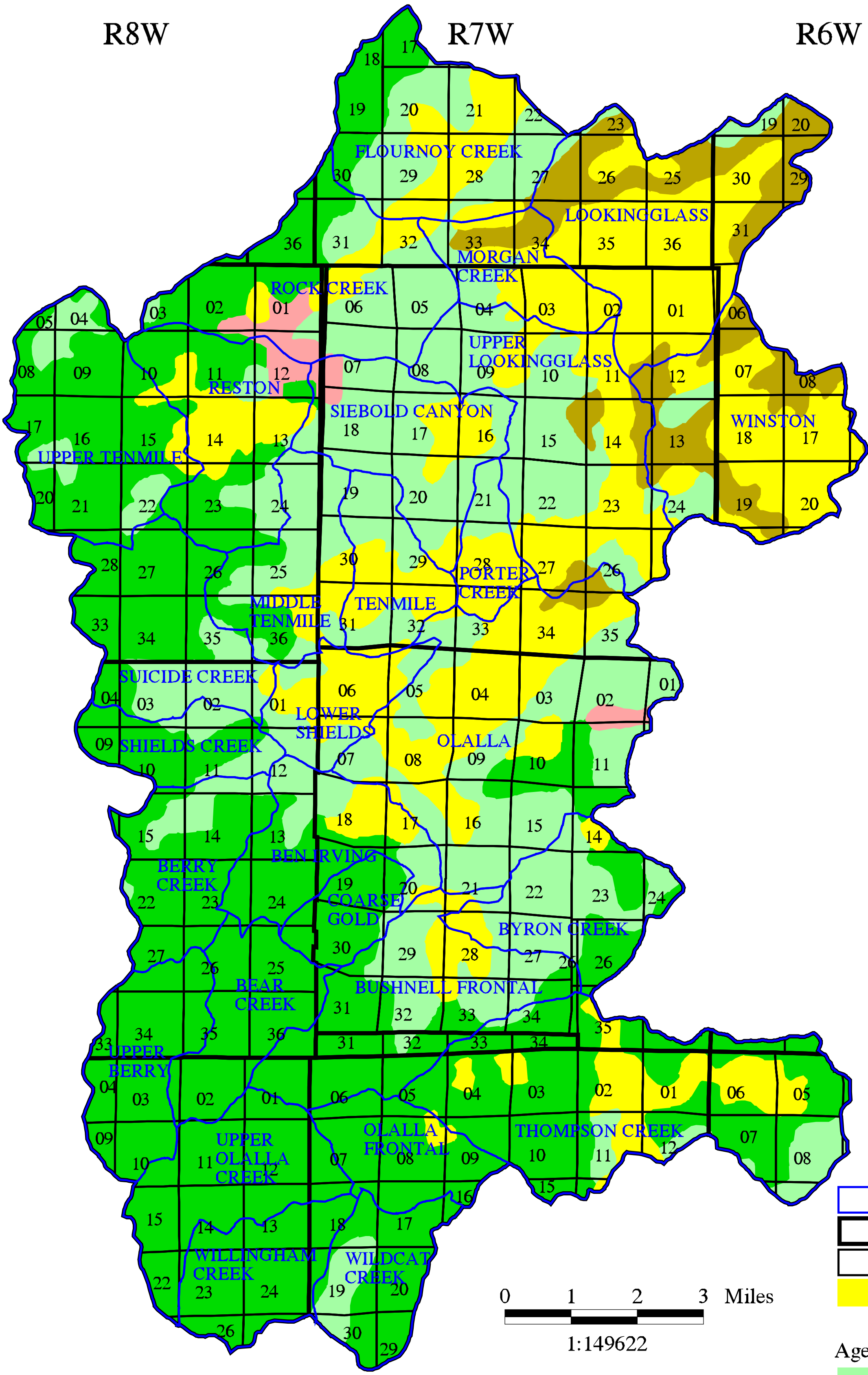
In 1936, there was less fragmentation of age classes over the landscape. All structural classes ranging from establishment to late seral were represented in large uniform blocks. The Olalla-Lookingglass Watershed Analysis Unit was comprised of 23% in agricultural land, 5% in hardwoods, 1% early seral, 29% mid seral, and 42% late seral.

a. Fire History and Natural Fire Regimes

Fire has been an important disturbance factor in Pacific Northwest forests for thousands of years. The "unmanaged"or "natural" forests, those that developed before widespread logging or fire protection existed, were initiated by fire and most have been altered by fire since establishment. Early accounts suggest that fires were highly variable, occurring frequently or infrequently, and killing all the trees at times or sometimes leaving the mature trees unscathed (Agee 1990).

Fire regimes of the Pacific Northwest have been described by Agee (1981). Fire regimes are broad, artificially grouped categories, which overlap considerably with one another. Forests are considered to have a similar fire regime when fires occur with similar frequency, severity, and extent. Effects of forest fires can be more precisely described if areas can be grouped by fire regimes. The Olalla-Lookingglass WAU is considered to have a high-severity regime, where fires are very infrequent (more than 100 years between

Map 4. Olalla-Lookingglass Watershed Analysis Unit
1936 Vegetation Age Classes



Drainages
Township Lines
Section Lines
Agricultural Land

Age Classes
30 to 80 Years Old
Less Than 30 Years Old
Greater Than 80 Years Old
Hardwoods

N
W E
S

Table 4. 1936 Age Class Distribution.

	Nonforest		Early Seral (0 to 30 Years Old)		Mid Seral (31 to 80 Years Old)		Late Seral (80 + Years Old)		Hardwoods		
Area	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Total Acres
Bear Creek	0	0	0	0	0	0	2,544	100	0	0	2,544
Ben Irving	488	17	0	0	939	32	1,490	51	0	0	2,917
Berry Creek	0	0	0	0	570	20	2,281	80	0	0	2,851
Coarse Gold	0	0	0	0	66	5	1,208	95	0	0	1,274
Upper Berry	0	0	0	0	0	0	2,780	100	0	0	2,780
Berry Creek Subwatershed	488	4	0	0	1,575	13	10,303	83	0	0	12,366
Lookingglass	3,921	60	0	0	271	4	0	0	2,325	36	6,517
Upper Lookingglass	2,319	38	0	0	3,292	53	0	0	559	9	6,170
Winston	2,729	53	0	0	472	9	0	0	1,979	38	5,180
Lookingglass Creek Subwatershed	8,969	50	0	0	4,035	23	0	0	4,863	27	17,867
Porter Creek	689	64	0	0	391	36	0	0	0	0	1,080
Siebold Canyon	686	19	186	5	2,706	75	18	1	0	0	3,596
Tenmile	922	46	0	0	1,084	54	0	0	0	0	2,006
Lower Tenmile Subwatershed	2,297	34	186	3	4,181	63	18	0	0	0	6,682
Bushnell Frontal	546	11	0	0	1,784	36	2,566	52	0	0	4,896
Byron Creek	253	8	0	0	1,936	64	841	28	0	0	3,030
Middle Olalla Subwatershed	799	10	0	0	3,720	47	3,407	43	0	0	7,926
Olalla Frontal	83	4	0	0	0	0	1,973	96	0	0	2,056
Upper Olalla Creek	0	0	0	0	0	0	3,425	100	0	0	3,425
Wildcat Creek	0	0	0	0	467	21	1,715	79	0	0	2,182
Willingham Creek	0	0	0	0	4	0	2,428	100	0	0	2,432
Mt. Shep Subwatershed	83	1	0	0	471	5	9,541	95	0	0	10,095

	Nonforest		Early Seral (0 to 30 Years Old)		Mid Seral (31 to 80 Years Old)		Late Seral (80 + Years Old)		Hardwoods		
Area	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Total Acres
Olalla	3,251	36	166	2	4,613	51	842	9	230	3	9,102
Olalla Subwatershed	3,251	36	166	2	4,613	51	842	9	230	3	9,102
Middle Tenmile	516	18	0	0	1,677	59	668	23	0	0	2,861
Reston	1,070	28	226	6	511	13	1,984	52	0	0	3,791
Upper Tenmile	191	4	0	0	847	18	3,659	78	0	0	4,697
Reston Subwatershed	1,777	16	226	2	3,035	27	6,311	56	0	0	11,349
Lower Shields	1,056	57	0	0	792	43	12	1	0	0	1,860
Shields Creek	0	0	0	0	527	30	1,254	70	0	0	1,781
Suicide Creek	53	1	0	0	1,200	31	2,633	68	0	0	3,886
Shields Subwatershed	1,109	15	0	0	2,519	33	3,899	52	0	0	7,527
Flournoy Creek	1,436	30	0	0	2,081	44	1,191	25	20	0	4,728
Morgan Creek	1,152	58	0	0	452	23	0	0	373	19	1,977
Rock Creek	604	12	441	9	2,075	42	1,877	38		0	4,997
Sugar Pine Subwatershed	3,192	27	441	4	4,608	39	3,068	26	393	3	11,702
Thompson Creek	1,754	21	0	0	894	11	5,842	69	0	0	8,490
Thompson Subwatershed	1,754	21	0	0	894	11	5,842	69	0	0	8,490
Olalla-Lookingglass Watershed Analysis Unit	23,719	23	1,019	1	29,651	29	43,231	42	5,486	5	103,106

fires) and are usually high-intensity, stand replacing fires. High-severity fire regimes typically occur in cool, moist forest types. In high-severity fire regimes, fires occur under unusual conditions such as during drought years, during east wind weather events (hot and dry foehn winds), and with an ignition source such as lightning. Fires are often of short duration (days to weeks) but of high intensity and severity (Pickford et al. 1980). Most of the Roseburg BLM District administered lands are classified as being in the high-severity fire regime, which is common to the coastal mountains of Oregon, the middle to northern Cascades, the Olympic Mountains, and other typical westside forests.

Other fire regimes exist within the Olalla-Lookingglass WAU. Lower elevations along Olalla and Lookingglass Creeks and the Flournoy Valley have more open, grass covered forest types that transition to Western hemlock/Douglas-fir forests. The transition occurs with changes in aspect and elevation.

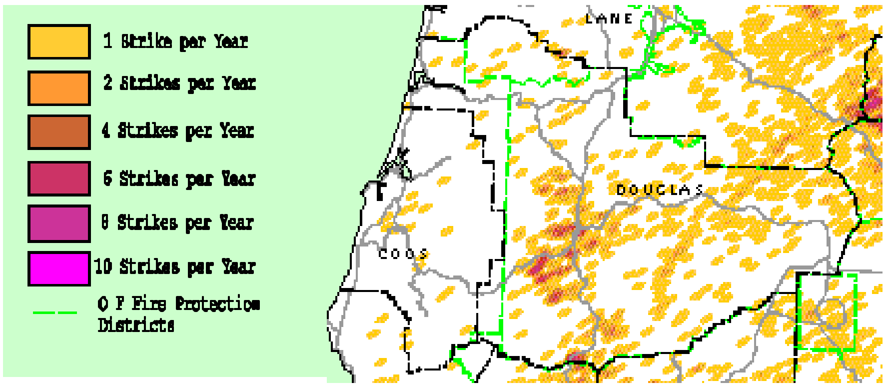
Accurate fire return intervals have not been calculated in Pacific Northwest forests, because the intervals between fires are long and may not be cyclic (Agee and Flewelling 1983). On drier sites, forests may burn every 100 to 200 years. Fahnestock and Agee (1983) estimated the regional average to be 230 years. Douglas-fir begins to be replaced by the more shade tolerant western hemlock at approximately 250 years old and continues until the stand is about 700 to 1,000 years old, when western hemlock dominates the stand. The cycle from Douglas-fir to western hemlock is rarely completed because fires, which create stand openings allowing Douglas-fir to regenerate, usually occur before Douglas-fir disappears from the stand (Agee 1981).

b. Recent Fire History

Fire suppression during the past 75 years has been successful at minimizing the number of forested acres lost to wildfire. During this same period prescribed fire has been used extensively. The pattern of prescribed fire use has evolved in the last 50 years. Originally, prescribed fire was used almost exclusively for reducing fire hazard. More recently the emphasis has shifted to using prescribed fire for site preparation prior to reforestation (Norris 1990).

Lightning is the primary natural source of forest fires in the world. Although the Pacific Northwest has relatively mild thunderstorm activity compared to the southeastern United States, the average annual number of lightning caused fires is greater in the West because less precipitation accompanies the thunderstorms (Agee 1993). Considerable variation in thunderstorm tracking patterns exists from year to year and from storm to storm, some being widespread and others consisting of localized events (Morris 1934). The lightning strike frequency map (Map 5) shows less than one lightning strike per year occurred over most of the Roseburg District during the four year period from 1992 to 1996. This map graphically displays the widespread and random distribution of lightning across Douglas County but gives no indication of which lightning strikes may have ignited wildfires.

Map 5. Number of Lightning Strikes in Douglas County from 1992 to 1996.



Nineteen eighty-seven was the most severe fire year in the last 50 years, and one of the two worst in the last 120 years, yet the acreage burned was only 30 percent of the average acreage historically burned by wildfire in Oregon. Modern fire suppression and fire management strategies have had a profound effect on natural fire frequency and intensity, species composition, vegetative density, and forest structure in many forests in the Pacific Northwest (Norris 1990).

From 1980 to 1994 there were 16 fires within the Olalla-Lookingglass WAU that burned approximately 35 acres. Most of the fires were human caused. Seven fires were caused by lightning, burning approximately 9 acres.

The combined effects of fire suppression, timber harvesting followed by prescribed burning, and occasional wildfires have shaped current forest conditions in the Olalla-Lookingglass WAU. Discussing these forests in terms of the natural fire regime helps explain why species composition and forest density has changed with human management, dating back thousands of years when native Indians set fires as a means of improving areas for foraging. In many forests of the West, years of successful fire suppression have created unnatural fuel accumulations causing fires to be more destructive, burning with greater intensity and in fire regimes where stand replacement fires would rarely occur in a "natural" forest. Forest health has declined in many areas because fire has been excluded. Fire suppression has probably had little or no effect on fuel accumulation on the westside (with the exception of southwest Oregon) where the natural fire regime has a long return interval (Norris 1990).

2. Current Vegetation Conditions

Various vegetation age classes have been documented in the Olalla-Lookingglass WAU. For this analysis, vegetation on BLM administered lands is described by the age of the dominant conifer cover for each stand. The stands are aggregated into selected age class groupings for comparison with the 1936 vegetation data (see Table 5 and Map 6). Private lands are aggregated by the same age class groupings. Acres of nonforested lands, including agricultural lands, are also identified. The arrangement of these age

Table 5. 1997 Age Class Distribution Comparison Between Data from FOI and WODIP.

		Nonforest		Early Seral (0 to 30 Years Old)		Mid Seral (31 to 80 Years Old)		Late Seral (80 + Years Old)		
Area		Acres	%	Acres	%	Acres	%	Acres	%	Total
Bear Creek	FOI	0	0	414	36	19	2	714	62	1,147
	WODIP	11	1	520	45	199	17	417	36	1,147
Ben Irving	FOI	63	7	299	32	37	4	527	57	926
	WODIP	25	3	348	38	171	18	382	41	926
Berry Creek	FOI	23	2	355	32	74	7	649	59	1,101
	WODIP	16	1	462	42	181	16	441	40	1,100
Coarse Gold	FOI	0	0	110	27	0	0	305	73	415
	WODIP	1	0	128	31	58	14	228	55	415
Upper Berry	FOI	0	0	485	38	111	9	681	53	1,277
	WODIP	2	0	395	31	365	29	514	40	1,276
Berry Creek Subwatershed	FOI	86	2	1,663	34	241	5	2,876	59	4,866
	WODIP	55	1	1,853	38	974	20	1,982	41	4,864
Lookingglass	FOI	0	0	0	0	0	0	43	100	43
	WODIP	0	0	9	20	11	25	24	55	44
Upper Lookingglass	FOI	176	15	166	14	8	1	834	70	1,184
	WODIP	18	2	496	42	166	14	504	43	1,184
Winston	FOI	10	53	0	0	0	0	9	47	19
	WODIP	1	5	7	37	1	5	10	53	19
Lookingglass Creek Subwatershed	FOI	186	15	166	13	8	1	886	71	1,246
	WODIP	19	2	512	41	178	14	538	43	1,247

Table 5. 1997 Age Class Distribution Comparison Between Data from FOI and WODIP.

Area		Nonforest Acres	Nonforest %	Early Seral (0 to 30 Years Old) Acres	Early Seral (0 to 30 Years Old) %	Mid Seral (31 to 80 Years Old) Acres	Mid Seral (31 to 80 Years Old) %	Late Seral (80 + Years Old) Acres	Late Seral (80 + Years Old) %	Total
Porter Creek	FOI	14	7	0	0	0	0	190	93	204
	WODIP	1	0	13	6	61	30	129	63	204
Siebold Canyon	FOI	137	12	228	20	14	1	746	66	1,125
	WODIP	9	1	318	28	231	21	566	50	1,124
Tenmile	FOI	126	36	1	0	0	0	227	64	354
	WODIP	5	1	136	38	47	13	166	47	354
Lower Tenmile Subwatershed	FOI	277	16	229	14	14	1	1,163	69	1,683
	WODIP	15	1	467	28	339	20	861	51	1,682
Bushnell Frontal	FOI	6	0	474	21	433	19	1,310	59	2,223
	WODIP	14	1	482	22	730	33	997	45	2,223
Byron Creek	FOI	27	3	232	23	99	10	671	65	1,029
	WODIP	7	1	329	32	185	18	508	49	1,029
Middle Olalla Subwatershed	FOI	33	1	706	22	532	16	1,981	61	3,252
	WODIP	21	1	811	25	915	28	1,505	46	3,252
Olalla Frontal	FOI	33	3	320	32	192	19	446	45	991
	WODIP	6	1	195	20	395	40	394	40	990
Upper Olalla Creek	FOI	0	0	775	49	337	21	469	30	1,581
	WODIP	16	1	670	42	678	43	217	14	1,581
Wildcat Creek	FOI	26	2	360	29	450	37	388	32	1,224
	WODIP	5	0	194	16	595	49	430	35	1,224
Willingham Creek	FOI	0	0	434	38	440	38	274	24	1,148
	WODIP	4	0	393	34	575	50	177	15	1,149
Mt. Shep Subwatershed	FOI	59	1	1,889	38	1,419	29	1,577	32	4,944
	WODIP	31	1	1,452	29	2,243	45	1,218	25	4,944

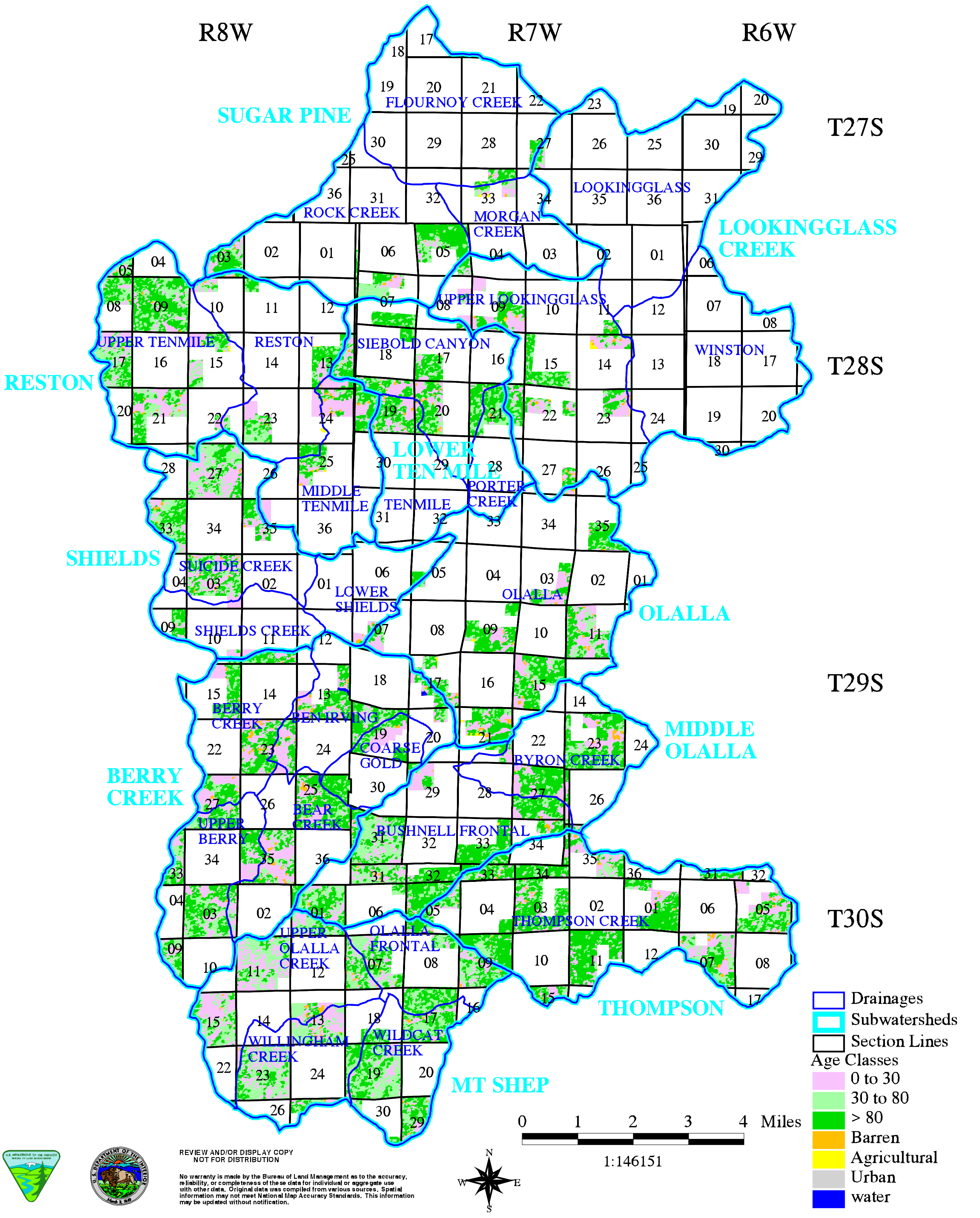
Table 5. 1997 Age Class Distribution Comparison Between Data from FOI and WODIP.

		Nonforest		Early Seral (0 to 30 Years Old)		Mid Seral (31 to 80 Years Old)		Late Seral (80 + Years Old)		
Area		Acres	%	Acres	%	Acres	%	Acres	%	Total
Olalla	FOI	121	6	496	25	264	13	1,139	56	2,020
	WODIP	29	1	709	35	308	15	975	48	2,021
Olalla Subwatershed	FOI	121	6	496	25	264	13	1,139	56	2,020
	WODIP	29	1	709	35	308	15	975	48	2,021
Middle Tenmile	FOI	252	38	71	11	0	0	337	51	660
	WODIP	8	1	361	55	63	10	230	35	662
Reston	FOI	123	19	57	9	93	15	367	57	640
	WODIP	9	1	218	34	154	24	261	41	642
Upper Tenmile	FOI	46	2	385	20	272	14	1,254	64	1,957
	WODIP	11	1	525	27	646	33	776	40	1,958
Reston Subwatershed	FOI	421	13	513	16	365	11	1,958	60	3,257
	WODIP	28	1	1,104	34	863	26	1,267	39	3,262
Lower Shields	FOI	0	0	40	50	0	0	40	50	80
	WODIP	2	3	42	53	3	4	33	41	80
Shields Creek	FOI	0	0	73	44	0	0	92	56	165
	WODIP	3	2	89	54	20	12	53	32	165
Suicide Creek	FOI	27	2	449	28	554	35	557	35	1,587
	WODIP	8	1	614	39	524	33	442	28	1,588
Shields Subwatershed	FOI	27	1	562	31	554	30	689	38	1,832
	WODIP	13	1	745	41	547	30	528	29	1,833
Flournoy Creek	FOI	14	12	0	0	0	0	104	88	118
	WODIP	1	1	11	9	14	12	92	78	118

Table 5. 1997 Age Class Distribution Comparison Between Data from FOI and WODIP.

		Nonforest		Early Seral (0 to 30 Years Old)		Mid Seral (31 to 80 Years Old)		Late Seral (80 + Years Old)		
Area		Acres	%	Acres	%	Acres	%	Acres	%	Total
Morgan Creek	FOI	0	0	0	0	0	0	89	100	89
	WODIP	2	2	38	43	24	27	25	28	89
Rock Creek	FOI	1	0	278	37	11	1	469	62	759
	WODIP	3	0	140	19	202	27	411	54	756
Sugar Pine Subwatershed	FOI	15	2	278	29	11	1	662	69	966
	WODIP	6	1	189	20	240	25	528	55	963
Thompson Creek	FOI	187	6	531	16	421	13	2,185	66	3,324
	WODIP	29	1	926	28	603	18	1,765	53	3,323
Thompson Subwatershed	FOI	187	6	531	16	421	13	2,185	66	3,324
	WODIP	29	1	926	28	603	18	1,765	53	3,323
Olalla-Lookingglass Watershed Analysis Unit	FOI	1,412	5	7,033	26	3,829	14	15,116	55	27,390
	WODIP	246	1	8,768	32	7,210	26	11,167	41	27,391

Map 6. Olalla-Lookingglass Watershed Analysis Unit
BLM Age Class Distribution using Satellite Imagery



classes on the landscape within the WAU is a result of historic and recent natural (e.g., fire and blowdown), and human caused disturbance (e.g., introduced fire for clearing, tree harvesting, road construction, home building, and division of land by straight line boundaries).

Two sets of data were used to determine the current vegetation conditions in the Olalla-Lookingglass WAU. Because of the lack of data for about half of the private land in the Olalla-Lookingglass WAU, satellite imagery (from the Western Oregon Digital Image Project or WODIP) from 1993 was used to fill the data gap on private lands. On BLM administered land age classes based on the forest operations inventory (FOI) with defined stand birthdates were compared with the data from satellite imagery (see Table 5). Size classes from WODIP were interpreted to fit into the same three age classes used for the 1936 vegetation conditions and the data on BLM administered land. The 0 to 10 size class was correlated with stands between 0 and 30 years old (early seral stands). The 10 to 20 size class was correlated with stands between 30 and 80 years old (mid seral stands). Size classes greater than 20 were correlated with stands greater than 80 years old (late seral stands).

The WODIP information categorized more of the WAU as being in the Early and Mid Seral age classes and less in the Late Seral age classes than the FOI data. This difference in the data may be due to the FOI grouping the data into larger stands and WODIP separating the data into smaller areas.

In 1997 (using WODIP), the Olalla-Lookingglass Watershed Analysis Unit was comprised of approximately 21% in agricultural land, 36% early seral, 23% mid seral, and 20% late seral conditions (see Table 6 and Map 7). The structural classes occur in smaller blocks than what was present in 1936. Generally, the late seral stands have been converted to early seral stands. Today, edge habitats are more abundant throughout the WAU.

The Olalla-Lookingglass Watershed Analysis Unit 1936 and 1997 Vegetation Type maps show the changes in age distribution that have occurred over the past 60 years. Although these two maps may be used for comparison, they cannot be directly related because they are based on two different types of data. However, they do illustrate the fragmenting of the landscape over the years. The trend is the same using the FOI information, although the magnitude is not as great as with the WODIP data.

The major change in the WAU has been a decrease in late seral habitat and an increase in early seral habitat. The greatest change in age class distribution has occurred in the Berry Creek and Mt. Shep Subwatersheds. Reston, Shields, Sugar Pine, and Thompson Subwatersheds follow this pattern to lesser degrees.

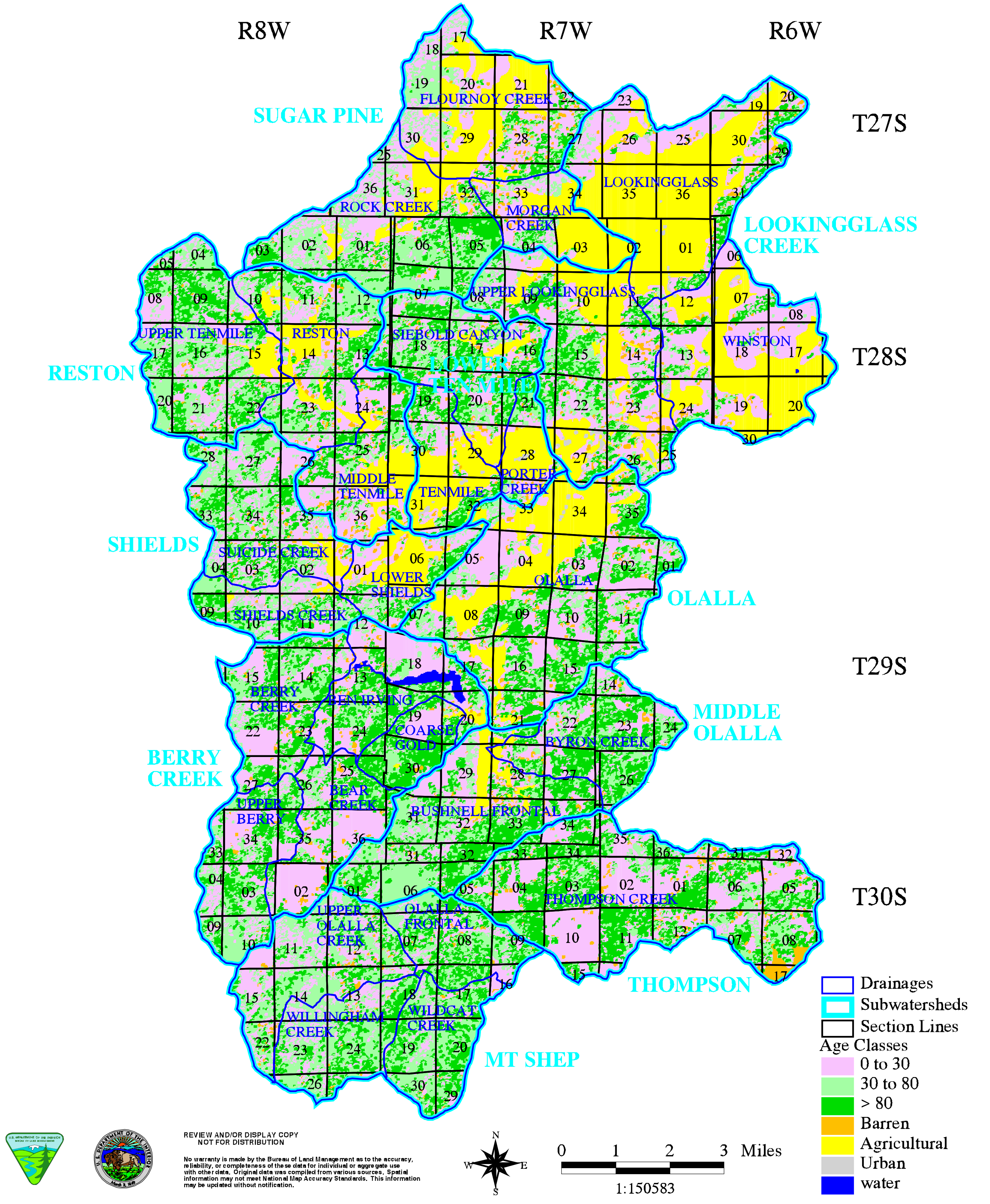
Lookingglass Creek, Lower Tenmile, Middle Olalla, and Olalla Subwatersheds contained larger amounts of mid seral age stands in 1936, which have grown into late seral habitat. These late seral age stands could be expected to be harvested in the future, especially those on private lands.

Table 6. 1997 Age Class Distribution (Data from WODIP).

	Nonforest		Early Seral (0 to 30 Years Old)		Mid Seral (31 to 80 Years Old)		Late Seral (80 + Years Old)		
Area	Acres	%	Acres	%	Acres	%	Acres	%	Total
Bear Creek	33	1	1,661	65	318	13	532	21	2,544
Ben Irving	311	11	1,388	48	548	19	669	23	2,916
Berry Creek	26	1	1,266	44	789	28	771	27	2,852
Coarse Gold	30	2	322	25	246	19	676	53	1,274
Upper Berry	10	0	1,034	37	949	34	786	28	2,779
Berry Creek Subwatershed	410	3	5,671	46	2,850	23	3,434	28	12,365
Lookingglass	4,258	65	1,680	26	197	3	384	6	6,519
Upper Lookingglass	2,042	33	2,244	36	876	14	1,008	16	6,170
Winston	2,638	51	2,117	41	173	3	253	5	5,181
Lookingglass Creek Subwatershed	8,938	50	6,041	34	1,246	7	1,645	9	17,870
Porter Creek	586	54	217	20	127	12	151	14	1,081
Siebold Canyon	390	11	1,253	35	951	26	1,003	28	3,597
Tenmile	1,017	51	496	25	150	7	343	17	2,006
Lower Tenmile Subwatershed	1,993	30	1,966	29	1,228	18	1,497	22	6,684
Bushnell Frontal	485	10	1,354	28	1,661	34	1,397	29	4,897
Byron Creek	75	2	1,001	33	849	28	1,105	36	3,030
Middle Olalla Subwatershed	560	7	2,355	30	2,510	32	2,502	32	7,927
Olalla Frontal	15	1	542	26	854	42	645	31	2,056
Upper Olalla Creek	33	1	1,368	40	1,569	46	454	13	3,424
Wildcat Creek	14	1	369	17	1,178	54	621	28	2,182
Willingham Creek	8	0	615	25	1,370	56	439	18	2,432
Mt. Shep Subwatershed	70	1	2,894	29	4,971	49	2,159	21	10,094

	Nonforest		Early Seral (0 to 30 Years Old)		Mid Seral (31 to 80 Years Old)		Late Seral (80 + Years Old)		
Area	Acres	%	Acres	%	Acres	%	Acres	%	Total
Olalla	2,630	29	3,386	37	1,224	13	1,862	20	9,102
Olalla Subwatershed	2,630	29	3,386	37	1,224	13	1,862	20	9,102
Middle Tenmile	805	28	1,337	47	293	10	427	15	2,862
Reston	841	22	1,313	35	999	26	637	17	3,790
Upper Tenmile	302	6	1,462	31	1,795	38	1,138	24	4,697
Reston Subwatershed	1,948	17	4,112	36	3,087	27	2,202	19	11,349
Lower Shields	818	44	601	32	204	11	237	13	1,860
Shields Creek	115	6	626	35	688	39	352	20	1,781
Suicide Creek	236	6	1,621	42	1,310	34	719	19	3,886
Shields Subwatershed	1,169	16	2,848	38	2,202	29	1,308	17	7,527
Flournoy Creek	1,955	41	1,755	37	747	16	270	6	4,727
Morgan Creek	1,035	52	607	31	195	10	140	7	1,977
Rock Creek	632	13	1,571	31	1,979	40	813	16	4,995
Sugar Pine Subwatershed	3,622	31	3,933	34	2,921	25	1,223	10	11,699
Thompson Creek	324	4	4,143	49	1,397	16	2,627	31	8,491
Thompson Subwatershed	324	4	4,143	49	1,397	16	2,627	31	8,491
Olalla-Lookingglass Watershed Analysis Unit	21,664	21	37,349	36	23,636	23	20,459	20	103,108

Map 7. Olalla-Lookingglass Watershed Analysis Unit
1997 Age Class Distribution from Satellite Imagery



a. Vegetative Characterization

Vegetation zones in the Olalla-Lookingglass Watershed Analysis Unit were characterized from the Natural Resources Conservation Service Soil Survey report (Gene Hickman 1994). Vegetation zones may cover large geographical areas, but always have a single set of potential native plant communities repeated throughout the zone. The patterns are predictable since they are related to local landscape features such as aspect, soil, and landform. Microclimate should be relatively similar throughout a given zone. Vegetation zones give an approximate guide to complex local vegetation patterns.

Natural plant succession and stand development processes differ between vegetative zones within the WAU. A wide variety of soils and related geologic features directly affect local plant distribution and the resulting plant communities.

Four vegetative zones are identified within the Olalla-Lookingglass Watershed Analysis Unit (see Map 8). Two zones make up 97% of the WAU. They are the Grand Fir Zone and Interior Valleys and Foothills Zone. Two others, the Western Hemlock Zone and the Cool Douglas-fir/Hemlock Zone, make up very little of the WAU at higher elevations.

1) Grand Fir Zone

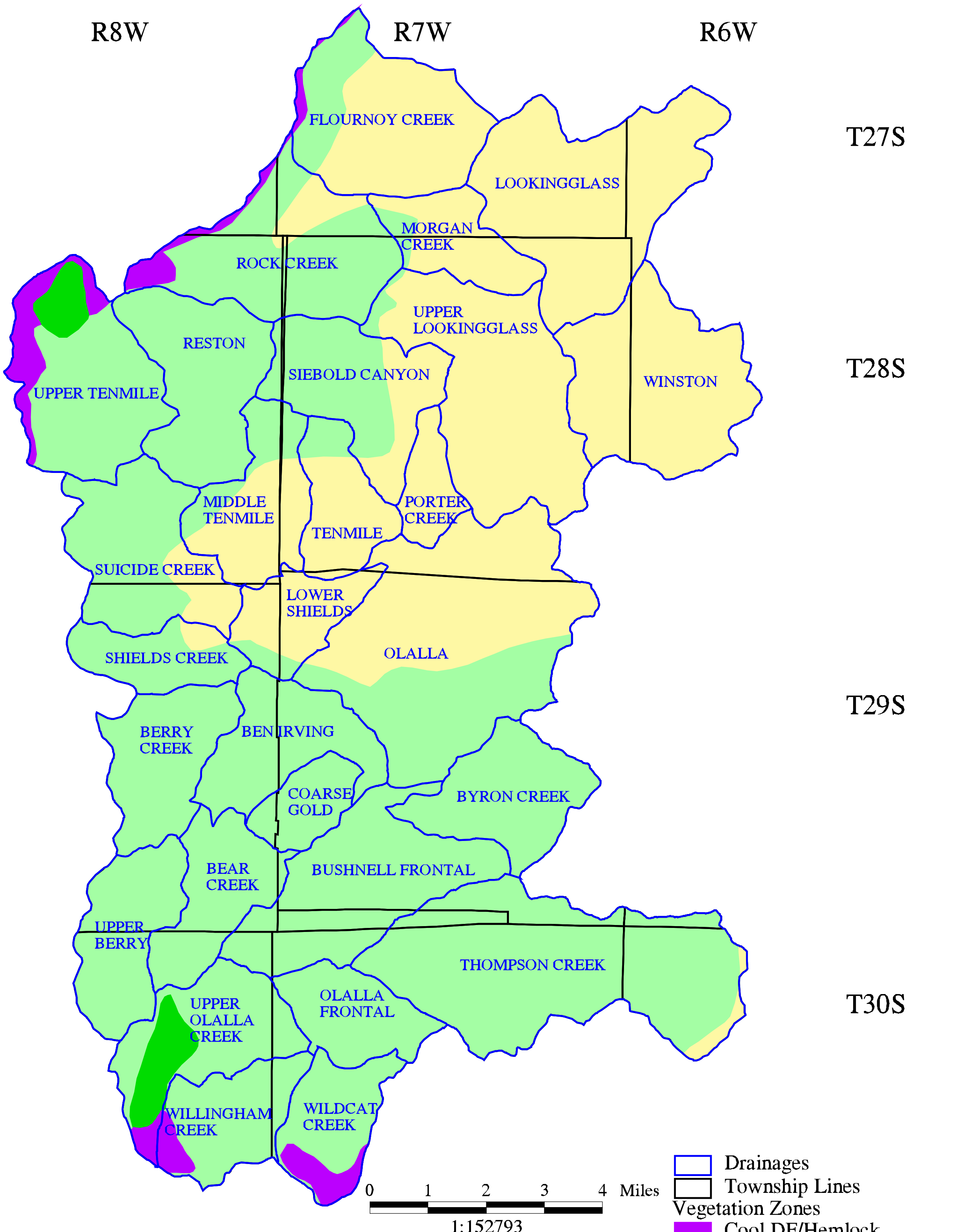
The Grand Fir Zone forms a transition between moist hemlock forests and the drier interior valleys. This zone makes up about 61% of the Olalla-Lookingglass WAU, in the southern and western parts. This area of mountains and foothills receives from 40 to 55 inches average annual precipitation. Elevation remains below about 3,200 feet.

Douglas-fir dominates the older stands with grand fir common on the northern slopes and minor or absent on the south slopes. Golden chinkapin occurs regularly on north aspects, with Pacific madrone and occasionally California black oak on south aspects. Incense cedar is often present. The area is generally too dry for western hemlock except in some drainages or very moist north slopes. Serpentine soils present are unique and do not necessarily fit the criteria for the Grand Fir Zone.

There are numerous valleys, south slopes, and foothill areas within the zone where droughty, clayey, or wet soils favor white oak savanna and restrict the development of coniferous forests. This probably explains the history of tree clearing and farming that has taken place in the past in these areas.

Understory shrubs on north slopes include salal, cascade Oregon grape, western hazel, creambush oceanspray, red huckleberry, western prince's pine, whipplevine, yerba buena, and hairy honeysuckle. South slopes support any of the above, although red huckleberry, cascade Oregon grape, and salal which require more moisture, have minor species occurrence. Grasses and poison oak become more abundant on the south slopes. Where the drier edge of the zone approaches the Interior Valleys and Foothills Zone

Map 8. Olalla-Lookingglass WAU Vegetation Zones



salal, red huckleberry, and even grand fir may drop out. Some key indicator species for the zone remain present such as Oregon grape, golden chinkapin, wild ginger, and insideout flower.

The Grand Fir Zone represents a transition area with the northern portion in the WAU more like forests of the southern Willamette Valley foothills. The southern portion resembles Josephine and Jackson counties. The southern portion also overlaps the Klamath Mountain geologic province. Geological differences and climatic changes result in more species diversity and increasing importance of California black oak, sugar pine, ponderosa pine, canyon live oak, incense cedar, and grasses.

2) Interior Valleys and Foothills Zone

The Interior Valleys and Foothill Zone occurs in the northeast portion of the Olalla-Lookingglass Watershed Analysis Unit and occupies approximately 36% of the land. Much of the zone is composed of hills and low mountains extending into the interior from the Coast Range. The average annual precipitation ranges from about 30 to 50 inches. Much of the natural vegetation of this zone has been affected by settlement or grazing.

This zone is separated ecologically from the adjacent vegetative zones by its dry, warm climate, the high proportion of hardwoods in the uplands, and the absence of indicator species from the Grand Fir Zone. Uplands with the most favorable soils have coniferous forests of Douglas-fir with subordinate species such as madrone, maple, or oaks. More droughty soils in the uplands support hardwood dominated stands of madrone, Oregon white oak, sometimes California black oak, and with minor amounts of conifers. Some shallow slopes support only scattered Oregon white oak and grass or shrubs such as wedgeleaf ceanothus and poison oak. Serpentine soils found here are unique and are not consistent with the criteria characterizing the zone.

Understories on bottom lands vary with soil conditions but usually contain common snowberry and Pacific poison oak. Some areas were naturally treeless meadows.

3) Western Hemlock Zone

This zone occupies a very small percentage (1%) of the land of the Olalla-Lookingglass Watershed Analysis Unit. It occurs in two small areas. One area occurs just below Mt. Gurney in the Upper Tenmile Drainage in the northwest portion of the WAU. The other area occurs north of Live Oak Mountain in the Upper Olalla Creek Drainage in the southwestern portion of the WAU.

Douglas-fir is the dominant species. Western hemlock is a significant understory species or overstory dominant in older stands on north aspects. It may be present in minor amounts on south aspects. Grand fir is often an understory or overstory component. Western redcedar and chinkapin also occur. Red alder and bigleaf maple occur in favorable locations. Understory species include western sword fern, oxalis, vine maple, current, western hazel, creambush oceanspray, Pacific rhododendron, salal, red huckleberry, cascade Oregon grape, and some evergreen huckleberry.

4) Cool Douglas-fir/Hemlock Zone

The Cool Douglas-fir/Hemlock Zone makes up a very small percentage (about 2%) of the land in the Olalla-Lookingglass Watershed Analysis Unit. This zone occupies high elevations, generally above 3,000 feet on Table Mountain and Live Oak Mountain at the southern end of the WAU and in the northwestern portion of the WAU. A portion of the average annual precipitation comes in the form of snow.

Douglas-fir is the dominant species. Depending on the soil, western hemlock may also occur. Some areas also include sporadic occurrences of western redcedar, incense cedar, sugar pine, Pacific yew, and white fir. Canyon live oak is found on soils with high amounts of rock fragments. Rhododendron, Oregon grape, salal, chinkapin, and red huckleberry occur in the understory.

Forest managers can expect lower tree growth rates, climatic limitations for regeneration and severe competition from evergreen shrubs in this zone. Areas burned or with the overstory removed develop dense brush fields.

b. Insects and Pathogens

Insects and pathogens are capable of causing both large and small-scale disturbances across the landscape. White pine blister rust and Port-Orford cedar root disease are introduced diseases. All other diseases in the WAU are native to the region and have evolved with their hosts. Native insects and diseases may cause mortality of a single tree or small patches of trees (less than one acre). Insects or pathogens may be operating across the entire WAU or be restricted to local areas by favorable environmental conditions. The magnitude of insect and disease-related disturbance is greatly influenced by species composition, age class, stand structure, and history of other disturbances on the same site.

1) White Pine Blister Rust

White pine blister rust is caused by the fungus Cronartium ribicola and is evident in the Olalla-Lookingglass Watershed Analysis Unit. It affects all five-needle pines, including western white pine and sugar pine. The pathogen girdles and kills infected stems and branches. It causes top and branch death in larger hosts and outright mortality in seedling, sapling, and pole-sized hosts. Infections in larger trees can predispose these trees to bark beetle attack. Moist cool weather in the Summer and Fall favor the disease, whereas warm dry weather is unfavorable. Pine infection requires at least two days of saturated atmosphere and maximum temperatures not exceeding 68 degrees Fahrenheit (Scharpf 1993).

Tree improvement programs have developed resistant western white pine and sugar pine trees that can tolerate infection by the fungus. Sugar pine is desirable because it is highly resistant to laminated root rot and is a preferred species for planting in root disease centers.

2) Port-Orford Cedar Root Disease

Port-Orford cedar root disease is caused by the fungus Phytophthora lateralis and is present in the Olalla-Lookingglass Watershed Analysis Unit. Old-growth trees die within two to four years after infection, seedlings die within a few weeks of infection (Roth et al. 1987). Infected trees are often attacked by bark beetles, which speeds the death of the tree. In virtually all cases, infection of Port-Orford cedar occurs in areas where obvious avenues for water borne spore dispersal exists. Infection is highly dependent on the presence of water in the immediate vicinity of susceptible tree roots. High risk areas for infection are stream courses, drainages, or low lying areas down slope from infection centers or below roads and trails where new inoculum may be introduced. Major spread of the disease is through movement of infected soil in road construction, road maintenance, daily use of roads, and logging operations. The fungus may also be moved on the feet of livestock or game animals, particularly elk.

Port-Orford cedar regenerates profusely from surviving trees. The continuing supply of susceptible new seedlings on high-risk sites is likely to sustain a chronic disease source, threatening trees on more favorable sites.

Port-Orford cedar occurs in natural and planted mixed conifer stands within the Olalla-Lookingglass WAU. Extensive roadside surveys in the South River Resource Area during the summer of 1996 identified where healthy and infected Port-Orford cedar occur adjacent to roads. A follow-up aerial survey also identified areas of infection. Sections identified from the surveys are shown in Table 7.

Table 7. Port-Orford Cedar Occurrence.

Location	Land Use Allocation	Type of Survey	Natural	Planted	Healthy	Diseased
28-8-17	MMR	Road	X		X	
29-7-19	GFMA	Road		X	X	
29-8-23	CONN	Road	X		X	
29-8-33	GFMA	Aerial	X			X
30-6-5	GFMA	Road		X	X	
30-7-30	LSR	Aerial	X			X
30-8-3	LSR	Aerial	X			X

Management guidelines to manage areas of Port-Orford cedar root disease and prevent additional spread are listed in the Port-Orford Cedar Management Guidelines (USDI 1994a). Actions being implemented as suggested in the Port-Orford Cedar Management Guidelines are limiting special use permits to the time of year when the pathogen is least likely to be spread and assessing activities likely to spread the pathogen, such as road maintenance, area work projects, fire suppression activities, and silvicultural treatments, to determine methods for preventing further spread of the pathogen.

3) Other Root Diseases

Laminated root rot (Phellinus weirii), annosus root disease (Heterobasidion annosum), armillaria root disease (Armillaria ostoyae), and black stain root disease (Ceratocystis wageneri) are common root diseases that may be present in the WAU. Root diseases affect stand structure, species composition, tree density, and crown closure. They injure trees by decaying and killing roots or by preventing proper root function. Damage is expressed as reduced growth rates, butt decay, windthrow, death, and predisposition to bark beetle attack. Expansion rates of the disease centers average about one to two feet per year for laminated, annosus, and armillaria root pathogens (Filip and Schmitt 1990). Black stain root disease spreads more rapidly, the disease center may double every three years. Root diseases can cause scattered mortality of individual trees or large openings devoid of susceptible, mature trees. The size of the openings are dependent upon the root disease susceptibility of the vegetation on the margins and regenerating in the openings.

Root pathogens are extremely difficult to eradicate from the site once they become established, but the damage they cause can be minimized. Depending on the disease present, this may be accomplished by increasing host vigor, favoring disease-tolerant conifer species, or reducing inoculum (Filip and Schmitt 1990).

4) Bark Beetles

There is a common association between root diseases and bark beetles. Bark beetles, such as the fir engraver beetle (Scolytus ventralis) which attacks all true fir species and the Douglas-fir beetle (Dendroctonus pseudotsugae) which attacks Douglas-fir, are commonly associated with root disease.

A high proportion of Phellinus weirii infected trees are actually killed by bark beetles and not by the root rot fungus (Thies and Sturrock 1995). Phellinus weirii plays a significant role in maintaining endemic bark beetle populations over time. Root pathogens provide a continuous source of favorable host material for bark beetles between those times when conditions are favorable for epidemics (Thies and Sturrock 1995). Bark beetles rarely kill healthy, vigorous trees except when epidemic levels are reached. Bark beetle populations are most likely to build up when at least four trees per acre which are at least ten inches in diameter at breast height (DBH) are downed (Goheen 1996). Following wind and snow storms during the winter of 1996, conditions were highly favorable for insect population increases throughout Southwest

Oregon. The Olalla-Lookingglass WAU had very little blowdown from the storms of 1996 and would be considered a low risk area for a bark beetle outbreak.

Mountain pine beetle (Dendroctonus ponderosae) and western pine beetle (Dendroctonus brevicomis) also attack trees that are stressed by drought or root disease. However, infestations are more strongly correlated with low host vigor resulting from overstocking. Major hosts of mountain pine beetle are ponderosa, white, and sugar pines. Western pine beetle infests ponderosa pine.

Insect attacks are almost always associated with conditions that stress the tree. When epidemic insect populations are reached, healthy trees may be attacked and killed. Direct control measures are impractical and generally not recommended. Forest damage can be reduced, indirectly, by thinning. Keeping trees in a healthy, vigorous condition is the most practical means of reducing the impact from bark beetles (Filip and Schmitt 1990).

c. Riparian Vegetation

Riparian Reserves within the Olalla-Lookingglass WAU and outside of the LSR and MMR account for approximately 32 percent (8,634 acres out of 27,390 acres) of BLM administered land (see Table 8 and Map 9). The purpose of Riparian Reserves is to maintain and restore riparian structures and functions of intermittent streams, confer benefits to riparian-dependent and associated species other than fish, enhance conservation for organisms that are dependent on the transition zone between upslope and riparian areas, improve travel and dispersal corridors for many terrestrial animals and plants, and provide greater connectivity of the watershed (USDA and USDI 1994b). Silvicultural treatments applied within Riparian Reserves would be to control stocking, reestablish, establish, or maintain desired vegetation characteristics to attain Aquatic Conservation Strategy objectives.

For this analysis, Riparian Reserve widths were developed using a site potential tree height of 160 feet. All intermittent streams were given a Riparian Reserve width of 160 feet on each side of the stream. Perennial streams were given a Riparian Reserve width of 320 feet (2 times the site potential tree height) on each side of the stream. Actual projects would use site specific information for determining if a stream needed a Riparian Reserve width of 160 feet or 320 feet.

Riparian Reserve widths may be adjusted following watershed analysis, a site specific analysis, and describing the rationale for the adjustment through the appropriate NEPA decision making process (USDI 1995). Critical hillslope, riparian, channel processes and features, and the contribution of Riparian Reserves to benefit aquatic and terrestrial species would be the basis for the analysis. At a minimum, a fisheries biologist, soil scientist, hydrologist, botanist, and wildlife biologist would conduct the analysis for adjusting Riparian Reserve widths.

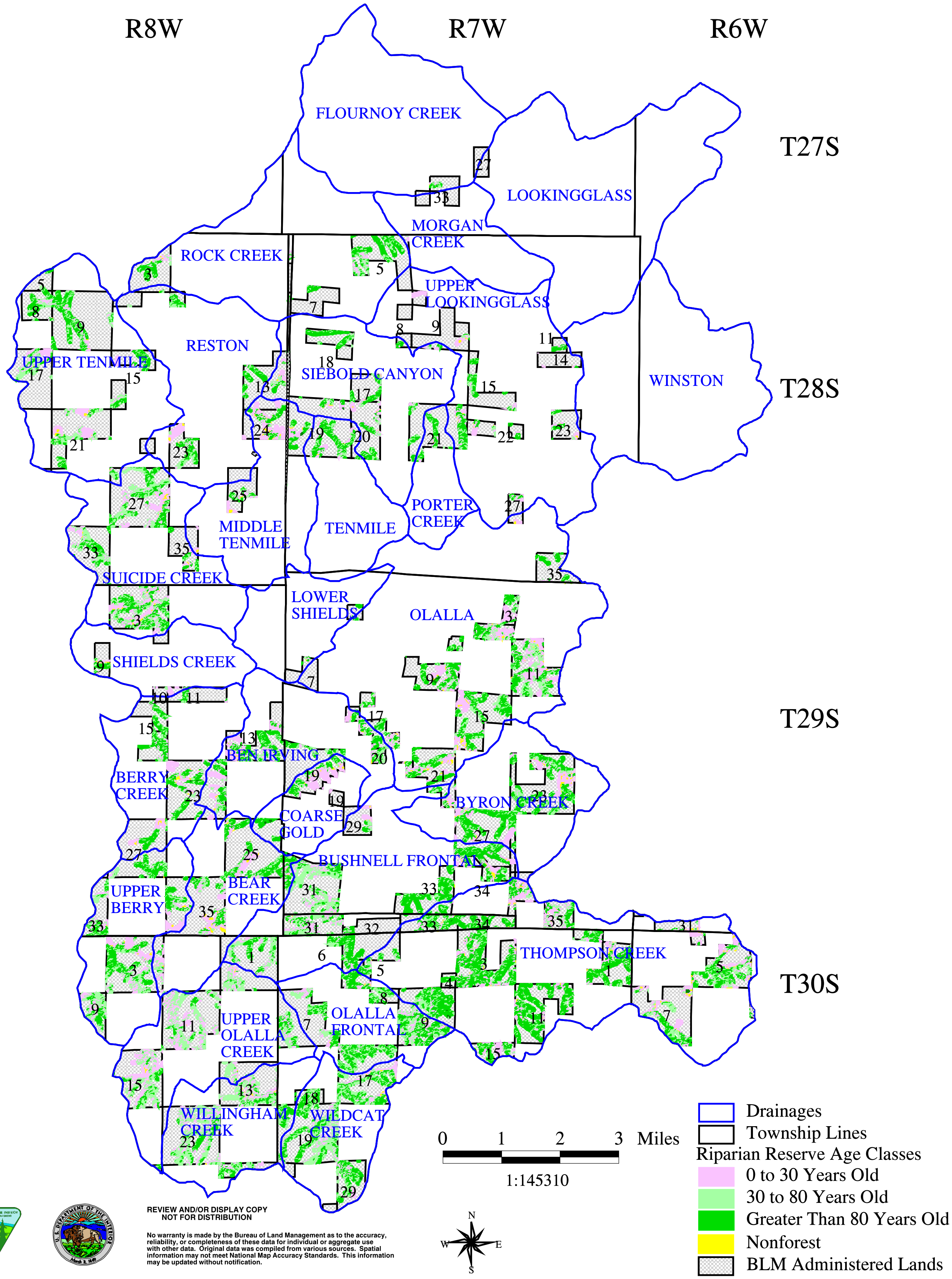
Table 8. Vegetation in Riparian Reserves in Olalla-Lookingglass WAU (Data from Satellite Imagery).

	Nonforest		Early Seral (0 to 10 Inch DBH = 0 to 30 Years Old)		Mid Seral (10 to 19 Inch DBH = 30 to 80 Years Old)		Late Seral (Greater Than 20 Inch DBH = Greater Than 80 Years Old)		
Area	Acres	%	Acres	%	Acres	%	Acres	%	Total
Bear Creek	8	3	129	42	55	18	116	38	308
Ben Irving	21	7	113	35	59	18	129	40	322
Berry Creek	8	3	71	30	37	16	120	51	236
Coarse Gold	2	2	53	47	14	12	44	39	113
Upper Berry	4	1	144	30	146	31	182	38	476
Berry Creek Subwatershed	43	3	510	35	311	21	591	41	1,455
Lookingglass	0	0	0	0	0	0	0	0	0
Upper Lookingglass	6	4	55	35	26	16	72	45	159
Winston	0	0	0	0	0	0	0	0	0
Lookingglass Creek Subwatershed	6	4	55	35	26	16	72	45	159
Porter Creek	0	0	4	12	7	21	22	67	33
Siebold Canyon	5	3	56	29	39	20	91	48	191
Tenmile	2	2	18	21	15	17	52	60	87
Lower Tenmile Subwatershed	7	2	78	25	61	20	165	53	311
Bushnell Frontal	11	1	178	24	257	34	306	41	752
Byron Creek	11	3	112	29	58	15	204	53	385
Middle Olalla Subwatershed	22	2	290	26	315	28	510	45	1,137
Olalla Frontal	6	1	79	18	160	37	192	44	437
Upper Olalla Creek	7	1	225	43	234	44	61	12	527
Wildcat Creek	4	1	83	17	228	46	185	37	500
Willingham Creek	6	1	136	30	232	52	74	17	448
Mt. Shep Subwatershed	23	1	523	27	854	45	512	27	1,912

Table 8. Vegetation in Riparian Reserves in Olalla-Lookingglass WAU (Data from Satellite Imagery).

	Nonforest		Early Seral (0 to 10 Inch DBH = 0 to 30 Years Old)		Mid Seral (10 to 19 Inch DBH = 30 to 80 Years Old)		Late Seral (Greater Than 20 Inch DBH = Greater Than 80 Years Old)		
Area	Acres	%	Acres	%	Acres	%	Acres	%	Total
Olalla	23	3	295	39	144	19	304	40	766
Olalla Subwatershed	23	3	295	39	144	19	304	40	766
Middle Tenmile	7	4	106	61	15	9	45	26	173
Reston	1	1	36	31	28	24	53	45	118
Upper Tenmile	7	2	136	31	125	29	168	39	436
Reston Subwatershed	15	2	278	38	168	23	266	37	727
Lower Shields	0	0	1	20	1	20	3	60	5
Shields Creek	5	16	13	42	2	6	11	35	31
Suicide Creek	12	2	203	36	176	32	167	30	558
Shields Subwatershed	17	3	217	37	179	30	181	30	594
Flournoy Creek	0	0	3	38	2	25	3	38	8
Morgan Creek	0	0	1	100	0	0	0	0	1
Rock Creek	3	2	28	17	33	20	97	60	161
Sugar Pine Subwatershed	3	2	32	19	35	21	100	59	170
Thompson Creek	29	2	327	23	262	19	785	56	1,403
Thompson Subwatershed	29	2	327	23	262	19	785	56	1,403
Olalla-Lookingglass Watershed Analysis Unit	188	2	2,605	30	2,355	27	3,486	40	8,634

Map 9. Riparian Reserves Within the Olalla-Lookingglass WAU using Satellite Imagery



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d. Private Lands

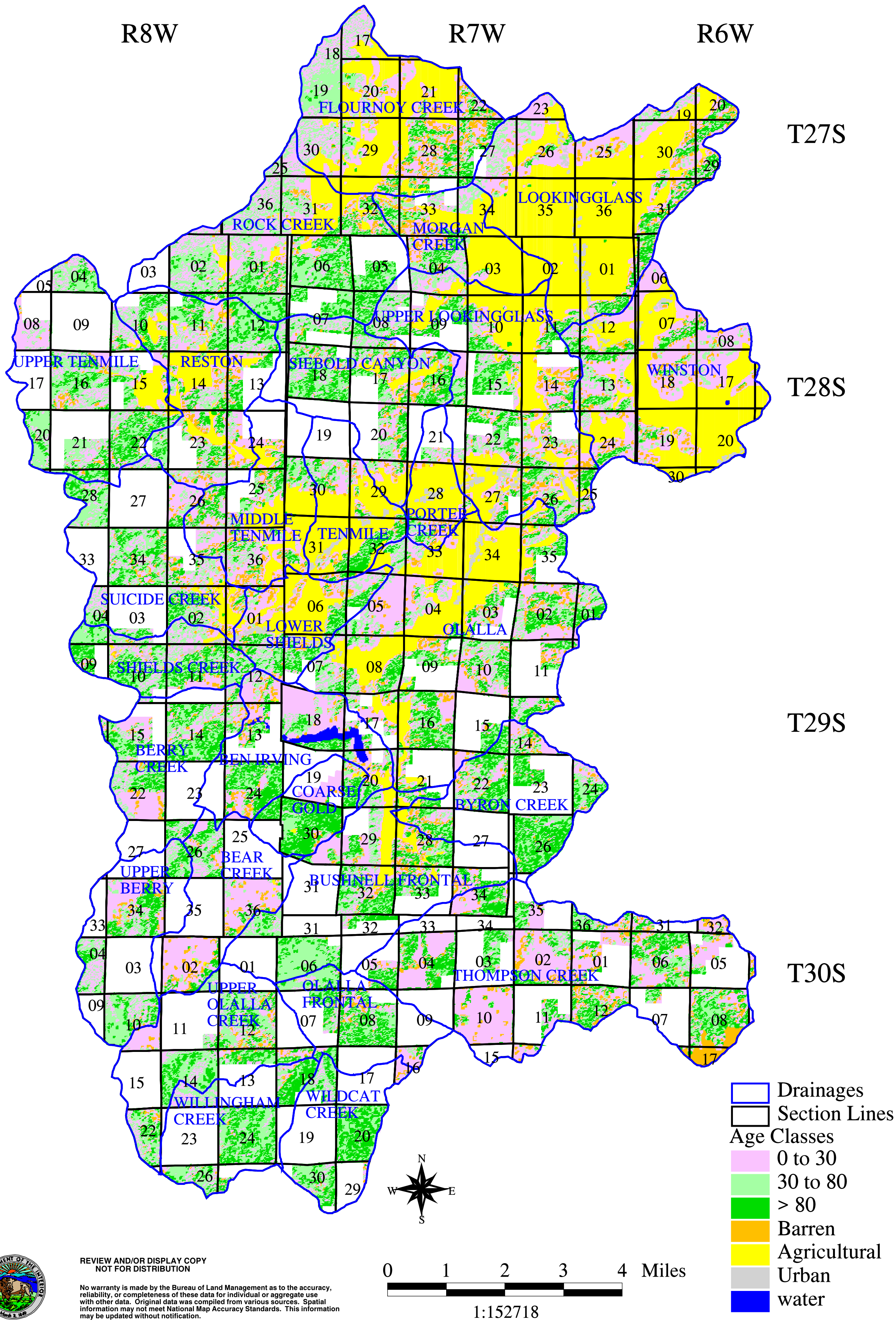
Private lands account for approximately 73% (75,626 acres) of the Olalla-Lookingglass WAU (see Table 9 and Map 10). Private ownership located in the interior valleys of Olalla and Lookingglass Creeks and Flournoy Valley consists mainly of agricultural lands (23,719 acres). The rest of the private lands are mainly forested lands intermingled with BLM administered lands. Approximately 35 percent of the private lands have been harvested within the past 30 years.

Table 9. 1997 Private Age Class Distribution (Data from WODIP).

	Nonforest		Early Seral (0 to 30 Years Old)		Mid Seral (31 to 80 Years Old)		Late Seral (80 + Years Old)		
Area	Acres	%	Acres	%	Acres	%	Acres	%	Total
Bear Creek	22	2	1,141	82	119	9	115	8	1,397
Ben Irving	287	14	1,040	52	377	19	287	14	1,991
Berry Creek	9	1	804	46	608	35	330	19	1,751
Coarse Gold	29	3	194	23	189	22	448	52	860
Upper Berry	8	1	639	42	585	39	272	18	1,504
Berry Creek Subwatershed	355	5	3,818	51	1,878	25	1,452	19	7,503
Lookingglass	4,258	66	1,671	26	186	3	360	6	6,475
Upper Lookingglass	2,024	41	1,749	35	710	14	504	10	4,987
Winston	2,637	51	2,110	41	172	3	243	5	5,162
Lookingglass Creek Subwatershed	8,919	54	5,530	33	1,068	6	1,107	7	16,624
Porter Creek	585	67	204	23	66	8	21	2	876
Siebold Canyon	381	15	935	38	720	29	437	18	2,473
Tenmile	1,012	61	360	22	103	6	177	11	1,652
Lower Tenmile Subwatershed	1,978	40	1,499	30	889	18	635	13	5,001
Bushnell Frontal	470	18	871	33	932	35	400	15	2,673
Byron Creek	68	3	672	34	664	33	597	30	2,001
Middle Olalla Subwatershed	538	12	1,543	33	1,596	34	997	21	4,674
Olalla Frontal	8	1	347	33	460	43	251	24	1,066
Upper Olalla Creek	18	1	698	38	892	48	237	13	1,845
Wildcat Creek	9	1	175	18	583	61	191	20	958
Willingham Creek	5	0	222	17	796	62	262	20	1,285
Mt. Shep Subwatershed	40	1	1,442	28	2,731	53	941	18	5,154

	Nonforest		Early Seral (0 to 30 Years Old)		Mid Seral (31 to 80 Years Old)		Late Seral (80 + Years Old)		
Area	Acres	%	Acres	%	Acres	%	Acres	%	Total
Olalla	2,601	37	2,677	38	917	13	887	13	7,082
Olalla Subwatershed	2,601	37	2,677	38	917	13	887	13	7,082
Middle Tenmile	798	36	976	44	230	10	196	9	2,200
Reston	832	26	1,095	35	846	27	377	12	3,150
Upper Tenmile	291	11	938	34	1,149	42	362	13	2,740
Reston Subwatershed	1,921	24	3,009	37	2,225	28	935	12	8,090
Lower Shields	816	46	560	31	201	11	204	11	1,781
Shields Creek	112	7	537	33	668	41	299	19	1,616
Suicide Creek	228	10	1,007	44	786	34	278	12	2,299
Shields Subwatershed	1,156	20	2,104	37	1,655	29	781	14	5,696
Flournoy Creek	1,954	42	1,744	38	733	16	178	4	4,609
Morgan Creek	1,033	55	569	30	170	9	115	6	1,887
Rock Creek	629	15	1,431	34	1,776	42	402	9	4,238
Sugar Pine Subwatershed	3,616	34	3,744	35	2,679	25	695	6	10,734
Thompson Creek	295	6	3,217	62	794	15	862	17	5,168
Thompson Subwatershed	295	6	3,217	62	794	15	862	17	5,168
Olalla-Lookingglass Watershed Analysis Unit	21,419	28	28,583	38	16,432	22	9,292	12	75,726

Map 10. Olalla-Lookingglass Watershed Analysis Unit Private Age Class Distribution using Satellite Imagery



C. Geology, Soils, and Erosion Processes

1. Geology

The Olalla-Lookingglass WAU is composed mainly of sedimentary and volcanic rocks. Seventy-nine percent of the watershed is in the Coast Range Geologic Province and 21 percent is in the Klamath Mountains Province. The Klamath Mountains Province is located in the middle and southwestern parts of the WAU.

Following is a listing of the geologic types located within the WAU and a short description of each type. Geology types are shown on Map 11. The Geologic Map of Oregon by George W. Walker and Norman S. MacLeod (1991) is the source of information for the geology section.

Jop - 4,424 acres
Otter Point Formation of Dott (1971) and related rocks (Upper Jurassic) - Highly sheared graywacke, mudstone, siltstone, and shale with lenses and pods of sheared greenstone, limestone, chert, blueschist, and serpentine. Identified as melange by some investigators.

Ju - 1,567 acres
Ultramafic and related rocks of ophiolite sequences (Jurassic) - Predominantly harzburgite and dunite with both cumulate and tectonite fabrics. Locally altered to serpentinite. Includes gabbroic rocks and sheeted diabasic dike.

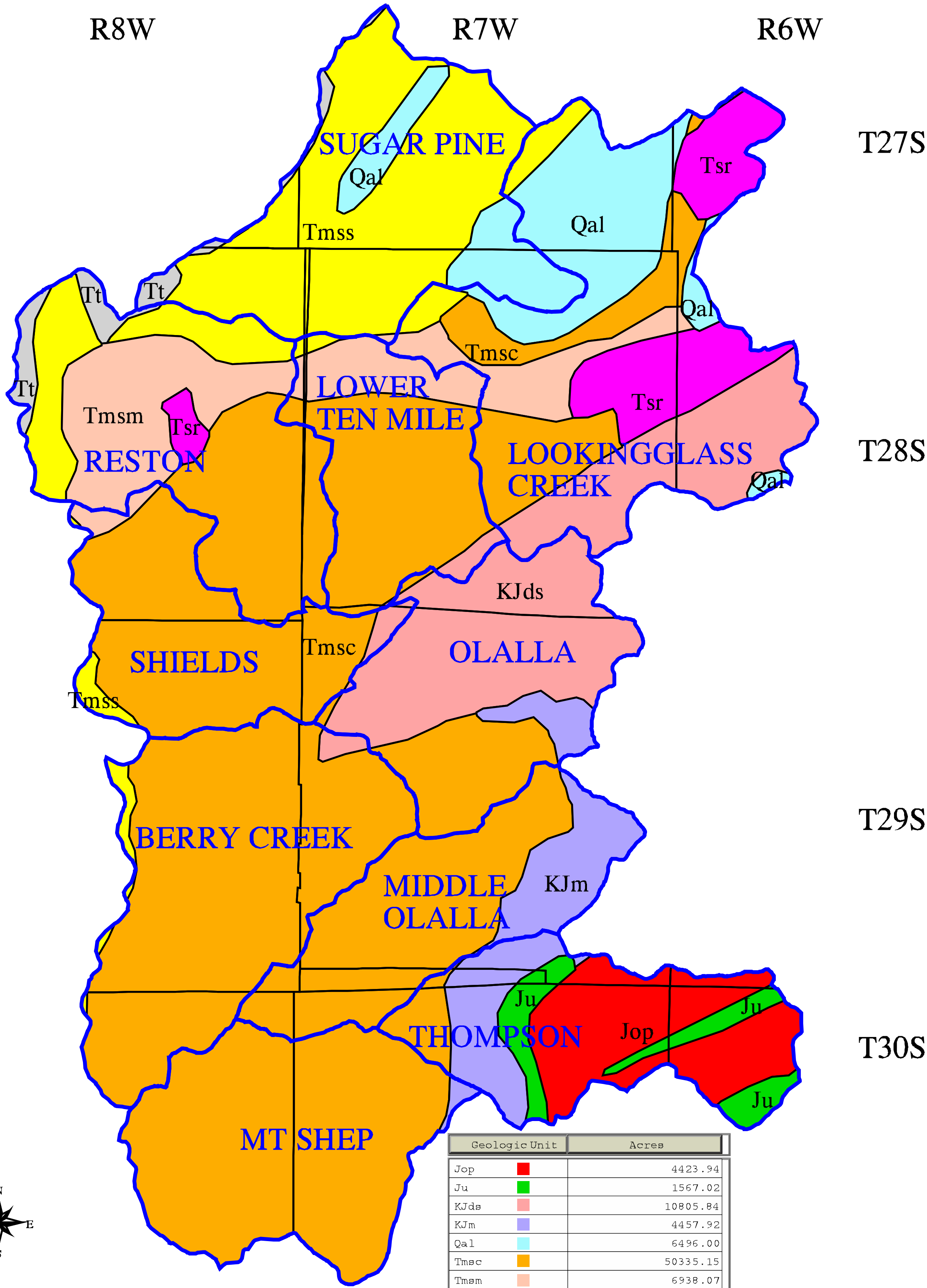
KJds - 10,806 acres
Dothan Formation and related rocks (Lower Cretaceous and Upper Jurassic) - Sedimentary rocks, sandstone, conglomerate, graywacke, rhythmically banded chert lenses.

KJm - 4,458 acres
Myrtle Group (Lower Cretaceous and Upper Jurassic) - Conglomerate sandstone, siltstone, and limestone. Locally fossiliferous.

Qal - 6,496 acres
Alluvial deposits (Holocene) - Sand, gravel, and silt forming flood plains and filling channels of present streams. In places includes talus and slope wash. Locally includes soils containing abundant organic material, and thin peat beds.

Tmsc - 50,335 acres
Marine siltstone, sandstone, and conglomerate (lower Eocene) - Cobble and pebble conglomerate, pebbly sandstone, lithic sandstone, siltstone, and mudstone; massive to thin bedded; shelf and slope depositional setting. Contains foraminiferal faunas referred to the Penutian Stage of early Eocene age.

Map 11. Olalla-Lookingglass Watershed Analysis Unit
Geology



Geologic Unit	Acres
Jop	4423.94
Ju	1567.02
KJds	10805.84
KJm	4457.92
Qal	6496.00
Tmsc	50335.15
Tmsm	6938.07
Tmss	12996.20
Tsr	4004.80
Tt	1083.72
Total	103108.66

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Tmsm - 6,938 acres
Marine sandstone, siltstone, and mudstone (lower Eocene and Paleocene?) - Rhythmically interbedded sandstone, siltstone, and mudstone with minor conglomerate; deposited in deep-sea fan depositional setting on submarine basalts of the Silek River Volcanics.

Tmss - 12,996 acres
Marine sandstone and siltstone (middle Eocene) - Thin to thick-bedded, crossbedded, well-sorted, fine to medium-grain sandstone, siltstone, and mudstone; characterized by sparse fine white mica; shallow marine depositional setting at least partly of deltaic origin. Contains foraminiferal and molluscan faunas of early middle Eocene age.

Tsr - 4,005 acres
Siletz River Volcanics and related rocks (middle and lower Eocene and Paleocene) - Aphanitic to porphyritic, vesicular pillow flows, tuff-breccias, massive lava flows and sills of tholeiitic and alkalic basalt. Upper part of sequence contains numerous interbeds of basaltic siltstone and sandstone, basaltic tuff, and locally derived basalt conglomerate. Rocks of unit pervasively zeolitized and veined with cakite. Most of these rocks are of marine origin and have been interpreted as oceanic crust and seamounts.

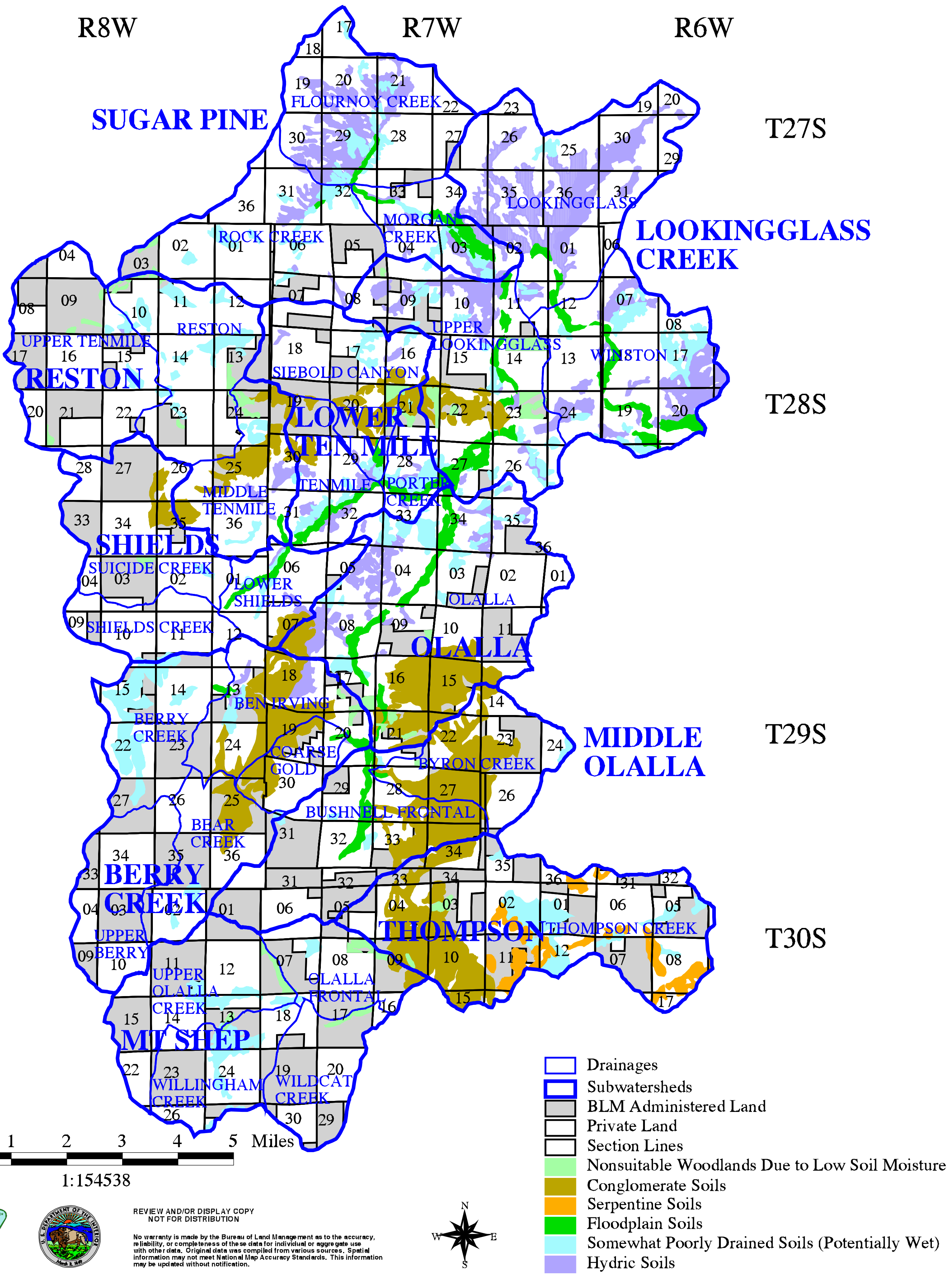
Tt- 1,083 acres
Tyee Formation (middle Eocene) - Very thick sequence of rhythmically bedded, medium to fine-grained micaceous, feldspathic, lithic, or arkosic marine sandstone and micaceous carbonaceous siltstone; contains minor interbeds of dacite tuff in upper part. Foraminiferal fauna are referred to the Ulatisian Stage. Groove and flute casts indicate deposition by north-flowing turbidity currents.

2. Soils

The National Cooperative Soil Survey (NCSS) conducted by the Natural Resources Conservation Service (NRCS) and the Timber Production Capability Classification (TPCC) conducted by the Bureau of Land Management are the main sources of information for the soils section. Soils information from NCSS data include private as well as BLM administered lands. Information from TPCC data includes only BLM administered lands.

Soils in the Olalla Lookingglass Watershed Analysis Unit have developed dominantly from sedimentary and volcanic parent materials within the Coast Range and Klamath Mountains Geologic Provinces. The main soils related properties significant to planning and analysis are floodplain soils (riparian), somewhat poorly drained soils (riparian and slope stability), hydric soils (wetlands), serpentine soils (nutrient imbalances), and soils formed from conglomerates (slope stability) (see Map 12). Additional significant properties determined using the TPCC are nonsuitable woodlands due to mass movement and slope gradient potential, soils with droughtiness and nutrient imbalances, and areas that are too wet.

Map 12. Problem Soils in the Olalla-Lookingglass WAU



There are approximately 1,913 acres of floodplain soils in the Olalla-Lookingglass WAU (see Table 10). Floodplain soils occur mostly on non-industrial private lands with approximately 38% in the Lookingglass Creek Subwatershed.

Table 10. Acres of Floodplain, Somewhat Poorly Drained, and Hydric Soils in the Olalla-Lookingglass WAU.

DRAINAGE **SUBWATERSHED**	ACRES					
	Floodplain Soils		Somewhat Poorly Drained (Potentially Wet) Soils		Hydric Soils	
	Total	BLM	Total	BLM	Total	BLM
Bear Creek	0	0	68	20	0	0
Ben Irving	40	0	85	38	152	<1
Berry Creek	14	0	640	178	0	0
Coarse Gold	9	0	<1	0	1	0
Upper Berry	0	0	<1	0	0	0
Berry Creek	63	0	794	236	153	<1
Lookingglass	64	0	58	0	1,681	0
Upper Lookingglass	342	0	342	23	592	24
Winston	326	0	475	0	883	0
Lookingglass Creek	732	0	875	23	3,157	24
Porter Creek	104	0	195	15	37	0
Siebold Canyon	31	0	140	10	68	0
Tenmile	104	0	140	0	219	0
Lower Ten Mile	239	0	475	25	324	0
Bushnell Frontal	164	0	61	9	4	0
Byron Creek	16	0	39	0	0	0
Middle Olalla	180	0	100	9	4	0
Olalla Frontal	0	0	41	0	0	0
Upper Olalla Creek	0	0	195	10	0	0

Wildcat Creek	0	0	0	0	0	0
Willingham Creek	0	0	290	164	0	0
Mt Shep	0	0	526	174	0	0
Olalla	367	1	461	37	614	0
Olalla	367	1	461	37	614	0
Middle Tenmile	20	0	97	3	103	0
Reston	0	0	337	22	0	0
Upper Tenmile	0	0	93	0	7	0
Reston	20	0	527	25	110	0
Lower Shields	78	0	71	0	48	0
Shields Creek	0	0	19	15	0	0
Suicide Creek	0	0	18	0	0	0
Shields	78	0	108	15	48	0
Flournoy Creek	34	0	272	0	901	0
Morgan Creek	194	0	308	0	287	1
Rock Creek	6	0	255	3	159	0
Sugar Pine	234		835	3	1,347	1
Thompson Creek	0	0	620	103	0	0
Thompson	0	0	620	103	0	0
Olalla-Lookingglass WAU	1,913	1	5,321	650	5,757	26

Somewhat Poorly Drained soils can include riparian areas and have slope stability problems. Hydric or wet soil areas too small for mapping (NCSS standards <5 acres) exist as minor components within mapped units and have been labeled Somewhat Poorly Drained (potentially wet). Somewhat Poorly Drained soils occur on approximately 5,321 acres within the Olalla-Lookingglass WAU, mostly on private land. The greatest acreage of Somewhat Poorly Drained soils on BLM administered lands is in the Willingham Creek and Berry Creek Drainages.

There are approximately 5,757 acres of hydric soils in the Olalla-Lookingglass WAU. Hydric soils generally have a watertable within 10 inches of the soil surface for at least 5 percent of the growing season.

The current definition of a hydric soil from the NRCS is a soil that is sufficiently wet in the upper part to develop anaerobic conditions during the growing season. Hydric soils occur on BLM administered land in the Upper Lookingglass and Morgan Creek Drainages.

There are approximately 623 acres of serpentine soils in the Olalla-Lookingglass WAU. All of the serpentine soils occur in the Thompson Creek Drainage. Approximately 45 acres of BLM administered land within the Thompson Creek Drainage are classified in the TPCC as being Nonsuitable Woodlands Due to Nutrient Imbalance. These are considered to be areas with serpentine soils. Serpentine soils generally have high amounts of magnesium and iron and low amounts of nitrogen, phosphorus, potassium, and molybdenum. Productivity for Douglas-fir is poor and grasses grow at a rapid rate. Existing native forest vegetation is best suited for areas with serpentine soils. Stand conversion to another commercial forest type is risky and should be approached with caution.

There are approximately 8,194 acres of conglomerate soils in the Olalla-Lookingglass WAU (see Table 11). When exposed to the elements, conglomerates tend to weather unevenly producing unpredictable slope stability. Dry ravel erosion occurs on steep hill slopes, producing a high rock fragment content in the soil surface layers. The added droughtiness due to the high rock fragment content makes it more difficult to establish tree seedlings. Olalla, Thompson Creek, Ben Irving, Bushnell Frontal, and Byron Creek Drainages contain the most conglomerate soils on BLM administered lands.

Table 11. Acres of Conglomerate Soils in the Olalla-Lookingglass WAU.

DRAINAGE **SUBWATERSHED**	**ACRES ON BLM ADMINISTERED LANDS**	**TOTAL ACRES**
Bear Creek	252	296
Ben Irving	367	904
Coarse Gold	208	355
Berry Creek	827	1,555
Lookingglass	136	361
Lookingglass Creek	136	361
Porter Creek	93	93
Siebold Canyon	132	344
Tenmile	35	130
Lower Ten Mile	260	567
Bushnell Frontal	475	772

Byron Creek	512	1,049
Middle Olalla	987	1,821
Olalla Frontal	78	78
Mt Shep	78	78
Olalla	681	1,424
Olalla	681	1,424
Middle Tenmile	239	546
Reston	7	7
Reston	246	553
Lower Shields	31	113
Suicide Creek	97	167
Shields	128	280
Sugar Pine	0	0
Thompson Creek	616	1,555
Thompson	616	1,555
Olalla-Lookingglass WAU	3,959	8,194

Areas determined to be unsuitable for forest practices due to moisture deficiencies were based on soil physical characteristics and occur on approximately 885 acres in the WAU (see Table 12). Textures of moisture deficient soils are dominantly sands or loamy sands with 15 to 70 percent rock fragments. These soils have less than 1 inch of available water holding capacity in the top 12 inches.

Table 12. Areas Considered to be Nonsuitable Woodlands Due to Low Soil Moisture.

DRAINAGE **SUBWATERSHED**	**TOTAL ACRES**
Ben Irving	23
Berry Creek	23
Upper Lookingglass	235
Winston	2

Lookingglass Creek	237
Porter Creek	18
Siebold Canyon	65
Lower Ten Mile	83
Byron Creek	11
Middle Olalla	11
Olalla Frontal	76
Upper Olalla Creek	75
Wildcat Creek	41
Willingham Creek	7
Mt Shep	199
Olalla	81
Olalla	81
Middle Tenmile	42
Reston	73
Upper Tenmile	44
Reston	159
Suicide Creek	20
Shields	20
Rock Creek	23
Sugar Pine	23
Thompson Creek	47
Thompson	47
Olalla-Lookingglass WAU	885

Commercial conifer survival and productivity are severely limited due to excessive groundwater. Areas nonsuitable for timber production due to excessive groundwater occur in the Upper Lookingglass (25 acres), Olalla (5 acres), and Reston (4 acres) Drainages.

3. Slope Gradient and Mass Movement Potential

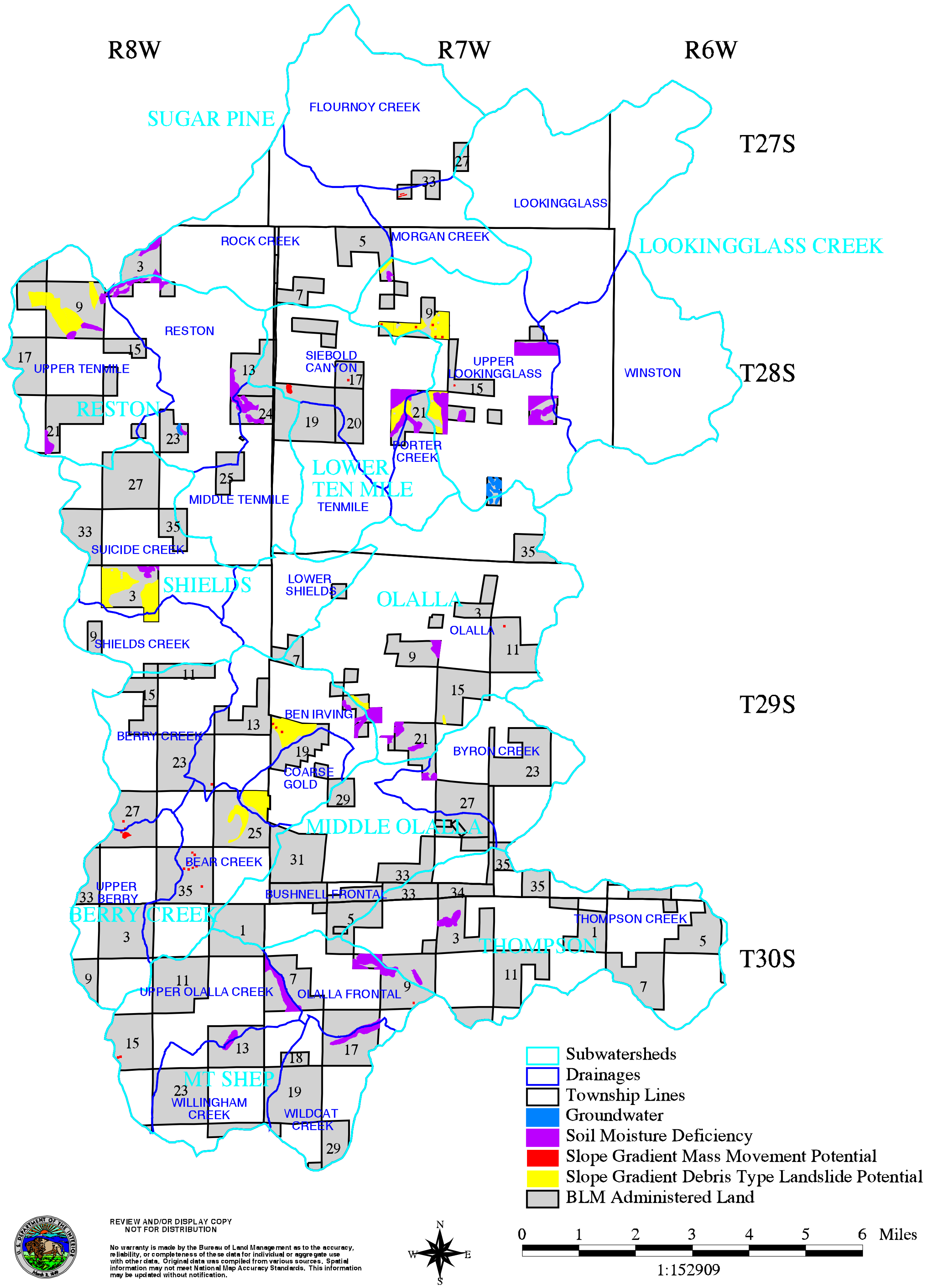
Landslides can affect water quality, erosion, and sedimentation. Landslides occur naturally or can be triggered by human activities such as road building or logging. Translational slide areas (shown in red on Map 13) are generally on steep slopes (60% to 100% plus) where debris type landslides exist. These areas have a high potential for debris type landslides and are not suitable for forest management activities. There are approximately 47 acres in the WAU (see Table 13).

Table 13. Areas within the Olalla-Lookingglass WAU with Slope Gradient or Mass Movement Potential.

Area	Acres
Bear Creek	8.05
Ben Irving	4.03
Berry Creek	1.75
Upper Berry	9.40
Berry Creek Subwatershed	23.23
Upper Lookingglass	6.00
Lookingglass Creek Subwatershed	6.00
Siebold Canyon	10.57
Lower Ten Mile Subwatershed	10.57
Olalla Frontal	0.99
Upper Olalla Creek	2.02
Mt. Shep Subwatershed	3.01
Olalla	1.01
Olalla Subwatershed	1.01
Morgan Creek	3.00
Sugar Pine Subwatershed	3.00
Olalla-Lookingglass WAU	46.82

Areas classified as fragile are characterized by slopes commonly ranging from 60% to 100% plus. There are approximately 1,151 acres in the WAU (see Table 14). Unacceptable soil and organic matter loses

Map 13. Olalla-Lookingglass WAU
Slope Gradient and Mass Movement Potential



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are expected to occur as a result of forest management activities unless mitigating measures are applied to protect the soil/site productivity (see Best Management Practices, Appendix D, Roseburg District Resource Management Plan, USDI 1995).

Table 14. Areas in the Olalla-Lookingglass WAU Characterized by Slope Gradients from 60 to 100%.

Area	Acres
Bear Creek	60
Ben Irving	140
Coarse Gold	103
Berry Creek Subwatershed	303
Upper Lookingglass	246
Lookingglass Creek Subwatershed	246
Porter Creek	20
Siebold Canyon	56
Lower Ten Mile Subwatershed	76
Olalla	24
Olalla Subwatershed	24
Upper Tenmile	229
Reston Subwatershed	229
Shields Creek	25
Suicide Creek	247
Shields Subwatershed	273
Olalla-Lookingglass WAU	1,151

D. Hydrology

The Olalla-Lookingglass Watershed Analysis Unit is 161 square miles in size. Lookingglass Creek, which flows into the South Umpqua River near Winston, is the outflow for the WAU. The Roseburg District BLM does not have any Memorandum of Understanding for municipal water use within the WAU.

1. Climate

The Olalla-Lookingglass Watershed Analysis Unit has a Mediterranean type of climate, characterized by cool, wet winters and hot, dry summers. Weather stations used to characterize the climate in the WAU are presented in Table 15. The National Oceanic and Atmospheric Administration (NOAA) weather station located at Riddle, which is East of the WAU, is being used to characterize both temperature and precipitation. Other stations used to characterize precipitation are operated by Douglas County. Most of the climate information used for this watershed analysis is from the Riddle station because it has a long period of record and temperature data were not collected at the other sites. Differences in precipitation and temperature would be expected to occur throughout the WAU due to topographic variation. For example, precipitation is known to be affected by elevation due to orographic effects and the physical distance from the Pacific Ocean.

Table 15. Weather Station Data Used to Characterize Climate in the Olalla-Lookingglass WAU.

Name	Station Number	Elevation (feet)	Period of Record (water year)	Mean Water Year Precipitation (inches)
Flournoy Valley	352974	700	1979-1996	45
Lookingglass	355026	620	1979-1996	38
Reston	357112	890	1956-1996	52
Riddle	357169	680	1949-1996	32
Upper Olalla	358788	760	1979-1996	41

Mean annual precipitation from 1961 to 1990 for the Reston station was 51 inches and 31 inches for the Riddle station (Owenby and Ezell 1992). Chart 3 shows the range and variability of precipitation between the Reston and Riddle weather stations. Reston receives the highest amount of precipitation and Riddle the lowest, Flournoy Valley exceeds Lookingglass, and Upper Olalla is usually in the middle. About 85% of the annual precipitation occurs from October to April. Summer precipitation averages about five inches at Reston and four inches at Riddle (see Chart 4). Annual precipitation in the Olalla-Lookingglass WAU ranges from about 30 inches at Winston to 70 inches at the highest elevations. Precipitation occurs mostly as rainfall since little of the WAU is above 2,000 feet.

Chart 3. Comparison of water year precipitation

at Reston and Riddle (incomplete data not shown).

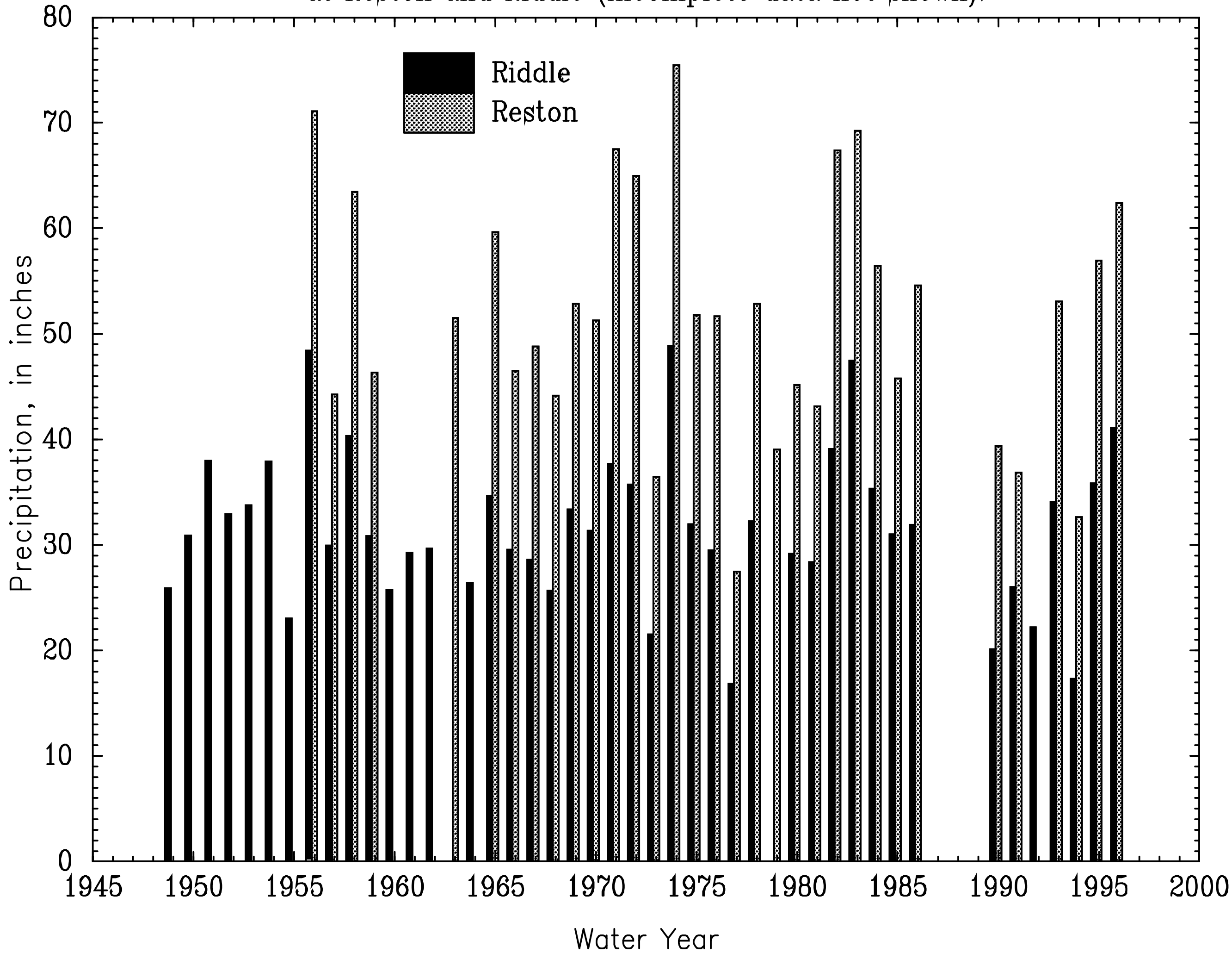
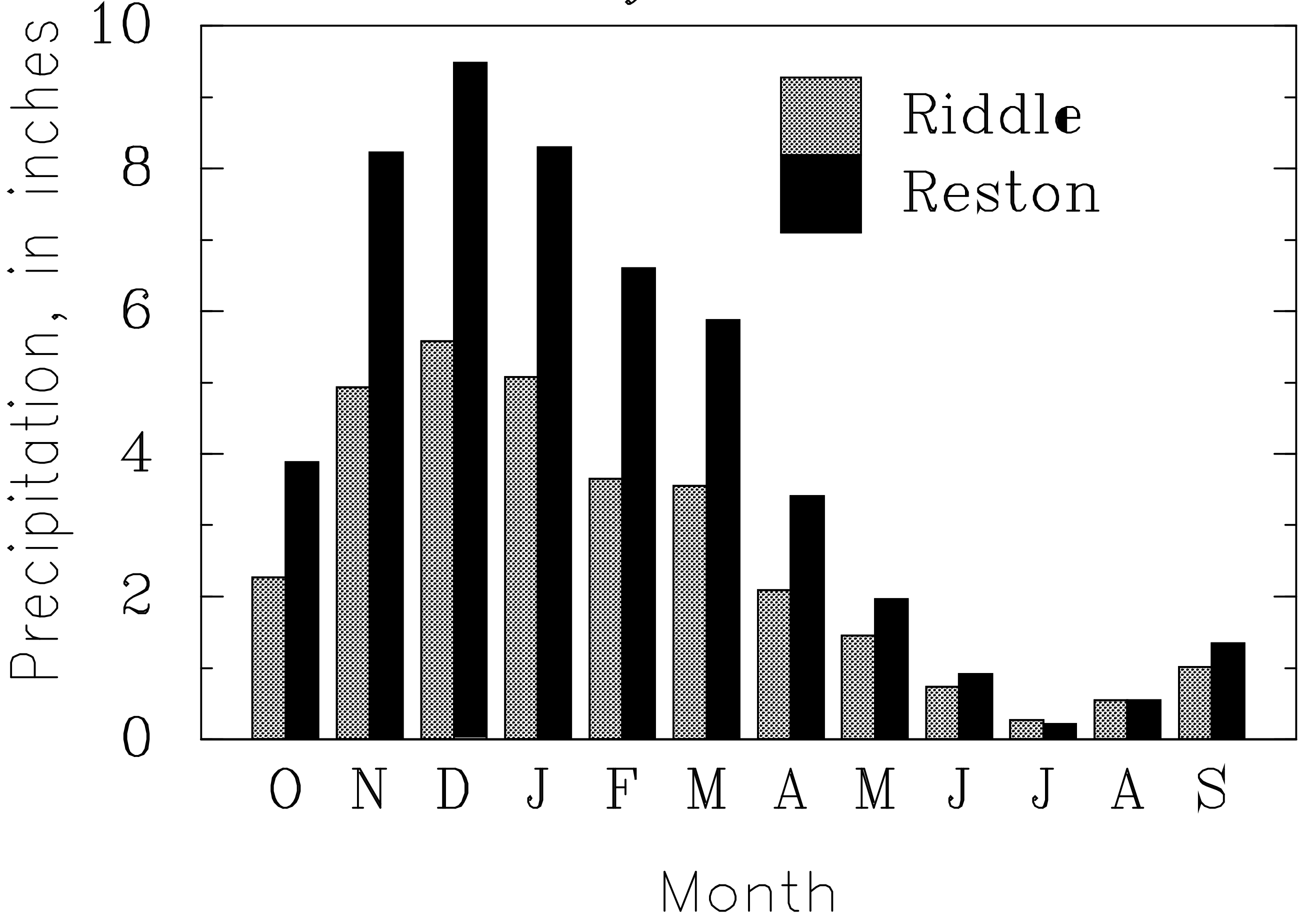


Chart 4. Monthly precipitation
Water years 1956–96



Average temperatures during the summer for Riddle are shown in Table 16. Summer maximum daily temperatures are typically in the low 90s degrees Fahrenheit (F) and winter minimum daily temperatures are in the mid 30s degrees Fahrenheit.

Table 16. Average Temperatures (EF) During the Summer at Riddle, Oregon from 1949 to 1996.

Month	Maximum	Minimum	Mean
June	76.2	49.3	62.8
July	82.9	52.6	67.8
August	83.2	52.4	67.8
September	78.2	46.8	62.5

Chart 5 shows the deviation from the mean of water year temperature and precipitation from 1949 to 1996 at Riddle. Years that did not have at least 350 daily observations were not included and are shown by gaps in the data. Average temperature was 54E F and average precipitation was 32 inches. Chart 5 also shows a qualitative ranking of the climate as being cool or warm and wet or dry.

2. Streamflow

Streamflow has been monitored at four locations in the Olalla-Lookingglass WAU. The Olalla Creek and Lookingglass Creek sites were used to characterize the streamflow for this watershed analysis. Streamflow for the Olalla Creek and Lookingglass Creek sites are considered to be representative of the flow conditions found within the WAU. These sites are located within the WAU and have a long period of record.

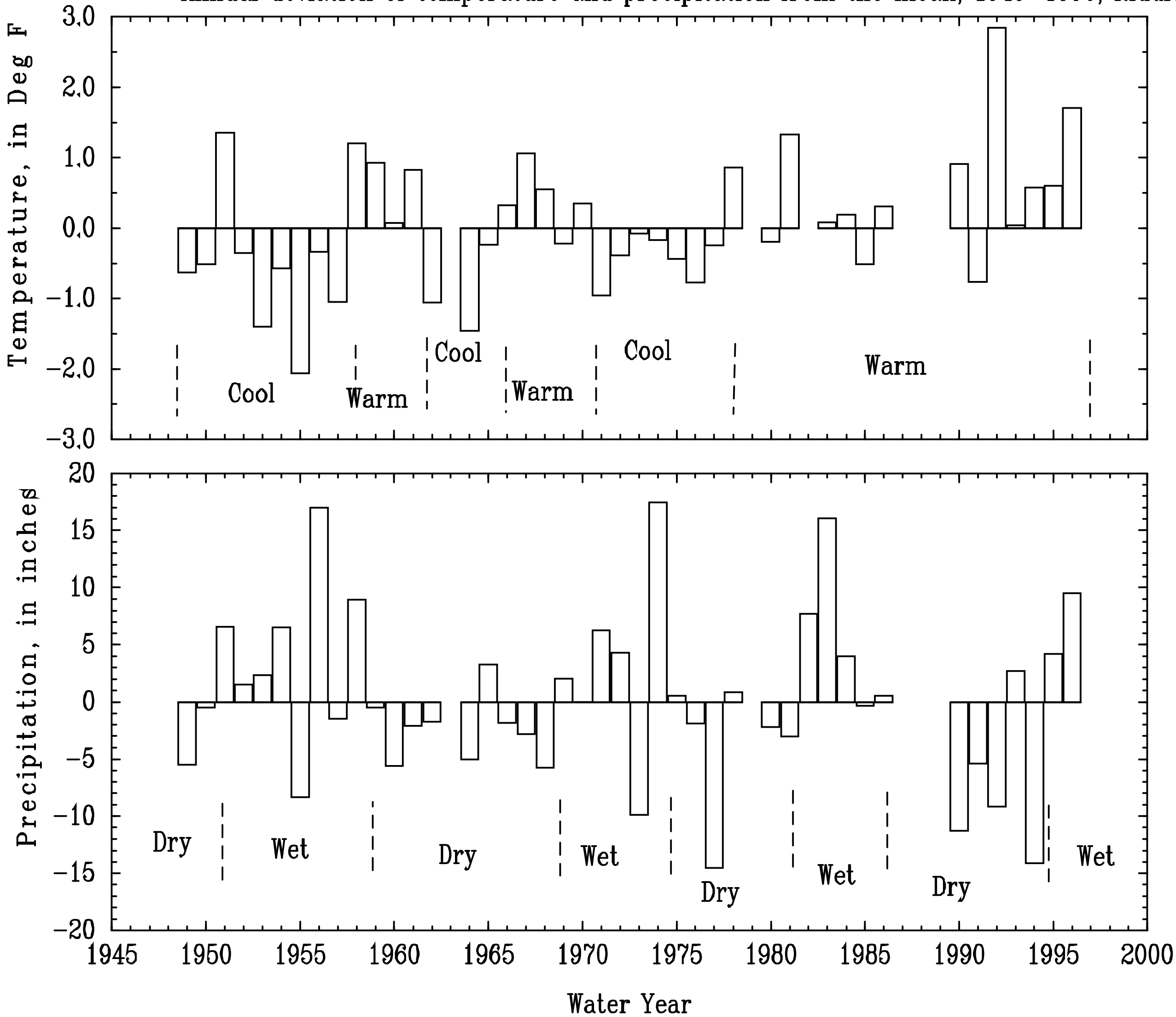
Ben Irving Reservoir has regulated some of the flow in Olalla and Lookingglass Creeks since January 1980. Many small irrigation diversions occur upstream from the streamflow gages. Annual peak flow data for Olalla and Lookingglass Creeks and daily discharge data for Lookingglass Creek are presented in Appendix D.

After Ben Irving Reservoir was constructed, the mean and maximum monthly flows during the winter months have generally become less in Lookingglass Creek, while the minimum and mean monthly flows during the summer months have generally become greater. Some of this may be explained by variations in precipitation for the different time periods but mostly it is due to water storage in the winter and the controlled release of water throughout the year, especially in the summer.

The average annual runoff percent for Olalla and Lookingglass Creeks is shown in Chart 6. More than 98% of the runoff occurs from November through May (Moffatt et al. 1990). Most of the streamflow

Chart 5.

Annual deviation of temperature and precipitation from the mean, 1949–1996, Riddle.



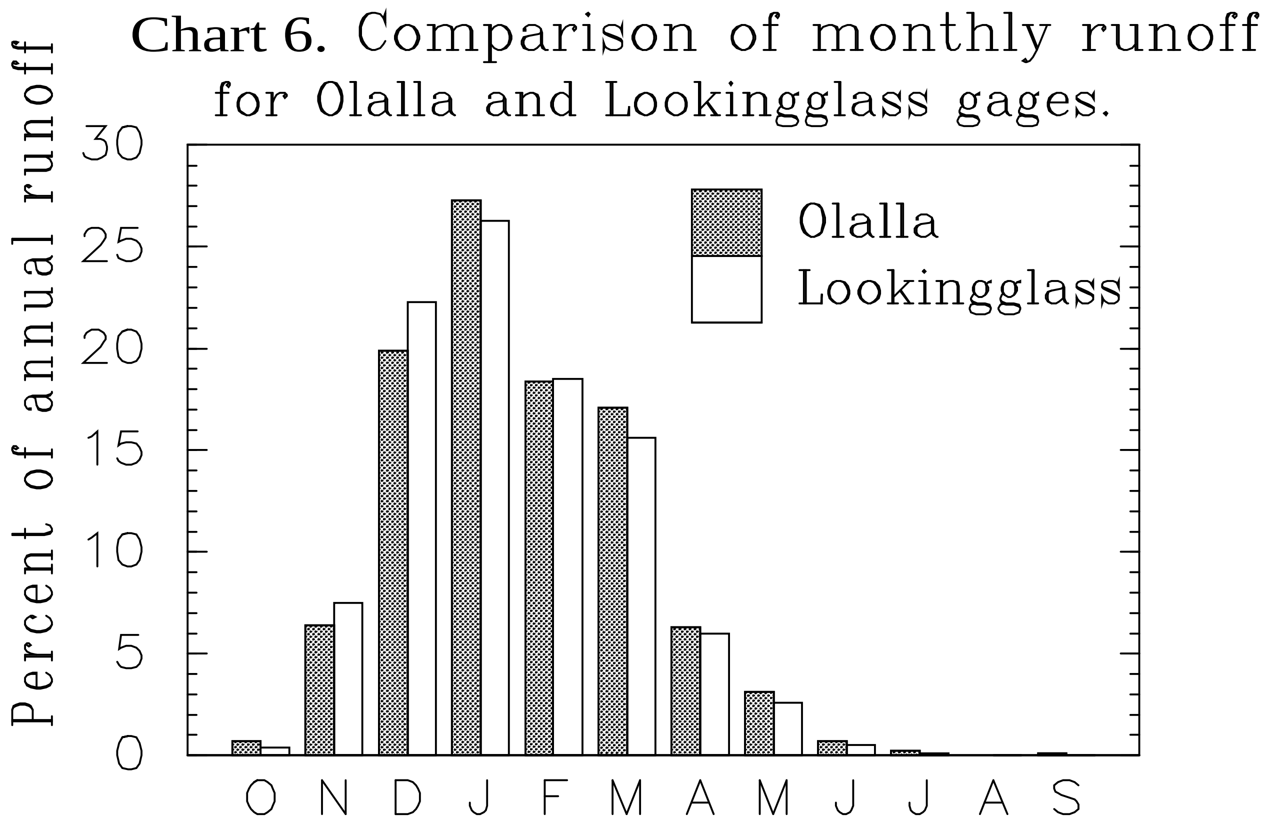


Chart 6. Comparison of monthly runoff for Olalla and Lookingglass gages.
Percent of annual runoff
30
25
20
15
10
5
0
Olalla
Lookingglass
O
N
D
J
F
M
A
M
J
J
A
S

would be expected to occur from November through May with the maximum occurring in January. Some creeks may have no flow for short periods of time. However, this does not mean the entire WAU would dry up, only some stream reaches where all of the water flows underground then resurfaces further downstream. Fourth order and larger streams in the headwaters of the WAU probably flow year round.

Summer low flows may be affected by human water withdrawals. An inventory of water rights for Lookingglass Creek in 1993 listed 196 appropriated permits totaling 37.3 cubic feet per second. Domestic water withdrawal, irrigation, agriculture, and livestock watering have all contributed to lower volumes of water in the stream channels during the summer months. The volumes withdrawn are not known but water removal during the summer may decrease available habitat for aquatic life and increase summer water temperatures and pH simply because less water is in the channel.

The flood frequencies for Olalla Creek near Tenmile and Lookingglass Creek at Brockway are presented in Table 17. Recurrence intervals of 50 and 100 years on Olalla Creek and 100 years on Lookingglass were not estimated because the period of record was not long enough.

Table 17. Magnitude and probability of instantaneous peak flow for Olalla Creek near Tenmile and Lookingglass Creek at Brockway.

Recurrence Interval (Years)	1.25	2	5	10	25	50	100
Annual Exceedence Probability	80%	50%	20%	10%	4%	2%	1%
Olalla Creek near Tenmile Discharge (cfs)	2,970 (ND)	4,430 (3,920)	6,550 (6,660)	7,990 (8,620)	9,860 (11,400)	ND (13,600)	ND (16,000)
Lookingglass Creek at Brockway Discharge (cfs)	5,780 (ND)	10,500 (11,500)	17,700 (17,900)	22,600 (22,600)	28,900 (28,800)	33,400 (33,700)	ND (38,800)

Data from Wellman et al. 1993 and Harris et al. 1979 (listed in parenthesis). ND = No Data.

Significant recurrence intervals for major annual peak flows for Olalla and Lookingglass Creeks were extrapolated from Table 17. The top five flows for each station are shown in Table 18.

Table 18. Recurrence intervals for select annual peak flows for Olalla Creek and Lookingglass Creek gaging stations.

Olalla Creek near Tenmile			Lookingglass Creek at Brockway		
Flow (cfs)	Date	Return Period (Year)	Flow (cfs)	Date	Return Period (Year)
9,160	1/3/66	20	35,000	12/26/55	50
8,280	1/17/71	15	20,300	1/20/64	8
7,670	2/12/59	10	20,200	1/4/66	8
6,590	1/19/64	6	19,100	1/12/59	7
6,110	12/22/64	5	17,500	12/21/57	5

The United States Forest Service (USFS) developed a hydrologic recovery procedure to evaluate the cumulative effects of timber harvesting on streamflow in the Umpqua Basin for areas in the Transient Snow Zone (elevations between 2,000 and 5,000 feet). The Olalla-Lookingglass WAU has a rain dominated precipitation regime since most of the WAU is below 2,000 feet in elevation. The area above 2,000 totals about 14% of the WAU (see Table 19). However, peak flows occurring in some of the Drainages of the Olalla-Lookingglass WAU may be affected by rain on snow events. The Subwatersheds with the most area in the Transient Snow Zone are Thompson with 3,859 acres and Mt. Shep with 5,046 acres.

Road densities are very high, at about five miles per square mile, in the Thompson and Mt. Shep Subwatersheds. The volume of runoff during a rain on snow event would be larger due to the high road densities.

3. Stream Channel

There are approximately 725 miles of streams in the Olalla-Lookingglass WAU. Drainage density is about 4.5 miles of stream per square mile (Table 20). Mt. Shep Subwatershed has the highest drainage density (6.36 miles per square mile). Drainage density can be related to erosion potential. Higher drainage densities produce more complex watersheds and streamflow responds faster to rainfall (Chow 1964). Soils would be expected to erode easily and slopes are steep. It should be noted that not all streams have been mapped in GIS. Drainage densities in some Subwatersheds may be higher than what is shown in Table 20. Specifically the stream coverage for the Sugar Pine and Lookingglass Creek Subwatersheds is incomplete.

Wemple (1994) estimated roads in her study area extended the stream network 60% over winter base flow stream lengths and 40% over storm event stream lengths. Road densities in her study area were 1.6 miles per square mile. Road density in the Olalla-Lookingglass WAU ranges from 2.4 miles per square mile in

Table 19. Transient Snow Zone (TSZ) Acres in the Olalla-Lookingglass WAU.

Drainage Name **Subwatershed Name**	Acres of BLM Land in TSZ	% of Total BLM Land in WAU	Total Acres in TSZ	% of Total Acres in WAU
Bear Creek	265	23	471	19
Ben Irving	5	1	37	1
Berry Creek	59	5	69	2
Coarse Gold	41	10	73	6
Upper Berry	693	54	1,394	50
Berry Creek Subwatershed	1,063	22	2,044	17
Lookingglass	0	0	0	0
Upper Lookingglass	0	0	0	0
Winston	0	0	0	0
Lookingglass Creek Subwatershed	0	0	0	0
Porter Creek	0	0	0	0
Siebold Canyon	5	0	7	0
Tenmile	1	0	10	1
Lower Tenmile Subwatershed	6	0	17	0
Bushnell Frontal	493	22	803	16
Byron Creek	27	3	88	3
Middle Olalla Subwatershed	520	16	891	11
Olalla Frontal	346	35	563	27
Upper Olalla Creek	1,011	64	1,814	53
Wildcat Creek	944	77	1,574	72
Willingham Creek	535	47	1,095	45
Mt. Shep Subwatershed	2,836	57	5,046	50
Olalla	1	0	7	0
Olalla Subwatershed	1	0	7	0

Drainage Name **Subwatershed Name**	Acres of BLM Land in TSZ	% of Total BLM Land in WAU	Total Acres in TSZ	% of Total Acres in WAU
Middle Tenmile	1	0	5	0
Reston	63	10	207	5
Upper Tenmile	810	41	1,490	32
Reston Subwatershed	874	27	1,702	15
Lower Shields	0	0	0	0
Shields Creek	0	0	0	0
Suicide Creek	44	3	47	1
Shields Subwatershed	44	2	47	1
Flournoy Creek	0	0	307	7
Morgan Creek	0	0	0	0
Rock Creek	222	28	551	11
Sugar Pine Subwatershed	222	23	858	7
Thompson Creek	1,284	39	3,859	45
Thompson Subwatershed	1,284	39	3,859	45
Olalla-Lookingglass Watershed Analysis Unit	6,850	25	14,471	14

Table 20. Mile of Roads and Streams, Stream Crossings, and Densities in the Olalla-Lookingglass WAU.

Drainage Name **Subwatershed Name**	Acres	Square Miles	Miles of Roads	Road density (miles per square mile)	Miles of Streams	Stream drainage density (miles per square mile)	Stream Crossings per Stream Mile
Bear Creek	2,544	3.98	21.04	5.29	19.33	4.86	2.33
Ben Irving	2,920	4.56	19.78	4.34	25.61	5.62	1.80
Berry Creek	2,851	4.46	18.24	4.09	19.03	4.27	2.10
Coarse Gold	1,274	1.99	5.10	2.56	11.05	5.55	1.81
Upper Berry	2,780	4.34	22.25	5.12	24.96	5.75	1.56
Berry Creek Subwatershed	12,367	19.32	86.41	4.47	99.98	5.17	1.90
Lookingglass	6,518	10.18	29.60	2.91	16.77	1.65	1.43
Upper Lookingglass	6,170	9.64	39.83	4.13	32.06	3.33	1.68
Winston	5,179	8.09	25.45	3.14	13.67	1.69	2.05
Lookingglass Creek Subwatershed	17,867	27.92	94.88	3.40	62.50	2.24	1.70
Porter Creek	1,080	1.69	4.73	2.80	6.92	4.10	1.16
Siebold Canyon	3,597	5.62	22.43	3.99	24.41	4.34	1.80
Tenmile	2,007	3.14	14.08	4.49	12.77	4.07	1.88
Lower Tenmile Subwatershed	6,684	10.44	41.24	3.95	44.10	4.22	1.72
Bushnell Frontal	4,896	7.65	39.41	5.15	41.70	5.45	1.92
Byron Creek	3,031	4.74	20.88	4.41	25.68	5.42	1.87
Middle Olalla Subwatershed	7,927	12.39	60.29	4.87	67.38	5.44	1.90
Olalla Frontal	2,056	3.21	16.65	5.18	26.27	8.18	2.63
Upper Olalla Creek	3,425	5.35	30.82	5.76	28.79	5.38	2.67
Wildcat Creek	2,182	3.41	16.39	4.81	23.66	6.94	1.99
Willingham Creek	2,433	3.80	21.30	5.60	21.67	5.70	2.49
Mt. Shep Subwatershed	10,095	15.77	85.16	5.40	100.39	6.36	2.46

Drainage Name **Subwatershed Name**	Acres	Square Miles	Miles of Roads	Road density (miles per square mile)	Miles of Streams	Stream drainage density (miles per square mile)	Stream Crossings per Stream Mile
Olalla	9,101	14.22	63.43	4.46	86.36	6.07	1.95
Olalla Subwatershed	9,101	14.22	63.43	4.46	86.36	6.07	1.95
Middle Tenmile	2,861	4.47	14.55	3.25	22.52	5.04	1.33
Reston	3,791	5.92	28.96	4.89	21.14	3.57	2.79
Upper Tenmile	4,697	7.34	33.91	4.62	23.96	3.26	2.21
Reston Subwatershed	11,350	17.73	77.42	4.37	67.62	3.81	2.10
Lower Shields	1,860	2.91	17.30	5.95	16.36	5.63	2.63
Shields Creek	1,781	2.78	20.41	7.33	14.10	5.06	3.12
Suicide Creek	3,886	6.07	30.74	5.06	34.17	5.63	1.81
Shields Subwatershed	7,527	11.76	68.45	5.82	64.63	5.49	2.31
Flournoy Creek	4,728	7.39	17.42	2.36	16.97	2.30	1.53
Morgan Creek	1,976	3.09	14.45	4.68	7.57	2.45	1.98
Rock Creek	4,996	7.81	37.95	4.86	26.36	3.38	2.20
Sugar Pine Subwatershed	11,700	18.28	69.82	3.82	50.90	2.78	1.94
Thompson Creek	8,490	13.27	66.36	5.00	81.41	6.14	2.00
Thompson Subwatershed	8,490	13.27	66.36	5.00	81.41	6.14	2.00
Olalla-Lookingglass Watershed Analysis Unit	103,109	161.11	713.46	4.43	725.27	4.50	2.02

the Flournoy Creek Drainage to 7.3 miles per square mile in the Shields Creek Drainage (Table 20). However, not all roads are on GIS and the actual road densities may be higher.

Ditch lines may increase the surface flow in a watershed allowing rain or melting snow to get into streams quicker. Drainage from roads may be a major cause of increased winter peak flows in streams in the WAU. The majority of roads within the Olalla-Lookingglass WAU were constructed with ditches and/or insloped road surfaces designed to carry water flow off of the road surface. Once it is in the ditch, much of the water reaches stream channels faster than in an unroaded area. In fact, some ditchlines effectively function as stream channels extending the actual length of flowing streams during rain storms. Increased drainage densities, due to road construction, may increase peak flows and mean annual floods. Drainages with fewer streams per square mile experience higher winter peak flows as a result of roads than drainages with a lot of streams. Fewer streams to handle the rapid runoff increase streamflow, potentially leading to down cutting, bank failures, bed scour, and mass wasting where streams undercut adjacent slopes. The dominant factor affecting peak flows in smaller drainages is how quickly water gets to the channels. Tractor harvesting usually compacts soils, adding to the surface runoff.

The number of stream crossings by roads found in GIS is shown in Table 20. Crossing density can be used as an indicator for the potential of culverts to become plugged. Peak flow increases due to channel extension may be estimated using the number of stream crossings. The highest crossing densities would be assumed to have the greatest potential for peak flow increases from road related run-off. The crossing density can be used to show the proportion of culverts which may become plugged during a 100-year flood. Limited inventories have been conducted to determine if existing culverts are appropriately sized to accommodate a 100-year flood.

Streams may be divided into sediment source areas, transport areas, or depositional areas based upon the slope or gradient of the stream channel. High gradient streams are source areas for debris torrents. Medium gradient streams are transport areas that do not change significantly with time. Medium gradient streams are presumed to be lacking in large woody debris (LWD). Sediment tends to pass through medium gradient streams rather than be deposited. In general, low gradient streams are the most likely to change due to deposition and erosion of sediments. Low gradient streams provide the best quality fish habitat because they have meanders, under cut banks, deep pools, large amounts of downed logs, and gravel tends to accumulate.

Many stream channels in the Olalla-Lookingglass WAU have been eroded down to bedrock, probably due to increased peak flows associated with timber harvesting and high road densities. Channel downcutting has occurred due to over grazing on streambanks and large woody debris (LWD) is lacking in many stream channels because of previous stream cleaning practices.

Proper Functioning Condition (PFC) surveys were conducted on select reaches of the Olalla-Lookingglass WAU. Representative reaches, totaling about three miles were surveyed for three Subwatersheds. The surveys generally found that stream channels are downcutting causing accelerated bank erosion, floodplain abandonment, and narrowing of riparian areas. The causes include road encroachment (the most damaging), lack of large woody debris (LWD), lack of riparian vegetation, and placer mining. About 33% of the reaches surveyed were found to be nonfunctional (on Wildcat and Bushnell Creeks) and over 50% were found to be functional at risk with a downward trend (on Thompson, Wildcat, Olalla, and Willingham Creeks). About 1/4 mile of Olalla Creek was found to be in proper functioning condition, which is eight percent of the stream reaches surveyed. These surveys are meant to be representative of the Olalla-Lookingglass WAU and could be used to extrapolate riparian conditions to the rest of the WAU.

Riparian functioning condition in the Olalla-Lookingglass WAU is much less than other WAUs in the Roseburg BLM District. About 90 miles of streams were surveyed for PFC on BLM lands during the Summer of 1997. Twenty-five percent of the streams surveyed in the Roseburg BLM District were found to be in proper functioning condition compared to 8% in the Olalla-Lookingglass WAU. About 19% of the streams surveyed in 1997 were found to be nonfunctional compared to 33% in the Olalla-Lookingglass WAU. In 1991, the BLM Director approved the Riparian-Wetland Initiative for the 1990s, one of the chief goals was to restore and maintain riparian-wetland areas so that 75% or more are in proper functioning condition by 1997. Previous stream cleaning efforts removed the LWD from many stream channels in the Olalla-Lookingglass WAU. Also, past heavy equipment use in stream channels compacted the soils. Road encroachment is the most damaging because once a stream channel has been straightened it will begin to down cut and widen trying to reach a new equilibrium. Table 21 shows channel characteristics at selected sites on Olalla and Lookingglass Creeks.

Table 21. Channel Geometry Characteristics on Olalla and Lookingglass Creeks.

	Olalla Creek near Tenmile	Lookingglass Creek at Brockway
Drainage Area (square miles)	61	158
Stream Type	F	F
Bankfull Width (feet)	69	91
Bankfull Mean Depth (feet)	5.1	6.1
Bankfull Stage (feet)	6.5	10.2
Bankfull Cross-Section Area (square feet)	354	558
Bankfull Discharge (cfs)	2,695	4,633
Width/Depth Ratio	13.5	14.9
Maximum Depth at Bankfull (feet)	6.8	8.7
Floodprone Area Width (feet)	106.6	116
Entrenchment ratio	1.5	1.27

4. Water Quality

The objective of the Clean Water Act of 1977 is to restore and maintain the chemical, physical, and biological integrity of the nations' waters. The act directs the State to set water quality standards. Water quality is to be managed to protect and recognize beneficial uses.

The Oregon Administrative Rules Antidegradation Policy (OAR 340-41-026) is to prevent unnecessary degradation from point and nonpoint sources of pollution, protect, maintain, and enhance existing surface water quality, and protect all existing beneficial uses. The identified Beneficial Uses of surface waters in the Umpqua Basin include public and private domestic and industrial water supplies, livestock watering, irrigation, salmonid fish rearing and spawning, anadromous fish passage, resident fish, aquatic life, fishing, wildlife, hunting, water contact recreation, boating, hydroelectric power, and aesthetic quality.

The Department of Environmental Quality (DEQ) routinely monitors 3,500 miles of streams in the State of Oregon. Table 22 summarizes water quality conditions for streams within the Olalla-Lookingglass WAU. Dates and frequencies are not available for determining the time of the year or the magnitude of the problem.

General water quality in Olalla Creek was identified using water samples collected in 1996. The data are presented in Table 23. Summer baseflow water quality in Olalla Creek was very good for the sampled constituents. Drinking water standards set by the Environmental Protection Agency (EPA) were not exceeded. The water type in Olalla Creek consisted of sodium bicarbonate which is typical for sandstone and siltstone sedimentary deposits found in the area upstream.

5. Stream Temperature

Water temperature is one characteristic to be managed to protect recognized beneficial uses. No measurable increase in water temperature is allowed when stream temperatures are 58 degrees Fahrenheit (F) or greater and no more than a two degree increase is allowed when stream temperatures are 56 degrees Fahrenheit or less. The water quality standard for temperature is being revised upward. Currently, streams with salmonids must be maintained at or below 58 EF. In non-salmonid streams, the temperature standard is 64E F.

Table 22. Summary of DEQ 1988 Nonpoint Source Pollution Assessment.

Tributary and DEQ ID	Pollution Type	Severity	Source of Information	Impacted Beneficial Uses	Probable Cause
Lookingglass Creek (70)	---	---	---	Coldwater Fish, Other Aquatic Life	Reservoir Storage And Removal
Lookingglass Creek (71)	Low Dissolved Oxygen	Severe	Data	Irrigation	Water Withdrawal, Baseflow Depletion
	Decreased Flow	Severe	Data		
Olalla Creek (72)	---	---	---	Coldwater Fish, Other Aquatic Life	Reservoir Storage And Removal
Olalla Creek (73)	Sedimentation	Moderate	Observation	Coldwater Fish, Other Aquatic Life	Reservoir Storage And Removal
Olalla Creek (74)	Low Dissolved Oxygen	Severe	Data	Irrigation	Water Withdrawal, Baseflow Depletion
	Decreased Flow	Severe	Data		
Tenmile Creek (75)	Low Dissolved Oxygen	Severe	Data	Irrigation	Water Withdrawal, Baseflow Depletion
	Decreased Flow	Severe	Data		
Byron Creek (76)	Low Dissolved Oxygen	Severe	Observation	Irrigation	Water Withdrawal, Baseflow Depletion
	Decreased Flow	Severe	Observation		
Thompson Creek (402)	Turbidity	Moderate	Observation	Domestic Water Supply, Coldwater Fish	Unknown
	Low Dissolved Oxygen	Moderate	Observation		
	Sedimentation	Moderate	Observation		
	Streambank Erosion	Moderate	Observation		
	Decreased Flow	Moderate	Observation		

Table 23. Water quality data for Olalla Creek[1].

Flow (cfs)	**Specific Cond. (*u*S/cm)**	**pH**	**Alkalinity (mg/L)**	**Temperature (EC)**	**Barometric pressure (mm)**	**DO (mg/L)**	**$N-NO_2$ (mg/L)**	**$N-NO_3$ (mg/L)**	**F (mg/L)**	**Cl (mg/L)**
0.3	208	8.0	72	13.0	736	9.9	<.01	0.03	<0.2	17
Br (mg/L)	**$P-PO_4$ (mg/L)**	**SO_4 (mg/L)**	**Li (mg/L)**	**Na (mg/L)**	**$N-NH_3$ (mg/L)**	**K (mg/L)**	**Mg (mg/L)**	**Ca (mg/L)**	**Sr (mg/L)**	**Ba (mg/L)**
0.4	<0.2	7.7	<0.5	9.4	<.05	0.5	1.7	1.8	<1.0	<0.5

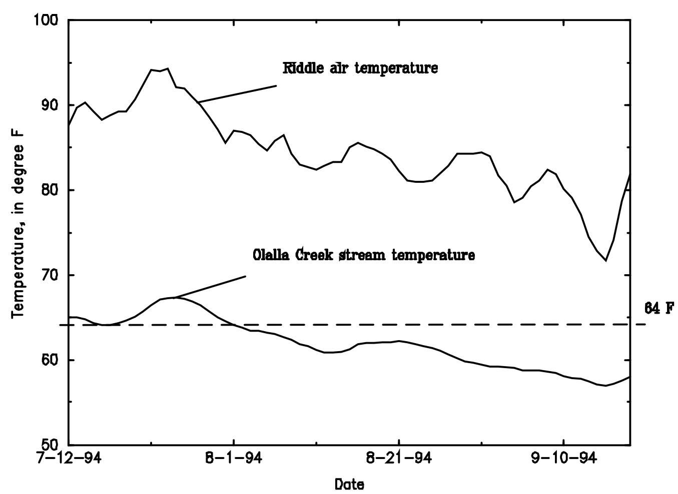
[1.] Sample taken in T29S, R7W, Section 32 on 8/19/96 at 10 a.m.

The BLM has monitored stream temperature on Olalla Creek (T29S, R7W, Section 32) since 1994. The seven-day maximum water and air temperatures are compared in Graphs 1, 2, 3, and 4. Air temperature was not available for 1997. Stream temperatures generally followed air temperature patterns. The seven-day maximum water temperature exceeded DEQ standards in each year monitored. Seven-day maximum temperatures exceeded 64E F longer into the summer each year. The seven-day maximum water temperature in Olalla Creek dropped (recovered) below 64E F on August 2, 1994, August 14, 1995, September 4, 1996, and September 10, 1997. This trend may be attributed to warmer weather (see Chart 5) or to land management activities that have occurred in the Olalla-Lookingglass WAU. Timber harvesting occurred within riparian areas and long term beneficial vegetation has not reestablished. In 1997, the water temperature recovered below 64E F for a short period of time in June, probably due to the rain and cloud cover that occurred during that time. Water released from the Ben Irving Reservoir enters Olalla Creek at the confluence with Berry Creek decreases the water temperature downstream. The water temperature was 47E F at 1 PM on August 20, 1997 near the confluence of Berry Creek and Olalla Creek. It is not known how far downstream the temperature remained low. The water was also very turbid, which is probably common. In general, peak water temperatures in Olalla Creek occur in July.

Regression analysis was used to evaluate possible trends or characteristics of the relationship between stream and air temperatures. Results show a good relationship between the seven-day maximum water temperature in Olalla Creek and the seven-day maximum air temperature at Riddle. The slope of the lines are shown in Graph 5. Correlation coefficients (r^2) are 0.92 for 1994, 0.50 for 1995, and 0.86 for 1996, all are statistically significant. Graph 5 shows the slope of the relation for the 1994 and 1996 data are similar, whereas the slope of the relation for the 1995 data differs from the other two years. The explanation for these relations are not know and a trend is not apparent. Further regression analysis would need to be conducted using additional stream and air temperature data. For example, air temperature from Roseburg could be used in a future analysis. Water temperature data collected by Douglas County Water Resources on Berry, Olalla, and Lookingglass Creeks were not included for this analysis. However, DEQ probably used the data for the 1988 assessment (see Table 22).

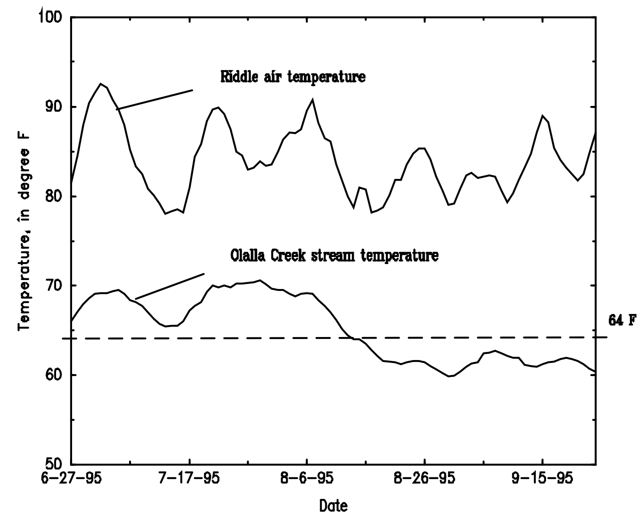
Graph 1.

Comparison of 7-day maximum temperature 1994



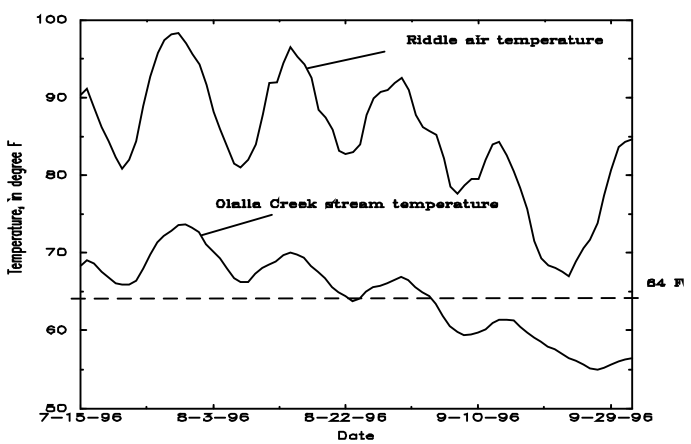
Graph 2.

Comparison of 7-day maximum temperature 1995



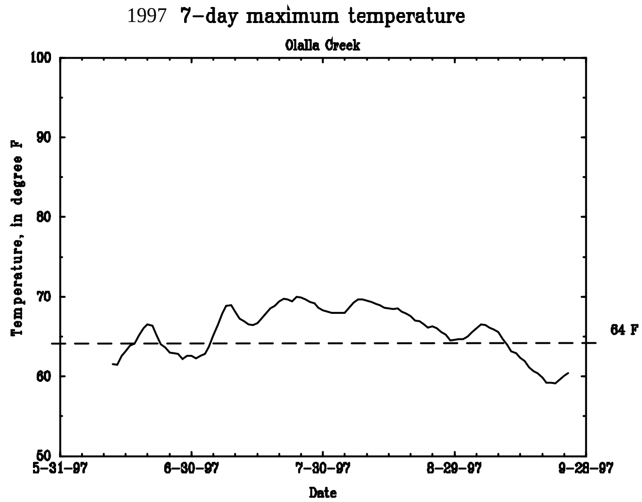
Graph 3.

Comparison of 7-day maximum temperature 1996

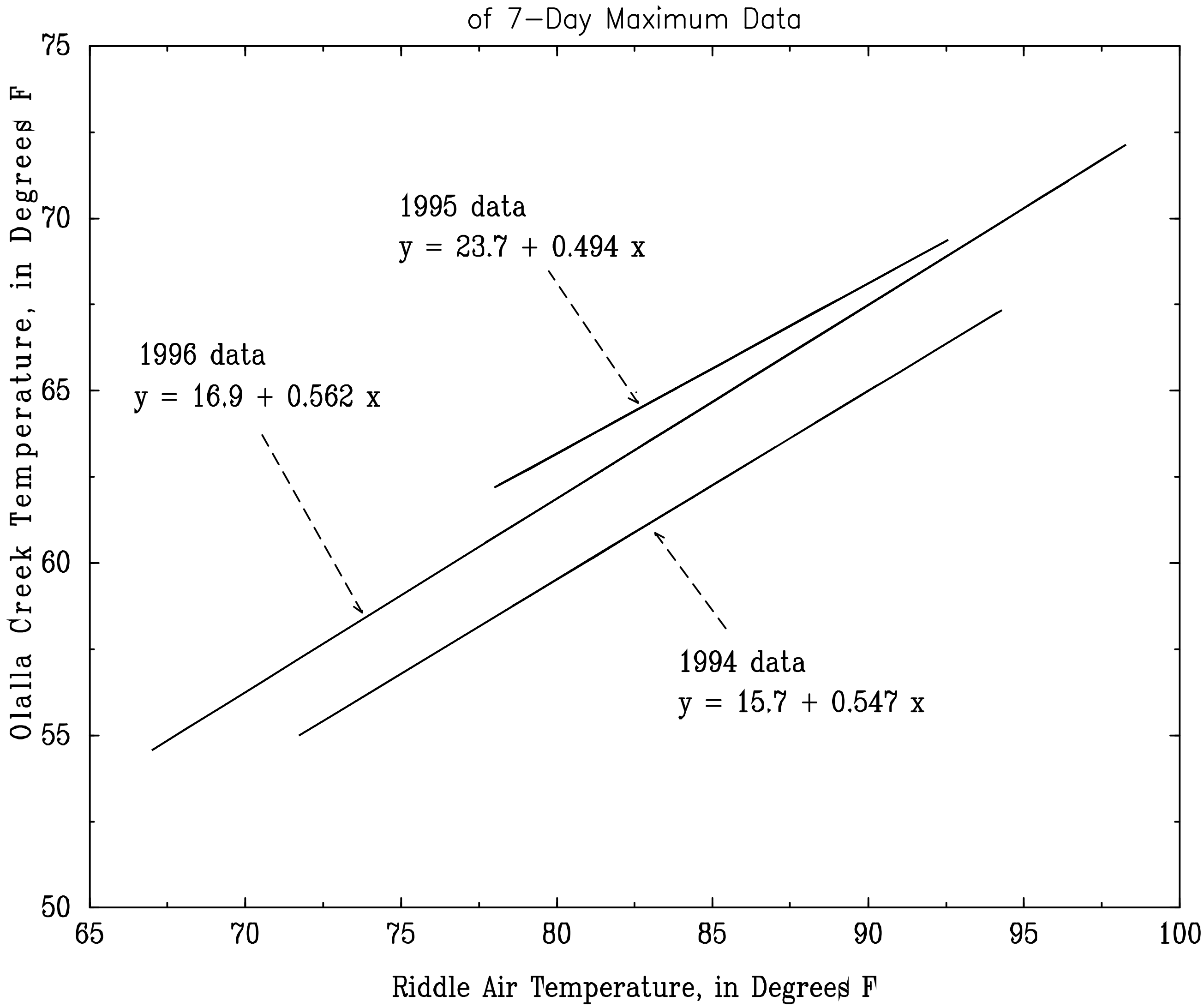


Graph 4.

1997 7-day maximum temperature



Graph 5. Comparison of Regression Equations



6. Dissolved Oxygen

Higher forms of aquatic life require oxygen for survival. Low Dissolved Oxygen (DO) has been identified by DEQ as a severe to moderate problem in steams within the WAU. This is probably due to the decreased amount of flow caused by irrigation water being withdrawn from the streams.

7. Turbidity and Sedimentation

Turbidity is another characteristic managed to protect recognized beneficial uses. No more than a ten percent increase in natural stream turbidities is allowed, as measured relative to a control point immediately upstream of the turbidity causing activity. High turbidity levels can impact salmonid feeding and fish growth (MacDonald et al. 1990). Turbidity may also impact drinking water quality, and recreational and aesthetic water uses. Turbidity reduces the depth sunlight penetrates, altering the rate of photosynthesis and impairing a fish's ability of capturing food. Turbidity increases with, but not as fast as, suspended sediment concentrations. Turbidity data have not been collected by the BLM in the Olalla-Lookingglass WAU. Problems with turbidity were identified by DEQ on Thompson Creek and with sediment on Olalla and Thompson Creeks (see Table 22).

Roads have the potential to affect the sediment regime. Additional erosional effects can occur when culverts plug or fail to handle peak flows diverting streams out of the original channel flowing down the road grade and entering another stream channel. Road surface erosion varies greatly with the type and amount of traffic, season of use, and the type and quality of road surfacing material (Reid and Dunne 1984). These types of road-related surface erosion were not quantified for this analysis. It is suggested as a future data need. The quantity of sediment associated with mass wasting and potential stream crossing failures needs to be evaluated. Sediment data have not been collected by the BLM in this WAU.

8. pH

The pH standard set by DEQ for aquatic life in the Umpqua Basin is 6.5 to 8.5. MacDonald et al. (1990) found that pH levels of greater than 9.0 and less than 6.5 can have an adverse affect on fish and aquatic insects. However, sub-lethal effects of pH levels higher than 9.0 on fish are not known.

The accumulation of algae in streams may affect pH. Aquatic organisms take up dissolved carbon dioxide (CO_2) during the process of photosynthesis and consume hydrogen (H+) ions in the daylight hours, increasing pH. At night CO_2 is released during respiration, decreasing pH. Diurnal algae driven pH levels in Little River were 9.1 in the late afternoon and 7.8 in the morning (USDA and USDI 1995). When photosynthesis is restricted, such as in shaded stream reaches and on cloudy days, pH levels are lower. In rivers not influenced by pollution pH fluctuations may occur, with the maximum values reaching as high as 9.0 (Hem 1985). One pH measurement on Olalla Creek was within the standards set by DEQ (see Table 23).

9. Trace Metals

Trace metals are probably not of much concern in the Olalla-Lookingglass WAU. Heavy metal outcrops, generally, do not occur in the WAU. Much of the historic and current mining activities have been as placer mines.

10. Ground Water

Ground water in the Winston area is diverse in chemical character (Robison and Collins 1978). There is no definite pattern in chemical character. Waters with high concentrations of dissolved solids are more likely to be found near the contact zones of the basalt members and the sandstone and siltstone member of the Umpqua Formation. The Tyee Formation is not characterized by a single type of water, except that high concentrations of dissolved solids are not common. Average water temperature reported by drillers was about 54E F, the same as the mean annual air temperature at Riddle.

E. Species and Habitats

1. Fisheries

a. Historic Fish Use in the South Umpqua River Basin

The South Umpqua River historically supported healthy populations of resident and anadromous salmonid fish. A survey conducted in 1937 by the Umpqua National Forest reported that salmon, steelhead, and cutthroat trout were abundant throughout many reaches of the river and its tributaries (Roth 1937). Excellent fishing opportunities for resident trout and anadromous salmon and trout historically existed within the South Umpqua River (Roth 1937). The historical condition of the riparian zone along the South Umpqua River favored conditions typical of old-growth forests found in the Pacific Northwest. Roth noted the shade component that existed along the reaches of streams surveyed. The majority of the stream reaches surveyed were "arboreal" in nature, meaning "tall timber along the banks, shading most of the stream" (Roth 1937). The river and its tributaries were well shaded by the canopy closure associated with mature trees. Streambanks were provided protection by the massive root systems of these trees.

Since 1937, many changes have occurred within the South Umpqua River Basin and in the stream reaches surveyed by Roth. A comparative study conducted by the Umpqua National Forest during the summer low-flow periods between 1989 and 1993 surveyed the same stream reaches in the 1937 report. The results of the study showed 22 of the 31 stream reaches surveyed were significantly different from the 1937 survey (Dose and Roper 1994). Nineteen stream reaches became significantly wider while the remaining three stream reaches were significantly narrower. Of the eight streams surveyed within designated wilderness areas, only one stream channel increased in width since 1937. In contrast, 13 of the 14 stream reaches located in timber harvest emphasis areas were significantly wider than in 1937.

The stream widening could have resulted from increased peak flows. Peak flows typically occur due to the removal of vegetation (tree canopy) and the increase in compacted areas within a watershed, especially within the Transient Snow Zone (Meehan 1991). Peak flows can introduce sediment into the channel from upslope and upstream and can also simplify the channel by rearranging instream structure. Excessive sediment delivery to streams usually changes stream channel characteristics and channel configuration. These stream channel changes normally result in decreasing the depth and the number of pool habitats and reducing the space available for rearing fish (Meehan 1991).

Winter steelhead and resident rainbow trout (Oncorhynchus mykiss), fall and spring chinook salmon (Oncorhynchus tshawytscha), coho salmon (Oncorhynchus kisutch), and sea-run cutthroat and resident cutthroat trout (Oncorhynchus clarki) have been documented using the Olalla-Lookingglass WAU. Over the last 150 years, salmonids have had to survive dramatic changes in the environment where they evolved. The character of streams and rivers in the Pacific Northwest has been altered through European settlement, by urban and industrial development, and by land management practices. Modifications in the landscape and waters of the South Umpqua River Basin, beginning with the first settlers, have made the South Umpqua River less habitable for salmonid species (Nehlsen 1994).

Results from the recent United States Forest Service (USFS) study document changes in low-flow channel widths within the South Umpqua River Basin since 1937 (Dose and Roper 1994). Land management activities (road construction and timber harvesting) have contributed to the changes in channel characteristics. These changes in channel condition may have resulted in the observed decline of three of the four anadromous salmonid stocks occurring in the South Umpqua River Basin (Dose and Roper 1994).

The South Umpqua River once supported abundant populations of chinook and coho salmon, and steelhead and cutthroat trout. These species survived in spite of the naturally low streamflows and warm water temperatures that occurred historically within this Subbasin (Nehlsen 1994). Currently, salmonid populations throughout the Pacific Northwest are declining. A 1991 status report identified a total of 214 native, naturally spawning stocks in the Pacific Northwest as vulnerable and at-risk of extinction (Nehlsen et al. 1991). According to this 1991 report, within the South Umpqua River, one salmonid stock is considered extinct, two stocks of salmonids are at-risk of extinction, and two stocks were not considered at-risk.

Historically steelhead runs in the South Umpqua River were strongest in the winter (Roth 1937). Currently, winter steelhead are considered to be the most abundant anadromous salmonid in the South Umpqua River (Nehlsen 1994). In 1937, Roth reported summer steelhead above the South Umpqua Falls. Summer steelhead are now considered to be extinct (Nehlsen et al. 1991).

Roth (1937) reported the principal run of chinook was in the late spring and summer. Presently, spring chinook runs are considered to be depressed by the Oregon Department of Fish and Wildlife (ODFW). Nehlsen et al. (1991) reported the spring chinook run at high risk of extinction. Fall chinook are considered to be healthy by ODFW (Nehlsen 1994).

Coho salmon were considered abundant in the South Umpqua River Basin in 1972 by the Oregon State Game Commission (Lauman et al. 1972). An estimated 4,000 fish spawned in the basin with the largest number of fish (1,450) spawning within Cow Creek. Presently, coho salmon in the South Umpqua River Basin are suffering the same declines as other coastal stocks. These declines may be due to several factors, including the degradation of their habitat, the effects of extensive hatchery releases, and overfishing (Nehlsen 1994). No coho salmon were sampled within the survey area (i.e., upper stream reaches of the South Umpqua River) during the 1937 survey. A subsequent study conducted during the summer of 1989 in Jackson Creek, a major tributary to the South Umpqua River, documented the common presence of coho salmon within this tributary (Roper et al. 1994). The documentation of coho salmon using Jackson Creek qualifies this species existence in the upper reaches of the South Umpqua River Basin. Coho salmon have been observed and sampled within the Olalla-Lookingglass WAU as well.

Sea-run cutthroat are assumed to be depressed from historic levels. The information provided in the 1937 Roth report noted cutthroat trout were common and/or abundant throughout the stream reaches surveyed in the upper South Umpqua River Basin. There are limited historical records on cutthroat population size within the South Umpqua River.

The assumption that sea-run cutthroat trout abundance is currently below historic levels throughout the Umpqua Basin has been based upon the information provided by the fish counting station at Winchester Dam on the North Umpqua River. Between the years of 1947 and 1957 the North Umpqua River boasted runs of sea-run cutthroat trout averaging approximately 900 fish per year. The highest number return of 1,800 fish occurred in 1954 and the lowest return for the ten year period was 450 fish in 1949. In the late 1950s the sea-run cutthroat trout returns declined drastically.

The stocking of Alsea River cutthroat trout into the Umpqua system began in 1961 and was continued until the late 1970s. The stocking of this genetically distinct stock of trout into the Umpqua system has apparently led to compounding the problem for the sea-run cutthroat trout native to the Umpqua River Basin. Sea-run cutthroat trout returns have been extremely low since discontinuing the hatchery releases in the late 1970s. The levels of returns resemble prehatchery release conditions of the late 1950s, with an average return of <100 fish/year (ODFW 1994 - overhead packet). In the 1992-1993 run, no sea-run cutthroat returned to the North Umpqua River. In subsequent years, sea-run cutthroat trout numbers have been a total of 29 fish in the 1993-1994 run, 1 fish in the 1994-1995 run, 79 fish in the 1995-1996 run, and 81 fish in the 1996-1997 run.

According to the available data, the South Umpqua River appears to have supported a larger run of sea-run cutthroat trout than the North Umpqua River. In 1972, a total of 10,000 sea-run cutthroat trout were estimated within the South Umpqua River Basin. Sea-run cutthroat trout populations seemed to have the highest occurrence in those streams occupied by and accessible to coho salmon (Lauman et al. 1972). Today, these fish are limited to the upper portion of the mainstem South Umpqua River and Cow Creek, one of the major tributaries to the South Umpqua River. Warm water temperatures, lack of over-summering pool habitats, and low flows have precluded their use of the lower stream reaches in the basin (Nehlsen 1994).

b. Current Stream Habitat Conditions

The Umpqua Basin cutthroat trout has been listed by the National Marine Fisheries Service (NMFS) as an endangered species under the Endangered Species Act (ESA) of 1973, as amended. The Oregon Coast coho salmon was a proposed species. The National Marine Fisheries Service determined the Oregon Coast coho salmon Evolutionary Significant Unit did not warrant listing but may consider the Oregon Coast coho salmon to be a candidate species in 3 years (or earlier if warranted by new information) (Federal Register, Vol. 62, No. 87/Tuesday, May 6, 1997/Rules and Regulations). The West Coast steelhead has been proposed for listing by NMFS as a threatened species under the ESA. Two fish species, the Pacific lamprey (Lampetra tridentata) and the Umpqua chub (Oregonichthys kalawatseti) are on the United States Fish and Wildlife Service (USFWS) list as Species of Concern and are considered Bureau Sensitive species by the BLM (Manual 6840). All these species have been documented within the South Umpqua River.

Fish distribution limits have been mapped, using GIS, for streams with documented barriers within the Olalla-Lookingglass WAU (see Map 14). Distribution limits of anadromous and resident fish are determined by the extent these fish are able to migrate upstream. Natural waterfalls, log or debris jams, beaver dams, and road crossings are potential barriers to fish movement and migration. Fish barriers are shown on Map 15.

Aquatic habitat inventories have been completed for the mainstems of Bear, Berry, Byron, Coarse Gold, Olalla, Thompson, Wildcat, and Willingham Creeks in the Olalla-Lookingglass WAU. The aquatic habitat inventory covers about 43 miles of the approximate 725 total stream miles within the Olalla-Lookingglass WAU (see Table C-1 in Appendix C). The inventories are used to describe the current condition of the aquatic habitat with a focus on the fish bearing stream reaches within a watershed.

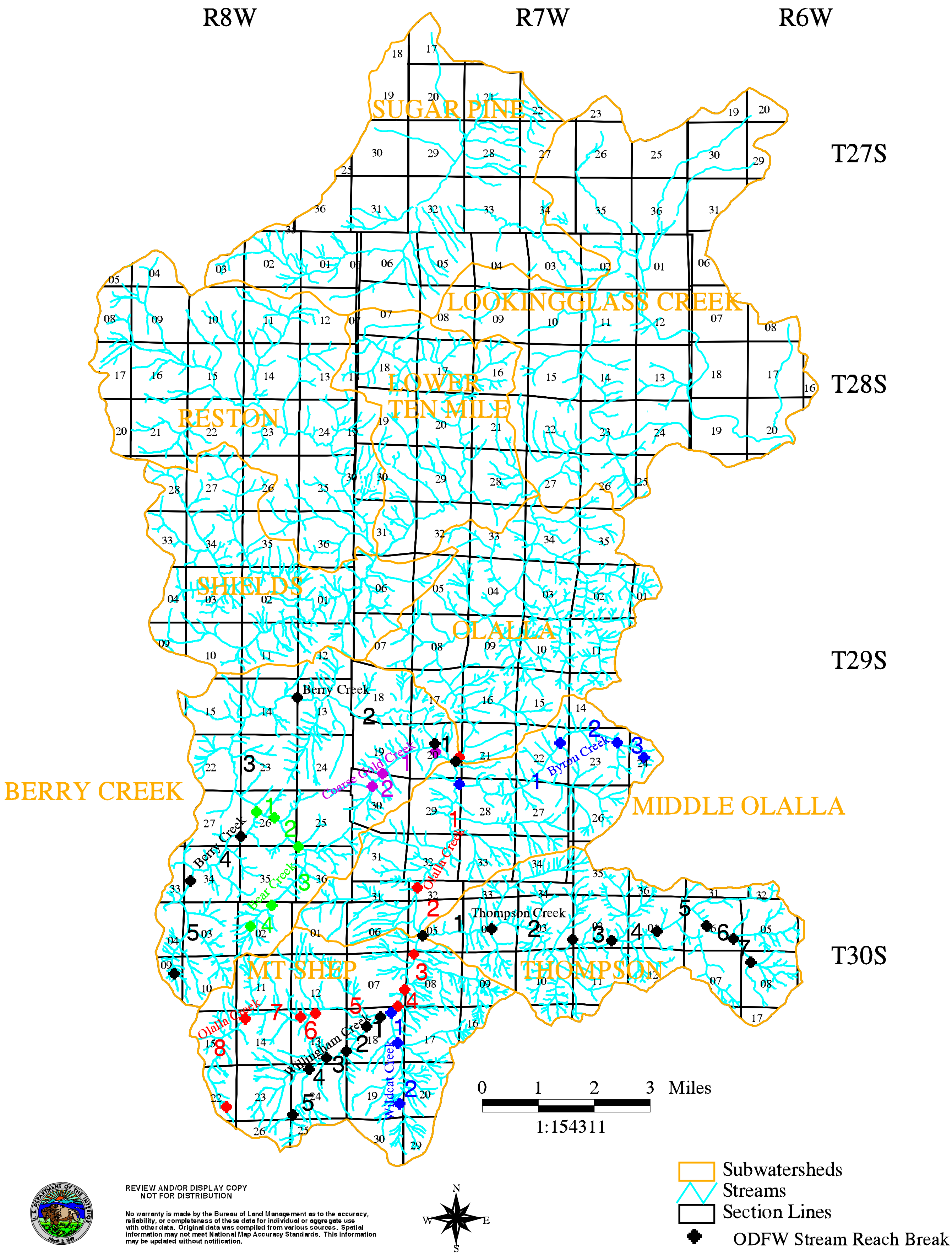
The aquatic habitat inventory is not a fish distribution or fish abundance survey. The habitat inventory is designed only to survey physical habitat features. However, fish use and distribution information was noted in the habitat inventories. The stream surveyors noted fish use by visual observation only. Fish distribution surveys are currently underway on the Roseburg District BLM to determine the upper limits of resident fish use on BLM administered lands. The Olalla-Lookingglass WAU is planned to be surveyed for resident fish use during the summer of 1998. The information available on the habitat condition and the distribution of fish species in the streams that have not been surveyed is in the form of personal communications and observations by ODFW and BLM biologists.

The data collected through the ODFW Aquatic Habitat Inventory can be used to analyze the components that may limit the aquatic habitat and the fishery resource from reaching their optimal functioning condition. The Habitat Benchmark Rating System is a method developed by the Umpqua Basin Biological Assessment Team (BAT team) to rank aquatic habitat conditions. The BAT team consists of fisheries biologists from the Southwest Regional Office of the ODFW, Coos Bay District BLM, Roseburg District BLM, Umpqua National Forest USFS, and Pacific Power and Light Company. The intention of the matrix designed by the BAT team is to provide a framework to easily and meaningfully categorize habitat condition. This matrix is not intended to reflect equality of the habitat condition of each stream reach, but is intended to summarize the overall condition of the surveyed reaches. The matrix is a four category rating system consisting of an *Excellent*, *Good*, *Fair*, or *Poor* rating.

Data from the 1995 ODFW Aquatic Habitat Inventories for Olalla-Lookingglass WAU were analyzed to determine an overall aquatic habitat rating (AHR) for each stream. How the ratings correlate to the NMFS Matrix (see Appendix C) are shown in Table 24.

Each stream contains different limiting factors. Limiting factors for the fishery resource may include conditions where there has been a reduction in instream habitat structure, an increase in sedimentation, the absence of a functional riparian area, a decrease in water quantity or quality, or the improper placement of drainage and erosion control devices associated with the forest road network.

Map 14. Olalla-Lookingglass WAU
ODFW Aquatic Habitat Inventory Stream Reaches



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Map 15. Olalla-Lookingglass WAU
Fish Barriers

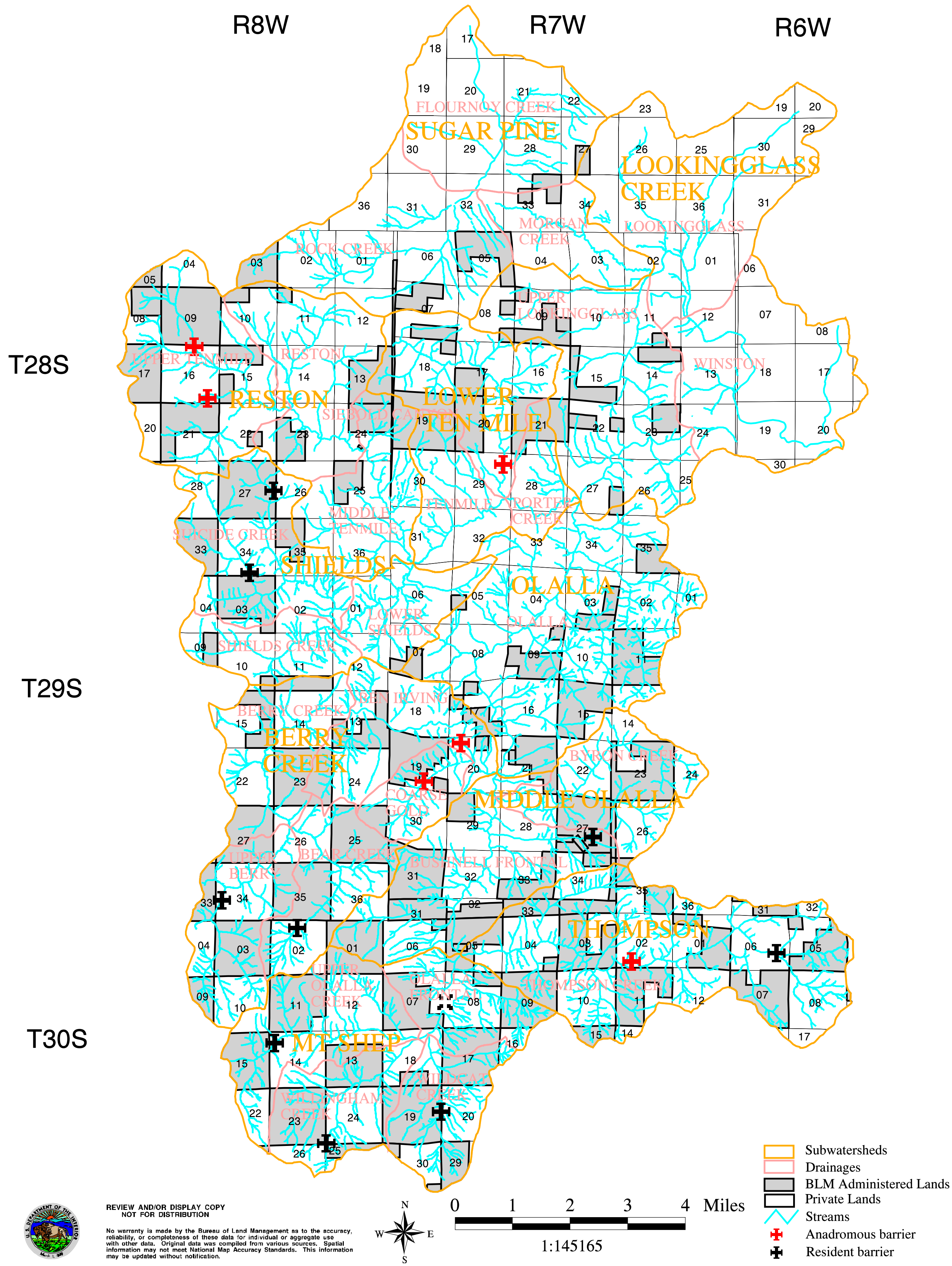

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Table 24. Aquatic Habitat Ratings (AHR).

ODFW Aquatic Habitat Inventories	NMFS Matrix
Excellent or Good	Properly Functioning
Fair	At Risk
Poor	Not Properly Functioning

Twenty of the 35 stream reaches identified in the aquatic habitat inventories were rated as being in fair condition (see Table C-1 in Appendix C). No stream reaches were rated excellent. Eight stream reaches were rated in good condition. These eight stream reaches are located in the higher elevations, above anadromous fish barriers. Seven of these eight stream reaches contain resident fish populations. Three of the fish-bearing stream reaches are located in Olalla Creek.

Seven reaches were rated as being in poor condition. Some of the limiting factors associated with these reaches were the lack of Large Woody Debris (LWD), high width to depth ratios (W/D), relatively high sediment loads located in riffle habitats, and hardwood dominated riparian vegetation.

Thompson Creek, a major tributary to Olalla Creek, contains approximately 3.5 miles of anadromous habitat on BLM administered and private lands. The BLM administers 1 mile of anadromous habitat and approximately 2.5 miles of resident fish habitat on Thompson Creek. Reach 5 was rated good. Half of reach 2 is located on BLM administered lands in T30S, R7W, Section 3. The Thompson Subwatershed has a relatively intact Riparian Reserve system when compared to the other subwatersheds in this WAU. Approximately 56% of the Riparian Reserves in the Thompson Subwatershed is in timber stands greater than 80 years old. The potential for these Riparian Reserves to provide LWD to the stream system in the near future (next 10-20 years) is high.

2. Wildlife

A variety of wildlife species live in the different plant communities present in the WAU. The various vegetation types provide habitat to over 200 vertebrate species and thousands of invertebrate species. Fifty-six animal species are of special concern because they are Federally Threatened (FT), Endangered (FE), Bureau Sensitive (BS), Bureau Assessment species (BA), or Oregon State sensitive species (see Table E-1 in Appendix E). In addition to these species, the Standards and Guidelines in the Record of Decision (ROD) for the Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl (USDA and USDI 1994b), lists animal species to survey and manage (S&M) for in Oregon, Washington, and California (USDA and USDI Appendix J2 1994a).

a. Threatened and Endangered Species

Five terrestrial species known to occur in the Roseburg District are legally listed as Federally Threatened (FT) or Federally Endangered (FE). These include the American Bald Eagle (Haliaeetus leucocephalus) (FT), the Marbled Murrelet (Brachyramphus marmoratus) (FT), the Northern Spotted Owl (Strix occidentalis caurina) (FT), the Peregrine Falcon (Falco peregrinus anatum) (FE), and the Columbian White-tailed Deer (Odecoilus virginianus leucurus) (FE). The northern spotted owl and the marbled murrelet are the only Federally listed threatened or endangered terrestrial species known to occur within the Olalla-Lookingglass WAU.

1) The Northern Spotted Owl

The northern spotted owl is found in the Pacific Northwest, from northern California to lower British Columbia in Canada. The geographic range of the northern spotted owl has not changed much from historical boundaries. Nesting habitat historically used by spotted owls has been changed to the point that owl population numbers have declined and distribution rearranged.

Suitable forest stands where spotted owls have been located are known as spotted owl activity centers or master sites. In the Olalla-Lookingglass WAU, there are 37 spotted owl master sites. This number includes current and historically active and inactive master sites. Of the 37 total sites, 32 sites are found on BLM administered lands (16 in the LSR/Marbled Murrelet Reserves and 16 in Matrix) and five on private lands. Of the 32 potential sites on BLM administered land, 18 sites were occupied in 1996 (9 in the LSR/Marbled Murrelet Reserves and 9 in Matrix). One out of the five potential sites on private land was occupied in 1996.

Habitat important to the spotted owl on Federal land was identified by Roseburg District BLM biologists based upon on-the-ground knowledge, inventory description of forest stands, and known characteristics of the forest structure. Two habitat types were described and named Habitat 1 (HB1) and Habitat 2 (HB2). Habitat 1 describes forest stands that provide nesting, foraging, and resting components. Habitat 2 describes forest stands that provide foraging and resting components but lack nesting components. Other areas not fitting into the HB1 or HB2 category and greater than 40 years old are considered dispersal habitat. Dispersal habitat refers to forest stands greater than 40 years of age that provide cover, roosting, foraging and dispersal components spotted owls use while moving from one area to another (Thomas et al. 1990, USDI 1992a, USDI 1994b). There are 13,962 acres of suitable habitat in the WAU. Fifty-one percent of Federally administered lands in the Olalla-Lookingglass WAU, which is 22% of the total of all lands in the WAU, are considered to be suitable spotted owl habitat. Map 16 shows the distribution of suitable (HB1 and HB2) and dispersal habitat within the Olalla-Lookingglass WAU.

a) Dispersal Habitat

One method used to quantify dispersal habitat on Federally administered lands is the amount of 50-11-40 acres. This number (50-11-40) refers to the condition where 50% of forested stands within a quarter township is composed of 11 inch diameter trees with a minimum of 40% canopy closure (Thomas et al. 1990). This habitat condition is important as dispersal habitat outside of Late-Successional Reserves. Map 17 shows which quarter townships meet the 50-11-40 specifications on Federally administered lands.

b) Critical Habitat for the Recovery of the Northern Spotted Owl

The Olalla-Lookingglass WAU boundary overlaps two Critical Habitat Units (CHU-OR-61 and CHU-OR-62) (see Map 18). There are 2,775 acres in CHU-OR-61 and 49,503 acres in CHU-OR-62. Approximately 90% of CHU-OR-61 and about 30% of CHU-OR-62 are inside the WAU boundary.

Critical Habitat Unit OR-62 was designated to provide a source of future owls. Approximately 57% of CHU-OR-62 is considered to be HB1 or HB2 and 59% is in dispersal habitat. Eight pairs of owls within the Olalla-Lookingglass WAU have activity centers in CHU-OR-62 and have reproduced within the last three years. Approximately 80% of CHU-OR-62 is located in the LSR Land Use Allocation and would be expected to improve in habitat quality over time.

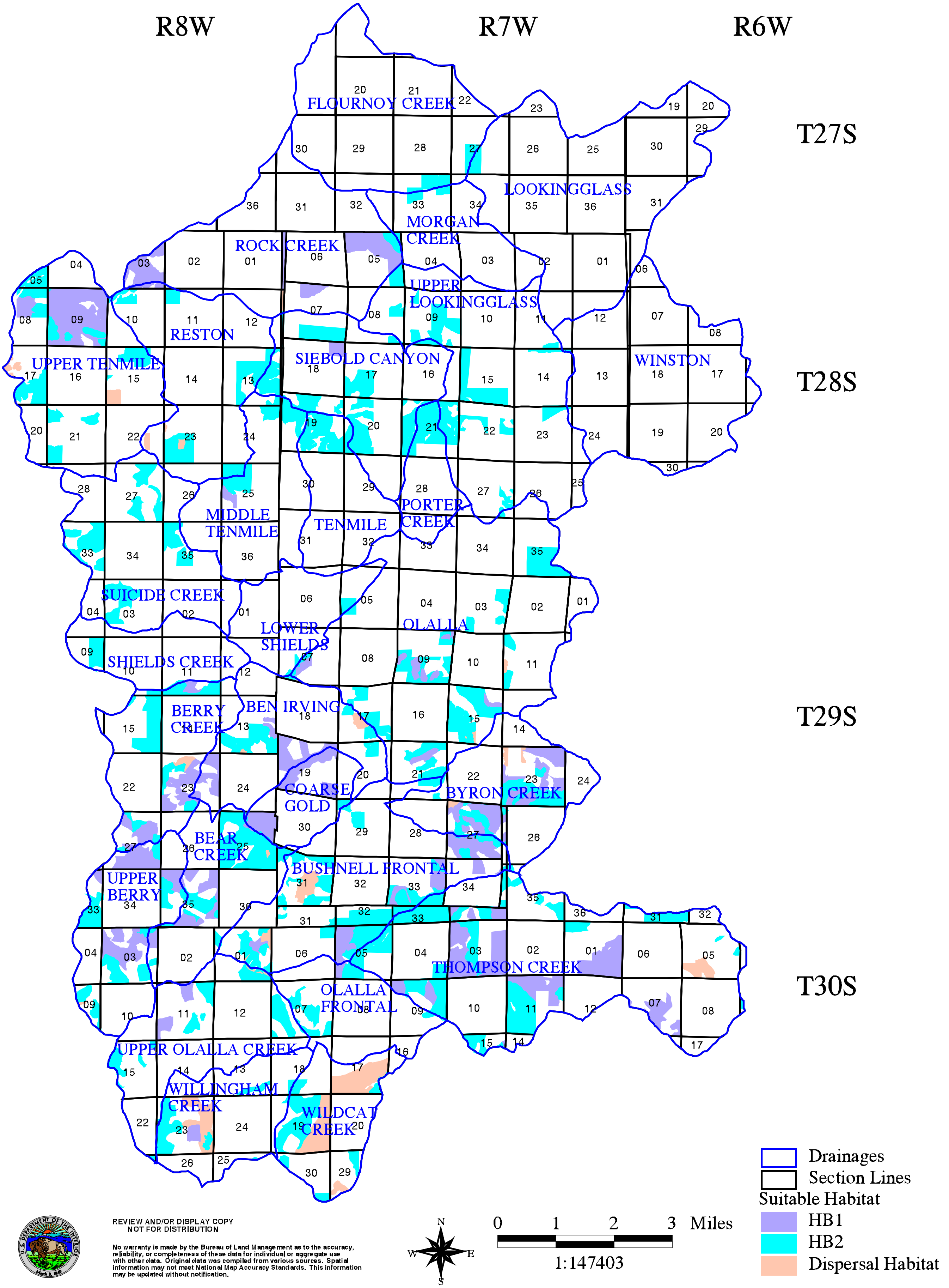
Critical Habitat Unit OR-61 was designated to provide dispersal habitat for linkage between provinces and foraging opportunities. The final designation of Critical Habitat emphasized the importance of dispersal habitat in CHU-OR-61 and the region (USDI 1992b). Approximately 65% of Federally administered land in CHU-OR-61 is in dispersal habitat. All of the dispersal habitat is located in the Marbled Murrelet Reserve Land Use Allocation and would be expected to improve in habitat quality over time.

2) The American Bald Eagle

Historic distribution of the bald eagle included the entire northwestern portion of the United States (California, Oregon, and Washington), Alaska, and western Canada. Bald eagle populations probably started declining in the 19th century but did not become noticeable until the 1940s (USDI 1986).

Throughout the North American range, drastic declines in bald eagle numbers and reproduction occurred between 1947 and the 1970s. In many places, the bald eagle disappeared from the known breeding range.

Map 16. Suitable and Dispersal Habitat Within the Olalla-Lookingglass WAU



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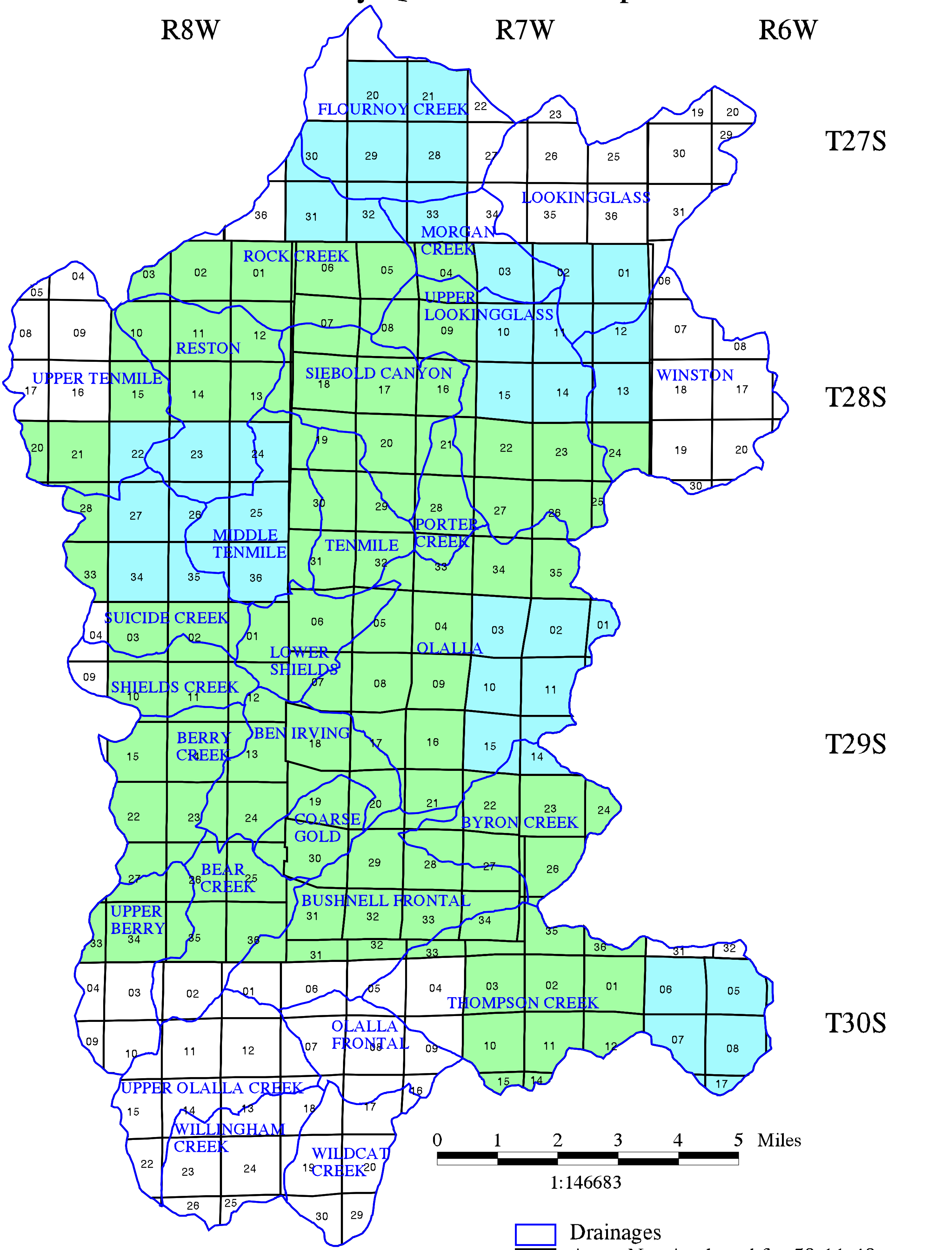
Map 17. Olalla-Lookingglass WAU 50-11-40 Habitat Available by Quarter Township



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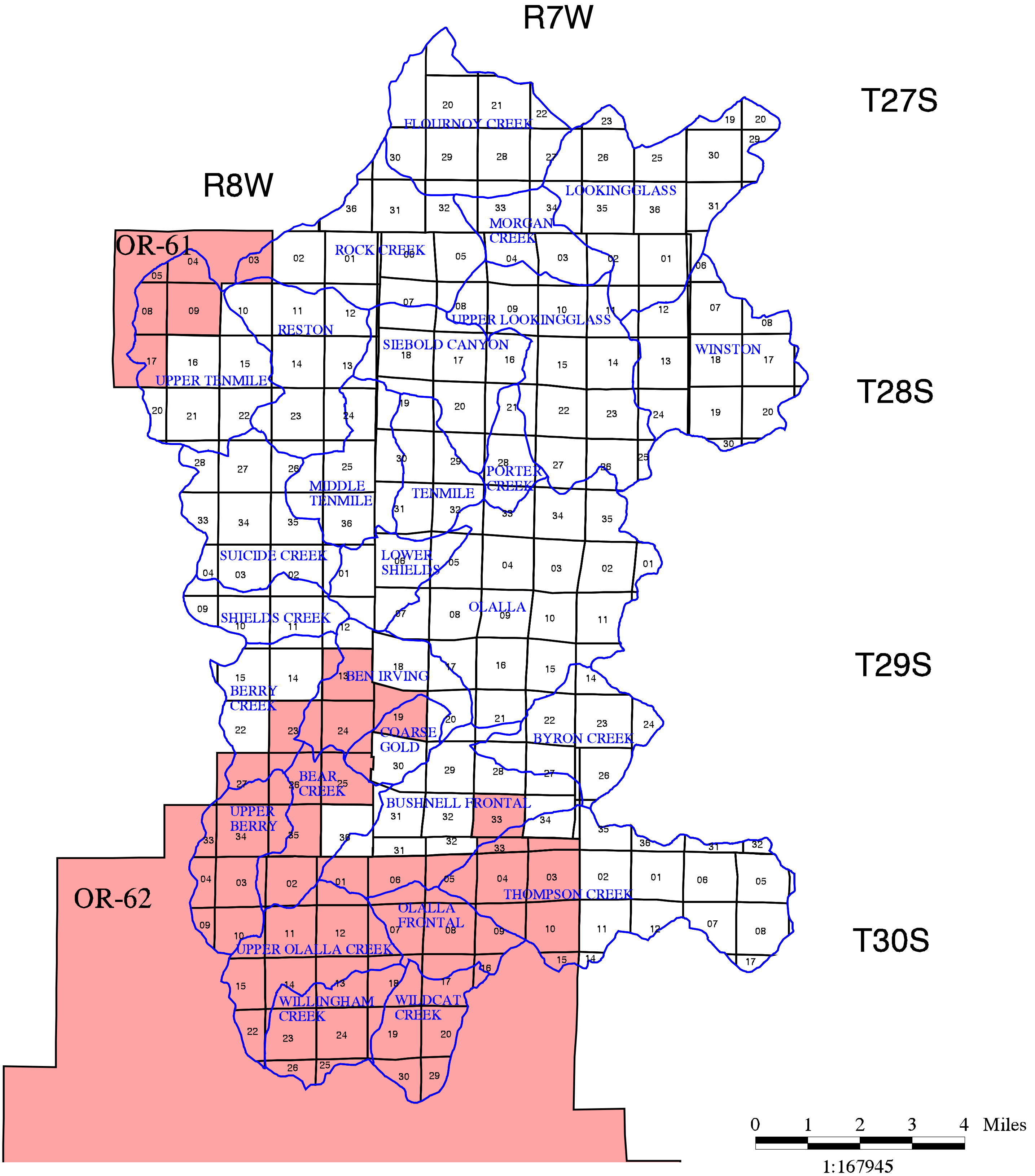
Map 18. Spotted Owl Critical Habitat Units in the Olalla-Lookingglass WAU



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N
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Drainages
Section Lines
Spotted Owl Critical Habitat Units (CHU)

The reason for this decline was the impact organochloride pesticide (DDT) use had on the quality of egg shells produced by bald eagles (USDI 1986). Bald eagle numbers probably declined on the Roseburg BLM District because DDT was used in western Oregon from 1945 to the 1970s (Henny 1991). Other causes of bald eagle decline included shooting and habitat deterioration (Anthony et al. 1983). Historically, removal of old-growth forests near major water systems (e.g., North and South Umpqua Rivers) contributed to habitat deterioration through the loss of bald eagle nesting, feeding, and roosting habitat.

Information collected from yearly inventories (1971 to 1995) by Isaacs and Anthony (1995) of known bald eagle sites in Douglas County does not list any sites, nests, or territories within or near the Olalla-Lookingglass WAU. Some forest stands along Ben Irving Reservoir are considered potential bald eagle habitat. Stand characteristics such as large, dominant trees with large limbs and broken tops and close to water, often used by eagles for nesting, are present in some of the forest stands within one mile of the reservoir. Midwinter surveys, from Days Creek to Melrose, have not detected bald eagles in the Olalla-Lookingglass WAU (Isaacs 1995). On occasion, bald eagles are observed during the winter near the reservoir but the eagles do not stay and do not appear to use the area as a long term wintering ground. To date there is no evidence of nesting by bald eagles in the WAU.

3) The Peregrine Falcon

In Oregon, peregrine falcons were a "common breeding resident" along the Pacific coastline and were present in many areas including southwestern Oregon (Haight 1991). Peregrine falcon populations in the Pacific Northwest declined because of organochloride pesticide use, shooting, other chemicals (avicides, such as organophosphates) used to kill other bird species considered pests, and habitat disturbance (loss of wetlands, loss of fresh water marsh environments in interior valleys, and increased rural development) (Aulman 1991).

Several areas in the Olalla-Lookingglass WAU have exposed bedrock due to erosion and other geological processes. An evaluation of aerial photographs and on-the-ground surveys determined rock outcrops or cliff habitats are present in the WAU. The potential exists for peregrine falcons to use these habitats. Peregrine falcons have been reported in the South River Resource Area. However, there is no record of an occupied site within the Olalla-Lookingglass WAU, as of 1997. Adult peregrine falcons have been observed for several years near one habitat location in the WAU. Surveys are continuing to document the status of eight potential sites in the WAU.

4) The Marbled Murrelet

The marbled murrelet was listed as a threatened species in 1992 (USDI 1992c). Critical habitat for the recovery of the marbled murrelet was designated in 1996 (Federal Register 61(102):26256-26278). Several hundred acres of designated marbled murrelet critical habitat fall within the Olalla-Lookingglass WAU. The marbled murrelet is found in the Roseburg BLM District.

All of the Olalla-Lookingglass WAU is inside the 50 mile zone from the coast, which is considered to be the extent of suitable marbled murrelet habitat. Information about the biology and inland nest sites indicates the marbled murrelet is unlikely to be found more than 50 miles from the Oregon Coast (USDA and USDI 1994a, USDI 1992c). Surveys to detect marbled murrelets are not required beyond 50 miles from the Oregon Coast. Within the 50 mile zone, there are 12,152 acres of suitable marbled murrelet habitat in the WAU (see Map 19). Almost half of the suitable marbled murrelet habitat is not within the LSR Land Use Allocation in the WAU. No marbled murrelet sites have been located in the WAU.

5) The Columbian White-tailed Deer

The Olalla-Lookingglass WAU is outside the current and historical distribution range of the Columbian white-tailed deer (USDI 1983). The Columbian white-tailed deer is not present in the WAU. The officially designated white-tailed deer range is restricted to an area northeast of Roseburg, approximately 10 air miles from the northern boundary of the Olalla-Lookingglass WAU (USDI 1983). A small sub-population was introduced over the past ten years into the Happy Valley area, which is directly east of the Winston and Lookingglass Drainages. The size of this population is unknown, but is thought to be less than 30 animals. The Happy Valley sub-population is not considered to be a stable source for expanding the range of the Columbian white-tailed deer at this time.

b. Remaining Species of Concern

Animal species not threatened or endangered, may belong to the Federal Candidate, Bureau Sensitive, Bureau Assessment, or Survey and Manage category. On the Roseburg BLM District 23 are Bureau Sensitive and 14 are Bureau Assessment species. Table E-1 in Appendix E lists the species expected to occur in the Olalla-Lookingglass WAU.

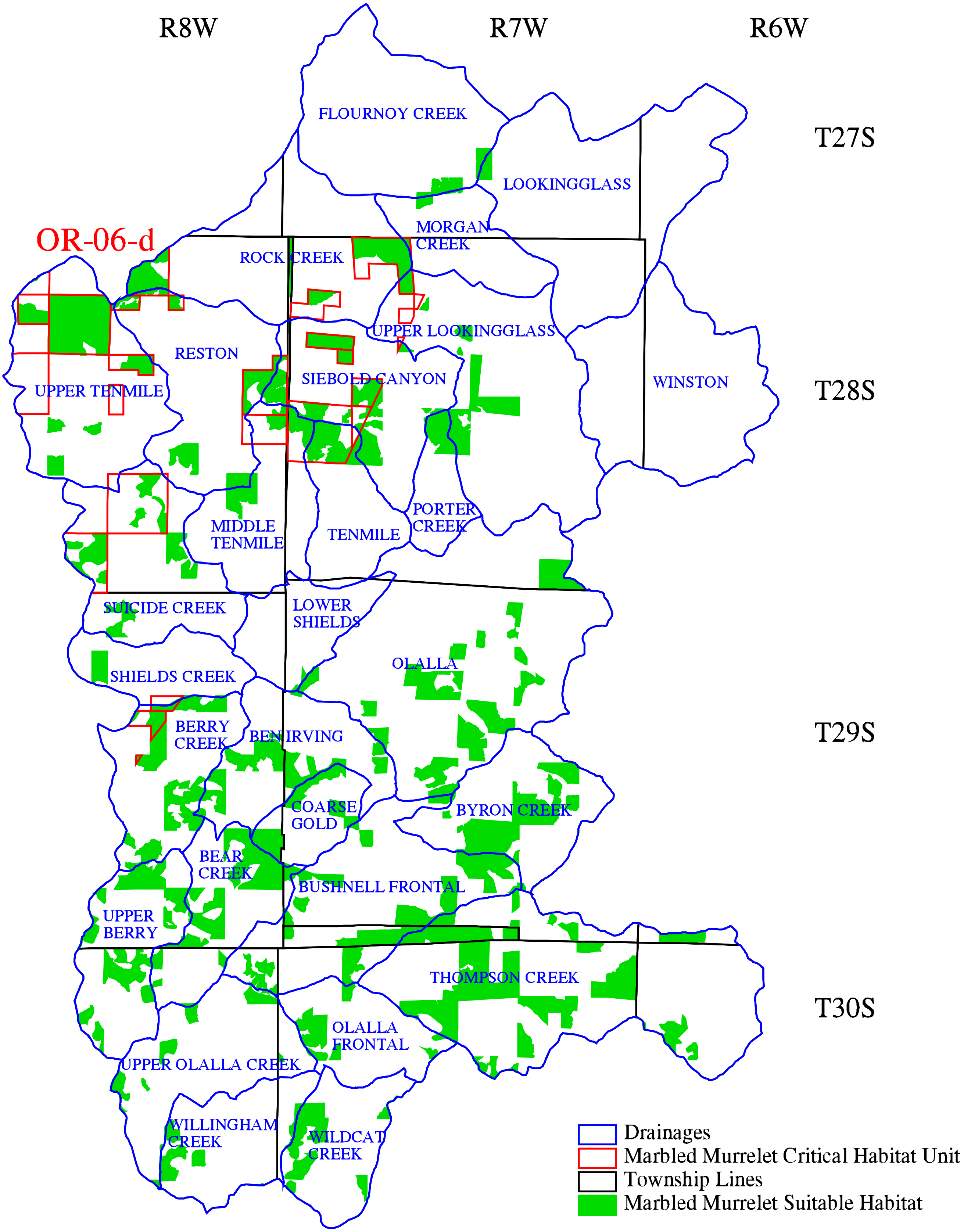
Although there is information about the biology and habitat requirements of the Bureau Sensitive and Bureau Assessment species, population levels and current distribution are not available. Many of these animals use unique features such as ponds, seeps, caves, or talus found throughout the landscape and associated vegetation cover. In the Olalla-Lookingglass WAU, the forest inventory of age classes is available, but the distribution patterns and abundance of unique habitats are not available at this time.

1) Mollusks

In western Oregon and Washington, over 150 species of land snails and slugs have been identified. Mollusks can be found at any elevation and in different habitat types. Generally, snails and slugs avoid disturbed areas where habitat modification leads to loss of moisture and increased exposure to solar radiation (Frest and Johannes 1993).

Managing for late seral characteristics tends to increase the moisture retention of an area. Increased tree species diversity (especially hardwood species), down woody debris amounts, and soil depth in late seral

Map 19. Marbled Murrelet Habitat and Critical Habitat Unit Within the Olalla-Lookingglass WAU



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stands produce a more favorable moisture regime at a given site and increases the abundance and diversity of mollusks present. Mollusk abundance increases the available nutrients at a site, increasing growth rates and moisture retention.

Over 200 species of aquatic mollusks have been documented in western North America. These species inhabit permanent or seasonal water bodies. Most freshwater mollusks prefer cold and clear streams with dissolved oxygen (DO) near saturation levels (Frest and Johannes 1993). In 1993, Frest and Johannes stated that 108 mollusk species (57 freshwater aquatic and 51 land) are known in the range of the spotted owl. Of these, 102 species are known or are likely to occur on Federally administered lands.

In 1997, Frest and Johannes reported 46 mollusk species (17 land and 29 aquatic species) were known to occur in Douglas County. An additional 75 species may be present. Thirty-one of these species were analyzed in the SEIS ROD as sensitive taxons. Only five species of land snails and slugs present in Douglas County are listed in Table C-3 of the SEIS ROD as requiring surveys prior to ground disturbing activities.

The current distribution of mollusks reflects the progressive fragmentation of historically more uniform habitat and widespread ranges due to human alteration of forested environments. Three mollusk survey plots were located in the Berry Creek Subwatershed in 1997. Several species were common on most plots, including Ancotrema sportella, Haplotrema vancouverense, and undescribed species of Vespericola and Monadenia. One Survey and Manage species, Prophysaon dubium, was located at two sites within the WAU.

One Survey and Manage species thought to be present in the southern portion of the Roseburg BLM District is Helminthoglypta hertleini, a medium-sized land snail that frequently is found in rocky talus habitats. The habitat type and range is similar to that of the Del Norte salamander, which is also a Survey and Manage species. Surveys for these two species could be conducted simultaneously. No sites of Helminthoglypta hertleini had been found on the Roseburg BLM District, as of July 1997.

2) Amphibians

An inventory of amphibians in the South River Resource Area was completed in 1994 (Bury 1995) and another inventory was conducted in 1997. These inventories document amphibian species in the area. The spotted frog is not expected to occur in the Olalla-Lookingglass WAU and was not found during the 1994 inventory. Species like the Southern Torrent salamander (Rhyacotriton variegatus), western red-backed salamander (Plethodon vehiculum), Dunn's salamander (Plethodon dunni), and other regional species were documented in the WAU.

Amphibian species such as the northern red-legged frog, foothill yellow-legged frog, and clouded salamander use unique habitats often found within many vegetation types. Features like large down woody material, talus slopes, creeks, seeps, ponds, and wetlands are often used by amphibian species in southwestern Oregon. Because these features are found in the Olalla-Lookingglass WAU, these amphibian species are expected to occur here.

The Del Norte salamander (Plethodon elongatus), a Survey and Manage species, was located north of the Medford BLM District line near Union Creek in the Cow Creek Watershed in 1997. This is the first and farthest north known Del Norte salamander site located in the South River Resource Area and the Roseburg BLM District. The Del Norte salamander uses forested talus habitat, rocky substrates in hardwood forests, and riparian areas. Other habitat features include cool moist conditions with moss and fern ground cover, lichen downfall, deep litter, and cobble dominated rocky substrates (IB-OR-96-161, Protocols for Survey and Manage Amphibians). Ongoing surveys may extend the range of the Del Norte salamander into the Olalla-Lookingglass WAU. Surveys for the Del Norte salamander need to be conducted within 25 miles of known sites. The entire Olalla-Lookingglass WAU falls within the 25 mile buffer zone, which means surveys for the Del Norte salamander need to be conducted within the WAU.

3) Mammals

During the summer of 1994, a survey to identify the bat species present in the South River Resource Area was conducted by Dr. Steve Cross of Southern Oregon College in Ashland, Oregon. Bat species use unique habitats like caves, talus, cliffs, snags, and tree bark for roosting, hibernating, and maternity sites. In addition, bats use other unique habitats (ponds, creeks, and streams) for food and water. Special status bat species are present on the Roseburg BLM District and are expected to occur in the Olalla-Lookingglass WAU.

Mammals like the white-footed vole and the red tree vole, which have geographic ranges including the Roseburg BLM District, are expected to be present in the Olalla-Lookingglass WAU. Information about the biology and life history of the white-footed vole is limited (Marshall 1991). This species is associated with riparian zones, woody materials, and heavy cover. More recent information suggests the white-footed vole is associated with mature forests (Marshall 1991). The red tree vole is an arboreal rodent, which lives inside the tree canopy of Douglas-fir forests in Oregon and Northern California. Its primary food is Douglas-fir needles. However, needles from Sitka spruce, western hemlock, and grand fir are also eaten by red tree voles (Huff et al. 1992). In 1997, the South River Resource Area began surveying for red tree voles. The results will not be available until end of 1997 or the beginning of 1998. Reports from evaluating spotted owl pellets indicate the red tree vole is present in the Olalla-Lookingglass WAU.

4) Northern Goshawk

Information about the northern goshawk is readily available (Marshall 1991). However, most of the work with this species was done east of the Cascades. Current geographic distribution suggests that the goshawk would not be expected to occur in most of the Roseburg BLM District. Observations recorded since 1984 show the goshawk is present north of the expected distribution range. In the early 1980s, two nest sites were found on the Roseburg BLM District but were not located within the Olalla-Lookingglass WAU. Goshawks have been observed in the WAU but no nesting sites are known to be within the WAU.

5) Other Raptors

The Olalla-Lookingglass WAU supports bird of prey species common to the region but estimates of local populations are not available. Raptor species are present and occur where suitable habitat is present.

c. Neotropical Bird Species

Bird species that migrate and spend the winter in the various ecosystems found south of the North American Continent are considered neotropical bird species. Bird species that live on the North American Continent year round are resident birds. Oregon has over 169 bird species that are considered neotropical migrants. Over 25 species are documented to be declining in numbers (Sharp 1990).

Widespread concern for neotropical species, related habitat alterations, impacts from pesticide use, and other threats began in the 1970s and 1980s (Peterjohn et al. 1995). Population trends of neotropical migrants in Oregon show declines and increases. Oregon populations of 19 bird species show statistically significant declining trends while nine other bird species show significant increasing trends (Sharp 1990). Including all species that show declines, increases, or almost statistically significant trends as a proportion of routes, there are 33 species decreasing and 12 species increasing in numbers in Oregon (Sharp 1990).

During 1993, 1994, 1995, and 1996, neotropical birds were captured and banded, and habitat evaluations were conducted in the South River Resource Area. However, none of this work was done inside the Olalla-Lookingglass WAU.

The Olalla-Lookingglass WAU supports populations of neotropical species. Given the different vegetation zones within the Olalla-Lookingglass WAU, the WAU may provide habitat for more neotropical species than those species located at the banding station. The unique and diverse habitats found in the Interior Valley vegetative zone have hardwood, shrub, and conifer species not found at the banding station that function as habitat for many neotropical birds.

d. Big Game Species (Elk and Deer)

Historically, the range of Roosevelt Elk extended from the summit of the Cascade Mountains to the Oregon Coast. In 1938, the elk population in Oregon was estimated to be 7,000 animals (Graf 1943). Elk numbers and distribution changed as people settled in the region. Over time, elk habitat areas shifted from the historical distribution to "concentrated population centers which occur as islands across forested lands of varying seral stages" (South Umpqua Planning Unit 1979). Information about the historical distribution of elk within the Olalla-Lookingglass WAU and the equivalent management unit set by ODFW is not available. Given the increased number of people, road construction, home construction, and timber harvesting in the area, it is suspected that elk numbers have declined as reported in other parts of the region (Brown 1985).

The WAU includes portions of three elk management areas identified in the Roseburg District ROD/RMP (USDI 1995). The majority of this WAU is located within the Melrose unit (ODFW designation) which is being managed to reduce elk numbers in order to reduce the amount of damage caused on private lands.

The current, as well as historic, black-tailed deer range is throughout Oregon. During the logging that occurred after WWII, suitable young seral age stands (less than 20 years old) were abundant and black-tailed deer populations increased to the point that liberal hunting seasons were permitted. Overall, black-tailed deer numbers remained stable through the late 1970s in the South Umpqua Planning Unit (South Umpqua Planning Unit 1979).

Current numbers of Roosevelt Elk and black-tailed deer in the Olalla-Lookingglass WAU are not available (Personal communication from ODFW). Creation of early seral stands as a result of timber harvesting benefitted deer and elk as a byproduct and not as part of a specific management plan for these game species. Both species are present and use similar habitats. One or two elk herds are known to use the more remote areas in the WAU. Elk and deer forage for food in open areas where the vegetation includes grass-forb, shrubs, and open sapling communities. Both species use a range of vegetation age classes for hiding. This hiding component is provided by large shrub, open sapling, closed sapling, and mature or old growth forest communities (Brown 1985).

3. Plants

Field surveys have been conducted for Special Status Plants on portions of the Olalla-Lookingglass WAU. Nine Special Status Plants have been documented to occur in the WAU. The majority of the Special Status Plants documented in the Olalla-Lookingglass WAU are found in special or unique areas, such as grass balds, rock outcrops, oak/grass savannas, or oak-madrone-conifer woodlands. Some may occur in mixed conifer forests.

Allium bolanderi (Bolander's Onion); Assessment Species
Allium bolanderi grows on stony slopes and gravelly flats on serpentine soils below 3,000 feet. Distribution ranges from Douglas County, Oregon to Lake County, California.

Horkelia congesta ssp. congesta (Dense-flowered horkelia); Bureau Sensitive Species
Horkelia congesta ssp. congesta grows in meadows and open woods at low elevations. Distribution ranges from the Willamette Valley to the Umpqua Valley.

Lewisia cotyledon var. howellii (Imperial lewisia); Tracking Species
Lewisia cotyledon var. howellii grows on rocky soils and rock outcrops at low elevations, typically below 2,000 feet and on cool exposures. Imperial lewisia is often associated with oak woodlands.

Limnanthes gracilis var. gracilis (Slender meadow-foam); Bureau Sensitive Species
Limnanthes gracilis var. gracilis grows on moist to wet rocky slopes and in meadows on various substrates including serpentine soils at elevations ranging from 1,500 to 5,500 feet.

Mimulus douglasii (Douglas' Monkey Flower); Assessment Species
Mimulus douglasii grows in open woods and meadows with moist or gravelly soils in Douglas, Curry, Josephine, and Jackson Counties of southwest Oregon south to central California. This plant usually grows on serpentine soils below 4,000 feet in elevation.

Pellaea andromedaefolia (Coffee Fern); Assessment Species
Pellaea andromedaefolia is a fern that occurs on dry rock outcrops, mostly in the open but at times along shaded stream banks below 4,000 feet in elevation. Distribution ranges from Lane County, Oregon south to Baja, California.

Phacelia verna (Spring Phacelia); Tracking Species
Phacelia verna is a annual forb in the waterleaf family which grows on mossy, sparsely vegetated, rock outcrops and balds between 500 and 6,600 feet in elevation. It occurs mostly in the Umpqua River Valley. Spring Phacelia has been observed to repopulate an area after a low intensity fire.

Polystichum californicum (California Shield Fern); Assessment Species
Polystichum californicum grows on rock outcrops beneath forest canopies or on slopes at low and mid elevations. It is often on rock overhangs and shear bluffs or cliffs. Distribution ranges from British Columbia south to Santa Cruz County, California.

Romanzoffia thompsonii (Thompson's mistmaiden); Bureau Sensitive
Romanzoffia thompsonii grows seasonally on wet outcrops occurring on open slopes at low and mid elevations. The distribution range includes Linn, Lane, and Douglas Counties.

Five other Special Status Plants that have been documented in South River Resource Area are suspected to occur in the Olalla-Lookingglass WAU.

Aster vialis (Wayside aster); Bureau Sensitive and Survey and Manage Species
Aster vialis is a rare locally endemic taxon known only from Lane, Linn, and Douglas Counties, in Oregon. It occurs primarily along ridges between Eugene and Roseburg. Plant succession resulting in canopy closure of the forest over these plants could be a significant management concern. Long term survival of this species may depend on controlled disturbance of the habitat to allow more light to penetrate the canopy and improve conditions for Aster vialis reproduction. The role of fire is probably important in maintaining viability. Aster vialis seems to thrive most vigorously in openings within old growth stands or associated with edge habitat (Alverson and Kuykendall 1989).

Astragalus umbraticus (Woodland milk vetch); Assessment Species
Woodland milk vetch grows in open woods at low to mid elevations from Southwest Oregon to Northwest California. Woodland milk vetch has been observed in habitat impacted by fire and logging. It is likely this species has become rarer because of fire suppression activities.

Bensoniella oregona (Bensoniella); Bureau Sensitive Species
This species occurs along intermittent streams or meadow edges in mixed evergreen and white fir communities from 3,000 to 5,000 feet in elevation. It is typically less frequent in riparian shrub and forest openings, usually occupying upper slopes and ridgetop saddles with north aspects. It appears to tolerate some disturbance, if subsurface drainage is not altered. Populations along streams in clearcuts are very small. Bensoniella occurs within very specific meadow and stream edge habitat on soils derived from ancient sedimentary rocks (Copeland 1980, in Lang 1988).

Cypripedium montanum (Mountain Lady's Slipper); Tracking and Survey and Manage Species
Cypripedium montanum populations are small and scattered. Less than 20 exist west of the Cascades. Small populations may reflect the slow establishment and growth rate of this species. Cypripedium montanum seems to persist in areas that have been burned. The species ranges from Southern Alaska and British Columbia to Montana, Idaho, Wyoming, Oregon, and California. Survival of the species may depend on protecting known populations and developing a conservation plan (USDA and USDI 1994a).

Lupinus sulphureus var kincaidii (Kincaids Lupine); Bureau Sensitive Species

This is one of the three varieties of Lupinus sulphureus found in Oregon. It is known to occur in the Willamette Valley and south into Douglas County, with a disjunct population reported in Lewis County, Washington (Eastman 1990). Lupinus sulphureus has been observed growing in road cuts and jeep trails. Long term survival of this species may depend on controlled disturbance of the habitat to allow more light to penetrate the canopy and improve conditions for lupine reproduction (Kaye et al. 1991).

Other plant species to consider include Protection Buffer and Survey and Manage species that are suspected to occur in the Olalla-Lookingglass WAU. Protection Buffer species suspected to occur in the Olalla-Lookingglass WAU include the Bryophytes Brotherella roellii, Buxbaumia viridis, Rhizomnium nudum, Schistostega pennata, Tetraphis feniculata, and Ulota meglospora and the Fungus Sarcosoma mexicana. Survey and Manage plant species suspected to occur in the Olalla-Lookingglass WAU are listed in Table F-1 in Appendix F.

V. Interpretation

A. Vegetation

The main causes for the difference between conditions in 1936 and 1997 are land ownership, mining, management activities, timber harvesting, and natural disturbances. Land ownership and timber harvesting have fragmented forest stands within the WAU. Before fire suppression and timber harvesting activities occurred, stand replacing fires concentrated the early seral stage in more contiguous blocks.

Although private lands are a major component of this Watershed Analysis Unit (73%), the focus of the interpretation will be on BLM administered lands. Private lands are in a constant state of change and although stands greater than 30 years old will continue to be harvested, the timing or amount of harvest can not be predicted.

Bureau of Land Management administered lands available for intensive forest management are those lands outside of Late-Successional Reserves (which includes Marbled Murrelet Reserves), Riparian Reserves, and other areas reserved or withdrawn from timber harvesting. The WAU contains approximately 8,472 acres (31%) of BLM administered lands that are available for intensive forest management (see Table 25). Silvicultural practices including prescribed fire could be used to obtain desired vegetation conditions in special habitat areas.

Management direction from the Roseburg District RMP states that 15 percent of all federal lands, considering all Land Use Allocations, within fifth field watersheds should remain in late-successional forest stands. The Olalla-Lookingglass WAU is a fifth field watershed. Approximately 36 percent (9,818 out of 27,390 acres) of the Olalla-Lookingglass WAU is in stands 80 years old or older and located in reserved or withdrawn land use allocations (LSR, MMR, Riparian Reserve, Owl Core Area, or TPCC Withdrawn). These areas would be expected to remain in late-successional forest conditions. The Olalla-Lookingglass WAU meets the Standard and Guideline to retain 15 percent of all federal lands within fifth field watersheds in late-successional forest stands.

Matrix lands in the Olalla-Lookingglass WAU are to be managed for timber production to help meet the Probable Sale Quantity (PSQ) established in the Roseburg BLM District RMP. Table 26 shows acre estimates of GFMA and Connectivity/Diversity Block Land Use Allocations to be harvested per decade. Approximately 689 acres per decade are expected to be harvested on BLM administered lands within the Olalla-Lookingglass WAU. This would be about eight percent of the 8,472 acres considered available for regeneration harvests within the WAU. Although, less than one percent of the Olalla-Lookingglass WAU would be harvested per decade. All of the stands in GFMA greater than 80 years old would be harvested in approximately 70 years and in Connectivity/Diversity Blocks in approximately 100 years.

Table 25. Acres of BLM Administered Land by Land Use Allocation.

	Reserved or Withdrawn		Connectivity		GFMA		
Area	Acres	%	Acres	%	Acres	%	Total
Bear Creek	443	39	668	58	35	3	1,146
Ben Irving	363	39	305	33	256	28	924
Berry Creek	526	48	574	52	0	0	1,100
Coarse Gold	206	50	14	3	193	47	413
Upper Berry	923	72	239	19	114	9	1,276
Berry Creek Subwatershed	2,461	51	1,800	37	598	12	4,859
Lookingglass	0	0	0	0	43	100	43
Upper Lookingglass	593	50	0	0	588	50	1,181
Winston	12	63	0	0	7	37	19
Lookingglass Creek Subwatershed	605	49	0	0	638	51	1,243
Porter Creek	47	23	0	0	157	77	204
Siebold Canyon	996	89	0	0	127	11	1,123
Tenmile	354	100	0	0	0	0	354
Lower Tenmile Subwatershed	1,397	83	0	0	284	17	1,681
Bushnell Frontal	1,163	52	140	6	919	41	2,222
Byron Creek	496	48	484	47	48	5	1,028
Middle Olalla Subwatershed	1,659	51	624	19	967	30	3,250
Olalla Frontal	989	100	0	0	0	0	989
Upper Olalla Creek	1,579	100	0	0	0	0	1,579
Wildcat Creek	1,223	100	0	0	0	0	1,223
Willingham Creek	1,148	100	0	0	0	0	1,148
Mt. Shep Subwatershed	4,939	100	0	0	0	0	4,939

	Reserved or Withdrawn		Connectivity		GFMA		
Area	Acres	%	Acres	%	Acres	%	Total
Olalla	925	46	320	16	773	38	2,018
Olalla Subwatershed	925	46	320	16	773	38	2,018
Middle Tenmile	520	79	0	0	140	21	660
Reston	437	68	0	0	204	32	641
Upper Tenmile	1,644	84	0	0	311	16	1,955
Reston Subwatershed	2,601	80	0	0	655	20	3,256
Lower Shields	11	14	0	0	69	86	80
Shields Creek	71	43	1	1	92	56	164
Suicide Creek	1,250	79	0	0	337	21	1,587
Shields Subwatershed	1,332	73	1	0	498	27	1,831
Flournoy Creek	18	15	0	0	100	85	118
Morgan Creek	15	17	0	0	74	83	89
Rock Creek	756	100	0	0	0	0	756
Sugar Pine Subwatershed	789	82	0	0	174	18	963
Thompson Creek	2,179	66	338	10	802	24	3,319
Thompson Subwatershed	2,179	66	338	10	802	24	3,319
Olalla-Lookingglass Watershed Analysis Unit	18,887	69	3,083	11	5,389	20	27,359

Table 26. Estimated Acres of Proposed Harvest (per decade) in Matrix in the Olalla-Lookingglass WAU.

Subwatershed	GFMA (Acres per decade)	Connectivity/Diversity Block (acres per decade)
Berry Creek	96	99
Lookingglass Creek	5	0
Lower Ten Mile	0	0
Middle Olalla	157	28
Mt. Shep	0	0
Olalla	141	39
Reston	0	0
Shields	0	0
Sugar Pine	0	0
Thompson	79	45

Stand treatments would be based on the age class of the stand and the Land Use Allocation. The following are general management guidelines that could be altered by site specific evaluations. All acreage figures include Riparian Reserve acres.

1. Matrix

a. Early Seral (0 to 30 years old): The early seral stage consists of approximately 3,326 acres on BLM administered lands (1,257 acres in Connectivity and 2,069 acres in GFMA). Regeneration is usually achieved by planting seedlings following site preparation. Genetically selected stock would be used, when available. A mixture of species would be planted, monitored, and maintained to ensure adequate stocking levels. Treatments to reduce competition from undesirable vegetation may be necessary to allow the seedlings to become established.

Precommercial thinning may be prescribed to maintain stand vigor and control species composition and stand density. Precommercial thinning generally would be conducted on stands with high stocking densities in the 10 to 20 year age class. There are 1,261 acres in this age class in the Olalla-Lookingglass WAU, 545 acres have been precommercial thinned.

Thinned stands could be fertilized to temporarily increase stand growth, improve tree vigor, and reduce insect and drought related mortality. Fertilizer would usually be applied at a rate of 200 pounds of available nitrogen per acre by helicopter in the form of urea based prill. Fertilizer has been applied to 1,176 acres in the Matrix Land Use Allocation. These fertilized stands may be ready for a commercial thinning.

Pruning young stands improves wood quality by producing clear wood in a shorter amount of time than would be required without the action. Pruning would generally be done on highly productive sites. Mortality risk in young plantations, due to white pine blister rust, can be reduced by pruning sugar pine to a height of ten feet.

b. Mid Seral (31 to 80 years old): The mid seral stage consists of approximately 1,788 acres of BLM administered lands. Most of the acres are in the 30 to 60 year age class, with only 103 acres in the 60 to 80 year age class. Commercial thinning in GFMA or density management in Connectivity/ Diversity Blocks would be carried out where practical and where research indicates increased gains in timber production are likely. Thinning intervals generally range from 10 to 30 years, varying by site class, with poor sites having longer intervals. The location of potential thinning stands are shown by age classes on the BLM Age Class Distribution Map (Map 6). Some mid-seral aged stands may not benefit from density management. Stands that started out at lower densities may be developing adequately and are becoming valuable to late-successional dependent species.

Proposed thinning stands generally have a closed canopy, dead lower limbs, dead standing and down trees, and slowed tree growth. These conditions are evidence that mortality is occurring in the suppressed and intermediate crown positions where stocking (the number of trees per acre) is the highest. Suppression mortality is expected in stands with a high relative density (a relative density of 0.55 is the lower limit of imminent competition mortality). Thinning should strive to maintain the stand at a relative density of 0.35 to 0.50.

Thinning overstocked Riparian Reserves would promote tree survival and growth. Entering the Riparian Reserves would increase or maintain tree growth and vigor, reduce the probability of insect outbreaks, maintain or enhance the existing diversity, and attain larger trees in a shorter time period. Not thinning within a Riparian Reserve may result in smaller diameter trees. Snags created by suppression mortality would also be smaller in diameter. The intermediate and suppressed trees would continue to die. Snag recruitment and down log input into streams would be as small logs. Activities within the Riparian Reserves would be designed to acquire the desired vegetative characteristics and to meet Aquatic Conservation Strategy objectives.

In the GFMA Land Use Allocation commercial thinnings would be designed to assure high levels of volume productivity. In the Olalla-Lookingglass WAU, commercial thinnings could be programmed for stands in the 40 to 70 year age classes.

In Connectivity/Diversity Blocks density management strategies would be conducted to provide habitat for a variety of organisms associated with both late-successional and younger forests. Thinning would be designed to assure high levels of volume productivity. The proposed treatment would accelerate the development of the stand into a multilayered stand with large trees, canopy gaps for spatial diversity and understory development, snags, and large down woody debris. Density management units would retain patches of denser habitat, where desired, to provide wildlife habitat. Treatments would strive to optimize habitat for late-successional forest related species in the short term. Density management could occur in stands under 120 years old. Stands greater than 120 years old which currently exhibit late-successional or old-growth characteristics could be retained without active management. A minimum of 25% of each Connectivity/Diversity Block would be maintained in late-successional habitat.

c. Late Seral (81 years old and older): The late seral stage comprises approximately 8,796 acres of BLM administered land. Late seral stands in the Matrix would provide a sustainable supply of timber and other forest commodities. Coarse woody debris and snags would be retained to meet management objectives.

Bureau of Land Management administered lands in the GFMA Land Use Allocation contain approximately 4,918 acres in late seral age stands. Regeneration harvests would be programmed for stands at least 60 years old. Long term rotation age would be planned for culmination of mean annual increment (CMAI), which is generally between 80 and 110 years old in this area. The modified reserve seed-tree method of harvest removes the majority of a stand in a single entry except for six to eight conifer trees per acre.

Connectivity/Diversity Blocks contain approximately 3,878 acres in late seral age stands. Connectivity/Diversity Blocks provide important ecological functions such as dispersal of organisms, carryover of some species from one stand to the next, and maintenance of ecologically valuable structural components such as down logs, snags, and large trees. Connectivity/Diversity Blocks would be managed using a 150 year area control rotation and leaving 12 to 18 green conifer trees per acre within harvest units. Twenty-five to thirty percent of each block would be maintained in late-successional forests.

There are eleven Connectivity/Diversity Blocks within the Olalla-Lookingglass WAU. All of the Connectivity/Diversity Blocks currently have more than 30 percent in late-successional stands. Six of the eleven Connectivity/Diversity Blocks have more than 25 percent of the late-successional stands in Reserved or Withdrawn areas (see Table 27).

2. Late Successional Reserves

The South Coast - Northern Klamath Late-Successional Reserve Assessment (LSRA) would be consulted to facilitate implementation of appropriate management activities. The South Coast - Northern Klamath LSRA presents management strategies for LSR 259 which is in the southern portion of the Olalla-Lookingglass WAU and LSR 261 which includes the Marbled Murrelet Reserves within the Olalla-Lookingglass WAU. There are approximately 12,086 acres (44% of the BLM administered land) in the LSR and MMR within the WAU.

According to the SEIS ROD, silvicultural systems proposed for LSRs have two principal objectives. They are 1) the development of old-growth characteristics including snags, logs on the forest floor, large trees, and canopy gaps that enable establishment of multiple tree layers and diverse species composition; and 2)

Table 27. Acres of Late Seral Stands in Connectivity/Diversity Blocks in the Olalla-Lookingglass WAU.

Connectivity/Diversity Blocks	Total Acres in Block	Acres Reserved or Withdrawn 80 Years Old or Older	Percent	Total Acres 80 Years Old or Older	Percent
T28S, R7W, Section 35	173	46	27	173	100
Block 4					
T29S, R6W, Section 29	229	8		58	
T29S, R6W, Section 31	485	101		210	
Total for Block 4	714	109	15	268	38
Block 2					
T29S, R7W, Section 9	292	68	23	228	78
Total for Block 2	292	68	23	228	78
T29S, R7W, Section 23	588	183	31	380	65
T29S, R7W, Section 27	541	211	39	437	81
Block 1					
T29S, R8W, Section 11	129	107		108	
T29S, R8W, Section 13	341	102		221	
T29S, R8W, Section 15	138	105		138	
Total for Block 1	608	314	52	467	77
T29S, R8W, Section 23	641	99	15	319	50
T29S, R8W, Section 25	625	235	38	525	84
T29S, R8W, Section 27	631	148	23	269	43
T29S, R8W, Section 35	640	98	15	337	53
Block 5					
T30S, R7W, Section 1	330	204		273	
T30S, R7W, Section 11	438	217		410	
Total for Block 5	768	421	55	683	89

the prevention of large-scale disturbances by fire, wind, insects, and diseases that would destroy or limit the ability of the reserves to sustain viable forest species populations.

Stand management in LSRs would generally focus on stands regenerated following timber harvesting or stands that have been thinned. The overall criteria for silviculture treatments is that they are beneficial to the creation of late-successional forest conditions. There are approximately 5,745 acres in the LSRs that are currently not in a late-successional or old-growth condition but are capable of developing into those conditions. Silvicultural manipulation of younger stands can accelerate the development of desired stand characteristics. The South Coast - Northern Klamath LSRA details the benefits, stand selection criteria, and desired conditions of various silviculture treatments.

a. Early Seral (0 to 30 years old): The SEIS ROD encourages the use of silvicultural practices to accelerate the development of overstocked young plantations into stands with late-successional and old-growth characteristics. There are approximately 3,705 acres of early seral stage stands in the LSR or MMR. Reforestation, maintenance, release, precommercial thinning, pruning, and fertilization are possible activities that may be conducted in the early seral stage stands. There are 967 acres in the age class considered appropriate for precommercial thinning, 242 acres have already been thinned. All of the thinned acres have been in the Marbled Murrelet Reserves. Additional acres could be thinned after the South Coast - Northern Klamath LSRA is finalized. Fertilization has occurred on 1,467 acres in the LSRs.

b. Mid Seral(31 to 80 years old): There are approximately 2,040 acres of mid seral stage stands in the LSR and MMRs (only 90 acres are in the 60 to 80 year age class). Density management, fertilization, and tree culturing are possible activities that may occur in the mid seral stage stands.

c. Late Seral (81 years old and older): There are approximately 6,341 acres of late seral stage stands in the LSR and MMRs. Stands older than 80 years would be retained, except for risk reduction efforts or salvage as outlined in the South Coast - Northern Klamath LSRA. Risk reduction treatments would be designed to protect more acres than are treated.

B. Fire and Fuels Management

Treatments of natural fuels may be planned around areas of high recreation use, along heavily traveled road corridors, or on forest stands to reduce the risks of a wildfire occurring, improve habitat of special status plants, or improve forest health. Prescribed underburning, pile burning, and manual or mechanical treatments could be used on areas where wildfire exclusion has resulted in natural fuel accumulations considered unnatural and is considered to be a high risk due to wildfire. Extensive fuels management treatments are difficult to justify, economically, for the sole reason of wildfire risk reduction. Other site specific resource objectives would normally be the basis for prescribing a fuels treatment on natural forest fuels. Prescribed broadcast burning poses risks that in many cases would out weigh potential risk reduction benefits. In summary, fuels management treatments including prescribed broadcast burning, pile burning, manual or mechanical fuels treatments, or fuels removal would be applied primarily on activity fuels created from timber management operations.

C. Hydrology

Proper functioning condition (PFC) surveys indicate stream channels in the headwaters of the Olalla-Lookingglass WAU are downcutting, causing accelerated bank erosion, floodplain abandonment, and narrowing of riparian areas. The causes include road encroachment (the most damaging), the lack of large woody debris (LWD), the lack of riparian vegetation, and placer mining. Portions of Lookingglass, Olalla, Tenmile, Byron, and Thompson Creeks were identified by DEQ, in 1988, as having low dissolved oxygen (DO) and decreased flows due to water withdrawal. The riparian areas in the Olalla-Lookingglass WAU can be improved in the long term by decommissioning roads, placing LWD in streams, planting conifers in riparian areas, and modifying placer mining techniques.

D. Fisheries

A rating system was developed to evaluate which subwatersheds may be most appropriate for timber harvest. The following criteria were used to evaluate the subwatersheds from the fisheries resource perspective.

Aquatic habitat condition - rating was based on best or potential future best aquatic habitat for cutthroat trout and coho salmon. This rating relied heavily on professional judgement, current aquatic habitat data, and partly on personal observations by biologists in the resource area.

Species diversity - Subwatersheds containing cutthroat, coho, steelhead, and chinook were rated the highest. Subwatersheds with a high degree of diversity (larger number of fish species) received a "4".

Access for anadromous fish - Subwatersheds containing natural blockages (i.e. waterfalls) were rated low (i.e. a "1" or "2"), because these subwatersheds were never refugia for anadromous fish stocks.

Ownership pattern was considered to a lesser degree. This takes into account how much influence BLM actions would have on cumulative impacts within the subwatershed and if the BLM administers a significant enough land base to improve current aquatic conditions.

E. Wildlife

1. Northern Spotted Owl

Based on the Standards and Guidelines in the SEIS ROD, activity centers on Matrix lands located before January 1 1994, must be protected by maintaining the best 100 acres of suitable habitat near known owl sites (USDA and USDI 1994b). Seven spotted owl sites on BLM administered lands within the Olalla-

Lookingglass WAU are protected with 100 acre activity centers (core areas). An additional 16 spotted owl sites occur within the LSR portion of the WAU.

Land Use Allocations in the Olalla-Lookingglass WAU consist of Matrix, Riparian Reserves, and LSR, which includes Marbled Murrelet Reserves. The Roseburg BLM District ROD/RMP (USDI 1995) identified Matrix lands for timber management while providing for forest connectivity, various habitat types, a variety of forest successional stages, and ecological functions like dispersal of organisms. Managing the timing and spacing of harvest activities in Matrix is important to minimize impacts to spotted owls and other species associated with late-successional habitat.

Late-Successional Reserves are to be managed for late-successional, old-growth forests and the species that use these forests. The amount of suitable habitat on private lands surrounding BLM administered lands in the LSR is low. Future actions by private land owners would most likely reduce the current amount of suitable habitat on private lands.

The spotted owl is an example of a species that requires habitat connectivity, dispersal areas, and nesting areas. To assist in the decision making process and to guide the selection of areas where projects such as timber harvests, roads, or recreation sites may be located, a ranking of the owl master sites using the provincial radius (1.3 miles) and the 0.7 mile radius surrounding each owl site is presented in Table 28. The ranking is to provide management with a guide and does not represent a clearance as needed or a may affect determination as required by section 7 of the Endangered Species Act (ESA) of 1973, as amended.

All of the spotted owl territories, except one, on BLM administered lands within the Olalla-Lookingglass WAU have less than 40% (1336 acres) of suitable habitat within 1.3 miles of the activity center. The amount of suitable habitat within 0.7 mile of activity centers is below 500 acres at all but two owl sites occupied in 1996 in the Olalla-Lookingglass WAU (see Table 28).

a. Dispersal Habitat

Dispersal habitat is especially important in this WAU because of its location connecting two large LSRs in two provinces. Populations in these LSRs need to mix freely to maintain species genetic viability. Physically connected dispersal habitat is considered important to successful movement of populations between the two provinces. A narrow corridor of forested habitat, five to six miles wide, separates Camas Valley and the Tenmile valley. Private lands contribute to dispersal habitat, but have not been quantified. The amount and arrangement of connected dispersal habitat in this corridor is considered important for the ability of species to move between the Coast Range and Klamath Mountain Provinces.

Map 20 shows the distribution of suitable nesting and roosting habitat, as well as dispersal habitat, in this corridor. Map 21 shows the amount of dispersal habitat within reserved areas and in this corridor. Table 29 lists the amount of dispersal habitat in each section within this corridor and adjacent areas. Some sections are not entirely within the WAU, but the acres used are for the entire section. Other sections

Table 28. Spotted Owl Activity Center Ranking Data Within the Ollala-Lookingglass WAU in the South River Resource Area (1996).

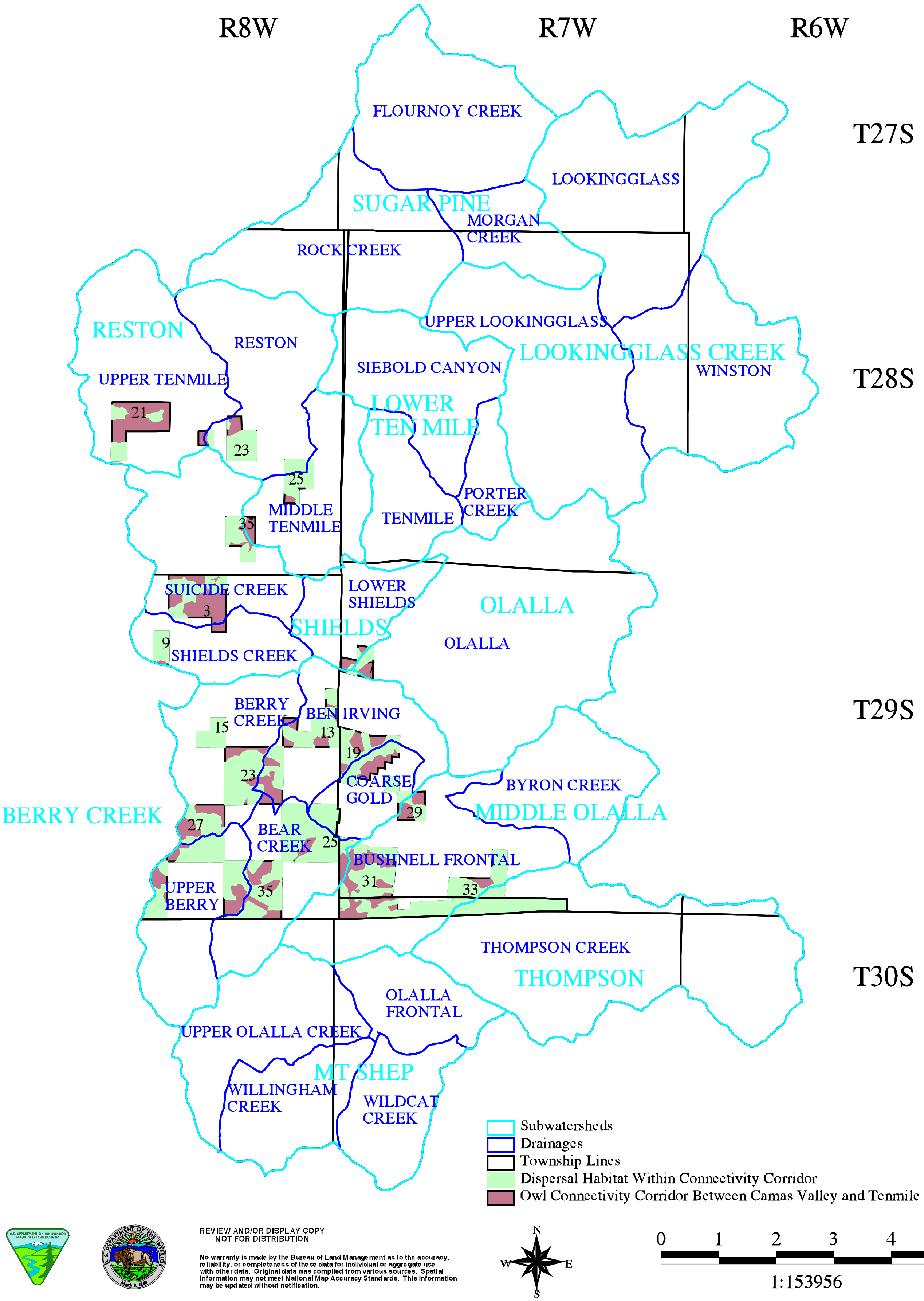
MSNO	Year Site was Located	Last Year of Known Active Pair (Pair Status + # Juveniles)	Last Year Occupied (Pair Status)	No. of Years of Reproduction/Pair Status Since 1985	Suitable Habitat Acres in Provincial Radius (1.3 Miles)	Suitable Habitat Acres in 0.7 Mile Radius	Land Use Allocation	History Ranking	Acres Rank	Occupancy Rank
0306	1984	1990(P+0J)	1995(X)	0/3	294	82	GFMA	3	D	3
0306A	1987	1987(P+2J)	1987(P)	1/1	171	75	GFMA	3	D	3
0306B	1988	1988(P+2J)	1988(P)	1/1	152	61	GFMA	3	D	2
0379	1987	1989(P+0J)	1989(P)	0/3	773	190	PRIVATE	3	D	3
0380	1976	ND	ND	ND	933	278	PRIVATE	3	D	3
0513	1983	1987(P+0J)	1987(P)	2/4	1,382	564	MMR	2	A	3
0513A	1988	1988(P+0J)	1988(P)	0/1	1,084	507	MMR	2	A	3
0513B	1989	1996(P+2J)	1996(P)	1/2	1,285	614	MMR	1	A	1
0513C	1994	1995(P+0J)	1995(P)	0/2	1,274	629	MMR	1	A	1
0513D	1992	1992(P+2J)	1992(P)	1/1	1,309	610	MMR	1	A	3
1362	1896	ND	1993(S)	ND	911	128	CONN	3	D	3
1807	1986	1995(P+0J)	1996(P)	0/5	774	366	CONN	2	D	2
1807A	1991	1994(P+0J)	1994(P)	2/4	1,054	285	PRIVATE	1	D	1
1807B	1996	1996(P+2J)	1996(P)	1/1	920	366	CONN	3	D	2
1914	1987	1987(P+0J)	1996(S)	0/2	867	175	LSR	1	D	1
1914A	1991	1994(P+0J)	1994(P)	1/4	393	176	LSR	2	D	3
1915	1987	1993(P+0J)	1996(X)	0/10	1,110	424	LSR	3	D	1
2039	1988	1994(P+2J)	1994(P)	2/6	651	118	PRIVATE	2	D	2
2039A	1995	1996(P+0J)	1996(P)	1/2	857	407	CONN	1	D	1
2095	1989	1996(P+0J)	1996(P)	0/2	435	168	GFMA	3	D	3
2098	1989	1996(P+0J)	1996(P)	2/7	959	500	CONN	1	C	2
2098A	1991	1991(P+0J)	1991(P)	0/1	995	393	CONN	1	D	1
2098B	1994	1994(P+1J)	1994(P)	1/1	985	462	CONN	1	D	1
2100	1990	1996(P+2J)	1996(P)	3/6	335	94	LSR	1	D	1

Table 28. Spotted Owl Activity Center Ranking Data Within the Ollala-Lookingglass WAU in the South River Resource Area (1996).

MSNO	Year Site was Located	Last Year of Known Active Pair (Pair Status + # Juveniles)	Last Year Occupied (Pair Status)	No. of Years of Reproduction/Pair Status Since 1985	Suitable Habitat Acres in Provincial Radius (1.3 Miles)	Suitable Habitat Acres in 0.7 Mile Radius	Land Use Allocation	History Ranking	Acres Rank	Occupancy Rank
2198	1990	1996(P+2J)	1996(P)	3/7	368	190	LSR	1	D	1
2199	1990	1991(P+0J)	1991(P)	1/2	442	183	CONN	2	D	2
2199A	1992	1992(P+0J)	1992(P)	0/1	458	92	PRIVATE	2	D	2
2199B	1993	1994(P+1J)	1996(U)	1/3	575	217	CONN	1	D	2
2533	1991	1996(P+0J)	1996(P)	0/2	568	291	MMR	2	D	3
2533A	1992	1992(P+2J)	1994(S)	1/1	589	240	MMR	2	D	3
2534	1991	1995(P+0J)	1995(P)	1/3	985	196	MMR	2	D	1
2534A	1994	1994(P+2J)	1994(P)	1/1	1,072	348	MMR	2	D	1
2748	1991	1992(P+0J)	1994(X)	0/4	671	247	CONN	3	D	2
3268	1993	1996(P+2J)	1996(P)	3/4	547	245	CONN	1	D	2
3901	1994	1996(P+2J)	1996(P)	2/3	415	200	LSR	1	D	1
3907	1994	1995(P+0J)	1996(B)	1/3	832	349	LSR	2	D	1
4050	1994	1996(P+0J)	1996(P)	1/3	755	172	GFMA	1	D	1

Definitions
OCCUPANCY RANK - 1: Sites with this ranking have current occupancy and have been occupied by a single owl or pair of owls for the last 3 years; 2: Sites with this ranking have been occupied in the past, show sporadic occupancy by a single owl or an owl pair, or may be currently occupied; 3: Sites with this ranking have not been occupied during the last 3 years.
LAST YEAR OF KNOWN ACTIVE PAIR - Gives the year, pair status, and number of young produced; NP = site has not had a pair; ND = No Data.
ACRES RANK - These acres are in regards to suitable spotted owl habitat. A: These sites have greater than 1,000 acres in the provincial radius and greater than 500 acres within the 0.7 mile radius; B: These sites have greater than 1,000 acres in the provincial radius but less than 500 acres within the 0.7 mile radius; C: These sites have less than 1,000 acres in the provincial radius and greater than 500 acres in the 0.7 mile radius; D: These sites have less than 1,000 acres in the provincial radius and less than 500 acres in the 0.7 mile radius.
HISTORY RANKING - This ranking includes occupancy ranking, reproduction data, acres ranking, habitat evaluation, field experience about the site (location, quality, and forest structure). 1: A site considered stable due to consistant occupation by spotted owls and has been producing young consistently; 2: Site is consistently used by spotted owls but reproduction sporadic; 3: Site shows some reproduction, occupation has been sporadic, or no occupation. Pv = Site is located on private land; OR = Site is located on Oregon State Lands.
PAIR STATUS - M = MALE; F = FEMALE; J = JUVENILE; P = PAIR STATUS; (M+F) = TWO ADULT BIRDS, PAIR STATUS UNKNOWN; PU = PAIR STATUS UNDETERMINED; B = SINGLE OWL; X = OTHER; ND = INCOMPLETE OR NO DATA.
NUMBER OF YEARS OF REPRODUCTION/PAIR STATUS SINCE 1985 - The first number gives the number of years with spotted owl reproduction at this site since 1985. The second number gives the number of years for the entire history of the activity center since 1985 (including the original and alternate sites, i.e. 1090A). ND = No Data.

Map 20. Dispersal Habitat Within Connectivity Corridor in the Olalla-Lookingglass WAU



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0 1 2 3 4 5 Miles

1:153956

Map 21. Dispersal Habitat Within Reserves and Connectivity Corridor in the Olalla-Lookingglass WAU

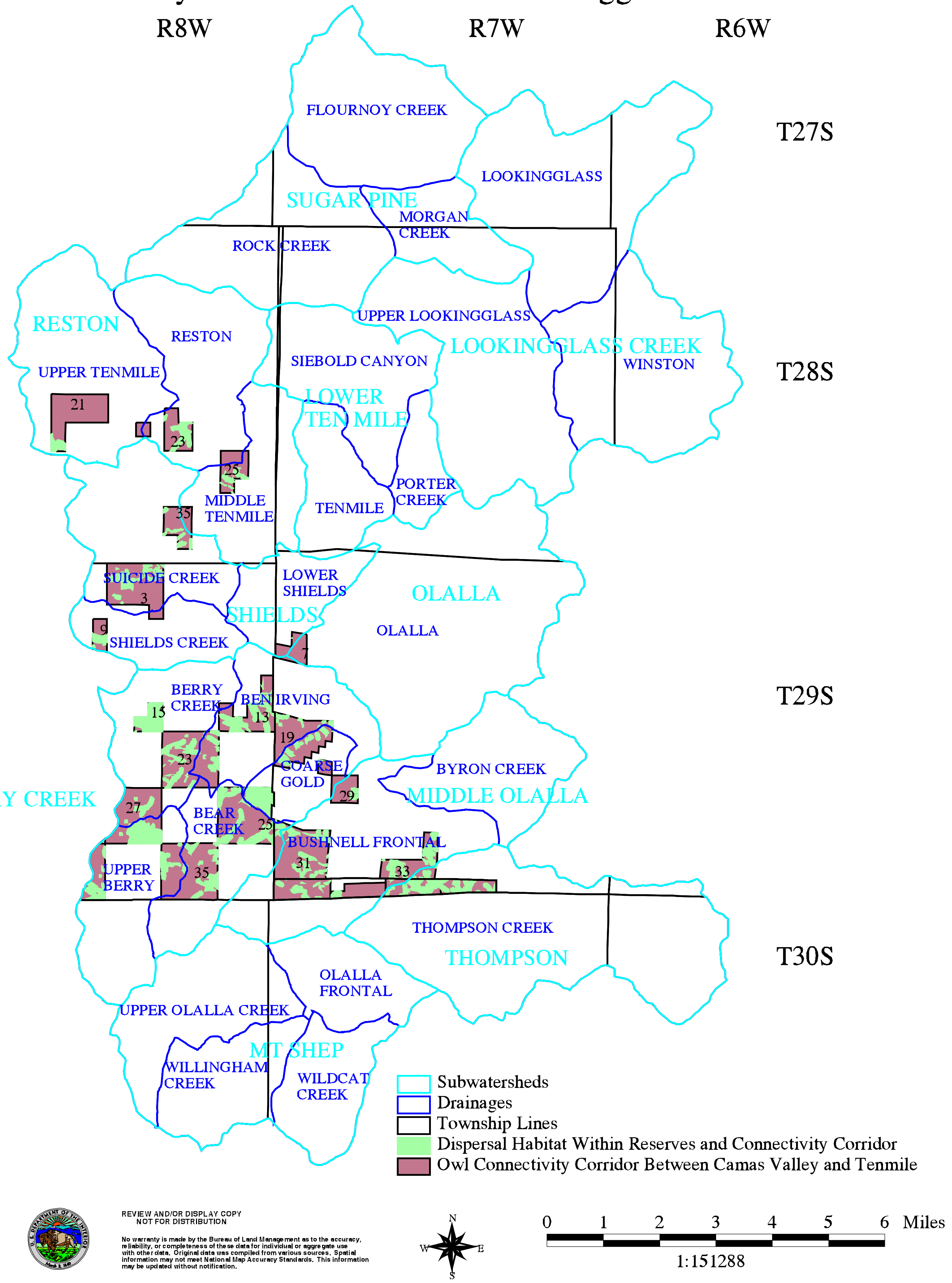

Table 29. Acres of Dispersal Habitat by Section in Connectivity Corridor Between Camas and Tenmile Valleys Within the Olalla-Lookingglass WAU.

Township, Range, Section	Subwatershed	Total Acres in Section	Acres of Dispersal Habitat	Percent of Section in Dispersal Habitat	Land Use Allocation
T29S, R7W, Sec. 19	Berry Creek	490	282	58	GFMA
T29S, R8W, Sec. 35	Berry Creek	640	354	55	CONN
T29S, R8W, Sec. 15 (Entire Section)		317	217	68	CONN
T29S, R8W, Sec. 15 (Portion Just in WAU)	Berry Creek	119	119	100	CONN
T29S, R8W, Sec. 23	Berry Creek	641	404	63	CONN
T29S, R8W, Sec. 27 (Entire Section)		631	334	53	CONN
T29S, R8W, Sec. 27 (Portion Just in WAU)	Berry Creek	506	318	63	CONN
T29S, R8W, Sec. 13	Berry Creek	341	233	68	CONN
T29S, R8W, Sec. 25	Berry Creek	624	578	93	CONN
T29S, R8W, Sec. 33 (Entire Section)		635	468	74	GFMA
T29S, R8W, Sec. 33 (Portion Just in WAU)	Berry Creek	179	118	66	GFMA
T29½S, R7W, Sec. 31	Middle Olalla	233	99	42	GFMA
T29½S, R7W, Sec. 32	Middle Olalla	137	137	100	GFMA
T29S, R7W, Sec. 29	Middle Olalla	147	57	39	GFMA
T29S, R7W, Sec. 31	Middle Olalla	563	294	52	GFMA
T29S, R7W, Sec. 33	Middle Olalla	290	244	84	GFMA
T29S, R7W, Sec. 7	Olalla	138	56	41	GFMA
T28S, R8W, Sec. 21	Reston	409	93	23	GFMA
T28S, R8W, Sec. 23	Reston	200	152	76	GFMA
T28S, R8W, Sec. 25	Reston	197	169	86	GFMA
T28S, R8W, Sec. 22	Reston	40	11	28	GFMA
T28S, R8W, Sec. 35	Shields	200	112	56	GFMA
T29S, R8W, Sec. 9 (Entire Section)		398	306	77	GFMA
T29S, R8W, Sec. 9 (Portion Just in WAU)	Shields	90	80	89	GFMA
T29S, R8W, Sec. 3	Shields	513	172	34	GFMA
T29½S, R7W, Sec. 33	Thompson	183	183	100	GFMA
T29½S, R7W, Sec. 34	Thompson	148	148	100	GFMA

within this pathway corridor outside of the Olalla-Lookingglass WAU have not been analyzed in this watershed analysis.

Riparian Reserves within the Berry Creek Subwatershed contain 41% in suitable nesting, roosting, and foraging (NRF) habitat and 21% in other dispersal habitat, the Shields Subwatershed, which is the most important in terms of location, has 30% in suitable NRF habitat and 30% in other dispersal habitat, the Reston Subwatershed, which is the second most important area for having connected habitat, has 37% in suitable NRF habitat and 23% in other dispersal habitat, and the Lower Tenmile Subwatershed has 53% in NRF and 20% in other dispersal habitat. The amount of BLM administered land and the checkerboard ownership within these subwatersheds allow Riparian Reserves to be linked spatially mainly at section corners and limits the dispersal ability of late seral dependent organisms that cannot cross areas of non-habitat.

Riparian Reserves within the WAU are composed of 40% functional late seral habitat. Private riparian areas within the WAU have 14% in functional late seral habitat. Taken together, the percentage of functional riparian habitat in the Olalla-Lookingglass WAU is approximately 20%.

b. Critical Habitat

Two critical habitat units (CHU-OR-61 and CHU-OR-62) lie within the Olalla-Lookingglass WAU. The Critical Habitat Units are about six miles from one another. A narrow corridor between the Tenmile Valley and Camas Valley connect the two CHUs. The functionality of the corridor as dispersal habitat depends on management practices by both the federal government and private landowners. About five sections within CHU-OR-62 in the Olalla-Lookingglass WAU are designated as Connectivity/Diversity Blocks. Eighty percent of CHU-OR-62 in the WAU is in the LSR Land Use Allocation. All of CHU-OR-61 is located in Marbled Murrelet Reserves.

2. Marbled Murrelet

There are approximately 12,152 acres of suitable marbled murrelet habitat in the WAU. Approximately 50% of the suitable murrelet habitat in the WAU is outside of the LSRs or other reserves. Two years of protocol surveys are required prior to implementation of projects that modify suitable marbled murrelet habitat. General surveys for murrelets have not been conducted in the Olalla-Lookingglass WAU.

VI. Recommendations

A. Vegetation

Recommendations for silviculture actions would vary based on Land Use Allocations. Intensive forest management would occur on General Forest Management Areas. Silviculture actions within Late Successional Reserves and Riparian Reserves would tend to focus on stands regenerated following timber harvest or stands that were thinned. Management actions within LSRs 259 and 261 would need to consider the guidelines presented in the South Coast - Northern Klamath Late Successional Reserve Assessment. Silvicultural practices applied within Riparian Reserves would generally be to control stocking, reestablish and manage stands, establish and maintain desired nonconifer vegetation, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy objectives.

A rating system was developed to determine which subwatersheds were considered most appropriate for planning timber harvesting activities. The rating was based on individual resource values for wildlife, fisheries, and hydrology (see Table 30). A rating of where to harvest based on timber concerns is also listed in Table 30. The timber rankings reflect where the BLM has the most acres available for timber harvesting. The Sugar Pine, Reston, and Lookingglass Creek Subwatersheds have a very small amount of BLM administered land. The rating system defined a rating of 1 = first place, 2 = second place, 3 = third place, and 4 = last place to plan timber harvests. The system was used to develop a ten year sale plan scenario.

Table 30. Timber Harvesting Priority Ratings of Subwatersheds in the Olalla-Lookingglass WAU by Individual Resource Concerns.[1]

Overall	Timber	Wildlife	Fisheries	Hydrology
Sugar Pine	3. Olalla	1. Sugar Pine	1. Sugar Pine	1. Sugar Pine
Lookingglass Creek	3. Berry Creek	1. Lookingglass Creek	1. Reston	1. Lookingglass Creek
Olalla	3. Thompson	1. Olalla	1. Berry Creek	2. Olalla
Reston	3. Mt. Shep	3. Reston	2. Lookingglass Creek	2. Reston
Berry Creek	4. Sugar Pine	3. Thompson	2. Olalla	2. Berry Creek
Thompson	4. Lookingglass Creek	4. Berry Creek	3. Thompson	3. Thompson
Mt. Shep	4. Reston	4. Mt. Shep	3. Mt. Shep	3. Mt. Shep

1. Numbers indicate how Subwatersheds were ranked by Individual Resources in the Ten Year Sale Plan scenario, which ranks all of the Subwatersheds in the South River Resource Area. Subwatersheds in a column with the same numbers indicate they were rated the same priority.

The rankings for the Ten Year Sale Plan scenario do not necessarily match the Subwatersheds used in the watershed analysis since some of the boundaries have been changed. The Mt. Shep and Middle Olalla Subwatersheds use to be the Mt. Shep Subwatershed. The Reston and Lower Ten Mile Subwatersheds and part of the Shields Subwatershed use to be the Reston Subwatershed. The Berry Creek and part of the Shields Subwatersheds use to be the Berry Creek Subwatershed.

Rust resistant stock should be used with all reforestation efforts for western white pine and sugar pine species.

Management activities within the range of Port-Orford cedar should conform to the BLM Port-Orford Cedar Management Guidelines to mitigate damage caused by Phytophthora lateralis.

B. Fire and Fuels Management

Fire management in the Olalla-Lookingglass WAU should consider aggressively suppressing all wildfires. Because of the checkerboard ownership pattern, very high resource values, air quality concerns, and extremely narrow windows of opportunity, natural ignition prescribed fires are not considered feasible. Risks to life, property, and resources are considered to be too high.

Prescribed fire, both broadcast burning and pile burning, should continue to be used to prepare regeneration harvest units for reforestation when other resource objectives can be achieved. Burning activity fuels achieves a secondary benefit of wildfire hazard reduction. When other resource concerns eliminate using prescribed fire, mechanical or manual fuels treatments may be used to achieve reforestation objectives.

C. Soils

Best Management Practices (BMPs) should be applied during all ground and vegetation disturbing activities. See Appendix D, Roseburg District Record of Decision and Resource Management Plan (USDI 1995) for a list and explanation of BMPs. Along with the BMPs, the Standards and Guidelines in the SEIS Record of Decision (USDA and USDI 1994b) should be implemented in order to achieve proper soil management. Best Management Practices should be monitored for implementation and effectiveness in order to document if soil goals are being achieved.

D. Hydrology

Consider determining bankfull discharge, meander width ratio of valleys, and belt width on all fourth order streams using bankfull width, mean depth, width/depth ratio, maximum bankfull depth, entrenchment ratio, channel and valley slope, sinuosity, and channel material measurements. Consider developing curves of bankfull channel dimensions versus drainage area for the region.

Consider classifying streams in the WAU using Rosgen stream classification (Rosgen 1994).

Consider implementing bioengineered stream stabilization improvements. Consider stabilizing bank erosion in main channels and decreasing peak flows on unstable soil.

Consider using the following techniques for designing stream restoration projects. Place LWD in streams to lower width/depth ratio, heighten belt width, lower radius of curvature, and shorten meander length. Set root wads to decrease width/depth ratio and dissipate energy. Use cross wing deflectors to increase stream sinuosity. Use rock vanes to stabilize banks and slow streamflow and role it. Use weirs to deepen up and down stream channels and constrict flow.

When installing new culverts or replacing culverts, consider installing multiple culverts, where it is appropriate, to avoid constricting stream flows.

Consider continuing proper functioning condition surveys in the WAU.

Determine if there are reference stream reaches in the WAU not influenced by management activities for comparing to stream reaches impacted by management activities.

Consider collecting data during all seasons of the year.

Consider determining which culverts have the potential for failing.

Consider identifying roads to be closed.

E. Fisheries

Consider following Ten Year Sale Plan team recommendations for timber sale planning purposes. Integrate new information from the Ten Year Sale Plan work group to this watershed analysis as the information becomes available. However, scheduling timber harvests in subwatersheds in the following order would protect the fisheries resource the best in this WAU.

1. Sugar Pine
2. Reston
3. Berry Creek
4. Lookingglass Creek
5. Olalla Creek
6. Mt. Shep
7. Thompson

Watershed restoration opportunities may be closely linked to land management activities (i.e. road construction or timber harvesting) for the purposes of mitigating the management activity. Subwatersheds rated fair or good for habitat condition, with high species diversity, and streams with low gradients and easily accessible habitat should be priority areas for watershed restoration.

The priority for fisheries restoration in this WAU would be to remove man-made barriers to fish passage (i.e. culvert) and replace them with structures that provide fish passage (i.e. bridges or bottomless arch pipes).

Consider conducting coho spawning surveys in the mainstems of Thompson and Olalla Creeks.

Consider describing how projects meet Aquatic Conservation Strategy (ACS) objectives, using a process similar to what was developed during the Sugar Pine Density Management project, for activities occurring within Riparian Reserves.

Consider conducting watershed restoration activities in the Thompson Subwatershed. Site specific surveys within Thompson Creek may need to be conducted to adequately address the need for instream, riparian, or upslope (i.e. road improvement, decommissioning, or slope stabilization) restoration projects.

Consider reducing road densities in subwatersheds where peak flows have negatively altered stream channel condition and have had negative impacts on the fisheries resource. Transportation Management Objectives (TMO) could be the basis for determining restoration needs within each subwatershed. Areas to consider first for road decommissioning would be subwatersheds within the Transient Snow Zone and containing anadromous fish-bearing stream reaches. The most important roads for decommissioning would be valley bottom, then midslope, and finally ridgetop roads.

Minimize the amount of soil disturbance, timber falling, and yarding within existing late-successional or old-growth timber stands in Riparian Reserves. Salvage activities within Riparian Reserves in late seral age stands should not retard or prevent attainment of ACS objectives.

Avoid, as much as possible, constructing new stream crossings and roads within Riparian Reserves. Consider using existing roads when planning future land management activities in the Olalla-Lookingglass WAU.

F. Roads

Roads in the Olalla-Lookingglass WAU have been evaluated using the Transportation Management Objectives (TMOs) as a guide. A preliminary list of roads to be decommissioned or improved is listed in Appendix G. Appendix G also lists roads that have been decommissioned or surveyed for decommissioning within the WAU.

Table G-1 identifies road segments that could be considered for decommissioning. Roads considered for decommissioning would be those that were rated as having a low value for future access needs. Roads that access private land would not be decommissioned without the adjacent landowners concurrence.

Natural surfaced roads on BLM administered lands to decommission would be the top priority. Decommissioning, also referred to as hydrologic obliteration, could be accomplished by removing those elements of a road that reroute hillslope drainage and present slope stability hazards. Decommissioning can include removal of culverts, decompaction of the road surface (ripping), outsloping, waterbarring, and removal of unstable or potentially unstable fills. With decommissioning, most of the road bed may be left in place, facilitating inexpensive reconstruction should the need arise, but hydrologic risks are greatly reduced (USDA, et al. 1993 (FEMAT, Appendix V-J)).

Table G-2 lists roads which could be considered for either decommissioning or improving. Table G-3 identifies roads which could be considered for improving. Roads to be improved are identified as important for access, but are in need of some treatment. Improving a road could include rocking the road or replacing or adding culverts.

G. Wildlife

1. The Northern Spotted Owl

The spotted owl sites were ranked to provide management with a guide for planning and conducting activities around owl sites. This ranking does not represent a clearance as needed, or may effect determination as required by section 7 of the Endangered Species Act (ESA) of 1973, as amended. The steps used to rank the owl sites are presented in Appendix E.

When planning projects that manipulate suitable spotted owl habitat, project areas should be selected considering the evaluation and ranking of owl sites in the Olalla-Lookingglass WAU presented in Table 28. Table 28 provides information about the status of use, habitat acres, occupation, and reproduction success of owls in the Olalla-Lookingglass WAU. The goal was to evaluate the habitat, connectivity and fragmentation of the habitat, and owl site history to create a priority list. This list can be used to locate project areas while taking into account the location of active spotted owl sites. The rankings in Table 28 were used to develop owl site rankings where projects could be planned.

The results of the owl site rankings for the Olalla-Lookingglass WAU are listed in Table 31. Activities in the Matrix that modify or remove suitable owl habitat should be considered first in areas outside of known spotted owl territories. When it is not possible to avoid modifying or removing suitable habitat within an owl territory, then sites with a "go to" rank of "one" should be first, "two" should be second, and "three" should be last.

For owl sites in the LSR, the rankings are where habitat evaluation should be considered first, before manipulating stands to improve habitat. Sites in the LSR with a rank of "1" should be considered first for habitat evaluation, "two" should be second, and "three" should be last. Habitat evaluation would determine which LSR objectives (increasing late seral age forests, increasing physical connectivity of late successional forests, reducing fragmentation, or connectivity of habitat) apply to a particular area.

Table 31. Ranking of Owl sites in the Olalla-Lookingglass WAU.

MATRIX LANDS		LSR	
MSNO[1]	Go To Rank For Timber Harvesting	MSNO[1]	Go To Rank For Habitat Evaluation
0306	1	0513	3
1362	1	1914	3
1807	3	1915	2
2039	3	2100	3
2095	1	2198	3
2098	3	2533	2
2199	3	2534	2
3268	3	3901	3
4050	3	3907	2

[1.] Complex includes original ID number (i.e. 0300) and alternate sites (i.e. 0300A) unless identified as unique. MSNO = Master Site Number.

The subwatersheds in the WAU were rated for importance to wildlife for the Ten Year Timber Sale Plan. The criteria used included the percent of BLM administered land in the subwatershed, condition of Riparian Reserves, number of owl activity centers, and a subjective evaluation of connectivity based on the location and fragmentation of late seral habitat. The subwatersheds were given the following ratings for where to plan timber harvests first in the Olalla-Lookingglass WAU from the wildlife perspective.

1. Lookingglass Creek, Sugar Pine, and Olalla are subwatersheds to consider first for timber harvesting.
2. Middle Olalla Subwatershed (previously rated with the Mt. Shep Subwatershed as a 4) would be considered next.
3. Reston, Thompson, and Lower Tenmile (previously rated with the Reston Subwatershed as a 3) are subwatersheds to consider third for timber harvesting.
4. Berry Creek, Mt. Shep, and Shields (Shields Creek and Lower Shields Drainages were previously rated with the Berry Creek Subwatershed as a 4, and the Suicide Creek Drainage was previously rated with the Reston Subwatershed as a 3) are the last subwatersheds to consider for timber harvesting within the WAU.

a. Dispersal Habitat

Land ownership patterns create a narrow corridor of BLM administered lands, located in Township 29, Range 8, Sections 3, 9, and 15 between Camas Valley and the Tenmile valley. This narrow pathway corridor is important since it connects two provinces and the LSRs in the northern and southern portions of the WAU. The amount of dispersal habitat in this corridor affects the ability of species to mix between these provinces and LSRs.

The next ten years are the most important in this corridor. Within the next ten to twenty years, the area west of Camas Valley will begin to provide a pathway of dispersal habitat between the same LSRs and provinces.

Plan timber harvesting so physically connected dispersal habitat within and between sections in this pathway corridor and the reduction of dispersal habitat in these sections is considered. Managing the location and timing of timber harvesting could reduce the effects of habitat fragmentation. This would provide a pathway of connected dispersal habitat species could use to move between these LSRs and provinces.

Management actions to consider, outside of the corridor between Camas Valley and the Tenmile valley, would be to maintain dispersal habitat at or above 50 percent in each quarter township and physically connected to other forest areas. Consider avoiding reducing dispersal habitat in quarter townships currently below 40 percent.

b. Critical Habitat

The checkerboard ownership in Critical Habitat Units OR-61 and OR-62 would be expected to maintain a fragmented pattern of late-successional/old-growth forests. Critical Habitat Unit OR-62 contains forest stands in the Matrix and LSR Land Use Allocations. Silvicultural treatments within the LSR portion of CHU-OR-62 should emphasize development of multistoried stand structure which provides the best owl habitat. Harvesting stands in the Matrix, using the owl site ranking and dispersal corridor management recommendations, would help to keep critical habitat units well connected and functioning.

2. The Peregrine Falcon

Management guides include locating a no activity buffer around an active peregrine falcon site, seasonal restrictions during the peregrine falcon breeding season from March 1 to July 15, or maintaining the integrity of medium to high potential sites (USDI 1995). The buffer should include a no activity area of ½ to 1½ mile radius around known occupied sites. A secondary zone (½ to 1½ mile radius reflecting the shape of the primary zone) should be established where no management activities, such as timber harvesting, road construction, or helicopters are allowed during the peregrine falcon breeding season. Activities may resume in the secondary zone 14 days after fledgling or nest failure is confirmed. To maintain the integrity of a medium to high potential peregrine falcon nesting site, it should be managed as if it was occupied by including a no activity buffer and seasonal restrictions (March 1 to July 15). Projects that require a disturbance, such as blasting, near any medium to high potential habitat, located in the future, should be surveyed before project initiation. Blasting should be restricted if it occurs within three miles of an active site or potentially occupied site.

A resource area wildlife biologist should be consulted to evaluate the proximity a project is to peregrine falcon habitat. Consider continuing peregrine falcon habitat evaluation in the WAU.

3. Marbled Murrelet

Terms and conditions from the USFWS should be followed to mitigate disturbance to potential marbled murrelet sites when project areas (LSR or Matrix) are located within 1/4 mile of unsurveyed suitable murrelet habitat. Consider implementing a project to evaluate and survey the identified suitable murrelet habitat in the Olalla-Lookingglass WAU. Within designated Marbled Murrelet Critical Habitat, develop nesting structure by considering treatments which open young stands around natural clearings and hardwoods to encourage development of large branches in the remaining trees. Selecting and clearing around potential nest trees during commercial thinning projects could be done to enhance the growth of individual trees in a stand.

4. Other Species of Concern

a. Goshawk

Consider conducting surveys to determine if and where goshawks are present in the WAU. Continue to gather information about other raptor species that use habitat present in the WAU.

b. Mollusks

Surveys for Survey and Manage mollusk species should be conducted according to established protocol guides before any ground disturbing activities are conducted, this should also include commercial thinning and herbicide use. Surveys should be conducted according to the following priorities 1) clearance surveys of Fiscal Year (FY) 1999 and later projects, 2) survey LSRs and Riparian Reserves to document species occurrence in these areas, and 3) survey managed habitats and adjacent Riparian Reserves to evaluate impacts of timber harvesting and other habitat disturbances on specific mollusk sites.

5. Neotropical Birds

Impacts to neotropical birds come from all actions that modify habitat. This usually changes the bird species composition using a particular area. Brushing, precommercial, and commercial activities impact neotropical birds by removing habitat and physically displacing birds. Displacement includes removing occupied habitat during the breeding season.

Ways to benefit neotropical birds would be to reduce impacts from broadcast burning, brushing, regeneration harvesting, precommercial thinning (PCT), commercial thinning, and other activities that manipulate habitat. Scheduling management activities to avoid disturbing birds during nesting and breeding periods should be considered. Local populations of neotropical birds start breeding in April and May and continue through the end of August. However, most species have young capable of flight by the beginning of July or August. Consider implementing projects impacting nesting habitat before April 1 or after July 30 of any given year.

Another way to reduce impacts is to consider the goals of Riparian Reserves when brushing, precommercial thinning (PCT), or broadcast burning areas. Brushing and PCT contracts should consider including different prescriptions for Riparian Reserves. This may include not brushing or thinning within the Riparian Reserves or increasing the number of shrub and non-commercial tree species retained. Matrix lands outside of Riparian Reserves also provide brush and non-commercial tree species used by neotropical birds. Prescriptions in these areas should retain brush and tree species that are not competing directly with the desired conifer species. Some brushing and PCT projects following these recommendations have been accomplished. The results should be reviewed and evaluated.

6. Big Game Species (Elk and Deer)

Considering the desired goal of ODFW is to reduce elk numbers in the Melrose unit, which includes the Olalla-Lookingglass WAU, proactive enhancement programs would not be appropriate in this WAU. Consider coordinating with ODFW to achieve desired population numbers in the Melrose unit.

Any approach to elk management would benefit from information about distribution and use of the Olalla-Lookingglass WAU by elk. This information is not currently available.

Management of road use by people would help elk, deer, and other wildlife. Decommissioning or closing unwanted or unneeded roads and reducing new road construction would increase elk use of undisturbed areas. Seeding decommissioned road beds, designing timber harvesting units to minimize visibility from roads, seeding firebreaks and other open areas with high quality forage, and protecting travel corridors and wintering and calving areas would benefit elk.

A potential conflict is the goal of habitat manipulation for elk and spotted owl habitat, especially in the LSR portion of the WAU. Maintaining or creating early seral stands may conflict with LSR goals of maintaining and improving late-successional/old-growth habitat. Private lands would probably continue to provide early seral habitat for elk foraging areas.

VII. Synthesis

The main issues identified in the Olalla-Lookingglass WAU are connectivity of dispersal habitat between LSRs, timber harvesting, water quality, aquatic habitat conditions, road densities (number of roads), and conglomerate soils.

The amount of dispersal habitat in the pathway corridor between the LSR in the south portion and the MMR in the northwest portion of the WAU was brought forward as a concern. The concern with dispersal habitat in this corridor is mainly for next ten years, since the area west of Camas Valley should begin to provide dispersal habitat and an additional pathway between LSRs and provinces. Plan projects so physically connected dispersal habitat within this pathway corridor is considered. Scheduling the location and timing of timber harvests to provide and maintain physically connected dispersal habitat would lessen the effects of habitat fragmentation.

Two objectives of Matrix lands are to produce a sustainable supply of timber and other forest commodities and to provide early-successional habitat. Even though a rating system for the subwatersheds was developed, it is anticipated that all subwatersheds will have some timber harvesting occurring on Matrix lands at some time within the next ten years.

It was the consensus of the watershed analysis team that the scattered pieces of BLM administered land, such as in the Sugar Pine or Lookingglass Subwatersheds, would have less impact on most of the resources. Timber harvesting should consider the rankings of the subwatersheds used for the Ten Year Sale Plan. Management activities would have more of an effect on subwatershed conditions where the BLM administers more land.

Thompson Subwatershed was the focus of fisheries. The BLM manages approximately 3.5 miles (1 mile of anadromous and 2.5 miles of resident fish habitat) of land adjacent to Thompson Creek. A number of fish species use Thompson Creek and its tributaries. Thompson Creek has a low gradient in the lower reaches, which is in the LSR Land Use Allocation.

Generally, road densities are high in the WAU. Mt. Shep, Shields, and Thompson Subwatersheds have road densities greater than five miles per square mile. Consider these subwatersheds for road decommissioning, closure, or restoration opportunities.

Conglomerate soils tend to weather unevenly producing unpredictable slope stability. Building roads in areas of conglomerates is a concern due to the unpredictable slope stability. Berry Creek, Middle Olalla, Olalla, and Thompson Subwatersheds have the most conglomerates. These subwatersheds may be areas to consider for road restoration or decommissioning opportunities.

VIII. Monitoring

General objectives of monitoring are:
1) To determine if the plan is being implemented correctly.
2) Determine the effectiveness of management practices at multiple scales, ranging from individual sites to watersheds.
3) Validate whether ecosystem functions and processes have been maintained as predicted.

The Roseburg RMP, Appendix I provides monitoring guidelines for various land use allocations and resources discussed by the plan. Implementation, effectiveness, and validation monitoring questions are addressed. Management actions on the Roseburg District BLM may be monitored prior to project initiation and following project completion, depending on the resource or activity being monitored.

Some key resource elements to monitor in the Olalla-Lookingglass WAU are as follows:

A. All land use allocations

Are surveys for the species listed in the Roseburg District RMP, Appendix H conducted before ground disturbing activities occur?
Are protection buffers being provided for specific rare and locally endemic species and other species in the upland forest matrix?
Are the sites of amphibians, mammals, bryophytes, mollusks, vascular plants, fungi, lichens, and arthropod species listed in Appendix H of the Roseburg District RMP being surveyed?
Are the sites of amphibians, mammals, bryophytes, mollusks, vascular plants, fungi, lichens, and arthropod species listed in Appendix H of the Roseburg District RMP being protected?
Are high priority sites for species management being identified?

B. Riparian Reserves

Is the width and integrity of the Riparian Reserves maintained?
Are management activities within Riparian Reserves consistent with SEIS ROD Standards and Guideline, RMP management direction, and Aquatic Conservation Strategy objectives?
Has Watershed Analysis been completed prior to on-the-ground actions being initiated in Riparian Reserves?

C. Matrix

Are suitable numbers of snags, coarse woody debris, and green trees being left following timber harvesting as called for in the SEIS ROD Standards and Guidelines and Roseburg RMP management direction?
Are timber sales being designed to meet ecosystem objectives for the Matrix?
Are forests growing at a rate that will produce the predicted yields?
Are forests in the Matrix providing for connectivity between Late-Successional Reserves?

D. Late-Successional Reserves

What activities were conducted or authorized within the LSR and how were they compatible with objectives of the LSR Assessment?
Were activities consistent with the SEIS ROD Standards and Guidelines, Roseburg RMP management direction, the LSR Assessment, and REO review requirements?
What is the status of development and implementation plans to eliminate or control non-native species which adversely impact late-successional objectives?
Are projects conducted in the LSR designed to maintain, improve, or attain LSR objectives?

IX. Revisions to the Watershed Analysis and Data Gaps

Watershed analysis is an ongoing, iterative process designed to help define important resource information needed for making sound management decisions. This watershed analysis would, generally, be updated as existing information is refined, new data becomes available, new issues develop, when significant changes occur in the WAU, or as management needs dictate.

Data gaps include the amount of terrestrial large woody debris occurring in late-successional/old-growth stands within the Olalla-Lookingglass WAU, water quality, and stream temperature information.

Appendix A

Glossary

Appendix A

Glossary

Age Class - One of the intervals into which the age range of trees is divided for classification or use.

Anadromous Fish - Fish that are born and reared in freshwater, move to the ocean to grow and mature, and return to freshwater to reproduce. Salmon, steelhead, and shad are examples.

Aquatic Conservation Strategy - Plan developed in Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl, designed to maintain and restore ecosystem health at watershed and landscape scales to protect habitat for fish and other riparian-dependent species and resources and restore currently degraded habitats.

Beneficial Use - The reasonable use of water for a purpose consistent with the laws and best interest of the peoples of the state. Such uses include, but are not limited to, the following: instream, out of stream and groundwater uses, domestic, municipal, industrial water supply, mining, irrigation, livestock watering, fish and aquatic life, wildlife, fishing, water contact recreation, aesthetics and scenic attraction, hydropower, and commercial navigation.

Best Management Practices (BMPs) - Methods, measures, or practices designed to prevent or reduce water pollution. Not limited to structural and nonstructural controls, and procedures for operations and maintenance. Usually, Best Management Practices are applied as a system of practices rather than a single practice.

Bureau Assessment Species - Plant and animal species on List 2 of the Oregon Natural Heritage Data Base, or those species on the Oregon List of Sensitive Wildlife Species (OAR 635-100-040), which are identified in BLM Instruction Memo No. OR-91-57, and are not included as federal candidate, state listed or Bureau sensitive species.

Bureau Sensitive Species - Plant or animal species eligible for federal listed, federal candidate, state listed, or state candidate (plant) status, or on List 1 in the Oregon Natural Heritage Data Base, or approved for this category by the State Director.

Candidate Species - Those plants and animals included in Federal Register "Notices of Review" that are being considered by the United States Fish and Wildlife Service (FWS) for listing as threatened or endangered.

> Category 1. Taxa for which the Fish and Wildlife Service has substantial information on hand to support proposing the species for listing as threatened or endangered. Listing proposals are either being prepared or have been delayed by higher priority listing work.

Commercial Thinning - The removal of merchantable trees from an even-aged stand to encourage growth of the remaining trees.

Connectivity - A measure of the extent to which conditions between late-successional/old-growth forest areas provide habitat for breeding, feeding, dispersal, and movement of late-successional/old-growth-associated wildlife and fish species.

Connectivity/Diversity Block - A land use classification under Matrix lands managed on 150 year area control rotations. Periodic timber sales will leave 12 to 18 green trees per acre.

Core Area - That area of habitat essential in the breeding, nesting and rearing of young, up to the point of dispersal of the young.

Critical Habitat - Under the Endangered Species Act, (1) the specific areas within the geographic area occupied by a federally listed species on which are found physical and biological features essential to the conservation of the species, and that may require special management considerations or protection; and (2) specific areas outside the geographic area occupied by a listed species when it is determined that such areas are essential for the conservation of the species.

Density Management - Cutting of trees for the primary purpose of widening their spacing so that growth of remaining trees can be accelerated. Density management harvest can also be used to improve forest health, to open the forest canopy, or to accelerate the attainment of old growth characteristics if maintenance or restoration of biological diversity is the objective.

District Defined Reserves (DDR) - Areas designated for the protection of specific resources, flora and fauna, and other values. These areas are not included in other land use allocations nor in the calculation of the Probable Sale Quantity.

Endangered Species - Any species defined through the Endangered Species Act as being in danger of extinction throughout all or a significant portion of its range and published in the Federal Register.

Endemic - Native or confined to a certain locality.

Environmental Assessment (EA) - A systematic analysis of site-specific BLM activities used to determine whether such activities have a significant effect on the quality of the human environment and whether a formal environmental impact statement is required; and to aid an agency's compliance with National Environmental Protection Agency when no Environmental Impact Statement is necessary.

Ephemeral Stream - Streams that contain running water only sporadically, such as during and following storm events.

50-11-40 Rule - A proposed guideline requiring maintenance of adequate spotted owl dispersal habitat on lands outside designated "habitat conservation areas" for the Northern Spotted Owl. It would assure that, on the quarter township basis, 50 percent of the stands would have conifers averaging 11 inches dbh and a 40 percent canopy closure.

Fluvial - Migratory behavior of fish moving away from the natal stream to feed, grow, and mature then returning to the natal stream to spawn.

General Forest Management Area (GFMA) - Forest land managed on a regeneration harvest cycle of 70-110 years. A biological legacy of six to eight green trees per acre would be retained to assure forest health. Commercial thinning would be applied where practicable and where research indicates there would be gains in timber production.

GIS - Geographic Information System, a computer based mapping system used in planning and analysis.

Intermittent Stream - Any nonpermanent flowing drainage feature having a definable channel and evidence of scour or deposition. This includes what are sometimes referred to as ephemeral streams if they meet these two criteria.

Issue - A matter of controversy or dispute over resource management activities that is well defined or topically discrete. Addressed in the design of planning alternatives.

Land Use Allocations - Allocations which define allowable uses/activities, restricted uses/activities, and prohibited uses/activities. They may be expressed in terms of area such as acres or miles etc. Each allocation is associated with a specific management objective.

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

Late-Successional Reserve (LSR) - A forest in its mature and/or old-growth stages that has been reserved.

Matrix Lands - Federal land outside of reserves and special management areas that will be available for timber harvest at varying levels.

Mitigating Measures - Modifications of actions which (a) avoid impacts by not taking a certain action or parts of an action; (b) minimize impacts by limiting the degree or magnitude of the action and its implementation; (c) rectify impacts by repairing, rehabilitating or restoring the affected environment; (d) reduce or eliminate impacts over time by preservation and maintenance operations during the life of the action; or (e) compensate for impacts by replacing or providing substitute resources or environments.

Monitoring - The process of collecting information to evaluate if objectives and anticipated or assumed results of a management plan are being realized or if implementation is proceeding as planned.

Nonpoint Source Pollution - Water pollution that does not result from a discharge at a specific, single location (such as a single pipe) but generally results from land runoff, precipitation, atmospheric deposition or percolation, and normally is associated with agricultural, silvicultural and urban runoff, runoff from construction activities, etc. Such pollution results in the human-made or human-induced alteration of the chemical, physical, biological, radiological integrity of water.

Orographic - Of or pertaining to the physical geography of mountains and mountain ranges.

Peak Flow - The highest amount of stream or river flow occurring in a year or from a single storm event.

Perennial Stream - A stream that has running water on a year round basis.

Phenotypic - Of or pertaining to the environmentally and genetically determined observable appearance of an organism.

Precommercial Thinning (PCT) - The practice of removing some of the trees less than merchantable size from a stand so that remaining trees will grow faster.

Probable Sale Quantity (PSQ) - Probable sale quantity estimates the allowable harvest levels for the various alternatives that could be maintained without decline over the long term if the schedule of harvests and regeneration were followed. "Allowable" was changed to "probable" to reflect uncertainty in the calculations for some alternatives. Probable sale quantity is otherwise comparable to allowable sale quantity (ASQ). However, probable sale quantity does not reflect a commitment to a specific cut level. Probable sale quantity includes only scheduled or regulated yields and does not include "other wood" or volume of cull and other products that are not normally part of allowable sale quantity calculations.

Proposed Threatened or Endangered Species - Plant or animal species proposed by the U.S. Fish & Wildlife Service or National Marine Fisheries Service to be biologically appropriate for listing as threatened or endangered, and published in the Federal Register. It is not a final designation.

Resident Fish - Fish that are born, reared, and reproduce in freshwater.

Resource Management Plan (RMP) - A land use plan prepared by the BLM under current regulations in accordance with the Federal Land Policy and Management Act.

Riparian Reserves - Designated riparian areas found outside Late-Successional Reserves.

Riparian Zone - Those terrestrial areas where the vegetation complex and microclimate conditions are products of the combined presence and influence of perennial and/or intermittent water, associated high water tables and soils which exhibit some wetness characteristics. Normally used to refer to the zone within which plants grow rooted in the water table of these rivers, streams, lakes, ponds, reservoirs, springs, marshes, seeps, bogs and wet meadows.

Stream Order - A hydrologic system of stream classification. Each small unbranched tributary is a first order stream. Two first order streams join to form a second order stream. A third order stream has only first and second order tributaries, and so on.

Stream Reach - An individual first order stream or a segment of another stream that has beginning and ending points at a stream confluence. Reach end points are normally designated where a tributary confluence changes the channel character or order. Although reaches identified by BLM are variable in length, they normally have a range of 1/2 to 1-1/2 miles in length unless channel character, confluence distribution, or management considerations require variance.

Survey and Manage - Those species that are listed in Table C-3 of the Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl for which four survey strategies are defined.

Tillage - Breaking up the compacted soil mass to promote the free movement of water and air using a self drafting individual tripping winged subsoiler.

Transportation Management Objectives (TMO) - An evaluation of the current BLM transportation system to assess future need for roads, and identify road problem areas which need attention, and address future maintenance needs.

Watershed - The drainage basin contributing water, organic matter, dissolved nutrients, and sediments to a stream or lake.

Watershed Analysis - A systematic procedure for characterizing watershed and ecological processes to meet specific management and social objectives. Watershed analysis is a stratum of ecosystem management planning applied to watersheds of approximately 20 to 200 square miles.

Appendix B

References

Appendix B - References

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Appendix C

Fisheries

Table C-1. ODFW Aquatic Habitat Inventory Data

Stream	Reach	% Pool Area	Residual Pool Depth	Riffle W/D Ratio	% Fines in Riffles	% Gravel in Riffles	Riparian Vegetation (dominant/subdominant)	Riparian Conifer Size	% Shade	LWD pieces per 100m	LWD vol per 100m	Aquatic Habitat Rating
Bear Cr (Berry Cr)	1	39.5	0.2	32.9	7	20	hdwd/con	small	78	4.8	7.2	Poor
	2	45.3	0.5	20.3	6	53	hdwd/con	small	77	9.3	24.0	Fair
	3	64.1	0.4	17.0	4	48	con/hdwd	small/med	70	12.9	17.9	Fair
	4	12.0	0.3	16.7	9	55	con/hdwd	small	46	7.1	5.2	Poor
Berry Cr	1	49.1	0.7	18.5	5	31	con/hdwd	small	70	1.2	0.8	Fair
	2	--	--	--	--	--	--	--	--	--	--	--
	3	74.6	0.5	34.1	8	52	con/hdwd	small	72	16.0	24.3	Fair
	4	62.7	0.5	27.1	12	48	con/hdwd	small	75	27.6	68.4	Good
	5	59.6	0.5	9.9	33	60	con/hdwd	small/med	78	15.2	31.5	Good
Byron Cr	1	39.0	0.3	45.2	4	29	hdwd/con	small	76	2.1	4.7	Poor
	2	40.9	0.3	31.3	13	31	con/hdwd	small/med	86	16.0	35.1	Fair
	3	9.3	0.3	19.2	36	32	hdwd/con	small	76	8.2	20.6	Fair
Coarse Gold Cr	1	50.2	0.4	31.9	7	52	hdwd/con	small	51	2.9	2.0	Fair
	2	2.4	0.3	--	--	--	con/hdwd	small/med	77	5.7	16.7	Poor
Olalla Cr	1	30.5	0.5	35.6	1	10	hdwd/con	small	57	1.4	1.0	Poor
	2	55.4	0.5	27.9	6	20	con/hdwd	small	78	4.1	21.7	Fair
	3	50.5	0.5	11.5	1	36	hdwd/con	small	55	6.0	14.9	Fair
	4	56.3	0.7	29.5	0	35	hdwd/con	medium	86	15.8	62.9	Good
	5	57.3	0.3	21.1	18	28	con/hdwd	medium	86	13.1	21.5	Fair
	6	82.2	0.5	12.5	21	55	con/hdwd	medium	70	24.7	40.4	Good
	7	62.9	0.3	14.6	19	39	con/hdwd	medium	89	32.7	63.1	Good
	8	45.8	0.3	13.2	24	44	con/hdwd	medium	77	33.0	64.9	Good

Table C-1. ODFW Aquatic Habitat Inventory Data

Stream	Reach	% Pool Area	Residual Pool Depth	Riffle W/D Ratio	%Fines in Riffles	% Gravel in Riffles	Riparian Vegetation (dominant/subdominant)	Riparian Conifer Size	% Shade	LWD pieces per 100m	LWD vol per 100m	Aquatic Habitat Rating
Thompson Cr	1	53.6	0.6	21.7	7	34	con/hdwd	medium	72	6.1	7.1	Fair
	2	55.6	0.5	20.6	4	35	con/hdwd	medium	74	7.0	12.6	Fair
	3	16.8	0.5	--	--	--	hdwd/con	small/med	78	6.2	8.4	Poor
	4	54.1	0.5	17.8	6	43	con/hdwd	medium	76	5.2	9.9	Fair
	5	39.0	0.6	13.3	5	76	con/hdwd	small/med	71	10.5	25.3	Good
	6	36.8	0.4	17.3	6	65	con/hdwd	small	62	14.5	17.0	Fair
	7	0.7	0.2	--	--	--	con/hdwd	medium	77	6.8	12.3	Poor
Wildcat Cr	1	15.7	0.3	21.0	9	36	con/hdwd	small	82	38.3	61.2	Fair
	2	13.6	0.3	13.0	5	35	con/hdwd	medium	90	32.3	48.0	Good
Willingham Cr	1	48.0	0.3	12.0	7	40	con/hdwd	small	82	7.5	9.3	Fair
	2	56.8	0.2	14.6	9	41	con/hdwd	medium	71	18.0	17.8	Fair
	3	92.3	0.3	17.0	10	29	con/hdwd	small	65	40.0	47.0	Fair
	4	32.2	0.3	13.3	10	20	hdwd/con	small	60	19.1	10.5	Fair
	5	11.3	0.2	8.0	15	35	hdwd/con	small	88	20.5	25.5	Fair

AHR = Aquatic Habitat Rating
-- = no data available

Table C-2. Summary Table of Current Conditions in the Olalla-Lookingglass WAU.

Drainage Name **Subwatershed Name**	Road density	Stream drainage density	% BLM ownership	stream crossing density	Percent Less than 30 Years Old (from WODIP)	HRP %	Percent of Riparian Reserves at least 80 Years Old (from WODIP)
Bear Creek	5.29	4.86	45	2.33	65	91	38
Ben Irving	4.34	5.62	32	1.80	19	99	40
Berry Creek	4.09	4.27	39	2.10	28	99	51
Coarse Gold	2.56	5.55	33	1.81	25	98	39
Upper Berry	5.12	5.75	46	1.56	37	84	38
Berry Creek Subwatershed	4.47	5.17	39	1.90	46		41
Lookingglass	2.91	1.65	1	1.43	26	NA	NA
Upper Lookingglass	4.13	3.33	19	1.68	36	NA	45
Winston	3.14	1.69	<1	2.05	41	NA	NA
Lookingglass Creek Subwatershed	3.40	2.24	7	1.70	34	NA	45
Porter Creek	2.80	4.10	19	1.16	20	NA	67
Siebold Canyon	3.99	4.34	31	1.80	35	NA	48
Tenmile	4.49	4.07	18	1.88	25	NA	60
Lower Tenmile Subwatershed	3.95	4.22	25	1.72	29	NA	53
Bushnell Frontal	5.15	5.45	45	1.92	28	97	41
Byron Creek	4.41	5.42	34	1.87	33	99	53
Middle Olalla Subwatershed	4.87	5.44	41	1.90	30		45
Olalla Frontal	5.18	8.18	48	2.63	26	93	44
Upper Olalla Creek	5.76	5.38	46	2.67	40	81	12
Wildcat Creek	4.81	6.94	56	1.99	17	85	37
Willingham Creek	5.60	5.70	47	2.49	25	93	16
Mt. Shep Subwatershed	5.40	6.36	49	2.46	29		27

Drainage Name **Subwatershed Name**	Road density	Stream drainage density	% BLM ownership	stream crossing density	Percent Less than 30 Years Old (from WODIP)	HRP %	Percent of Riparian Reserves at least 80 Years Old (from WODIP)
Olalla	4.46	6.07	22	1.95	37	NA	40
Olalla Subwatershed	4.46	6.07	22	1.95	37	NA	40
Middle Tenmile	3.25	5.04	23	1.33	47	NA	26
Reston	4.89	3.57	17	2.79	35	ND	45
Upper Tenmile	4.62	3.26	42	2.21	31	ND	39
Reston Subwatershed	4.37	3.81	29	2.10	36		37
Lower Shields	5.95	5.63	4	2.63	32	NA	56
Shields Creek	7.33	5.06	9	3.12	35	NA	36
Suicide Creek	5.06	5.63	41	1.81	42	NA	30
Shields Subwatershed	5.82	5.49	24	2.31	38	NA	30
Flournoy Creek	2.36	2.30	2	1.53	37	ND	43
Morgan Creek	4.68	2.45	5	1.98	31	NA	14
Rock Creek	4.86	3.38	16	2.20	31	ND	60
Sugar Pine Subwatershed	3.82	2.78	8	1.94	34		59
Thompson Creek	5.00	6.14	39	2.00	49	92	56
Thompson Subwatershed	5.00	6.14	39	2.00	49	92	56
Olalla-Lookingglass Watershed Analysis Unit	4.43	4.50	27	2.02	36		40

NA = Not Applicable; Less Than 2 Percent of the Drainage is within the Transient Snow Zone or No Acres are in Riparian Reserves.
ND = Complete Data was Not Available for Determining Hydrologic Recovery Percentage.

Riparian Reserve Discussion - Impacts to RR based on ACS objectives.

NOTE: This discussion is based on a 180' Riparian Reserve width not 160' as is applicable in some watersheds.

ACS OBJECTIVE	SUMMARY OF ACS OBJECTIVE	POTENTIAL IMPACTS (beneficial and adverse)	MITIGATION
1*	Watershed & landscape scale features		Objective attained with emphasis on restoration.
2*	Spatial/temporal connectivity	Some short-term adverse impacts, but not sufficient enough to impact connectivity. In long-term, effects would likely be beneficial.	- 90' (from stream) no touch buffer on non-fish bearing and 180' on fish bearing (see FEMAT V26-27 for justification). - Do not clear around sugar pine closer than 200' of each other in the area outside the 90' or 180' no touch buffer (between 90'-180' or 180'-360' from stream, respectively).
3**	Physical integrity of aquatic system	1) Short term sedimentation impacting H_20 quality (from harvest). 2) Short term sedimentation due to consttuction of temporary roads. 3) Sedimentation from skid trails. 4) Increased sedimentation from all roads. 5) Disturbance in RR from yarding. 6) Increased sediment in channels (winter).	1) 90' (from stream) no touch buffer on non-fish bearing and 180' on fish bearing. 2) No mid-slope rd. locations, narrow rd. surfaces and low cuts. 3) Till existing skid trails (reduces sediment in long term & restores function). 4) Summer show. 5) No yarding across channel. 6) Renovate (money limited) using BMP's; seasonal restrictions; directionally fall from RR.
4*	Water quality	1) Building roads and skid roads in RR. 2) Impacts similar to objective 3 (above).	1) Do not build roads or skid roads within the RR. Existing skid roads through draws would not be used.
5**	Sediment regime	Same as objective 3 (above).	Same as objective 3 (above).
6*	Instream flows	1) Compaction due to hauling & yarding. 2) Increased peak flows due to reduced canopy closure (will happen only in areas of s.p. concentrations). 3) Removal of potential future DWD.	1) Till; seasonal restrictions (except what's done from existing rocked roads); one-end log suspension. 2) Layout (where concentrated, don't necessarily clear around all s.p.); do not remove vegetation (including trees) from anywhere else except around s.p. (in RR). 3) For "poor" s.p. and snags in RR, don't thin around and don't harvest the "poor" s.p. in RR.
7*	Floodplain inundation & water table elevation	1) Decrease of H_20 in the meadow or wetland.	1) Do not yard through; no harvest in these areas and do not construct roads.
8*	Species comp. & diversity of plant communities	Reduction of canopy in more concentrated s.p. areas (thermal regulation occurs within 100' of stream).	Do not clear around s.p. closer than 200' of each other within 90-180' of the buffered draw (nonfish-bearing); or within 180-360' of the buffered draw (fish-bearing.).
9*	Habitat to support populations of riparian dependent species.	1) Vascular plants = no impacts; survey & manage = potential short term adverse impacts; silviculture = short-term removes all brush and small trees & long-term revegetates; beneficial for s.p. maintenance in ecosystem and mimics low-intensity fire which would allow for early successional species to come back which is natural for the ecosystem; invertebrates/vertebrates = short-term adverse impacts due to harvest of trees & long-term beneficial impacts since it perpetuates successional events which maintain or create desired future conditions.	This objective would be maintained since the activity has beneficial impacts on habitat in the long-term and contributes to restoration of the s.p. population.

* Objective attained with application of mitigation (revised 7/28/97)

** Objective attained with application of mitigation and restored in some cases.

Habitat Bench Marks Related to Category Types

Pools	Bench Mark Weighing Scale 1-5	4-Excellent	3-Good	2-Fair	1-Poor	Row Totals
a) Pool Area %	2	≥ 45	30-44	16-29	≤ 15	
b) Residual Pool						
Small (1-3 ordered)	4	≥ 0.55	0.35 - 0.54	0.15 - 0.34	0 - 0.14	
Large (4th order and greater)	4	≥ 0.95	0.76 - 0.94	0.46 - 0.75	≤ 0.45	
Riffles						
a) Width/Depth (wetted) (ODFW)	3	≤ 10.4	10.5 - 20.4	20.5 - 29.4	≥ 29.5	
b) Width/Depth (bank full) (USFS)	3	≤ 10	11 - 15	16 - 19	≥ 20	
c) Silt/Sand/Organics (% area) (ODFW)	2	≤ 1	2 - 7	8 - 14	≥ 15	
d) Embeddedness (% by unit) (USFS)	2	0	1 - 25	26 - 49	≥ 50	
e) Gravel % (Riffles)	3	≥ 80	30 - 79	16 - 29	≤ 15	
f) Substrate dominant	3	Gravel	Cobble	Cobble	Bedrock	
subdominant (USFS)	2	Cobble	Large Boulder	Small Boulder	Anything	
Reach Average						
a) Riparian condition Species dom/subdom. (> 15 cm)	2	conifer/hdwd* Klam - hdwd*	conifer/hdwd* Klam - hdwd*	hdwd*/conifer	alder/anything	
Size (Conifers)	3	≥ 36" Klam - ≥ 24"	24 - 35" Klam - 12 - 23"	7 - 23"	≤ 6"	
b) Shade (%) (ODFW)						
Stream Width < 12 M	1	≥ 80	71 - 79	61 - 70	≤ 60	
Stream Width > 12 M	1	≥ 70	61 - 69	51 - 60	≤ 50	
LWD						
a) Pieces (lg/sm) 100 M Stream	3	≥ 29.5	19.5 - 29.4	10.5 - 19.4	≤ 10.4	
b) Vol/100 M Stream	2	≥ 39.5	29.5 - 39.4	20.5 - 29.4	≤ 10.4	
USFS - Pieces 50' or more long and 24" dbh per mile	5	≥ 70	45 - 69	31 - 44	≤ 30	
Temperatures	1	≤ 55	56 - 60	61 - 69	≥ 70	
Macroinvertebrates						
Totals for Category						

* Hardwood category does not include alder.
*Where USFS designations appear, either USFS or ODFW measurements may be used but not both.

HABITAT BENCHMARK RATING SYSTEM

100 - 82 EXCELLENT
81 - 63 GOOD
62 - 44 FAIR
43 - 25 POOR

Appendix D

Hydrology

Appendix D

Table D-1. Monthly and Annual Discharge Data for Olalla Creek near Tenmile from 1957 to 1973.

Month	Minimum Flow (cfs)	Year	Maximum Flow (cfs)	Year	Mean Flow (cfs)
October	0.9	1973	51	1963	8.9
November	3.4	1960	253	1962	79
December	11	1960	660	1965	239
January	24	1963	613	1965	328
February	56	1973	755	1958	242
March	44	1965	463	1971	205
April	19	1968	283	1963	78
May	6.9	1966	247	1963	36
June	2.8	1973	28	1958	8.6
July	0.4	1973	5.8	1958	2.0
August	0.0	1973	1.5	1963	0.5
September	0.1	1970	1.8	1971	0.8
Annual	42	1973	170	1958	102

Table D-2. Monthly and Annual Discharge Data for Lookingglass Creek at Brockway from 1956 to 1979. (data from 1981 to 1993 listed in parenthesis)

Month	Minimum Flow (cfs)	Year	Maximum Flow (cfs)	Year	Mean Flow (cfs)
October	0 (8)	1965,1975 (1988)	97 (86)	1963 (1987)	14 (26)
November	5 (8)	1977 (1994)	1440 (809)	1974 (1985)	256 (209)
December	5 (33)	1977 (1990)	3320 (1961)	1956 (1982)	741 (503)
January	10 (122)	1977 (1981)	1810 (1265)	1956 (1995)	873 (409)
February	29 (133)	1977 (1988)	1950 (1544)	1958 (1983)	674 (557)
March	110 (55)	1965 (1992)	1110 (965)	1971 (1983)	519 (358)
April	33 (38)	1977 (1990)	751 (826)	1963 (1982)	207 (249)
May	19 (15)	1966 (1987)	631 (149)	1963 (1988)	87 (70)
June	4 (5)	1973 (1994)	57 (73)	1958 (1993)	16 (22)
July	0 (3)	1977 (1985)	10 (22)	1958 (1983)	2 (8)
August	0 (4)	Many before 1980 (1982)	3 (13)	1976 (1983)	0.1 (7)
September	0 (5)	Many before 1980 (1987)	9 (23)	1978 (1986)	1 (11)
Annual	27 (71)	1977 (1994)	626 (451)	1956 (1982)	282 (207)

Table D-3. Drainage area of each Drainage (seventh field watershed) in the Olalla-Lookingglass WAU.

Drainage Name	Square Miles	Drainage Name	Square Miles
Berry Creek Subwatershed		**Olalla Subwatershed**	
Bear Creek[1]	3.98	Olalla	74.97
Ben Irving	19.32	**Reston Subwatershed**	
Berry Creek	12.78	Middle Tenmile	17.73
Coarse Gold[1]	1.99	Reston	13.26
Upper Berry[1]	4.34	Upper Tenmile[1]	7.34
Lookingglass Creek Subwatershed		**Shields Subwatershed**	
Lookingglass	102.89	Lower Shields	11.76
Upper Lookingglass	84.61	Shields Creek[1]	2.78
Winston	161.11	Suicide Creek[1]	6.07
Lower Tenmile Subwatershed		**Sugar Pine Subwatershed**	
Porter Creek	39.93	Flournoy Creek[1]	7.39
Siebold Canyon[1]	5.62	Morgan Creek	18.28
Tenmile	32.63	Rock Creek[1]	7.81
Middle Olalla Subwatershed		**Thompson Subwatershed**	
Bushnell Frontal	41.43	Thompson Creek[1]	13.27
Byron Creek[1]	4.74		
Mt. Shep Subwatershed			
Olalla Frontal	15.77		
Upper Olalla Creek[1]	5.35		
Wildcat Creek[1]	3.41		
Willingham Creek[1]	3.8		

[1]individual watershed -- headwater

Table D-4. Annual instantaneous peak flow for Olalla Creek near Tenmile. Station number 14311200. Water Years 1956 to 1995.[3]

Year	Month	Day	Peak Flow (cfs)
1956	12	11	3,190
1957	12	20	5,550
1959	02	12	7,670
1960	02	09	2,880
1961	02	10	3,450
1961	11	23	3,240
1963	05	06	2,410
1964	01	19	6,590
1964	12	22	6,110
1966	01	03	9,160
1966	12	04	2,300
1968	01	15	2,310
1969	01	12	4,320
1969	12	21	4,500
1971	01	17	8,280
1972	03	01	4,360
1972	12	22	698
1975	05	25	2,480
1976	01	08	2,290
1980	01	14	1,360[4]
1980	12	03	1,170

[3]No data are available for water years 1974, 1977 to 1979.

[4] Only the maximum daily discharge for the water year (highest daily mean) was available from water years 1980 to 1987.

1981	12	06	3,360
1983	02	18	4,370
1984	02	13	2,430
1984	11	28	1,900
1986	02	19	2,100
1987	02	02	1,070
1987	12	06	1,330
1989	01	10	1,540
1990	02	08	654
1991	03	04	1,130
1992	04	12	345
1993	01	20	2,450
1994	02	18	456
1995	01	09	5,820

Table D-5. Annual instantaneous peak flow for Lookingglass Creek at Brockway.
Station number 14311500. Water Years 1956 to 1995.

Year	Month	Day	Peak Flow (cfs)
1955	12	26	35,000
1957	02	26	10,800
1957	12	21	17,500
1959	01	12	19,100
1960	02	09	10,200
1961	02	10	12,100
1961	11	23	16,500
1962	12	02	5,880
1964	01	20	20,300
1964	12	22	18,000
1966	01	04	20,200
1967	01	28	6,550
1968	01	15	5,900
1969	01	13	8,550
1969	12	21	10,200
1971	01	17	15,600
1972	03	02	11,300
1973	01	13	1,680
1974	01	15	10,600
1975	01	05	7,590
1976	01	08	8,230
1977	03	09	844
1977	11	24	7,850
1979	01	11	4,350

1980	01	12	5,510
1980	12	03	7,710
1981	12	06	14,200
1983	02	18	14,600
1984	02	13	8,460
1984	11	27	5,290
1986	02	18	7,750
1987	02	02	4,990
1988	01	10	3,940
1989	01	10	5,300
1990	01	08	3,290
1991	03	04	2,460
1991	12	06	1,460
1993	01	20	4,190
1994	02	18	923
1995	01	09	11,100

Table D-6. Daily maximum, minimum, and mean discharge for Lookingglass Creek at Brockway. Station number 14311500. Water Years 1956 to 1995.

	Daily Discharge (cfs)		
Water Year	Maximum	Minimum	Mean
1956	9,390	0.0	497
1957	5,700	0.0	259
1958	8,410	0.0	409
1959	5,840	0.0	223
1960	7,890	0.0	197
1961	7,450	0.0	270
1962	3,030	0.0	239
1963	4,270	0.0	288
1964	7,860	0.0	229
1965	7,000	0.0	318
1966	8,260	0.0	214
1967	4,830	0.0	239
1968	4,080	0.0	175
1969	5,080	0.0	327
1970	6,440	0.0	270
1971	6,050	0.0	315
1972	9,050	0.0	396
1973	1,260	0.0	108
1974	9,150	0.0	517
1975	4,130	0.0	253
1976	5,720	0.0	226
1977	634	0.0	27
1978	4,320	0.0	233

1979	2,980	0.0	156
1980	4,500	0.0	225
1981	3,420	0.3	118
1982	9,540	0.1	450
1983	9,670	6.0	427
1984	6,940	0.9	324
1985	4,600	0.0	198
1986	5,600	3.5	225
1987	3,400	0.1	168
1988	3,110	3.5	150
1989	3,720	0.8	188
1990	1,690	2.1	96
1991	2,010	0.8	120
1992	971	2.8	83
1993	2,770	1.2	231

APPENDIX E

Wildlife

APPENDIX E

These steps were followed to reach the recommendations given in Table 30. It uses information gathered at the Resource Area level. Spotted owl site ranking and general suitable habitat evaluation are the two topics to consider when planning management activities affecting spotted owl suitable habitat.

A. Spotted Owl Site Ranking

1. Gathered information to create Table 28. Values given in Table 28 were from owl survey data and suitable habitat inventory data.

2. Table 28 contains information on historic and current owl sites. The owl sites best representing the territory locations were selected. Usually the number of potential sites is lower than the sum number of historical sites and current sites. The reason is that any one activity center can have more than one alternate location. Usually the area of these different alternate numbers overlap. Some have alternate numbers that are physically in a different drainage, subwatershed, ownership, or section.

3. Criteria steps **a** through **m,** listed below, were used to group the selected owl sites to determine the rankings.

Criteria list:

a) Areas where owl sites are **not** present should be considered first.

b) If sites cannot be avoided, then sites that have more than 1,000 acres of suitable habitat in the provincial radius and more than 500 acres in the 0.7 mile radius with occupancy and history rankings of "3" should be considered **second**.

c) Sites with less than 1,000 acres of suitable habitat in the provincial radius and less than 500 acres in the 0.7 mile radius with occupancy and history rankings of "3" should be considered **third**.

d) Sites with an occupancy ranking of "2" and a history ranking of "3" should be considered **fourth**.

e) Sites with an occupancy ranking of "3" and a history ranking of "2" should be considered **fifth**.

f) Sites with more than 1,000 acres of suitable habitat in the provincial radius and more than 500 acres in the 0.7 mile radius with occupancy and history rankings of "2" should be considered **sixth**.

g) Sites with less than 1,000 acres of suitable habitat in the provincial radius and less than 500 acres in the 0.7 mile radius with occupancy and history rankings of "2" should be considered **seventh**.

h) Sites with more than 1,000 acres of suitable habitat in the provincial radius and more than 500 acres in the 0.7 mile radius with an occupancy ranking of "1" and a history ranking of "2" should be considered **eighth**.

i) Sites with more than 1,000 acres of suitable habitat in the provincial radius and more than 500 acres in the 0.7 mile radius with an occupancy ranking of "2" and a history ranking of "1" should be considered **ninth**.

j) Sites with more than 1,000 acres of suitable habitat in the provincial radius and less than 500 acres in the 0.7 mile radius with an occupancy ranking of "1" and a history ranking of "2" should be considered **tenth**.

k) Sites with less than 1,000 acres of suitable habitat in the provincial radius and less than 500 acres in the 0.7 mile radius with an occupancy ranking of "1" and a history ranking of "2" should be considered **eleventh**.

l) Sites with less than 1,000 acres of suitable habitat in the provincial radius and less than 500 acres in the 0.7 mile radius with an occupancy ranking of "2" and a history ranking of "1" should be considered **twelfth**.

m) Sites with occupancy and history rankings of "1" should be considered **last**.

4. Projects meeting criteria **a,** which is removing or modifying suitable spotted owl habitat outside of known provincial territories should be considered first.

5. Owl territories meeting criteria **b** through **g** were grouped and given a ranking of **one**.

6. Owl territories meeting criteria **h** through **j** were grouped and given a ranking of **two**.

7. Owl territories meeting criteria **k** through **m** were grouped and given a ranking of **three**.

8. The following conditions apply to the individual rankings.

When it is not possible to avoid modifying or removing suitable habitat within a known territory, then sites with "go to" rank of "one" should be first, "two" should be second, and "three" should be last. The rank (Table 28) for any given owl site number gives a different purpose based on Land Use Allocation (LSR or Matrix). For example, a site with a final rank of "1" in Matrix should be considered as a potential area where harvest may occur first. Details of timing, location, and distance from core area would be determined by an ID Team and other staff evaluations.

Sites with a rank of "1" in the LSR portion of the WAU should be considered first for habitat evaluation. Details of timing, location, distance from core area, objectives, and treatment prescription would be determined by the ID Team or other staff evaluations.

B. Habitat Evaluation

The concept of habitat evaluation would be applied to the landscape while maintaining objectives for the various Land Use Allocations. Habitat evaluation would describe the timing, location, and spatial distribution of habitat removal or modification on Matrix lands in the WAU. Habitat evaluation may include topics like connectivity of mature and late-successional blocks to other similar blocks and their relationship to topography, the amount suitable habitat present around spotted owl sites, where the suitable habitat is located, the connectivity of suitable habitat, and the status of dispersal habitat. The function and objectives of critical habitat should be considered in areas where Critical Habitat Units overlap Matrix lands.

In the LSR portion of the WAU, the habitat evaluation would consider current forest age classes, future age classes, location, and connection to similar habitat within or between spotted owl territories across the landscape. This evaluation could locate LSR project areas and actions where manipulation of forest stands could aid reaching old-growth characteristics sooner than if left in the current condition.

Evaluation of the connectivity of suitable habitat would be done with the aid of a photo of the Olalla-Lookingglass WAU, seral age class maps, and ground inspection. This way the connection of late-successional blocks and the relationship to topography could be examined. Topography is important because knowing where connectivity is present or lacking and the relationship to riparian systems or uplands may make a difference on its success. Because of the checkerboard ownership, connectivity of the remaining older forest stands is very important. Even avian species capable of flight require connectivity of habitat for moving from one place to another. The ability to move within the forest from one place to another becomes more important to species that require or have dependency on older age classes, have small territories and move by crawling or walking across the ground.

The following is an example of steps to evaluate forest connectivity on the landscape. This example deals with owls but the process can be used for other species. This process should involve wildlife biologists, planning, and silviculture specialists.

1. Use the ranking system given before. Keep in mind habitat acre thresholds of maintaining 500 acres within 0.7 miles, 1,335 acres within 1.3 miles, or 1,286 acres within 1.2 miles of a spotted owl activity center and LSR objectives. This data was presented in Table 28 in this watershed analysis.

2. Owl sites would be evaluated using the spatial arrangement of seral age classes within the provincial radii (1.2 or 1.3 miles) around an owl site. In the LSR, the purpose would be to locate suitable forest age classes, next to suitable habitat, where stand development toward late successional characteristics could be accelerated. On Matrix lands, the purpose would be to locate areas where manipulation may provide a functional forest corridor and coordinate the timing and spacing of harvest units.

3. Within the WAU, the connectivity of suitable spotted owl habitat within an owl site to other late successional habitat in the vicinity would be evaluated. Blocks of older age class stands (80 years old and

older) and how they are connected to other similar blocks would be analyzed. The following questions and comments would be reviewed and answered.

a. Does the provincial radii of owl sites contain forest stands suitable for harvest (Matrix) or manipulation (LSR/Matrix)? If the ranking table has been completed this information is already available.

b. Will manipulation of forest stands (LSR/Matrix) speed up attaining older age class characteristics to provide connectivity between owl sites and suitable spotted owl habitat?

c. Will timber harvesting of stands reduce connectivity between suitable owl habitat and adjacent habitat?

d. Will manipulation of the stand increase/decrease connectivity between suitable owl habitat and adjacent habitat, between the LSR and Matrix, between connectivity blocks?

e. Where is connectivity needed? In the upland or in the riparian area of the drainage? Both? Is the Riparian Reserve connection adequate to meet objectives?

f. Evaluate and select forest stands to leave without manipulation and likely pros and cons of such choice (in Matrix or LSR). This can lead to long-term connection across the landscape of older forest stands.

Table E-1. Special Status Wildlife Species in the Olalla-Lookingglass WAU.			
SPECIES	**STATUS**	**PRESENCE**	**MONITORING LEVEL**
VERTEBRATES			
FISH			
Coho Salmon (Oncorhynchus kisutch)	FT, SC, AS	D	3
Umpqua Chub (Oregonighthys kalawatseti)	SoC, SV, BS	S	1
Umpqua Basin Cutthroat Trout (Oncorhynchus clarki clarki)	FE	D	3
Pacific Lamprey (Lampetra ayresi)	SoC, BS	D	3
Steelhead Trout (Oncorhynchus mykiss)	FP	D	3
AMPHIBIANS AND REPTILES			
Clouded salamander (Aneides ferrous)	SU, AS	D	3
Del Norte salamander (Plethodon elongatus)	S&M, SoC, SV, BS	U	3
Foothill yellow-legged frog (Rana boylii)	SoC, SV, BS	S	3
Northern Red-legged frog (Rana aurora aurora)	SoC, SU, BS	D	3
Southern Torrent salamander (Rhyacotriton variegatus)	SoC, SC, BS	S	3
Tailed frog (Ascaphus truis)	SoC, SV, BS	U	3
Western toad (Bufo boreas)	SV, BT	S	1
California Mountain kingsnake (Lampropeltis zonata)	SV, AS	S	1
Common kingsnake (Lampropeltis getulus)	SV, AS	S	1
Northwestern pond turtle (Clemmys marmorata marmorata)	SoC, SC, BS	D	3
Sharptail snake (Contia tenuis)	SV, AS	S	3
BIRDS			
Harlequin duck (Histrionicus histrionicus)	SoC, BS	U	1
Marbled murrelet (Brachyramphus marmoratus marmoratus)	FT, ST, CH	S	3
Bald eagle (Haliaeetus leucocephalus)	FT, ST	S	1
Northern goshawk (Accipiter gentilis)	SoC, SC, BS	S	3
Peregrine falcon (Falco peregrinus anatum)	FE, ST	S	4
Great gray owl (Strix nebulosa)	S&M, SV, AS	S	1
Northern spotted owl (Strix occidentalis caurina)	FT, ST, CH	D	4
Flammulated owl (Otus flammeolus)	SC, AS	U	1
Pygmy owl (Glaucidium gnoma)	SU	D	3

Table E-1. Special Status Wildlife Species in the Olalla-Lookingglass WAU.

SPECIES	STATUS	PRESENCE	MONITORING LEVEL
Northern Saw-whet Owl (Aegolius acadicus)	AS	S	1
Acorn Woodpecker (Melanerpes formicivorous)	SU	S	1
Lewis' woodpecker (Melanerpes lewis)	SC, AS	U	1
Pileated woodpecker (Dryocopus pileatus)	SV, AS	D	3
Little willow flycatcher (Empidonax traillii brewsteri)	SoC, BS	S	1
Purple martin (Progne subis)	SC, AS	D	3
Pygmy nuthatch (Sitta pygmae)	SV	U	1
Western bluebird (Sialia mexicana)	SV, AS	D	3
Oregon vesper sparrow (Pooecetes gramineus)	SC, BT	U	1
MAMMALS			
Fringed myotis (Myotis thysanodes)	SoC, SV, BS, S&M	S	3
Long-eared Myotis (Myotis evotis)	SoC, BS, S&M	D	3
Long-legged Myotis (Myotis volans)	SoC, BS, S&M	D	3
Pacific pallid bat (Antrozous pallidus)	S&M, SC, AS	D	3
Silver Haired Bat (Lasionycteris noctivagans)	BT	D	3
Townsend's big-eared bat (Corynorhinus townsendii)	SoC, SC, BS	S	3
Yuma Myotis (Myotis yumanensis)	SoC, BS	D	3
Ringtail (Bassariscus astutus)	SU	S	1
American marten (Martes americana)	SC, AS	S	1
Pacific Fisher (Martes pennanti pacifica)	SoC, SC, BS	U	1
California wolverine (Gulo gulo luteus)	SoC, BS	U	1
North American Lynx (Felis lynx canadensis)	S&M	U	1
White-footed vole (Arborimus albipes)	SoC, BS, SP	S	1
Red Tree Vole (Arborimus longicaudus)	S&M	D	3
INVERTEBRATES			
Blue-gray taildropper (Prophysaon coeruleum)	S&M	D	3
Oregon shoulderband (Helminthoglypta hertleini)	S&M	S	3
Oregon megomphix (Megomphix hemphilli)	S&M	S	3
Papillose taildropper (Prophysaon dubium)	S&M	D	3

Table E-1. Special Status Wildlife Species in the Olalla-Lookingglass WAU.

SPECIES	STATUS	PRESENCE	MONITORING LEVEL
Alsea ochrotichian micro caddisfly (Ochrotrichia alsea)	SoC, BS	U	1
Denning's agapetus caddisfly (Agapetus denningi)	SoC, BS	U	1
Vertree's ochrotichian micro caddisfly (Ochrotrichia vertreesi)	SoC, BS	U	1
Franklin's bumblebee (Bombus franklini)	SoC, BS	U	1

STATUS ABBREVIATIONS:	PRESENCE ABBREVIATIONS:
FE -- Federal Endangered	**D** -- Documented by surveys or identified in the field
FT -- Federal Threatened	**S** -- Suspected, habitat present
FP -- Federal Proposed	**U** -- Uncertain
FC -- Federal Candidate	
SoC-- Federal species of concern	August 14, 1997 RHEspinosa
CH -- Critical habitat designated	**MONITORING LEVELS USED TO DOCUMENT SPECIES:**
SE -- State Endangered	**N** -- No surveys done or planned
ST -- State Threatened	**1** -- Literature search only
SC -- ODFW Critical	**2** -- One field search done
SV -- ODFW Vulnerable	**3** -- Some surveys completed
SP -- ODFW Peripheral/Naturally Rare	**4** -- Protocol completed
SU -- ODFW Undetermined	
BS -- Bureau Sensitive Species (BLM) - This status reflects interim guidelines for former USFWS FC1 and FC2 species as per instruction communication from the Oregon state office (March 7,1996) and IM-OR-97-118 (April 30,1997).	
AS -- Bureau Assessment Species (BLM)	
BT -- Bureau Tracking species (BLM)	
S&M--Survey and Manage (ROD)	

Appendix F

Plants

Appendix F

Table F-1. Survey and Manage Plant Species Suspected to Occur in the Olalla-Lookingglass WAU.

Species	Survey Strategy			
	1	2	3	4
Vascular plants				
Allotropa virgata	X	X		
Aster vialis	X	X		
Bensoniella oregana	X	X		
Cypripedium fasciculata	X	X		
Cypripedium montanum	X	X		
Fungi				
Rare False Truffles				
Gautieria otthii	X		X	
False Truffles				
Rhizopogon truncatus			X	
Chanterelles				
Cantharellus cibarius			X	X
Cantharellus subalbidus			X	X
Cantharellus tubaeformis			X	X
Rare Resupinates and Polypores				
Otidea leporina			X	
Otidea onatica			X	
Otidea smithii	X		X	
Sarcosoma mexicana			X	
Rare Cup Fungi				
Aleuria rhenana	X		X	

Appendix F

Table F-1. Survey and Manage Plant Species Suspected to Occur in the Olalla-Lookingglass WAU.

Species	**Survey Strategy**			
	1	**2**	**3**	**4**
Lichens				
Rare Leafy Lichens				
Hypogymnia duplicata	X	X	X	
Rare Nitrogen-Fixing Lichens				
Nephroma occultum	X		X	
Pseudocyphellaria rainierensis	X	X	X	
Riparian Lichens				
Usnea longissima				X
Bryophytes				
Marsupella emarginata var. aquatica	X	X		
Ptilidium californicum (Liverwort)	X	X		

Survey Strategies:
1= Manage Known Sites
2= Conduct Surveys Prior to Activities and Manage Sites
3= Conduct Extensive Surveys and Manage Sites
4= Conduct General Regional Surveys

Appendix G

Roads

Table G-1. Roads in the Olalla-Lookingglass WAU to Consider Decommissioning.

Road Number	Miles	Subwatershed
29-7-7.01A	0.17	Berry Creek
29-7-19.00A	0.20	Berry Creek
29-8-11.00A	0.39	Berry Creek
29-8-11.01A	0.24	Berry Creek
29-8-13.03A	0.12	Berry Creek
29-8-14.01C	0.29	Berry Creek
29-8-23.01A	0.84	Berry Creek
29-8-23.05A	0.20	Berry Creek
29-8-23.06A	0.20	Berry Creek
29-8-27.01B	0.10	Berry Creek
29-8-27.03A	0.36	Berry Creek
29-8-27.04A	0.14	Berry Creek
29-8-27.05A	0.11	Berry Creek
29-8-27.06A	0.11	Berry Creek
29-8-35.00A	0.22	Berry Creek
29-8-35.01A	0.23	Berry Creek
29-8-35.02A	0.15	Berry Creek
29-8-35.03A	0.29	Berry Creek
29-8-35.05A	0.54	Berry Creek
30-8-3.04A	0.13	Berry Creek
28-7-9.00C	0.04	Lookingglass Creek
28-7-9.01A	0.25	Lookingglass Creek
30-7-18.05A	0.44	Mt. Shep
30-7-18.06A	0.13	Mt. Shep
30-7-19.02A	0.34	Mt. Shep
30-7-20.01B	0.22	Mt. Shep
30-8-1.02A	0.33	Mt. Shep

Road Number	Miles	Subwatershed
30-8-1.03A	0.22	Mt. Shep
30-8-1.04A	0.31	Mt. Shep
30-8-11.02A	0.27	Mt. Shep
30-8-11.04A	0.30	Mt. Shep
30-8-13.00B	0.59	Mt. Shep
30-8-24.02E	0.34	Mt. Shep
29-7-7.00A	0.33	Olalla
29-7-11.04A	0.30	Olalla
28-8-9.00A2	0.15	Reston
28-8-9.02A	0.40	Reston
28-8-13.02A	0.23	Reston
28-8-13.03A	0.28	Reston
28-8-15.02A	0.26	Reston
28-8-16.03B	0.57	Reston
28-8-21.02A	0.10	Reston
28-8-21.03A	0.07	Reston
28-8-26.00B	0.08	Reston
28-8-26.00C	0.60	Reston
28-8-27.02A	0.63	Reston
28-8-27.03A	0.16	Reston
28-8-27.06A	0.25	Reston
28-8-27.07A	0.19	Reston
28-8-27.08A	0.45	Reston
29-7-35.03C	0.11	Thompson
30-6-7.06A	0.13	Thompson
Total	14.1	

Table G-2. Roads Which Could Either Be Decommissioned or Improved in the Olalla-Lookingglass WAU.

Road Number	Miles	Subwatershed
29-8-27.02A	0.28	Berry Creek
30-7-8.03A	0.78	Mt. Shep
30-7-8.04A	0.56	Mt. Shep
30-7-9.00A	0.70	Mt. Shep
30-7-20.00B	1.16	Mt. Shep
30-7-20.00C	0.21	Mt. Shep
30-8-12.00B	0.59	Mt. Shep
29-7-17.00A	0.16	Olalla
28-8-15.00B	0.30	Reston
28-8-15.00D	0.26	Reston
28-8-27.01A	0.49	Reston
28-8-27.01B	0.11	Reston
30-6-7.02A	0.20	Thompson
Total	5.8	

Table G-3. Roads to Consider Improving in the Olalla-Lookingglass WAU.

Road Number	Miles	Subwatershed
29-7-20.02A	0.40	Berry Creek
29-7-20.02B	1.20	Berry Creek
29-8-1.00C	3.70	Berry Creek
29-8-1.00D	2.65	Berry Creek
29-8-2.02B1	0.87	Berry Creek
29-8-13.00F	0.30	Berry Creek
29-8-13.00H	0.40	Berry Creek
29-8-13.00J	0.10	Berry Creek
29-8-13.01A	3.09	Berry Creek
29-8-27.00C	1.00	Berry Creek
29-8-27.00D	0.70	Berry Creek
30-8-3.00A	0.75	Berry Creek
30-8-3.01A	0.10	Berry Creek
30-8-9.02C	0.92	Berry Creek
30-8-9.03A	0.26	Berry Creek
28-7-9.00A	2.69	Lookingglass Creek
28-7-27.00B	0.29	Lookingglass Creek
29-7-31.02A	0.59	Mt. Shep
30-7-5.00G	0.14	Mt. Shep
30-7-5.00I	0.04	Mt. Shep
30-7-5.01A	0.65	Mt. Shep
30-7-6.02A	1.25	Mt. Shep
30-7-7.01A	1.18	Mt. Shep
30-7-8.02A	0.79	Mt. Shep

Road Number	Miles	Subwatershed
30-7-18.01B1	0.90	Mt. Shep
30-7-18.01B2	0.70	Mt. Shep
30-7-18.04B	0.13	Mt. Shep
30-7-19.00A	0.05	Mt. Shep
30-7-19.00C	0.60	Mt. Shep
30-7-19.01A	1.76	Mt. Shep
30-8-11.00A	0.43	Mt. Shep
30-8-11.00B	0.82	Mt. Shep
30-8-11.00C	0.09	Mt. Shep
30-8-11.01A1	0.91	Mt. Shep
30-8-11.01A2	1.39	Mt. Shep
30-8-11.03A	0.32	Mt. Shep
30-8-14.00B	0.74	Mt. Shep
30-8-14.00C	0.50	Mt. Shep
30-8-14.01A	0.33	Mt. Shep
30-8-14.04A	0.40	Mt. Shep
30-8-15.01A	0.40	Mt. Shep
30-8-23.00A	0.60	Mt. Shep
30-8-23.01A	0.16	Mt. Shep
30-8-23.01B	0.15	Mt. Shep
30-8-24.00B	1.50	Mt. Shep
30-8-26.00A	1.04	Mt. Shep
29-7-3.00E	1.74	Olalla
29-7-11.01A	0.62	Olalla
29-7-11.01B	0.50	Olalla

Road Number	Miles	Subwatershed
29-7-11.02A	0.70	Olalla
29-7-15.00B	0.40	Olalla
28-8-12.02B	0.05	Reston
28-8-13.00A	2.93	Reston
28-8-13.01A	0.96	Reston
28-8-16.00A	4.30	Reston
28-8-23.02A1	0.20	Reston
28-8-23.02A2	0.70	Reston
28-8-27.05A	0.25	Reston
28-8-34.00C	1.00	Reston
28-8-34.01B	0.50	Reston
28-8-34.02A	1.19	Reston
29-8-2.00D	0.60	Reston
29-8-2.00F2	0.51	Reston
29-8-2.01F	0.08	Reston
29-8-3.01A	1.01	Reston
29-6-31.03A	0.39	Thompson
29-6-31.03B	0.15	Thompson
30-6-4.02B	1.85	Thompson
30-6-5.00A	0.33	Thompson
30-6-5.00E	0.14	Thompson
30-7-2.02B	0.30	Thompson
Total	59.38	

Decommissioned Roads Within the Olalla-Lookingglass WAU.

Unmarked road off of the 30-7-19.1 road.
Unmarked road off of the 30-7-7.1 road.
Unmarked road off of the 30-7-7.0 road.
Unmarked road off of a new unmarked road off of the 30-7-19.1 road.

Roads that have been surveyed for decommissioning.

30-7-8.0 Road from junction of 29-7-31.2 road.
Unmarked road off of the 30-7-8.0 road.
Unmarked road off of the 30-7-18.1 road.
Unmarked road off of the 30-7-19.1 road.