Myrtle Creek Watershed Analysis and Water Quality Restoration Plan

Roseburg District
South River Resource Area

Second Iteration
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Watershed Analysis Team:

Paul Meinke	-Coordinator/Soils
Lowell Duell	-Co-Team Leader/Hydrology
Nancy Duncan	-Wildlife Biology
Erin Strange	-Fisheries
Craig Kintop	-Silviculture
Julie Knurowski	-Botany/Noxious Weeds
Mike Anderson	-Engineering/Roads/TMOs
Gary Basham	-Botany/Noxious Weeds
Dave Mathweg	-Recreation
Don Scheleen	-Archeology/Human Uses
Dave Roberts	-GIS Support
Joe Ross	-Management Representative

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Executive Summary
Myrtle Creek WAU

Characterization

The Myrtle Creek WAU covers approximately 76,265 acres. Approximately 11,466 acres (15 percent) of the WAU is in nonforested conditions, mainly agricultural. About two percent (approximately 1,618 acres) of the WAU are dominated by hardwoods. The rest of the WAU is considered to be conifer forests.

The Bureau of Land Management administers approximately 31,008 acres (41 percent) of the WAU. Approximately 15,493 acres (50 percent) of BLM-administered lands are in the Matrix Land Use Allocation. This is about 20 percent of the WAU.

Timber harvesting, agriculture, transportation, mining, recreation, service-related activities, and residential dwellings have been some of the human uses in the WAU. The town of Myrtle Creek is located in 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 summarize the information included in the watershed analysis.

Key Issues

The following issues and concerns were identified during the analysis.

Potential areas for timber harvesting on BLM-administered land in the WAU.

The amount of timber harvesting conducted in the past.

The amount of late-successional habitat in the WAU.

The distribution and condition of habitat used by Special Status Species.

Condition of Riparian Reserves (vegetation conditions and effects of roads).

Water quality.

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

Restoration opportunities in the WAU.

Findings

Vegetation

Bureau of Land Management administered land comprises about 50 percent of the WAU.

About 50 percent of the BLM-administered land in the WAU is available for timber harvesting. It is estimated about 24 percent of the BLM-administered land in the WAU will be less than 30 years old in 2025. The age class distribution would be about the same as it is now.

Port-Orford cedar does not occur in the WAU.

Soils

Approximately 18,105 acres (58 percent) on BLM-administered land are considered to have Category 1 Soils that are highly sensitive to prescribed slash burning.

Approximately 11,947 acres (39 percent) on BLM-administered land have slopes less than 35 percent and could potentially be harvested with ground based equipment. Ground based harvesting equipment can compact the soil and affect soil productivity.

Hydrology and Fisheries

Road densities in the WAU range from 3.03 to 5.94 miles per square mile. The average road density in the WAU is 4.36 miles per square mile.

Road densities on BLM-administered land range from zero to 6.82 miles per square mile. The average road density on BLM-administered land in the WAU is 3.85 miles per square mile.

North Myrtle Creek is on the water quality limited list for habitat modification. South Myrtle Creek and Riser Creek are on the water quality limited list for temperature. South Myrtle Creek (from the mouth to Weaver Creek) is on the water quality limited list for flow modification.

Three streams surveyed in the Aquatic Habitat Inventory were rated as being in poor condition. Nine streams were rated as being in fair condition.

Pfankuch surveys were conducted in 42 stream segments on 16 creeks in the WAU. Nine stream segments were rated as being in poor condition, 27 were rated as being in fair condition, and six were rated as being in good condition.

Sediment in the streams, poor width to depth ratios, and the lack of large woody debris and pools are some of the limiting factors reported in the stream surveys conducted by ODFW.

Wildlife

The Northern Spotted Owl

The northern spotted owl is the only Federally listed terrestrial wildlife species known to occur in the Myrtle Creek WAU.

There are 23 known spotted owl centers in the Myrtle Creek WAU.

One peregrine falcon nest site occurs in the WAU. The peregrine falcon is considered to be a Bureau Sensitive Species. A Habitat Management Plan is being prepared and expected to be completed in 2002.

One northern goshawk site occurs in the WAU. The northern goshawk is considered to be a Bureau Sensitive Species.

One Townsend's big-eared bat site occurs at the Continental Mine in the WAU. The Townsend's big-eared bat is considered to be a Bureau Sensitive Species. The Continental Mine Bat Strategy is being prepared and expected to be completed in 2002.

Survey and Manage Species

There is habitat within the WAU that some Survey and Manage species may use.

Recommendations and Restoration Opportunities

Vegetation

Conduct regeneration harvests on the Matrix Land Use Allocation in conformance with the RMP.

Manage young stands, including those in Riparian Reserves, to maintain or improve growth and vigor and improve stand structure and composition.

Soils

Appropriate methods should be used for reducing vegetative competition on Category 1 Soils. Consider using methods other than prescribed burning on Category 1 Soils unless considered essential for resource management, such as habitat improvement, tree seedling establishment, or reducing fire risks.

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 to document that soil goals are being achieved.

Maintain or enhance long term soil productivity while meeting management objectives.

Hydrology

Consider conducting density management activities in Riparian Reserves to maintain or improve tree growth for future stream side shade, channel stability, and potential large woody debris.

Consider placing large woody debris in the stream channel to manipulate channel form and improve aquatic diversity.

Decommission, obliterate, or improve roads causing or having the potential to cause sediment being delivered to streams.

Fisheries

Consider replacing human-made (i.e. culvert) barriers to fish passage.

Wildlife

The Northern Spotted Owl

Density management activities could be conducted to accelerate development of late-successional habitat to benefit northern spotted owl productivity and survival. Stands occurring near northern spotted owl sites with the poorest suitable northern spotted owl habitat, occupation, and reproduction would be areas to consider first.

Fender's Blue Butterfly

Consider surveying Kincaid's lupine sites to determine if the Fender's blue butterfly occurs in the WAU.

The Peregrine Falcon

The occupied peregrine falcon site would be managed in accordance with the most current peregrine falcon habitat management plan.

The Northern Goshawk

Follow management direction in the RMP when conducting management activities around the northern goshawk site.

Bat Species

The Townsend's big-eared bat site would be managed in accordance with the most current Continental Mine Bat Strategy when it is completed.

Consider leaving large diameter, green trees with deeply fissured bark, cavities, or other defects to provide roosting habitat for bats.

Invasive Species in Ponds

Consider controlling non-native amphibian and fish species in ponds to benefit native amphibians.

Consider restoration activities in ponds to benefit native aquatic species.

Neotropical Bird Species

Consider implementing projects impacting nesting habitat before April 1 or after July 30 in any given year.

Consider retaining brush and non-commercial tree species that are not competing with the desired tree species.

Consider including different prescriptions when brushing or thinning in Riparian Reserves.

Plants

Consider maintaining or restoring the native plant diversity in the WAU.

Follow the management guidelines in the Conservation Strategy for Calochortus coxii.

Follow the management guidelines in the Conservation Strategy for Calochortus umpquaensis.

Follow the management guidelines in the recovery plan for Kincaid's lupine after it is completed by the USFWS.

Noxious Weeds

Consider conducting noxious weed inventories in the WAU.

Consider requiring equipment involving ground disturbing activities be cleaned before traveling onto BLM-administered lands.

Use biological control agents, where it is appropriate, on noxious weed infestations on BLM-administered lands. Priority noxious weeds are those considered to be Target Species on the Oregon Department of Agriculture "T" list, equivalent county lists, and as otherwise decided in consultation with BLM representatives.

Provide integrated noxious weed management including prevention/detection, education/awareness, inventory, planning, weed treatment/control, contract administration, monitoring, evaluation, and coordination.

Evaluate nonnative species for noxious weed characteristics and control while populations are small.

I. Characterization of the Watershed

Watershed analysis is a systematic procedure to characterize a watershed. The information would be used for making management decisions to meet ecosystem management objectives. This watershed analysis follows the format presented in the Ecosystem Analysis at the Watershed Scale, Federal Guide for Watershed Analysis.

Watershed analysis is one component of the Aquatic Conservation Strategy (ACS). The other components of the Aquatic Conservation Strategy are Key Watersheds, Riparian Reserves, and Watershed Restoration. These components are designed to operate together to maintain and restore the productivity and resiliency of riparian and aquatic ecosystems. The Myrtle Creek Watershed Analysis Unit (WAU) is not within a Key Watershed. Riparian Reserves are portions of the landscape where riparian-dependent and stream resources receive primary emphasis. Riparian Reserves help meet the Aquatic Conservation Strategy by maintaining streambank integrity, large woody debris (LWD), riparian shade and microclimate, and surface and groundwater systems (see Appendix H). Riparian Reserves also provide sediment filtration, travel and dispersal corridors, nutrient sources, pool habitat, and drainage network connections. Watershed Restoration would help in the recovery of fish habitat, riparian habitat, and water quality. A Water Quality Restoration Plan is included as an appendix to this watershed analysis (see Appendix L).

The Myrtle Creek Watershed Analysis Unit is located in the east central portion of the South River Resource Area on the Roseburg District Bureau of Land Management (see Map 1). The Myrtle Creek WAU also includes approximately 143 acres (less than one percent) of land administered by the United States Forest Service (USFS). The Watershed Analysis Unit covers approximately 76,265 acres. Elevation ranges from about 600 feet where Myrtle Creek flows into the South Umpqua River in the western portion of the WAU to 4,500 feet near Deadman Mountain in the eastern portion of the WAU. The town of Myrtle Creek is located in this WAU.

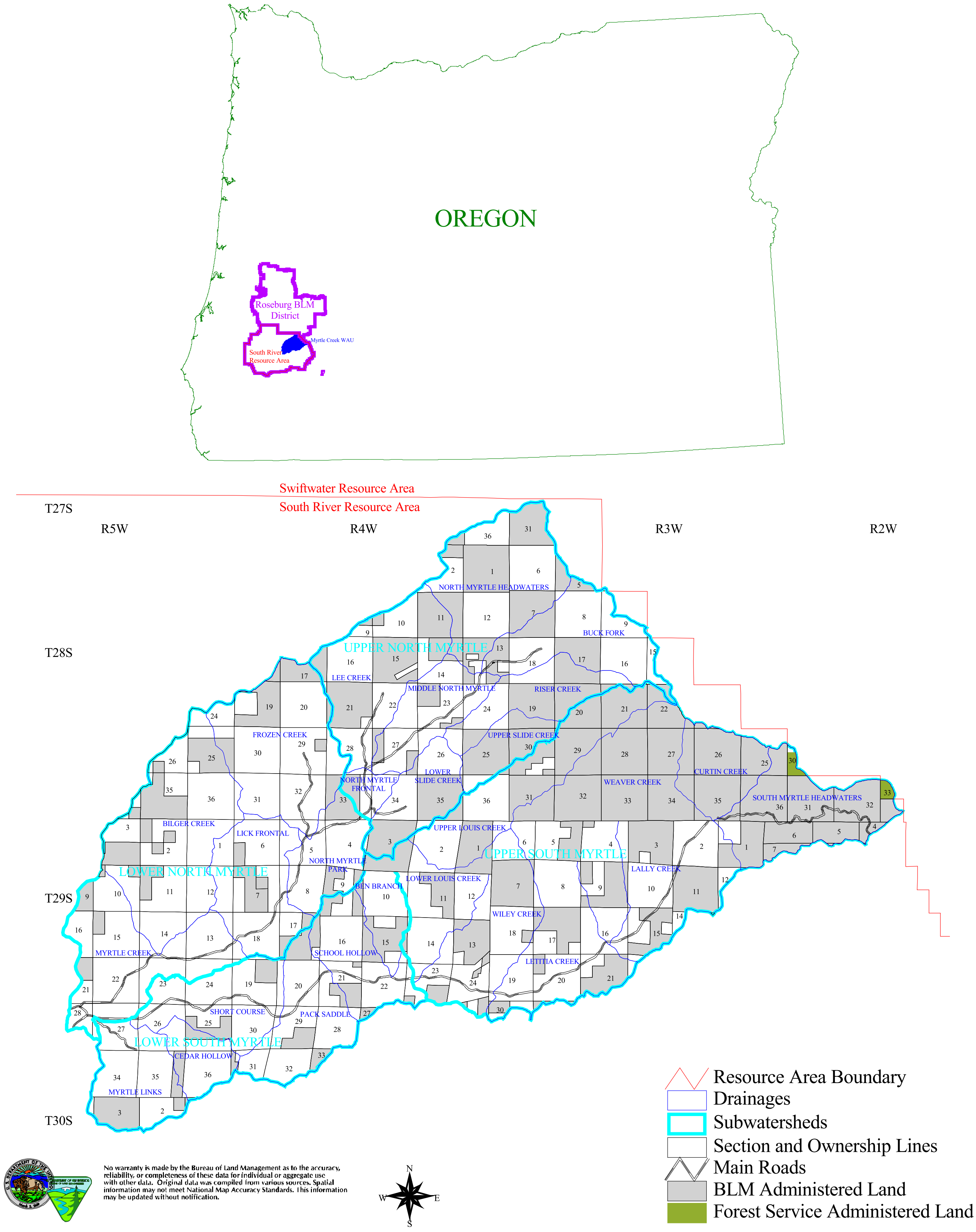
The Myrtle Creek Watershed Analysis Unit is interchangeable with the Myrtle Creek Watershed, which is a fifth field watershed. The fifth field watershed is the scale of analysis used when determining whether activities retard or prevent attainment of Aquatic Conservation Strategy objectives (USDI 1995).

The Myrtle Creek Watershed Analysis Unit includes four subwatersheds, which are further divided into 27 drainages. The subwatersheds and their drainages are shown on Map 2 and the acres of each are listed in Table 1.

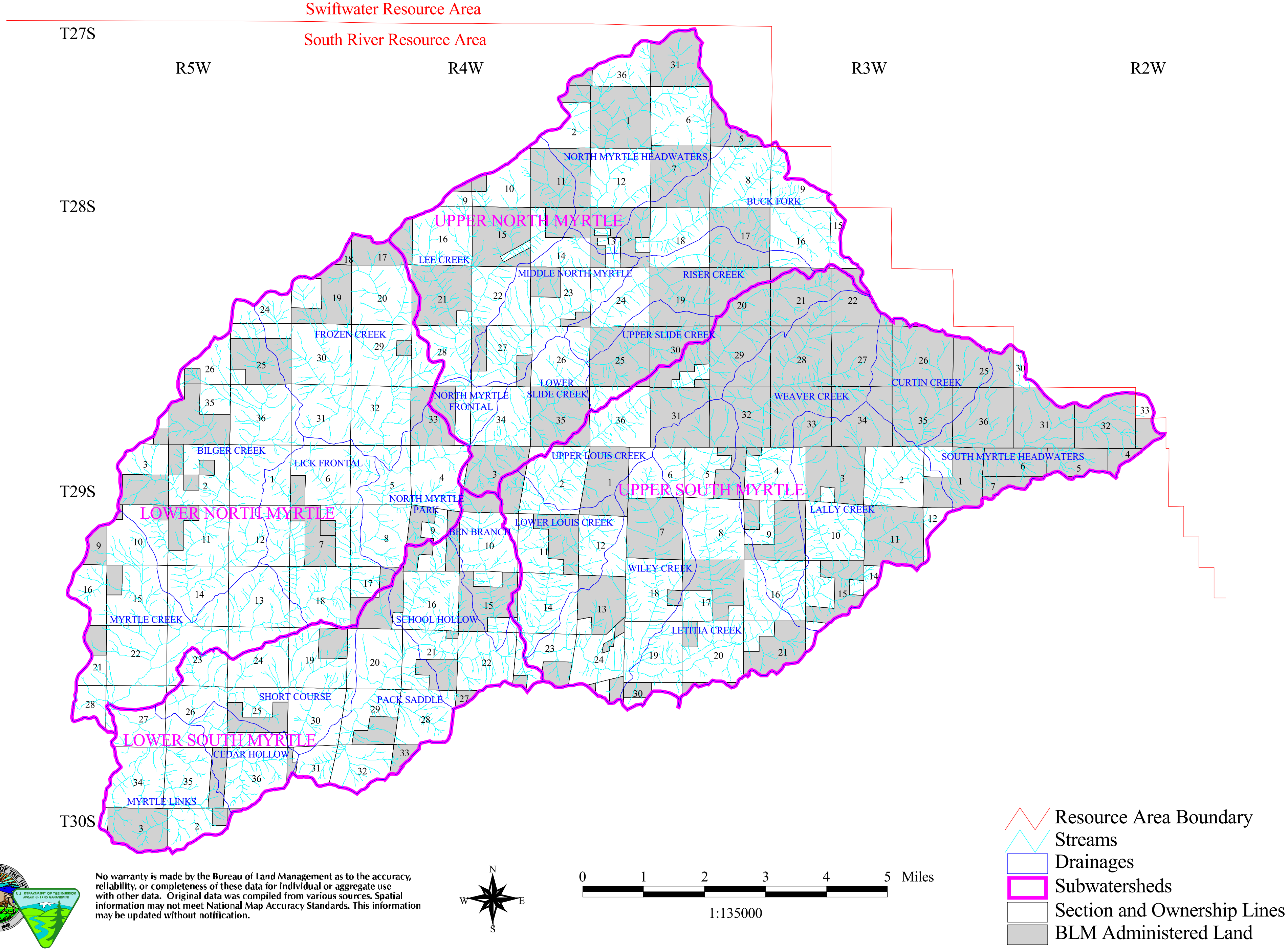
The Bureau of Land Management (BLM) administers approximately 31,000 acres (41 percent) of the Myrtle Creek WAU. Privately owned lands cover approximately 45,000 acres (59 percent) of the WAU.

Bureau of Land Management administered lands are composed of Matrix and Riparian Reserve Land Use Allocations established in the Northwest Forest Plan (USDA and USDI 1994b) and the

Map 1. Myrtle Creek Watershed Analysis Unit Vicinity Map



Map 2. Myrtle Creek Watershed Analysis Unit
Subwatersheds and Drainages



No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data was compiled from various sources. Spatial information may not meet National Map Accuracy Standards. This information may be updated without notification.

Roseburg District Resource Management Plan (RMP). Matrix lands are further delineated into General Forest Management Areas (GFMA) and Connectivity/Diversity Blocks (CONN). Map 3 and Chart 1 show the percentage of GFMA, Connectivity/Diversity Blocks, and Riparian and Other Reserves and how they are distributed in the WAU. Table 2 and Chart 2 show the number of acres by Land Use Allocation.

Table 1. Acres and Percent Ownership by Drainage and Subwatershed.

Drainage Name **Subwatershed Name**	BLM		Forest Service		Private		Total Acres
	Acres	Percent	Acres	Percent	Acres	Percent	
Bilger Creek	1,433	26	0	0	4,136	74	5,569
Frozen Creek	947	21	0	0	3,648	79	4,595
Lick Frontal	499	17	0	0	2,441	83	2,940
Myrtle Creek	317	8	0	0	3,716	92	4,033
North Myrtle Park	383	20	0	0	1,495	80	1,878
Lower North Myrtle Subwatershed	3,579	19	0	0	15,436	81	19,015
Buck Fork	899	30	0	0	2,100	70	2,999
Lee Creek	1,831	47	0	0	2,025	53	3,856
Lower Slide Creek	953	53	0	0	843	47	1,796
Middle North Myrtle	420	20	0	0	1,635	80	2,055
North Myrtle Frontal	140	26	0	0	401	74	541
North Myrtle Headwaters	2,220	54	0	0	1,884	46	4,104
Riser Creek	1,238	62	0	0	774	38	2,012
Upper Slide Creek	983	85	0	0	168	15	1,150
Upper North Myrtle Subwatershed	8,684	47	0	0	9,830	53	18,514

Table 1. Acres and Percent Ownership by Drainage and Subwatershed.

Drainage Name **Subwatershed Name**	BLM		Forest Service		Private		Total Acres
	Acres	Percent	Acres	Percent	Acres	Percent	
Ben Branch	451	39	0	0	706	61	1,157
Cedar Hollow	208	19	0	0	897	81	1,105
Myrtle Links	525	22	0	0	1,857	78	2,381
Pack Saddle	497	19	0	0	2,127	81	2,625
School Hollow	590	27	0	0	1,590	73	2,181
Short Course	310	12	0	0	2,352	88	2,662
Lower South Myrtle Subwatershed	2,581	21	0	0	9,529	79	12,111
Curtin Creek	1,830	100	0	0	0	0	1,830
Lally Creek	2,222	54	0	0	1,904	46	4,126
Letitia Creek	1,619	36	0	0	2,836	64	4,455
Lower Louis Creek	625	31	0	0	1,421	69	2,046
South Myrtle Headwaters	3,087	92	143	4	129	4	3,359
Upper Louis Creek	2,363	66	0	0	1,199	34	3,562
Weaver Creek	3,118	79	0	0	844	21	3,963
Wiley Creek	1,300	40	0	0	1,984	60	3,285
Upper South Myrtle Subwatershed	16,164	61	143	1	10,317	39	26,625
Myrtle Creek WAU	31,008	41	143	0	45,112	59	76,265

Map 3. Myrtle Creek Watershed Analysis Unit
BLM Land Use Allocations

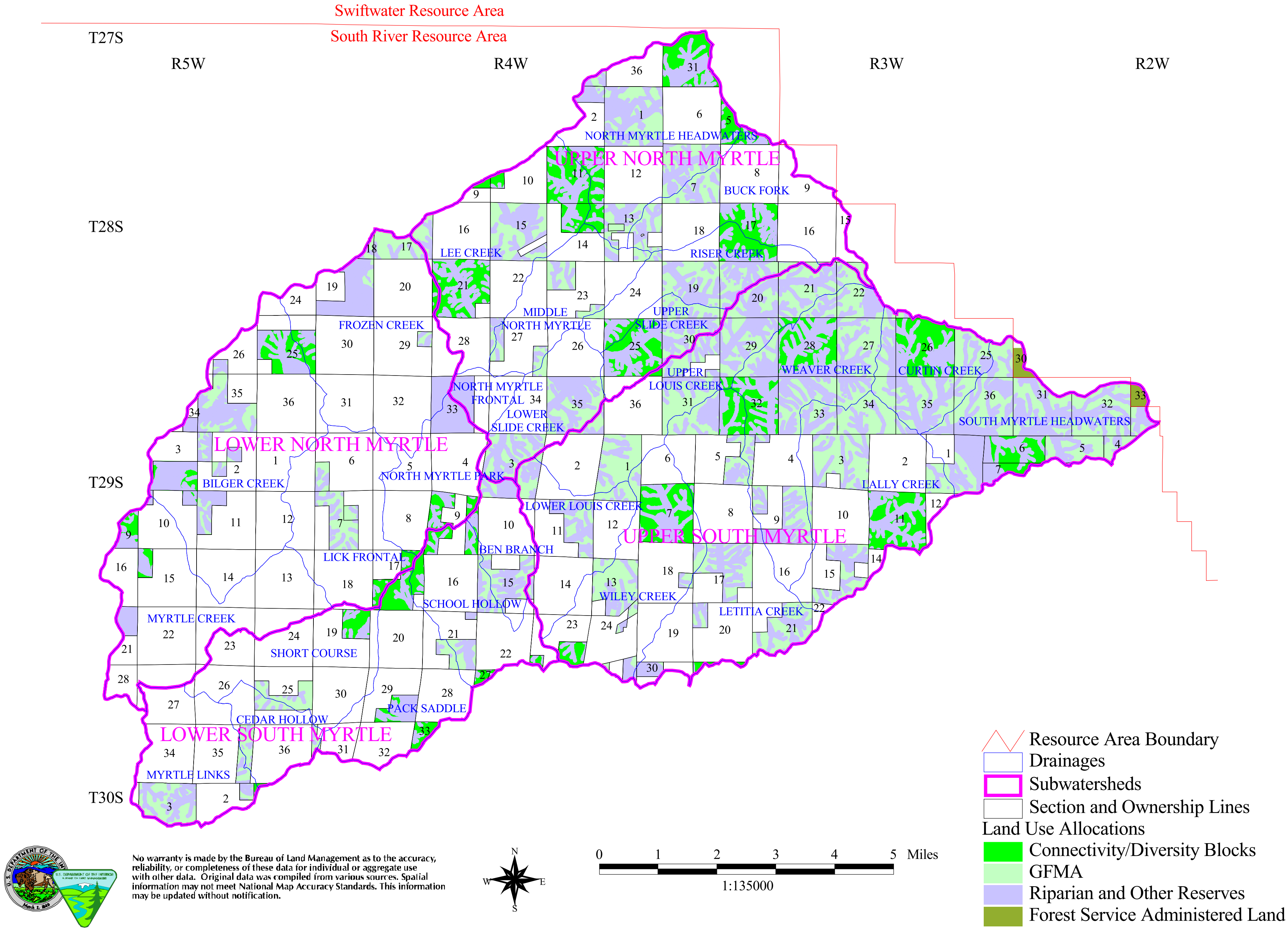


Chart 1. Myrtle Creek WAU

Land Use in the WAU

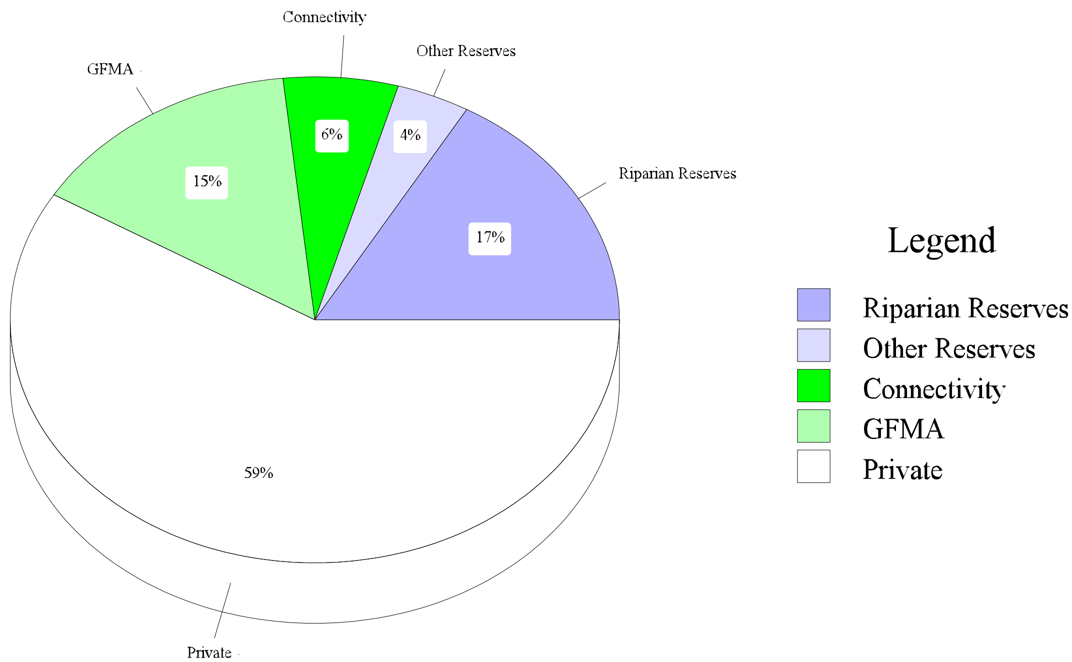


Chart 2. Myrtle Creek WAU

Federal Land Use Allocations

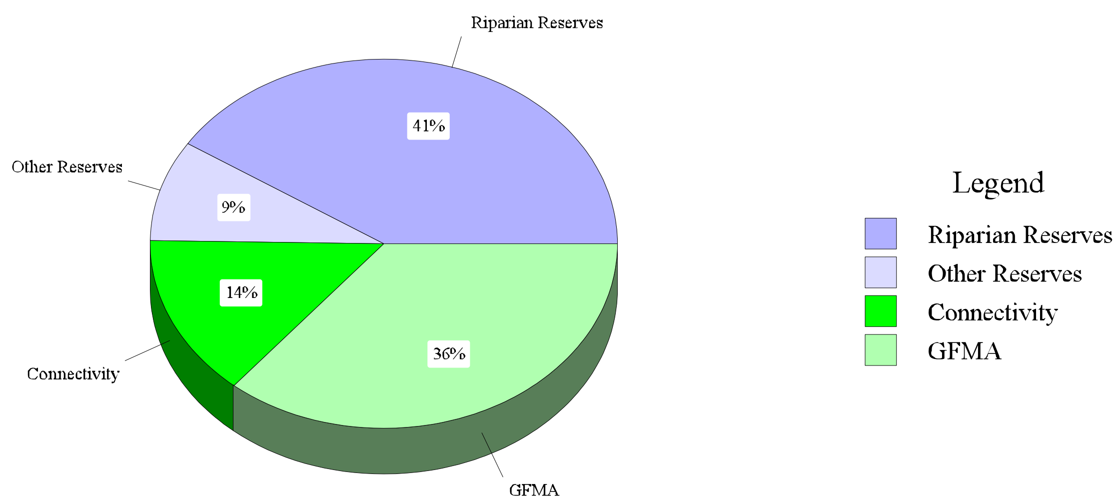


Table 2. Acres and Percentages of Federally Administered Lands by Land Use Allocation.

Land Use Allocation	Acres in Roseburg District	Acres in Umpqua National Forest	Total Acres of Federally Managed Lands	Percent of Federally Managed Lands	Percent of Watershed Analysis Unit
Riparian Reserves	12,728	49	12,777	41	17
Other Reserved Areas (Owl Core Areas and TPCC Withdrawn Areas)	2,767	0	2,767	9	4
Connectivity/Diversity Blocks	4,505	0	4,505	14	6
General Forest Management Area (GFMA)	10,988	94 (Matrix)	11,082	36	15
Total	30,988	143	31,131	100	41

II. Issues and Key Questions

The purpose of developing issues is to focus the analysis on the key elements of the ecosystem that are relevant to the management questions, human values, or resource conditions within the WAU. Areas covered by this watershed analysis 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 would be appended to the watershed analysis document as an update.

A. Issue 1 - 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, maintenance of ecologically valuable structural components such as down logs, snags, and large trees, and providing early-successional habitat.

Key Questions

Vegetation Patterns

What are the historic and current vegetation conditions? See pages 18 through 70.

What is the current age class distribution in the WAU? Where are the early and mid seral stands in the WAU? Where are the late-successional/old-growth stands within the WAU? See Table 7 on page 40 and Map 9 on page 42.

Where are the stands of harvestable age (at least 40 years old) within the Matrix Land Use Allocation? See Map 10 on page 47.

Can the scale, timing, and spacing of timber harvest areas be adjusted to minimize fragmentation and the effects on other resources while meeting the objectives for the Matrix Land Use Allocation established in the SEIS ROD and the Roseburg District RMP? See pages 65 through 70, Map 14 on page 69, pages 192 and 193, Table 46 on page 195, Appendix E, and Appendix I.

B. Issue 2 - Watershed Health and Restoration

Watershed restoration is an integral part of a program to aid recovery of fish habitat, riparian habitat, and water quality. One component of a watershed restoration program involves road treatments (such as decommissioning or upgrading), which would reduce sedimentation and erosion and improve water quality. A second component deals with riparian vegetation. Silvicultural treatments in Riparian Reserves, 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. A 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. Other restoration opportunities may include mine reclamation or meadow or wetland restoration.

Opportunities may exist to promote the long-term health on lands outside of riparian areas. Management activities would be designed so forests remain productive, resilient, and stable over time to withstand the effects of periodic natural or human-caused stresses such as drought, insect attack, disease, climatic changes, flood, resource management practices, and resource demands.

Key Questions

a. Vegetation Patterns

What processes created the vegetation patterns? See pages 33 to 38.

Where are the opportunities to maintain or restore stand health or vigor in the upland areas of the WAU? See pages 202 through 206 and Table 47 on page 205.

What is the current condition of Riparian Reserves in the WAU? See pages 48 through 53.

What and where are the opportunities to restore late-successional conditions in Riparian Reserves? See pages 180 through 185 and Map 11 on page 51.

b. Soils / Erosion

What are the dominant erosion processes within the WAU? Where have these erosion processes occurred in the past? Where might they occur in the future? See pages 83 through 88 and Map18 on page 88.

Where are the soils that management activities could reduce soil productivity? See pages 89 through 93, Map 19 on page 91, and Map 20 on page 94.

c. Hydrology / Channel Processes

What are the dominant hydrologic characteristics (e.g. total discharge, and peak, base, and low flows) and other notable hydrologic features and processes in the WAU? See pages 95 through 135.

d. Water Quality

What beneficial uses dependant on aquatic resources occur in the WAU and which water quality parameters are critical to these uses? See pages 121 through 135 and Appendix L.

What are the effects of management activities on hydrologic processes? See pages 95 through 135.

Where are the opportunities to improve water quality and hydrologic conditions? See pages 121 through 135 and Appendix L.

e. Fisheries

Where are the historic and current locations of fish populations? See pages 136 through 155 and Appendix C.

How have fish habitat and populations been affected by hydrologic processes and human activities? See pages 136 through 155 and Appendix C.

What and where are the restoration opportunities that would benefit the fisheries resource? See pages 187 through 193, Appendix G, and Appendix L..

f. Roads

What are the current conditions and distribution of roads in the WAU? See pages 105 through 114.

How are roads impacting other resources within the WAU? See pages 105 through 120, 134, 135, and Appendix L.

Are there road decommissioning or improvement opportunities in the WAU? Where are the road treatment opportunities? See pages 187 and 188, Appendix G, and Appendix L.

C. Issue 3 - Special Status Species

Key Questions

Special Status Species and Their Habitats

What are the species of concern important in the WAU (e.g. threatened or endangered species, special status species, or species emphasized in other plans)? See pages 156 through 179, Appendix E, and Appendix F

What is the distribution and character of their habitats? See pages 156 through 179.

III. Human Uses

A. Reference Conditions

Studies indicate people have been living in the Umpqua Basin for at least 8,000 years, which would include the Myrtle Creek Watershed Analysis Unit. Uses in the WAU have included hunting and gathering, fur trapping, subsistence and commercial agriculture, mining, transportation, logging and lumbering, service related activities, residential dwellings, and recreation.

1. Pre-European Settlement

Little knowledge exists of prehistoric use in the WAU prior to European-American settlement. Twelve prehistoric sites have been identified on BLM-administered land. Nine archaeological sites are located near White Rock. Two sites are located along Weaver and South Myrtle creeks. Another site is located on a bench directly north of South Myrtle Creek. Five archaeological sites have been evaluated for eligibility to be included on the National Register of Historic Places. Two archaeological sites are eligible, while the other three archaeological sites are not eligible to be included on the National Register of Historic Places.

Native American Indians followed a seasonal way of life hunting deer and elk, gathering nuts, berries, seeds, and roots, and fishing. They fished for salmon and gathered camas (which provided a large portion of their diet) in the WAU. The Native American Indians changed the landscape very little. Although, George Riddle described how they burned areas to control brush making hunting and the gathering of tar weeds seeds for food easier. Cadastral survey notes recorded in the mid-nineteenth century described the vegetation as consisting of grasslands and oaks growing in the lower elevations and timber on the upper slopes.

2. European-American Exploration and Settlement

Fur trappers, miners, and settlers arrived in the Myrtle Creek WAU in the 1800s. Fur trappers from the Hudson Bay and Northwest Fur companies began exploring the Umpqua Valley in the 1820s.

Jesse and Lindsay Applegate, along with Levi Scott, surveyed in the area to establish a new emigrant trail into Oregon from the south. By the fall of 1846, the Applegate Trail opened a new route for emigrants into the Willamette Valley through southern Oregon. This event, along with the passage of the Donation Land Claim Act in 1850, opened the region to settlers.

The primary period of settlement in the WAU was between 1850 and 1900. The early settlers established homes along Myrtle Creek. The town of Myrtle Creek had a population of 196 in 1860 and had grown to 827 in 1900.

Early settlers maintained a subsistence lifestyle until a market was established for grain and livestock. These agricultural products became the main source of income throughout the 1880s and 1890s.

3. Mining

Placer gold deposits were discovered in the Myrtle Creek WAU in 1852. Placer mining for gold occurred in Lee Creek, Buck Fork Creek, South Myrtle Creek, and North Myrtle Creek. Principal lode mines were the Chieftain and Continental gold/silver mines located on the north side of South Myrtle Creek in T29S, R3W, section 20. The ore was discovered in 1898 and produced an estimated $100,000 by 1928 (Ramp 1968). The Chieftain and Continental gold mines worked a disconnected vein of quartz which extended about one mile. These mines operated during the early 1900s with most production occurring prior to the 1930s. The mining town of Nugget sprang up along South Myrtle Creek to support these mining operations. Little evidence of this settlement remains today.

The China Ditch was constructed in the 1890s to supply water for the proposed placer mining of 2,000 acres in the Lee Creek drainage. The China Ditch is approximately 30 miles long.

4. Timber Harvesting/Logging

The first sawmill to operate in Myrtle Creek was constructed in 1852 by Moses True Dyer. It was one of the earliest sawmills in the Umpqua Basin (Beckham 1986). Other early saw mills in Myrtle Creek included C. Luddinton and Son, constructed in 1906, and Jackson Brothers, constructed in 1912 (Beckham 1986). Timber harvesting became a major influence on the WAU landscape in the 1950s. The increased demand for lumber to build houses and transportation system improvements generated a marked increase in timber harvesting and lumber production in the WAU. After World War II the BLM and private timber companies began to extend roads onto timbered lands in the WAU.

5. Transportation

Jesse Applegate helped lay out the military wagon road from Myrtle Creek to the Rogue River Valley in 1853. By 1858 the military wagon road extended from Scottsburg on the Umpqua River to Camp Stuart in the Rogue River Valley (Beckham 1986). The California and Oregon Stage Company was operating between Portland and Sacramento by 1860. The stage connected Myrtle Creek to other parts of the region.

The Oregon and California Railroad was constructed to Myrtle Creek in 1882. The stage coach, in 1860, and the railroad, in 1882, included Myrtle Creek as a link in the transportation system.

State officials approved construction of the Pacific Highway in 1915, which made improvements to the California and Oregon Stage Line road from Portland to Sacramento. The Pacific Highway was paved through Douglas County and opened to all-weather travel by 1924. The construction of the

Interstate freeway through Douglas County began in the 1950s, which allowed faster and increased travel north and south through the county. Also in the 1950s the BLM and private timber companies constructed more roads into their timbered lands. The improvements in the transportation system allowed wider distribution of timber and agricultural products, an increase in the number of travelers, and people to commute longer distances to work.

B. Current Conditions

The dominant human uses in the WAU have been timber production, transportation, agriculture, mining, recreation, and service-related activities. Service-related activities include providing food, gas, and other essentials for tourists, commercial travelers, and local residents. The town of Myrtle Creek, located at the mouth of Myrtle Creek, is the only population center in the WAU. The population of Myrtle Creek has grown from 196 people in 1860 to 3,063 people in 1990. There are no treaty rights or tribal uses in the WAU. Although, individual tribal members may use the area.

Three historic sites are located in the Myrtle Creek WAU. They are the White Rock Ranger Station, White Rock Lookout, and China Ditch. The China Ditch is located in the North Myrtle Creek Drainage and is on the National Register of Historic Places.

1. Timber

Production of forest products is an important human use in the WAU. The Myrtle Creek WAU contains approximately 34,257 acres (45 percent of the WAU) of private land capable of forest production, some are currently being harvested. Bureau of Land Management administered lands contain potential timber harvest areas, as well. These activities are important to the local economy, providing both jobs and revenue to local inhabitants.

2. Agriculture

There are approximately 9,943 acres (13 percent of the WAU) of agricultural lands in the WAU. These lands contain pastures for grazing cattle and sheep, fields for grain production, and farmlands for seasonal crops of fruits and vegetables. Grazing permits on BLM-administered lands are not a major factor in the WAU.

3. Mining and Minerals

The WAU has high and moderate potential areas for gold, silver, copper, mercury, lead/zinc, and chromium/nickel deposits. There are numerous mining claims in the WAU. Gold has been produced from placer mines in the Lee Creek Drainage. The production of gold from placer deposits is expected to continue.

Road construction in the WAU led to the development and mining of rock quarries to provide road surfacing material. Decomposed granite, shale, and sandstone are common, with few viable rock sources available. Of the nine quarries existing in the WAU, two are located on private land, and seven are on BLM-administered land. Most of the quarries have been exhausted of useable rock. Surfacing rock will continue to be in demand in the WAU and is used to reduce sediment and soil runoff when improving roads.

4. Special Forest Products

Another use in the WAU is the collection of Special Forest Products. Cedar boughs, greenery, and firewood were the main Special Forest Products collected in the South River Resource Area in 1999. Special Forest Product sale prices are strongly influenced by product quality, which varies by product and the collection area. Salvaging dead and down trees for sawtimber near roads has been the Special Forest Product affecting the WAU the most. Areas where salvaging sawtimber has occurred often contain less large woody debris (LWD). Management direction in the RMP provides guidelines for the salvaging of sawtimber.

5. Recreation

Recreation use in the Myrtle Creek Watershed Analysis Unit is determined by the land ownership, topography, forest types, and stand ages in the area. Most recreation opportunities are limited to dispersed forms. Three developed recreation sites occur on BLM-administered land in the WAU. They include the China Ditch Interpretive Auto Tour Loop, the Red Top Ponds Recreation Area, and the Scenic/Historic Tour Route, which includes the area from Red Top Pond to the town of Myrtle Creek. Special Use Permits are not required for recreation use in the WAU, unless the event is commercial or competitive.

a. Recreation Opportunity Spectrum (ROS)

The Recreation Opportunity Spectrum (ROS) considers the majority of the BLM-administered land in the WAU to be Roaded Natural. The WAU has a strong rural setting. The areas containing BLM-administered lands are characterized by predominantly natural appearing environments with moderate evidence of the sights and sounds of humans. Resource modification and utilization practices are evident but usually blend with the natural environment. Interaction between users may be low to moderate but with the 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.

b. Off Highway Vehicles (OHV)

The predominant OHV designation in the RMP for the Myrtle Creek 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).

Two areas are designated as an Area of Critical Environmental Concern/Research Natural Area (ACEC/RNA). These areas are closed to OHV use because they are unstable or considered to be fragile. The North Myrtle ACEC/RNA is located in T28S, R4W, Section 33 and contains 280 acres. The Tater Hill ACEC/RNA is located in T29S, R2W, Sections 6 and 7; T29S, R3W, Section 1; and T28S, R3W, Section 37 and contains 472 acres.

New roads and trails may be approved and constructed in limited areas, through the NEPA process. State funds from gas taxes and registrations may be available to BLM to develop any OHV areas. If problems occur within road and trail systems, they may be closed on an emergency basis through 43 CFR 8341 and 8364.

c. Visual Resource Management (VRM)

Visual Resource Management classes are assigned through an inventory system and range from Class I through IV. Class I lands are reserved for their scenic quality and allow for very limited management. Class IV lands allow for major modifications to the existing character of the landscape. These classes are based on the combination of scenic quality, sensitivity level, and distance zones.

The WAU contains VRM Class III and Class IV lands. Under the Class III designation, management activities would partially retain the existing visual character of the landscape. Class III lands are located in four small parcels along the North and South Myrtle county roads and in the North Myrtle ACEC/RNA. The remainder of the WAU is designated as Class IV land. Under the Class IV designation, the extent of change to the character of the landscape can be high. Management activities may dominate the view and may be the major focus of the viewer's attention. However, every attempt should be made to minimize the impact of activities through careful unit location, minimal disturbance, and repetition of the basic elements of form, line, and texture.

d. Recreation Management

The WAU is in the South River Extensive Recreation Management Area (ERMA). Within the ERMA, recreation is mainly unstructured and dispersed requiring minimal recreation investments. The ERMA, which constitutes the bulk of the BLM-administered land, gives recreation visitors the freedom of choice with minimal regulatory constraints.

Forms of recreation commonly observed in the WAU include driving for pleasure, hunting, photography, picnicking, camping, shooting or target practice, and gathering (berries, flowers, mushrooms, greens, and rocks).

Designated recreation sites do not occur in the WAU, but some areas have more use and development. Red Top Pond in T29S, R2W, Section 4 receives more recreational use than other areas of the WAU. It has an improved trail around the larger pond, a boardwalk over a wet area, and a viewing platform for visitors to observe a wet meadow. The China Ditch Auto Tour Route in T28S, R3W, Sections 11, 14, 15, and 23 is a loop road with interpretive panels discussing placer mining and a 33 mile long ditch system. As part of a Scenic/Historic Tour Route visitors drive through the WAU on a sixty-eight mile back road interpretive tour between the towns of Canyonville and Myrtle Creek. The tour route designed by the Tiller Ranger District on the Umpqua National Forest uses one BLM access road in the WAU.

Potential trail sites extend from the Red Top Pond area in T29S, R2W, Section 4 to the Windy Camp area in T29S, R2W, Section 17. Additional trails could travel southeast toward Coffee and Corn Creeks or south past Deer Springs to Tin Hat Pond. These trails had historic use, and portions of them are still used, but are unimproved and need extensive renovation.

IV. Vegetation

A. Reference Conditions

Most of the Lower North Myrtle and Lower South Myrtle Subwatersheds consisted of prairies and savannahs in the valleys and hardwood, conifer, or mixed species forests on the adjacent foothills in the early 1800s. The Upper North Myrtle and Upper South Myrtle Subwatersheds were predominantly mixed-conifer forests in a mosaic of age classes and structures. Most of the forest stands probably contained overstories with varying amounts of large trees greater than 20 inches in diameter.

The Native American Indians probably maintained the prairies and savannahs by burning them. The fires started by the Native American Indians in the prairies and savannahs probably did not burn in upland areas (LaLande and Pullen 1999 and Agee 1991). After the Native American Indians were moved to reservations in the 1850s, many settlers continued the practice of burning the prairies and savannahs. Although, the settlers often applied the practice indiscriminately. The unregulated use of fire decreased after about 1910. The fires set by the settlers probably affected the moister mixed-conifer vegetation type more than when the Native American Indians burned the same areas. The average annual amount of mixed-conifer forest burned in the late nineteenth and early twentieth centuries was probably more than the area burned by the Native American Indians (LaLande and Pullen 1999). Some field and hillside pasture burning continues but is less widespread than in the past because of air quality concerns.

Timber harvesting began in the lower elevations because of the easy access and closeness to the mills. Timber harvesting on Federally-administered lands in WAU began in the1940s. The current age class distribution reflects the timber harvesting that has occurred in the WAU.

Range of Natural Variability

Determining the range of natural variability is difficult due to the lack of data. At best, it represents a comparison of the available data at a few points in time. Variability of landscapes across space and time is extreme (USDA 1993). Climate was the principal influence in the development of forest composition and structure. The forested areas of the Pacific Northwest, including those in the WAU, developed after the last post-glacial period began. The current forest communities of the Pacific Northwest developed within the last 5,000 to 6,000 years. Oregon was either too cold and dry or too warm and dry before that time. This suggests that old-growth Douglas-fir forests probably do not represent a co-evolved complex of species bound together by tightly linked interactions. Tree species have responded to climate individually and continuously reassemble in different combinations to follow the changing climate (Brubaker 1991 and Whitlock 1992).

Even within the last 6,000 years, there have been large variations in climate. In southwestern Oregon, the high temperatures and dry climate of the Xerothermic Period (8,000 to 4,000 years B.P.) favored vegetation types consisting of oaks, manzanita, and other chaparral species (Atzet and

McCrimmon 1990). The Little Ice Age influenced the global climate, including the WAU, from about 1300 to 1850. The Little Ice Age ended about the time the western United States was being settled. A global warming trend has been occurring since that time (Fagan 2000).

Short-term precipitation cycles may also influence vegetation by affecting processes, such as fire frequency and severity or length of the tree regeneration period following disturbance. The weather data collected since the 1890s indicates the Pacific Northwest precipitation pattern has a repeating cycle of wet and dry periods, each lasting between 20 and 25 years (Taylor 1999).

Reports by early explorers, settlers, and surveyors described the vegetative conditions when they arrived in western Oregon and the Umpqua Valley. The low elevation valleys were dominated by native prairie and savannah, maintained by aboriginal burning, while the upland areas were either hardwood or conifer dominated forests (Agee 1990, Riddle 1993, LaLande and Pullen 1999, and Franklin and Dyrness 1973). Data and maps are available from about 1850 to the present. Mapping resolutions are at various scales, often quite large, which makes stand structural characteristics and small scale landscape patterns difficult to determine.

Two data sources were used to estimate reference conditions and the range of natural variability in the WAU. The 1850 historic vegetation map derived from General Land Office surveyor notes and a 1936 forest land use and type map prepared by the United States Forest Service (USFS) were the main data used to describe historic conditions (see Table 3 and Maps 4 and 5). Data from 1910 and 1914 were also used to represent historic conditions in the WAU (see Tables 4, 5, and 6 and Maps 6 and 7).

The data sets were collected using different processes and different levels of mapping resolution. The 1850 data was collected at one mile intervals. Collecting data to delineate vegetation types was not the objective in 1850. The 1936 data was based on observations from open vantage points supplemented by some transect data (Andrews and Cowlin 1940). The objective in 1936 was to assess broad timber inventories and harvest opportunities, not to prepare forest type maps.

The 1850 vegetation data was prepared from interpretations of General Land Office land survey notes (Nature Conservancy 2000). This map is used as one reference point for estimating pre-settlement conditions and the range of natural variability. It covers most of the WAU, except for the eastern portion, which had not been surveyed in 1850. The information included species composition and topographic positions. It does not provide enough information to determine age class distinctions. Prairie, savannah, and woodland dominated the Lower North Myrtle and Lower South Myrtle Subwatersheds. The Upper North Myrtle and Upper South Myrtle Subwatersheds contained mixed-conifer forests as the predominant vegetation types. The WAU contained about five percent prairies, 20 percent oak or conifer savannah/open woodlands and 75 percent closed forests, mostly conifer dominated stands. The prairies and savannah/open woodlands occurred mainly in the western portion (lower elevations) of the WAU.

The 1936 data was from a forest type map containing broad scale size class and structure information and some species information (Andrews and Cowlin 1940). Consequently the mapping resolution was at a large scale in comparison to type mapping for identifying similar vegetation types and structures. The first type mapping for the WAU was completed in the early to mid 1950s (Gross 1973). Estimates of historic vegetation age classes have an unknown margin of error.

The amount of late-successional forest area in 1850 was estimated by using the 1936 data. About 15 percent of the WAU was characterized as being between 20 and 40 inches in diameter and assumed to be between 80 and 160 years old in 1936. Those stands would have been less than 80 years old in 1850. The old-growth in 1936 was assumed to be at least 80 years old in 1850. The 30 to 80 year age class stands (six inch to 22 inch sized trees) in 1936 are located in the area considered to be open woodland in the 1850 data, so these stands were assumed to be less than 30 years old in 1850. Approximately 45 percent of the WAU would have been late-successional conifer stands using the 1936 data to estimate what the stands were like in 1850. The rest of the WAU was assumed to be less than 80 years old or nonforest, mostly prairie. Based on this interpretation and the 1936 data, between 45 and 75 percent of the WAU was at least 80 years old before the time timber harvesting occurred. The range of natural variability of late-successional forests was estimated to be between 45 and 75 percent on lands administered by the Forest Service in the South Umpqua Basin (USDA 1993). The Forest Service estimate provides a check of reasonableness of the estimate based on the 1850 and 1936 data.

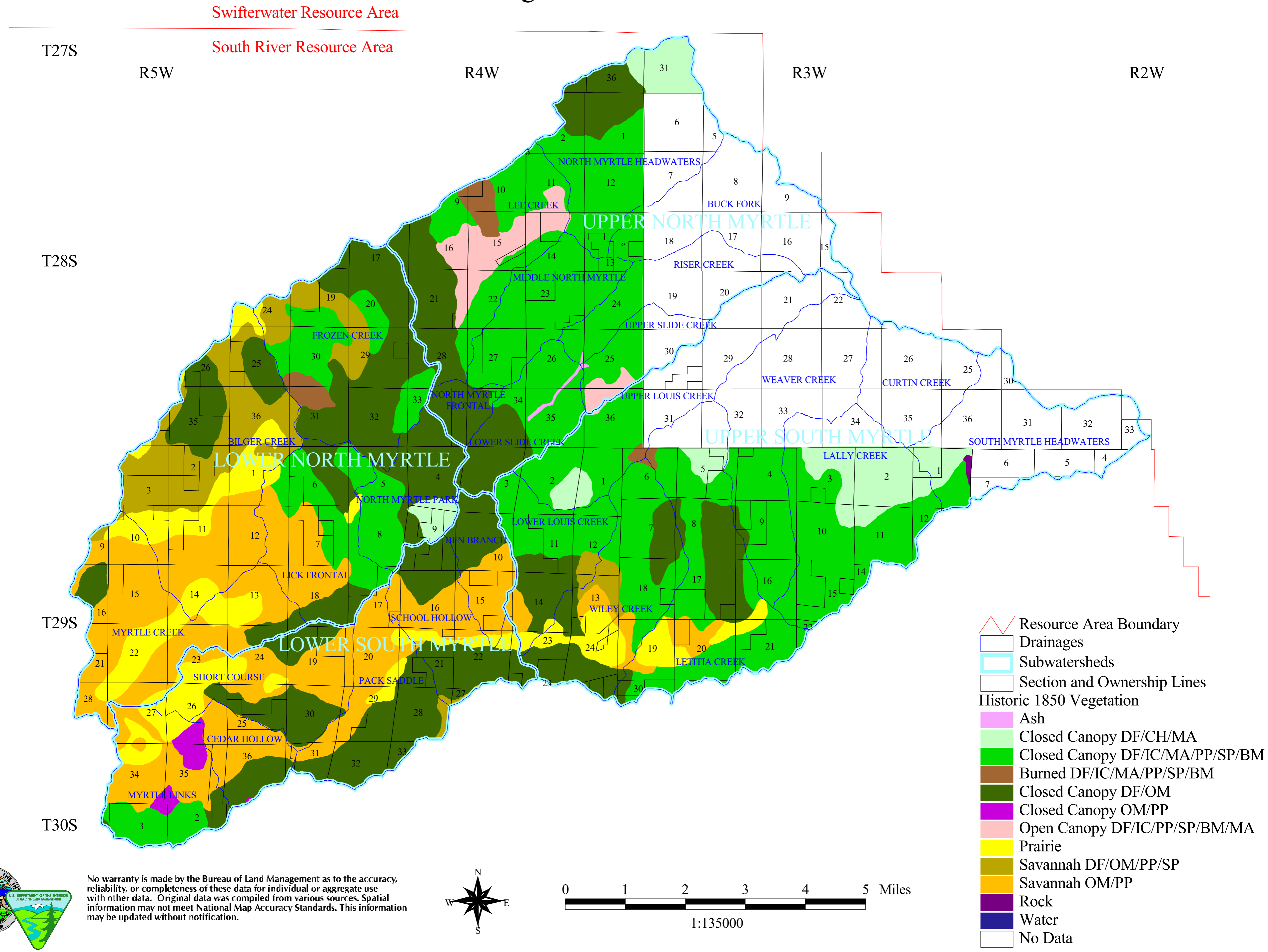
Table 3. 1936 Age Class Distribution in the Myrtle Creek WAU.

Drainage Name **Subwatershed Name**	Nonforest		Early Seral (0 to 30 Years Old)		Mid Seral (30 to 80 Years Old)		Late Seral (At Least 80 Years Old)		Hardwoods		
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Total Acres
Bilger Creek	1,822	33	0	0	3,442	62	123	2	182	3	5,569
Frozen Creek	993	22	0	0	563	12	3,039	66	0	0	4,595
Lick Frontal	353	12	0	0	1,869	64	713	24	5	0	2,940
Myrtle Creek	2,041	51	0	0	1,500	37	0	0	492	12	4,033
North Myrtle Park	527	28	0	0	75	4	1,276	68	0	0	1,878
Lower North Myrtle Subwatershed	5,736	30	0	0	7,449	39	5,151	27	679	4	19,015
Buck Fork	9	0	0	0	0	0	2,990	100	0	0	2,999
Lee Creek	235	6	0	0	99	3	3,522	91	0	0	3,856
Lower Slide Creek	214	12	0	0	0	0	1,582	88	0	0	1,796
Middle North Myrtle	496	24	0	0	0	0	1,559	76	0	0	2,055
North Myrtle Frontal	202	37	0	0	0	0	340	63	0	0	542
North Myrtle Headwaters	92	2	0	0	0	0	4,013	98	0	0	4,105
Riser Creek	0	0	0	0	0	0	2,012	100	0	0	2,012
Upper Slide Creek	0	0	0	0	0	0	1,150	100	0	0	1,150
Upper North Myrtle Subwatershed	1,248	7	0	0	99	1	17,168	93	0	0	18,515
Ben Branch	53	5	0	0	346	30	758	66	0	0	1,157
Cedar Hollow	175	16	0	0	854	77	76	7	0	0	1,105
Myrtle Links	604	25	0	0	1,228	52	100	4	450	19	2,382
Pack Saddle	940	36	0	0	771	29	914	35	0	0	2,625
School Hollow	700	32	0	0	954	44	526	24	0	0	2,180
Short Course	1,438	54	0	0	861	32	363	14	0	0	2,662
Lower South Myrtle Subwatershed	3,910	32	0	0	5,014	41	2,737	23	450	4	12,111

Table 3. 1936 Age Class Distribution in the Myrtle Creek WAU.

Drainage Name **Subwatershed Name**	Nonforest		Early Seral (0 to 30 Years Old)		Mid Seral (30 to 80 Years Old)		Late Seral (At Least 80 Years Old)		Hardwoods		
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Total Acres
Curtin Creek	0	0	0	0	251	14	1,579	86	0	0	1,830
Lally Creek	136	3	79	2	0	0	3,910	95	0	0	4,125
Letitia Creek	870	20	115	3	6	0	3,464	78	0	0	4,455
Lower Louis Creek	181	9	0	0	47	2	1,818	89	0	0	2,046
South Myrtle Headwaters	53	2	654	19	320	10	2,332	69	0	0	3,359
Upper Louis Creek	0	0	159	4	0	0	3,403	96	0	0	3,562
Weaver Creek	0	0	103	3	0	0	3,860	97	0	0	3,963
Wiley Creek	694	21	8	0	53	2	2,530	77	0	0	3,285
Upper South Myrtle Subwatershed	1,934	7	1,118	4	677	3	22,896	86	0	0	26,625
Myrtle Creek WAU	12,828	17	1,118	1	13,239	17	47,952	63	1,129	1	76,266

Map 4. Myrtle Creek Watershed Analysis Unit
1850 Vegetation Classifications



Map 5. Myrtle Creek Watershed Analysis Unit
1936 Age Class Distribution

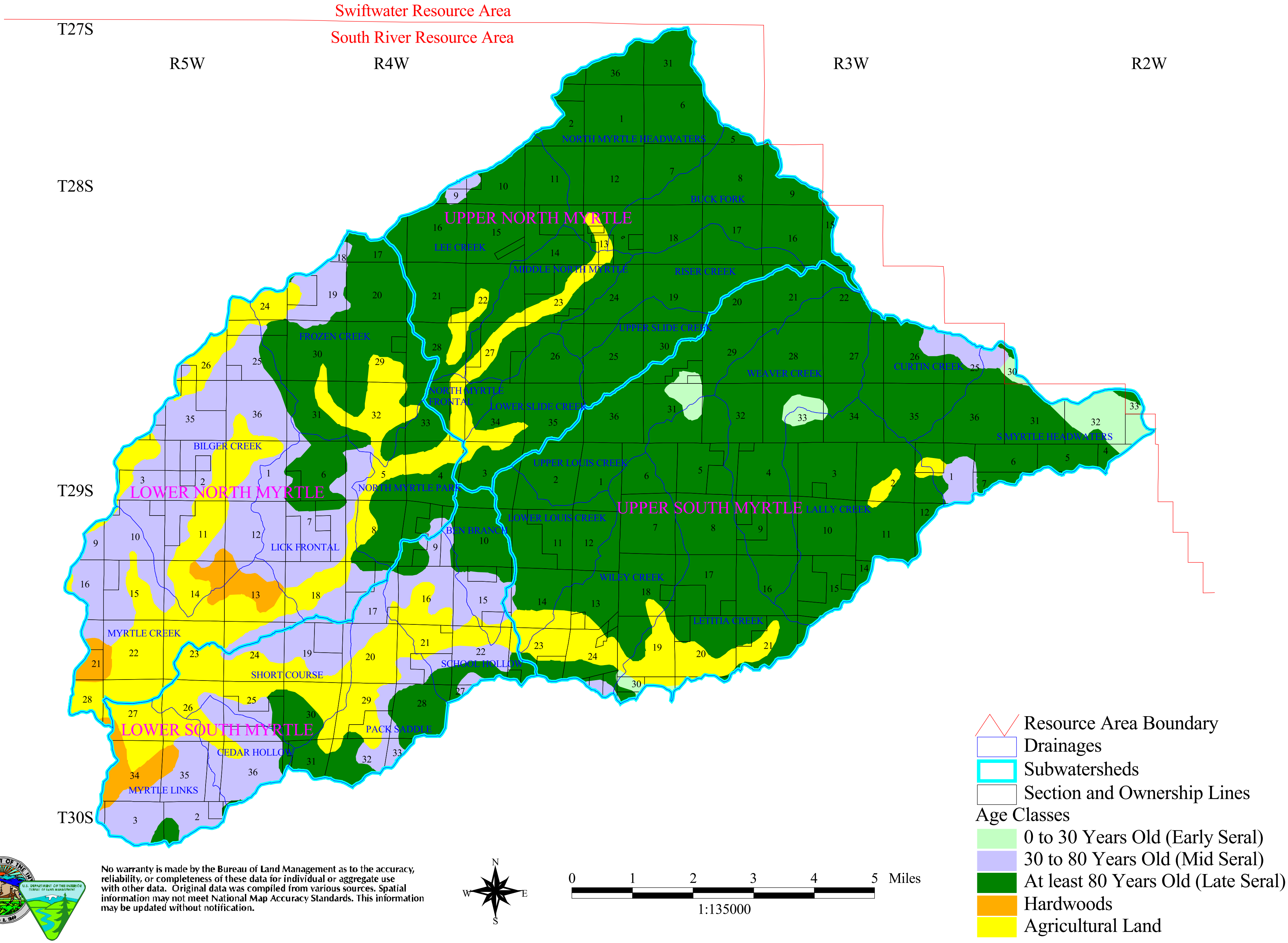


Table 4. 1900 Vegetation Data.

Drainage Name **Subwatershed Name**	Open (Nonforested)		Woodland (Hardwoods, Brush)		5 to 10 MBM per Acre (Mid Seral)		10 to 25 MBM per Acre (Merchantable Timber, Mid to Late Seral)		
	Acres	%	Acres	%	Acres	%	Acres	%	Total Acres
Bilger Creek	2,083	37	3,486	63	0	0	0	0	5,569
Frozen Creek	790	17	545	12	0	0	3,260	71	4,595
Lick Frontal	1,235	42	1,705	58	0	0	0	0	2,940
Myrtle Creek	3,338	83	695	17	0	0	0	0	4,033
North Myrtle Park	1,440	77	32	2	0	0	406	22	1,878
Lower North Myrtle Subwatershed	8,886	47	6,463	34	0	0	3,666	19	19,015
Buck Fork	0	0	0	0	0	0	2,999	100	2,999
Lee Creek	403	10	116	3	0	0	3,337	87	3,856
Lower Slide Creek	1,556	87	0	0	0	0	240	13	1,796
Middle North Myrtle	335	16	0	0	0	0	1,721	84	2,056
North Myrtle Frontal	226	42	0	0	0	0	315	58	541
North Myrtle Headwaters	67	2	0	0	0	0	4,037	98	4,104
Riser Creek	603	30	0	0	0	0	1,409	70	2,012
Upper Slide Creek	270	23	0	0	0	0	880	77	1,150
Upper North Myrtle Subwatershed	3,460	19	116	1	0	0	14,938	81	18,514
Ben Branch	147	13	0	0	0	0	1,010	87	1,157
Cedar Hollow	511	46	0	0	0	0	594	54	1,105
Myrtle Links	1,300	55	0	0	0	0	1,081	45	2,381
Pack Saddle	1,050	40	0	0	0	0	1,575	60	2,625
School Hollow	922	42	0	0	0	0	1,259	58	2,181
Short Course	1,613	61	0	0	0	0	1,050	39	2,663
Lower South Myrtle Subwatershed	5,543	46	0	0	0	0	6,569	54	12,112

Table 4. 1900 Vegetation Data.

Drainage Name **Subwatershed Name**	Open (Nonforested)		Woodland (Hardwoods, Brush)		5 to 10 MBM per Acre (Mid Seral)		10 to 25 MBM per Acre (Merchantable Timber, Mid to Late Seral)		
	Acres	%	Acres	%	Acres	%	Acres	%	Total Acres
Curtin Creek	568	31	0	0	0	0	1,262	69	1,830
Lally Creek	24	1	0	0	0	0	4,102	99	4,126
Letitia Creek	715	16	0	0	0	0	3,740	84	4,455
Lower Louis Creek	175	9	0	0	0	0	1,871	91	2,046
South Myrtle Headwaters	346	10	0	0	1,808	54	1,204	36	3,358
Upper Louis Creek	482	14	0	0	0	0	3,080	86	3,562
Weaver Creek	766	19	0	0	0	0	3,196	81	3,962
Wiley Creek	787	24	0	0	0	0	2,498	76	3,285
Upper South Myrtle Subwatershed	3,863	15	0	0	1,808	7	20,953	79	26,624
Myrtle Creek WAU	21,752	29	6,579	9	1,808	2	46,126	60	76,265

Table 5. 1914 Vegetation Data.

Drainage Name **Subwatershed Name**	Non-timber		Brush		Burned, restocked		Burned, not restocked		Merchantable timber		
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Total Acres
Bilger Creek	5,550	100	0	0	0	0	0	0	20	0	5,570
Frozen Creek	3,374	73	0	0	0	0	0	0	1,221	27	4,595
Lick Frontal	2,865	97	75	3	0	0	0	0	0	0	2,940
Myrtle Creek	4,033	100	0	0	0	0	0	0	0	0	4,033
North Myrtle Park	864	46	136	7	0	0	0	0	878	47	1,878
Lower North Myrtle Subwatershed	16,686	88	211	1	0	0	0	0	2,119	11	19,016
Buck Fork	0	0	0	0	0	0	0	0	2,999	100	2,999
Lee Creek	3	0	0	0	0	0	24	1	3,828	99	3,855
Lower Slide Creek	0	0	0	0	0	0	0	0	1,796	100	1,796
Middle North Myrtle	0	0	0	0	0	0	0	0	2,055	100	2,055
North Myrtle Frontal	61	11	0	0	0	0	0	0	480	89	541
North Myrtle Headwaters	0	0	0	0	0	0	0	0	4,104	100	4,104
Riser Creek	0	0	0	0	0	0	0	0	2,012	100	2,012
Upper Slide Creek	0	0	0	0	0	0	0	0	1,150	100	1,150
Upper North Myrtle Subwatershed	64	0	0	0	0	0	24	0	18,424	100	18,512
Ben Branch	0	0	539	47	0	0	0	0	619	53	1,158
Cedar Hollow	1,105	100	0	0	0	0	0	0	0	0	1,105
Myrtle Links	2,381	100	0	0	0	0	0	0	0	0	2,381
Pack Saddle	215	8	1,073	41	0	0	0	0	1,337	51	2,625
School Hollow	0	0	1,259	58	0	0	0	0	921	42	2,180
Short Course	1,858	70	725	27	0	0	0	0	79	3	2,662
Lower South Myrtle Subwatershed	5,559	46	3,596	30	0	0	0	0	2,956	24	12,111

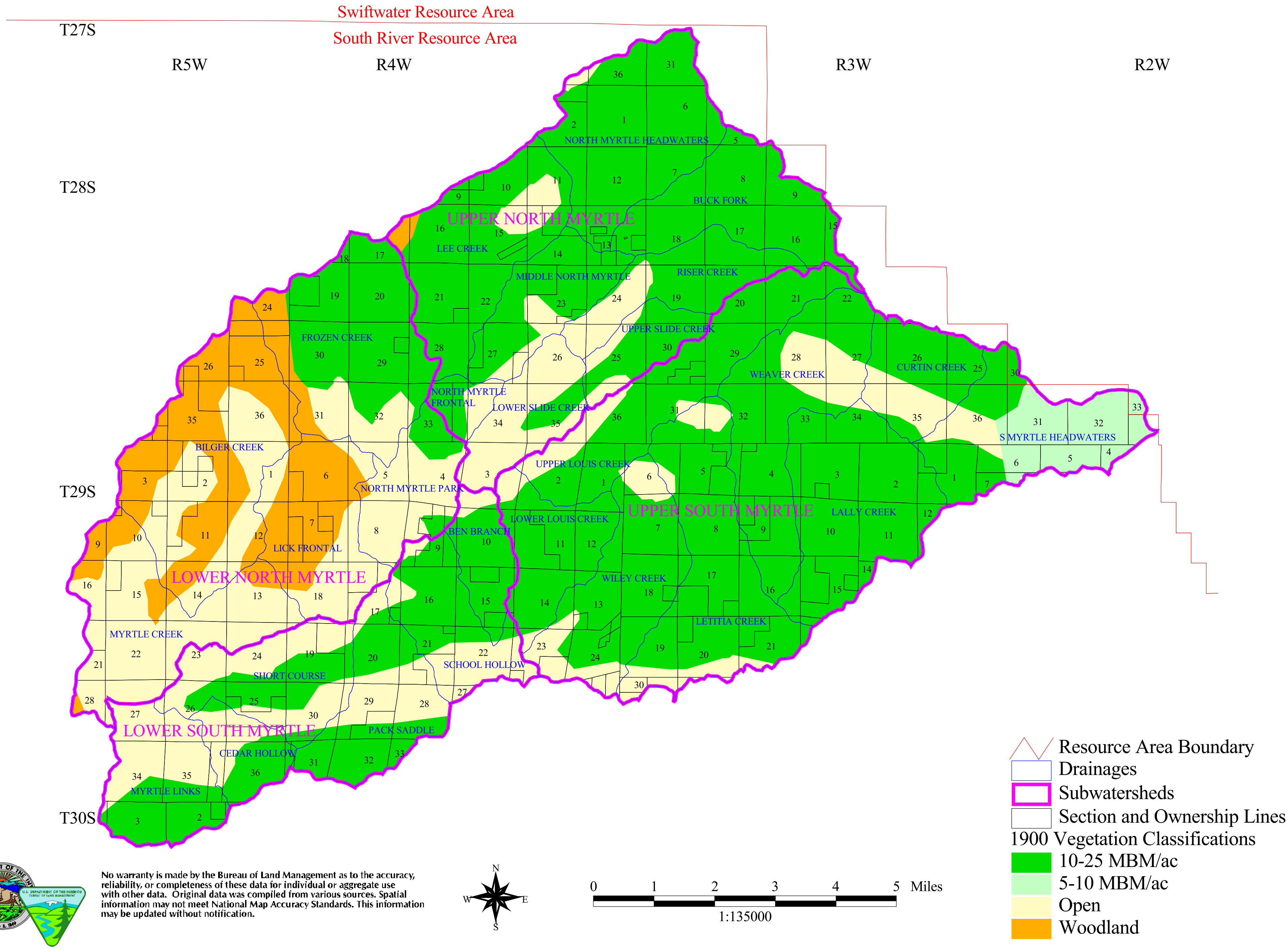
Table 5. 1914 Vegetation Data.

Drainage Name **Subwatershed Name**	Non-timber		Brush		Burned, restocked		Burned, not restocked		Merchantable timber		
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Total Acres
Curtin Creek	0	0	0	0	161	9	0	0	1,669	91	1,830
Lally Creek	4,126	100	0	0	0	0	0	0	0	0	4,126
Letitia Creek	1,289	29	0	0	0	0	0	0	3,166	71	4,455
Lower Louis Creek	0	0	440	22	0	0	0	0	1,606	78	2,046
South Myrtle Headwaters	0	0	0	0	721	21	0	0	2,638	79	3,359
Upper Louis Creek	0	0	0	0	0	0	0	0	3,562	100	3,562
Weaver Creek	0	0	0	0	0	0	0	0	3,963	100	3,963
Wiley Creek	611	19	0	0	0	0	0	0	2,673	81	3,284
Upper South Myrtle Subwatershed	6,026	23	440	2	882	3	0	0	19,277	72	26,625
Myrtle Creek WAU	28,335	37	4,247	6	882	1	24	0	42,776	56	76,264

Table 6. Comparison of 1900, 1914, and 1936 Vegetation Type Percentages in the Myrtle Creek WAU.

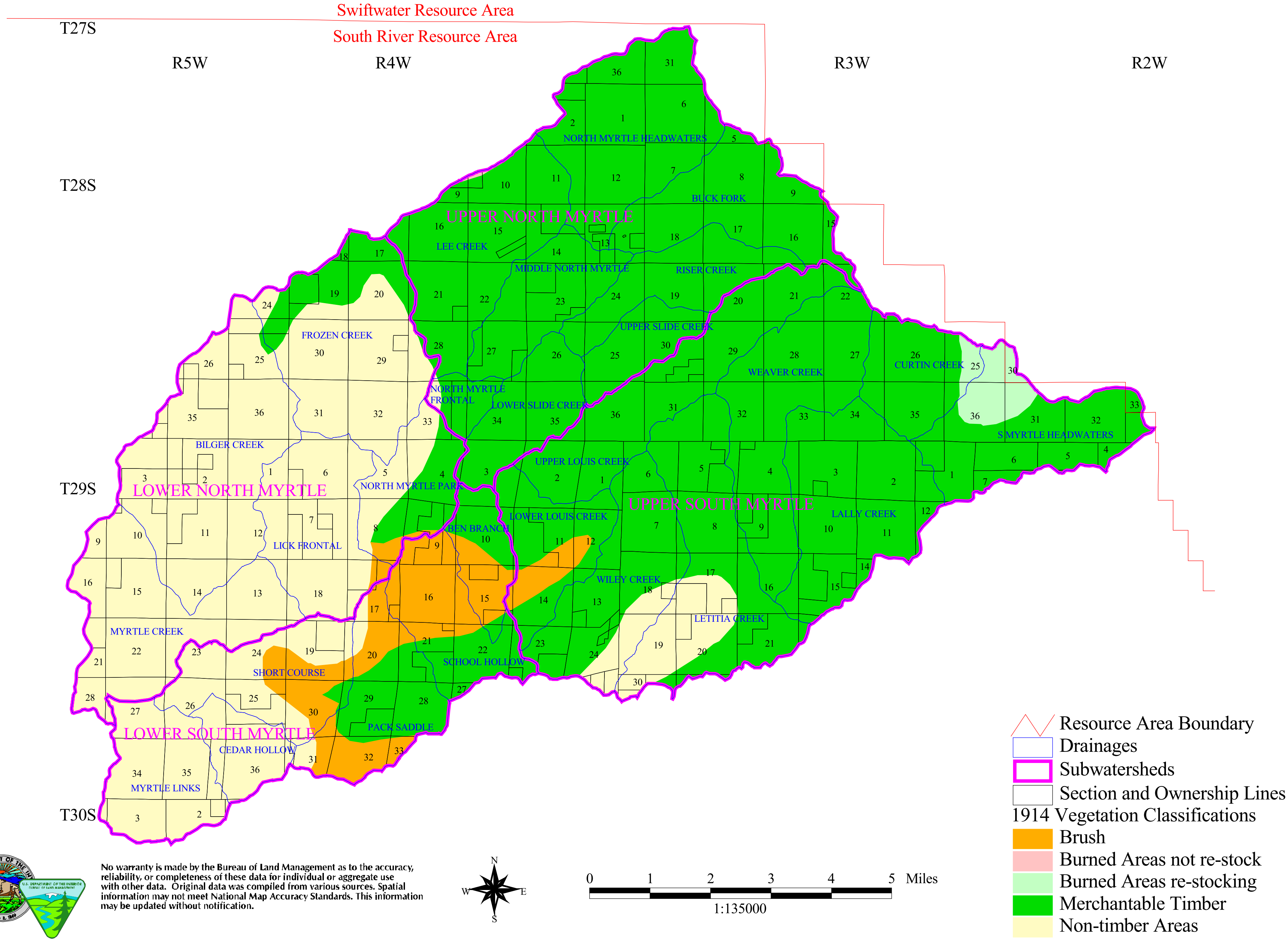
Vegetation Type	1900	1914	1936
Open, Non-timber, Brush	38	43	18
Burned, Early Seral	0	1	1
Merchantable Timber	62	56	80

Map 6. Myrtle Creek Watershed Analysis Unit
1900 Vegetation Classifications



No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data was compiled from various sources. Spatial information may not meet National Map Accuracy Standards. This information may be updated without notification.

Map 7. Myrtle Creek Watershed Analysis Unit
1914 Vegetation Classifications



No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data was compiled from various sources. Spatial information may not meet National Map Accuracy Standards. This information may be updated without notification.

B. Current Vegetation Conditions

1. Ecological Characterization

The major ecological vegetation zones in the WAU are the Interior Valley and Mixed-Conifer zones (Franklin and Dyrness 1973). The Soil Conservation Service (SCS) has mapped smaller scale ecological zones within these broad zones (see Map 8). The SCS zones in the WAU include the Interior Valleys and Foothills, Grand Fir, Cool Douglas-fir/Western Hemlock, Cold Douglas-fir, and Western Hemlock (Hickman 1994). A vegetation zone may cover large areas but always has a single set of potential native plant communities repeated throughout the zone. The patterns are somewhat predictable since they are related to climatic influences, local landscape features such as aspect, soil, and landform.

a. Interior Valleys and Foothills Zone

This zone occupies the warmest and driest climatic zone within the WAU. Most of Lower North Myrtle and Lower South Myrtle Subwatersheds fall within this zone. The valley bottoms have been converted for the most part from native prairie and savanna to agricultural and grazing use. Uplands with the most favorable soils and moisture conditions support coniferous forests of Douglas-fir and subordinate species, such as madrone, bigleaf maple, California black oak, Ponderosa pine, incense-cedar, and Oregon white oak. More droughty soils in the uplands support hardwood dominated stands of madrone, Oregon white oak, and sometimes California black oak but may also contain minor amounts of Douglas-fir, ponderosa pine, and incense-cedar. Some shallow soils support only oaks and shrubs, such as wedgeleaf ceanothus and poison oak, with an herbaceous ground-cover.

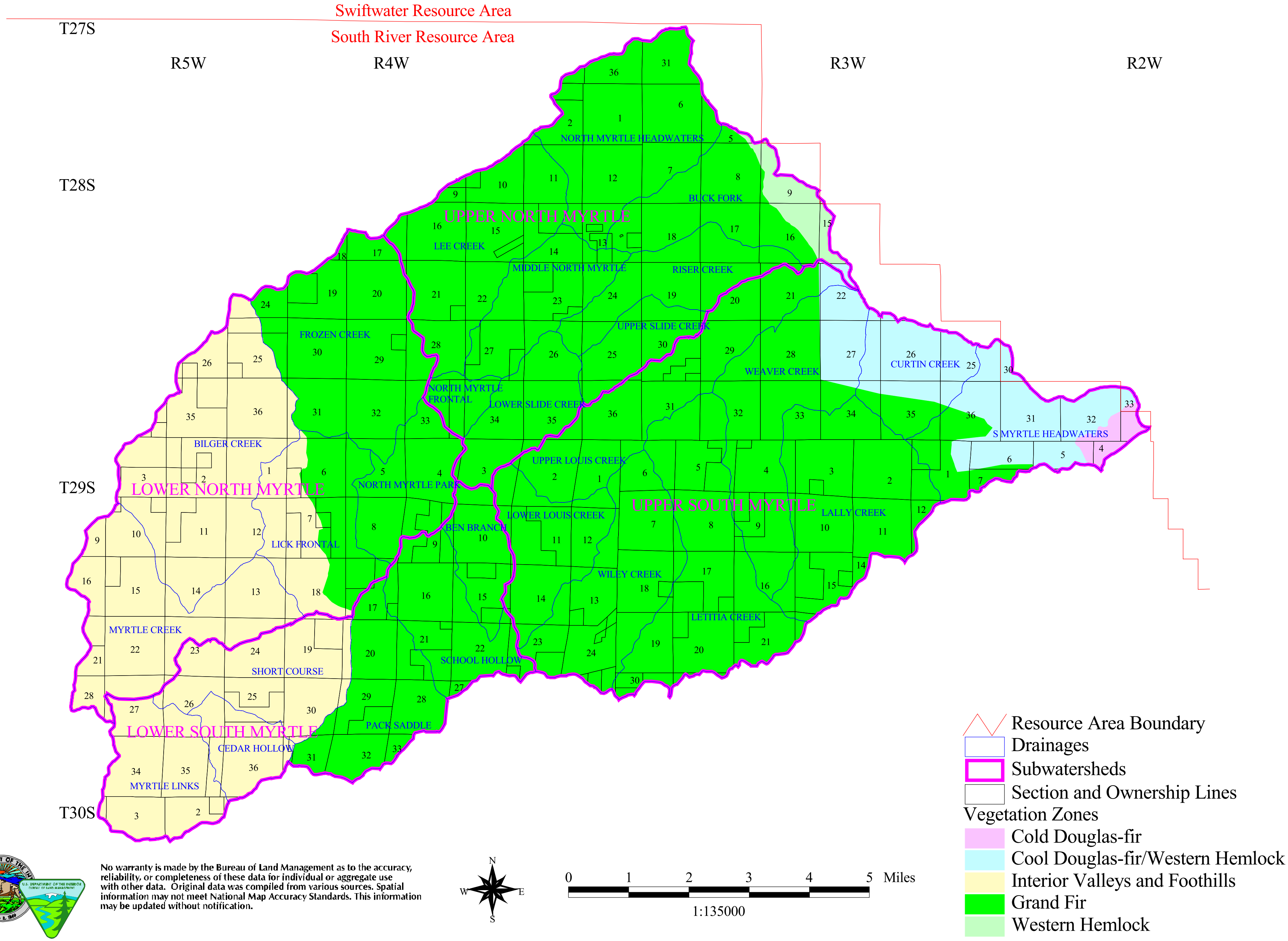
b. Grand Fir Zone

This zone covers the majority of the Upper North Myrtle and Upper South Myrtle Subwatersheds. It borders the Interior Valleys and Foothills Zone and extends to approximately 3,000 feet in elevation. Douglas-fir is the dominant species within this zone, with grand/white fir common on north aspects and absent or a minor component on south aspects. Golden chinquapin is common on north aspects, with madrone common on the south aspects. Bigleaf maple, western red cedar, and incense-cedar are often present. Western hemlock and California black oak may also be present where conditions are favorable. Understory shrubs on north facing slopes include salal, Oregon grape, western hazel, ocean-spray, and red huckleberry. South slopes may support the same species but those requiring more moisture such as red huckleberry, Oregon grape, and salal would be minor components.

c. Cool Douglas-fir/Western Hemlock Zone

This zone occupies high elevations (above 3,000 feet) and is located in the eastern portion of the WAU. The dominant tree species in this zone are Douglas-fir and western hemlock. Overstories may include western red cedar, incense-cedar, sugar pine, Pacific yew, and grand/white fir. Madrone

Map 8. Myrtle Creek Watershed Analysis Unit
Vegetation Zones



can occur on warmer positions but is not very common. Stony soils can support canyon live oak on all aspects. Understory species include rhododendron, Oregon grape, salal, golden chinquapin, red huckleberry, western sword fern, and bracken fern.

d. Cold Douglas-fir Zone

This zone occurs at the highest elevations (above 3,800 feet) in the WAU. The Cold Douglas-fir Zone occurs in the Deadman Mountain area. The growing season is very short in comparison to the other zones. Important tree species in this zone are Douglas-fir, western hemlock and grand/white fir. Other species may include western red cedar, incense-cedar, sugar pine, Pacific yew, and western white pine.

e. Western Hemlock Zone

This Western Hemlock Zone occurs in the northeastern portion of the WAU. Douglas-fir is the dominant species. Western hemlock is a significant understory or dominant overstory species in older stands on north aspects. It may be present in minor amounts on south aspects. Grand fir, western red cedar, and chinkapin may also occur. Red alder, bigleaf maple, and cascara buckthorn occur in favorable locations. Understory species include western sword fern, oxalis, vine maple, currant, western hazel, creambush oceanspray, Pacific rhododendron, salal, red huckleberry, cascade Oregon grape, and evergreen huckleberry. Forest managers encounter a variety of competitive evergreen and deciduous shrubs in tree regeneration efforts. Red alder is especially aggressive after fires or overstory removal on many north aspects.

2. Processes Affecting Vegetation Composition, Seral Stages and Landscape Pattern

Fire is the primary natural disturbance in southwestern Oregon. Other natural processes affecting landscape and stand level composition are wind, snow, insects, and diseases. Humans also affect vegetation composition and patterns.

a. Fire

Fire has played a major role in developing vegetation patterns in the WAU. Lightning is the principal ignition source in southwestern Oregon. Humans are an ignition source, also. Native American Indians used fire to clear lands, improve hunting areas, and produce desirable plant species. Miners and settlers also used fire to clear lands for mining activities and agriculture (Atzet et al. 1988).

Fire regimes are classified from low to high severity (Agee 1990). A detailed fire history for the Myrtle Creek WAU does not exist. However, there is one for the adjacent Little River Watershed, which has similar ecological vegetation zones (Van Norman 1998). Based on the study conducted in the Little River Watershed and the similarity of ecological vegetation zones, the Myrtle Creek

WAU probably includes a range of fire severity regimes, with low-severity and moderate-severity regimes being most prevalent.

Most of the Lower North Myrtle and Lower South Myrtle Subwatersheds would be considered to have a low-severity fire regime. The low-severity fire regime is associated with frequent fires having low intensity. Lightning and human-caused fires affected the amount of native prairie, savannah, and closed canopy forest in the lower elevations, maintaining the grassland and savannah/open woodland vegetation types (Franklin and Dyrness 1973 and LaLande and Pullen 1999). The natural fire frequency may have been as short as every five to ten years (Agee 1990). Native American Indians burned the valleys annually to maintain desired conditions (Riddle 1993).

Most of the Upper North Myrtle and Upper South Myrtle Subwatersheds would be considered to have a moderate-severity fire regime. The moderate-severity fire regime is characteristic of moist-dry Douglas-fir forests. Multi-aged stand development is common in a moderate-severity regime with fire removing or thinning stand components and structures (Agee 1991). Figure 1 shows the stand development sequence with a moderate-severity fire regime. Figure 1 shows a fire occurring about every fifty years and how stand composition might be altered.

Landscape vegetation patterns created by a moderate-severity fire regime are very patchy, since the fire intensity varies. Figure 2 shows what an area in the western Cascade Mountains with a moderate-severity fire regime might look after eight separate fires burned during a 100-year period (Morrison and Swanson 1990).

The same patchy vegetation pattern occurs in the White Rock area in the eastern part of the WAU. Figure 3 shows the vegetation pattern for part of the WAU in the early 1950s before timber harvesting occurred. The age classes of the understories in the multi-storied stands and overstories in the single-story stands suggest fire influenced the vegetation composition and landscape arrangement. The amount of multi-storied stands, various ages of Douglas-fir in the understories, and absence of shade tolerant conifers in most stands also indicates fire was the principal disturbance.

Moderate-severity regimes usually have fire frequencies ranging from 25 to100 years. Detailed studies in western Cascade Mountain areas similar to the Upper North Myrtle and Upper South Myrtle Subwatersheds found natural fire frequencies ranging from 95 to 145 years in the 400 years before fire suppression began (Agee 1991). A study in the Little River Watershed, which is adjacent to and has ecological zones similar to the Myrtle Creek WAU, found median fire return intervals were between 90 and 123 years during the past 700 years (Van Norman 1998).

Depending on the time period examined, the natural fire frequency can vary greatly. Morrison and Swanson (1990) calculated a fire frequency between 95 and 149 years from 1500 to 1910 in a western Cascade Mountain watershed with a mixture of high-severity and moderate-severity fire regimes. However, from 1750 to 1910 the natural fire frequency ranged between 72 and 213 years.

Figure 1. Development Pattern of Old-growth Conditions Under a Moderate-severity Fire Regime in Moist-dry Douglas-fir Forests (Adapted From Agee 1991).

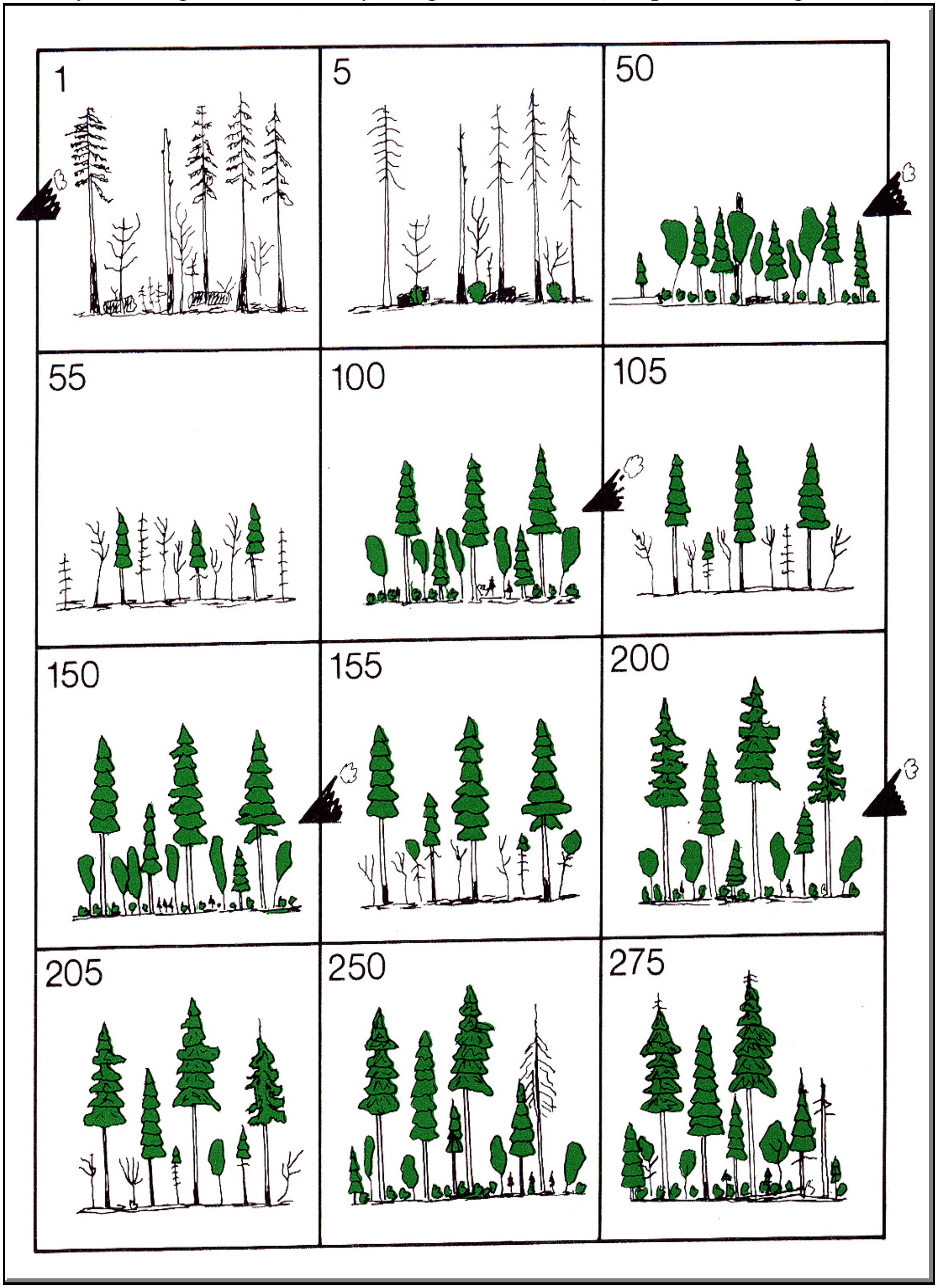


Figure 2. Moderate-severity Fire Regime Tree Mortality Pattern (Adapted From Morrison and Swanson 1990).

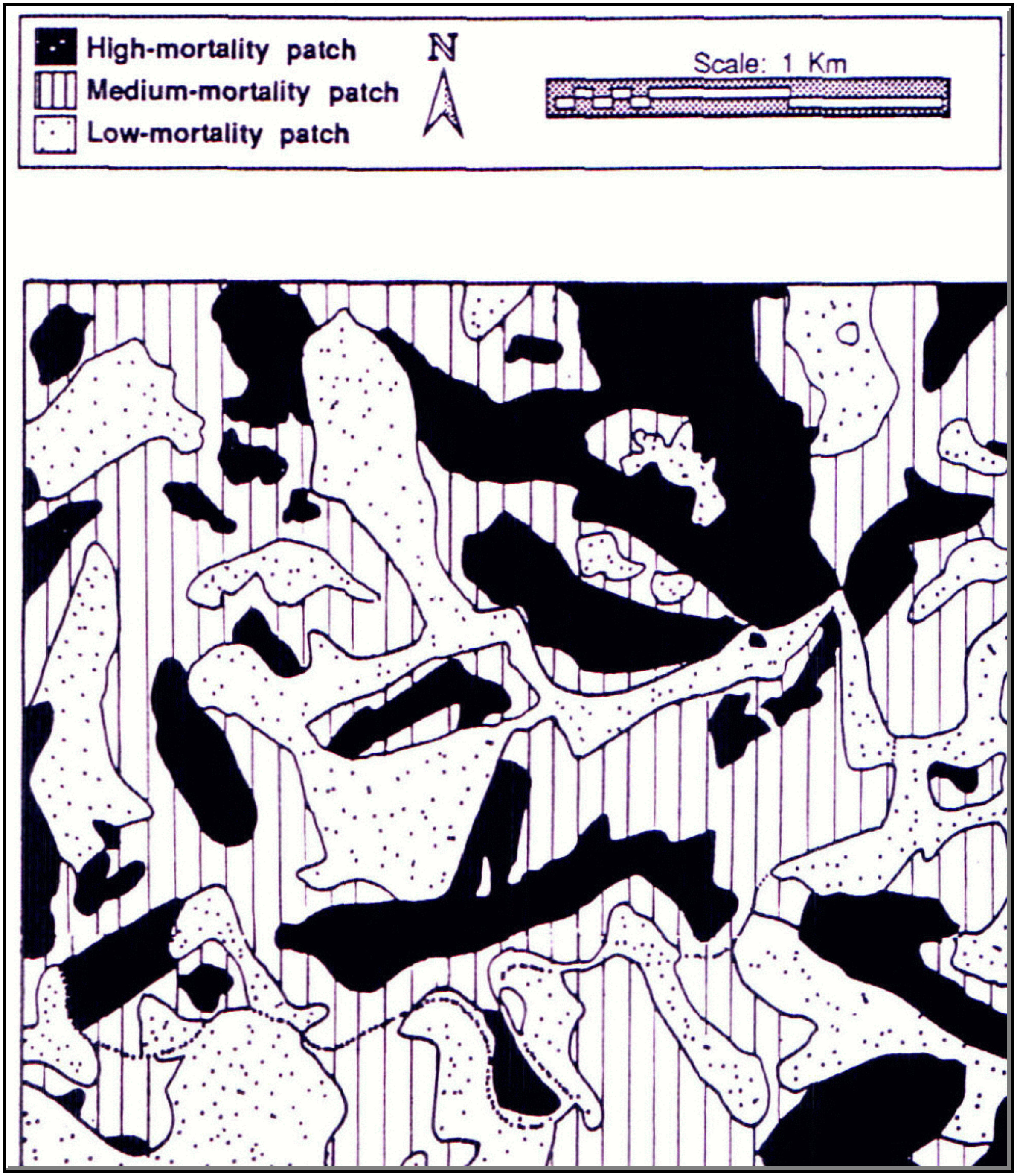
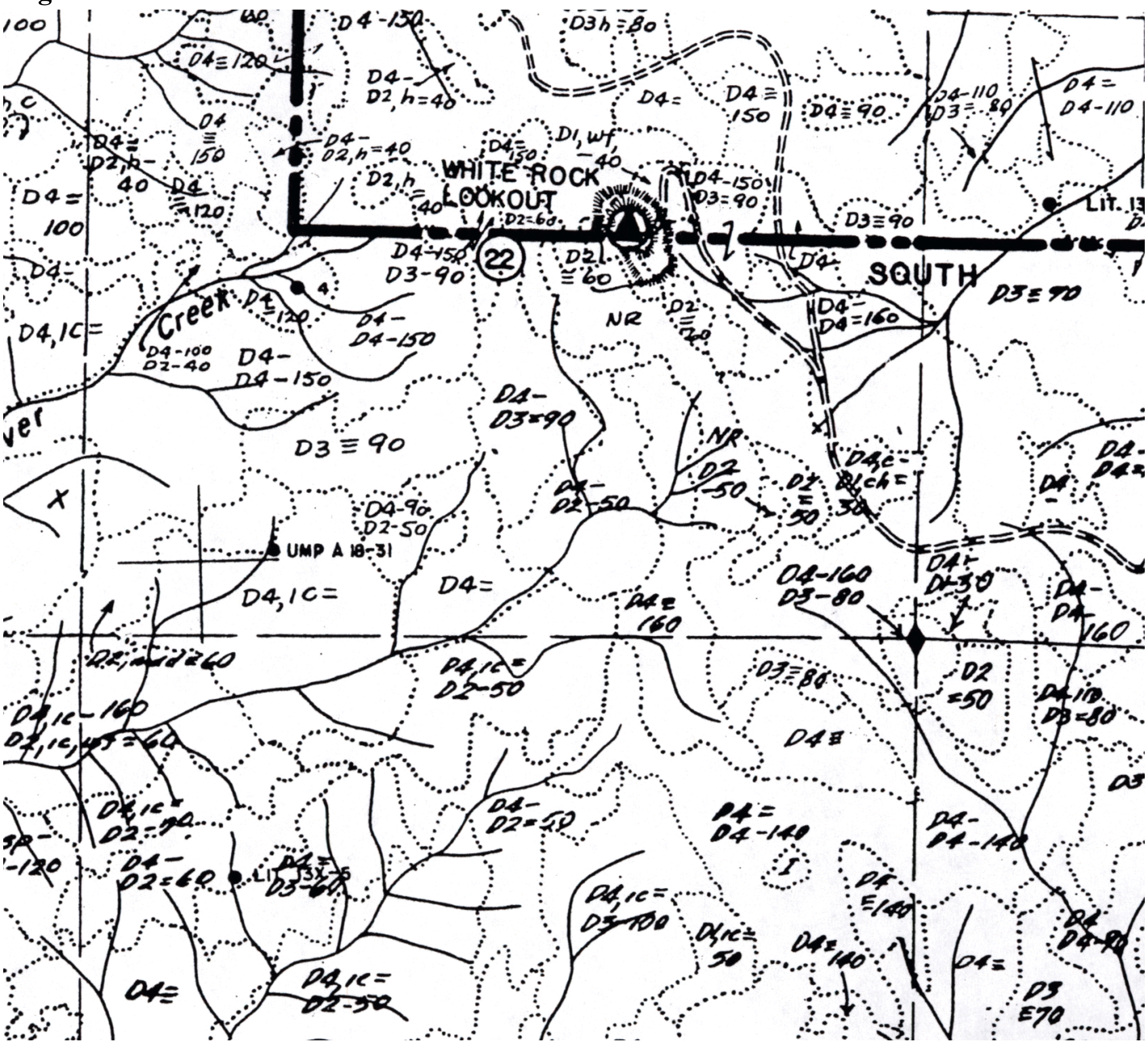


Figure 3. 1954 Vegetation Type Map Around White Rock Showing Moderate-severity Fire Regime Pattern.



The cold, wet, high elevation, Deadman Mountain area would be considered to have a high-severity fire regime. A high-severity fire regime usually has infrequent, high intensity fires, which kill the overstory trees.

Fire is still influencing the vegetation composition in the WAU. Wildfires in 1987 were both high-severity and moderate-severity fires. The fires were started by lightning and burned in the Frozen Creek, Lee Creek, and North Myrtle Headwaters Drainages. Large areas of trees were killed but islands of partially killed stands or areas where the fires burned under the tree canopies with little or no overstory mortality also occurred.

b. Wind

Severe windstorms, which blow down forests, occur infrequently in western Oregon (Wright and Lauterbach 1958 and Curtis et al. 1998). Major windstorms in the last 60 years occurred in 1949, 1950, 1951, 1962, and 1975. It is unknown to what extent the Myrtle Creek WAU was affected by these windstorms. Blowdown can also occur at abrupt stand edges.

c. Snow

Heavy, wet snow can damage forest stands by causing trees to break. The damage may be minor or cause the tree to die. The effects of the snow are worse when it is accompanied by high winds (Wright and Lauterbach 1958 and Curtis et al. 1998). Such an event occurred above 3,000 feet in elevation in the Upper South Myrtle Subwatershed during the winter of 1995 and1996.

d. Insects and Diseases

Insects and diseases naturally occur in forest stands of all age classes. However, insect levels can reach epidemic proportions if conditions are favorable. An example is the increase in Douglas-fir bark beetles after large blowdown, snow breakage, or fire events because of the increase in high quality insect habitat (Wright and Lauterbach 1958). Bark beetles are the major insect pests affecting Douglas-fir stands west of the Cascade Mountains (Curtis et al. 1998). Root diseases are the main disease group infecting Douglas-fir forests (Curtis et al. 1998). Diseases, such as laminated root rot, can cause small long-term growth loss and mortality (USDA 1996). Non-native diseases, such as white pine blister rust, can also cause growth loss and mortality among susceptible species (USDA 1983).

e. Humans

Human disturbances have affected the vegetation composition and pattern in the Myrtle Creek WAU. Human disturbances include converting native to non-native vegetation types, such as agriculture, and altering seral stage amounts and patterns by starting fires, timber harvesting, grazing, and suppressing fires. Humans have spread noxious weeds, also. Himalayan blackberry and Scotch broom have become widespread in upland and riparian areas due to human activities.

3. Current Age Classes

Vegetation conditions in this watershed analysis are classified by the age of the dominant tree species for each stand, aggregated into age class groupings (see Table 7 and Map 9). Nonforested areas (such as agricultural and hardwood uses) are also identified. The arrangement of the age classes on the landscape is a result of disturbance, such as fire, wind, snow, insects, diseases, and human-caused disturbance (for example land clearing, timber harvesting, road construction, home construction, and subdivision of land by straight line boundaries). The age class data was summarized from the BLM Forest Operations Inventory (FOI) and Private Operations Inventory (POI) databases.

Chart 3 shows age class groups for BLM-administered and private lands. Chart 4 shows the percent ownership and age class groups for the entire WAU. The charts are shown proportional to the total acres by ownership classification in the WAU. Forest stands greater than 80 years old comprise about 25 percent of the WAU, concentrated on BLM-administered land. Fifteen percent of the WAU is classified as nonforest. The nonforested land is mainly agricultural land and located in the western half of the WAU (Lower North Myrtle and Lower South Myrtle Subwatersheds). About 60 percent of the WAU consists of forest stands less than 80 years old with a higher proportion on private lands.

a. BLM-administered Lands

The BLM-administered lands comprise approximately 41 percent (31,009 acres) of the WAU. The eastern portion of the WAU contains a block of land administered by the BLM unlike the usual checkerboard ownership pattern in the WAU. The Curtin Creek and South Myrtle Headwaters Drainages contain a larger percentage of mature stands, while the Upper North Myrtle Subwatershed reflects the impact of the 1987 North Myrtle Fire, which burned many of the mature stands in the Lee Creek and North Myrtle Headwaters Drainages (see Tables 7 and 8 and Maps 9 and 10).

Table 7. 2001 Age Class Distribution in the Myrtle Creek WAU.

Area	Number of Acres by Age Class and Percent of Total																				
	Nonforest		0 to 10		10 to 20		20 to 30		30 to 50		50 to 80		80 to 120		120 to 200		200 +		Hardwoods		Total
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	
Bilger Creek	1,677	30	300	5	461	8.3	79	1	810	15	500	9	354	6	389	7	42	1	954	17	5,566
Frozen Creek	1,117	24	135	3	616	13	163	4	993	22	764	17	99	2	338	7	360	8	10	0	4,595
Lick Frontal	502	17	37	1	477	16	135	5	325	11	794	27	296	10	163	6	1	0	209	7	2,939
Myrtle Creek	2,148	53	0	0	135	3	26	1	600	15	499	12	392	10	20	0	46	1	166	4	4,032
North Myrtle Park	334	18	84	4	0	0	90	5	743	40	355	19	5	0	46	2	188	10	33	2	1,878
Lower North Myrtle Subwatershed	5,778	30	556	3	1,689	8.9	493	3	3,471	18	2,912	15	1146	6	956	5	637	3	1,372	7	19,010
Buck Fork	63	2	49	2	341	11	352	12	1,346	45	625	21	2	0	66	2	153	5	0	0	2,997
Lee Creek	186	5	197	5	189	5	339	9	1,524	40	295	8	236	6	101	3	787	20	0	0	3,854
Lower Slide Creek	106	6	98	5	45	3	127	7	374	21	792	44	8	0	150	8	97	5	0	0	1,797
Middle North Myrtle	266	13	135	7	153	7	0	0	223	11	1,027	50	106	5	0	0	144	7	0	0	2,054
North Myrtle Frontal	120	22	2	0	0	0	0	0	52	10	251	46	0	0	0	0	116	21	0	0	541
North Myrtle Headwaters	84	2	86	2	1,192	29	141	3	519	13	785	19	69	2	32	1	1,183	29	11	0	4,102
Riser Creek	0	0	132	7	152	8	149	7	767	38	114	6	16	1	6	0	652	32	23	1	2,011
Upper Slide Creek	0	0	0	0	276	24	172	15	159	14	8	1	0	0	12	1	523	45	0	0	1,150
Upper North Myrtle Subwatershed	825	4	699	4	2348	13	1280	7	4,964	27	3,897	21	437	2	367	2	3,655	20	34	0	18,506

Table 7. 2001 Age Class Distribution in the Myrtle Creek WAU.

Area	Number of Acres by Age Class and Percent of Total																				
	Nonforest		0 to 10		10 to 20		20 to 30		30 to 50		50 to 80		80 to 120		120 to 200		200 +		Hardwoods		Total
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	
Ben Branch	13	1	33	3	82	7	118	10	48	4	620	53	88	8	74	6	83	7	0	0	1,159
Cedar Hollow	101	9	0	0	288	26	0	0	248	22	256	23	183	17	27	2	0	0	0	0	1,103
Myrtle Links	639	27	78	3	93	4	1	0	679	29	269	11	342	14	4	0	151	6	126	5	2,382
Pack Saddle	571	22	70	3	26	1	0	0	862	33	773	29	80	3	31	1	198	8	13	0	2,624
School Hollow	661	30	88	4	84	4	64	3	531	24	285	13	130	6	180	8	156	7	0	0	2,179
Short Course	1,079	41	140	5	16	1	15	1	577	22	539	20	117	4	125	5	0	0	52	2	2,660
Lower South Myrtle Subwatershed	3,064	25	409	3	589	5	198	2	2,945	24	2,742	23	940	8	441	4	588	5	191	2	12,107
Curtin Creek	2	0	61	3	49	3	121	7	46	3	53	3	214	12	267	15	1,017	56	0	0	1,830
Lally Creek	155	4	830	20	234	6	280	7	1,135	28	260	6	99	2	180	4	935	23	14	0	4,122
Letitia Creek	683	15	181	4	337	8	21	0	891	20	1,365	31	0	0	308	7	668	15	0	0	4,454
Lower Louis Creek	287	14	97	5	66	3	156	8	452	22	669	33	55	3	15	1	249	12	0	0	2,046
South Myrtle Headwaters	110	3	0	0	48	1	73	2	178	5	739	22	304	9	1,302	39	605	18	0	0	3,359
Upper Louis Creek	51	1	114	3	350	10	605	17	771	22	355	10	18	1	323	9	966	27	7	0	3,560
Weaver Creek	106	3	382	10	216	5	231	6	672	17	846	21	161	4	7	0	1,340	34	0	0	3,961
Wiley Creek	405	12	225	7	222	7	205	6	470	14	938	29	16	0	211	6	591	18	0	0	3,283
Upper South Myrtle Subwatershed	1,799	7	1890	7	1522	6	1692	6	4,615	17	5,225	20	867	3	2613	10	6,371	24	21	0	26,615
Myrtle Creek WAU	11,466	15	3,554	5	6,148	8	3,663	5	15,995	21	14,776	19	3,390	4	4,377	6	11,251	15	1,618	2	76,238

Map 9. Myrtle Creek Watershed Analysis Unit
2001 Age Class Distribution

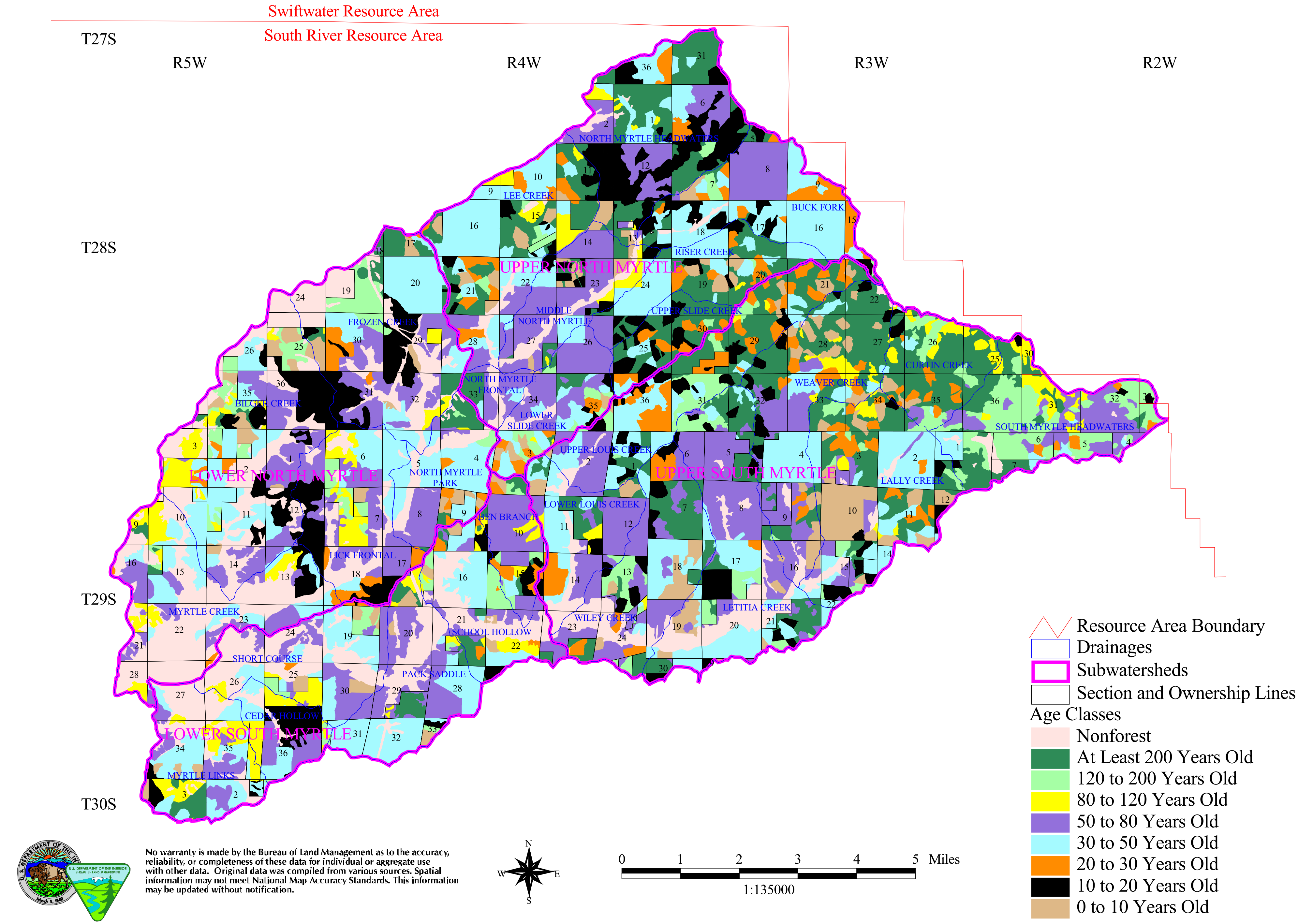


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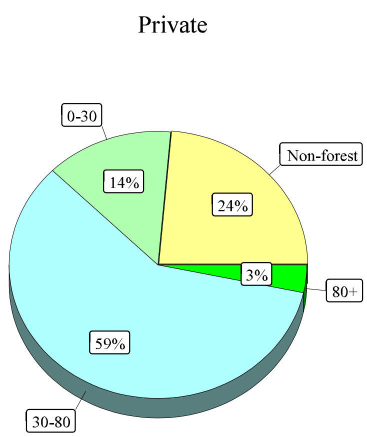
Chart 3. Myrtle Creek Watershed Analysis Unit
2001 Forest Age Class Groups by Ownership Type



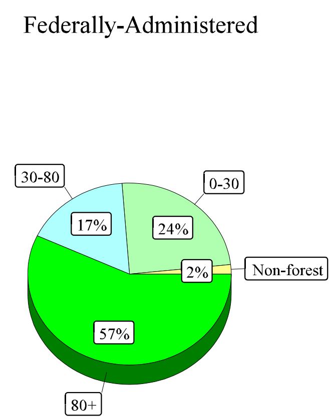
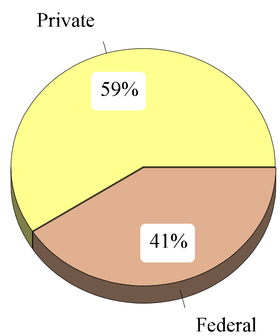


Chart 4. Myrtle Creek Watershed Analysis Unit

Ownership and Forest Age Class Groups

Ownership



Forest Age Class Groups

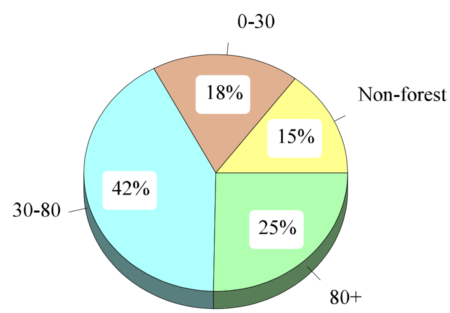


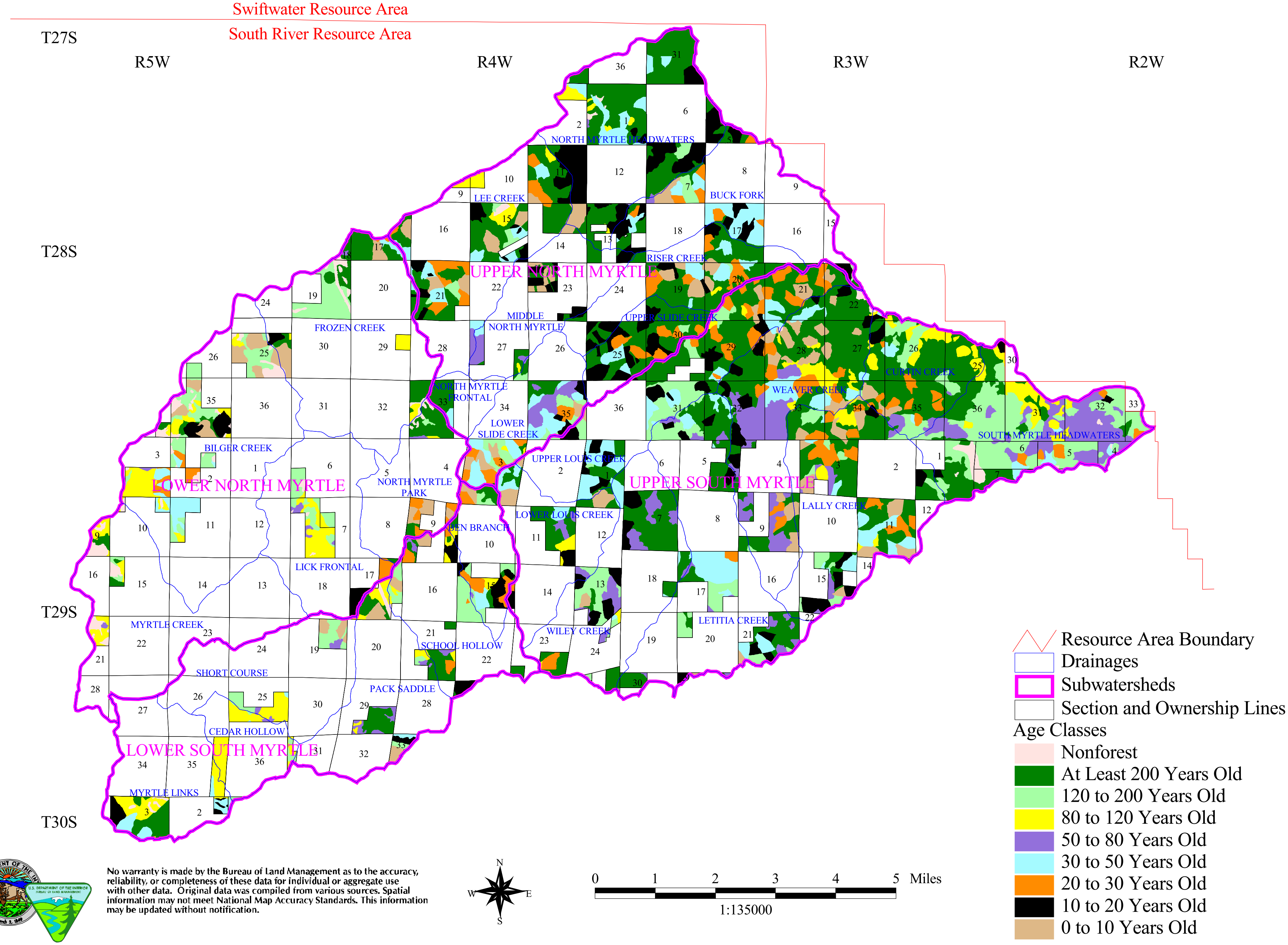
Table 8. 2001 BLM Age Class Distribution in the Myrtle Creek WAU.

Area	Number of Acres by Age Class and Percent of Total																		
	Nonforest		0 to 10		10 to 20		20 to 30		30 to 50		50 to 80		80 to 120		120 to 200		200 +		Total
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	
Bilger Creek	153	11	214	15	98	7	79	6	191	13	7	0	258	18	389	27	42	3	1,431
Frozen Creek	85	9	100	11	30	3	11	1	35	4	4	0	62	7	259	27	360	38	946
Lick Frontal	15	3	1	0	59	12	42	8	0	0	25	5	193	39	163	33	1	0	499
Myrtle Creek	125	40	0	0	0	0	0	0	0	0	5	2	119	38	20	6	46	15	315
North Myrtle Park	26	7	73	19	0	0	72	19	5	1	7	2	4	1	7	2	188	49	382
Lower North Myrtle Subwatershed	404	11	388	11	187	5	204	6	231	6	48	1	636	18	838	23	637	18	3,573
Buck Fork	0	0	49	5	212	24	103	11	307	34	8	1	0	0	66	7	153	17	898
Lee Creek	21	1	176	10	188	10	222	12	215	12	26	1	131	7	63	3	787	43	1,829
Lower Slide Creek	0	0	96	10	45	5	127	13	282	30	150	16	8	1	149	16	97	10	954
Middle North Myrtle	0	0	69	16	128	30	0	0	14	3	61	15	4	1	0	0	144	34	420
North Myrtle Frontal	3	2	0	0	0	0	0	0	21	15	0	0	0	0	0	0	116	83	140
North Myrtle Headwaters	16	1	65	3	618	28	0	0	231	10	5	0	69	3	32	1	1,183	53	2,219
Riser Creek	0	0	132	11	149	12	149	12	141	11	0	0	8	1	6	0	652	53	1,237
Upper Slide Creek	0	0	0	0	254	26	130	13	64	7	0	0	0	0	12	1	523	53	983
Upper North Myrtle Subwatershed	40	0	587	7	1,594	18	731	8	1,275	15	250	3	220	3	328	4	3,655	42	8,680

Table 8. 2001 BLM Age Class Distribution in the Myrtle Creek WAU.

Area	Number of Acres by Age Class and Percent of Total																		
	Nonforest		0 to 10		10 to 20		20 to 30		30 to 50		50 to 80		80 to 120		120 to 200		200 +		Total
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	
Ben Branch	0	0	33	7	82	18	109	24	38	8	3	1	29	6	74	16	83	18	451
Cedar Hollow	0	0	0	0	0	0	0	0	0	0	4	2	176	85	27	13	0	0	207
Myrtle Links	19	4	0	0	66	13	1	0	112	21	0	0	172	33	4	1	151	29	525
Pack Saddle	23	5	70	14	26	5	0	0	16	3	53	11	80	16	31	6	198	40	497
School Hollow	1	0	52	9	84	14	55	9	0	0	22	4	38	6	180	31	156	27	588
Short Course	0	0	50	16	1	0	0	0	4	1	25	8	104	34	125	40	0	0	309
Lower South Myrtle Subwatershed	43	2	205	8	259	10	165	6	170	7	107	4	599	23	441	17	588	23	2,577
Curtin Creek	2	0	61	3	49	3	121	7	46	3	53	3	214	12	267	15	1,017	56	1,830
Lally Creek	0	0	281	13	178	8	264	12	223	10	77	3	93	4	180	8	923	42	2,219
Letitia Creek	0	0	23	1	133	8	21	1	356	22	109	7	0	0	308	19	668	41	1,618
Lower Louis Creek	0	0	97	16	66	11	10	2	94	15	51	8	41	7	15	2	249	40	623
South Myrtle Headwaters	99	3	0	0	36	1	73	2	68	2	739	24	246	8	1,250	40	576	19	3,087
Upper Louis Creek	2	0	114	5	279	12	314	13	343	15	3	0	18	1	323	14	966	41	2,362
Weaver Creek	22	1	318	10	216	7	231	7	247	8	575	18	161	5	7	0	1,340	43	3,117
Wiley Creek	0	0	20	2	185	14	39	3	55	4	211	16	16	1	181	14	591	46	1,298
Upper South Myrtle Subwatershed	125	1	914	6	1,142	7	1,073	7	1,432	9	1,818	11	789	5	2,531	16	6,330	39	16,154
Myrtle Creek WAU	612	2	2,094	7	3,182	10	2,173	7	3,108	10	2,223	7	2,244	7	4,138	13	11,210	36	30,984

Map 10. Myrtle Creek Watershed Analysis Unit
2001 BLM Age Class Distribution



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b. Riparian Reserves

Riparian Reserves were designated to provide habitat for terrestrial wildlife species. Over two hundred terrestrial wildlife species expected to occur in the WAU are associated with riparian habitat. Terrestrial wildlife species associated with riparian habitat are listed in Table E-2 in Appendix E. Silvicultural treatments applied within Riparian Reserves would be to control stocking or reestablish, establish, or maintain desired vegetation characteristics to attain Aquatic Conservation Strategy objectives.

Riparian Reserve widths are defined based on the most limiting criteria of the extent of unstable or potentially unstable areas, the top of the inner gorge, the extent of riparian vegetation, the outer edges of the 100 year floodplain, or the site potential tree height. The site potential tree height defines the widest Riparian Reserves in the WAU.

Riparian Reserve widths were developed using the Regional Ecosystem Office approved methodology in determining site tree heights. This methodology uses average site index computed from inventory plots throughout the fifth field watershed (Myrtle Creek Watershed), which corresponds with this WAU. For this watershed analysis, Riparian Reserve widths use a potential tree height of 160 feet. All first and second order streams, which are considered to be non-fish bearing streams for this watershed analysis, were analyzed using a Riparian Reserve width of 160 feet on each side of the stream. Third order and larger streams, which are considered to be fish bearing streams for this watershed analysis, were analyzed using a Riparian Reserve width of 320 feet (two times the site potential tree height) on each side of the stream. Actual projects would use site specific information, such as if a stream was fish bearing, to determine if a stream needed a Riparian Reserve width of 160 or 320 feet.

There are approximately 12,718 acres of Riparian Reserves on BLM-administered land in the WAU. Riparian Reserves within the Myrtle Creek WAU account for approximately 41 percent of the Federally-administered land. There are approximately 49 acres of Riparian Reserves on the Tiller Ranger District of the Umpqua National Forest. About 52 percent (6,573 out of 12,718 acres) of the Riparian Reserves in the WAU are at least 80 years old (see Tables 9 and 10 and Map 11).

In about 60 years, approximately 82 percent of the Riparian Reserves on BLM-administered land would be at least 80 years old (see Table 9 and Map 12). In approximately 80 years, all of the forested Riparian Reserves on BLM-administered land would be at least 80 years old. Approximately one percent of the Riparian Reserves are considered to be nonforested.

Table 9. Percent of Riparian Reserves at Least 80 Years Old in the Myrtle Creek Watershed (Fifth Field).

Year	2001	2011	2021	2031	2041	2051	2054	2061	2071	2081
Percent	52	52	56	60	67	73	75	82	92	99

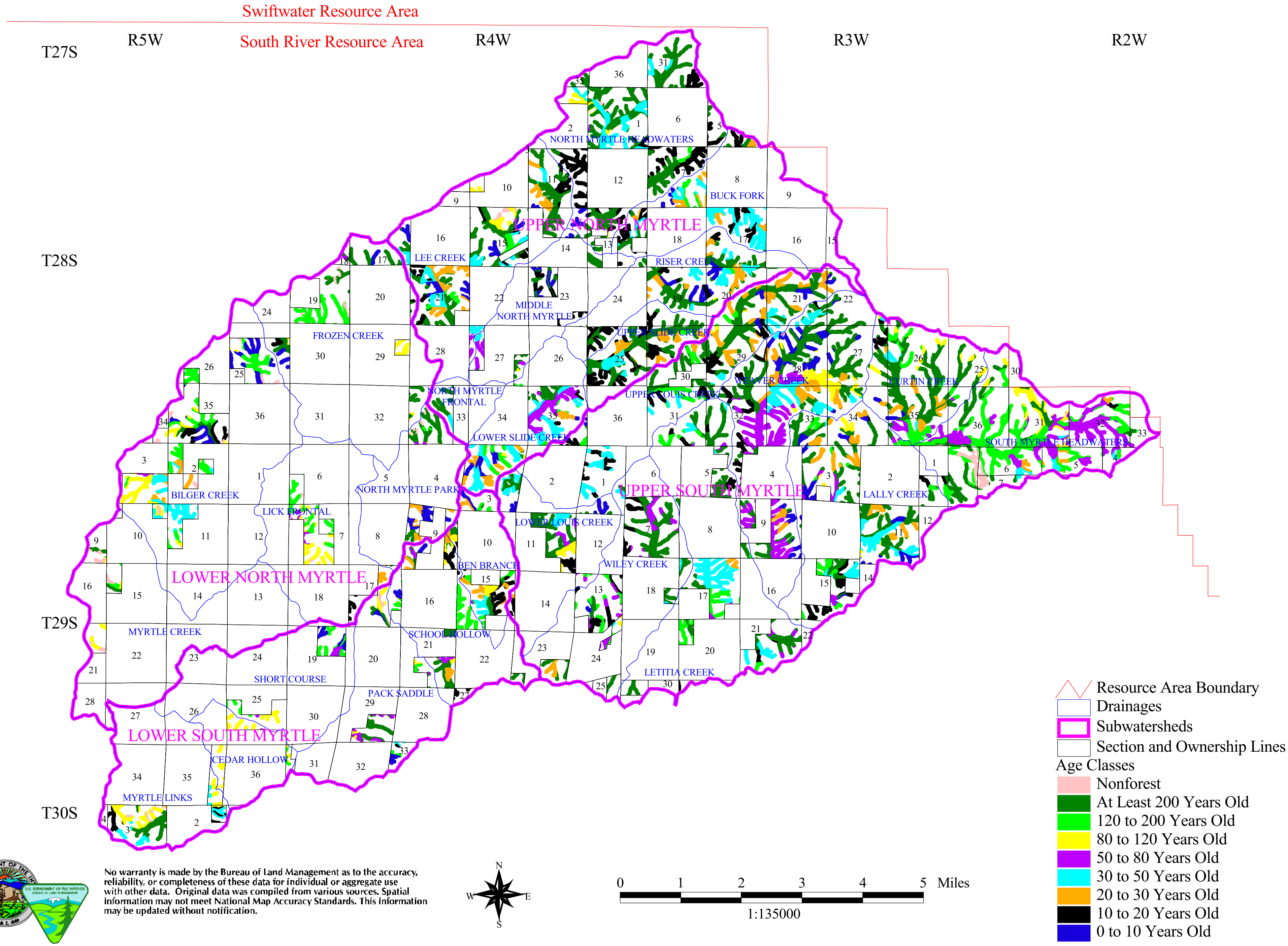
Table 10. 2001 Riparian Reserve Age Class Distribution on BLM Administered Land.

Area	Number of Acres by Age Class and Percent of Total																		
	Nonforest		0 to 10		10 to 20		20 to 30		30 to 50		50 to 80		80 to 120		120 to 200		200 +		Total
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	
Bilger Creek	32	5	94	15	42	7	35	6	109	17	5	1	99	16	191	30	22	3	629
Frozen Creek	14	5	26	9	12	4	0	0	0	0	2	1	25	9	98	34	109	38	286
Lick Frontal	6	4	0	0	12	7	13	8	0	0	11	6	56	33	72	42	0	0	170
Myrtle Creek	23	35	0	0	0	0	0	0	0	0	0	0	18	28	7	11	17	26	65
North Myrtle Park	9	6	39	25	0	0	26	16	0	0	3	2	0	0	3	2	79	50	159
Lower North Myrtle Subwatershed	84	6	159	12	66	5	74	6	109	8	21	2	198	15	371	28	227	17	1,309
Buck Fork	0	0	11	3	100	25	56	14	174	44	0	0	0	0	22	6	36	9	399
Lee Creek	12	1	79	9	85	10	118	14	128	15	8	1	35	4	36	4	331	40	832
Lower Slide Creek	0	0	39	9	9	2	60	13	156	35	96	21	3	1	44	10	44	10	451
Middle North Myrtle	0	0	24	16	34	22	0	0	8	5	26	17	1	1	0	0	61	40	154
North Myrtle Frontal	0	0	0	0	0	0	0	0	8	19	0	0	0	0	0	0	35	81	43
North Myrtle Headwaters	4	0	19	2	275	28	0	0	150	15	1	0	25	3	13	1	496	50	983
Riser Creek	0	0	60	12	75	15	69	14	78	16	0	0	1	0	4	1	206	42	493
Upper Slide Creek	0	0	0	0	130	28	65	14	50	11	0	0	0	0	7	1	220	47	472
Upper North Myrtle Subwatershed	16	0	232	6	708	19	368	10	752	20	131	3	65	2	126	3	1,429	37	3,827

Table 10. 2001 Riparian Reserve Age Class Distribution on BLM Administered Land.

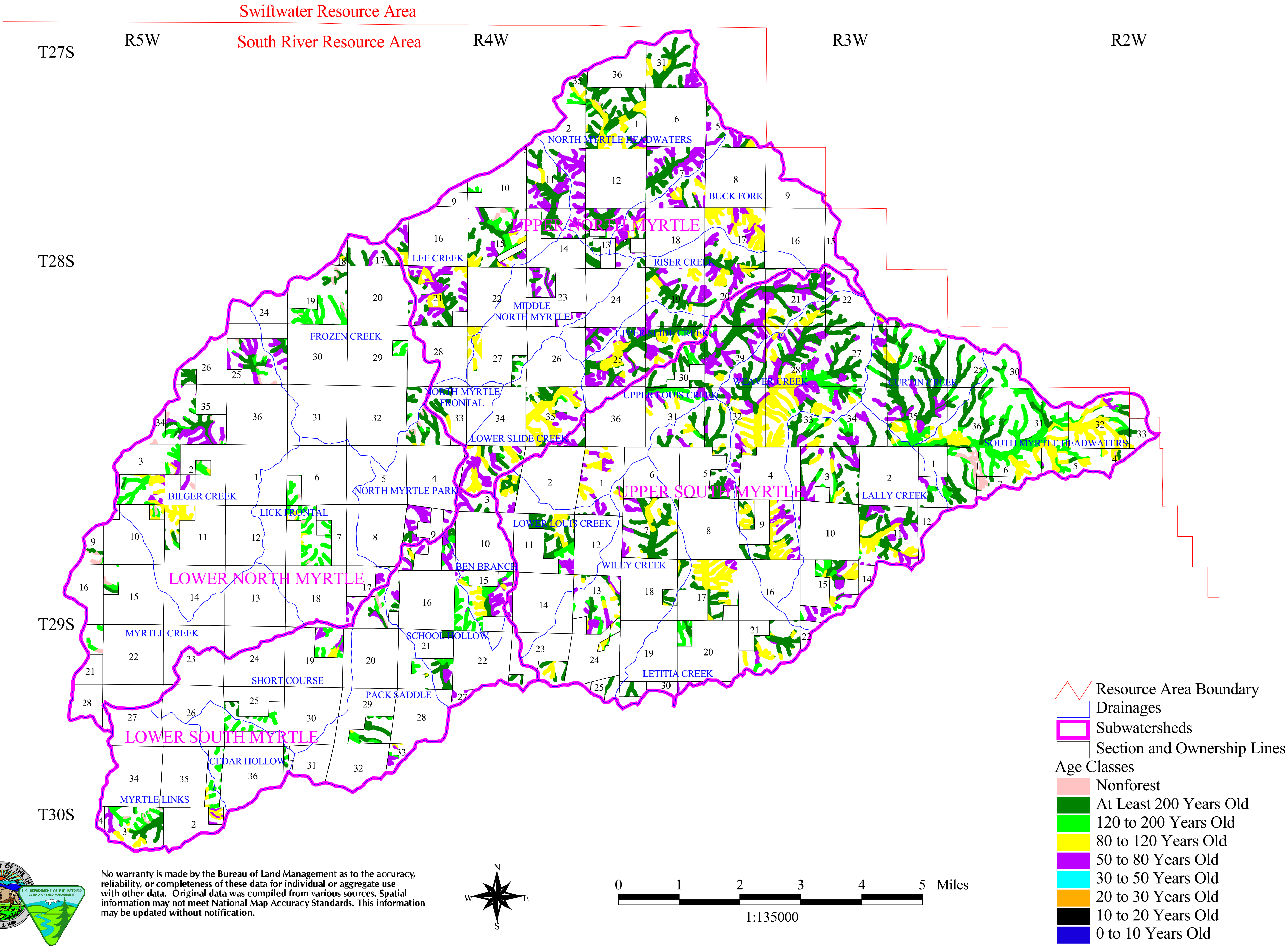
Area	Number of Acres by Age Class and Percent of Total																		
	Nonforest		0 to 10		10 to 20		20 to 30		30 to 50		50 to 80		80 to 120		120 to 200		200 +		Total
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	
Ben Branch	0	0	13	6	48	23	42	20	26	12	1	0	26	12	29	14	28	13	213
Cedar Hollow	0	0	0	0	0	0	0	0	0	0	1	2	46	88	5	10	0	0	52
Myrtle Links	8	4	0	0	30	13	0	0	44	20	0	0	78	35	0	0	64	29	224
Pack Saddle	9	6	17	12	2	1	0	0	3	2	23	16	22	16	12	9	52	37	140
School Hollow	0	0	17	7	30	12	34	14	0	0	17	7	13	5	72	29	66	27	249
Short Course	0	0	23	24	0	0	0	0	0	0	14	15	18	19	41	43	0	0	96
Lower South Myrtle Subwatershed	17	2	70	7	110	11	76	8	73	7	56	6	203	21	159	16	210	22	974
Curtin Creek	0	0	15	2	28	4	67	10	21	3	27	4	44	6	103	15	387	56	692
Lally Creek	0	0	90	10	71	8	133	14	136	15	35	4	25	3	81	9	349	38	920
Letitia Creek	0	0	0	0	43	7	12	2	189	30	21	3	0	0	112	18	252	40	629
Lower Louis Creek	0	0	29	10	35	12	2	1	47	16	20	7	28	9	3	1	137	46	301
South Myrtle Headwaters	62	5	0	0	10	1	30	2	33	3	342	28	83	7	480	39	185	15	1,225
Upper Louis Creek	1	0	43	5	139	15	166	18	115	13	0	0	6	1	85	9	356	39	911
Weaver Creek	1	0	137	9	81	6	149	10	152	10	343	23	94	6	1	0	502	34	1,460
Wiley Creek	0	0	4	1	83	18	19	4	16	3	76	16	4	1	38	8	230	49	470
Upper South Myrtle Subwatershed	64	1	318	5	490	7	578	9	709	11	864	13	284	4	903	14	2,398	36	6,608
Myrtle Creek WAU	181	1	779	6	1,374	11	1,096	9	1,643	13	1,072	8	750	6	1,559	12	4,264	34	12,718

Map 11. Myrtle Creek Watershed Analysis Unit
BLM Riparian Reserve Age Class Distribution in 2001



No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data was compiled from various sources. Spatial information may not meet National Map Accuracy Standards. This information may be updated without notification.

Map 12. Myrtle Creek Watershed Analysis Unit
BLM Riparian Reserve Age Class Distribution in 2054



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 (USDA and USDI 1994b and 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. As a minimum, a fisheries biologist, soil scientist, hydrologist, botanist, and wildlife biologist would be expected to conduct the analysis for adjusting Riparian Reserve widths. The Riparian Reserve Module could be used to evaluate adjusting Riparian Reserve widths.

c. Private Lands

Private lands account for approximately 59 percent (45,254 acres) of the Myrtle Creek WAU (see Table 11 and Map 13). Agricultural lands total approximately 9,943 acres (13 percent of the WAU) while forested lands account for approximately 35,311 acres (46 percent of the WAU). The privately owned lands are intermingled with BLM-administered lands in a checkerboard pattern. Approximately 72 percent of the private forested lands are in the 30 to 80 year old age classes (see Table 11).

Although private lands are a major component of this Watershed Analysis Unit (59 percent), the focus of this analysis is on BLM-administered land. Timber harvesting on private forest lands could be expected to be influenced by tree maturity, market conditions, and other economic factors. Timber harvest rotation lengths would probably occur every 40 to 60 years on private lands and stands would probably have an average diameter of less than 15 inches when the final regeneration harvest occurs (Oregon Department of Forestry 2000).

The Oregon Forest Practices Act addresses timber harvesting on private lands. Private industrial forest lands would contribute to watershed recovery because changes in Oregon forest practices laws regarding structural retention and riparian protection were established in 1994. Retention of conifers in riparian areas has increased from about 17 percent of pre-harvest basal area to 70 percent since the rules changed (Hairston-Strang and Adams 1997 and Hairston-Strang and Adams 2000). The number of retained conifers has doubled since 1994. In southwestern Oregon percent canopy closure has increased from about 70 percent to 95 percent. Snag densities have increased from an average of one per acre to eight per acre. Average snag diameter is 15 inches, which is about the same as before the rules changed (Hairston-Strang and Adams 2000).

Riparian management areas adjacent to fish bearing streams on private lands are between 50 and 100 feet wide compared to 320 feet on Federally-administered lands in the WAU. Non-fish bearing stream riparian management areas on private lands are between zero and 70 feet wide compared to 160 feet on Federally-administered lands in the WAU (Oregon Department of Forestry 1994).

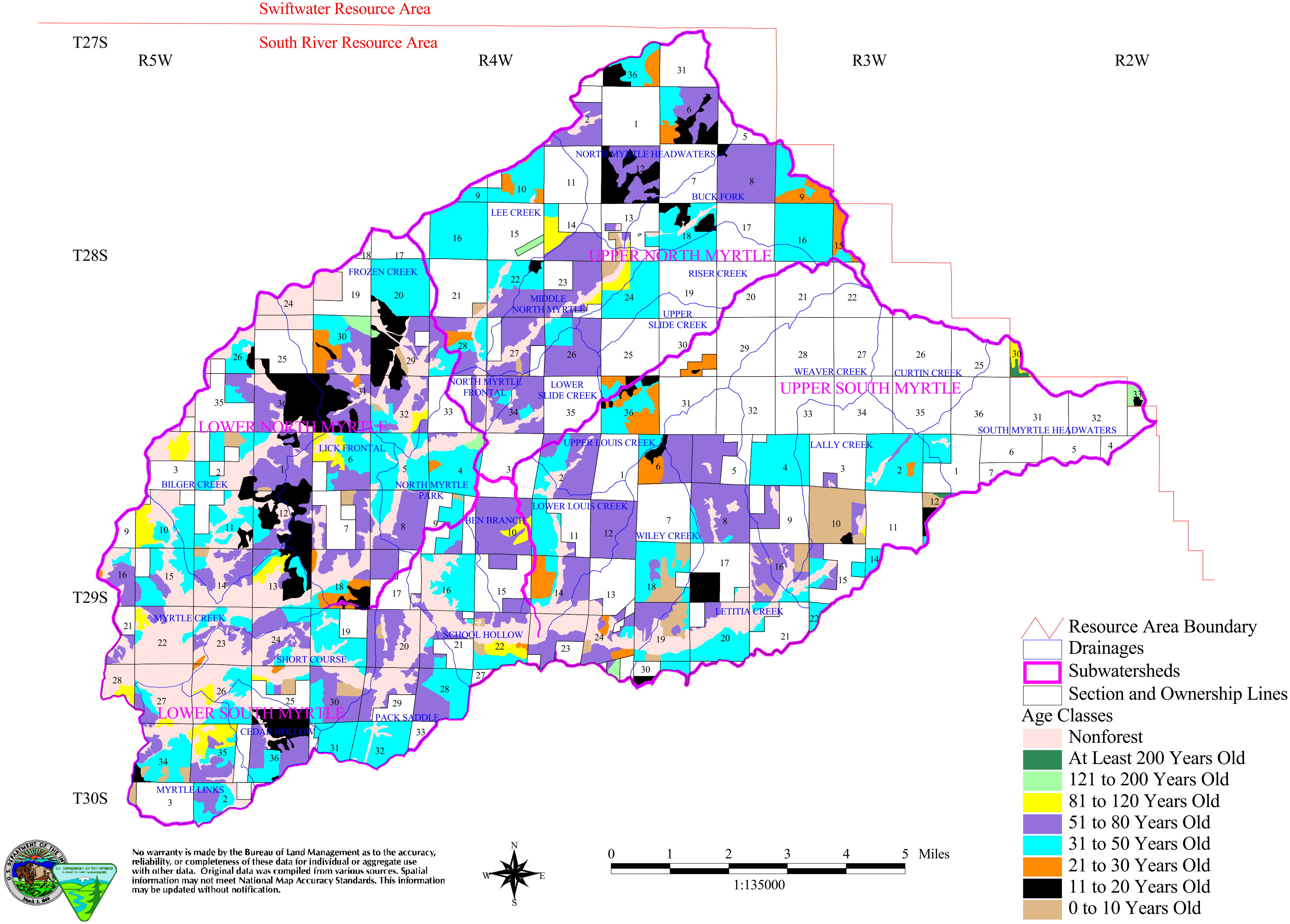
Table 11. 2001 Non-BLM Administered Land Age Class Distribution in the Myrtle Creek WAU.

Area	Number of Acres by Age Class and Percent of Total																				
	Nonforest		0 to 10		10 to 20		20 to 30		30 to 50		50 to 80		80 to 120		120 to 200		200 +		Hardwoods		Total
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	
Bilger Creek	1,524	37	86	2	363	9	0	0	619	15	493	12	96	2	0	0	0	0	954	23	4,135
Frozen Creek	1,032	28	35	1	586	16	152	4	958	26	760	21	37	1	79	2	0	0	10	0	3,649
Lick Frontal	487	20	36	1	418	17	93	4	325	13	769	32	103	4	0	0	0	0	209	9	2,440
Myrtle Creek	2,023	54	0	0	135	4	26	1	600	16	494	13	273	7	0	0	0	0	166	4	3,717
North Myrtle Park	308	21	11	1	0	0	18	1	738	49	348	23	1	0	39	3	0	0	33	2	1,496
Lower North Myrtle Subwatershed	5,374	35	168	1	1,502	10	289	2	3,240	21	2,864	19	510	3	118	1	0	0	1,372	9	15,437
Buck Fork	63	3	0	0	129	6	249	12	1,039	49	617	29	2	0	0	0	0	0	0	0	2,099
Lee Creek	165	8	21	1	1	0	117	6	1,309	65	269	13	105	5	38	2	0	0	0	0	2,025
Lower Slide Creek	106	13	2	0	0	0	0	0	92	11	642	76	0	0	1	0	0	0	0	0	843
Middle North Myrtle	266	16	66	4	25	2	0	0	209	13	966	59	102	6	0	0	0	0	0	0	1,634
North Myrtle Frontal	117	29	2	0	0	0	0	0	31	8	251	63	0	0	0	0	0	0	0	0	401
North Myrtle Headwaters	68	4	21	1	574	30	141	7	288	15	780	41	0	0	0	0	0	0	11	1	1,883
Riser Creek	0	0	0	0	3	0	0	0	626	81	114	15	8	1	0	0	0	0	23	3	774
Upper Slide Creek	0	0	0	0	22	13	42	25	95	57	8	5	0	0	0	0	0	0	0	0	167
Upper North Myrtle Subwatershed	785	8	112	1	754	8	549	6	3,689	38	3,647	37	217	2	39	0	0	0	34	0	9,826

Table 11. 2001 Non-BLM Administered Land Age Class Distribution in the Myrtle Creek WAU.

Area	Number of Acres by Age Class and Percent of Total																				
	Nonforest		0 to 10		10 to 20		20 to 30		30 to 50		50 to 80		80 to 120		120 to 200		200 +		Hardwoods		Total
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	
Ben Branch	13	2	0	0	0	0	9	1	10	1	617	87	59	8	0	0	0	0	0	0	708
Cedar Hollow	101	11	0	0	288	32	0	0	248	28	252	28	7	1	0	0	0	0	0	0	896
Myrtle Links	620	33	78	4	27	1	0	0	567	31	269	14	170	9	0	0	0	0	126	7	1,857
Pack Saddle	548	26	0	0	0	0	0	0	846	40	720	34	0	0	0	0	0	0	13	1	2,127
School Hollow	660	41	36	2	0	0	9	1	531	33	263	17	92	6	0	0	0	0	0	0	1,591
Short Course	1,079	46	90	4	15	1	15	1	573	24	514	22	13	1	0	0	0	0	52	2	2,351
Lower South Myrtle Subwatershed	3,021	32	204	2	330	3	33	0	2,775	29	2,635	28	341	4	0	0	0	0	191	2	9,530
Curtin Creek	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lally Creek	155	8	549	29	56	3	16	1	912	48	183	10	6	0	0	0	12	1	14	1	1,903
Letitia Creek	683	24	158	6	204	7	0	0	535	19	1,256	44	0	0	0	0	0	0	0	0	2,836
Lower Louis Creek	287	20	0	0	0	0	146	10	358	25	618	43	14	1	0	0	0	0	0	0	1,423
South Myrtle Headwaters	11	4	0	0	12	4	0	0	110	40	0	0	58	21	52	19	29	11	0	0	272
Upper Louis Creek	49	4	0	0	71	6	291	24	428	36	352	29	0	0	0	0	0	0	7	1	1,198
Weaver Creek	84	10	64	8	0	0	0	0	425	50	271	32	0	0	0	0	0	0	0	0	844
Wiley Creek	405	20	205	10	37	2	166	8	415	21	727	37	0	0	30	2	0	0	0	0	1,985
Upper South Myrtle Subwatershed	1,674	16	976	9	380	4	619	6	3,183	30	3,407	33	78	1	82	1	41	0	21	0	10,461
Myrtle Creek WAU	10,854	24	1,460	3	2,966	7	1,490	3	12,887	28	12,553	28	1,146	3	239	1	41	0	1,618	4	45,254

Map 13. Myrtle Creek Watershed Analysis Unit
2001 Non-BLM Age Class Distribution



C. Interpretation

Fire, land conversion, fire suppression, and timber harvesting have had the greatest impacts on vegetation conditions in the WAU. Land conversion occurred in the lower elevations of the WAU. Native prairies and savannah were converted to residential, agricultural, and grazing uses.

The Lower North Myrtle and Lower South Myrtle Subwatersheds had experienced vegetation type changes between 1850 and 1936. Changes in vegetation between 1850 and 1930 probably followed the same documented processes as in the Willamette Valley (Franklin and Dyrness 1973). By the 1930s, the native prairies and much of the savannah/open woodland in the Myrtle Creek WAU would have been converted to agricultural uses or grazing pastures. Closed forest conditions would have replaced the remaining open woodland areas where fire had been excluded in the Lower North Myrtle and Lower South Myrtle Subwatersheds. Annual pasture burning maintained grassy areas, although native species would have been replaced by exotic species. Fewer human caused effects would have occurred before 1936 in the Upper North Myrtle and Upper South Myrtle Subwatersheds, since these areas were less desirable for agriculture based settlement and timber harvesting had not yet commenced. However, fire suppression may have influenced vegetation composition and structure, despite poor access for suppression activities in the eastern part of the WAU.

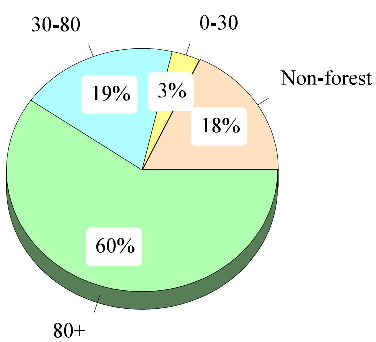
Fire suppression resulted in open woodlands developing into closed forest stands, both hardwood and conifer stands. Fire suppression allowed shade tolerant but fire intolerant understories of grand/white fir and western hemlock to develop in late-seral stands. The late-seral stands probably have different densities and species compositions than before fire suppression. Fire suppression has also lengthened the natural fire cycle of the mixed-conifer forests in the WAU, resulting in changes to both the vertical and horizontal structure of the forest. In late-successional stands where timber harvesting or salvaging has not occurred, coarse woody debris levels are most likely above the range of natural variability (Kaufmann 1990).

Human activities have changed the amount and size of seral stage areas, as well as forest stand structure. Timber harvesting has decreased the amount of late-seral forests and increased the amount of early-seral forests (see Chart 5 and Tables 12 and 13). Comparing 1954 and 1984 type maps, produced by the BLM, indicates larger early-seral vegetation patch sizes were created by timber harvesting. Timber harvesting often removed riparian vegetation, which decreased stream shading and structures (large woody debris).

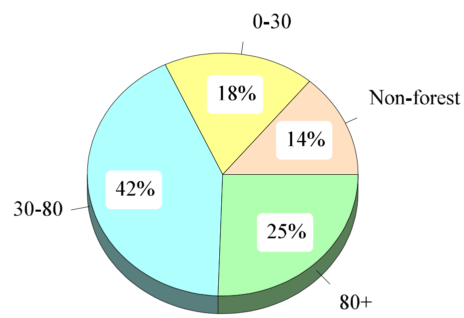
Vegetation conditions would probably not reach the historic range of natural variability in the Lower North Myrtle and Lower South Myrtle Subwatersheds because of the ownership pattern, fire suppression, and the land uses. Vegetation conditions may move closer to the historic range of natural variability in the Upper North Myrtle and Upper South Myrtle Subwatersheds where more Federally-administered land occurs because of the changes in timber harvesting practices, such as retaining structural components, longer rotation lengths, and a reduction in harvest unit sizes.

Chart 5. Myrtle Creek Watershed Analysis Unit

Comparison of Forest Age Class Groups Between 1936 and 2001



1936



2001

Table 12. Comparison of 1936 Cover Type with 2001 Age Classes in the Myrtle Creek WAU.

Approximate Seral Stage	1936 Cover Type			2001 Age Class		
		Acres	Percent		Acres	Percent
Early	Burned, Cut < 1920, Less Than 6"	1,118	1	0 to 30 Years Old	13,365	18
Mid	Conifer 6-20"	13,239	17	30 to 80 Years Old	30,771	40
Late	Conifer 20-40", Greater Than 22"	47,952	63	At Least 80 Years Old	19,018	25
Hardwoods	Hardwoods	1,129	1	Hardwoods	1,618	2
Non-forest	Non-forest, Agricultural	12,828	17	Non-forest	11,466	15
Total		76,266	100		76,238	100

Table 13. Comparison of 1936 Cover Type with 2001 Age Classes on BLM Administered Land in the Myrtle Creek WAU.

Approximate Seral Stage	1936 Cover Type			2001 Age Class		
		Acres	Percent		Acres	Percent
Early	Burned, Cut < 1920, Less Than 6"	980	3	0 to 30 Years Old	7,449	24
Mid	Conifer 6-20"	4,710	15	30 to 80 Years Old	5,331	17
Late	Conifer 20-40", Greater Than 22"	24,372	79	At Least 80 Years Old	17,592	57
Hardwoods	Hardwoods	40	0	Hardwoods	Not Determined	0
Non-forest	Non-forest, Agricultural	906	3	Non-forest	612	2
Total		31,008	100		30,984	100

Figure 4 shows the difference between more recently and previously harvested stands. Retaining live trees and snags partially mimics the disturbance effects of the moderate-severity fire regime, which most of the BLM-administered land in the WAU would be considered to have. These stands

Figure 4. Recent Regeneration Harvest Units With Retention Trees and Previous Units Without Retention Trees.

would develop late-successional vegetation conditions more rapidly than clearcut harvested stands (Swanson and Franklin 1991 and Franklin et al. 1997). Riparian Reserves and aggregated retention blocks shown in Figure 5 would also decrease the average patch size, moving it closer to the natural range of variability.

At least 50 percent of the BLM-administered land in the WAU would be maintained in late-successional vegetation conditions, because approximately 15,487 acres (50 percent) of BLM-administered lands are in Riparian Reserves and other areas reserved or withdrawn from timber harvesting (see Table 14). The range of natural variability for late-successional forest (45 to 75 percent) would be maintained on BLM-administered land.

Table 14. Acres of BLM Administered Land by Land Use Allocation.

	Reserved or Withdrawn		Connectivity/Diversity Block		GFMA		
Area	Acres	Percent	Acres	Percent	Acres	Percent	Total Acres
Bilger Creek	1,003	70	159	11	269	19	1,431
Frozen Creek	602	64	101	11	243	26	946
Lick Frontal	179	36	78	16	240	48	497
Myrtle Creek	236	75	79	25	0	0	315
North Myrtle Park	282	74	97	25	3	1	382
Lower North Myrtle Subwatershed	2,302	64	514	14	755	21	3,571
Buck Fork	408	45	190	21	299	33	897
Lee Creek	895	49	574	31	360	20	1,829
Lower Slide Creek	512	54	0	0	440	46	952
Middle North Myrtle	158	38	16	4	246	59	420
North Myrtle Frontal	140	100	0	0	0	0	140
North Myrtle Headwaters	1,184	53	472	21	563	25	2,219
Riser Creek	590	48	227	18	421	34	1,238
Upper Slide Creek	487	50	218	22	277	28	982
Upper North Myrtle Subwatershed	4,374	50	1,697	20	2,606	30	8,677

Table 14. Acres of BLM Administered Land by Land Use Allocation.

	Reserved or Withdrawn		Connectivity/Diversity Block		GFMA		
Area	Acres	Percent	Acres	Percent	Acres	Percent	Total Acres
Ben Branch	275	61	13	3	161	36	449
Cedar Hollow	54	26	7	3	146	71	207
Myrtle Links	238	45	8	2	280	53	526
Pack Saddle	228	46	216	43	53	11	497
School Hollow	252	43	203	35	133	23	588
Short Course	97	31	84	27	128	41	309
Lower South Myrtle Subwatershed	1,144	44	531	21	901	35	2,576
Curtin Creek	840	46	321	18	668	37	1,829
Lally Creek	935	42	288	13	997	45	2,220
Letitia Creek	803	50	156	10	659	41	1,618
Lower Louis Creek	304	49	0	0	319	51	623
South Myrtle Headwaters	1,587	51	197	6	1,302	42	3,086
Upper Louis Creek	977	41	51	2	1,333	56	2,361
Weaver Creek	1,677	54	386	12	1,055	34	3,118
Wiley Creek	544	42	364	28	391	30	1,299
Upper South Myrtle Subwatershed	7,667	47	1,763	11	6,724	42	16,154
Myrtle Creek WAU	15,487	50	4,505	15	10,986	35	30,978

Management direction from the Northwest Forest Plan and 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. Approximately 57 percent (17,592 acres out of 31,131 acres) of the Federally-administered land in the Myrtle Creek Watershed (the fifth field watershed) is in forest stands at least 80 years old (late-successional) (see Table 8). The Myrtle Creek Watershed meets the management direction to retain 15 percent of all Federal lands within fifth field watersheds in late-successional forest stands. Approximately 28 percent (8,673 acres out of 31,131 acres) of the Federally administered land in the Myrtle Creek Watershed is in late-successional forest stands and in reserved or withdrawn areas (see Table 15). Maintaining about 4,670 acres of late-successional forest stands on Federally-administered land in the Myrtle Creek Watershed would meet the management direction to retain 15 percent of all Federal lands within fifth field watersheds in late-successional forest stands.

Figure 5. Riparian Reserves and Aggregated Structural Retention Areas (Adapted From Creating a Forestry for the 21st Century 1997).

Table 15. Age Class Distribution in Reserved or Withdrawn Areas on BLM Administered Land Within the Myrtle Creek WAU.

Area	Number of Acres by Age Class and Percent of Total																		
	Nonforest		0 to 10		10 to 20		20 to 30		30 to 50		50 to 80		80 to 120		120 to 200		200 +		Total
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	
Bilger Creek	152	15	105	10	43	4	37	4	142	14	7	1	228	23	254	25	35	3	1,003
Frozen Creek	82	14	26	4	13	2	0	0	1	0	2	0	42	7	257	43	179	30	602
Lick Frontal	14	8	0	0	13	7	13	7	0	0	11	6	56	31	72	40	0	0	179
Myrtle Creek	125	53	0	0	0	0	0	0	0	0	5	2	74	31	15	6	17	7	236
North Myrtle Park	26	9	39	14	0	0	27	10	2	1	7	2	4	1	7	2	170	60	282
Lower North Myrtle Subwatershed	399	17	170	7	69	3	77	3	145	6	32	1	404	18	605	26	401	17	2,302
Buck Fork	0	0	11	3	104	25	56	14	175	43	0	0	0	0	23	6	39	10	408
Lee Creek	21	2	79	9	91	10	121	14	131	15	8	1	66	7	36	4	342	38	895
Lower Slide Creek	0	0	39	8	9	2	61	12	160	31	103	20	3	1	73	14	64	13	512
Middle North Myrtle	0	0	25	16	36	23	0	0	8	5	26	16	1	1	0	0	62	39	158
North Myrtle Frontal	3	2	0	0	0	0	0	0	21	15	0	0	0	0	0	0	116	83	140
North Myrtle Headwaters	15	1	20	2	295	25	0	0	158	13	2	0	56	5	13	1	625	53	1,184
Riser Creek	0	0	62	11	75	13	78	13	83	14	0	0	1	0	4	1	287	49	590
Upper Slide Creek	0	0	0	0	133	27	67	14	50	10	0	0	0	0	7	1	230	47	487
Upper North Myrtle Subwatershed	39	1	236	5	743	17	383	9	786	18	139	3	127	3	156	4	1,765	40	4,374

Table 15. Age Class Distribution in Reserved or Withdrawn Areas on BLM Administered Land Within the Myrtle Creek WAU.

Area	Number of Acres by Age Class and Percent of Total																		
	Nonforest		0 to 10		10 to 20		20 to 30		30 to 50		50 to 80		80 to 120		120 to 200		200 +		Total
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	
Ben Branch	0	0	13	5	48	17	43	16	26	9	1	0	26	9	42	15	76	28	275
Cedar Hollow	0	0	0	0	0	0	0	0	0	0	1	2	48	89	5	9	0	0	54
Myrtle Links	19	8	0	0	30	13	0	0	44	18	0	0	81	34	0	0	64	27	238
Pack Saddle	23	10	17	7	2	1	0	0	3	1	37	16	22	10	12	5	112	49	228
School Hollow	1	0	17	7	31	12	34	13	0	0	17	7	13	5	72	29	67	27	252
Short Course	0	0	23	24	0	0	0	0	0	0	14	14	18	19	42	43	0	0	97
Lower South Myrtle Subwatershed	43	4	70	6	111	10	77	7	73	6	70	6	208	18	173	15	319	28	1,144
Curtin Creek	0	0	16	2	28	3	68	8	24	3	27	3	72	9	107	13	498	59	840
Lally Creek	0	0	91	10	73	8	136	15	139	15	36	4	27	3	82	9	351	38	935
Letitia Creek	0	0	0	0	44	5	12	1	203	25	34	4	0	0	125	16	385	48	803
Lower Louis Creek	0	0	29	10	35	12	2	1	47	15	21	7	28	9	3	1	139	46	304
South Myrtle Headwaters	98	6	0	0	10	1	33	2	34	2	345	22	90	6	696	44	281	18	1,587
Upper Louis Creek	2	0	46	5	140	14	170	17	116	12	0	0	14	1	86	9	403	41	977
Weaver Creek	22	1	140	8	82	5	153	9	154	9	344	21	96	6	5	0	681	41	1,677
Wiley Creek	0	0	4	1	83	15	19	3	16	3	76	14	4	1	38	7	304	56	544
Upper South Myrtle Subwatershed	122	2	326	4	495	6	593	8	733	10	883	12	331	4	1,142	15	3,042	40	7,667
Myrtle Creek WAU	603	4	802	5	1,418	9	1,130	7	1,737	11	1,124	7	1,070	7	2,076	13	5,527	36	15,487

Matrix lands in the Myrtle Creek WAU are to be managed for timber production to help meet the Probable Sale Quantity (PSQ) established in the Roseburg BLM District RMP. If all of the Matrix lands greater than 80 years old were to be harvested about 29 percent (8,919 acres) of the BLM-administered land would be affected. Table 16 and Map 14 show what the age class distribution would be based on a timber harvesting plan through the year 2024. The timber harvesting plan went through a rigorous process to identify suitable locations while evaluating impacts to wildlife, fisheries, and hydrology resources. The process attempted to adjust the scale, timing, and spacing of timber harvesting to minimize the effects on other resources. The planning process is described in more detail in Appendix I. The results of the process are shown on Map I-1. Table 17 compares the 2000 and 2025 age class distribution based on the same timber harvesting plan. The timber harvesting plan would maintain about 57 percent of the BLM-administered land in the WAU in late-successional forest in 2025.

Some portion of 19 Connectivity/Diversity Blocks occur in the Myrtle Creek WAU. All of the Connectivity/Diversity Blocks contain more than 30 percent in late-successional forests (see Table 18). These 19 Connectivity/Diversity Blocks meet the Standard and Guideline to maintain at least 25 percent of each Connectivity/Diversity Block in late-successional forests. Nine Connectivity/Diversity Blocks have at least 25 percent that are in reserved areas and late-successional forests.

Table 16. Potential 2025 BLM Age Class Distribution.

	Number of Acres by Age Class and Percent of Total										
Area	Nonforest	%	0 to 30	%	30 to 60	%	60 to 80	%	At least 80 Years Old	%	Total
Bilger Creek	153	11	391	27	198	14	0	0	689	48	1,431
Frozen Creek	85	9	165	17	10	1	4	0	681	72	945
Lick Frontal	14	3	102	21	0	0	25	5	356	72	497
Myrtle Creek	125	40	0	0	5	2	0	0	186	59	316
North Myrtle Park	26	7	146	38	5	1	7	2	199	52	383
Lower North Myrtle Subwatershed	403	11	804	23	218	6	36	1	2,111	59	3,572

Table 16. Potential 2025 BLM Age Class Distribution.

	Number of Acres by Age Class and Percent of Total										
Area	Nonforest	%	0 to 30	%	30 to 60	%	60 to 80	%	At least 80 Years Old	%	Total
Buck Fork	0	0	364	41	307	34	8	1	219	24	898
Lee Creek	21	1	595	32	229	13	5	0	981	54	1,831
Lower Slide Creek	0	0	267	28	288	30	144	15	253	27	952
Middle North Myrtle	0	0	197	47	67	16	7	2	148	35	419
North Myrtle Frontal	3	2	0	0	21	15	0	0	116	83	140
North Myrtle Headwaters	16	1	682	31	233	11	3	0	1,284	58	2,218
Riser Creek	0	0	430	35	141	11	0	0	667	54	1,238
Upper Slide Creek	0	0	384	39	64	7	0	0	535	54	983
Upper North Myrtle Subwatershed	40	0	2,919	34	1,350	16	167	2	4,203	48	8,679
Ben Branch	0	0	224	50	38	8	3	1	185	41	450
Cedar Hollow	0	0	0	0	1	0	3	1	203	98	207
Myrtle Links	19	4	67	13	112	21	0	0	327	62	525
Pack Saddle	23	5	96	19	16	3	52	10	310	62	497
School Hollow	1	0	191	32	0	0	22	4	375	64	589
Short Course	0	0	51	16	20	6	9	3	230	74	310
Lower South Myrtle Subwatershed	43	2	629	24	187	7	89	3	1,630	63	2,578

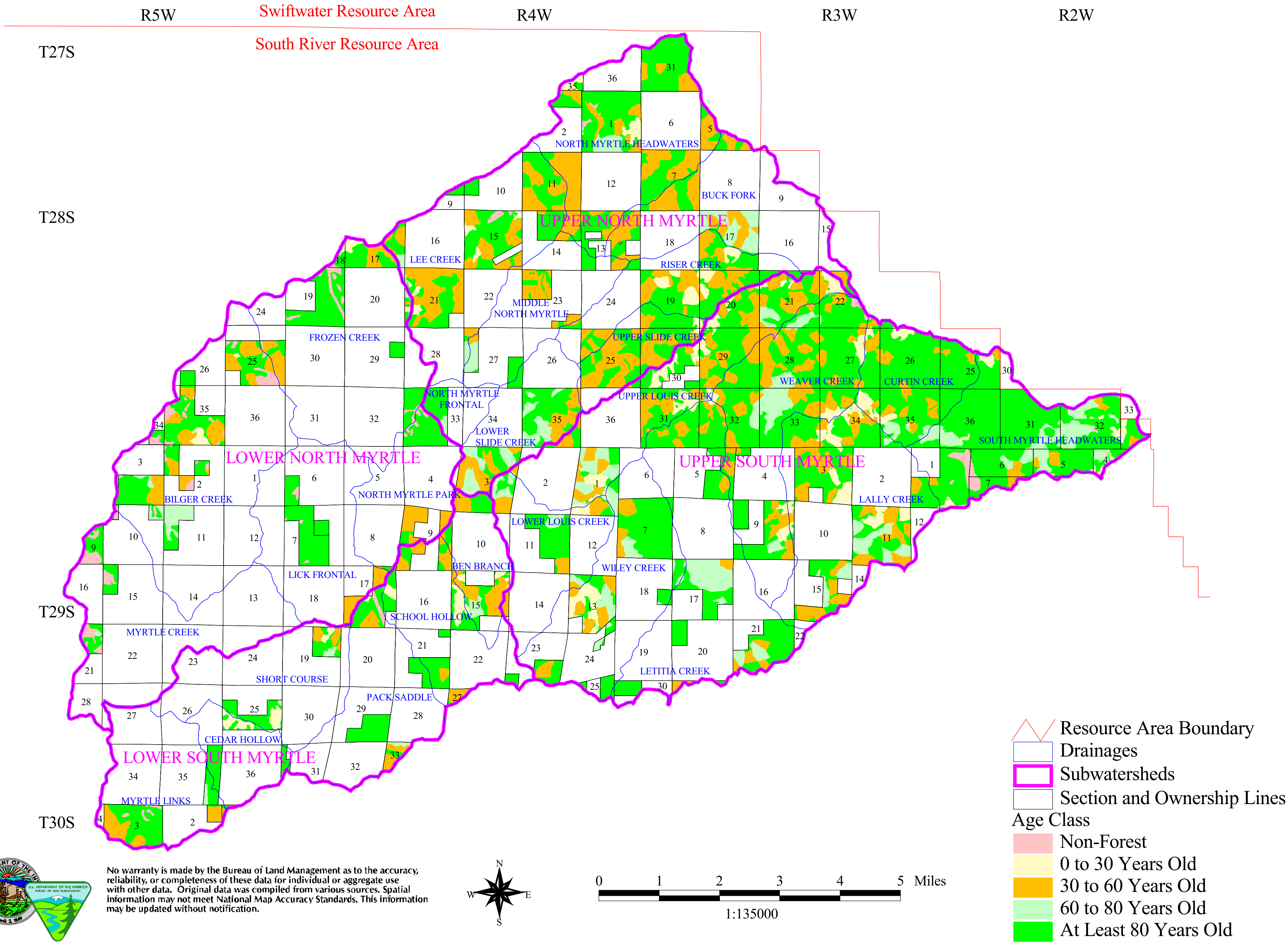
Table 16. Potential 2025 BLM Age Class Distribution.

	Number of Acres by Age Class and Percent of Total										
Area	Nonforest	%	0 to 30	%	30 to 60	%	60 to 80	%	At least 80 Years Old	%	Total
Curtin Creek	2	0	231	13	96	5	2	0	1,498	82	1,829
Lally Creek	0	0	723	33	257	12	43	2	1,196	54	2,219
Letitia Creek	0	0	177	11	359	22	106	7	976	60	1,618
Lower Louis Creek	0	0	173	28	112	18	34	5	305	49	624
South Myrtle Headwaters	99	3	109	4	484	16	322	10	2,071	67	3,085
Upper Louis Creek	2	0	706	30	343	15	3	0	1,306	55	2,360
Weaver Creek	22	1	764	25	404	13	418	13	1,508	48	3,116
Wiley Creek	0	0	245	19	189	15	76	6	787	61	1,297
Upper South Myrtle Subwatershed	125	1	3,128	19	2,244	14	1,004	6	9,647	60	16,148
Myrtle Creek WAU	611	2	7,480	24	3,999	13	1,296	4	17,591	57	30,977

Table 17. Comparison of Age Class Distributions on BLM Administered Land in the Myrtle Creek WAU Between 2001 and 2025 (based on a timber harvesting plan through 2024).

Age Classes	2001		2025	
	Acres	Percent	Acres	Percent
0 to 30 Years Old	7,449	24	7,480	24
30 to 80 Years Old	5,331	17	5,295	17
At Least 80 Years Old	17,592	57	17,591	57
Nonforest	612	2	611	2

Map 14. Myrtle Creek Watershed Analysis Unit
Potential BLM Age Class Distribution in 2025



No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data was compiled from various sources. Spatial information may not meet National Map Accuracy Standards. This information may be updated without notification.

Table 18. Acres of Late Successional Stands in Connectivity/Diversity Blocks in the Myrtle Creek WAU.

Connectivity/Diversity Block	Total Acres in Block	Amount of Reserved or Withdrawn Areas 80 Years Old or Older		Total Area 80 Years Old or Older	
		Acres	Percent	Acres	Percent
Block 11	1,170	502	43	828	71
Block 12	883	114	13	360	41
Block 13	1,464	464	32	730	50
Block 14	373	43	12	245	66
Block 15	839	172	21	357	43
Block 16	986	428	43	758	77
Block 17	528	178	34	383	73
Block 18	195	20	10	67	34
Block 19	626	63	10	199	32
Block 20	581	90	15	245	42
Block 21	618	133	22	261	42
Block 22	633	158	25	277	44
Block 23	638	195	31	303	47
Block 24	612	271	44	577	94
Block 25	581	196	34	372	64
Block 26	611	135	22	249	41
Block 27	642	106	17	239	37
Block 36	648	147	23	322	50
Block 37	600	171	28	322	54

V. Geology, Soils, and Erosion Processes

A. Geology

Soils in the Myrtle Creek WAU have developed dominantly from granitic and sedimentary rocks. Geology of the WAU is shown on Map 15. The following unit descriptions are from the Geologic Map of Oregon by George W. Walker and Norman S. MacLeod (1991).

Ju

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 complexes.

Jv

Volcanic rocks (Jurassic) - Lava flows, flow breccia, and agglomerate dominantly of plagioclase, pyroxene, and hornblende porphyritic and aphyric andesite. Includes flow rocks that range in composition from basalt to rhyolite as well as some interlayered tuff and tuffaceous sedimentary rocks. Commonly metamorphosed to greenschist facies; locally foliated, schistose or gneissic.

KJds

Dothan Formation and related rocks (Lower Cretaceous and Upper Jurassic) - Sedimentary rocks - Sandstone, conglomerate, graywacke, rhythmically banded chert lenses.

KJg

Granitic rocks (Cretaceous and Jurassic) - Mostly tonalite and quartz diorite but including lesser amounts of other granitoid rocks.

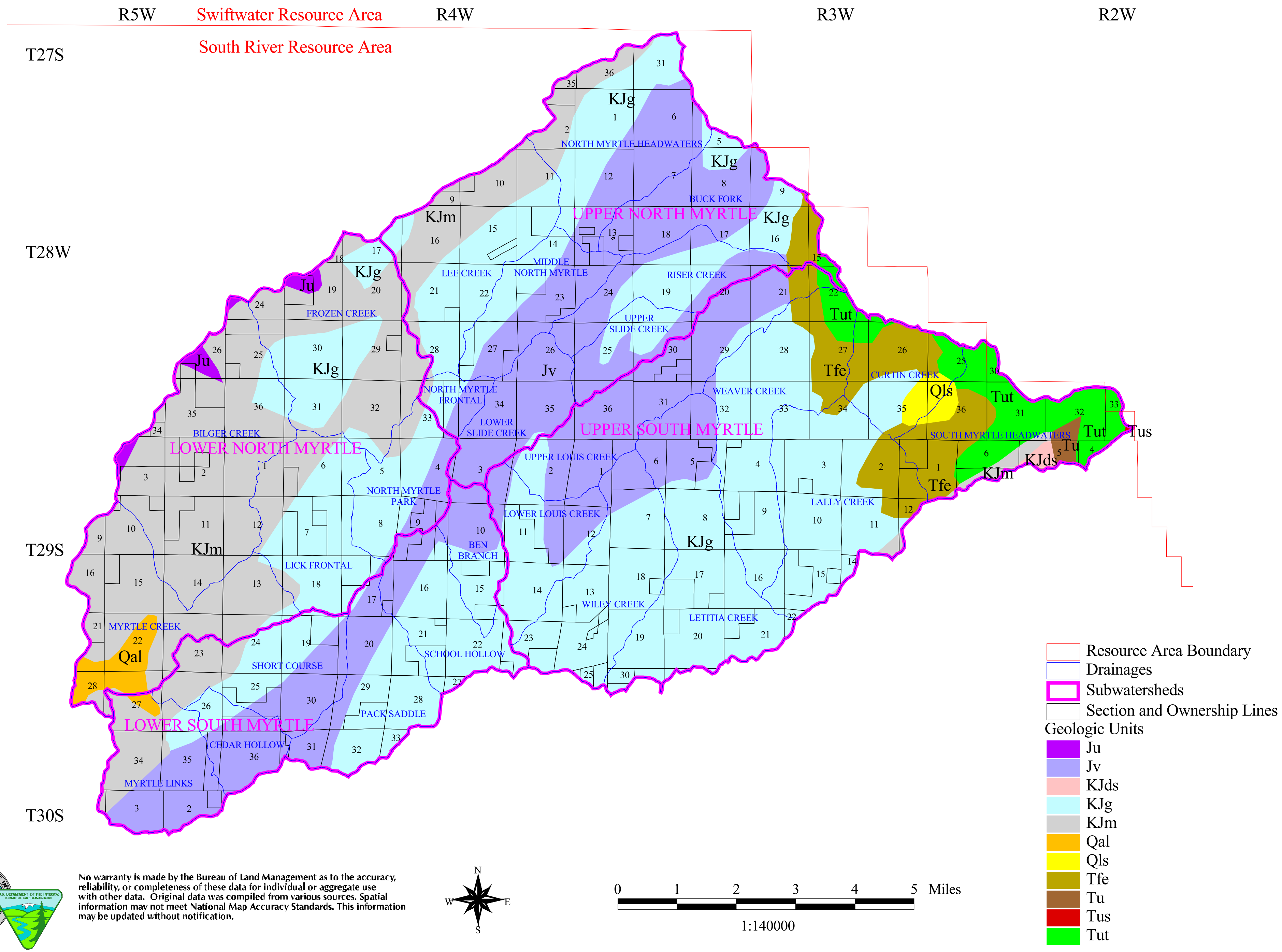
KJm

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

Qal

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.

Map 15. Myrtle Creek Watershed Analysis Unit
Geology



No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data was compiled from various sources. Spatial information may not meet National Map Accuracy Standards. This information may be updated without notification.

Qls

Landslide and debris-flow deposits (Holocene and Pleistocene) - Unstratified mixtures of fragments of adjacent bedrock. Locally includes slope wash and colluvium.

Tfe

Fisher and Eugene Formations and correlative rocks (Oligocene and upper Eocene) - Thin to moderately thick bedded, coarse- to fine-grained arkosic and micaceous sandstone and siltstone, locally highly pumiceous.

Tu

Undifferentiated tuffaceous sedimentary rocks, tuffs, and basalt (Miocene and Oligocene) - Heterogeneous assemblage of continental, largely volcanogenic deposits of basalt and basaltic andesite, including flows and breccia, complexly interstratified with epiclastic and volcaniclastic deposits of basaltic to rhyodacitic composition.

Tus

Sedimentary and volcaniclastic rocks - Lapilli tuff, mudflow deposits (lahars), flow breccia, and volcanic conglomerate, mostly of basaltic to dacitic composition; rare iron-stained palagonitic tuff and breccia of basaltic and andesitic composition; and ash-flow, air-fall, and water-laid tuff of dacitic to rhyolitic composition. The palagonite tuff and breccia grade laterally into peperite and into lava flows of basalt and basaltic andesite.

Tut

Tuff - Welded to unwelded, mostly vitric crystal and vitric ash-flow tuff of several ages. Glass in tuff locally altered to clay, zeolites, and secondary silica minerals.

B. Soils

Historic and Current Conditions

The main sources of information for the soils section are the National Cooperative Soil Survey (NCSS) of Douglas County, conducted by the Natural Resources Conservation Service (NRCS), and the Timber Production Capability Classification (TPCC) conducted by the Bureau of Land Management. Interpretations for most of the chemical and physical soil characteristics are included in the NCSS. Tables and maps built from NCSS data include information on private and BLM-administered lands. Tables and maps built from TPCC data include information only on BLM-administered lands.

Soils in the Myrtle Creek WAU have developed dominantly from granitic and sedimentary parent materials mostly in the Klamath Mountains Geomorphic Province. The Klamath Mountains Geomorphic Province is an area of complex geology and rugged topography. The Cascade Geomorphic Province makes up the rest of the WAU.

Soils are influenced by five soil forming factors consisting of climate (hot, cold, wet, dry), geologic parent material (the rocks and minerals which soil is made from), topography (aspect, slope, elevation, and landforms), biological (vegetation and animals), and time (interaction of the four previous properties to develop soil types). Human influence could be considered the sixth soil forming factor. Management actions can affect soil depth, structure, organic matter content, texture, pH, infiltration, permeability, and drainage properties. These soil properties can be improved or degraded depending on the type and degree of management.

Human influences began in the Myrtle Creek WAU before the 1700s. Native American Indians used fire to burn grass in the valleys and lower hill sides. They also set many small fires in portions of the upland forests (Boyd 1899). Cooler burning fires usually affect the soil less than fires that burn under hot, dry, and windy conditions. Fires may burn organic matter, destroy the soil food web complexity contained in the upper soil layers, and remove the protective vegetative cover.

European-Americans began settling in the WAU around 1850. They were in search of gold and land for farming. Placer mining in the 1890s extracted gold from gravel terrace deposits. Ditches were constructed to supply water to hydraulic hoses that would wash the soil and gold bearing gravels into sluice boxes. Scars are still visible from this type of mining due to a lack of top soil, organic matter, and nutrient base.

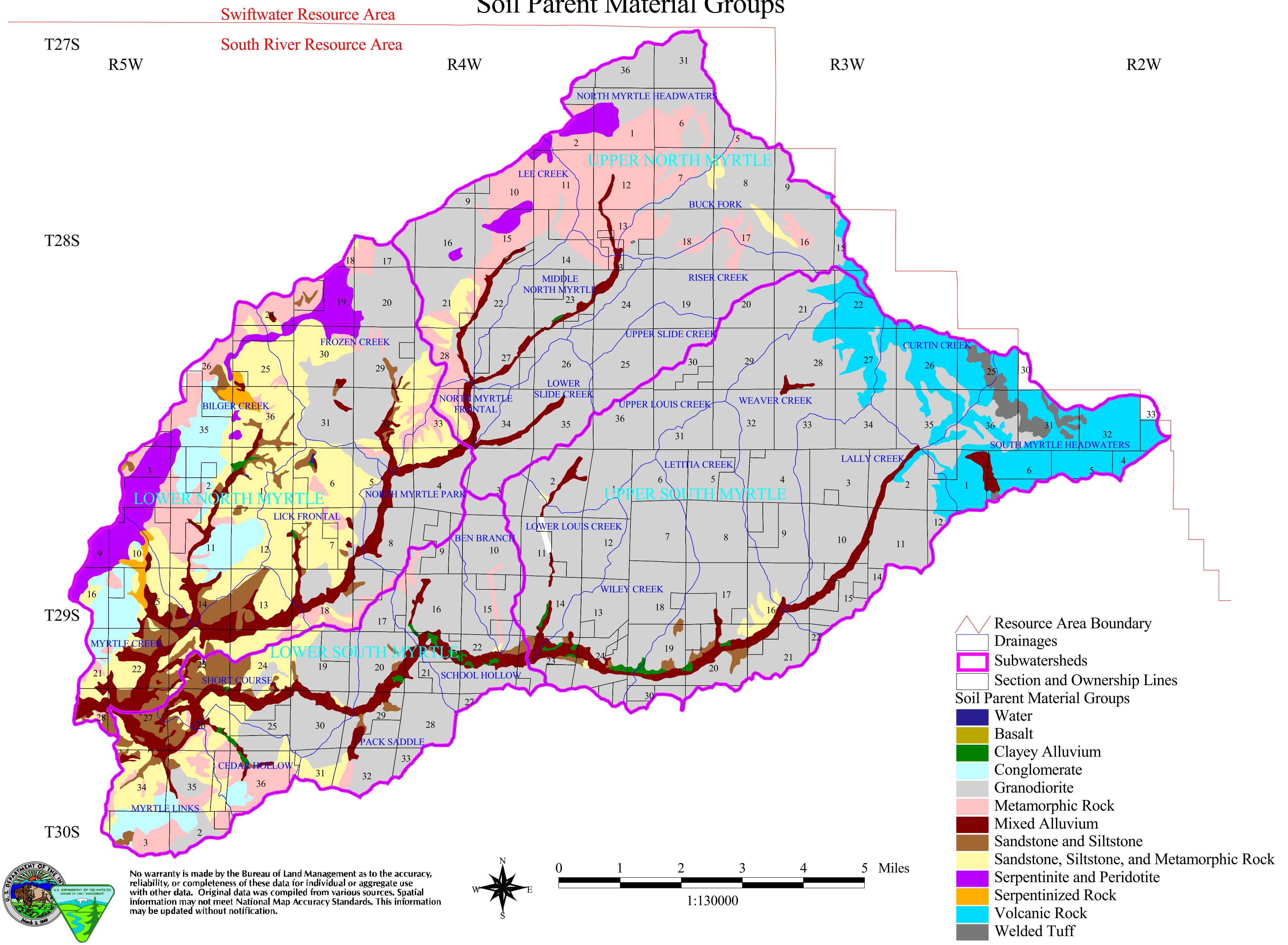
Grain and fruit crops were important until the 1930s, then sheep and cattle grazing became more prominent. Intensive agricultural practices and overgrazing removed vegetation from hillsides and along creeks and streams, increasing surface erosion and runoff.

Extensive timber harvesting in the WAU began during the 1950s. Roads were constructed to transport logs to the lumber mills. Ground based timber harvesting (pulling logs along the ground behind horses, oxen, or tractors) is generally the most economical way to transport trees to the road. Soil compaction and displacement can occur with this type of harvesting. Ground based harvesting generally occurs on slopes less than 45 percent. A little more than half of the Myrtle Creek WAU has slopes less than 45 percent. Improvements in logging system technology has generally reduced the soil impacts.

a. General Soil Groups as Defined by Parent Material

The NCSS of Douglas County was used to group soils by parent material type (see Map 16 and Table A-1 in Appendix A). The information presented here and in Appendix A is based on weighted averages of the soil types. The information is meant to be a general description of the soil and used to characterize the soil type. The main soil parent material types in the WAU are the granitic;

Map 16. Myrtle Creek Watershed Analysis Unit
Soil Parent Material Groups



sandstone, siltstone, and metamorphic rock; and metamorphic rock groups. These three groups cover about 79 percent of the WAU. Volcanic soils make up about six percent of the WAU. Serpentine soils cover about three percent of the WAU.

(1) Basalt

Basalt parent materials cover less than one percent of the WAU. They occur along the northwest boundary on foot slopes and ridges of the WAU. The average depth to bedrock is 24 inches. These soils are well drained with an average subsoil clay content of 50 percent. The shrink-swell potential is high. Permeability is slow resulting in high surface runoff potential.

(2) Clayey Alluvium

The clayey alluvium parent materials cover less than one percent of the WAU. They are found on low terraces mainly along South Myrtle Creek. Soil depths average greater than 60 inches to bedrock. Clayey alluvium soils are poorly drained with an average subsoil clay content of 46 percent. These soils are hydric (wet). Permeability is slow resulting in high surface runoff potential.

(3) Mixed Alluvium

Mixed alluvium parent materials cover about six percent of the WAU. They occur mostly on low and high floodplains, low terraces and alluvial fans. Soils depths average greater than 60 inches to bedrock. These soils are somewhat poorly to excessively drained with an average subsoil clay content of 27 percent. Soil permeability is slow to very rapid and the surface runoff potential is moderate. The majority of prime farmland (areas capable of producing sustained high yield crops) is found in these soils.

(4) Conglomerate

Conglomerate parent materials cover about three percent of the WAU. These soils are located on side slopes. Soil depths average 27 inches to bedrock. Conglomerate soils are well drained with an average subsoil clay content of 18 percent. High rock fragment content can occur on the surface and in the subsoil. Soil permeability is moderately rapid and the surface runoff potential is low.

(5) Granodiorite

Granodiorite parent materials cover about 58 percent of the WAU. They occur on side and foot slopes and ridges in the WAU. Soil depths average 55 inches to bedrock. These soils are well drained with an average subsoil clay content of 30 percent. Soil permeability is moderate and the surface runoff potential is moderately high. Soil erodibility is high.

(6) Metamorphic Rock

Metamorphic rock parent materials cover about ten percent of the WAU. They occur on side slopes in the WAU. Soil depths average 39 inches to bedrock. These soils are well drained with an average subsoil clay content of 30 percent. Soil permeability is moderate and the surface runoff potential is moderate.

(7) Sandstone and Siltstone

Sandstone and siltstone parent materials cover about three percent of the WAU. They occur on side slopes, alluvial fans, and toe slopes in the WAU. Soil depths average 45 inches to bedrock. These soils are well drained with an average subsoil clay content of 43 percent. Soil permeability is moderate and the surface runoff potential is moderate to moderately high. Soil erodibility is high.

(8) Sandstone, Siltstone, and Metamorphic Rock

Sandstone, siltstone, and metamorphic rock parent materials cover about eleven percent of the WAU. They occur on hill slopes mainly in the western portion of the WAU. Soil depths average 44 inches to bedrock. These soils are well drained with an average subsoil clay content of 32 percent. Soil permeability is moderate and the surface runoff potential is moderate.

(9) Serpentinite and Peridotite

Serpentinite and Peridotite parent materials cover about three percent of the WAU. They occur on side slopes and ridges in the WAU. Soil depths average 28 inches to bedrock. These soils are well drained with an average subsoil clay content of 44 percent. Soil permeability is slow and the surface runoff potential is high.

(10) Serpentinized Rock

Serpentinized rock covers less than one percent of the WAU. They occur on alluvial fans in the WAU. Soil depths average 59 inches to bedrock. These soils are moderately well drained with an average subsoil clay content of 50 percent. Soil permeability is very slow and the surface runoff potential is moderate.

(11) Volcanic Rock

Volcanic rock parent materials cover about six percent of the WAU. They occur on ridges and side slopes mainly in the eastern portion of the WAU and above 2,000 feet in elevation. Soil depths average 54 inches to bedrock. These soils are well drained with an average subsoil clay content of 36 percent. Soil permeability is moderate and the surface runoff potential is moderate.

(12) Welded Tuff

Welded tuff parent materials cover less than one percent of the WAU. They occur on south facing side slopes and headwalls. These soils average 21 inches to bedrock. High rock fragment content can occur on the surface and in the subsoil. Welded tuff soils are well drained with an average subsoil clay content of 13 percent. Permeability is moderate and surface runoff potential is moderate.

b. National Cooperative Soil Survey (NCSS) Information

The main soils related concerns for planning and analysis are the prime farmland, conglomerate, floodplain, granitic, somewhat poorly drained, hydric, and serpentine soil groups (see Table 19 and Map 17).

(1) Prime Farmland Soils

Prime farmland has the combination of soil properties, low slope gradient, growing season, and moisture supply to produce sustained high crop yields. The Farmland Protection Policy Act, published in the Federal Register, Vol. 43, No. 21, January 31, 1978, directs federal agencies to identify and take into account the adverse effects of federal programs on the preservation of prime farmland.

(2) Conglomerate Soils

Conglomerate soils tend to weather rapidly and unevenly when exposed. Slope stability is difficult to predict because of parent material and cementing agent variability. Dry ravel erosion may occur on steep slopes producing high coarse fragment content on the surface and in the soil. Droughtiness, seedling mortality, road maintenance needs, and sediment potential increase as dry ravel increases.

(3) Floodplain Soils

Floodplain management objectives on BLM-administered lands include reducing the risk of flood loss or damage to property, minimizing the impact of flood loss on human safety, health, and welfare, and restoring, maintaining, and preserving the natural and beneficial functions of floodplains. These objectives originate from Executive Order 11988, Floodplain Management, Section 1, May 24, 1977.

(4) Granitic Soils

Granitic soils are highly susceptible to surface erosion and shallow slope failure. They have low organic carbon reserves and are not very resilient. Resiliency is the ability of a soil to recover from a disturbance, whether it is natural or human caused. Management options on these soils are reduced.

Approximately 17,972 acres of the granitic soils on BLM-administered land occur on slopes greater than 35 percent. These soils are classified as Category 1 soils, as defined in Monitoring Western Oregon Records of Decision (USDI 1988).

(5) Somewhat Poorly Drained Granitic Soils

These areas consist of granitic soils that are somewhat poorly drained. Both granitic and somewhat poorly drained soil concerns would be included in these areas. There are approximately 5,012 acres of somewhat poorly drained granitic soils on BLM-administered land and approximately 4,114 acres on private land in the WAU.

(6) Hydric Soils

Hydric soils generally have a watertable within ten inches of the soil surface for at least five 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." These areas have the greatest potential to be classified as wetlands. Hydric or wet soil areas too small for mapping (NCSS standards of less than five acres) commonly exist as minor components within areas mapped as somewhat poorly drained.

(7) Serpentine Soils

Serpentine soils may contain high amounts of magnesium, chromium, cobalt, nickel, or iron. These soils may also have low amounts of nitrogen, phosphorus, potassium, and molybdenum. Productivity of Douglas-fir is poor. However, grasses grow rapidly. Conversion from native forest vegetation to other commercial forest types is difficult. Serpentine areas are usually associated with geologic contact zones, indicating an increase in the amount of groundwater present and decreased slope stability.

(8) Somewhat Poorly Drained Soils

Somewhat poorly drained soils usually have a seasonal high water table within 18 inches of the soil surface. These soil types are frequently associated with riparian areas and areas with slope stability problems. Timber is more susceptible to windthrow on these soils.

(9) Somewhat Poorly Drained Floodplain Soils

These areas consist of somewhat poorly drained floodplain soils. Both somewhat poorly drained and floodplain soil concerns would be included in these areas. There are approximately 305 acres of somewhat poorly drained floodplain soils on private land in the WAU. Bureau of Land Management administered land in the WAU does not include any soils classified as somewhat poorly drained floodplain.

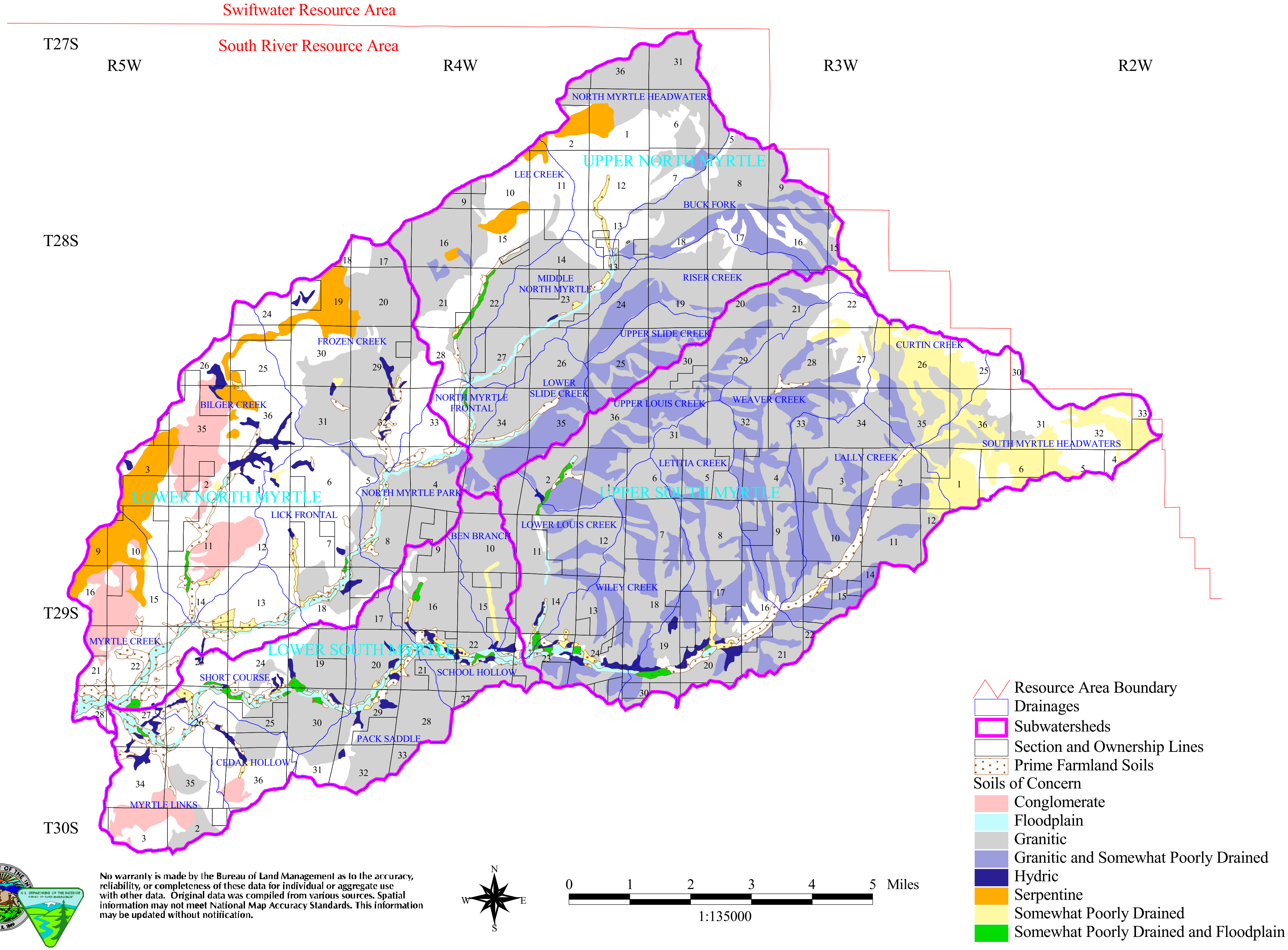
Table 19. Soil Management Concerns Within the Myrtle Creek WAU.

Drainage Name **Subwatershed Name**	Acres of Prime Farmland Soils		Acres of Conglomerate Soils		Acres of Floodplain Soils		Acres of Granitic Soils		Acres of Granitic and Somewhat Poorly Drained Soils		Acres of Hydric Soils		Acres of Serpentine Soils		Acres of Somewhat Poorly Drained Soils		Acres of Somewhat Poorly Drained and Floodplain Soils	
	BLM	Private	BLM	Private	BLM	Private	BLM	Private	BLM	Private	BLM	Private	BLM	Private	BLM	Private	BLM	Private
Bilger Creek	3	239	363	786	0	22	0	2	0	0	0	203	293	438	0	38	0	19
Frozen Creek	0	142	0	0	0	3	209	2,058	0	0	0	82	328	139	0	21	0	0
Lick Frontal	0	181	0	0	0	89	52	537	0	8	0	59	0	0	0	56	0	6
Myrtle Creek	0	723	142	442	0	306	0	0	0	0	0	7	138	392	0	97	0	18
North Myrtle Park	1	175	0	0	0	125	177	1,035	3	65	0	0	0	0	0	11	0	0
Lower North Myrtle Subwatershed	4	1,460	505	1,228	0	545	438	3,632	3	73	0	351	759	969	0	223	0	43
Buck Fork	0	5	0	0	0	4	315	1,225	239	544	0	0	0	0	36	51	0	0
Lee Creek	9	119	0	0	0	13	713	1,102	32	31	0	0	128	74	0	6	0	43
Lower Slide Creek	30	28	0	0	7	33	336	651	580	130	0	0	0	0	0	0	0	0
Middle North Myrtle	0	59	0	0	0	132	358	1,327	1	44	0	4	0	0	0	21	0	0
North Myrtle Frontal	0	50	0	0	0	34	0	211	0	0	0	0	0	0	0	0	0	7
North Myrtle Headwaters	15	38	0	0	0	4	1,072	714	53	5	0	0	139	112	15	33	0	0
Riser Creek	0	0	0	0	0	0	948	484	212	256	0	0	0	0	0	0	0	0
Upper Slide Creek	0	0	0	0	0	0	608	82	374	86	0	0	0	0	0	0	0	0
Upper North Myrtle Subwatershed	54	299	0	0	7	220	4,350	5,796	1,491	1,096	0	4	267	186	51	111	0	50
Ben Branch	0	0	0	0	0	1	429	663	0	0	0	5	0	0	22	38	0	0
Cedar Hollow	0	40	3	77	0	6	47	185	0	0	0	27	0	0	0	18	0	0
Myrtle Links	0	239	204	165	0	130	0	274	0	0	0	67	0	0	0	0	0	8
Pack Saddle	0	140	0	0	0	114	481	1,632	0	0	0	68	0	0	0	20	0	3
School Hollow	1	177	0	0	2	116	539	1,211	0	0	0	79	0	0	0	42	0	34
Short Course	0	340	0	0	0	188	275	1,010	0	0	0	58	0	0	0	29	0	63
Lower South Myrtle Subwatershed	1	936	207	242	2	555	1,771	4,975	0	0	0	304	0	0	22	147	0	108

Table 19. Soil Management Concerns Within the Myrtle Creek WAU.

Drainage Name **Subwatershed Name**	Acres of Prime Farmland Soils		Acres of Conglomerate Soils		Acres of Floodplain Soils		Acres of Granitic Soils		Acres of Granitic and Somewhat Poorly Drained Soils		Acres of Hydric Soils		Acres of Serpentine Soils		Acres of Somewhat Poorly Drained Soils		Acres of Somewhat Poorly Drained and Floodplain Soils	
	BLM	Private	BLM	Private	BLM	Private	BLM	Private	BLM	Private	BLM	Private	BLM	Private	BLM	Private	BLM	Private
Curtin Creek	0	0	0	0	0	0	590	0	178	0	0	0	0	0	816	0	0	0
Lally Creek	63	190	0	0	0	0	1,574	878	507	758	0	0	0	0	77	87	0	0
Letitia Creek	8	251	0	0	0	22	1,181	1,529	430	762	1	137	0	0	8	43	0	38
Lower Louis Creek	0	70	0	0	2	60	491	1,169	115	113	0	14	0	0	0	3	0	20
South Myrtle Headwaters	0	0	0	0	0	0	336	78	0	0	0	0	0	0	1,430	47	0	0
Upper Louis Creek	0	58	0	0	0	8	1,436	749	809	387	0	6	0	0	3	0	0	23
Weaver Creek	33	12	0	0	0	0	1,533	322	897	497	0	0	0	0	98	0	0	0
Wiley Creek	0	101	0	0	0	93	718	1,293	582	428	0	69	0	0	0	39	0	23
Upper South Myrtle Subwatershed	104	682	0	0	2	183	7,859	6,018	3,518	2,945	1	226	0	0	2,432	219	0	104
Myrtle Creek WAU	163	3,377	712	1,470	11	1,503	14,418	20,421	5,012	4,114	1	885	1,026	1,155	2,505	700	0	305

Map 17. Myrtle Creek Watershed Analysis Unit
Soils of Concern



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c. Timber Production Capability Classification (TPCC) Information, Fragile Sites

Soil related data for planning and analysis, using the Timber Production Capability Classification (TPCC), are the Fragile-Suitable and Fragile-Nonsuitable Classifications (see Table 20 and Map 18). Timber Production Capability Classification Fragile sites refer to those areas where the timber growing potential may be reduced due to inherent soil properties and landform characteristics. The TPCC groups sites into Fragile-Suitable and Fragile-Nonsuitable for timber production classifications. Fragile-Suitable sites have the potential for unacceptable soil productivity losses as a result of forest management activities unless mitigating measures (Best Management Practices) are applied to protect the soil/site productivity (see Best Management Practices, Appendix D, Roseburg District Resource Management Plan, USDI 1995). Fragile-Nonsuitable sites are considered to be unsuitable for timber production and are classified as Nonsuitable Woodland. Table 20 lists the number of acres in each classification on BLM-administered land within the WAU.

(1) Soil Moisture (FS)

Soils on these sites are typically moisture deficient due to soil physical characteristics. These sites are not considered moisture deficient due to competing vegetation or annual precipitation.

(a) Suitable (FSR)

Soils on these sites typically have sandy or loamy textures with gravelly modifiers. They generally have between one and one and a half inches of available water holding capacity in the top 12 inches of soil.

(b) Nonsuitable (FSNW)

Soils on these sites typically have loamy textures that are skeletal (having more than 35 percent coarse fragments) or fragmental (having more than 60 percent coarse fragments). They have less than one inch of available water holding capacity in the top 12 inches of soil.

(2) Slope Gradient (FG)

These sites have steep to extremely steep slopes with a high potential for debris type landslides. Gradients commonly range from 60 to more than 100 percent. Classifications are based on geology, geomorphology, physiographic position, climate (especially precipitation), and soil types.

(a) Suitable (FGR)

These sites are less fragile than the nonsuitable areas. Unacceptable soil and organic matter losses may occur from mass soil movement as a result of forest management activities unless mitigating measures (Best Management Practices) are used to protect the soil/growing site.

(b) Nonsuitable (FGNW)

Unacceptable soil and organic matter losses could occur from mass soil movement as a result of forest management activities. These losses cannot be mitigated even using Best Management Practices (BMP).

(3) Mass Movement Potential (FP)

These sites consist of deep seated, slump, or earth flow types of mass movements with undulating topography and slope gradients generally less than 60 percent.

(a) Suitable (FPR)

These sites may contain soil tension cracks and/or sag ponds. Trees on these sites may be curved at the butt or along the stem. Forest management is feasible on these sites when mitigating measures (BMP) are used.

(b) Nonsuitable (FPNW)

These sites have active, deep-seated slump-earthflow types of mass movements. They include areas where the soils have been removed and do not produce commercial forest stands and where the rate of movement has resulted in jackstrawed trees. Forest management is not feasible on these sites. Sites with this classification type are usually small in size.

(4) Nutrient (FN)

Soils on these sites are inherently low in nutrients or have a nutrient imbalance that inhibits tree growth.

(a) Suitable (FNR)

Forest management activities would not reduce site productivity below the threshold considered to be commercial forest land (20 cubic feet of wood production per acre per year).

(b) Nonsuitable (FNNW)

Forest management activities could reduce site productivity below the threshold considered to be commercial forest land of 20 cubic feet of wood production per acre per year.

(5) Surface Erosion Potential (FM)

Soils on these sites have surface horizons that are highly erodible and susceptible to dry ravel. The maximum annual soil erosion rate for crop productivity to be sustained economically and indefinitely may be reached on these sites. The T Factor is used to evaluate levels of soil erosion (USDI 1986).

(a) Suitable (FMR)

Forest management activities may increase surface erosion but site productivity losses, if they occurred, would be acceptable on these sites. Acceptable limits are defined as soil loss rates that do not exceed 20 times the T Factor for five years after timber harvesting.

(b) Nonsuitable (FMNW)

Forest management activities may increase surface erosion resulting in unacceptable site productivity losses on these sites. Unacceptable soil loss rates exceed 20 times the T Factor for five years after timber harvesting.

(6) Groundwater (FW)

These soils contain water at or near the soil surface for sufficient periods of time that vegetation survival and growth are affected.

(a) Suitable (FWR)

Conifer production is usually limited because the groundwater is close to the surface. Soils typically have high chroma mottles close to the surface. These sites may support water tolerant species. Depth to the water table, subsurface flow, or duration of the groundwater is usually altered when a site is disturbed but the productivity loss is considered to be acceptable. Forest management activities would not reduce site productivity below the threshold considered to be commercial forest land of 20 cubic feet of wood production per acre per year or cause noncommercial forest land to be converted to nonforest land.

(b) Nonsuitable (FWNW)

Water tolerant tree and understory species grow on these sites. Commercial conifer survival and productivity are severely limited because groundwater is close to the surface. Soils typically have dark colored surface horizons and low chroma mottles at or near the surface. Depth to the water table, subsurface flow, or duration of the groundwater is altered when a site is disturbed resulting in unacceptable productivity losses and/or the loss of water tolerant tree species. Forest management activities could reduce site productivity below the threshold considered to be commercial forest land of 20 cubic feet of wood production per acre per year or cause noncommercial forest land to be converted to nonforest land.

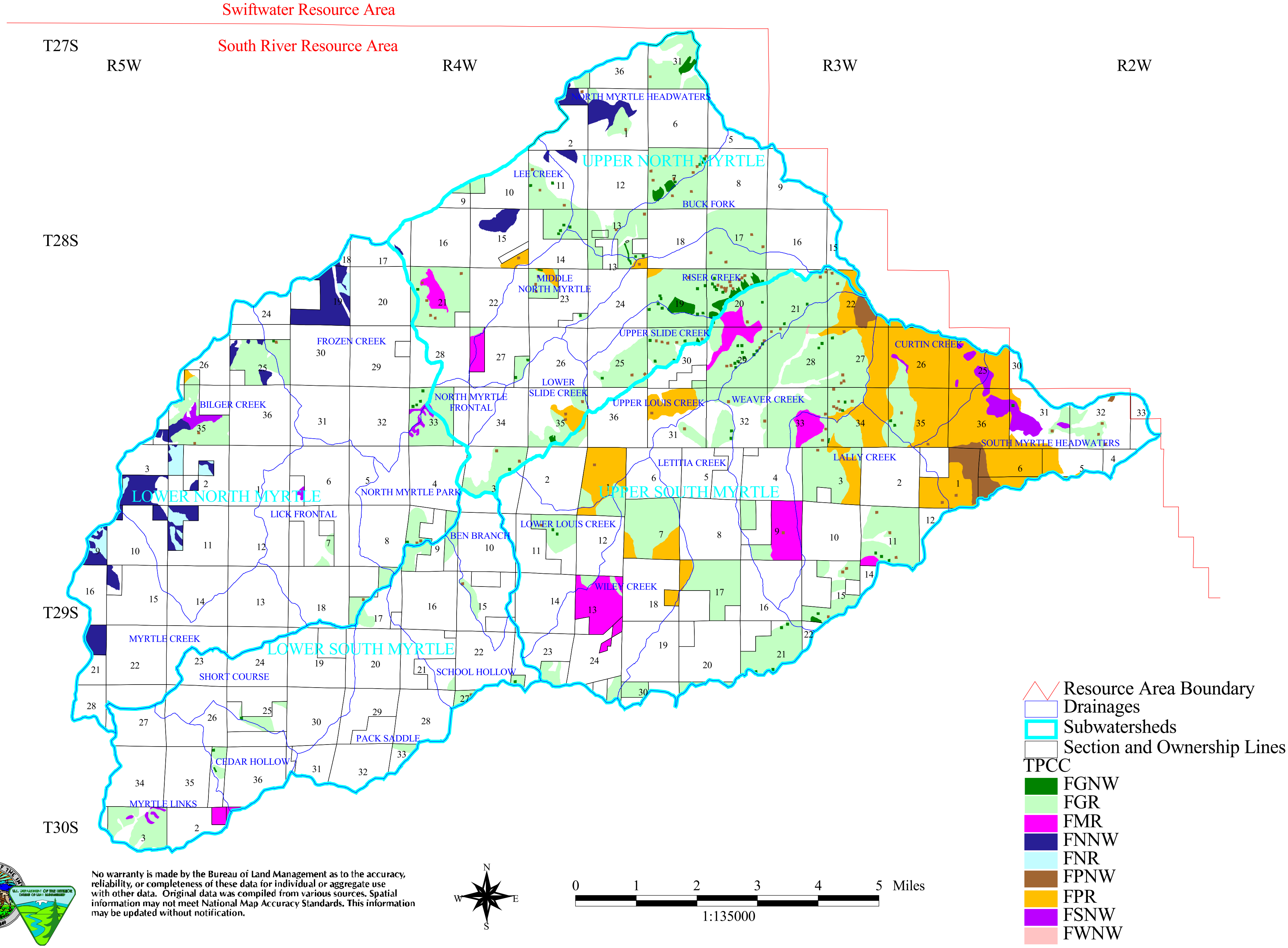
Table 20. Acres of Fragile Site Classifications on BLM Administered Lands From the Timber Production Capability Classification.

Drainage Name **Subwatershed Name**	**Fragile Soil Moisture Nonsuitable Woodland (FSNW)**	**Fragile Gradient Restrictive (FGR)**	**Fragile Gradient Nonsuitable Woodland (FGNW)**	**Fragile Mass Movement Potential Restrictive (FPR)**	**Fragile Mass Movement Potential Nonsuitable Woodland (FPNW)**	**Fragile Nutrient Restrictive (FNR)**	**Fragile Nutrient Nonsuitable Woodland (FNNW)**	**Fragile Surface Erosion Potential Restrictive (FMR)**	**Fragile Groundwater Nonsuitable Woodland (FWNW)**
Bilger Creek	60	528	0	12	2	172	436	0	0
Frozen Creek	14	244	5	0	1	31	326	0	0
Lick Frontal	10	141	0	0	1	0	0	0	0
Myrtle Creek	0	0	0	0	0	60	214	0	0
North Myrtle Park	27	319	1	0	2	0	0	0	0
Lower North Myrtle Subwatershed	111	1,232	6	12	6	263	976	0	0
Buck Fork	0	736	7	47	5	0	0	0	0
Lee Creek	0	840	6	47	9	0	109	115	0
Lower Slide Creek	0	402	7	82	5	0	0	0	0
Middle North Myrtle	0	274	6	32	3	0	0	70	0
North Myrtle Frontal	3	137	0	0	0	0	0	0	0
North Myrtle Headwaters	0	1,016	60	0	10	0	211	0	0
Riser Creek	0	904	126	39	16	0	0	0	0
Upper Slide Creek	0	713	12	0	7	0	0	0	0
Upper North Myrtle Subwatershed	3	5,022	224	247	55	0	320	185	0

Table 20. Acres of Fragile Site Classifications on BLM Administered Lands From the Timber Production Capability Classification.

Drainage Name **Subwatershed Name**	**Fragile Soil Moisture Nonsuitable Woodland (FSNW)**	**Fragile Gradient Restrictive (FGR)**	**Fragile Gradient Nonsuitable Woodland (FGNW)**	**Fragile Mass Movement Potential Restrictive (FPR)**	**Fragile Mass Movement Potential Nonsuitable Woodland (FPNW)**	**Fragile Nutrient Restrictive (FNR)**	**Fragile Nutrient Nonsuitable Woodland (FNNW)**	**Fragile Surface Erosion Potential Restrictive (FMR)**	**Fragile Groundwater Nonsuitable Woodland (FWNW)**
Ben Branch	0	77	0	0	1	0	0	0	0
Cedar Hollow	0	62	2	0	0	0	0	7	0
Myrtle Links	19	298	0	0	0	0	0	52	0
Pack Saddle	0	69	0	0	0	0	0	0	0
School Hollow	0	193	1	3	1	0	0	0	0
Short Course	0	61	1	0	0	0	0	0	0
Lower South Myrtle Subwatershed	19	760	4	3	2	0	0	59	0
Curtin Creek	57	271	2	1,499	1	0	0	0	0
Lally Creek	0	1,419	12	456	10	0	0	183	0
Letitia Creek	0	1,016	6	5	1	0	0	0	0
Lower Louis Creek	0	300	2	32	1	0	0	18	0
South Myrtle Headwaters	210	165	1	1,338	286	0	0	0	0
Upper Louis Creek		1,219	17	551	15	0	0	175	0
Weaver Creek	0	1,985	6	236	99	0	0	288	3
Wiley Creek	0	603	0	241	0	0	0	392	0
Upper South Myrtle Subwatershed	267	6,978	46	4,358	413	0	0	1,056	3
Myrtle Creek WAU	400	13,992	280	4,620	476	263	1,296	1,300	3

Map 18. Myrtle Creek Watershed Analysis Unit
Fragile Soil Classifications From the Timber Production Capability Classification (TPCC)



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d. Soil Productivity

(1) Category 1 Soils

Category 1 Soils are defined as shallow soils (soils with depths less than 20 inches to bedrock), soils with less than four inches of A horizon, soils formed from granitic or schistose parent material on slopes greater than 35 percent, or non-granitic soils on slopes greater than 70 percent. Category 1 Soils are considered highly sensitive to prescribed fire (including burning of hand and machine piles) because they are highly erodible, nutrient deficient, or low in organic matter (USDI1995). Approximately 18,105 acres of BLM-administered land in the WAU may be characterized as consisting of Category 1 Soils (see Table 21 and Map 19). The soil A horizon thickness property is not presented in Table 21 but is identified in the field by a soil scientist. The information in Table 21 was developed using ten meter Digital Elevation Models (DEM), which were used to identify slope groups and the Douglas County Soil Survey, which was used to identify the geologic parent materials and areas with shallow soils.

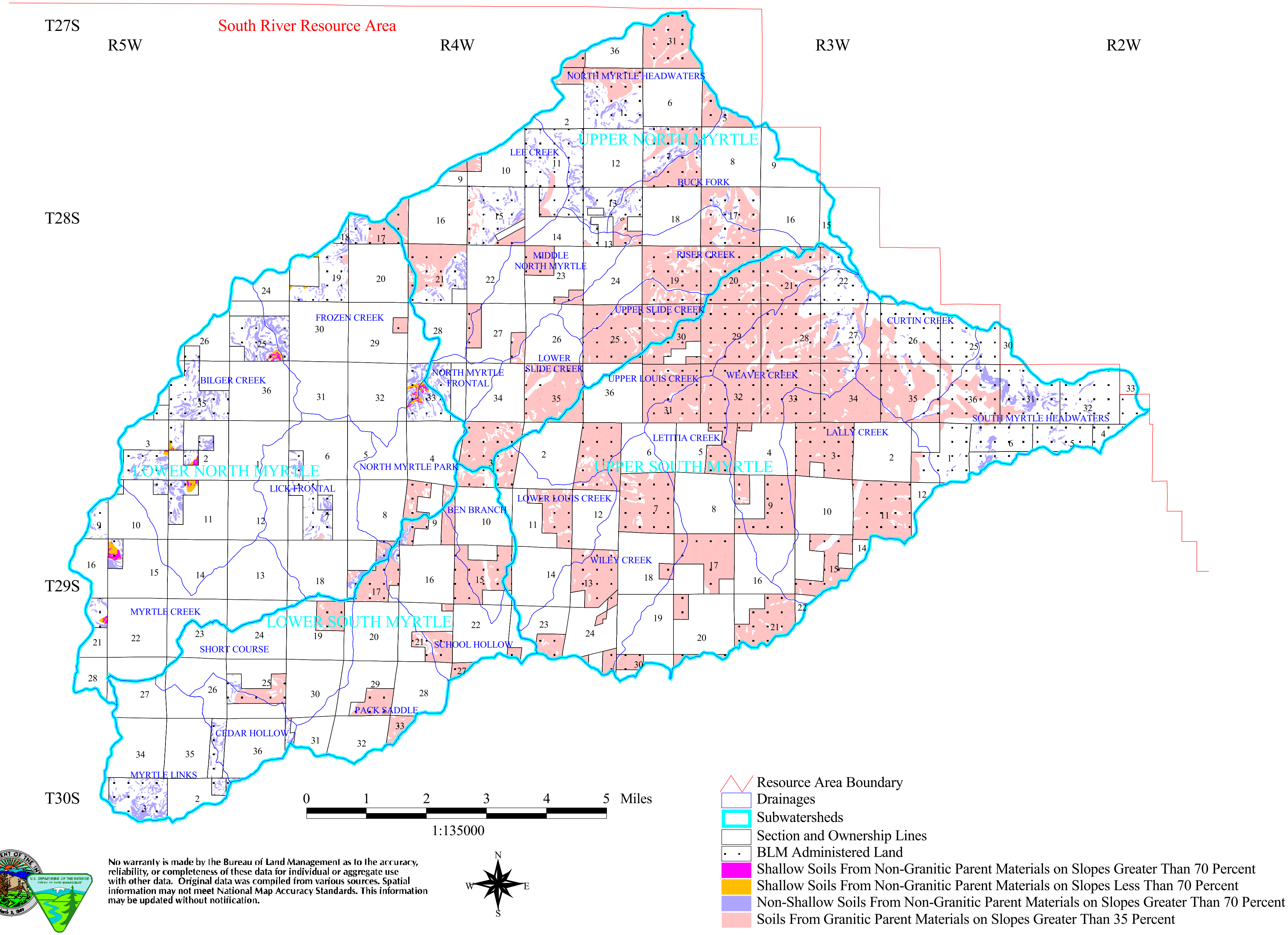
Table 21. Acres of Category 1 Soils on BLM Administered Land in the Myrtle Creek WAU.

Drainage Name **Subwatershed Name**	Acres		
	Shallow Soils	Granitic Soils on Slopes Greater Than 35 Percent	Non-Granitic Soils on Slopes Greater Than 70 Percent
Bilger Creek	54	0	221
Frozen Creek	23	196	110
Lick Frontal	0	42	63
Myrtle Creek	36	0	33
North Myrtle Park	20	146	26
Lower North Myrtle Subwatershed	133	384	453
Buck Fork	0	514	32
Lee Creek	0	638	88
Lower Slide Creek	0	806	0
Middle North Myrtle	0	349	0
North Myrtle Frontal	0	0	22
North Myrtle Headwaters	0	1,029	125
Riser Creek	0	1,003	3
Upper Slide Creek	0	870	0
Upper North Myrtle Subwatershed	0	5,209	270

Table 21. Acres of Category 1 Soils on BLM Administered Land in the Myrtle Creek WAU.

Drainage Name **Subwatershed Name**	Acres		
	Shallow Soils	Granitic Soils on Slopes Greater Than 35 Percent	Non-Granitic Soils on Slopes Greater Than 70 Percent
Ben Branch	0	365	0
Cedar Hollow	0	44	17
Myrtle Links	0	0	82
Pack Saddle	0	438	0
School Hollow	0	516	19
Short Course	0	248	4
Lower South Myrtle Subwatershed	0	1,611	122
Curtin Creek	0	714	7
Lally Creek	0	2,033	0
Letitia Creek	0	1,572	0
Lower Louis Creek	0	518	0
South Myrtle Headwaters	0	336	153
Upper Louis Creek	0	2,090	7
Weaver Creek	0	2,276	52
Wiley Creek	0	1,229	0
Upper South Myrtle Subwatershed	0	10,768	219
Myrtle Creek WAU	133	17,972	1,064

Map 19. Myrtle Creek Watershed Analysis Unit
Category 1 Soils



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(2) Soil Compaction

Soil compaction is a soil productivity concern, which could occur from ground based timber harvesting operations. Management direction is to plan timber harvests to reduce the growth loss effect to the extent practical, when using ground based yarding systems (USDI 2001a). Soil compaction and the removal or disturbance of humus layers and coarse woody debris may impact the soil food web. Minimizing soil and litter disturbance that may occur when using ground based yarding equipment would help maintain a healthy food web. The soil food web is the living component interacting with the nonliving (organic and mineral) component of the soil to produce a complex system of nutrient cycling, soil structure formation, decomposition, and organism cycles. The soil food web promotes healthy soil functions including biological activity, diversity, and productivity. It also regulates the flow of water and dissolved nutrients, stores and cycles nutrients and other elements, and filters, buffers, degrades, immobilizes, and detoxifies organic and inorganic materials that are potential pollutants (USDA 1999). Table 22 and Map 20 show the amount of BLM-administered land with slopes less than 35 percent that could potentially be ground based harvested.

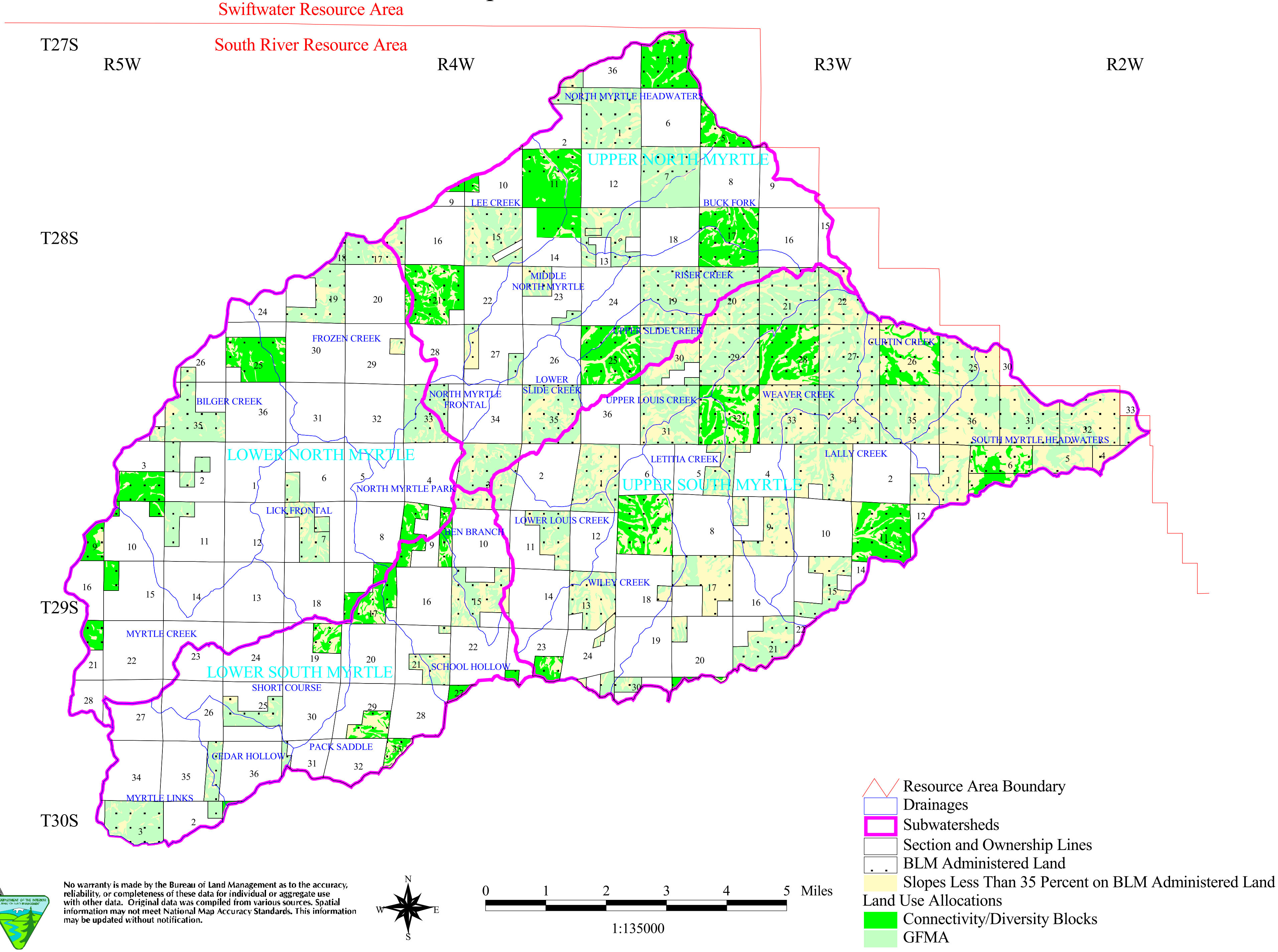
Table 22. Acres of BLM Administered Land by Land Use Allocation With Slopes Less Than 35 Percent.

Drainage Name **Subwatershed Name**	Acres		
	GFMA	Connectivity/Diversity Blocks	Total
Bilger Creek	103	72	175
Frozen Creek	220	27	247
Lick Frontal	118	17	135
Myrtle Creek	0	49	49
North Myrtle Park	46	42	88
Lower North Myrtle Subwatershed	487	207	694
Buck Fork	125	89	214
Lee Creek	241	334	575
Lower Slide Creek	330	0	330
Middle North Myrtle	175	13	188
North Myrtle Frontal	22	0	22
North Myrtle Headwaters	313	158	471
Riser Creek	189	82	271
Upper Slide Creek	131	144	275
Upper North Myrtle Subwatershed	1,526	820	2,346

Table 22. Acres of BLM Administered Land by Land Use Allocation With Slopes Less Than 35 Percent.

Drainage Name **Subwatershed Name**	Acres		
	GFMA	Connectivity/Diversity Blocks	Total
Ben Branch	182	10	192
Cedar Hollow	25	1	26
Myrtle Links	76	2	78
Pack Saddle	40	221	261
School Hollow	159	53	212
Short Course	34	84	118
Lower South Myrtle Subwatershed	516	371	887
Curtin Creek	656	404	1060
Lally Creek	835	166	1001
Letitia Creek	694	92	786
Lower Louis Creek	234	0	234
South Myrtle Headwaters	1,764	251	2015
Upper Louis Creek	901	13	914
Weaver Creek	957	407	1364
Wiley Creek	331	315	646
Upper South Myrtle Subwatershed	6,372	1,648	8,020
Myrtle Creek WAU	8,901	3,046	11,947

Map 20. Myrtle Creek Watershed Analysis Unit
Slopes Less Than 35 Percent



VI. Hydrology

The Myrtle Creek WAU is about 119 square miles in size. The Roseburg BLM District issued a Special Land Use Permit to the City of Myrtle Creek to protect where the city obtains water and the adjoining 190 acres. There are no Memorandum of Understanding (MOU) in the WAU.

Much of the land along North and South Myrtle creeks is used for agricultural purposes. In the agricultural areas many of the tributary streams have been straightened or had their flow patterns altered. Most of the native vegetation has been replace with low growing vegetation, such as grasses. Riparian areas may have deciduous trees along the streambanks.

The higher elevations of the WAU are a combination of Federally-administered and private timber lands. Timber harvesting and road construction have affected channel complexity, water quality, and hydraulic processes.

A. Climate

The Myrtle Creek WAU has a Mediterranean type of climate characterized by cool, wet winters and hot, dry summers. Most of the precipitation occurs as rainfall. However, the higher elevations could receive a considerable amount of snow. There are no long-term weather stations located in the WAU. The closest available station is at Riddle, Oregon, located about four miles southwest of the WAU.

The Riddle weather station is being used to characterize both temperature and precipitation in the WAU. One Douglas County precipitation station is located in the WAU. Other Douglas County precipitation stations are located within ten miles of the WAU. The Douglas County precipitation stations do not have temperature data and the period of record is short. Differences in precipitation and temperature would be expected to occur throughout the WAU due to the elevation differences. Precipitation in the WAU is influenced by elevation and the distance from the Pacific Ocean.

Map 21 shows the range in average annual precipitation in the WAU. Annual precipitation in the WAU ranges from about 35 inches at Myrtle Creek to 60 inches at the highest elevations. The mean annual precipitation from 1961 to 1990 at the Riddle weather station was 31 inches (Owenby and Ezell 1992). The mean water year precipitation from 1914 to 1948 was 30 inches and from 1949 to 1999 it was 32 inches. Chart 6 shows the range and variability in the amount of precipitation measured at the Riddle weather station since 1914. Chart 7 shows about 85 percent of the annual precipitation occurs between October and April and summer precipitation averages about four inches at the Riddle weather station.

Chart 8 shows the water year precipitation deviation from the mean at the Riddle weather station from 1914 to 1948. Chart 9 shows the water year temperature and precipitation deviations from the mean from 1949 to 1998. Some cyclical patterns between warmer or cooler temperatures and drier or wetter precipitation are noticeable. Gaps in the data for Charts 6, 8, and 9 are years when at least 350 daily observations were not recorded.

Seven-day maximum air temperatures at the Riddle weather station are shown in Graph 1. Graph 1 compares the 1998 daily maximum air temperatures with daily mean temperatures between 1949 and 1999 and two standard deviations from the daily mean temperatures. The data can be used to evaluate stream temperatures as they relate to water quality limiting criteria.

Streams exceeding the seven-day maximum temperature of 64 degrees Fahrenheit are considered to be water quality limited, except when air temperatures exceed the 90th percentile. Two standard deviations are at 95 percent. Plotting stream temperature data with Graph 1can help determine if stream temperatures greater than 64 degrees Fahrenheit may be due to abnormally high air temperatures (when the air temperature is greater than two standard deviations higher than the mean seven-day maximum air temperature). Air temperature data recorded in 1998 is used as an example in Graph 1. On July 28, 1998 and from September 2 to September 7, 1998 air temperatures exceeded or nearly exceeded the mean seven-day maximum air temperature plus two standard deviations (were abnormally high). If stream temperatures exceed 64 degrees Fahrenheit only on days when the air temperatures were considered to be abnormally high the stream would not be included on the water quality limited list for temperature. All streams could be evaluated using this type of information.

B. Streamflow

No active United States Geological Survey (USGS) gaging stations are operating in the WAU. Three USGS gaging stations did operate in the WAU. The South Myrtle Creek near Myrtle Creek (station number 14310700) and North Myrtle Creek near Myrtle Creek (station number 14311000) were continuous recording gaging stations. The West Fork Frozen Creek near Myrtle Creek gaging station (station number 14310900) was a crest gage. The crest gage only measured the annual peak flows. These USGS gaging stations are being used to characterize streamflow in the WAU. Streamflow at these sites are representative of the flow conditions found in the WAU.

The Douglas County Natural Resources Division operated one continuous recording gaging station on South Myrtle Creek above Carson Creek near Myrtle Creek (station number 14310800) for eight years from 1980 to 1987. This station did not have a long enough period of record to use for developing a flood frequency analysis.

Table 23 presents flood frequencies for the three gaging stations USGS operated in the WAU. The data presented in Table 23 would be useful for estimating when a peak flow may occur. Flow magnitude is dependent on the size of the drainage area. The recurrence interval (sometimes called the return period) is used more often than the exceedence probability. An example would be, an instantaneous peak flow exceeding 2,940 cubic feet per second (cfs) at the South Myrtle Creek near Myrtle Creek gage would have a ten percent probability of occurring in any year, or a recurrence interval of one in ten, which is called a ten-year flood.

Map 21. Myrtle Creek Watershed Analysis Unit
Average Annual Precipitation

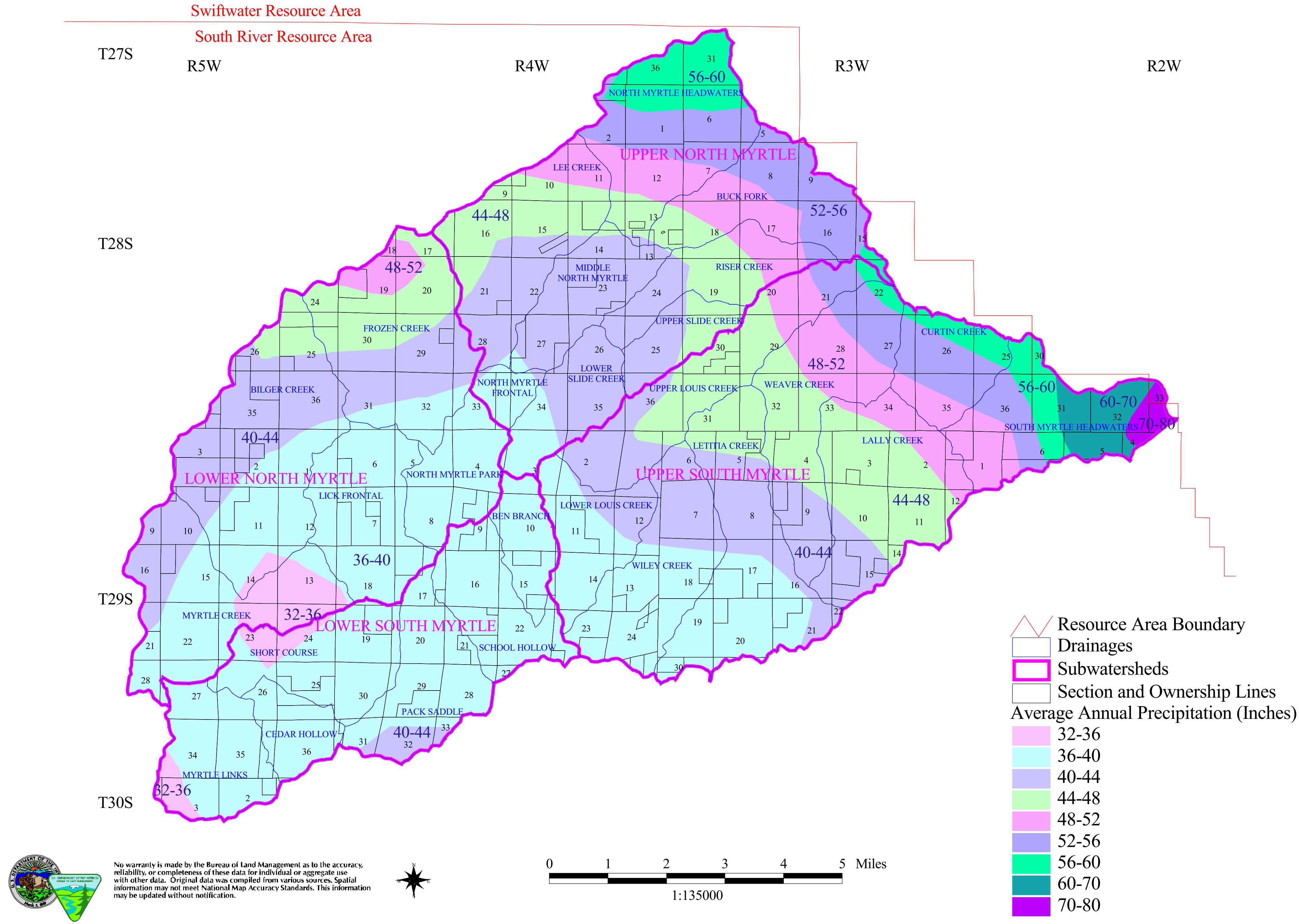


Chart 6. Water Year Precipitation at the Riddle, Oregon Weather Station From 1914 to 1999.

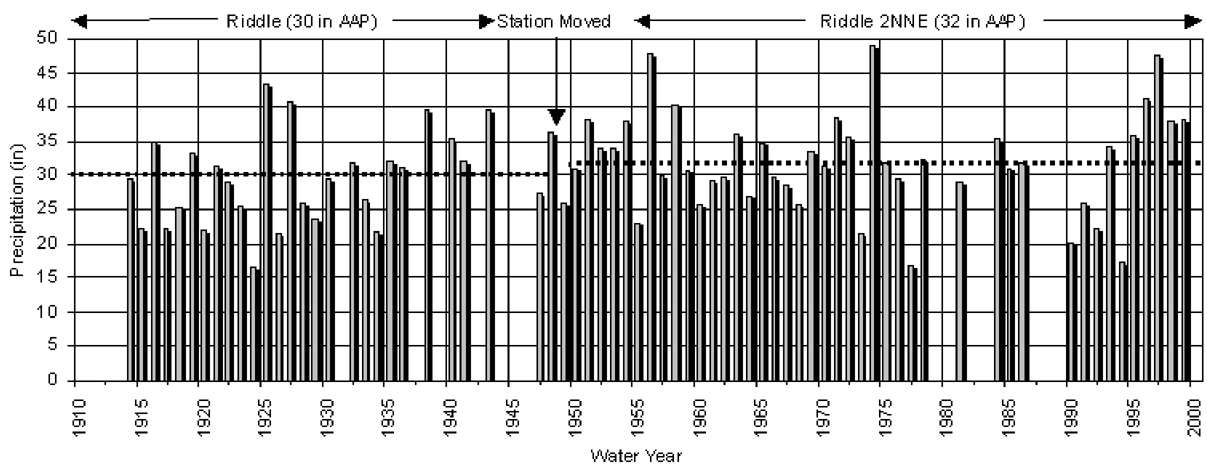


Chart 7. Monthly Precipitation at the Riddle, Oregon Weather Station From 1961 to 1990.

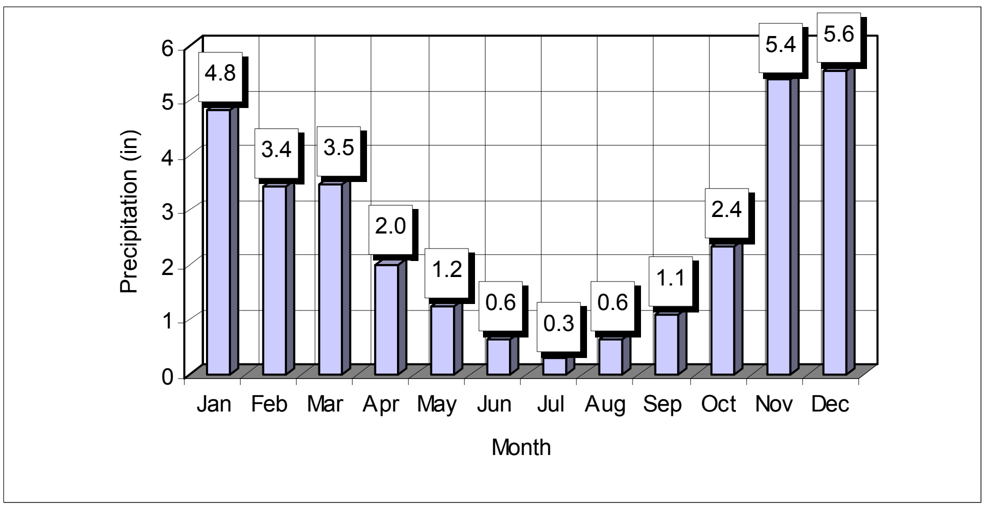
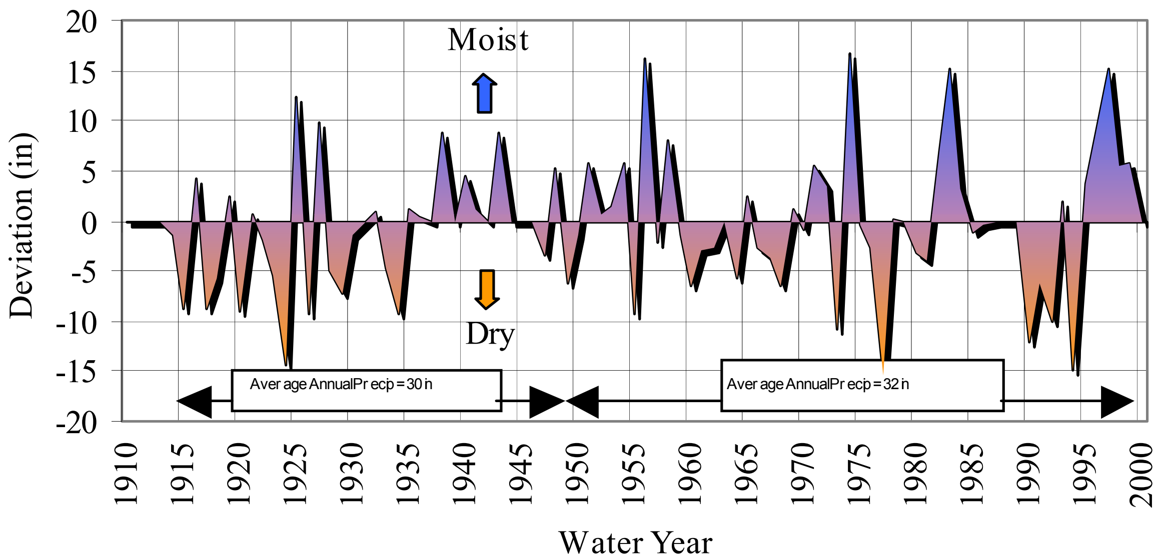
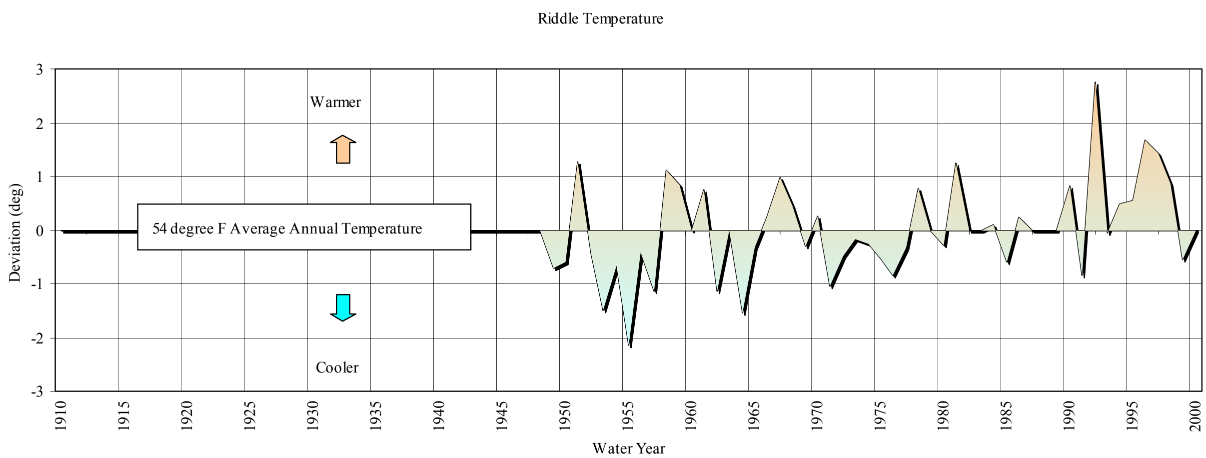


Chart 8. Annual Precipitation Deviation From the Mean at the Riddle, Oregon Weather Station From 1914 to 1999.



Riddle Precipitation

Chart 9. Annual Temperature Deviation From the Mean at the Riddle, Oregon Weather Station From 1949 to 1998.



Graph 1. Comparison of 1998 Air Temperatures With Mean Air Temperatures From 1949 to 1998 and Mean Air Temperatures From 1949 to 1998 Plus Two Standard Deviations at the Riddle, Oregon Weather Station.

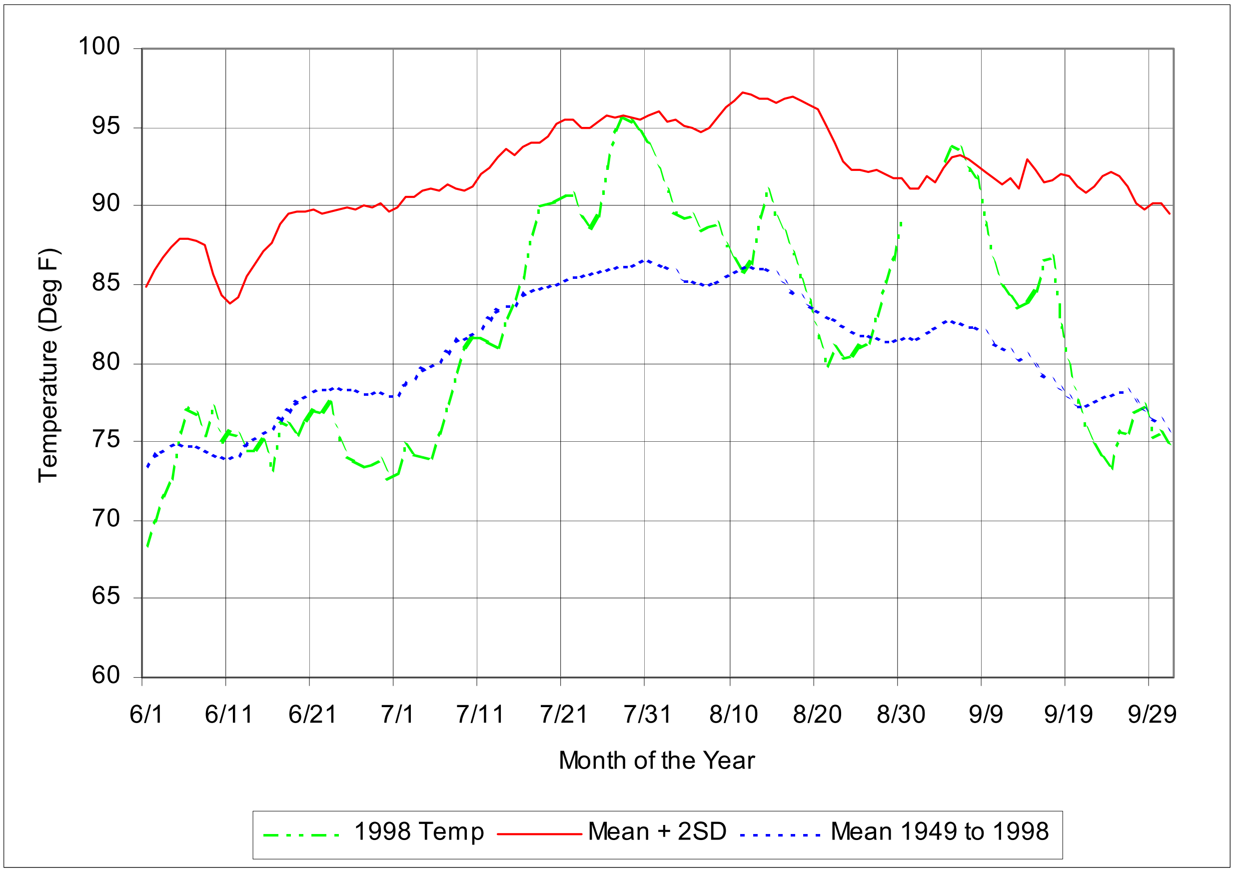


Table 23. Magnitude and Probability of Instantaneous Peak Flow for Stream Gaging Stations in the Myrtle Creek WAU.

Gaging Station Name (Number)	Drainage Area (square miles)	Period of Record	Discharge (cubic feet per second) for Indicated Recurrence Interval (years) and Annual Exceedence Probability (percent)						
			1.25	2	5	10	25	50	100
			80%	50%	20%	10%	4%	2%	1%
South Myrtle Creek near Myrtle Creek (14310700)	43.9	1955 to 1972	1,320	1,800	2,480	2,940	3,530	--	--
West Fork Frozen Creek near Myrtle Creek (14310800 ^)	3.2	1954 to 1968	90	125	225	300	--	--	--
North Myrtle Creek near Myrtle Creek (14311000)	54.2	1955 to 1986	1,270	1,870	2,660	3,160	3,740	4,160	4,550

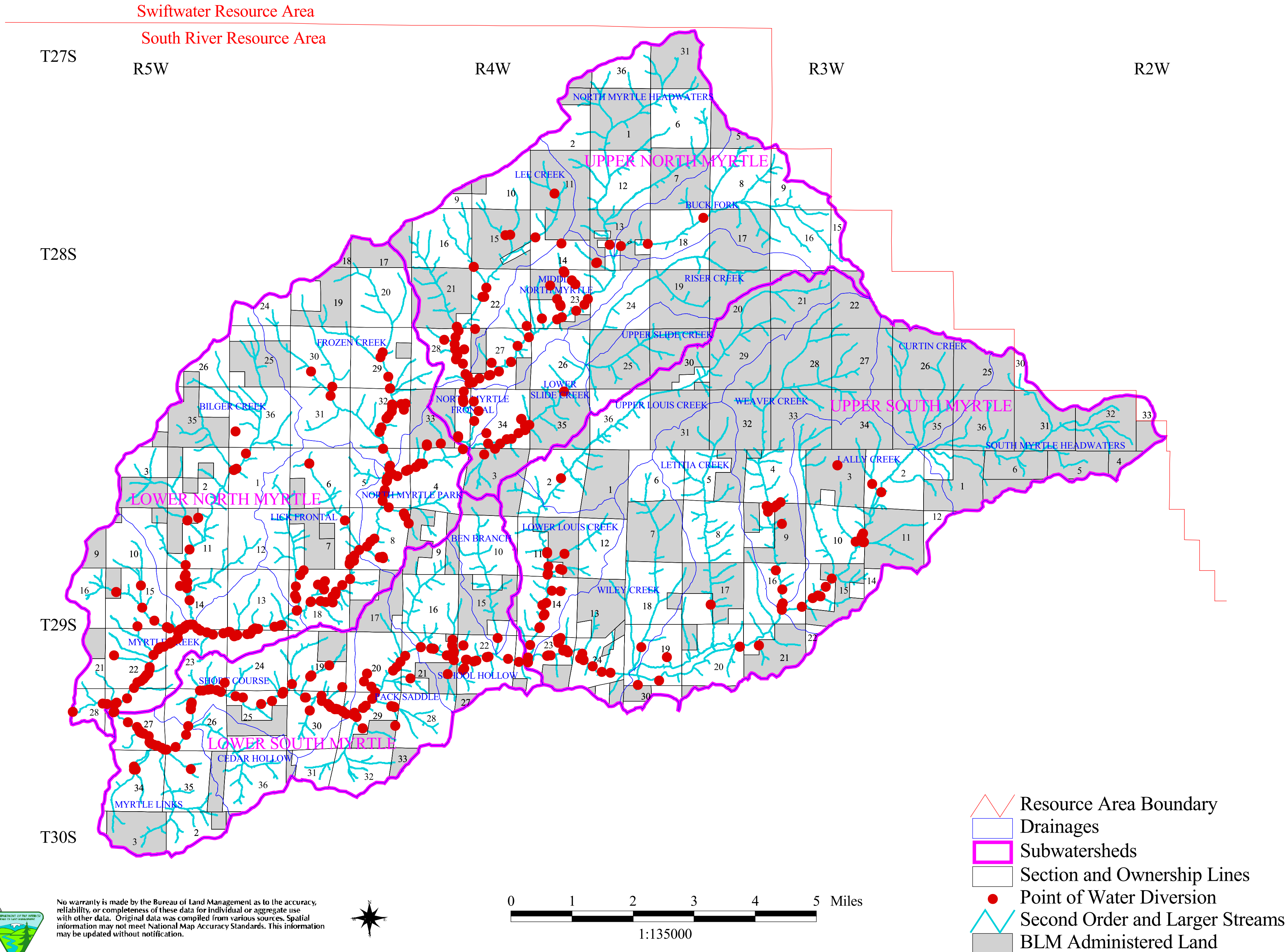
Data from Wellman et al. 1993
^ Recurrence interval determined by Roseburg District BLM using USGS or Douglas County data.

In general, streamflows follow the precipitation pattern with higher flows in the winter and lower flows in the summer. Most streamflow occurs from November through May with the maximum flow in January. Some streams may not flow for up to a week in August in normal years. Also in dry years, streams may not flow for a few days in July or September. Generally when a stream reach is dry, the water flows underground for a short distance then resurfaces downstream. Fourth order and larger streams probably flow year round.

Summer low flows may be affected by human water withdrawals. Most streams in the higher elevations of the WAU are not impacted by irrigation withdrawals. However, water is withdrawn from streams in the higher elevations for road maintenance and fire protection. An inventory of water rights listed 558 appropriated permits totaling approximately 55 cubic feet per second (cfs) of streamflow within the WAU (Oregon Water Resources Water Rights Information System). The water is used for domestic, irrigation, livestock, industrial, municipal, fish, mining, and forest management purposes. The restrictions on these water rights are unknown. Domestic water withdrawal, irrigation, industrial, and livestock watering use contribute to lower summertime streamflows. The largest use of appropriated water rights in the WAU is for irrigation. Water withdrawn during the summer may decrease available habitat for aquatic life, increase summer water temperatures and pH, and decrease dissolved oxygen because less water is in the stream.

Seventeen permits for water diversion or storage total 35 acre feet. Points of surface water diversion are shown on Map 22.

Map 22. Myrtle Creek Watershed Analysis Unit
Points of Water Diversions



The United States Geological Survey (USGS) method of estimating floods could be used to estimate the magnitude and frequency of floods for ungaged streams in the WAU (Harris et al. 1979). The information could be used to determine the size of culvert to install in a particular stream to accommodate a 100-year flood event. The area of lakes and ponds, precipitation intensity, and drainage area are information needed to be able to use the USGS method. The area of lakes and ponds may be insignificant in some drainages of the WAU. Precipitation intensity is the maximum 24-hour rainfall having a recurrence interval of two years. Precipitation intensity can be determined using a map prepared by the National Oceanic and Atmospheric Administration (USDC 1973). The estimated precipitation intensity ranges from three inches at the lower elevations to four inches in the higher elevations of the WAU.

1. Effects of Forest Management and Roads

Timber harvesting and road construction can potentially contribute to increased peak flows above normal rates, add sediment to the stream, increase the risk of landslides, increase stream temperature, and change stream channel morphology (Beschta 1978, Harr and McCorison 1979, Jones and Grant 1996, and Wemple et al. 1996). Although many of these impacts can be mitigated or lessened with improved management techniques, past practices would continue having some impacts on the hydrology of the WAU.

There are about 524 miles of roads in the WAU. Road densities in the WAU range from 3.03 to 5.94 miles per square mile (see Table 24). The average road density in the WAU is 4.39 miles per square mile. There are approximately 1,823 stream crossings in the WAU. Stream crossing densities in the WAU range from 1.22 to 3.06 crossings per stream mile. The average number of stream crossings per stream mile in the WAU is 2.08.

There are about 190 miles of roads on BLM-administered land in the WAU. Table 25 shows the number of miles and densities of roads on BLM-administered land in the WAU. Road densities on BLM-administered land range from zero to 6.82 miles per square mile. The average road density on BLM-administered land in the WAU is 3.93 miles per square mile. There are approximately 521 stream crossings on BLM-administered land in the WAU. Stream crossing densities on BLM-administered land range from zero to 3.81 crossings per stream mile. The average number of stream crossings per stream mile on BLM-administered land in the WAU is 1.66.

The National Marine Fisheries Service considers an area to be in a properly functioning condition when the road density is less than two miles per square mile. No drainages in the WAU have less than two miles per square mile of roads. Four drainages have less than two miles per square mile of roads when only BLM-administered lands are considered.

Table 24. Miles of Roads and Streams, Number of Stream Crossings, and Densities in the Myrtle Creek WAU.

Drainage Name **Subwatershed Name**	Area (Acres)	Area (Square Miles)	Miles of Roads	Road Density (Miles per Square Mile)	Miles of Streams	Stream Density (Miles per Square Mile)	Number of Stream Crossings	Stream Crossings per Stream Mile
Bilger Creek	5,569	8.70	34.41	3.96	61.55	7.07	121	1.97
Frozen Creek	4,595	7.18	29.48	4.11	48.49	6.75	92	1.90
Lick Frontal	2,940	4.59	14.68	3.20	37.48	8.17	70	1.87
Myrtle Creek	4,033	6.30	34.78	5.52	39.02	6.19	111	2.84
North Myrtle Park	1,878	2.93	11.15	3.81	21.90	7.47	52	2.37
Lower North Myrtle Subwatershed	19,015	29.71	124.50	4.19	208.44	7.02	446	2.14
Buck Fork	2,999	4.69	23.44	5.00	38.24	8.15	77	2.01
Lee Creek	3,856	6.03	35.81	5.94	45.73	7.58	140	3.06
Lower Slide Creek	1,796	2.81	15.98	5.69	21.80	7.76	64	2.94
Middle North Myrtle	2,055	3.21	17.16	5.35	24.35	7.59	44	1.81
North Myrtle Frontal	541	0.85	3.34	3.93	5.06	5.95	15	2.96
North Myrtle Headwaters	4,104	6.41	24.22	3.79	45.15	7.04	53	1.17
Riser Creek	2,012	3.14	15.15	4.82	21.01	6.69	26	1.24
Upper Slide Creek	1,150	1.80	7.56	4.20	13.10	7.28	18	1.37
Upper North Myrtle Subwatershed	18,514	28.93	142.66	4.93	214.44	7.41	437	2.04

Table 24. Miles of Roads and Streams, Number of Stream Crossings, and Densities in the Myrtle Creek WAU.

Drainage Name **Subwatershed Name**	Area (Acres)	Area (Square Miles)	Miles of Roads	Road Density (Miles per Square Mile)	Miles of Streams	Stream Density (Miles per Square Mile)	Number of Stream Crossings	Stream Crossings per Stream Mile
Ben Branch	1,157	1.81	6.16	3.40	14.58	8.06	31	2.13
Cedar Hollow	1,105	1.73	8.94	5.17	13.83	7.99	29	2.10
Myrtle Links	2,381	3.72	11.27	3.03	27.04	7.27	46	1.70
Pack Saddle	2,625	4.10	20.56	5.01	29.24	7.13	73	2.50
School Hollow	2,181	3.41	15.89	4.66	31.74	9.31	94	2.96
Short Course	2,662	4.16	19.86	4.77	29.27	7.04	75	2.56
Lower South Myrtle Subwatershed	12,111	18.92	82.68	4.37	145.70	7.70	348	2.39
Curtin Creek	1,830	2.86	9.07	3.17	16.82	5.88	30	1.78
Lally Creek	4,126	6.45	31.23	4.84	48.66	7.54	106	2.18
Letitia Creek	4,455	6.96	26.51	3.81	53.72	7.72	100	1.86
Lower Louis Creek	2,046	3.20	12.24	3.83	30.04	9.39	65	2.16
South Myrtle Headwaters	3,359	5.25	16.33	3.11	32.54	6.20	44	1.35
Upper Louis Creek	3,562	5.57	30.17	5.42	38.59	6.93	99	2.57
Weaver Creek	3,963	6.19	25.08	4.05	49.11	7.93	80	1.63
Wiley Creek	3,285	5.13	19.57	3.81	37.31	7.27	62	1.66
Upper South Myrtle Subwatershed	26,625	41.60	170.20	4.09	306.79	7.37	586	1.91
Myrtle Creek WAU	76,265	119.16	520.04	4.36	875.37	7.35	1,817	2.08

Table 25. Miles of Roads and Streams, Number of Stream Crossings, and Densities on BLM Administered Land in the Myrtle Creek WAU.

Drainage Name **Subwatershed Name**	Area (Acres)	Area (Square Miles)	Miles of Roads	Road Density (Miles per Square Mile)	Miles of Streams	Stream Density (Miles per Square Mile)	Number of Stream Crossings	Stream Crossings per Stream Mile
Bilger Creek	1,433	2.24	7.74	3.46	15.80	7.05	31	1.96
Frozen Creek	947	1.48	3.67	2.48	7.48	5.05	1	0.13
Lick Frontal	499	0.78	0.46	0.59	3.83	4.91	0	0
Myrtle Creek	317	0.50	0	0.00	1.38	2.76	0	0
North Myrtle Park	383	0.60	1.67	2.78	4.13	6.88	6	1.45
Lower North Myrtle Subwatershed	3,579	5.59	13.54	2.42	32.62	5.84	38	1.16
Buck Fork	899	1.40	9.55	6.82	9.53	6.81	27	2.83
Lee Creek	1,831	2.86	15.03	5.26	20.70	7.24	55	2.66
Lower Slide Creek	953	1.49	8.99	6.03	11.29	7.58	36	3.19
Middle North Myrtle	420	0.66	3.65	5.53	3.33	5.05	6	1.80
North Myrtle Frontal	140	0.22	0.02	0.09	1.04	4.73	0	0
North Myrtle Headwaters	2,220	3.47	10.32	2.97	23.83	6.87	25	1.05
Riser Creek	1,238	1.93	9.12	4.73	12.33	6.39	12	0.97
Upper Slide Creek	983	1.54	6.29	4.08	11.75	7.63	18	1.53
Upper North Myrtle Subwatershed	8,684	13.57	62.97	4.64	93.80	6.91	179	1.91

Table 25. Miles of Roads and Streams, Number of Stream Crossings, and Densities on BLM Administered Land in the Myrtle Creek WAU.

Drainage Name **Subwatershed Name**	Area (Acres)	Area (Square Miles)	Miles of Roads	Road Density (Miles per Square Mile)	Miles of Streams	Stream Density (Miles per Square Mile)	Number of Stream Crossings	Stream Crossings per Stream Mile
Ben Branch	451	0.70	3.48	4.97	5.31	7.59	13	2.45
Cedar Hollow	208	0.33	0.70	2.12	1.04	3.15	1	0.96
Myrtle Links	525	0.82	2.42	2.95	5.68	6.93	4	0.70
Pack Saddle	497	0.78	3.21	4.12	3.50	4.49	6	1.71
School Hollow	590	0.92	4.20	4.57	6.49	7.05	16	2.47
Short Course	310	0.48	0.86	1.79	2.37	4.94	3	1.27
Lower South Myrtle Subwatershed	2,581	4.03	14.87	3.69	24.39	6.05	43	1.76
Curtin Creek	1,830	2.86	9.07	3.17	16.82	5.88	30	1.78
Lally Creek	2,222	3.47	17.02	4.90	22.73	6.55	47	2.07
Letitia Creek	1,619	2.53	6.55	2.59	16.02	6.33	17	1.06
Lower Louis Creek	625	0.98	4.94	5.04	7.87	8.03	30	3.81
South Myrtle Headwaters	3,087	4.82	14.82	3.07	29.72	6.17	40	1.35
Upper Louis Creek	2,363	3.69	18.33	4.97	21.66	5.87	37	1.71
Weaver Creek	3,118	4.87	19.40	3.98	35.81	7.35	46	1.28
Wiley Creek	1,300	2.03	5.23	2.58	11.91	5.87	8	0.67
Upper South Myrtle Subwatershed	16,164	25.26	95.36	3.78	162.54	6.43	255	1.57
Myrtle Creek WAU	31,008	48.45	186.74	3.85	313.35	8.97	515	1.64

Roads have the potential to increase peak flows by delivering water to the stream faster than in a non-roaded landscape. Roads can also increase the stream drainage network by routing water into culverts, which if not properly located can cause gullying, effectively acting as another stream channel (Wemple et al. 1996). Increased sedimentation from roads can occur if culverts drain onto unstable or erodible slopes or if too few culverts are placed along the road and erode the ditchline.

Drainages with the most stream crossings and subsequently the most culverts would have the greatest risk of culverts failing or becoming blocked during storm events. Blocked or failed culverts can cause debris slides to occur or roads to erode or fail. Culverts can influence the stream channel by limiting stream meandering, changing stream gradient, limiting bedload movement, and increasing sediment. A limited number of the culverts in the WAU have been inspected and/or maintained. The Resource Management Plan (RMP) states new and replacement culverts should accommodate a 100-year flood event.

Table 26 shows the number of miles and densities of roads within Riparian Reserves and 100 feet of streams on BLM-administered land. About 65 miles of roads are located within Riparian Reserves and about 34 miles of roads are within 100 feet of a stream. Roads within 100 feet of a stream are more likely to add sediment to the stream, since the limited amount of vegetation between the road and stream cannot capture the sediment before it reaches the stream.

Many roads in the WAU are in need of some maintenance. Maintenance needing to be performed may include removing slides blocking ditch lines or culverts or installing additional cross drain culverts and/or waterbars on the roads to reduce the amount of runoff entering the stream. Installing cross drains would disperse the water flowing in the ditchline keeping it from flowing into the stream. This would decrease the potential for larger peak flows, increase the amount of subsurface flow, and provide more sediment filtration.

Maintenance needs may also include grading roads to reduce the amount of water flowing in ruts on the road. Water in a rut may flow past several culverts carrying sediment from the road surface into a stream. Mulching bare cutbanks and fill slopes, and limiting access on natural surfaced roads in the wet season could decrease surface erosion and minimize the amount of sediment flowing into streams from roads.

Natural surfaced spur and jeep roads that need maintenance, improvements, or could be decommissioned occur on BLM-administered land in the WAU. The main water quality problems observed in the WAU were erosion and sedimentation, culverts restricting the stream causing excessive downcutting in the channel, and roads restricting the natural meandering of streams.

Table 26. Miles of Roads and Road Densities Within Riparian Reserves and Within 100 Feet of a Stream on BLM Administered Land in the Myrtle Creek WAU.

	Riparian Reserves				Within 100 Feet of a Stream			
Drainage Name **Subwatershed Name**	Area (Acres)	Area (Square Miles)	Miles of Roads	Road Density (Miles per Square Mile)	Area (Acres)	Area (Square Miles)	Miles of Roads	Road Density (Miles per Square Mile)
Bilger Creek	629	0.98	2.88	2.93	366	0.57	1.86	3.26
Frozen Creek	287	0.45	0.31	0.69	178	0.28	0.19	0.68
Lick Frontal	171	0.27	0.05	0.19	100	0.16	0	0.00
Myrtle Creek	65	0.10	0	0.00	35	0.05	0	0.00
North Myrtle Park	158	0.25	0.65	2.63	96	0.15	0.30	2.00
Lower North Myrtle Subwatershed	1,310	2.05	3.89	1.90	775	1.21	2.35	1.94
Buck Fork	399	0.62	3.25	5.21	229	0.36	1.84	5.14
Lee Creek	832	1.30	6.58	5.06	483	0.75	3.19	4.23
Lower Slide Creek	450	0.70	4.58	6.51	262	0.41	2.68	6.55
Middle North Myrtle	155	0.24	0.89	3.67	87	0.14	0.45	3.31
North Myrtle Frontal	42	0.07	0.02	0.30	26	0.04	0.02	0.49
North Myrtle Headwaters	983	1.54	3.67	2.39	556	0.87	2.30	2.65
Riser Creek	494	0.77	2.14	2.77	288	0.45	1.09	2.42
Upper Slide Creek	471	0.74	2.19	2.98	269	0.42	0.98	2.33
Upper North Myrtle Subwatershed	3,826	5.98	23.32	3.90	2,200	3.44	12.55	3.65
Ben Branch	215	0.34	1.65	4.91	128	0.20	0.85	4.25
Cedar Hollow	52	0.08	0.05	0.62	30	0.05	0.04	0.85
Myrtle Links	224	0.35	0.42	1.20	134	0.21	0.20	0.96
Pack Saddle	139	0.22	0.46	2.12	87	0.14	0.30	2.21
School Hollow	250	0.39	1.70	4.35	152	0.24	1.06	4.46
Short Course	97	0.15	0.16	1.06	58	0.09	0.11	1.21
Lower South Myrtle Subwatershed	977	1.53	4.44	2.91	589	0.92	2.56	2.78

Table 26. Miles of Roads and Road Densities Within Riparian Reserves and Within 100 Feet of a Stream on BLM Administered Land in the Myrtle Creek WAU.

	Riparian Reserves				Within 100 Feet of a Stream			
Drainage Name **Subwatershed Name**	Area (Acres)	Area (Square Miles)	Miles of Roads	Road Density (Miles per Square Mile)	Area (Acres)	Area (Square Miles)	Miles of Roads	Road Density (Miles per Square Mile)
Curtin Creek	691	1.08	3.20	2.96	396	0.62	1.65	2.67
Lally Creek	920	1.44	5.96	4.15	534	0.83	2.64	3.16
Letitia Creek	630	0.98	1.74	1.77	375	0.59	1.05	1.79
Lower Louis Creek	303	0.47	2.98	6.29	181	0.28	1.61	5.69
South Myrtle Headwaters	1,225	1.91	5.83	3.05	698	1.09	2.84	2.60
Upper Louis Creek	912	1.43	4.98	3.49	514	0.80	2.35	2.94
Weaver Creek	1,462	2.28	6.94	3.04	845	1.32	3.54	2.68
Wiley Creek	470	0.73	0.85	1.16	281	0.44	0.37	0.84
Upper South Myrtle Subwatershed	6,613	10.33	32.48	3.14	3,824	5.98	16.05	2.69
Myrtle Creek WAU	12,726	19.88	64.13	3.23	7,388	11.54	33.51	2.90

The Transportation Management Objectives (TMO) identified roads which could be decommissioned or improved to decrease the impact of roads in the WAU. Information derived from the TMO process for potential road treatments is presented in Appendix G. Only roads controlled by the BLM are addressed by the TMO process. Since 1996, about 16 miles of roads have been improved and approximately six miles of roads have been decommissioned in the WAU (see Appendix G). Table 27 compares the miles and densities of roads and stream crossing information before and after road decommissioning occurred in some Drainages of the WAU. Table 28 compares the miles and densities of roads and stream crossing information on BLM-administered land before and after road decommissioning occurred in some Drainages of the WAU. Table 29 compares the miles and densities of roads within Riparian Reserves and within 100 feet of a stream before and after road decommissioning occurred in some Drainages of the WAU.

Table 27. Comparison of Road Miles and Densities in Drainages Before and After Roads Were Decommissioned.

	Before				After			
Drainage Name	Miles of Roads	Road Density	Stream Crossings	Stream Crossings per Stream Mile	Miles of Roads	Road Density	Stream Crossings	Stream Crossings per Stream Mile
North Myrtle Headwaters	25.19	3.93	55	1.22	24.22	3.79	53	1.17
Upper North Myrtle Subwatershed	143.63	4.96	439	2.05	142.66	4.93	437	2.04
Curtin Creek	11.24	3.93	32	1.90	9.07	3.17	30	1.78
South Myrtle Headwaters	16.84	3.21	46	1.41	16.33	3.11	44	1.35
Upper South Myrtle Subwatershed	172.88	4.16	590	1.92	170.20	4.09	586	1.91
Myrtle Creek WAU	523.69	4.39	1,823	2.08	520.04	4.36	1,817	2.08

Table 28. Comparison of Road Miles and Densities on BLM Administered Land in Drainages Before and After Roads Were Decommissioned.

	Before				After			
Drainage Name	Miles of Roads	Road Density	Stream Crossings	Stream Crossings per Stream Mile	Miles of Roads	Road Density	Stream Crossings	Stream Crossings per Stream Mile
North Myrtle Headwaters	11.26	3.24	27	1.13	10.32	2.97	25	1.05
Upper North Myrtle Subwatershed	63.91	4.71	181	1.93	62.97	4.64	179	1.91
Curtin Creek	11.24	3.93	32	1.90	9.07	3.17	30	1.78
South Myrtle Headwaters	15.33	3.18	42	1.41	14.82	3.07	40	1.35
Upper South Myrtle Subwatershed	98.04	3.88	259	1.59	95.36	3.78	255	1.57
Myrtle Creek WAU	190.36	3.93	521	1.66	186.74	3.85	515	1.64

Table 29. Change in Road Miles and Densities in Riparian Reserves and Within 100 Feet of a Stream on BLM Administered Land in Drainages Before and After Roads Were Decommissioned.

	Riparian Reserves				Within 100 Feet of a Stream			
	Before		After		Before		After	
Drainage Name	Miles of Roads	Road Density	Miles of Roads	Road Density	Miles of Roads	Road Density	Miles of Roads	Road Density
North Myrtle Headwaters	4.39	2.86	3.67	2.39	2.84	3.27	2.30	2.65
Upper North Myrtle Subwatershed	24.04	4.02	23.32	3.90	13.09	3.81	12.55	3.65
Curtin Creek	3.34	3.09	3.20	2.96	1.73	2.80	1.65	2.67
South Myrtle Headwaters	6.04	3.16	5.83	3.05	2.92	2.68	2.84	2.60
Upper South Myrtle Subwatershed	32.83	3.18	32.48	3.14	16.21	2.71	16.05	2.69
Myrtle Creek WAU	65.20	3.28	64.13	3.23	34.21	2.96	33.51	2.90

2. Peak Flows

Timber harvesting and road construction within the Transient Snow Zone (TSZ) can result in increased peak flows during rain-on-snow events. The Transient Snow Zone is defined as land between 2,000 and 5,000 feet in elevation. Map 23 shows where the TSZ occurs in the WAU. Snow melts slower when it is under a forest canopy with at least a 70 percent crown closure than when snow is in an opening (Harr and Coffin 1992). Rapid snowmelt may cause a large amount of water to flow into streams. Increased peak flows following timber harvesting in the TSZ could lead to an increase in landslides and erosion (Harr 1981).

Hydrologists on the Umpqua National Forest developed the Hydrologic Recovery Procedure (HRP) to evaluate the cumulative effects of timber harvesting in the TSZ on streamflow in the Umpqua River Basin (USDA 1990). The Myrtle Creek WAU is characterized as having a rain dominated precipitation regime, since about 77 percent of the WAU is below 2,000 feet in elevation (see Table 30). The HRP assumes the area less than 2,000 feet in elevation is 100 percent recovered and not affected by rain-on-snow events. However, rain-on-snow events could increase peak flows where more than 25 percent of a Drainage has been harvested in the TSZ (USDA 1990). Increased peak flows during a rain-on-snow event may occur if a Drainage is less than 75 percent hydrologically recovered, when determined by using the Hydrologic Recovery Procedure. Eight Drainages have at least 25 percent of the area in the TSZ. However, all of the Drainages in the WAU are more than 75 percent hydrologically recovered, as determined by using the HRP (see Table 30).

Map 23. Myrtle Creek Watershed Analysis Unit
Transient Snow Zone

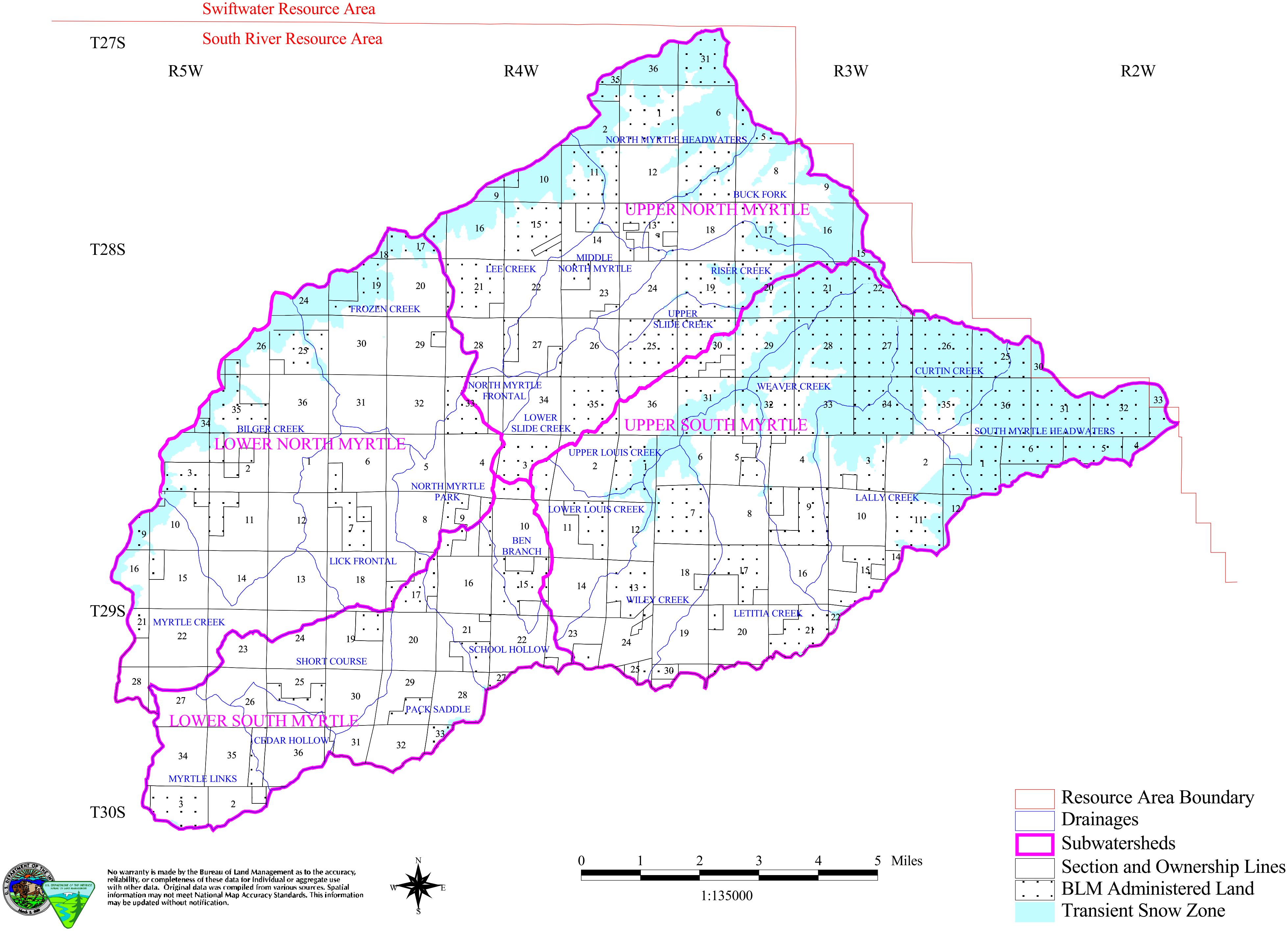


Table 30. Number of Acres and Percent of Drainage in the Transient Snow Zone in the Myrtle Creek WAU.

Drainage Name **Subwatershed Name**	BLM Acres in Transient Snow Zone	Total Acres in Transient Snow Zone	Percent of Entire Drainage in the Transient Snow Zone	HRP (Percent of Drainage Recovered)
Bilger Creek	394	1,003	18	98
Frozen Creek	519	959	21	99
Lick Frontal	0	0	0	100
Myrtle Creek	126	301	7	100
North Myrtle Park	2	3	0	100
Lower North Myrtle Subwatershed	1,041	2,266	12	99
Buck Fork	264	1,093	36	96
Lee Creek	384	1,100	29	96
Lower Slide Creek	0	0	0	100
Middle North Myrtle	5	6	0	100
North Myrtle Frontal	0	0	0	100
North Myrtle Headwaters	1,031	2,090	51	88
Riser Creek	367	457	23	97
Upper Slide Creek	36	37	3	100
Upper North Myrtle Subwatershed	2,087	4,783	26	96
Ben Branch	3	3	0	100
Cedar Hollow	0	0	0	100
Myrtle Links	10	10	0	100
Pack Saddle	16	50	2	100
School Hollow	3	6	0	100
Short Course	0	0	0	100
Lower South Myrtle Subwatershed	32	69	1	100

Table 30. Number of Acres and Percent of Drainage in the Transient Snow Zone in the Myrtle Creek WAU.

Drainage Name **Subwatershed Name**	BLM Acres in Transient Snow Zone	Total Acres in Transient Snow Zone	Percent of Entire Drainage in the Transient Snow Zone	HRP (Percent of Drainage Recovered)
Curtin Creek	1,626	1,627	89	92
Lally Creek	1,076	1,315	32	92
Letitia Creek	267	346	8	99
Lower Louis Creek	60	87	4	99
South Myrtle Headwaters	3,012	3,192	95	98
Upper Louis Creek	1,285	1,393	39	92
Weaver Creek	1,961	1,986	50	90
Wiley Creek	65	214	7	99
Upper South Myrtle Subwatershed	9,352	10,160	38	95
Myrtle Creek WAU	12,512	17,278	23	97

Approximately 25 percent of the forested BLM-administered land and 21 percent of the forested land in the WAU is less than 30 years old (see Table 31). The Bilger Creek, North Myrtle Headwaters, Upper Slide Creek, Lally Creek, and Upper Louis Creek Drainages have at least 30 percent of the forested area less than 30 years old.

Drainages with high road densities, high stream crossing densities, more than 25 percent in the TSZ, and a large percentage less than 30 years old may be susceptible to increased peak flows. During rain-on-snow events in the TSZ, water is routed to the streams faster because snow accumulation is greater in stands less than 30 years old and they have less canopy to intercept the rain. Management activities, such as regeneration harvesting and road construction, may magnify the effects of increased peak flows in these Drainages.

Table 31. Acres and Percentages of Forested Land Less Than 30 Years Old by Drainage in the Myrtle Creek WAU.

Drainage	Total Forested BLM Acres	Percent of Total Forested BLM Acres Less Than 30 Years Old	Total Forested Non-BLM Acres	Percent of Total Forested Non-BLM Acres Less Than 30 Years Old	Total Forested Acres	Percent of Total Forested Acres Less Than 30 Years Old
Bilger Creek	1,277	31	2,612	29	3,889	30
Frozen Creek	861	16	2,615	30	3,476	26
Lick Frontal	484	21	1,953	28	2,437	27
Myrtle Creek	190	0	1,695	10	1,885	9
North Myrtle Park	356	41	1,186	2	1,542	11
Lower North Myrtle Subwatershed	3,168	25	10,061	23	13,229	23
Buck Fork	897	41	2,036	19	2,933	25
Lee Creek	1,808	32	1,860	7	3,668	20
Lower Slide Creek	952	28	737	0	1,689	16
Middle North Myrtle	419	47	1,368	7	1,787	16
North Myrtle Frontal	138	0	284	1	422	0
North Myrtle Headwaters	2,203	31	1,815	41	4,018	35
Riser Creek	1,238	35	774	0	2,012	22
Upper Slide Creek	982	39	167	38	1,149	39
Upper North Myrtle Subwatershed	8,637	34	9,041	16	17,678	24

Table 31. Acres and Percentages of Forested Land Less Than 30 Years Old by Drainage in the Myrtle Creek WAU.

Drainage	Total Forested BLM Acres	Percent of Total Forested BLM Acres Less Than 30 Years Old	Total Forested Non-BLM Acres	Percent of Total Forested Non-BLM Acres Less Than 30 Years Old	Total Forested Acres	Percent of Total Forested Acres Less Than 30 Years Old
Ben Branch	450	50	695	1	1,145	20
Cedar Hollow	208	0	796	36	1,004	29
Myrtle Links	505	13	1,235	9	1,740	10
Pack Saddle	474	20	1,579	1	2,053	5
School Hollow	588	32	930	5	1,518	16
Short Course	310	16	1,273	10	1,583	12
Lower South Myrtle Subwatershed	2,535	25	6,508	9	9,043	13
Curtin Creek	1,828	13	0	0	1,828	13
Lally Creek	2,220	33	1,743	36	3,963	34
Letitia Creek	1,618	11	2,153	17	3,771	14
Lower Louis Creek	624	28	1,135	13	1,759	18
South Myrtle Headwaters	2,987	4	261	5	3,248	4
Upper Louis Creek	2,360	30	1,149	32	3,509	30
Weaver Creek	3,095	25	760	8	3,855	21
Wiley Creek	1,299	19	1,579	26	2,878	23
Upper South Myrtle Subwatershed	16,031	20	8,780	22	24,811	21
Myrtle Creek WAU	30,371	25	34,390	18	64,761	21

Roads have been found to extend the stream network 60 percent over winter base flow stream lengths and 40 percent over storm event stream lengths (Wemple 1994). Road densities were 1.6 miles per square mile in Wemple's study area. Road densities in the WAU averages 4.39 miles per square mile (see Table 24). However, road densities may be higher since all roads may not be on the Geographic Information System (GIS). Roads may increase winter peak flows in streams in the WAU. The majority of roads within the WAU were constructed with ditches and/or insloped road surfaces designed to carry water off of the road surface. Once the water is in the ditch, much of it may reach the stream 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 density 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 carry the rapid runoff increases streamflow, potentially leading to down cutting, stream bank failures, stream bed scouring, and mass wasting where streams undercut adjacent slopes. The dominant factor affecting peak flow in the smaller drainages is how quickly the water gets to the stream channel. Land management and urban development activities may lead to increased surface runoff.

C. Stream Channel

There are approximately 875 miles of streams in the WAU (see Table 24). Stream density is about 7.35 miles of streams per square mile (see Table 24). Stream (or drainage) density can be related to erosion potential. A higher stream (drainage) density means the drainage is more complex and streamflow would respond faster to rainfall (Chow 1964). The faster response to rainfall may erode soils easier, causing streams to become wider or deeper. Also, steeper slopes may occur where the stream density is higher.

The Rosgen stream classification method may be used to characterize channel morphology for stream reaches in the WAU. The Rosgen Classification can be used as an indicator to determine stability, sensitivity to disturbance, recovery potential, sediment supply, streambank erosion potential, and influence of vegetation on the stream channel (Rosgen 1994). Streams may be divided into sediment source, transport, and depositional areas based on the slope or gradient of the stream channel. Stream channels tend to be steeper in the upper reaches and flatter in the lower reaches. High gradient streams (A and Aa+ type streams) are source areas for debris torrents. Medium gradient streams (B type streams) are transport areas that do not change much over time. Medium gradient streams probably lack large woody debris (LWD), since sediment passes through them rather than being deposited. Low gradient streams (F or C type streams) are the stream type 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 woody debris, and gravel accumulates in these reaches. Many low gradient stream reaches in the WAU have been eroded to bedrock, probably due to increased peak flows as a result of timber harvesting, road construction, Himalayan blackberry noxious weeds dominating some riparian areas, channel down cutting due to overgrazing on streambanks, and the lack of LWD due to stream cleaning practices.

The Rosgen Level I classification is a first look at determining stream types. The Level I characterization uses topographic maps, aerial photographs, or GIS to delineate stream types based on gradient and sinuosity (Rosgen 1996). Levels II through IV classifications require field surveys to determine priorities for restoration, potential for changes in stream morphology due to management activities, and design restoration projects.

Regional hydraulic geometry curves of bankfull streamflow, mean depth, width, and cross-sectional area were developed for the South Umpqua River Basin using Rosgen's Level II classification (see Graph D-1 in Appendix D). Regional curves can be used to refine the initial estimates of bankfull channel dimensions for ungaged streams, if the curves represent the hydro-physiographic province (Rosgen 1996). Correct and reliable interpretations of the interrelationships between dimension, pattern, profile, and streamflow depends upon correctly identifying bankfull stage or elevation and the related discharge. The Level II classification system can also be used to determine the feasibility of restoration projects, what structures are needed to enhance and promote channel stability, and the size of culverts or bridges to install. Regional curves are required to develop and conduct the Shadow Model, which may be used to develop a Water Quality Management Plan (WQMP) and establish Total Maximum Daily Loads (TMDLs).

Bankfull discharge transports most of the available sediment over time (Wolman and Miller 1960). Channel formation and maintenance are influenced the most by bankfull discharge (Leopold et al. 1964). Bankfull flows provide the annual maintenance of transporting sediment supplied from upstream sources, forming and removing bars, and forming or changing bends that create the average morphologic characteristics of the channel (Dunne and Leopold 1978).

Proper Functioning Condition

Proper Functioning Condition (PFC) surveys were conducted on 14 miles of streams in the WAU from 1996 through 2001 using methods established in Barrett et al. (1995). Thirty-two percent of the stream reaches surveyed in the WAU were considered to be in a proper functioning condition, 34 percent were considered to be functioning-at-risk with an upward trend, 21 percent were considered to be functioning-at-risk with a downward trend, and 13 percent were considered to be functioning-at-risk with no apparent trend, no stream reaches were considered to be nonfunctional. Problems associated with channelization, road encroachment on the stream channel, tree removal from riparian areas, noxious weeds, and upstream channel conditions were noted on the PFC surveys. The PFC survey notes indicated some, but not all, of the problems could be corrected by the BLM.

Restoration activities could be conducted in areas the PFC surveys noted problems. However, higher priority restoration sites in the WAU may be identified during site specific analysis.

D. Water Quality

1. Water Quality Standards Set by Law and Beneficial Uses

The Federal Clean Water Act of 1972, Section 303(d) directs each state to identify streams which do not meet the States water quality standards. Waters may be included in the 303(d) list if they are identified in Oregon's Water Quality Status Assessment 305(b) Report; dilution calculations or agencies, institutions, or the public; or identified as impaired or threatened in the State's nonpoint assessment submitted to the Environmental Protection Agency (EPA) under Section 319 of the Clean Water Act (Oregon Department of Environmental Quality 1994). The objective of the Clean Water Act of 1977 is to restore and maintain the chemical, physical, and biological integrity of the nations' waters (Bureau of National Affairs 1977). Water quality would be managed to protect and recognize beneficial uses. The Oregon Department of Environmental Quality (DEQ) monitors water quality conditions of the streams in Oregon.

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 Oregon Administrative Rules (OAR 340-41-282) set the Standards to be used in the Umpqua River Basin. Beneficial Uses for surface waters in the Umpqua River Basin include public and private domestic water supply, industrial water supply, irrigation, livestock watering, anadromous fish passage, salmonid fish rearing, salmonid fish spawning, resident fish and aquatic life, wildlife, hunting, fishing, boating, water contact recreation, aesthetic quality, and hydroelectric power.

The Oregon DEQ water quality parameters and their affected beneficial uses are listed in Table 32. The criteria used to list a stream as water quality limited are in Listing Criteria for Oregon’s 1998 303(d) List of Water Quality Limited Water Bodies (Oregon Department of Environmental Quality 1998).

Table 32. Water Quality Parameters and Beneficial Uses.

Water Quality Parameter	Beneficial Uses Affected
Aquatic Weeds or Algae	Water Contact Recreation, Aesthetics, Fishing
Bacteria (E. coli) or Fecal Coliform	Water Contact Recreation
Biological criteria	Resident Fish and Aquatic Life
Chlorophyll a	Water Contact Recreation, Aesthetics, Fishing, Water Supply, Livestock Watering
Dissolved Oxygen	Resident Fish and Aquatic Life, Salmonid Spawning and Rearing
Habitat Modification	Resident Fish and Aquatic Life, Salmonid Spawning and Rearing
Flow Modification	Resident Fish and Aquatic Life, Salmonid Spawning and Rearing
Nutrients	Aesthetics or Use Identified Under Related Parameters
pH	Resident Fish and Aquatic Life, Water Contact Recreation
Sedimentation	Resident Fish and Aquatic Life, Salmonid Spawning and Rearing
Temperature	Resident Fish and Aquatic Life, Salmonid Spawning and Rearing
Total Dissolved Gas	Resident Fish and Aquatic Life
Toxics	Resident Fish and Aquatic Life, Drinking Water
Turbidity	Resident Fish and Aquatic Life, Water Supply, Aesthetics

Table 33 shows water quality data for the WAU from the 1998 303(d) list (Oregon Department of Environmental Quality 1998). The table contains the site descriptions, the water quality limited parameter and criteria for listing, miles of stream listed (only the length within the WAU), season of concern, and the affected beneficial uses, as identified by the 1998 303(d) list. North Myrtle Creek, Riser Creek, and South Myrtle Creek are the streams included in the 1998 303(d) list.

Table 33. Water Quality Limited Parameters in the Myrtle Creek WAU.

Name and Description	Parameter	Listing Criteria	Miles	Season	Beneficial Uses Affected
North Myrtle Creek Mouth to Headwaters	Habitat Modification	--	16.6	--	Resident Fish and Aquatic Life, Salmonid Spawning and Rearing
South Myrtle Creek Mouth to Headwaters	Temperature	Greater Than 17.8 Degrees Celsius (64 Degrees Fahrenheit)	20.5	Summer	Resident Fish and Aquatic Life, Salmonid Spawning and Rearing
South Myrtle Creek Mouth to Weaver Creek	Flow Modification	--	14.6	--	Resident Fish and Aquatic Life, Salmonid Spawning and Rearing
Riser Creek Mouth to Headwaters	Temperature	Greater Than 17.8 Degrees Celsius (64 Degrees Fahrenheit)	4.1	Summer	Resident Fish and Aquatic Life, Salmonid Spawning and Rearing

Water quality samples were collected by BLM hydrologists from five streams in the summer and three streams in the winter of 1996 in the WAU (see Map 24 and Table 34). The chemicals tested for in the water samples did not exceed EPA drinking water standards. Although, the water samples had such low ionic concentrations that the data in Table 34 probably has some errors due to the low detection levels. The non-suppressed ion chromatography laboratory method may have been the reason for the low concentrations of calcium and magnesium and the 30 percent imbalance between cations and anions (Michael T. Land, personnel communication, 2000).

Map 24. Myrtle Creek Watershed Analysis Unit Water Sampling Sites

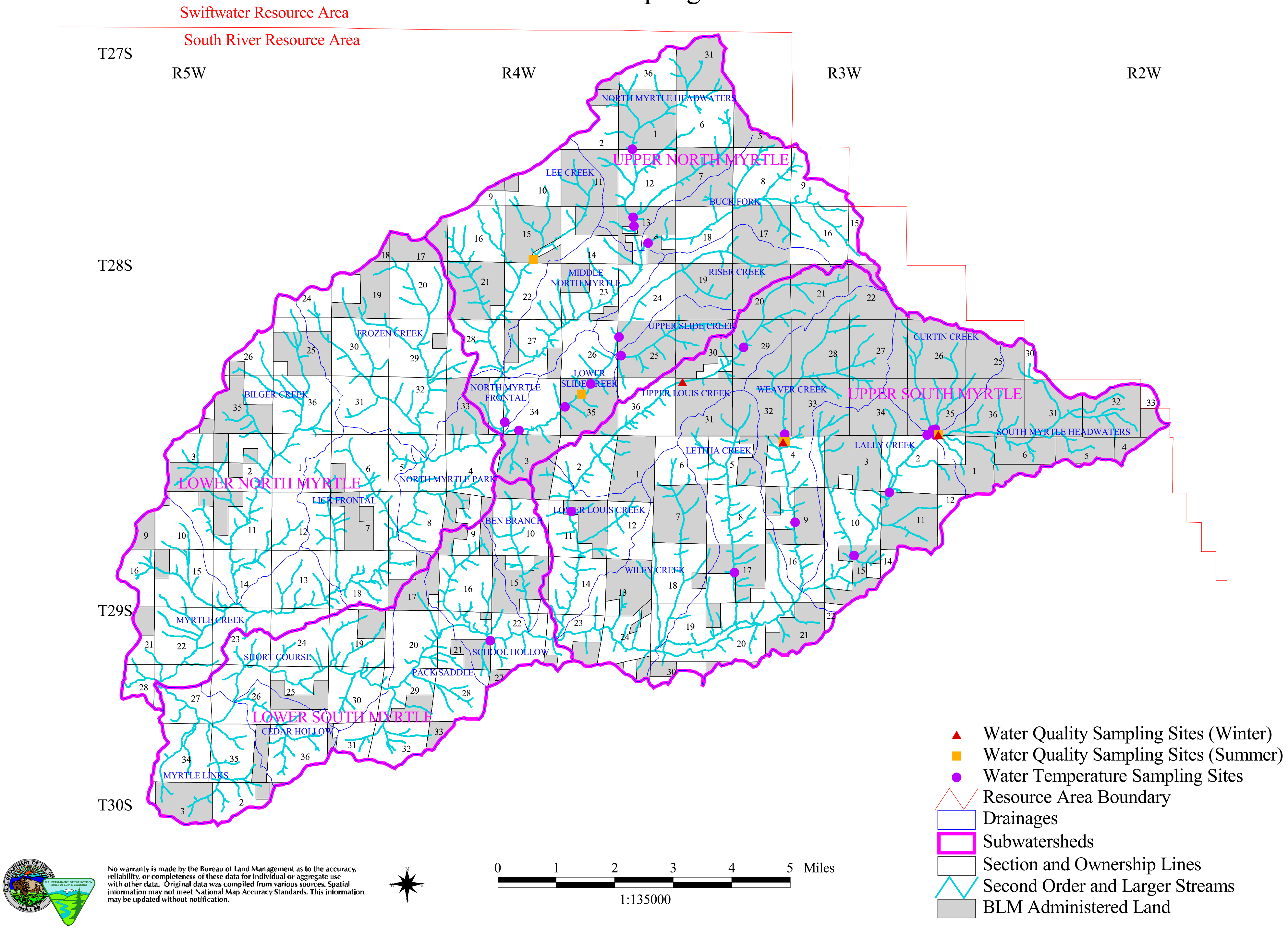


Table 34. Water Quality Data for Streams in the Myrtle Creek WAU.

	Lee Creek	Louis Creek	Slide Creek	South Myrtle Creek	South Myrtle Creek	Tributary to Weaver Creek	Weaver Creek	Weaver Creek
Date	8/22/96	2/29/96	8/22/96	2/29/96	8/6/96	8/6/96	2/29/96	8/6/96
Time	1530	1430	1400	1000	1230	1400	1200	1400
Discharge (cfs)	0.44	7.5	0.83	14.9	0.92	0.06	9.9	0.6
Specific Conductance (uS/cm at 25ºC)	189	114	230	70	208	208	111	214
Dissolved Oxygen (mg/l)	8.5	10.4	8.9	11.8	9.4	10	10.8	10
pH (standard units)	8.1	7.7	7.9	7.6	7.9	8.1	7.9	8.1
Water Temperature (ºC)	16.0	7.0	15.0	5.0	14.0	12.0	6.0	12.0
Calcium (mg/l)	2.6	2.1	3.9	0.7	1.3	4.2	1.8	26.0
Magnesium (mg/l)	1.9	0.5	1.1	0.3	0.4	1.1	0.5	6.5
Sodium (mg/l)	5.1	3.7	8.2	4.0	6.2	4.9	4.3	6.1
Potassium (mg/l)	0.2	0.4	0.7	0.7	0.9	0.6	0.4	0.6
Alkalinity (as CaCO3) (mg/l)	99	50	159	54	48	108	51	96
Sulfate (as SO4) (mg/l)	4.5	6.9	8.5	1.1	1.1	3.2	7.9	12.4
Chloride (mg/l)	2.8	1.9	15.9	1.3	4.1	2.5	1.9	2.9
Fluoride (mg/l)	<0.2	0.2	<0.2	0.2	<0.2	<0.2	<0.2	<0.2
Nitrogen (as NO2)	<0.01	<0.01	0.04	<0.01	<0.01	0.02	<0.01	<0.01
Nitrogen (as NO3)	0.02	<0.02	<0.02	<0.02	0.02	0.02	<0.02	<0.02
Nitrogen (as NH3)	<0.05	<0.1	<0.05	<0.1	<0.05	<0.05	<0.1	<0.05
Phosphate (as PO4)	<0.2	0.3	<0.2	<0.3	<0.2	0.3	<0.3	<0.2
Bromide (mg/l)	<0.3	<0.2	<0.3	0.2	<0.3	0.8	0.2	<0.3
Lithium (mg/l)	<0.05	<0.1	<0.05	<0.1	<0.05	<0.05	<0.1	<0.05
Strontium (mg/l)	0.9	<0.3	<1.0	<0.3	<1.0	<1.0	<0.3	<1.0
Barium (mg/l)	<0.5	<0.3	<0.5	<0.3	<0.5	<0.5	<0.3	<0.5

2. Stream Temperature

Stream temperature is an important water quality parameter monitored in the WAU. Stream temperature affects resident fish, aquatic life, and salmonid fish spawning and rearing. Currently, streams with salmonids meet the Oregon DEQ water quality for stream temperature criteria when maintained at or below 64 degrees Fahrenheit (17.8 degrees Celsius) for the seven-day moving average daily maximum temperature.

The Roseburg BLM District has collected stream temperature data on 11 streams in the WAU (see Map 24 and Table 35). The number of sites has varied from year to year. For example, there were eight sites in 1999 and 13 sites in 2000. The sites were selected to provide current stream conditions and water temperatures on BLM-administered land in the WAU.

Eight streams in the WAU had seven-day maximum temperatures exceeding 64 degrees Fahrenheit (17.8 degrees Celsius). The upper Weaver Creek site did have temperatures greater than 64 degrees Fahrenheit (17.8 degrees Celsius) for five days in 1998 but the seven-day maximum temperature was less than 64 degrees Fahrenheit (17.8 degrees Celsius). Also, the maximum water temperature at the upper Weaver Creek site occurred on July 28,1998, which happened to be when the air temperatures were abnormally high (see Graph 1).

Table 35. Water Temperature Data Collected by the Roseburg BLM District in the Myrtle Creek WAU.

Stream Name	Year Data was Collected	Drainage Area Above Site (Acres)	Site Elevation (Feet)	Range of Seven-Day Maximum Temperatures (°C)	Maximum Number of Days Temperature Exceeded 17.8 °C (Year)	Low Flow at Sites for 2001 (cfs)
Buck Fork Creek	2001	2,950	1,145	18.7	24 (2001)	----
Curtin Creek	1994,1996 to 1999	980	1,575	15.5 - 17.0	1 (1998)	----
Johnson Creek	1996 to 1999	800	1,575	15.0 - 17.3	0	----
Letitia Creek	2001	1,970	1,145	18.0	8 (2001)	0.14
Louis Creek (upper site)	1997 to 1999, 2001	1,180	1,600	14.6 - 16.7	0	----
Louis Creek (lower site)	2001	3,920	1,050	20.4	59	0.41
North Myrtle Creek (upper site)	2000	1,690	1,390	16.0	0	----
North Myrtle Creek (middle site)	2000 to 2001	3,900	1,140	16.8 - 19.1	24 (2000)	0.3
North Myrtle Creek (lower site)	2001	13,370	850	24.1	88 (2001)	----
Unnamed Tributary of North Myrtle Creek	1999	985	1,160	16.4	0	----
Riser Creek	1997 to 1999, 2001	1,920	1,060	17.5 - 21.2	53 (1997)	0.1
Slide Creek (above Riser Creek)	1997 to 2000	1,030	1,060	16.7 - 18.5	31 (1997)	----
Slide Creek (middle site)	2000	3,540	985	18.3	14 (2000)	----
Slide Creek (lower site)	2000	3,970	930	19.7	40 (2000)	----
Slide Creek (near mouth)	2001	4,610	870	21.1	81 (2001)	0.25

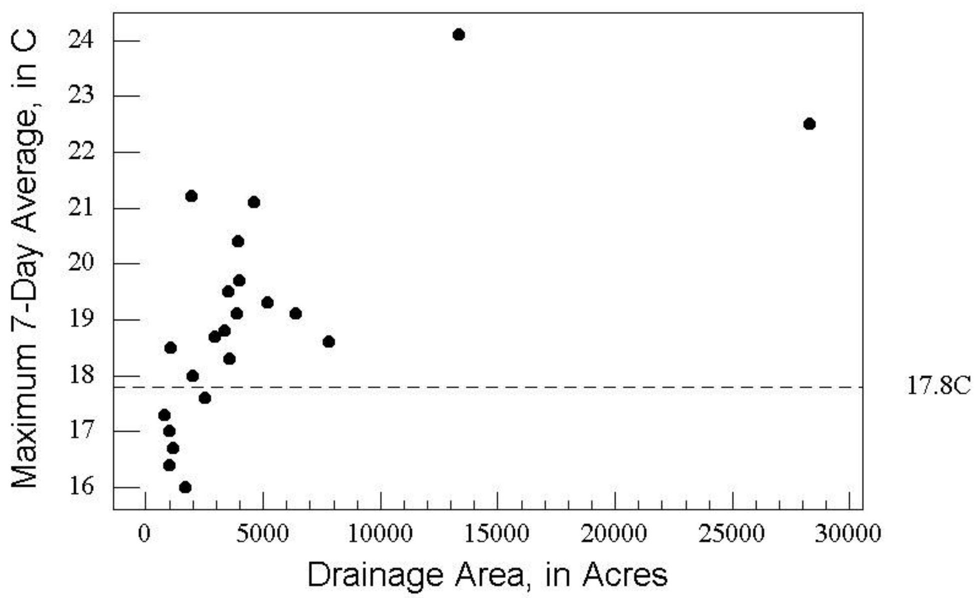
Table 35. Water Temperature Data Collected by the Roseburg BLM District in the Myrtle Creek WAU.

Stream Name	Year Data was Collected	Drainage Area Above Site (Acres)	Site Elevation (Feet)	Range of Seven-Day Maximum Temperatures (°C)	Maximum Number of Days Temperature Exceeded 17.8 °C (Year)	Low Flow at Sites for 2001 (cfs)
South Myrtle Creek (upper site)	1996 to 2000	3,370	1,565	16.7 - 18.8	23 (1998)	----
South Myrtle Creek (below Johnson Creek)	2000, 2001	5,180	1,530	17.1 - 19.3	8 (2001)	0.26
South Myrtle Creek (T29S,R3W, Section 11)	2000, 2001	6,410	1,360	19.0 - 19.1	17 (2000)	----
South Myrtle Creek (above Lally Creek)	2001	7,830	1,230	18.6	11 (2001)	0.66
South Myrtle Creek (lower site)	1994, 1995	28,330	840	20.2 - 22.5	56 (1994)	----
Weaver Creek (upper site)	1997 to 2001	2,500	1,470	16.5 - 17.6	5 (1998)	0.24
Weaver Creek (lower site)	2001	3,490	1,230	19.5	38 (2001)	0.41

Stream temperature data are separated by water year in Table 36. The seven-day maximum water temperatures correlated well with each other and with the seven-day maximum air temperatures at the Riddle weather station.

Water temperatures in the WAU were more related to the elevation of a stream than to the size of the upstream drainage area. Data from Table 36 were used to create Graphs 2 and 3.

Graph 2. Comparison of the Annual Maximum Seven-day Average Stream Temperature to Drainage Area for Streams in the Myrtle Creek WAU.



Graph 3. Comparison of the Annual Maximum Seven-day Average Stream Temperature to Elevation for Streams in the Myrtle Creek WAU.

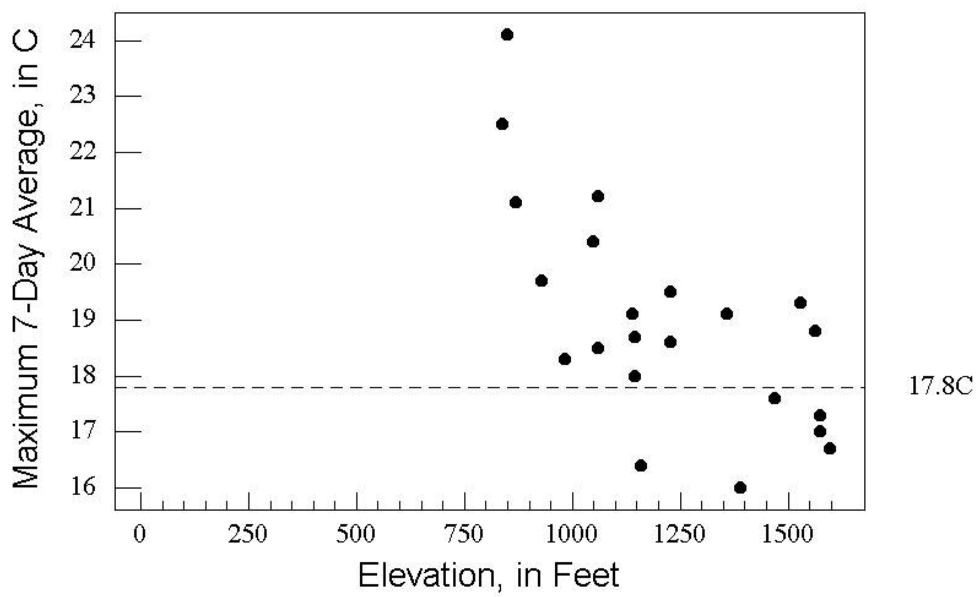


Table 36. Summer Stream Temperature Data Summarized by the Year Collected in the Myrtle Creek WAU by the Roseburg BLM District.

Stream Name	Date	Maximum Temperature (°C)	Date	Minimum Temperature (°C)	ΔT (°C)	Seven-Day Averages			Days Greater Than 17.8 °C
						Date	Maximum	ΔT (°C)	
Buck Fork Creek	08/10/01	19.4	06/04/01	8.9	5.7	08/09/01	18.7	3.8	24
Curtin Creek	07/21/94	17.4	10/16/94	7.0	2.6	07/22/94	16.5	1.9	0
Curtin Creek	07/29/96	17.0	09/23/96	8.6	2.3	07/27/96	16.8	1.4	0
Curtin Creek	08/06/97	16.1	06/06/97	9.8	2.3	08/05/97	15.5	1.4	0
Curtin Creek	07/28/98	18.0	06/17/98	9.5	2.5	07/26/98	17.0	1.7	1
Curtin Creek	08/28/99	16.1	06/09/99	6.9	2.5	08/26/99	15.6	1.0	0
Johnson Creek	07/29/96	17.5	09/23/96	8.4	2.5	07/27/96	17.3	1.6	0
Johnson Creek	08/14/97	15.4	06/06/97	9.5	2.2	08/14/97	15.0	1.0	0
Johnson Creek	07/28/98	17.3	06/17/98	8.9	2.7	07/26/98	16.5	1.8	0
Johnson Creek	08/28/99	16.4	06/09/99	7.2	2.3	08/26/99	15.8	1.0	0
Letitia Creek	08/12/01	18.5	05/17/01	8.8	6.1	08/12/01	18.0	3.2	8
Louis Creek (upper site)	07/21/97	15.1	06/22/97	9.6	2.6	07/23/97	14.6	2.0	0
Louis Creek (upper site)	07/28/98	16.7	06/17/98	9.0	2.8	07/26/98	15.7	2.0	0
Louis Creek (upper site)	08/28/99	15.3	10/16/99	6.4	2.5	08/26/99	14.8	1.2	0
Louis Creek (upper site)	08/10/01	17.1	06/04/01	7.5	5.0	08/12/01	16.7	3.2	0
Louis Creek (lower site)	08/10/01	21.0	05/17/01	8.7	7.3	08/12/01	20.4	4.3	59
North Myrtle Creek (upper site)	08/08/00	16.4	06/10/00	8.9	3.0	08/06/00	16.0	2.2	0
North Myrtle Creek (middle site)	08/08/00	19.6	06/10/00	9.7	5.8	08/06/00	19.1	4.4	24
North Myrtle Creek (middle site)	08/12/01	17.3	06/04/01	8.1	3.4	08/12/01	16.8	2.5	0
North Myrtle Creek (lower site)	08/10/01	24.9	06/04/01	11.2	7.6	08/12/01	24.1	6.7	88
Unnamed Tributary to North Myrtle Creek	08/28/99	17.0	10/17/99	5.7	3.1	08/26/99	16.4	1.9	0
Riser Creek	08/06/97	20.8	06/08/97	13.1	4.3	08/04/97	20.1	3.7	53
Riser Creek	07/28/98	22.2	09/11/98	9.7	4.8	07/27/98	21.2	3.3	51
Riser Creek	08/10/99	19.2	10/17/99	5.8	4.1	07/12/99	18.5	3.2	45
Riser Creek	08/10/01	18.3	09/07/01	10.1	4.5	08/10/01	17.5	2.2	5
Slide Creek (above Riser Creek)	08/06/97	19.3	09/07/97	12.4	4.7	08/06/97	18.5	3.9	31
Slide Creek (above Riser Creek)	07/28/98	15.4	06/17/98	9.3	2.6	07/26/98	14.9	1.6	0
Slide Creek (above Riser Creek)	08/10/99	17.2	10/17/99	5.4	3.9	07/31/99	16.7	2.8	0
Slide Creek (above Riser Creek)	08/08/00	17.7	09/10/00	10.1	3.3	08/07/00	17.3	2.4	0
Slide Creek (middle site)	07/31/00	19.0	09/10/00	10.7	3.8	08/07/00	18.3	2.6	14
Slide Creek (lower site)	07/31/00	20.4	09/09/00	10.7	5.7	08/06/00	19.7	4.2	40
Slide Creek (near mouth)	8/10/01	21.8	5/19/01	9.4	8.7	08/12/01	21.1	4.5	81
South Myrtle Creek (upper site)	07/29/96	18.3	09/22/96	9.2	3.4	07/27/96	18.0	2.5	5
South Myrtle Creek (upper site)	08/14/97	18.0	06/08/97	9.6	3.5	08/07/97	17.5	3.1	2
South Myrtle Creek (upper site)	09/01/98	19.3	06/17/98	9.3	5.6	09/03/98	18.8	4.5	23
South Myrtle Creek (upper site)	08/28/99	17.2	06/09/99	7.0	3.3	08/25/99	16.7	1.7	0
South Myrtle Creek (upper site)	08/08/00	17.9	06/11/00	9.1	3.0	08/06/00	17.5	2.3	1
South Myrtle Creek (below Johnson Creek)	08/08/00	17.7	06/11/00	8.1	3.7	08/06/00	17.1	3.1	0
South Myrtle Creek (below Johnson Creek)	08/10/01	19.3	05/17/01	7.6	4.4	08/12/01	18.7	3.4	8
South Myrtle Creek (T29S/R3W-11)	08/08/00	19.7	06/11/00	9.3	4.8	08/06/00	19.0	3.8	17
South Myrtle Creek (T29S/R3W-11)	08/10/01	19.7	05/17/01	7.7	5.3	08/12/01	19.1	3.7	14

Table 36. Summer Stream Temperature Data Summarized by the Year Collected in the Myrtle Creek WAU by the Roseburg BLM District.

Stream Name	Date	Maximum Temperature (°C)	Date	Minimum Temperature (°C)	ΔT (°C)	Seven-Day Averages			Days Greater Than 17.8 °C
						Date	Maximum	ΔT (°C)	
South Myrtle Creek (above Lally Creek)	08/10/01	19.2	06/04/01	8.1	5.0	08/12/01	18.6	3.2	11
South Myrtle Creek (lower site)	07/21/94	24.1	10/13/94	7.5	5.2	07/21/94	22.5	3.7	56
South Myrtle Creek (lower site)	07/28/95	21.0	06/21/95	10.0	4.6	07/20/95	20.2	2.6	38
Weaver Creek (upper site)	08/06/97	17.3	06/06/97	9.5	3.3	08/08/97	16.5	2.7	0
Weaver Creek (upper site)	07/28/98	18.6	06/17/98	9.0	3.4	07/26/98	17.6	2.5	5
Weaver Creek (upper site)	08/28/99	17.6	06/09/99	6.8	3.7	08/26/99	16.9	2.2	0
Weaver Creek (upper site)	08/08/00	17.7	06/10/00	9.0	3.6	08/07/00	17.2	2.5	0
Weaver Creek (upper site)	08/12/01	18.0	06/04/01	7.7	4.5	08/12/01	17.6	2.6	2
Weaver Creek (lower site)	08/12/01	20.0	05/17/01	7.9	7.3	08/12/01	19.5	3.7	38

Definitions:
ΔT = Highest value of the daily difference between the maximum and minimum temperatures for the season.
Seven-Day Maximum = Average value of daily maximum temperatures for the highest consecutive seven days.
Seven-Day Minimum = Average value of daily minimum temperatures for the same seven days.
Seven-Day ΔT = Average of the daily difference between the maximum and minimum temperatures for the same seven days.

3. pH

The pH standard set by DEQ for aquatic life in the Umpqua River Basin is 6.5 to 8.5. MacDonald et al. (1990) found pH levels less than 6.5 and greater than 9 can have adverse affects on fish and aquatic insects. However, non-lethal affects of pH levels on fish are unknown.

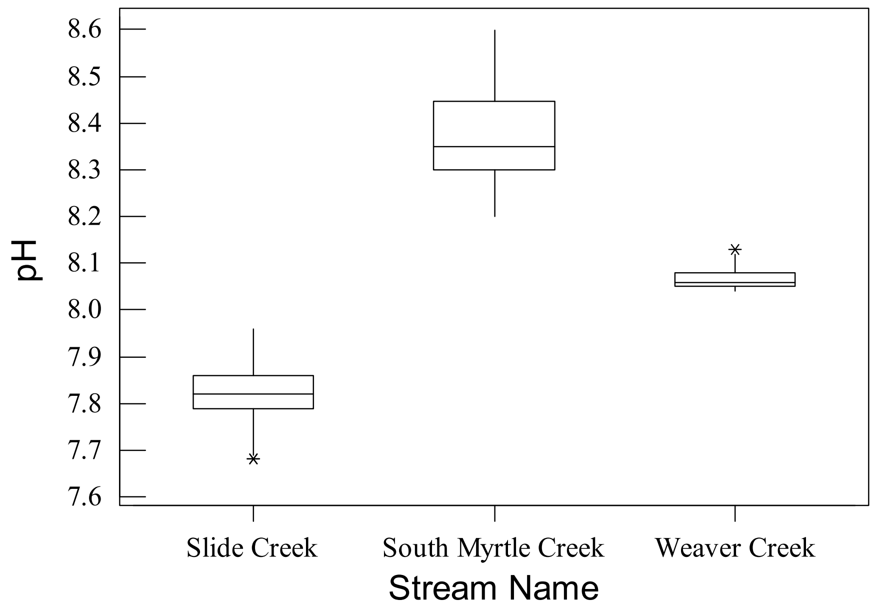
The Little River Watershed Analysis (USDA and USDI 1995) reported algae accumulations in streams can affect pH. The process of photosynthesis by aquatic organisms uses dissolved carbon dioxide and consumes hydrogen ions during the daylight hours, raising pH levels (more alkaline). Respiration by aquatic organisms at night releases carbon dioxide, decreasing pH levels. Diurnal algae-driven pH cycles in Little River were found to range from 7.8 in the morning to 9.1 in the late afternoon. Photosynthesis occurs less on shaded stream reaches or on cloudy days and pH levels are lower. Maximum pH values of 9.0 may occur in streams unaffected by pollution (Hem 1985).

Bureau of Land Management hydrologists set out instruments to collect pH data on three streams in the WAU. The pH data was collected every half-hour for up to seven consecutive days. The data are presented in Chart 10. The pH data met water quality standards. Data collected from 1996 through 2001 at the same sites also met the pH water quality standards.

4. Dissolved Oxygen

Dissolved oxygen (DO) is required for resident fish and aquatic organism survival and salmonid spawning and rearing. Temperature and air pressure affect the amount of DO in water. The Oregon DEQ set minimum DO standards at 6.5 mg/l for cool-water aquatic resources, which became effective July 1, 1996. Greater than ten percent of the samples must exceed the standard with at

Chart 10. Myrtle Creek WAU pH Data.



two samples collected per season in order for the stream to be considered water quality limited for DO. The minimum DO standards for salmonid spawning streams were set at eleven mg/l, except where barometric pressure, altitude, and naturally occurring temperatures preclude attainment of the standard, then DO levels should not be less than 95 percent saturation. The minimum DO standards for cold water aquatic resources were set at eight mg/l, unless the same conditions mentioned for salmonid spawning streams are present, then the DO levels should not be less than 90 percent saturation.

The BLM attempted to collected continuous DO at three sites in the WAU in August 2001. The instruments malfunctioned so the data are not presented. Dissolved oxygen data could be collected in the WAU later.

5. Turbidity and Sedimentation

Turbidity is a function of suspended sediments and algal growth in a stream. Turbidity varies naturally from stream to stream depending upon geology, slope stability, rainfall, and temperature. Turbidity causing activities are allowed no more than a ten percent cumulative increase in stream turbidities, as measured relative to a control point upstream. High turbidity levels can impact salmonid feeding and fish growth (McDonald et al. 1990). Turbidity may also impact drinking water quality and recreational and aesthetic uses of water. Turbidity reduces the depth sunlight penetrates, altering the rate of photosynthesis, and impairing a fish's ability to capture food. Turbidity increases with, but not as fast as, suspended sediment concentrations. Turbidity data have not been collected by the BLM in the WAU. The DEQ did not identify any problems with turbidity.

Roads have the potential to affect the sediment regime. Erosional effects can occur when culverts become plugged or cannot handle peak flows, diverting streams to out of the original channel, flowing down the road, 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). The types of road-related surface erosion were not quantified for this analysis. The quantity of sediment associated with mass wasting and potential stream crossing failures need to be evaluated. Sediment data have not been collected by the BLM in this WAU.

6. Trace Metals

Trace metals should not be introduced into waters of the state in amounts, concentrations, or combinations above natural background levels, which may be harmful, may chemically change to harmful forms in the environment, or may accumulate in sediments or bioaccumulate in aquatic life or wildlife to levels that adversely affect public health, safety, or welfare, aquatic life, wildlife, or other designated beneficial uses. Trace metal water quality criteria should not exceed the criteria established for the various metals by the Environmental Protection Agency (Environmental Protection Agency 1986). Trace metal data have not been collected in the WAU. No streams in the WAU have been listed as water quality limited due to trace metal toxicity.

7. Nitrogen

Forest fertilization can impact water quality by increasing nitrogen levels in streams. Nitrogen in streams can lead to an increase in primary productivity, particularly algal blooms. Algae accumulations in streams may affect pH. Aquatic organisms release carbon dioxide at night causing stream pH to decrease. During the day aquatic organisms use carbon dioxide and hydrogen during photosynthesis causing stream pH to increase. Aquatic organism respiration can lead to large changes in pH between night and day. Peak nitrogen concentrations coinciding with optimum growing conditions for aquatic organisms would have the greatest effect on a stream (Fredriksen et al. 1975). However, maximum nitrogen concentrations and losses have been measured in the winter when the water was cold and photosynthesis was minimal (Fredriksen et al. 1975).

Studies have measured less than 0.5 percent of the total nitrogen applied reached streams with adequate buffers, whereas two to three percent of the applied nitrogen was measured in streams with inadequate buffers (Moore 1975). Water samples were collected from four sites in the WAU in 1997. A slight increase in nitrogen levels in three of the streams occurred after fertilization of forested stands. At the fourth site, the nitrogen level increased 0.2 mg/l two weeks after fertilizer was applied. The natural range of nitrogen in the streams was not determined, so it is unknown if the increase of nitrogen in the streams was due to applying fertilizer to the forested stands.

8. Groundwater

Groundwater in the WAU is chemically diverse in character (Frank 1979). The water type is generally sodium bicarbonate. However, sodium/calcium bicarbonate and calcium bicarbonate water types have been found in the WAU. The variations depend mainly on the rock type forming the aquifer, the topography, and in some places, the depth of the well. The majority of the WAU contains Jurassic volcanic and sedimentary rocks with small areas of alluvium, Cretaceous sedimentary rocks, and Cretaceous and Jurassic intrusive rocks (Frank 1979). Yields from wells in the WAU range from less than one gallon per minute to 40 gallons per minute. Most of the wells yield less than ten gallons per minute.

E. Interpretation

Many Drainages in the WAU have been impacted by human activities. Agricultural uses can have a negative impact on streams. Water withdrawn for irrigation and removing riparian vegetation can lead to decreased flows and increased stream temperatures in the summer. Fertilizers, which can add nutrients and livestock in riparian areas, which can cause increased sediment, can negatively impact water quality.

Studies have documented road construction and timber harvesting affect stream channels and the hydrology of a watershed (Beschta 1978, Harr et al. 1979, Harr and McCorison 1979, Jones and Grant 1996, and Wemple et al. 1996). Roads can intercept water that would normally move through the ground as subsurface flow. When the water is routed to the stream channel faster it can cause increases in peak flows. This means less water would be stored as groundwater to be released in the summer for supporting fish and other aquatic organisms. Road density in the WAU is 4.39 miles per square mile. Fifteen Drainages have road densities greater than four miles per square mile, which can affect the hydrology in the WAU. Drainages with road densities greater than four miles per square mile, numerous stream crossings, and intensive timber harvesting activities probably have experienced peak flows greater than what would have occurred in an undisturbed drainage.

The Riparian Reserve age class distribution indicates the stream channels are less complex, the substrate has been degraded, and fish habitat is poor in many areas of the WAU. Table C-1 in Appendix C shows the percentage of Riparian Reserves that contain stands at least 80 years old. Removing LWD from the stream channels in the past and harvesting vegetation along streams has reduced the amount of LWD available for instream structures. Timber harvesting and road construction in and adjacent to riparian areas have lead to higher stream temperatures within the WAU. Riparian Reserves would help prevent increases in stream temperatures because of timber harvesting activities on BLM-administered land.

Many roads in the WAU have not been maintained on a regular schedule. Routine road maintenance could decrease sedimentation from roads, landslides from road failures, and the risks associated with culverts.

Water quality in the WAU is impacted during the summer low flows (Oregon Department of Environmental Quality 1998). Many streams have been impacted from agriculture, timber harvesting, and urban settlement and development. The BLM administers a small percentage of land in some of the Drainages. Improving water quality may require more than making improvements on BLM-administered land.

VII. Species and Habitats

A. Fisheries

1. Historic Fish Population Conditions

Accurate historic fish population data are not available since extensive fish population and distribution studies were not conducted in the Myrtle Creek WAU. Aquatic habitat and fish populations in Myrtle Creek are similar to the South Umpqua River but on a smaller scale. Information from the South Umpqua River is included in this watershed analysis because it is the available data that is the closest to characterizing the historic fish population status in the Myrtle Creek WAU.

The South Umpqua River historically supported healthy populations of resident and anadromous salmonid fish. A survey conducted by the Umpqua National Forest in 1937 reported salmon, steelhead, and cutthroat trout were abundant throughout many reaches of the upper South Umpqua River and its tributaries (Roth 1937). Excellent fishing opportunities for resident trout and anadromous salmon and trout historically existed in the South Umpqua River (Roth 1937). These species survived in spite of the naturally low streamflows and warm water temperatures that occurred historically within the South Umpqua River Basin (Nehlsen 1994).

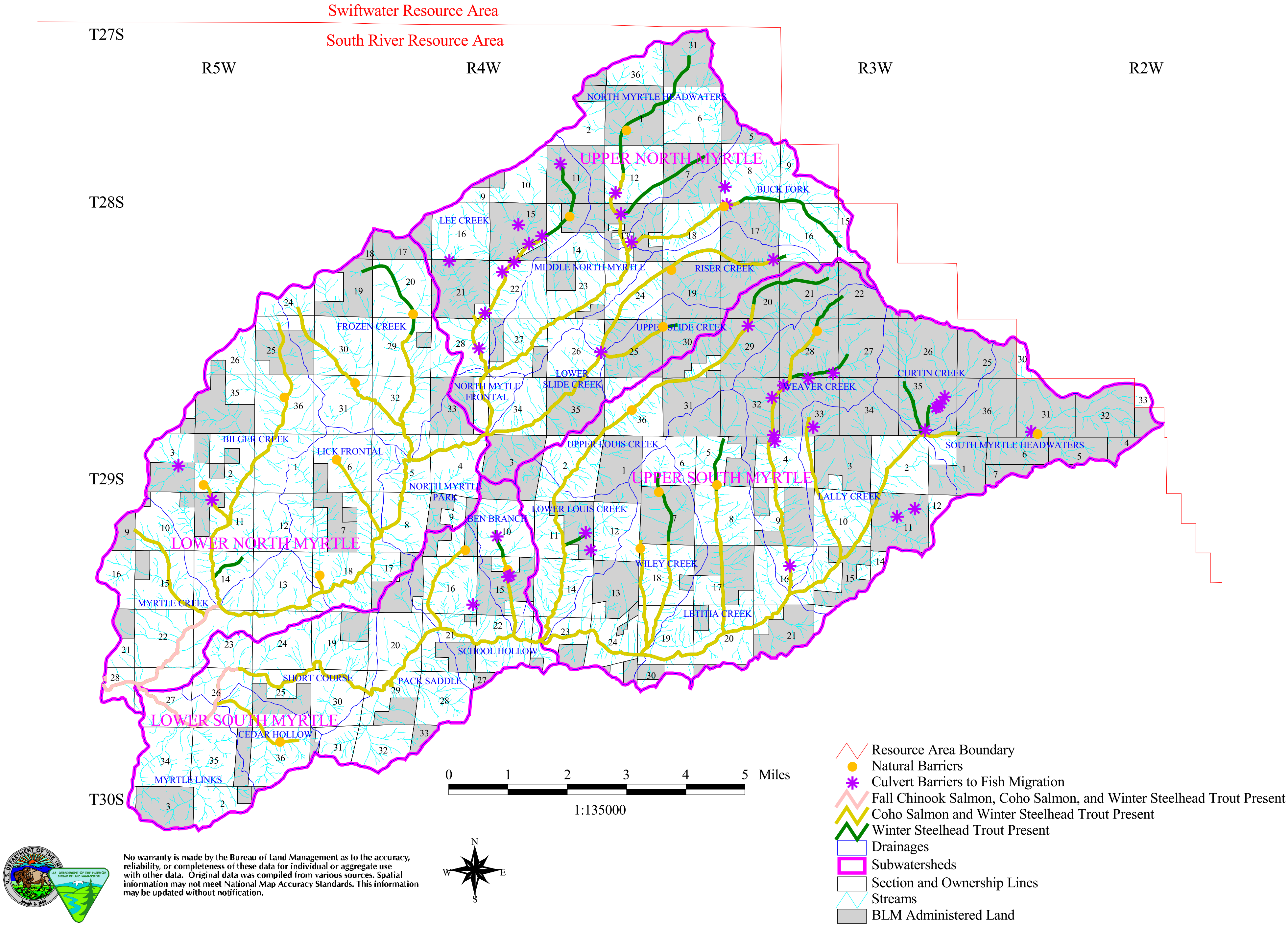
2. Current Fish Population Conditions

Ocean and freshwater conditions affect anadromous salmon populations because these fish live in both environments. Enhanced streamflows and nearshore ocean mixed layer conditions favor high Alaskan salmon productivity (Mantua et al. 1997). Generally, the converse appears to be true for Pacific Northwest salmon (Mantua et al. 1997).

Scientists are trying to evaluate the importance of suitable freshwater habitat in relationship to ocean conditions for sustaining healthy salmon populations. Decreased streamflows and water quality, dams, and spawning and rearing habitat degradation in Pacific Northwest streams has impacted salmon populations in the last fifty years. The South Umpqua River once supported abundant populations of chinook and coho salmon, steelhead, and cutthroat trout. A 1991 status report identified 214 native, naturally spawning fish stocks throughout the Pacific Northwest were vulnerable and at-risk of extinction (Nehlsen et al. 1991). According to the 1991 report, within the South Umpqua River, summer steelhead was considered to be extinct, spring chinook and coho salmon were considered to be at-risk of extinction, and winter steelhead and fall chinook salmon were not considered to be at-risk.

Winter steelhead and resident rainbow trout (Oncorynchus mykiss), fall and spring chinook salmon (Oncorynchus tshawytscha), coho salmon (Oncorynchus kisutch), and sea-run and resident cutthroat trout (Oncorynchus clarki) have been documented by the Oregon Department of Fish and Wildlife (ODFW) using streams in the Myrtle Creek WAU. Anadromous fish distribution limits and

Map 25. Myrtle Creek Watershed Analysis Unit
Anadromous Fish Distribution and Barriers



documented stream barriers in the Myrtle Creek WAU have been mapped, using GIS (see Map 25). Distribution limits are determined by the extent fish are able to migrate upstream. Natural waterfalls, log or debris jams, beaver dams, and road crossings are potential barriers to fish migration. Other barriers to fish migration may occur because of water quality impairment, such as high or low pH, or high water temperatures.

a. Steelhead

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). This is probably because of the extremely low stream flows and high water temperatures that occur in the South Umpqua River system during the summer.

The Oregon Coast steelhead trout Evolutionary Significant Unit (ESU) is a candidate for listing under the Endangered Species Act (Federal Register, Vol.63 No.53/Thursday, March, 19, 1998/ Rules and Regulations). An ESU is defined as a distinct population or group of populations that are reproductively isolated from other population units and represent an important component in the evolutionary legacy of the species.

Smolt trap data collected in Myrtle Creek between 1997 and 2000 provides some information about the steelhead population in the WAU. Although the amount of data collected represents a short amount of time, steelhead population trends show a steady increase in emigrating steelhead smolts. Steelhead distribution in the WAU is shown on Map 25.

b. Chinook Salmon

Historically, the principal chinook run in the South Umpqua River was in the late spring and summer (Roth 1937). The Oregon Department of Fish and Wildlife (ODFW) considered spring chinook runs to be depressed with 92 to 716 juvenile fish migrating to the ocean from 1985 to 1995 (ODFW unpublished data). The spring chinook run is considered to be at high risk of extinction (Nehlsen et al. 1991). Fall chinook runs were considered to be healthy by ODFW in 1994 (Nehlsen 1994).

Juvenile chinook salmon exhibit two general fresh water rearing patterns, stream-type rearing and ocean-type rearing. Stream-type chinook salmon delay migrating to the sea for one or two years (Healey 1983, as cited by Groot and Margolis1991). The stream-type chinook salmon often move out of the tributary streams and into the main river where they occupy deep pools or crevices between boulders and cobble during the winter. Ocean-type chinook salmon migrate to the sea during their first year of life, normally within three months.

Chinook spawning surveys have not been conducted in the Myrtle Creek WAU. However, data collected by ODFW indicates the ocean-type chinook salmon use about 2.8 miles of North Myrtle Creek and about 2.7 miles of South Myrtle Creek for spawning.

Smolt trap data collected in Myrtle Creek from 1997 to 2000 indicated the number of chinook smolt emigrating fluctuated during the four years the data was collected. The fluctuation may indicate changes in rainfall patterns, ocean conditions, sampling error, or migration timing.

c. Coho Salmon

Coho salmon were considered abundant in the South Umpqua River system in 1972 by the Oregon State Game Commission (Lauman et al. 1972). About 4,000 coho salmon spawned in the South Umpqua River system with 1,450 spawning in Cow Creek. Coho salmon in the South Umpqua River system are suffering the same declines as other coastal stocks. These declines may be due to the degradation of coho salmon habitat, the effects of extensive hatchery releases, and overfishing (Nehlsen 1994). No coho salmon were observed in the upper stream reaches of the South Umpqua River system during the 1937 survey (Roth 1937). Coho salmon were documented in Jackson Creek, a major tributary to the South Umpqua River, in the summer of 1989 (Roper et al. 1994). The documentation of coho salmon in Jackson Creek suggests this species exists in other tributaries in the upper reaches of the South Umpqua River system.

The National Marine Fisheries Service (NMFS) listed the Oregon Coast Coho salmon Evolutionary Significant Unit (ESU) as a threatened species in 1998 under the Endangered Species Act (ESA) of 1973 (Federal Register, Vol. 63, No. 153/ Monday, August 10, 1998/Rules and Regulations). Judge Michael Hogan ruled on September 12, 2001 that the coho salmon listing should have included hatchery fish, which meant coho salmon was to be considered as a candidate species. The ninth circuit court of appeals ordered a stay to Judge Hogan's ruling on December 12, 2001, which means coho salmon is considered to be a threatened species until a final ruling is made by the ninth circuit court.

Critical habitat for Oregon Coast coho salmon was designated on February 16, 2000 and includes all waterways below naturally impassable barriers. Critical habitat is designated based on physical and biological features considered essential for a listed species. Essential features of designated critical habitat for the coho salmon include substrate, water quality, stream flow, water temperature, food, riparian vegetation, and safe fish migration. This designation also includes the adjacent riparian zone, which is defined as the area that provides shade, sediment, nutrient or chemical regulation, streambank stability, and large woody debris or organic matter.

Random coho spawning surveys were conducted by ODFW in the Myrtle Creek WAU from 1996 to 1999 (see Table C-4 in Appendix C). Coho salmon were using spawning habitat in North Myrtle Creek and South Myrtle Creek, as well as some tributaries of both creeks.

Smolt trap data collected in Myrtle Creek from 1997 to 2000 indicated the number of coho salmon smolt emigrating fluctuated. The limited amount of data is insufficient to estimate the coho salmon population trend.

d. Cutthroat Trout

Cutthroat trout potentially found in the Myrtle Creek WAU can be divided into three distinct groups based on differences in life histories. The three groups include resident, fluvial (in-river migratory), and anadromous (or sea-run). Resident cutthroat trout do not migrate long distances, instead they remain in tributaries near spawning and rearing areas and maintain small territories (Trotter 1989, as cited by Johnson et al.1994). They appear to be slower growing than their fluvial and sea-run counterparts, seldom growing larger than six to eight inches in length. Resident cutthroat trout rarely live longer than two or three years (Wyatt 1959, Nicholas 1978, as cited by Johnson et al. 1994).

Fluvial cutthroat trout rear in large river basins but do not migrate to the sea. Similar to sea-run cutthroat trout, fluvial cutthroat trout migrate into smaller tributaries to spawn. Little is known about fluvial cutthroat trout. This life history group was discovered only recently in the Umpqua River Basin. Fluvial cutthroat trout have been reported below barriers or in locations occupied by anadromous fish on rare occasions (Johnson et al. 1994).

Anadromous (sea-run) cutthroat trout rear in estuaries or make short ocean migrations and then return to freshwater streams to spawn. Unlike other anadromous salmonids, sea-run cutthroat trout do not overwinter in the ocean and rarely make long migrations across large bodies of water.

The Oregon Coast cutthroat trout ESU is being reviewed whether to consider it as a candidate species under the Endangered Species Act by the United States Fish and Wildlife Service (USFWS). Jurisdiction for the Oregon Coast cutthroat trout was transferred from the National Marine Fisheries Service to the USFWS on April 21, 2000 (Federal Register, Vol. 65, No.78/Friday, April 21, 2000).

Sea-run cutthroat trout are assumed to be depressed from historic levels. Cutthroat trout were common or abundant throughout the stream segments surveyed in the upper South Umpqua River system in 1937 (Roth 1937). Historical information about cutthroat trout population size in the South Umpqua River system is limited.

The assumption that sea-run cutthroat trout abundance is currently below historic levels throughout the Umpqua River Basin is based upon the information provided by the fish counting station at Winchester Dam on the North Umpqua River. Although sea-run cutthroat trout populations may vary greatly between the South and North Umpqua Rivers, the number of fish counted at Winchester Dam are the best estimate of sea-run cutthroat populations in the Umpqua Basin. Between 1947 and 1957, sea-run cutthroat trout runs in the North Umpqua River averaged about 900 fish per year. The highest number of sea-run cutthroat trout returning to the North Umpqua River between 1947 and 1957 was 1,800 fish in 1954. The lowest number was 450 sea-run cutthroat trout in 1949. In the late 1950s, the sea-run cutthroat trout returns declined drastically.

The stocking of Alsea River cutthroat trout into the Umpqua River Basin began in 1961 and continued until the late 1970s. Introducing this genetically distinct trout stock into the Umpqua River Basin has apparently compounded the problem for 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 less than100 fish per year (ODFW 1994 - overhead packet). Graph 4 shows the number of sea-run cutthroat trout that returned to the North Umpqua River from 1992 through 2000.

According to the data available, the South Umpqua River appears to have supported a larger run of sea-run cutthroat trout than the North Umpqua River. Ten thousand sea-run cutthroat trout were estimated to have returned to the South Umpqua River in 1972. Sea-run cutthroat trout populations have the highest occurrence in streams occupied by and accessible to coho salmon (Lauman et al. 1972). Sea-run cutthroat trout are currently limited to the upper reaches of the 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 prevent sea-run cutthroat trout from using the lower stream reaches of the South Umpqua River system (Nehlsen 1994).

The various life histories and migration patterns of cutthroat trout makes population estimates and trends virtually impossible to determine using the limited smolt trap data. No marked cutthroat trout were recaptured in the smolt trap operated on Myrtle Creek between 1997 and 2000 (see Table C-5 in Appendix C). Sea-run cutthroat trout smolts were captured in the trap indicating they spawn and rear in the WAU. Population estimates are calculated when fish are recaptured in the smolt trap. The number of cutthroat trout emigrants captured in the smolt trap increased during the four years. The number of cutthroat trout captured in the smolt trap can be misleading because of sampling differences between years.

e. Native Non-salmonid Species

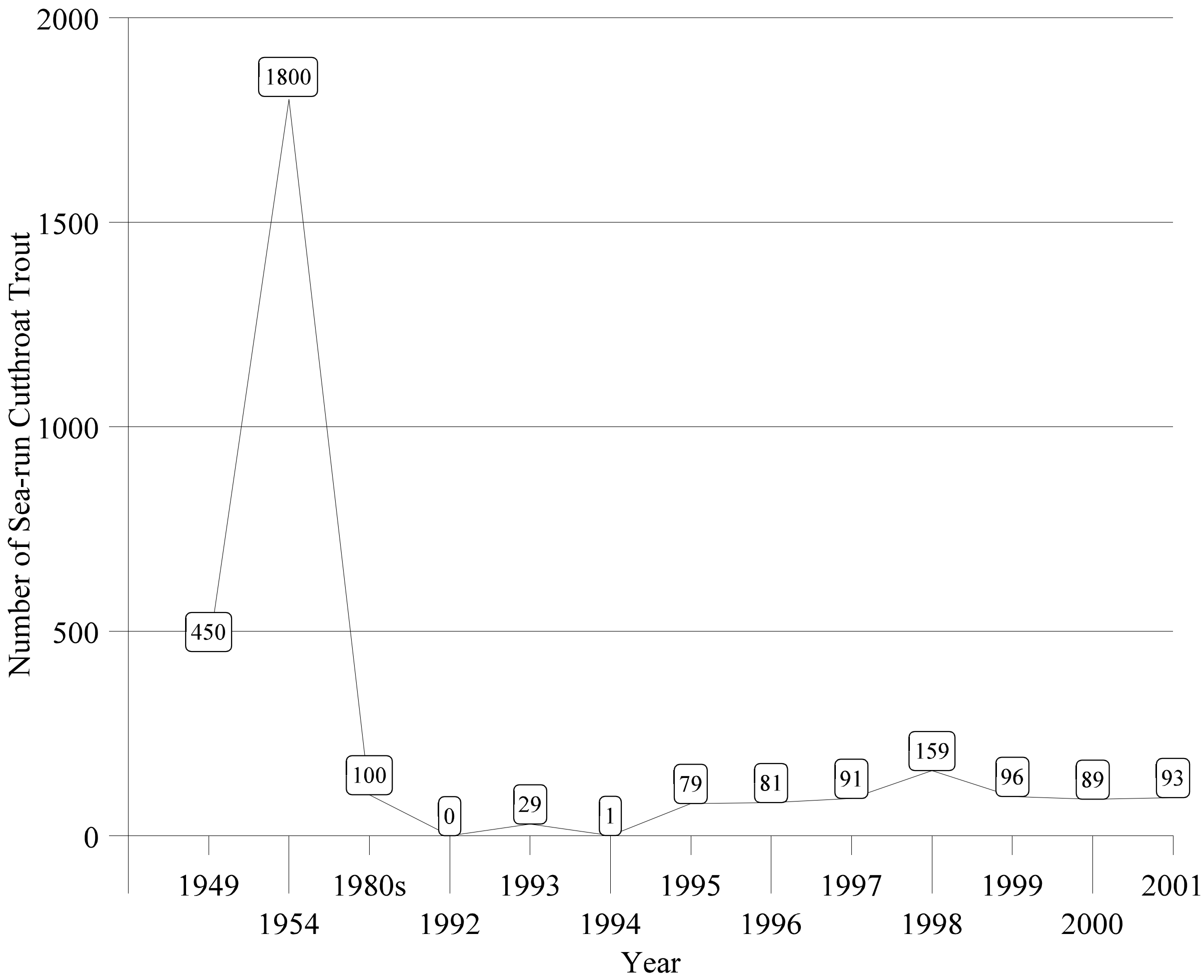
The smolt trap captured native non-salmonid fish species inhabiting Myrtle Creek. These species included Pacific lamprey (Lampetra tridentata), Umpqua pikeminnow (Ptychocheilus oregonensis), redside shiner (Richardsonius balteatus), sculpin (Cottus spp.), speckled dace (Rhinichthys osculus), Umpqua dace (Rhinichthys cataractae), western brook lamprey (Lampetra richardsoni), and largescale sucker (Catostomus macrocheilus).

The Pacific lamprey (Lampetra tridentata) is considered to be a Species of Concern by the USFWS. The USFWS needs additional information before a Species of Concern is proposed for listing. The Pacific lamprey and Umpqua chub (Oregonichthys kalawatseti) are Bureau Sensitive Species. Bureau Sensitive Species and their habitats are to be managed so as not to contribute to the need for listing. The Umpqua chub has not been documented as occurring in the WAU.

f. Non- native Species

Non-native species inhabit the WAU during various times of their life cycles. The brown bullhead (Ameiurus nebulosus) and pumpkinseed (Lepomis gibbosus) have been captured in the smolt trap operated on Myrtle Creek. Other non-native species, such as bluegill, crappie, sunfish, and

Graph 4. Number of Returning Adult Sea-run Cutthroat Trout in 1949, 1954, and the 1980s and Counted at Winchester Dam on the North Umpqua River From 1992 to 2001.



smallmouth bass living in the South Umpqua River may move into the lower portion of the Myrtle Creek WAU during summer low flows.

3. Historic Stream Habitat Conditions

During the last 150 years, salmonids have had to survive dramatic changes in the environment. Streams and rivers in the Pacific Northwest have been altered by European-American settlement, urban and industrial development, and 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).

The historical condition of the riparian zone along the upper South Umpqua River favored conditions typical of old-growth forests found in the Pacific Northwest (Roth 1937). Roth noted the shade component that existed along the surveyed stream reaches. 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 summer low flows between 1989 and 1993 surveyed the same stream reaches as in the 1937 report. The results of the study show that 22 of the 31 surveyed stream segments were significantly different than in 1937. Nineteen stream reaches were significantly wider while the remaining three stream segments were significantly narrower. Of the eight streams surveyed within designated wilderness areas, one stream channel increased in width since 1937. Thirteen of the 14 stream reaches located in areas where timber harvesting occurred were significantly wider than in 1937.

The stream widening may have resulted from increased peak flows. Peak flows may occur after vegetation (tree canopy) is removed and soil compaction increases within a watershed, especially within the Transient Snow Zone (Meehan 1991). Peak flows can introduce sediment into the stream channel from upslope and upstream, which can simplify the channel by rearranging instream structure. Fine sediment in streams changes stream channel characteristics and configuration. The stream channel depth, number of pools, and the space available for rearing fish decrease (Meehan 1991).

Results from the most recent Umpqua National Forest study document changes in low flow channel widths that have occurred in the upper South Umpqua River Basin since 1937 (Dose and Roper 1994). Land management activities (road construction and timber harvesting) may have contributed to the changes in stream channel characteristics. These channel condition changes may have contributed to the observed decline in three of the four anadromous salmonid stocks occurring in the South Umpqua River Basin (Dose and Roper 1994).

4. Current Stream Habitat Conditions

The ODFW conducted Aquatic Habitat Inventories on ten streams in the Myrtle Creek WAU. About 74 miles out of approximately 875 stream miles in the Myrtle Creek WAU were inventoried (see Table 37). A stream survey involves collecting general information from maps and other sources and direct observation of stream characteristics in the field (Moore 1997). Channel form, valley type, width, depth, streamside vegetation, temperature, flow, habitat type, woody debris, and bank erosion data are collected, summarized, and calculated for various parameters on each stream (see Tables C-8 through C-20 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. 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. Each stream contains different limiting factors. Limiting factors for the fishery resource may include reduced instream habitat structure, increased sedimentation, the absence of a functional riparian area, decreased water quantity or quality, or the improper placement of drainage (i.e. culverts) and erosion control devices associated with roads.

The Habitat Benchmark Rating System is a method developed by the Umpqua Basin Biological Assessment Team to rank aquatic habitat conditions. The Umpqua Basin Biological Assessment Team consists of fisheries biologists from the Southwest Regional Office of the ODFW, Coos Bay BLM District, Roseburg BLM District, Umpqua National Forest, and Pacific Power Company. This group of local fisheries biologists address and resolve local questions and problems associated with the fisheries resource in the Umpqua River Basin. The matrix designed by the Umpqua Basin Biological Assessment Team provides 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 to summarize the overall condition of the surveyed reaches. The matrix consists of four rating categories Excellent, Good, Fair, and Poor (see Table C-2 in Appendix C).

Data from the 1994 ODFW Aquatic Habitat Inventories conducted in the Myrtle Creek WAU were analyzed to determine an overall aquatic habitat rating (AHR) for each surveyed stream reach. How the ratings correlate to the NMFS Matrix of Pathways and Indicators is shown in Table 38. The Matrix of Pathways and Indicators is used to evaluate current stream conditions and what effects an action may have on those conditions during the Threatened and Endangered Species Section 7 consultation process (see Table C-3 in Appendix C).

Table 38. Fish Distribution and Stream Summary Data in the Myrtle Creek WAU.

Subwatershed Name Stream name	Total Miles of Streams	Total Miles of Streams on BLM-administered Land	Total Miles of Anadromous Fish-bearing Streams◇	Miles of Anadromous Fish-bearing Streams on BLM-administered Land◇	Total Miles of Resident Fish-bearing Streams	Miles of Resident Fish-bearing Streams on BLM-administered Land	ODFW Aquatic Habitat Rating#
Upper South Myrtle	307	163					
South Myrtle CreekË			11.8	3.3	13.9	5.4	Fair
Curtin Creek			0.05	0.05	0.4	0.4	n/a
Johnson Creek			0.05	0.05	1.1	1.1	n/a
Lally Creek			2.2	0.4	*n/a	0.4	n/a
Weaver CreekË			4.8	2.4	6.3	3.9	Fair
Letitia Creek			2.6	0.6	3.1	1.1	n/a
Long Wiley Creek			2.7	0.7	n/a	1.1	n/a
Short Wiley Creek			1.7	0.0	n/a	0	n/a
Louis Creek			4.8	0.4	5.8	4.0	n/a
Lower South Myrtle	146	24					
South Myrtle CreekË			9.8	0.05	9.8	0.05	Poor
Ben Branch Creek			1.0	0.4	n/a	n/a	n/a
School Hollow			2.0	0.1	n/a	n/a	n/a
Cedar Hollow			3.2	0.0	n/a	n/a	n/a
Upper North Myrtle	214	94					
North Myrtle CreekË			16.5	1.0	3.0@	2.0	Fair
Lee CreekË			3.5	0.5	4.2@	3.0	Fair
Riser CreekË			2.0	0.5	3.0@	20.	Fair
Slide CreekË			2.7	0.9	3.9@	3.0	Fair
Buck Fork CreekË			2.0	0.4	3.1@	0.5	Fair
Lower North Myrtle	208	33					
North Myrtle CreekË			10.5	0.0	9.8@	0	Fair
Frozen CreekË			2.7	0.0	3.3	n/a	Fair
West Fork of Frozen CreekË			1.2	0.0	2.6	0.25	Poor
Big Lick Creek◦			1.2	0.0	n/a	0	n/a
Little Lick Creek			0.2	0.0	n/a	n/a	n/a
Bilger CreekË			4.2	0.0	4.8	0.5	Poor

Ë Streams surveyed by ODFW Aquatic Habitat Inventory methodology.
ODFW Aquatic Habitat Rating (AHR) methodology used to rate aquatic conditions.
◦ Potential presence of warm water fish species.
@ Fish distribution data from Aquatic Habitat Inventory (by visual observation only).
n/a Data not available, not sampled, not surveyed, or no information.
*n/a Fish distribution is unknown, because upper limits are located upstream from BLM-administered land.
◇ Anadromous limits according to ODFW/ODSL fish distribution maps.

Table 38. Comparison of the Aquatic Habitat Ratings (AHR) to the NMFS Matrix Ratings.

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

The BLM conducted Proper Functioning Condition (PFC) surveys in the Myrtle Creek WAU from 1996 through 2001 (see Table C-6 in Appendix C). These surveys can discover potential fish habitat and the need for restoration activities. The PFC survey provides a consistent qualitative approach to consider hydrology, vegetation, and erosion/deposition (soils) attributes and processes to assess the condition of riparian and wetland areas. The first step in the PFC assessment process is identifying a representative stream reach to evaluate. Information collected from the representative stream reach would be extrapolated to other similar streams. Once sample reaches are identified an interdisciplinary (ID) team consisting of soil, vegetation, hydrology, and biology specialists conduct the stream surveys. A checklist is used to determine the overall health of a riparian or wetland area. The Proper Functioning Condition is determined by the ID team in the field.

Stream reach inventory and channel stability evaluation (Pfankuch) surveys were also conducted by the BLM in the Myrtle Creek WAU from 1995 through 2001 (see Table C-7 in Appendix C). The earlier Pfankuch surveys used a modified version developed by the Umpqua National Forest. More recent Pfankuch surveys incorporate Rosgen stream channel types into the evaluation. Pfankuch surveys can help identify sources of fish habitat degradation, such as sediment in gravels downstream from an eroding stream bank, and can help identify where to conduct restoration activities. The Pfankuch survey procedure was developed to evaluate the resistive capacity of a stream channel to the detachment of bed and bank materials and provide information about the capacity of the stream to adjust and recover from changes in flow or increases in sediment. The channel and adjacent floodplain banks are subjectively rated, item by item, after a field inspection (Pfankuch 1975).

a. Lower South Myrtle Subwatershed

The overall aquatic habitat inventory rating for lower South Myrtle Creek is Poor (see Table C-9 in Appendix C). Four stream reaches were designated along lower South Myrtle Creek (see Map 26). Survey access was denied on portions of reach number two and all of reach number four. Most of the land in the Lower South Myrtle Subwatershed is privately owned (79 percent) and the main land use is agriculture (32 percent). The limiting factors in lower South Myrtle Creek appear to be the lack of large woody debris (LWD) and the volume of LWD located in the stream channel. The potential for future recruitment of LWD to enter the stream from the adjacent riparian areas are low. The riparian areas adjacent to South Myrtle Creek contain stands of red alder (Alnus rubra) and other hardwood species (i.e. myrtlewood, cottonwood, and various oak species). The land use in reach numbers one through three is dominantly residential. Some of the residential areas have intermingled fields and pastures used for grazing livestock.

The Drainages within the Lower South Myrtle Subwatershed containing major fish-bearing streams include Ben Branch, School Hollow, and Cedar Hollow. Aquatic habitat inventories have not been conducted by ODFW in these Drainages.

Ben Branch Creek

A Pfankuch survey was conducted on Ben Branch Creek in 2001. This survey indicated erosion/deposition, downcutting, and the lack of large woody debris available for future recruitment were problems. Other Pfankuch surveys were not conducted because the BLM manages a small percentage of the Lower South Myrtle Subwatershed.

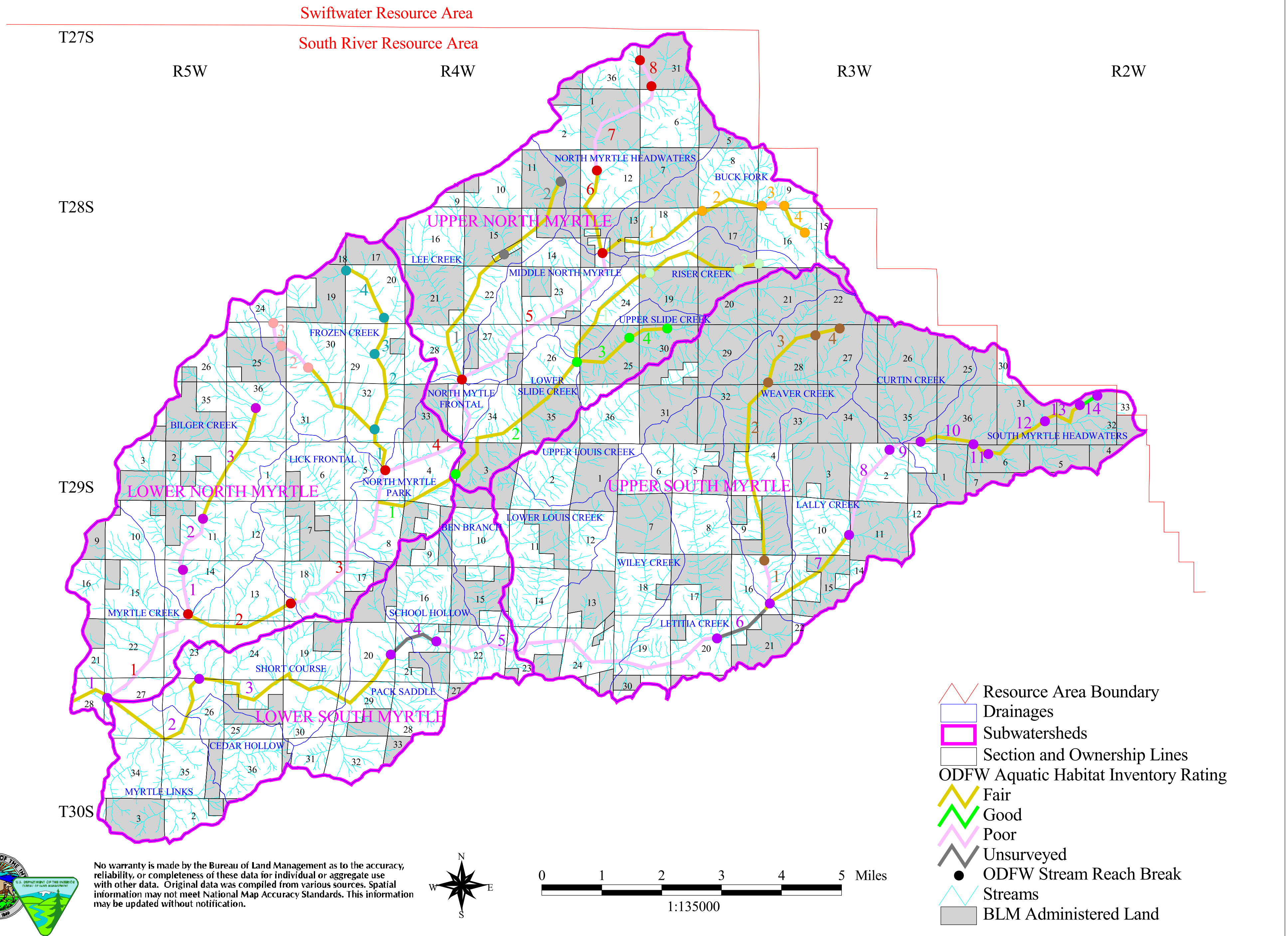
b. Upper South Myrtle Subwatershed

The overall aquatic habitat rating for upper South Myrtle Creek is Fair (see Table C-10 in Appendix C). Ten reaches were identified in this portion of the stream (see Map 26). Access was denied to reach number six. The majority of the Upper South Myrtle Subwatershed consists of Federally managed lands (60 percent) and the main land use is forests. The remaining 40 percent of the Subwatershed is privately owned land. Seventeen percent of the private ownership is agricultural land. The aquatic habitat data reflects the impacts from the land uses. Habitat components lacking in upper South Myrtle Creek include the number of LWD pieces and the volume of LWD in fish-bearing stream reaches, especially those occupied by anadromous fish (i.e. upper portion of reach number five through reach nine). The lack of deep pools (greater than one meter in depth), the relatively high amounts of silt, sand, and organics (i.e. fines), and the lack of future recruitment potential of LWD into the stream reaches accessible to anadromous fish (i.e. reach numbers five through nine) are all limiting factors in upper South Myrtle Creek.

There are large landslide areas in reach numbers ten and thirteen along South Myrtle Creek. These landslides have introduced upslope materials into the stream channel. The Tater Hill slide located along reach number ten is a major deep seated earthflow contributing fines, gravel, and woody debris to South Myrtle Creek. The Tater Hill slide is designated as an Area of Critical Environmental Concern (ACEC) by the Roseburg BLM District. A relatively large amount of fines were observed in the stream channel in the vicinity and downstream from the landslides. Reach numbers nine through fourteen have greater than 20 percent gravel substrates within the riffle habitat. There is good future recruitment potential of gravel substrates into lower gradient, fish-bearing portions of South Myrtle Creek (i.e. reach numbers one through eight).

Pfankuch and PFC surveys were conducted on South Myrtle Creek and on a tributary in Section 11 of T29S, R3W (see Table C-6 and C-7 in Appendix C). These surveys indicated mass wasting, downcutting, and the lack of instream LWD or recruitment potential as limiting habitat factors. The PFC surveys indicated a downward trend was occurring in South Myrtle Creek.

Map 26. Myrtle Creek Watershed Analysis Unit
ODFW Aquatic Habitat Surveys



Major tributaries of South Myrtle Creek in the Upper South Myrtle Subwatershed include Curtin Creek, Lally Creek, Letitia Creek, Long Wiley Creek, Short Wiley Creek, Louis Creek, and Weaver Creek. Weaver Creek is the only tributary of South Myrtle Creek inventoried by ODFW.

(1) Weaver Creek

The overall aquatic habitat inventory rating for Weaver Creek is Fair (see Table C-11 in Appendix C). Four reach breaks were identified in Weaver Creek (see Map 26). Seventy-nine percent of the Weaver Creek Drainage is Federally managed land and the main land use is forests. Grazing occurs along the lower portion of Weaver Creek. Four pools greater than one meter deep were located during the aquatic habitat inventory. Landslide activity was observed in reach numbers three and four. Beaver activity was prevalent in reach number two.

Proper Functioning Condition surveys were conducted in Weaver Creek on BLM-administered lands and on some private land in Section 4 of T29S, R3W (see Table C-6 in Appendix C). The survey on private land indicated properly functioning conditions with large debris jams, floodplain inundation and formation of large point bars. Surveys conducted on BLM-administered land indicated the lack of instream LWD and future LWD recruitment, downcutting, and erosion. The upper reaches of Weaver Creek were determined to be properly functioning with large conifers in the riparian areas and large debris jams. Several small tributaries to Weaver Creek were also surveyed (see Table C-6 in Appendix C).

(2) Curtin, Johnson, Louis, and Letitia Creeks

Proper Functioning Condition surveys were conducted in Curtin Creek, Johnson Creek, Louis Creek and Letitia Creek (see Table C-6 in Appendix C). Pfankuch surveys were conducted in Curtin Creek and Louis Creek (see Table C-7 in Appendix C). Good habitat conditions in Curtin Creek were due to a high percentage of pool habitat with instream LWD and boulders present to dissipate energy. Johnson, Louis, and Letitia Creeks were observed to have downcut, sediment in the stream, and lack instream LWD and future LWD recruitment potential.

c. Lower North Myrtle Subwatershed

The overall aquatic habitat rating for lower North Myrtle Creek is Fair (see Table C-12 in Appendix C). Four reach breaks were identified in lower North Myrtle Creek (see Map 26). Most of the Lower North Myrtle Subwatershed is privately owned (81 percent) and the major land use is agriculture (36 percent). Limiting factors of the aquatic habitat includes a lack of LWD pieces and volume, a relatively high width to depth ratio (W/D), and a low potential for LWD to be added to the stream channel in the next ten to 20 years. The lower reaches of North Myrtle Creek have low gradients, which are important for spawning salmonids. Pfankuch and PFC surveys were not conducted in lower North Myrtle Creek because the BLM does not manage any land along the low gradient reaches.

Tributaries of North Myrtle Creek in the Lower North Myrtle Subwatershed considered to be fish-bearing are Big Lick Creek, Little Lick Creek, Frozen Creek, the West Fork of Frozen Creek, and Bilger Creek. Streams that have been inventoried by ODFW are Frozen, the West Fork of Frozen, and Bilger Creeks. Big Lick Creek and Little Lick Creek have not been inventoried.

(1) Frozen Creek

The overall aquatic habitat rating for Frozen Creek is Fair (see Table C-13 in Appendix C). Four stream reaches were identified on Frozen Creek (see Map 26). About 79 percent of the land along Frozen Creek is privately owned. The major land use is agriculture (i.e. livestock grazing). Several irrigation dams and beaver activity occur in the lower reaches of Frozen Creek. The aquatic habitat survey indicated the obstructions did not impair upstream anadromous fish passage. The number of pools are probably due to the natural and human-made structures in the stream channel and not LWD. There are approximately 2.7 miles of anadromous salmonid habitat in Frozen Creek. The BLM does not administer lands along the anadromous fish habitat. Resident fish were observed in approximately 3.3 miles of Frozen Creek but they probably use more of Frozen Creek.

(2) West Fork of Frozen Creek

The overall aquatic habitat rating for the West Fork of Frozen Creek is Poor (see Table C-14 in Appendix C). Three stream reaches were identified in the West Fork of Frozen Creek (see Map 26). Forests are the main land use along the West Fork of Frozen Creek. The West Fork of Frozen Creek had a low pool area percentage. Reach number one had the lowest gradient (2.9 percent) and best percentage of pools of the three reaches. Stream gradient influences habitat type. Stream gradients greater than ten percent typically have fewer pool and more riffle or cascade habitat types than lower stream gradients. When a stream contains few steps or pools more energy is available to move sediment and stream substrates resulting in a simplified, high-gradient channel (Meehan 1991). These conditions create less than optimum salmonid habitat. Low amounts of LWD pieces and volume and a low potential for recruitment of LWD were observed in the West Fork of Frozen Creek.

(3) Bilger Creek

The overall aquatic habitat rating for Bilger Creek is Poor (see Table C-15 in Appendix C). Three reaches were identified in Bilger Creek (see Map 26). About 74 percent of the land along Bilger Creek is privately owned. The main land uses are rural residential and grazing. Numerous dry channel units were observed in reach number one. The dry channel units are probably due to the summer low flow conditions and water being removed for irrigation. Puddled units were primarily in reach number two. Fish were observed in the puddled and scour pool units during the aquatic habitat survey. Beaver activity was also noted in reach number two. However, pools deeper than one meter were not found during the aquatic habitat survey. The number of large woody debris pieces and volumes were relatively low. The riparian habitat was dominated by hardwood stands of myrtlewood and oak. There was a low potential for LWD to be added to the stream from the riparian area in the future. The Pfankuch survey indicated downcutting and LWD debris jams in the stream.

d. Upper North Myrtle Subwatershed

The overall aquatic habitat rating for upper North Myrtle Creek is Fair (see Table C-16 in Appendix C). Four stream reaches were identified (see Map 26). About 52 percent of the Upper North Myrtle Subwatershed is privately owned. The main land uses are forests and rural residential (along reach number five). The pool area percentage ranged from good to poor. Reach number eight had an average stream gradient of 21 percent and was dominated by pool-step-pool and pool-riffle habitat types. The pool-step-pool habitat types are usually in low to moderate and moderate to high stream reach gradients, typically found in the headwaters of streams.

Fewer stream diversions and irrigation dams were in the upper reaches of North Myrtle Creek than the lower reaches. The reduced number of water withdrawals in the upper reaches of North Myrtle Creek may provide more water and better water quality for salmonids. The upper reaches are potential rearing areas for juvenile anadromous and resident fish in the summer.

A low percentage of fines were documented in the riffle habitat types in reach number five but the upper reaches had a relatively high amount of sediment in the riffles. Low amounts of LWD were documented in the upper reaches. The riparian area in the upper reaches have the potential to provide LWD in the future and are a potential source of LWD to the lower gradient stream reaches downstream. Beaver activity was documented in three of the reaches. The high pool area percentage documented in these reaches reflect the influence of the beaver activity. Pfankuch surveys indicated some downcutting was occurring, pool habitats were filling in with sediment, and the potential for future LWD recruitment in upper North Myrtle Creek (see Table C-7 in Appendix C).

Fish-bearing tributaries of upper North Myrtle Creek include Lee Creek, Riser Creek, Slide Creek, and Buck Fork Creek. Aquatic habitat inventories were conducted by ODFW surveyors.

(1) Lee Creek

The overall aquatic habitat rating for Lee Creek is Fair (see Table C-17 in Appendix C). Two stream reaches were identified in Lee Creek (see Map 26). About 53 percent of Lee Creek is privately owned. Land uses along Lee Creek are forests, rural residential, and mining. Mining, timber harvesting, and road construction have influenced Lee Creek. A 40 mile long ditch called China Ditch was constructed to carry water from Cavitt Creek to Lee Creek for hydraulic mining. Sediment has decreased the quality of fish habitat in Lee Creek. Seven culverts on Lee Creek block upstream passage of resident and anadromous fish (see Map 25).

Pool area percentage for reach number one was rated as good and reach number two was rated as excellent. The amount of LWD in both stream reaches was rated as poor. These two reaches probably received good and excellent ratings for pool area percentage because of the amount of beaver activity in the stream. The pool habitats are probably filling with sediment because of the high percentage of sediment observed in the riffle habitat. Sediment decreases the amount and quality of pool habitat available to fish. Beaver dams act as sediment traps and can decrease the amount of sediment traveling downstream (Meehan 1991).

The riparian area consists of alder and other hardwoods. Large woody debris probably would not be provided to Lee Creek in the future because of the mostly residential use and hardwoods.

Pfankuch surveys indicated bank cutting, erosion, and downcutting were occurring on Lee Creek in 1996. Proper Functioning Condition surveys indicated beaver activity, LWD in the stream, and new floodplain development were occurring in 2001. The PFC surveys determined Lee Creek was functioning at risk with an upward trend, indicating the creek may be recovering.

(2) Riser Creek

The overall aquatic habitat rating for Riser Creek is Fair (see Table C-18 in Appendix C). Four stream reaches were identified in Riser Creek (see Map 26). About 62 percent of land along Riser Creek is managed by the BLM. Forests are the main land use along Riser Creek. Aquatic habitat inventories documented a high percentage of pool habitats, a lack of LWD, and sediment in the riffle habitats. Beaver activities created the high percentage of pool habitat. The sediment in the riffle habitats may mean there is sediment in the pool habitats. Pfankuch and PFC surveys found fair to poor conditions in Riser Creek due to little instream LWD, erosion, and downcutting (see Tables C-6 and C-7 in Appendix C).

(3) Slide Creek

The overall aquatic rating for Slide Creek is Fair (see Table C-19 in Appendix C). Four stream reaches were identified in Slide Creek (see Map 26). About 65 percent of the land along Slide Creek is managed by the BLM. The major land use is forests. Grazing occurs along reach number one.

The aquatic habitat inventory identified sediment in the riffle habitat. The fines currently located in the upper reaches will eventually move into the lower reaches of Slide Creek. Beaver activity in reach numbers two and three created the majority of pool habitat greater than one meter deep. Very little exposed bedrock and no boulders greater than 0.5 meters in diameter occurred in the creek. Slide Creek had a lack of LWD and a high amount of sand, silt, and organic matter. Future recruitment opportunities of LWD from the riparian area in the short term is low. Pfankuch and PFC surveys indicated runoff and sediment from roads and a lack of instream structure were affecting Slide Creek (see Tables C-6 and C-7 in Appendix C).

(4) Buck Fork Creek

The overall aquatic habitat rating for Buck Fork Creek is Fair (see Table C-20 in Appendix C). Four stream reaches were identified in Buck Fork Creek (see Map 26). About 70 percent of the land along

Buck Fork Creek is privately owned. Rural residential and forests are the land uses along Buck Fork Creek. Gravel percentages in the riffle habitat suggests Buck Fork Creek may provide gravel to North Myrtle Creek in the future. A Pfankuch survey indicated downcutting and sediment were occurring on Buck Fork Creek in 1996.

5. Interpretation

a. Fish Populations

Due to the lack of historical fish population and distribution information in the Myrtle Creek WAU, it is difficult to make comparisons with current fish data. Smolt trapping data from Myrtle Creek indicates consistent coho salmon, cutthroat trout, chinook salmon, and steelhead runs exist in the Myrtle Creek WAU. The life cycle length from three to six years of anadromous salmonids, varying rainfall patterns, and fluctuating ocean conditions makes it difficult to draw population trend conclusions from five years of smolt trapping data. Coho salmon spawning data collected by ODFW is sporadic. The data cannot be used to estimate population size but indicate coho salmon are using the WAU for spawning.

b. Aquatic Habitat

Historical habitat conditions along the upper South Umpqua River were used to make a general comparison to the historic conditions in the Myrtle Creek WAU. The old-growth forest conditions noted along the upper South Umpqua River probably occurred in the upper elevations of the Myrtle Creek WAU. The forested conditions provided shade to the streams, bank stability, instream large wood, and flow regimes that maintained frequent deep pools. The aquatic habitat conditions have probably decreased compared to historic conditions in the Myrtle Creek WAU based on the amount of timber harvesting and road construction that has occurred and the data in the aquatic habitat surveys.

Timber harvesting has occurred in many Drainages in the Myrtle Creek WAU affecting the amount of large woody debris. Large trees, generally greater than 24inches in diameter, that enter the stream channel provide habitat for fish and other aquatic species. Hardwoods became the dominant tree species along some streams after the riparian areas were harvested. Conifer species are the desirable riparian vegetation type along fish-bearing stream reaches because they provide a longer lasting habitat than hardwoods. Larger conifers are also more likely to stay in place and intact compared to hardwood species, which generally are short-lived when they enter the stream (Meehan 1991).

Large woody debris and boulders are lacking in most streams in the WAU. Some streams in the upper portions of the WAU contain an adequate amount of boulders and large woody debris. Large woody debris and boulders are important for stream health and maintenance. Large woody debris helps maintain hydrologic conditions in the stream channel by creating pools, multiple channels, sloughs, and backwater areas and reconnect the stream with the floodplain (Meehan 1991). Large woody debris often provides fish resting and escape cover, maintains pool habitat, and creates channel complexity. Boulders create backwater areas, pools, and current breaks migrating fish use for resting while swimming upstream. Installing large woody debris and boulder structures would help restore healthy stream habitats.

Pool depths and frequencies are poor in most of the reaches surveyed by ODFW in the WAU. Pool habitat provides juvenile salmonids hiding and escape cover from predators, summer rearing areas, and cool, well oxygenated water during low flow periods. Reducing the number of sediment sources and placing large wood in streams would help restore pool habitat quality and quantity in the WAU.

Aquatic habitat inventories conducted by ODFW indicated good sources of gravel occurred in the upper portions of the Myrtle Creek WAU. However, these gravels are heavily embedded with sediment in many areas. Sediment free gravel substrates are important for salmonid spawning and aquatic invertebrate habitat. Sediment can fill pools created by LWD and boulders and decrease water quality in streams. Clean gravels can be recruited and maintained by reducing sediment sources and placing large wood and boulders in the stream channel.

Non-native Himalayan blackberries have invaded disturbed streambanks and riparian areas in the WAU. Himalayan blackberries grow faster than many native plants, such as conifers, willows, alders, sedges, and rushes that have stronger root systems to provide streambank stability.

Culverts and other stream crossings interrupt stream continuity and channel dynamics, and can also prevent the migration of anadromous and resident salmonids. A Bureau of Land Management culvert inventory indicates nine major and 32 minor culverts in the Myrtle Creek WAU are blocking anadromous or resident fish passage. A culvert inventory for the entire Myrtle Creek Watershed is scheduled to be completed in 2002 by the Umpqua Basin Watershed Council. When the inventory is complete, culverts to be replaced can be identified for the WAU. Culvert replacement could provide fish access to habitat and restore some stream hydrologic functions.

c. Fish Use

Low gradient stream reaches are more accessible to migrating salmonids and are typically the areas where most spawning occurs. Stream order and size can vary the amount of suitable spawning substrate available to salmonids (Meehan 1991). Few first and second order streams provide spawning habitat for anadromous salmonids. Most anadromous salmonids use the accessible habitat in third and fourth order streams (Meehan 1991). Most of the low gradient stream reaches in the WAU are not administered by the BLM.

The upper reaches of North Myrtle Creek may be providing fish in the Upper North Myrtle Subwatershed a refuge during the summer months. The lack of LWD and relatively high amount of sediment reduces fish use and limits fish potential in Buck Fork Creek. The amount of gravel in riffle habitat suggests Buck Fork Creek has a high potential for providing gravel to North Myrtle Creek in the future. Slide Creek and Riser Creek provide fish spawning and rearing habitat. Although, the quality of habitat is limited due to sediment and the lack of instream structure.

Restoration activities to reduce the amount of sediment entering streams would help improve gravel conditions for spawning salmonids.

Curtin Creek, Johnson Creek, and the upper reaches of South Myrtle Creek may provide summer refuge for resident and anadromous juvenile salmonids. The Tater Hill slide is providing a source of gravel and large woody debris to upper South Myrtle Creek. Restoration downstream from Tater Hill could keep these important components functioning in the stream. Weaver Creek contains sediment but restoration activities could produce summer rearing habitat for coho salmon, steelhead, and cutthroat trout.

Aquatic habitat surveys conducted by ODFW in 1995 and 1996 indicate fair to poor fish habitat conditions exist in the Myrtle Creek WAU. The data indicates timber harvesting, road construction, and mining activities have contributed to the habitat conditions. The effect poor habitat conditions have on the fish populations in the WAU are unknown due to the lack of historical fish population data to compare with current data. Poor habitat conditions in the South Umpqua River has been associated with the decline in salmonid and other native fish populations.

B. Wildlife

1. Historic and Current Wildlife Use of the Myrtle Creek WAU

Historically, wildlife species known to be present in Douglas County, and probably in the WAU, included the grizzly bear (Ursus arctos), grey wolf (Canis lupus), wolverine (Gulo gulo), Pacific fisher (Martes pennanti pacifica),and Canada lynx (Lynx canadensis). The grizzly bear and grey wolf are considered to be extinct in Oregon. The wolverine, Pacific fisher and Canada lynx are considered to be very vulnerable to extinction in Oregon (Oregon Natural Heritage Program 1998). These species have not been observed in the WAU during the last 30 years.

Beaver populations have probably decreased from historic levels due to trapping and other human activities. The number of beavers harvested annually in Douglas County decreased from 1,440 in 1979 to 264 in 1996 (Verts and Carraway 1998). Beavers had a major influence on stream hydrology with their dams. The decreased number of beavers may alter stream function and the number of aquatic animals.

The number of river otters (Lutra canadensis) harvested annually in Douglas County decreased from 70 animals in 1977 to 36 in 1999. Changes in harvest numbers may be a reflection of economic conditions rather than actual population numbers. One family group of otters was living in the WAU in 2001. It is probably the maximum number of otter families that would live in the WAU based on the miles of second order and larger streams and the amount of habitat one family uses.

Black bears (Ursus americanus) have home ranges of up to six miles for females and 14 miles for adult males. Adult female and male home ranges do not overlap. However, sub-adult home ranges overlap both adult male and female home ranges. Black bears are more abundant in the Coast Range than the Klamath or Cascades Range provinces. It is estimated less than twelve bear territories occur in the WAU (Maser et al. 1981).

Cougar sightings have increased in recent years. However, this may be due to the increased number of humans in the WAU. The major prey species for the cougar is black tailed deer. The black tailed deer has been decreasing in numbers recently and may be influencing the abundance of cougars and their visibility as they travel farther to find food.

Many wildlife species live in the different vegetation types present in the WAU. The various vegetation types provide shelter, food, and habitat to over 300 terrestrial vertebrate species and thousands of invertebrate species. Fifty-nine species are of special concern to the Bureau of Land Management because they are considered to be Special Status Species, Special Attention Species in the Northwest Forest Plan, or are priority species to the Oregon Department of Fish and Wildlife. Twenty-two Special Status Species, which include Federally Threatened (FT), Federally Endangered (FE), Federally Proposed for Listing (P), Bureau Sensitive (BS), Bureau Assessment (BA), or Oregon state listed species, are expected to occur in the Myrtle Creek WAU (see Table E-1 in Appendix E). Bureau Tracking (BT) species are not considered to be Special Status Species but are listed in Table E-1 in Appendix E for reference. The BLM is documenting the occurrence of Bureau Tracking species, which may be used to detect population trends of these species. Other species of interest are Special Attention Species (Survey and Manage or Protection Buffer species) included in the Northwest Forest Plan or ODFW priority species, which include animals of special interest to the public (such as game animals).

a. Federally Threatened, Endangered, and Proposed Species

Four terrestrial species known to occur in the Roseburg BLM District are legally listed as Federally Threatened (FT), Federally Endangered (FE), Federally Proposed for Listing (P), or Federally Proposed for Delisting (PD). These species include the American bald eagle (Haliaeetus leucocephalus) (FT, PD), the marbled murrelet (Brachyramphus marmoratus) (FT), the northern spotted owl (Strix occidentalis caurina) (FT), and the Columbian white-tailed Deer (Odecoilus virginianus leucurus) (FE, PD). Three other legally listed species may occur in the Roseburg BLM District. They are the Canada lynx (Felix lynx canadensis) (P), the Fender's blue butterfly (FE), and the vernal pool fairy shrimp (Branchinecta lynchi) (FT). The vernal pool fairy shrimp is listed in California and has been documented occurring in the Medford BLM District. It is unknown if the Canada lynx, Fender's blue butterfly, or vernal pool fairy shrimp are present in the Roseburg BLM District.

(1) The Northern Spotted Owl

The northern spotted owl is found in the Pacific Northwest, from northern California to lower British Columbia, Canada. The geographic range of the northern spotted owl has not changed much from its historical boundaries. Nesting habitat historically used by northern spotted owls has changed enough the owl population has decreased and their distribution has been rearranged. These changes are considered to be a result of habitat alteration and removal by timber harvesting, fire, and land development (Thomas et al. 1990).

(a) Known Sites

Suitable forest stands where northern spotted owls have been located are known as spotted owl activity centers. There are 30 known spotted owl activity centers in the Myrtle Creek WAU representing nest locations for 23 northern spotted owl pairs. Seven northern spotted owl pairs have alternate nesting locations in the WAU. The accepted method for determining a northern spotted owl pair home range is to use a 1.3 miles radius circle (for the Klamath Physiographic Province) around the site. The territory used by a pair of owls with alternate nesting sites would be the total area around all of the alternate nesting sites. Another method of describing a northern spotted owl pair home range is by using the drainage boundaries (ridgetops) as the territory boundaries. This description is consistent with the northern spotted owl's tendency to defend a territory by hooting. Multiple alternate nesting sites tend to be more common in areas where the suitable habitat is poor in quality or the distribution is scattered. Northern spotted owl pairs with multiple alternate sites may need a larger territory for survival. Factors influencing nest site selection include prey base abundance, distribution of habitat, and disturbance. Table 39 contains information about the status of use, habitat acres, occupation, and reproduction success of the northern spotted owls in the WAU.

(b) Nesting, Roosting, and Foraging Habitat

Forest habitat important to the northern spotted owl was identified by Roseburg BLM District wildlife biologists. Suitable nesting, roosting and foraging habitat was identified in the WAU by using on-the-ground knowledge, inventory descriptions of forest stands, and known characteristics of the forest structure. There are approximately 15,090 acres of suitable northern spotted owl nesting, roosting, and foraging habitat in the WAU (see Map 27). This is about 49 percent of the Federally-administered land and 20 percent of the WAU.

(c) Dispersal Habitat

Other forested stands not identified as nesting, roosting, and foraging habitat and greater than 40 years old are considered to be dispersal habitat. Dispersal habitat refers to forest stands greater than 40 years old that provide cover, roosting, and foraging components northern spotted owls use while moving from one area to another (Thomas et al. 1990, USDI 1992b, and USDI 1994). Trees within these stands generally are an average of eleven inches in diameter at breast height (DBH) and with at least a 40 percent canopy closure. There are approximately 15,263 acres of dispersal habitat on Federally-administered land in the WAU (see Map 27).

A major factor contributing to the declining northern spotted owl population is the replacement rate of owls (specifically female) by new birds known as "floaters" (Burnham et al. 1994). Floaters are typically juvenile, unpaired adult, or subadult birds that move through and around established pair sites and use the habitat outside of defended territories. Minimizing risks for dispersing northern spotted owls in the short term may help maintain viable, reproducing pair sites, which may stabilize the northern spotted owl population.

The lower elevations in the WAU developed for agricultural and residential uses expose dispersing northern spotted owls to predators, such as the great horned owl, which are more abundant and efficient in open habitats. Open areas may be barriers to dispersing northern spotted owls forcing them to avoid such areas.

Northern spotted owl dispersal occurs in a north and south direction through the eastern portion of the WAU. The Upper North Myrtle Subwatershed is geographically important for dispersal north and south even with the somewhat poor quality northern spotted owl habitat on the serpentine soils in the area (see Map 27). Most of the younger, nonsuitable habitat is the result of the wildfires in 1987 and timber harvesting in the Upper North Myrtle Subwatershed. Timber harvesting on private land in T28S, R3W may increase northern spotted owl dispersal use of this WAU.

(d) Critical Habitat for the Recovery of the Northern Spotted Owl

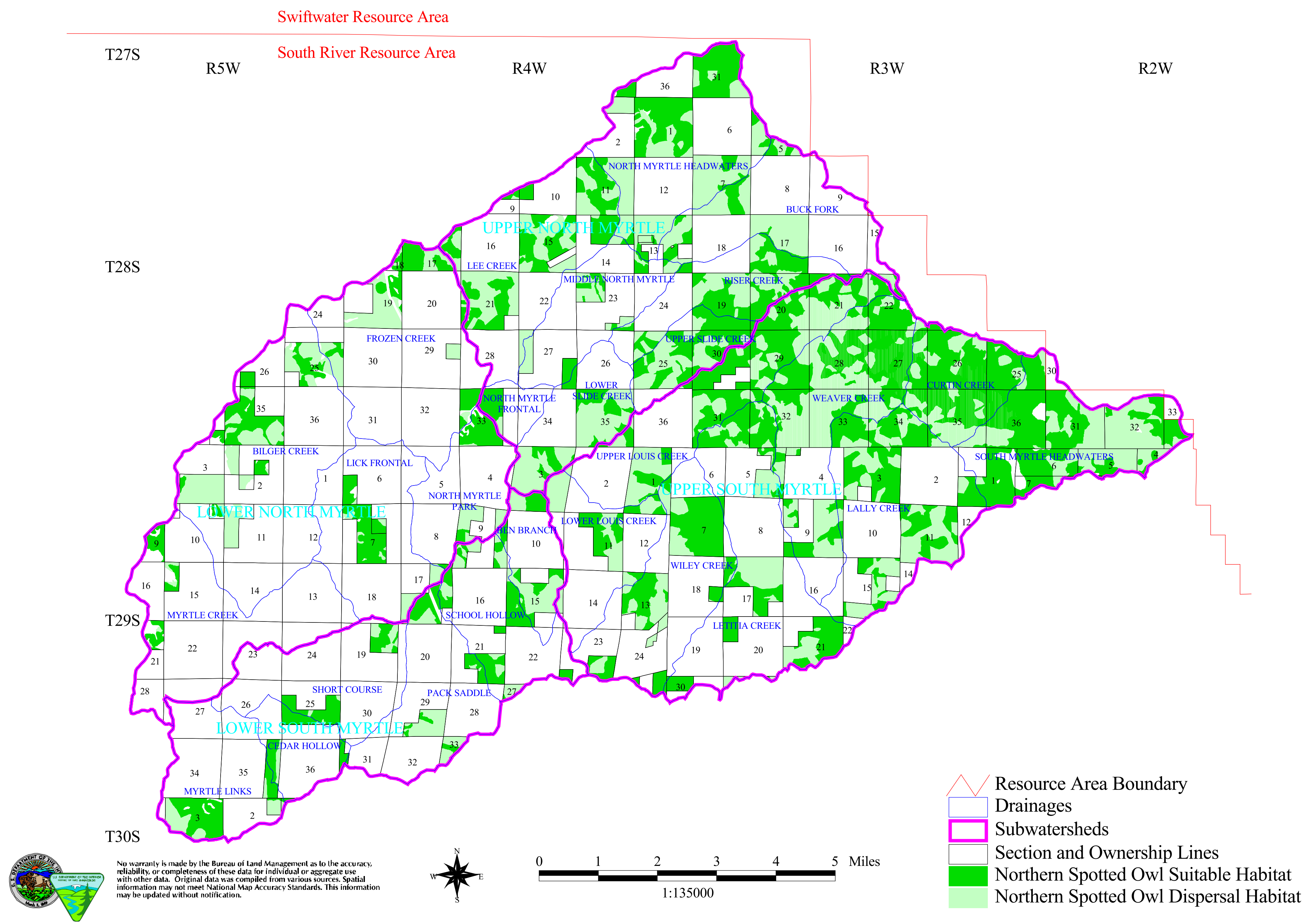
A portion of one designated Critical Habitat Unit (CHU) for the recovery of the northern spotted owl is located in the WAU (see Map 28). The function of CHU-OR-29, located in the eastern portion of the WAU, is to maintain areas of northern spotted owl nesting habitat to link the Western Cascade, Coast Range and Klamath Mountain Physiographic Provinces.

Table 39. Northern Spotted Owl Activity Center Ranking Data Within the Myrtle Creek WAU in the South River Resource Area (as of 2001).

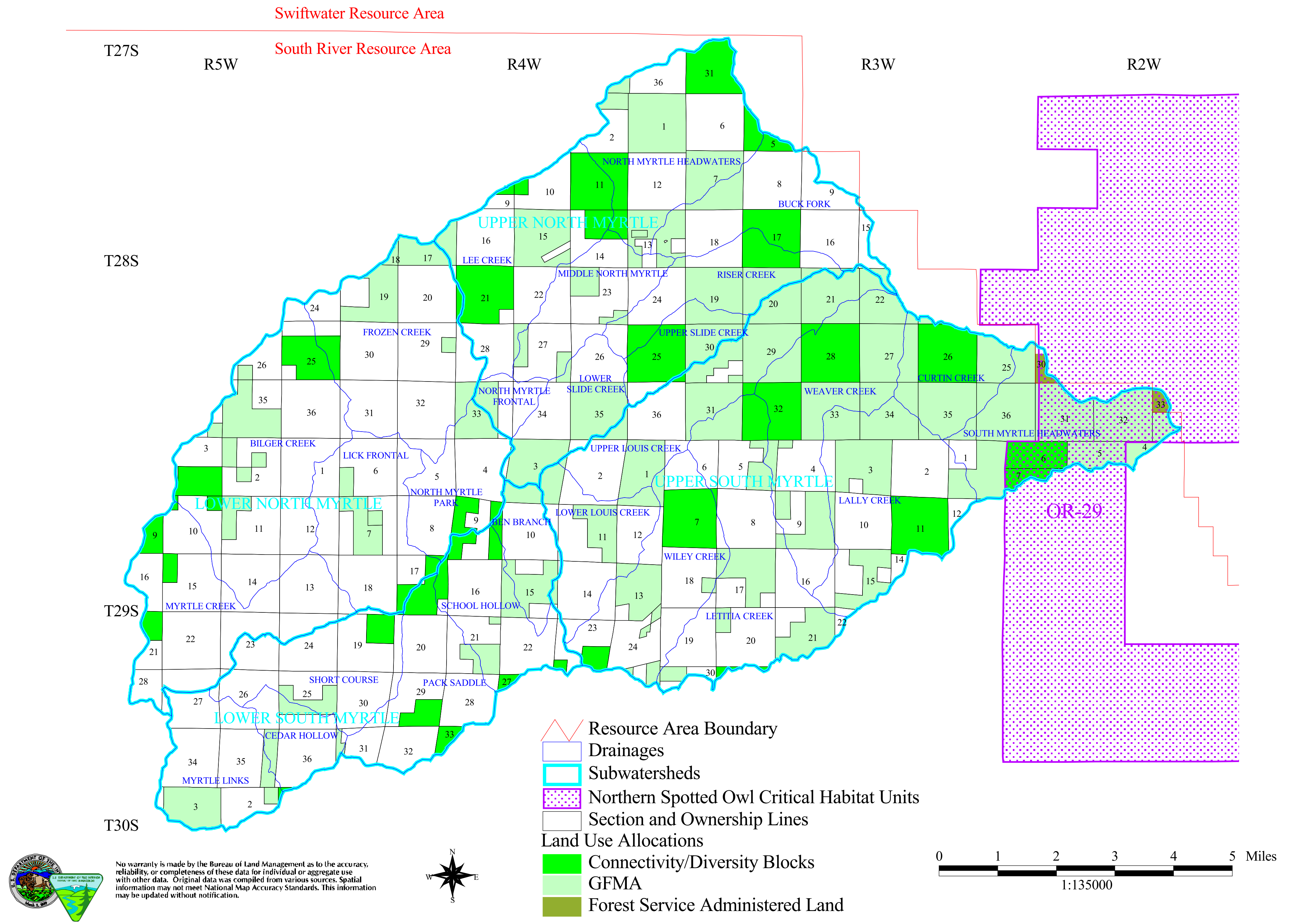
MSNO	Year Site Was Located	Last Year of Known Active Pair	Last Year Occupied (Pair Status)	Number of Years of Reproduction/Pair Status Since 1985	Acres of Suitable Habitat in Provincial Radius	Percent of Territory in Suitable Habitat	Acres of Suitable Habitat Within 0.7 Miles	Total Acres in Provincial Radius of all Alternate Sites	Occupancy Rank	Acres Rank	History Rank
2086	1989	2001	2001 (P)	3/12	1,255	24	684	5,176	1	A	1
0362	1992	2001	2001 (P)	4/9	397	11	168	3,475	1	D	1
2381	1989	1994	1997 (X)	0/12	1,746	61	702	2,881	3	A	3
2291	1990	1990	1995 (P)	0/11	570	18	288	2,881	3	D	3
2093	1989	1989	1996 (X)	0/12	510	18	159	2,881	3	D	3
2295	1990	2001	2001 (P)	5/11	1,798	62	720	2,881	1	A	1
0293	1983	2000	2001 (U)	2/16	869	28	439	3,111	1	D	2
3097	1991	1999	2001 (U)	3/10	667	20	462	3,266	1	D	2
1811	1985	1995	2000 (U)	0/16	1,152	40	373	2,881	2	B	3
4366	1996	2001	2001 (P)	3/6	1,221	31	350	3,990	1	B	3
2294	1990	1991	2001 (Q)	0/11	416	14	235	2,881	3	D	3
0292	1983	2001	2001 (U)	1/16	1,684	39	721	4,338	1	A	2
0294	1983	N/A	1994 (S)	0/16	868	20	452	4,388	3	D	3
2204	1990	1990	1991 (S)	1/11	337	12	123	2,881	3	D	2
2196	1990	1995	2001 (U)	3/11	357	12	91	2,881	2	D	2
2091	1989	2001	2001 (P)	5/12	624	22	246	2,881	1	D	1
0295	1983	2001	2001 (P)	3/16	1,559	54	601	2,881	1	A	2
2293	1990	2001	2001 (P)	2/11	1,890	57	754	3,309	1	A	2
2197	1990	1996	2001 (S)	3/11	738	21	403	3,588	1	D	2
1814	1985	1986	2001 (B)	0/16	1,425	49	326	2,881	1	B	3
4576	2000	2001	2001 (P)	0/2	565	20	248	2,881	1	D	2
0361	1983	1994	2001 (S)	0/16	546	19	279	2,881	1	D	3
1984	1988	1991	1991 (P)	1/13	509	18	185	2,881	3	D	3

Table 39 Definitions
Last Year of Known Active Pair - Shows the year, pair status, and number of young produced. NP = Site has not had a pair. ND = No Data.
Pair Status - M = Male; F = Female; J = Juvenile; P = Pair Status; (M+F) = Two Adult Birds, Pair Status Unknown; PU = Pair Status Undetermined; S = Single Owl; ND = Incomplete or No Data.
Number of Years of Reproduction/Pair Status Since 1985 - The first number represents the number of years with northern spotted owl reproduction at this site since 1985. The second number refers to the number of years for the entire history of the site since 1985 (including the original and alternate sites, i.e. 1090A). ND = No Data.
Occupancy Rank - 1: Sites with this ranking have current occupancy and have been occupied by a single northern spotted owl or pair of northern spotted owls for the last three years; 2: Sites with this ranking have been occupied in the past, show sporadic occupancy by a single northern spotted owl or a northern spotted owl pair, may be currently occupied; 3: Sites with this ranking have not been occupied during the last three years.
Acres Rank - These acres are in regards to suitable northern spotted owl habitat. A: These sites have more than 1,000 acres in the provincial radius and more than 500 acres within the 0.7 mile radius; B: These sites have more 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 more 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 Rank - This ranking includes occupancy ranking, reproduction data, acres ranking, habitat evaluation, and field experience about the site (location, quality, and forest structure). 1: A site considered stable due to consistent occupation by northern spotted owls, which have been producing young consistently; 2: Site is consistently used by northern spotted owls but reproduction is sporadic; 3: Northern spotted owls have reproduced some, occupation has been sporadic, or site has not been occupied. Private = Site is located on private land. State = Site is located on Oregon State Lands.
* These sites are occupied by a pair of barred owls or a pair composed of a female barred owl and a male northern spotted owl.

Map 27. Myrtle Creek Watershed Analysis Unit
Northern Spotted Owl Suitable and Dispersal Habitat on BLM Administered Land



Map 28. Myrtle Creek Watershed Analysis Unit
Northern Spotted Owl Critical Habitat Units



(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. 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 the bald eagle's decline included shooting and habitat removal (Anthony et al. 1983). Historically, removal of old-growth forests near major water systems (e.g., South Umpqua River) contributed to habitat deterioration through the loss of bald eagle nesting, feeding, and roosting habitat.

Information collected during yearly inventories from 1971 to 1995 by Isaacs and Anthony of known bald eagle sites in Douglas County does not list any sites, nests, or territories within or near the Myrtle Creek WAU (Isaacs and Anthony 1995). Occasionally, bald eagles are observed along the South Umpqua River, which is near the western boundary of the WAU, during the winter but the eagles do not stay and do not appear to use the area as a long term wintering ground. Bald eagles have not been observed nesting in the WAU. Some forest stands have large conifers and black cottonwoods, which may provide suitable bald eagle habitat.

(3) 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). The marbled murrelet is found in the Roseburg BLM District but the Myrtle Creek WAU is outside the range of suitable marbled murrelet forest habitat. The Myrtle Creek WAU is located more than 35 miles from the Oregon Coast, which is considered to be the extent the marbled murrelet would be found.

(4) Columbian White-tailed Deer

The Columbian white-tailed deer is not expected to occur in the Myrtle Creek WAU. Although, the WAU is within the historic and current distribution range of the Columbian white-tailed deer from northeast of Oakland, Oregon to Cow Creek (USDI 1983 and USDA and USDI 1994a). Today, the known white-tailed deer population is restricted to an area northeast of Roseburg. The Columbian white-tailed deer was listed as a Federal Endangered species in 1978. The Roseburg population of Columbian white-tailed deer is proposed to be delisted as a Federal Endangered species.

(5) The Canada Lynx

The Canada lynx was proposed by the USFWS for listing as a Federal Threatened species on July 8, 1998. The listing would apply to lynx populations in Washington, Oregon, and 14 other states from Idaho to Vermont. Nine counties in Oregon had historical records of lynx populations (USDI 1998). A self-sustaining resident population does not occur in Oregon but individual animals are present (Verts and Carraway 1998). Historically, the Canada lynx was not present in the WAU. The lynx has not been reported as occurring in Douglas County, the Roseburg BLM District, or the Myrtle Creek WAU. Although, the lynx has been reported to be present in the Cascade and the Blue Mountains in Oregon (USDI 1998). The lynx occurs in areas receiving large amounts of snow during the winter and where the snowshoe hare lives.

(6) Fender's Blue Butterfly

The Fender's blue butterfly was listed as a Federal Endangered species on January 25, 2000. This butterfly is only known to occur in the Willamette Valley (Federal Register 2000 and ONHP 1998). The historical distribution is unknown. The Fender's blue butterfly may occur in the WAU where the habitat is similar to conditions in the Willamette Valley. Surveys for the butterfly have not been conducted in the South River Resource Area.

Fender's blue butterfly is dependent on a few species of lupine, especially Kincaid's lupine (Lupinus sulphurous ssp. kincaidii). The caterpillar feeds on the lupine during its growing period prior to changing into a butterfly. Kincaid's lupine occurs in the Letitia Creek Drainage of the WAU. The presence of Kincaid's lupine means the Fender's blue butterfly may be present in the WAU. Although, the plant population is not as large as where the butterfly is known to occur and the WAU is outside the known range of the Fender's blue butterfly.

(7) The Vernal Pool Fairy Shrimp

The vernal pool fairy shrimp (Branchinecta lynchi) inhabits temporary pools of water found in grass or mud bottomed swales (Federal Register 1994). The primary distribution range is in the Central Valley in California. However, the vernal pool fairy shrimp has been located on the Medford BLM District, near Table Mountain. The vernal pool fairy shrimp is not expected to occur on BLM-administered land in the WAU due to the lack of suitable vernal pool habitat. Inventories have not been conducted for this species or its habitat in the Roseburg BLM District.

b. Bureau Sensitive Species

(1) The Peregrine Falcon

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

Several peregrine falcon nest locations occur in the South River Resource Area, including one occupied site in the WAU. A Draft Habitat Management Plan for the site in the WAU was completed recently (USDI 2001e). An evaluation using aerial photographs and on-the-ground review determined rock outcrops or cliff habitats occur in some other parts of the WAU. Evaluation of higher elevations of the WAU is continuing.

The peregrine falcon has been delisted and is no longer considered a Federal Endangered species under the Endangered Species Act of 1973, as amended. The peregrine falcon is a Bureau Sensitive Species. Its status will be reevaluated in 2004, after five years of monitoring.

(2) The Northern Goshawk

Information about the northern goshawk was collected east of the Cascade Mountains (Marshall 1991). Current geographic distribution suggests the northern goshawk would not be expected to occur in most of the Roseburg BLM District. Observations recorded since 1984 show the northern goshawk occurs north of its expected distribution range in Josephine County, Oregon. Several nest sites have been found on the Roseburg BLM District including one in the WAU. Several northern goshawks have hatched in the past including two in 2001. The nesting and post-fledgling areas are protected complying with the management directions in the RMP. Older forest stands are potential northern goshawk habitat but less than ten percent of the stands in the WAU have been surveyed.

(3) Bat Species

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. Some of these components may be near or within vegetated areas. Bats also use other unique habitats (ponds, creeks, and streams) to find food and water. Many abandoned mine shafts and adits are present in the WAU including one site occupied by Townsend's big-eared bats, which is a Bureau Sensitive Species.

Some bat species use coniferous forests for roosting habitat. Trees greater than 40 inches in diameter with defects and snags typically provide the best quality roosting habitat. A recent study using radio tracking technology found large, old, dominant trees with defects and snags were common roosting sites within forest ecosystems (Bogan et al. 1999).

(4) Amphibians and Reptiles

Amphibian inventories were conducted in the South River Resource Area in 1994 and 1997 (Bury 1995). A survey to locate tailed frogs (Ascaphus truei) was conducted in 1998 (Konkle 1998). Tailed frogs were found in the Louis Creek and Curtin Creek areas in 1997 and 1998. The spotted frog is not expected to occur in the 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 have been documented as occurring in the WAU.

Twelve Bureau Tracking amphibian and reptile species occur in the WAU. They use unique habitats within the many different vegetation types in the WAU. Features like large down woody material, talus slopes, creeks, seeps, ponds, and wetlands are often used by amphibian species in southwestern Oregon. Generally, floodplain areas contained the best habitat for amphibians before development and grazing began in the early 1900s.

Western pond turtles occur in several ponds in the WAU. Nesting turtles use warm, sandy locations near water to incubate eggs. Non-native fish and bullfrogs can decrease western pond turtle survival in the WAU because they eat juvenile turtles and the invertebrates the turtles eat.

c. Bureau Assessment Species

Two terrestrial animal species on the Roseburg BLM District are Bureau Assessment Species (BA). The two species include the Brazilian free-tailed bat (Tadarida brasiliensis mexicana) and the harlequin duck (Histrionicus histrionicus).

(1) The Brazilian Free-tailed Bat

The distribution range of the Brazilian free-tailed bat extends from southwestern Oregon to the Carolinas and south to Central America (Verts and Carraway 1998 and Csuti et al. 1997). The Brazilian free-tailed bat uses caves, tree hollows, barns, houses, and other buildings. One bat has been documented in the WAU. The warmer temperatures in the lower elevations of the WAU may provide conditions this bat prefers.

(2) Harlequin Duck

The harlequin duck nests along clean, fast-flowing creeks and streams on the western slopes of the Cascade Mountains. The Roseburg BLM District is near the southern limit of its breeding range. Harlequin ducks have been seen in the Roseburg BLM District during the breeding season but not in the WAU.

d. State of Oregon Listed Species

There are 25 animals listed as threatened or endangered by the State of Oregon. The marbled murrelet, northern spotted owl, and bald eagle are also Federally listed. The peregrine falcon is no longer listed as Federally Endangered but is listed as endangered by the State of Oregon.

e. Special Attention Species

Survey and Manage species were identified in the Northwest Forest Plan (USDA and USDI 1995) and the Amendments to the Record of Decision and Standards and Guidelines (USDA and USDI 2001). Management of known sites, surveys prior to ground disturbing activities, and extensive or general regional surveys are the components of Survey and Manage Standards and Guidelines. Protection Buffer species were identified to be protected by buffers from ground or habitat disturbing activities.

(1) Mollusks

In western Oregon and Washington, over 150 species of land snails and slugs have been identified. Generally, native snails and slugs avoid disturbed areas where habitat modification leads to loss of moisture and increased exposure to solar radiation (Frest and Johannes 1993).

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, 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) were known to occur within the range of the northern 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) were known to occur in Douglas County, Oregon. An additional 75 species may be present. Thirty-one of these species were analyzed in the SEIS ROD as sensitive taxons. Three terrestrial mollusk species present in Douglas County, Oregon require surveys prior to ground disturbing activities or management of known sites. The three species are the Crater Lake tightcoil (Pristiloma arcticum crateris), Oregon megomphix (Megomphix hemphilli), and Oregon shoulderband (Helminthoglypta hertleini). Although all of these species have been documented occurring on the Roseburg BLM District, only the Oregon megomphix is documented as occurring in the WAU. The Oregon megomphix prefers habitats associated with canopy closures greater than 70 percent, hardwoods, deep leaf litter, down logs, rock outcrops, talus, and ground vegetation, such as sword fern and salal. Nonforested areas probably do not provide habitat for these mollusk species. Survey and Manage aquatic mollusk species are not known to be present in the WAU.

(2) The Red Tree Vole

The red tree vole (Phenacomys longicaudus) is an arboreal rodent, which lives inside the canopy of Douglas-fir forests in Oregon and northern California. Its primary food is Douglas-fir needles. However, Sitka spruce, western hemlock, and grand fir needles are also eaten by red tree voles (Huff et al. 1992). The red tree vole's geographic range includes the Roseburg BLM District. The red tree vole is present in the Myrtle Creek WAU. There are approximately 35,412 acres of Douglas-fir forest stands greater than 50 years old, which are considered to be potential red tree vole habitat. About 56 percent of the stands are on Federally-administered land.

(3) The Great Gray Owl

The great gray owl (Strix nebulosa) was designated a Protection Buffer Species in the Northwest Forest Plan (USDA and USDI 1994b). This owl species uses forest stands for nesting while foraging in meadows or other openings. The great gray owl usually lives in areas above 2,500 feet in elevation. Great gray owls have been observed on the Roseburg BLM District. Forested stands near meadows occur in the WAU.

f. Special Interest Species

These species are of special interest to the general public or another agency, such as the Oregon Department of Fish and Wildlife.

(1) Osprey

The Myrtle Creek WAU supports bird of prey species common to the region but estimates of local populations are not available. These raptor species occur where suitable habitat is present.

Osprey (Pandion haliaetus) nesting habitat is present along the South Umpqua River, which flows along the western boundary of the WAU. Several nest sites have been monitored along the South Umpqua River. Potential nesting habitat is probably not different from what was historically present.

(2) Turkey

Historic distribution of the wild turkey (Meleagris gallopavo) extended from Arizona north and east to New England and southern Canada. Their range also extended to Veracruz, Mexico. The turkey has disappeared from its historic range. It has been introduced into California, Nevada, Oregon, Utah, Washington, and Wyoming (Csuti et al. 1997).

Wild turkeys inhabit savannah woodlands, young forest stands less than 10 years old, meadows, and riparian areas (Csuti et al. 1997 and Crawford and Keegan 1990). Oak savannahs present in the lower elevations of the WAU are mostly on private land. Turkeys may use the forested stands bordering areas with agricultural lands and hardwoods.

(3) Roosevelt Elk

Historically, the range of Roosevelt elk (Cervus elaphus) extended from the summit of the Cascade Mountains to the Oregon Coast. In 1938, the elk population 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 WAU is not available. Due to the increased number of people, road construction, home construction, and timber harvesting, it is suspected the elk population has decreased as reported in other parts of the region (Brown 1985).

The number of Roosevelt elk in the Myrtle Creek WAU are not available (Personal communication from ODFW). Elk forage for food in open areas where the vegetation includes grass-forb, shrub, and open sapling communities. Elk use a range of vegetation age classes for hiding. Hiding components include large shrub, sapling, mature, and old-growth forest habitat (Brown 1985).

The Myrtle Creek WAU includes part of two elk management areas identified in the Roseburg District Proposed Resource Management Plan (USDI 1994). Management direction for the Deadman Mountain elk management area discussed in the Roseburg District ROD/RMP was to develop a Habitat Management Plan before implementing major management programs (USDI 1995).

The quality of elk habitat in these management areas was evaluated in the Roseburg District Proposed Resource Management Plan (USDI 1994). Cover quality, forage quality and road density indices were calculated using the Wisdom model (Wisdom et al. 1986). The habitat indices are general guides for elk management. All three indices were below the minimum levels considered optimum for use by elk.

(4) Neotropical Bird Species

Bird species that migrate and spend winter south of the North American Continent are considered neotropical bird species. Bird species that live on the North American Continent year round are called resident birds. Widespread concern for neotropical bird species, related habitat alterations, impacts due to pesticide use, and other threats began in the 1970s and 1980s (Peterjohn et al. 1995).

Oregon has over 169 bird species considered to be neotropical migrants. Population trends of neotropical migrants in Oregon show declines and increases. Over 25 species have been documented to be declining in numbers (Sharp 1990). Oregon populations of 19 bird species show statistically significant declining trends while nine species show statistically significant increasing trends (Sharp 1990). Including all species showing declines, increases, or almost statistically significant trends, there are 33 species decreasing and twelve species increasing in number in Oregon (Sharp 1990).

From 1993 through 1999, neotropical birds were captured and banded and the habitat was evaluated in the South River Resource Area. Surveys from 1996 through 1998 found 62 bird species were present in the resource area. About 62 percent of the bird species banded were neotropical migrants. Six neotropical bird species declining in numbers in the State of Oregon were banded. Two species, the purple martin and Lewis' woodpecker, are listed as State of Oregon Critical species.

The Myrtle Creek WAU contains habitat for neotropical species. The hardwood, shrub, and conifer species in the WAU function as breeding, feeding, and resting habitat for neotropical birds. The conversion of native grasslands and oak savannahs to agricultural lands may have changed the number and types of bird species inhabiting the WAU.

2. Interpretation

The combination of age classes, stand structures, and plant communities produces a variety of wildlife habitat types. Habitat quality and distribution affects habitat use by wildlife. The arrangement of the various wildlife habitats in the WAU is a result of natural and human caused events. Natural disturbances like fire, wind, and flood change the landscape by altering plant community distribution and structure. Human impacts include fire, used to clear land of vegetation and debris, timber harvesting, road construction, home construction, and ownership patterns. Approximately 59 percent of the WAU is privately owned. The checkerboard pattern of vegetation differences is a dominant feature of the WAU, affecting wildlife habitat management.

The amount of area covered by nonforested habitats, such as agricultural and urban areas, have remained about the same during the past sixty years. The difference is the open grassland types have been converted to urban areas. The lower elevations of the WAU contain most of the agricultural and urban areas, as well as the mixed hardwood and oak savannah habitat. Fire suppression may allow conifers to become established in the mixed hardwood and oak savannah habitats changing the wildlife use in these areas.

The number of acres in early and mid seral age class stands increased from 14,357 (18 percent of the WAU) in 1936 to 44,136 (58 percent of the WAU) in 2001. Consequently, wildlife species that use early and mid seral age class habitat have experienced an increase in habitat availability. Wildlife habitat quality may depend upon how a stand is managed.

The amount of late seral habitat in the WAU has decreased from about 63 percent in 1936 to about 26 percent in 2001 (using the FOI and POI GIS data). Using 1993 satellite imagery, the late seral habitat comprised about 33 percent of the WAU (see Tables E-3, E-4, E-5, and E-6 and Map E-1 in Appendix E). The 1993 and 2001 data show the late seral stands in the WAU have become fragmented (separated from each other). About 93 percent of the late seral habitat in the WAU is on Federally-administered land.

Most late seral stands are a mixture of age classes, with gaps containing early seral vegetation nested within the late seral vegetation. In the Klamath Province especially, late seral stands contain a mixture of uneven aged hardwoods and conifers and not a uniform stand of large, old conifers, generally visualized as old-growth forests. The differences between historic vegetation conditions (small patches of early and mid seral vegetation nested in larger blocks of mature vegetation) and current conditions (large blocks of early and mid seral vegetation with scattered patches of late seral vegetation between them) has affected wildlife populations in the WAU.

Forest management practices may increase habitat for some wildlife species, such as early and mid seral stands providing forage for elk. However, some early and mid seral stands may not provide habitat used by other wildlife species. Silvicultural manipulation of some early seral stands may have removed some wildlife habitat components, changing wildlife habitat quality.

Snags, down wood, rock outcrops, caves, talus, ponds, and wetlands provide special habitat features for wildlife species. The amount and distribution of these features in the WAU is generally unknown.

Several ponds occur in the WAU. Some ponds were constructed as pump chances for fire suppression activities. The usefulness of ponds for wildlife is dependent on the shape, vegetation, and presence of non-native species. Descriptions of the ponds, including a species inventory, are presented in Appendix E.

Wetlands less than one acre and not mapped would be managed to retain the indicator vegetation. Microsite quality of the small wetlands may be reduced for some species by modifying the surrounding forest habitat. Table E-2 in Appendix E list riparian associated species of concern that may be affected by modifying habitat around wetlands less than one acre in size.

Landscape features associated with rock substrates, such as talus, cliffs, and caves are unmapped in the WAU. Locations and conditions of these features probably have not changed much in the past one hundred years. Road construction may have created some new talus habitat.

Mining activities have created new caves by digging tunnels and mine shafts. Habitat for wildlife associated with these features may have increased. Townsend's big-eared bats, a Bureau Sensitive Species, occupy an abandoned mine in the WAU.

Fire can cause the loss of wildlife habitat in the WAU. The Klamath Mountain Physiographic Province vegetation developed in the presence of wildfire. However, the WAU is in the northern part of the Klamath Mountain Physiographic Province, which has a cooler, wetter climate than other portions of physiographic province. Wildfires in 1987 burned wildlife habitat in the northern portion of the WAU. Limiting wildfires is important for maintaining wildlife habitat.

C. Plants

The diverse plant communities in the Myrtle Creek WAU have been influenced by natural and human occurrences. The WAU includes the Klamath and West Cascades Geographic Provinces. The Klamath Geographic Province is an older geologic formation with serpentine soils and some rare plant populations. The West Cascades Geologic Province includes the higher elevations in the eastern part of the WAU and does not support rare plants. Fires, landslides, wind, and floods are natural disturbances that have changed vegetation distribution and age. Human caused disturbances including fire, fire suppression, timber harvesting, road construction, building construction, landscaping, agriculture, ranching, nonnative species introductions, and pollution have also changed the distribution and age of the vegetation.

1. Special Status Plants

Six Special Status Plants have been documented or are suspected to occur in the Myrtle Creek WAU. Table 40 lists the Special Status Plants.

Table 40. Special Status Plants Documented or Suspected to Occur in the Myrtle Creek WAU.

Plant Name	Upper South Myrtle Subwatershed	Lower South Myrtle Subwatershed	Upper North Myrtle Subwatershed	Lower North Myrtle Subwatershed
Aster vialis	Documented	Suspected	Suspected	Suspected
Calochortus coxii	Not Suspected	Not Suspected	Not Suspected	Documented
Calochortus umpquaensis	Not Suspected	Not Suspected	Documented	Not Suspected
Cimicifuga elata	Documented	Suspected	Suspected	Suspected
Lupinus sulphureus var. kincaidii	Documented	Suspected	Suspected	Suspected
Pellaea andromedaefolia	Not Suspected	Not Suspected	Not Suspected	Documented

Aster vialis (Wayside Aster), Bureau Sensitive, Survey and Manage, and State Threatened Species
Aster vialis is a rare locally endemic plant only known to occur in Lane, Linn, and Douglas Counties in Oregon. It occurs primarily along ridges between Eugene and Roseburg. Five sites occur in the WAU. Plots were established on the ridge between Letitia and Long Wiley creeks in 1993 to monitor Aster vialis.

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 thrives most vigorously in openings within old-growth stands or associated with edge habitat (Alverson and Kuykendall 1989).

Calochortus coxii (Crinite Mariposa Lily), Bureau Sensitive and State Endangered Species
Calochortus coxii is a newly discovered and described species known only to exist along a twelve mile serpentine ridge system between Dodson Butte and Riddle in Douglas County, Oregon. Calochortus coxii is a distinct, showy, perennial forb in the lily family that blooms from late June to July. Calochortus coxii is restricted to serpentine soils. It is found in a number of different habitats ranging from woodlands to open grasslands. Two populations exist, separated by Interstate 5 (Fredricks 1989). A Conservation Strategy has been developed to identify and schedule management actions to remove or limit threats and provide for the long term survival of Calochortus coxii.

Calochortus umpquaensis (Umpqua Mariposa Lily), Bureau Sensitive and State Endangered Species
This plant is a distinct, showy, perennial forb in the lily family that blooms from late May to early June. It is restricted to serpentine soils in southwestern Oregon from southern Douglas County to northern Jackson and Josephine Counties. The plant is found in a number of different habitats ranging from woodlands to open grasslands (Fredricks 1989). A Conservation Strategy was developed to identify and schedule management actions to remove or limit threats to and provide for the long term survival of Calochortus umpquaensis.

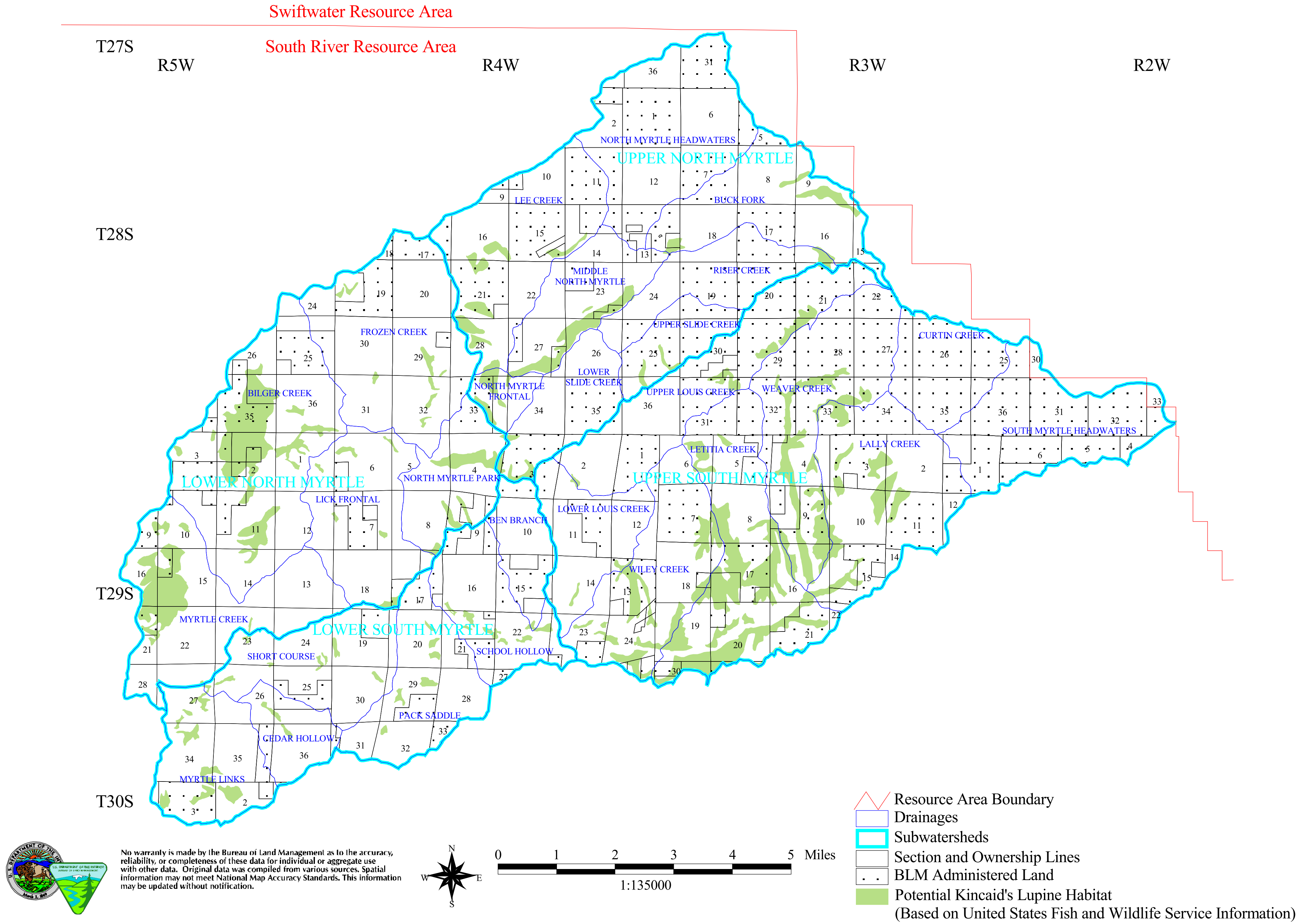
Cimicifuga elata (Tall Bugbane), Bureau Sensitive Species
This plant grows on north facing slopes with Douglas-fir and big leaf maple overstory trees and sword fern and vine maple growing in the understory. Cimicifuga elata is found west of the Cascade Mountains from British Columbia to Oregon. One site occurs in the WAU. A Conservation Strategy was developed to identify and schedule management actions to remove or limit threats to and provide for the long term survival of Cimicifuga elata.

Lupinus sulphureus var. kincaidii (Kincaid's Lupine), Federal Threatened Species
This is one of the three varieties of Lupinus sulphureus found in Oregon. It grows in the Willamette Valley and south into Douglas County, with a disjunct population reported in Lewis County, Washington (Eastman 1990).

Kincaid's lupine has been observed growing in road cuts, jeep trails, upland meadows, and oak savannahs. 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).

Kincaid's lupine is concentrated along the ridge dividing Letitia and Long Wiley creeks. The ridge-top area where Kincaid's lupine is growing was harvested about 30 year ago. Plots established to monitor Aster vialis in the same area could be used to monitor Kincaid's lupine.

Map 29. Myrtle Creek Watershed Analysis Unit
Potential Kincaid's Lupine Habitat



Potential Kincaid's lupine habitat is shown on Map 29. The habitat described by the USFWS consists of specific soil types occurring within certain USGS quads (USFWS communication 2002). A recovery plan is being developed for Kincaid's lupine by the USFWS. Kincaid's lupine habitat in Douglas County is often found under scattered oaks (Federal Register 65 FR 3878). According to General Land Office surveys, prairie, savannah, and woodland vegetation dominated the Lower North Myrtle and Lower South Myrtle Subwatersheds in 1850. Most of the native prairies and the savannah/open woodlands in the WAU were converted to agricultural uses by the 1930s. Human activities, such as fire suppression, urban and agricultural conversion, and timber management have decreased the amount of oak woodlands in the WAU. Closed forest conditions have replaced the open woodland areas where fire has been excluded.

Fire is probably important to maintain viability, since Kincaid's lupine thrives most vigorously in openings within old-growth stands or associated with edge habitat (Alverson and Kuykendall 1989). Maintaining or restoring Oregon white oak (Quercus garryana) and California black oak (Quercus kellogii) could help maintain or restore Kincaid's lupine habitat.

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

2. Bureau Tracking Species

Six Bureau Tracking Plant Species have been documented or are suspected to occur in the WAU. One of the Bureau Tracking Species is also a Survey and Manage Species. Table 41 lists the Bureau Tracking Plant Species.

Table 41. Bureau Tracking Plant Species Documented or Suspected to Occur in the Myrtle Creek WAU.

Plant Name	Upper South Myrtle	Lower South Myrtle	Upper North Myrtle	Lower North Myrtle
Allium bolanderi var. mirabile	Suspected	Suspected	Suspected	Documented
Astragalus umbraticus	Documented	Suspected	Suspected	Suspected
Cypripedium montanum	Documented	Suspected	Suspected	Suspected
Dichelostemma ida-maia	Documented	Suspected	Documented	Suspected
Montia howellii	Suspected	Suspected	Documented	Suspected
Phacelia verna	Not Suspected	Not Suspected	Not Suspected	Documented

Allium bolanderi var. mirabile (Bolander's Onion), Bureau Tracking Species
Allium bolanderi var. mirabile grows in brushy, Jeffery pine (Pinus jefferyii), and incense-cedar (Calocedrus decurrens) woods from Douglas County, Oregon to Lake County, California. Two sites occur in the western part of the WAU.

Astragalus umbraticus (Woodland Milk Vetch), Bureau Tracking Species
Woodland milk vetch grows in open woods at low to mid elevations from southwest Oregon to northwest California. One site occurs in the WAU. Woodland milk vetch has been observed to grow in areas impacted by fire and logging. It is likely this species has become rarer because of fire suppression activities.

Cypripedium montanum (Mountain Lady's Slipper), Bureau Tracking and Survey and Manage Species
Cypripedium montanum populations are small and scattered. Less than 20 exist west of the Cascade Mountains. Three sites occur in the WAU. Two sites consist of one plant each and the third site could not be relocated after timber harvesting activities occurred. Small populations may reflect the slow establishment and growth rate of this species. Cypripedium montanum persists 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 in western Oregon may depend on protecting known populations and developing a conservation plan (USDA and USDI 1994a).

Dichelostemma ida-maia (Firecracker Plant), Bureau Tracking Species
The firecracker plant grows in open woods, grassy hillsides, and roadsides at elevations between 1,000 and 4,000 feet. This lily ranges from Douglas County, Oregon south through the Siskiyou Mountains into California, where it is more common. It has been found in clearcuts, road cuts, and areas impacted by fire. Nine sites occur in the WAU.

Montia howellii (Howell's Montia), Bureau Tracking Species
Montia howellii grows in moist to wet meadows, balds, and rock outcrops at low elevations. Its distribution range is west of the Cascade Mountains from British Columbia to northwest California. The one site known to occur on the Roseburg BLM District is in the Upper North Myrtle Subwatershed.

Phacelia verna (Spring Phacelia), Bureau Tracking Species
Phacelia verna is an annual forb in the waterleaf family that blooms from April to June. Its distribution range is southwest Oregon. It grows on mossy sparsely vegetated rock outcrops and balds between 500 and 6,600 feet in elevation. Two sites occur in the WAU.

3. Survey and Manage Species

Survey and Manage plant species documented as occurring in the WAU are listed in Table F-1 in Appendix F. Many of the Survey and Manage plant species are found in an Area of Critical Environmental Concern/Research Natural Area (ACEC/RNA).

4. Areas of Critical Environmental Concern/Research Natural Areas (ACEC/RNA)

Two ACEC/RNAs occur in the Myrtle Creek WAU. Objectives of ACEC/RNAs are to manage for the maintenance, protection, or restoration of relevant and important resource values and for the purpose of scientific study, research, and education to provide a baseline against which human impacts on natural systems can be measured.

a. North Myrtle Creek ACEC/RNA

The North Myrtle Creek ACEC/RNA was designated an ACEC/RNA because of the Special Status Species occurring in the area. The North Myrtle Creek ACEC/RNA Management Plan outlines the objectives for the ACEC/RNA (USDI 2001b).

b. Tater Hill ACEC/RNA

The Tater Hill ACEC/RNA was designated an ACEC/RNA because of the unique geologic feature of an active landslide. The Tater Hill ACEC/RNA Management Plan outlines the objectives for the ACEC/RNA (USDI 2001c).

5. Noxious Weeds

Noxious weeds have invaded and become established in the Myrtle Creek WAU. They are a problem when they modify native plant communities. Noxious weeds without established weed management techniques have increased their presence in the WAU. Progress is being made to control or eliminate noxious weeds with weed management options.

The Bureau of Land Management has an agreement with the Oregon Department of Agriculture (ODA) to assist in eliminating or controlling target noxious weed species. The Noxious Weed Rating System, used to rate noxious weeds, is from the Noxious Weed Policy and Classification System (Oregon Department of Agriculture 2001).

The Noxious Weed Control Rating System considers an "A" designated weed a weed of economic importance and occurs in the state in small enough infestations to make eradication/containment possible. If the noxious weed does not occur in the state but is in neighboring states and the future occurrence in Oregon seems imminent it may also be considered an "A" designated weed. Infestations are intensively controlled when they are found.

A noxious weed is considered a "B" designated weed when a weed of economic importance is regionally abundant but may have limited distribution in some counties. Biological controls are the main methods when implementing a fully integrated statewide management plan is feasible. Intensive controls may be used at the state or county level after an evaluation.

A “T” designated weed is designated by the State Weed Board as a target weed species. The Department of Agriculture implements a statewide management plan for target weed species.

There are twelve noxious weed species known to occur in the WAU. Using Best Management Practices can limit introducing or spreading noxious weed infestations in the WAU.

Carduus pycnocephalus (Italian Thistle), ODA B designated weed
Italian thistle is native to the Mediterranean region. Populations of Italian thistle are isolated and small since it was introduced into Douglas County fairly recently. This species is spread by wind, vehicles, and animals, which means its spread is harder to track. The one known site in the WAU is in the Bilger Creek area and is being managed by ODA.

Carthamus lanatus (Wooly Distaff Thistle), ODA A and T designated weed
Wooly distaff thistle is native to the Mediterranean region. This species is not widespread in Oregon. The one known site in Douglas County occurs in the WAU and is being actively managed by ODA.

Centuarea melitensis (Malta Starthistle), Douglas County B and T designated weed
This species is not on the Oregon Noxious Weed list but is on noxious weed lists of other states. The BLM attempts to eliminate malta starthistle populations when they are small. One site in the WAU is small. However, control measures and monitoring may occur for several more years.

Centaurea solstitialis (Yellow Starthistle), ODA B designated weed
Yellow starthistle is native to southern and western Europe and Asia. It was discovered in California in 1869. Human activities are the primary methods of transporting yellow starthistle long distances. Yellow starthistle infests open areas once it is established. The one known site in the WAU is being actively managed by ODA. Several infestations in high use areas near the WAU could allow other yellow starthistle populations to develop in the WAU.

Cirsium arvense (Canada Thistle) and Cirsium vulgare (Bull Thistle), ODA B designated weeds
These thistles occur in the WAU in large numbers. Biological agents are the methods used to control wide spread and numerous noxious weed species. Manual or chemical controls are limited.

Cytisus scoparius (Scotch Broom), ODA B designated weed
Scotch broom colonizes roadsides, waste areas, grasslands, dunes, young stands and other areas with recent disturbances. Herbicide spraying and manual control methods are being used to reduce or eliminate Scotch broom along roads and in young forest stands. Removing scotch broom along haul routes and in project areas would help control its spread.

Hypericum perforatum (St. Johnswort), ODA B designated weed
St. Johnswort is widespread and common, especially along roadsides. Biological controls have been effective in reducing populations. Manual control methods have been limited to small, sensitive areas.

Polygonum cuspidatum (Japanese Knotweed), ODA B designated weed
Japanese knotweed is an introduced ornamental plant from Asia. It escaped to become a weed growing on roadsides, waste areas, ditches, stream banks, and pastures. This weed has the potential to spread rapidly along streams. Japanese knotweed has been in Douglas County a short amount of time. One known site occurs in the WAU. Controlling the small population would reduce the risk of this species spreading.

Potentilla recta (Sulphur Cinquifoil), ODA B designated weed
Sulphur cinquifoil is native to the eastern Mediterranean region of Eurasia. One site occurs along a county road in the WAU. The population is small but has the potential to spread.

Rubus discolor (Himalayan Blackberry), ODA B designated weed
Himalayan blackberry is the most abundant noxious weed in the WAU. It occurs along streams, roadsides, open grasslands, in recently disturbed areas, and in forested lands. Infestations occur more in the lower elevations where open and disturbed areas provide a place they can become established. They also occur in the open grasslands on ridges. The higher elevations and forested areas have fewer Himalayan blackberries due to shaded growing conditions and the shorter amount of time blackberries have been in those areas.

Senecio jacobea (Tansy Ragwort), ODA B and T designated weed
Tansy ragwort is native to western Europe and western Asia. Tansy ragwort was established and widespread in western Oregon by the 1950s. Biological controls have limited tansy ragwort to small scattered populations in the WAU.

Ulex europaeus (Gorse), ODA B and T designated weed
Gorse is native to central and western Europe. It was introduced to the west coast before 1894. Gorse was established in western Oregon, Washington, and northern California by the 1950s. Gorse is very difficult to control and is a high priority for controlling and eradicating. One historical gorse site occurred in Section 17 of T28S, R4W.

6. Interpretation

Many of the Special Status Species grow on unique or special habitats. Human activities, such as fire suppression, urban development, agriculture, and timber management have changed the vegetation conditions in the WAU. Reductions in the amount of Special Status Plant Species habitat has contributed to declines in native flora and fauna (Chiller et al. 2000).

A complete inventory of the noxious weeds present and their location in the WAU is not currently available. A complete survey would provide important data to prioritize noxious weed control. Noxious weeds become a problem when they modify native plant communities.

VIII. Recommendations

A. Vegetation

Silvicultural treatments can accelerate the reestablishment and growth rates of desired vegetation, principally trees, and develop structural complexity of vegetation in forests which lack complexity as a result of past disturbances. Silvicultural restoration can include controlling the amount of time between human-caused disturbances.

Silvicultural treatments can maintain and produce wildlife habitat and diverse stand structures including those associated with late-successional forests (Curtis et al. 1998). The Northwest Forest Plan recognized that active silvicultural programs would be necessary to restore large conifers in Riparian Reserves (USDA and USDI 1994b). Restoration treatments would vary by vegetation development stage and landscape and site conditions.

The desired future condition of Riparian Reserves is to approach late-successional forest conditions appropriate to the ecological site (Gregory 1997). The two principal silvicultural treatments recommended for application to the Riparian Reserves are density management (thinning) and fertilizing.

1. Density Management/Thinning

Young stands may not develop into stands comparable to present old-growth without human intervention (DeBell et al. 1997). There is evidence suggesting current young forest stands in western Oregon were established and are growing at higher densities than old-growth stands when they were younger (Tappeiner et al. 1997 and Poage 2001). Diameters and growth rates of old-growth stands during the first 100 years of their existence were greater than in current young stands at the same age. Growth rates of old-growth trees during their first 50 years were about 40 percent greater than the growth rates observed in modern young stands (Tappeiner et al. 1997). Diameters of old-growth trees at ages 100 and beyond were strongly correlated to their diameters and growth rates at age 50 (Poage 2001). The reason for these differences appear to be stand density. Large old-growth trees established and grew at lower densities than young stands now. These findings support thinning young, dense stands to accelerate the development of certain old-growth characteristics (Tappeiner et al. 1997 and Poage 2001).

Long-term growth studies in western Oregon found large differences in diameter growth, for the largest 40 trees per acre, between thinned and unthinned stands of comparable pre-treatment densities. Diameter growth increased between 33 and 56 percent on a very productive (SI_{50} >135) site over a twenty year period after thinning (Marshall et al. 1992). On a less productive (SI_{50} >110) site, diameter growth increased between 13 and 29 percent over a twenty year period after thinning (Curtis 1992).

Thinning also accelerates the development of multi-story structures. Thinned stands were more similar to old-growth stands in terms of overstory density, overstory tree diameters, tree growth rates, tree crown characteristics, survival of intermediate trees, and tall shrub frequency. Thinning also stimulated tree regeneration. The multi-storied canopies in the thinned stands influenced the current function of the stands and appeared to be fundamental to stand development, species composition, and future structural and functional attributes (Bailey 1996, Bailey and Tappeiner 1998, and Bailey et al. 1998). Figure 6 shows the differences in stand structure between thinned and unthinned stands.

Figure 6. Iron Creek LOGS Study at Age 45. (A) Unthinned Area, (B) Area With Repeated Light Thinning Showing Vertical Structure in Response to Thinning, and (C) Area With Repeated Heavy Thinning Showing Vertical Structure in Response to Thinning (Adapted From Curtis et al. 1998).

A B C

Precommercially thinned Douglas-fir stands had higher crown ratios, increased individual tree growth rates, increased shrub and fern understory cover, and lower height to diameter ratios (Tappeiner et al 2000). Low height to diameter ratios are important for tree stability. High height to diameter ratios (80-100) can predispose trees to stem bending, breakage, and windthrow (Oliver and Larson 1990). Precommercial thinning is most effective in controlling height to diameter ratios when subsequent thinnings maintain the stand below the high range (Wilson and Oliver 2000).

Several thinning treatments may be necessary to achieve the desired old-growth stand structures (Tappeiner et al. 1997 and Newton and Cole 1987). Repeated thinnings maintain rapid tree and stand growth (DeBell et al. 1997).

Early thinning provides the best opportunities to maintain large crown ratios and rapid growth rates in response to thinning (Bailey 1996, DeBell et al. 1997, and Curtis et al. 1998). Overstory and understory responses to thinning are most pronounced and consistent in stands less than 90 years old on poorer sites (SI_{50} < 110) and less than 70 years old on productive sites (SI_{50} >130) (Bailey 1998). The maximum age at which thinning is justified in vigorous stands is more a matter of management objectives than biological limitations (Curtis et al. 1998).

Dense understories of shade tolerant species (e.g., western hemlock, western red cedar, and grand fir) can be created when more than 20 percent of the timber volume is removed (assuming available seed sources), but dense Douglas-fir understories require more than 30 percent of the volume to be removed. Understory Douglas-fir are unlikely to persist over time unless at least 50 percent of the volume is removed. The greatest responses in terms of overstory tree diameter growth rates, crown (and branch) sizes, intermediate structure and seedling establishment occurs on sites when more than 50 percent of the volume is removed (Bailey 1996).

a. Recommendations for Density Management (Precommercial Thinning) of Sapling Sized Stands in Riparian Reserves

The purpose of precommercial thinning is to maintain or improve growth rates, manipulate species composition, and produce a spatial arrangement to preserve future management options. Thinning can be done by felling, girdling, or chemical injection depending on tree sizes and fuel considerations. Maintaining vigorously growing trees allows flexibility to regulate stand structure in the future.

(1) Stand Selection Criteria

Potential precommercial thinning stands are typically plantations stocked with trees too small to support a commercial harvesting operation. The stands are usually even-aged and single canopied with tree densities exceeding 300 trees per acre and between 10 and 15 feet tall. The optimum time to thin a stand is before crowns close causing the lower branches to die (about eight to 13 years after planting). However, substantial benefits can still be obtained when stands beyond the optimum conditions are treated (Reukema 1975). Table K-1 in Appendix K lists stands that have been or are planned to be precommercially thinned.

(2) Treatment Recommendations

Stands should average between 150 and 250 trees per acre after precommercial thinning. A portion of the stand could be treated to include stand variation. Variation in leave tree spacing should be encouraged.

Manage for a mix of conifers and hardwoods appropriate to the vegetative zone. Depending on the desired site specific characteristics, sprout form hardwoods could be maintained in that form, thinned to one dominant stem, or retained in a combination of forms.

Varying the definition of the minimum tree size to be cut may maintain shorter shade tolerant conifers in the stand. The shade tolerant trees may provide a releasable understory at the time of the next thinning (Curtis et al. 1998).

On the average, precommercial thinning aged stands contain openings greater than 22 feet in diameter on five percent of the area (Lewis and Kintop 1990). Creating additional openings (patch cuts) when the trees are taller would allow greater separation between the overstory and understory, enhancing multi-story stand structure.

Unthinned patches of trees should not be retained if the emphasis is to increase overstory tree diameters.

Refer to the Risk Assessment for the South River Resource Area for possible treatments of fuels created by precommercial thinning (USDI 2001d).

Riparian Reserves should be treated at the same time as upland areas to reduce treatment costs and improve efficiency.

b. Recommendations for Density Management (Commercial Thinning) of Mid and Late Seral Stands in Riparian Reserves

The purpose of commercial thinning is to maintain or improve overstory and understory tree growth rates and vigor and manipulate species composition and spatial arrangement by reducing stand density. Snag and coarse woody debris recruitment and releasing or thinning understory components may be done at the same time.

Treatment prescriptions may vary depending on site and landscape specific objectives. Treatments would maintain or improve diameter growth rates and control crown depth and crown closure to meet the objectives. Density management may also create gaps to release or thin the understory and recruit snags and coarse woody debris.

(1) Stand Selection Criteria

Potential commercial thinning stands have tree diameter distributions and densities which can support a commercial harvesting operation during average market conditions. The first commercial thinning usually occurs when a stand is between 30 and 40 years old. Stands usually are even-aged and have a single canopy or a young understory. The optimal timing is when crown ratios of the dominant trees are at least 40 to 50 percent and height growth rates are high. Stands may have had earlier density management treatments.

Stands at least 80 years old may have an understory of desired species to maintain or enhance. Stand structure and expected stand development should be the principal criteria for treatment, not the age of the stand. Even stands greater than 80 years old can be single canopied with little stand diversity and should be considered for density management.

Fire suppression in older stands may have caused them to develop differently than they would have under a natural fire regime. These stands may exhibit late-successional or old-growth characteristics and should be retained without active management, unless they are identified as needing treatment as part of a risk reduction effort. Understories in these stands may have developed undesirable characteristics, such as fuel ladders, due to fire suppression. Refer to the Risk Assessment for the South River Resource Area for potential fuel or understory treatments (USDI 2001d). Table K-1 in Appendix K lists stands that have been or are planned to be commercially thinned.

(2) Treatment Recommendations

Wide variable spacing may be prescribed to obtain rapid tree growth, a vigorous understory tree or shrub layer, large limbs, very deep crowns, coarse tree form, and rough textured canopies. Stands should be managed to maintain a relative density index below 0.55 between thinnings, in areas where high tree growth rates are desired (Hann and Wang 1990 and Curtis and Marshall 1986).

Closer spacings or no treatment areas may provide snags and down wood through the natural suppression process. Snags or down woody debris could be created, if they are determined to be appropriate treatments.

Retain hardwoods and conifers in a mix appropriate for the vegetative zone to maintain species diversity. Wider spacing may be needed to keep hardwoods as a stand component.

Consider removing young trees adjacent to remnant large trees to maintain vigorous large trees.

Canopy gaps would encourage understory vegetation to develop and contribute horizontal and vertical structural diversity. Canopy gap dimensions and composition should reflect local conditions (Gregory 1997). The gap should be at least 0.75 acre in size, if shade intolerant species are desired (Isaac 1943 and Tappeiner and Thompson 1996).

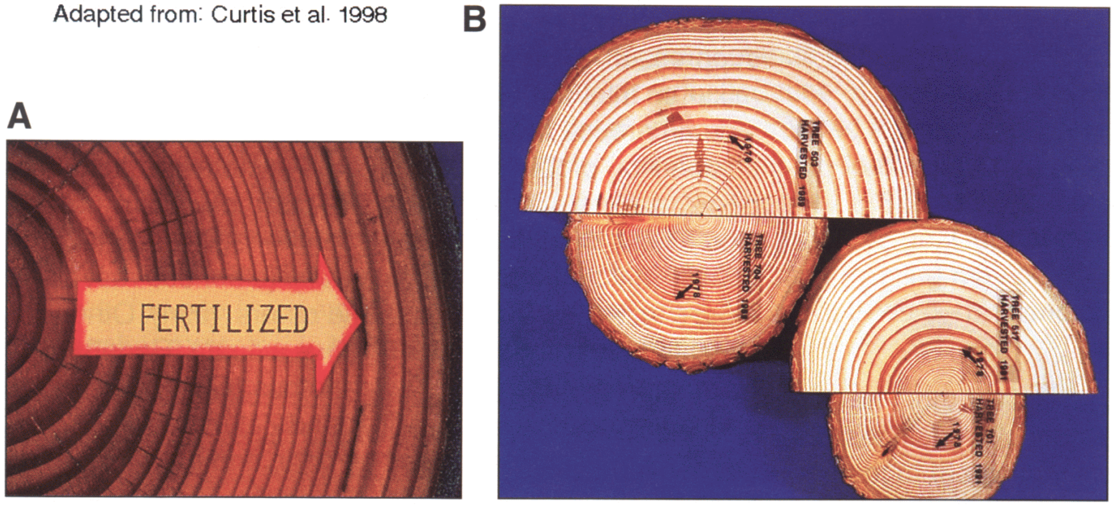
Riparian Reserves should be treated at the same time as upland areas to reduce treatment costs and improve efficiency.

2. Fertilization

The goal of fertilization is to accelerate tree and stand growth by improving stand nutrition. Growing larger trees would help develop late-successional conditions. Fertilization increases the tree growth rates so they reach a larger size in a shorter amount of time. Increased diameter and height growth have been reported. Volume growth rates from twelve percent to 38 percent can occur eight to twelve years after fertilization (Chappell et al. 1992). Figure 7 shows how fertilization can increase diameter growth. Canopy closure can also be accelerated by crown expansion and densification (Nason and Myrold 1992).

Figure 7. Response in Diameter Growth After Fertilizing Trees.

Adapted from: Curtis et al. 1998



–Relatively small and infrequent applications of nitrogen fertilizer often produce striking response in tree vigor and stand development, particularly on poor sites. Typical response in diameter growth (A), shown by wide growth rings commencing in the year following fertilization; and an extreme example of response (B) shown by paired stem sections, cut from trees on adjacent fertilized and unfertilized plots on a very poor site.

(a) Stand Selection Criteria

Stands containing at least 80 percent Douglas-fir, having relative density indexes less than 0.50, and less than 80 years old could be fertilized. Stands in moderate to low site classes should generally receive priority. Table K-1 in Appendix K lists stands previously or planned to be fertilized. Approximately 217 acres of Riparian Reserves in the WAU are planned to be fertilized.

(b) Fertilization Recommendations

Apply approximately 200 pounds of available nitrogen per acre. Incorporate minor nutritional elements if a site specific analysis indicates they are needed.

B. Soils

Appropriate methods should be used for reducing vegetative competition on Category 1 Soils. Consider using methods other than prescribed burning on Category 1 Soils unless considered essential for resource management, such as habitat improvement, tree seedling establishment, or reducing fire risks.

Maintain or enhance long term soil productivity while meeting management objectives.

C. Hydrology

Limited water quality, stream temperature, and summer base flow data are available for this WAU. Water quality data could be collected using multi-parameter instruments, which collect diurnal data. Temperature, DO, and pH data would be useful to quantify changes occurring in streams in the WAU.

Rosgen Level II surveys would be useful to classify stream channel morphology and identify potential stream restoration sites.

Improved regional curves could be used to predict streamflow, depth, width, and cross-sectional area of ungaged streams. The information would be useful to determine potential changes in stream morphology that may occur due to management activities and help with designing stream restoration projects.

Consider monitoring water quality parameters listed by ODEQ as water quality limited in the WAU.

Management in Riparian Reserves should improve or maintain riparian function or habitat conditions. Activities to consider include density management to maintain or improve tree growth for future stream side shade and potential LWD, placing LWD in the stream channel to manipulate channel form and improve aquatic habitat diversity, decommissioning or obliterating roads, and re-establishing riparian vegetation and valley bottom form. Eliminating noxious weeds and establishing native plants in the riparian areas would increase stream channel stability.

Consider planting conifers in riparian areas, where they occurred naturally, but are not growing now.

Consider adding LWD to increase habitat complexity and help restore degraded streams. Thinning in Riparian Reserves would also allow trees adjacent to stream channels to grow and provide LWD in a shorter amount of time than without any management.

Give preference to bioengineering techniques instead of rip rap, gabion baskets, or check dams when conducting stream restoration.

Monitor stream restoration projects for temperature, turbidity, sediment, and channel morphology changes.

Stream surveys could be used to help identify stream restoration opportunities, such as removing culverts when decommissioning roads or replacing culverts on fish bearing streams.

Road decommissioning, full decommissioning, or obliteration should be considered for roads that are no longer needed, current or potential sources of sediment being added to streams, and channel network extensions to streams.

Renovate roads to reduce the risk of erosion and sediment delivery to stream channels, culverts plugging, flow diversion at stream crossings, and channel network extension. Consider designing road and stream crossings to allow large woody debris to be transported downstream past the road crossing.

When fertilizing in the WAU, provide adequate buffers on streams and collect water samples from streams in the project area. Where streams or other water bodies have a pH greater than 8.0 or in municipal watersheds, apply fertilizer so stream pH or primary productivity would not increase by keeping the fertilizer out of the streams.

Consider the amount of forested land less than 30 years old, road density, amount of land in the TSZ when analyzing the potential impact of management activities.

Consider opportunities to adjust Riparian Reserve widths within the WAU. The Riparian Reserve Evaluation Techniques and Synthesis module should be used as a guide when considering adjusting Riparian Reserve widths.

D. Fisheries

Fisheries management in the Myrtle Creek WAU should include aquatic habitat restoration, improved fish passage, and improved water quality. Because of the ownership pattern in the WAU, cooperative agreements between county, state, and federal agencies, the watershed council, and private landowners to restore aquatic habitat should be considered.

1. Roads

Water quality conditions would benefit from road renovation, road decommissioning, road obliteration, and road maintenance where problem roads have been identified. Installing proper drainage structures to control erosion while conducting road maintenance would control sediment and water routing processes and accelerate recovery of the aquatic habitat. The Transportation Management Objectives (TMO) identify potential road restoration opportunities in the WAU (see Appendix G). Intensive surveys should be conducted to identify road treatment opportunities in the area of proposed projects. Roads in riparian areas are considered a high priority for maintenance or treatment opportunities because of their location near streams and the possibility of adding sediment to the streams.

Roads identified in the TMOs considered to be priorities by the fisheries biologist are included in Tables 42 and 43. They are not ranked in order of importance.

Table 42. Roads Important to Fisheries Included in Roads to Consider Decommissioning.

Road Number	Miles	Surface Type	Reason
28-2-32.03A	0.62	Natural	crosses a tributary of upper South Myrtle Creek
28-3-8.02A	0.36	Rock	crosses a stream
28-3-33.02A	0.50	Natural	crosses a tributary of Weaver Creek
29-4-3.00A	0.55	Natural	in riparian area of Louis Creek tributary
Total Miles	2.03		

Table 43. Roads Important to Fisheries Included in Roads to Consider Improving.

Road Number	Miles	Surface Type	Reason
28-3-30.01A	0.51	Rock	in Slide Creek riparian area
28-3-34.00A	0.34	Rock	runs along tributary of Weaver Creek
28-3-34.01A	0.14	Rock	crosses a tributary of Weaver Creek
28-3-34.06A*	0.45	Rock	crosses tributary of Johnson Creek
28-4-1.01A*	0.10	Rock	crosses North Myrtle Creek
28-4-12.01B	0.92	Rock	runs along tributary of upper North Myrtle Creek
28-4-15.00A	1.36	Rock	runs along tributary of Lee Creek, two culverts creating fish barriers
28-4-21.04A	0.40	Rock	runs along tributary of Lee Creek
28-4-28.00B	1.36	Rock	crosses Lee Creek, one culvert creating fish barrier
28-4-34.00E	2.97	Rock	runs along Slide Creek, sediment issues
28-2-32.02A	0.56	Rock	follows a tributary of South Myrtle Creek
28-3-33.00B	2.71	Rock	follows a tributary of Weaver Creek
28-4-36.03A	0.75	Rock	crosses tributary to Louis Creek, need to evaluate culvert
29-3-11.00A*	3.04	Rock	runs along tributary of South Myrtle Creek
29-3-11.02A	0.51	Rock	runs along tributary of South Myrtle Creek
29-3-11.02B	0.47	Natural	runs along and crosses a tributary of South Myrtle Creek, PFC survey indicates sediment and road encroachment
29-3-11.03A	0.49	Rock	crosses a tributary of South Myrtle Creek, PFC survey indicates sediment and road encroachment
29-4-3.01A	0.59	Rock	runs along Slide Creek tributary, Pfankuch survey indicates sediment
Total Miles	17.67		

* = Road renovation planned under sold timber sale contract or planned timber sale EA not completed.

2. Culverts

Culverts located on fish-bearing streams and needing to be replaced should accommodate a 100-year flood and provide anadromous and resident fish passage. Culverts needing to be replaced would be analyzed for the 1) number of miles of suitable anadromous fish habitat above the culvert, 2) sources of sediment, 3) number of miles of suitable resident fish habitat above the culvert, 4) amount of BLM-administered land is upstream, 5) number of cooperative private landowners, and 6) planned or completed instream habitat improvements on adjacent streams.

Culvert inventories are being conducted on anadromous fish bearing streams in the WAU. The culvert inventory data included in a GIS database contains some information on culverts in the Myrtle Creek WAU. Culvert information should updated in the GIS database after it is collected.

Table 44 lists some of the culverts needing to be replaced to restore fish passage based on the available information (the culvert number is from the GIS database). Priorities would be based on the amount and quality of upstream fish habitat, type of fish barrier (juvenile or adult), and known fish abundance.

Table 44. Culverts in the WAU Needing to be Replaced to Restore Fish Passage Based on the Available Information.

Stream Name	Road Number	Location	Culvert Number	Miles and Type of Habitat Blocked
Weaver Creek	29-3-16.00	T29S, R3W, Section 16	1018	6 miles of anadromous
Weaver Creek	29-3-16.00	T28S, R3W, Section 32	1020	3.5 miles of anadromous
Weaver Creek	29-3-16.00	T28S, R3W, Section 33	1019	2.5 miles of anadromous
Lee Creek	28-4-28.00	T28S, R4W, Section 28	1025	3 miles of anadromous
Slide Creek	28-4-34.00	T28S, R4W, Section 26	1023	2 miles of anadromous
Lee Creek	28-4-28.00	T28S, R4W, Section 21	1026	2 miles of anadromous
North Myrtle Creek	28-4-13.00	T28S, R4W, Section 12	1021	3 miles of anadromous
North Myrtle Creek	28-4-13.00	T28S, R4W, Section 13	1038	2 miles of anadromous
Lee Creek	28-4-28.00	T28S, R4W, Section 15	1039 (3011)	2 miles of anadromous
Buck Fork Creek	28-4-13.00	T28S, R4, Section 13	4750	4 miles of anadromous
Buck Fork Creek	28-3-17.00	T28S, R3W, Section 17	3452	2 miles of anadromous

Table 44. Culverts in the WAU Needing to be Replaced to Restore Fish Passage Based on the Available Information.

Stream Name	Road Number	Location	Culvert Number	Miles and Type of Habitat Blocked
Lee Creek	Private	T28S, R4W, Section 22	4860	2 miles of anadromous
Louis Creek	29-4-11.00	T28S, R3W, Section 29	3018	2 miles of anadromous
Ben Branch*	29-4-22.00	T29S, R4W, Section 15	3019	1 mile of anadromous
Curtin Creek	County 18	T28S, R3W, Section 35	3409	0.5 mile of anadromous
Ben Branch	29-4-22.00	T29S, R4W, Section 10	3020	0.25 mile of anadromous
Rock Creek	29-5-11.00	T29S, R5W, Section 11	3027	0.25 mile of anadromous
South Myrtle Creek	28-3-35.00	T28S, R2W, Section 31	3024	3 miles of resident
Tributary of Louis Creek	29-4-11.01	T29S, R4W, Section 11	3025	1 mile of resident
High Prairie Creek	28-4-28.00	T28S, R4W, Section 15	4760	1 mile of resident
Collins Creek	28-3-8.02	T28S, R3W, Section 8	3474	0.75 mile of resident
Curtin Creek	28-3-35.02	T28S, R3W, Section 35	3023	0.5 mile of resident
Tributary of Lee Creek	28-4-21.00	T28S, R4W, Section 21	3008	0.5 mile of resident
Curtin Creek	28-3-35.02	T28S, R3W, Section 35	3418	0.5 mile of resident
Curtin Creek	28-3-35.02	T28S, R3W, Section 35	3419	0.5 mile of resident
Tributary of Lee Creek	28-4-15.00	T28S, R4W, Section 15	3001	0.5 mile of resident
Tributary of South Myrtle Creek	29-3-11.00	T29S, R3W, Section 11	3015	0.5 mile of resident
Tributary of Weaver Creek	29-3-16.00	T28S, R3W, Section 32	3149	0.5 mile of resident
Tributary of Weaver Creek	28-3-33.00	T28S, R3W, Section 33	3216	0.5 mile of resident
Lee Creek	28-4-28.00	T28S, R4W, Section 11	3012	0.25 mile of resident
Tributary of Bilger Creek	29-5-2.00	T29S, R5W, Section 3	3010	0.25 mile of resident
Tributary of Lee Creek	28-4-28.00	T28S, R4W, Section 22	4918	0.25 mile of resident
Tributary of Weaver Creek	29-3-16.00	T29S, R3W, Section 4	3143	0.25 mile of resident
Tributary of Weaver Creek	28-3-33.00	T28S, R3W, Section 28	3222	0.25 mile of resident

Table 44. Culverts in the WAU Needing to be Replaced to Restore Fish Passage Based on the Available Information.

Stream Name	Road Number	Location	Culvert Number	Miles and Type of Habitat Blocked
Tributary of Ben Branch	29-4-22.00	T29S, R4W, Section 15	3248	0.25 mile of resident
Curtin Creek	28-3-35.04	T28S, R3W, Section 35	3422	0.25 mile of resident
Riser Creek	28-3-17.00	T28S, R3W, Section 17	3017	0.25 mile of resident
Tributary of South Myrtle Creek	29-3-11.00	T29S, R3W, Section 11	3426	0.25 mile of resident
Tributary of Lally Creek	29-3-9.00	T28S, R3W, Section 33	3173	0.1 mile of resident
Tributary of Louis Creek	Unnumbered spur of 29-4-11.01	T29S, R4W, Section 11	3292	0.1 mile of resident
Tributary of South Myrtle Creek	29-4-21.01	T29S, R4W, Section 16	3232	Unknown

* = Culvert is to be replaced under a sold timber sale contract.

3. Instream Structures and Riparian Restoration

Survey stream reaches to determine where to place LWD or other structures in the stream. Felling trees from the adjacent riparian area, pulling trees adjacent to the stream channel, or placing logs or boulders are methods that could be used to place structures in the stream.

Oregon Department of Fish and Wildlife aquatic habitat surveys indicated riparian areas lacked large conifers to produce future LWD in streams in the Myrtle Creek WAU. Stream restoration in areas lacking large conifers could be accomplished by planting and thinning trees in the riparian areas. Trees should be planted where conifers are lacking. Trees should be thinned where the conifers are overcrowded and growing slowly. Riparian areas dominated by alder or other hardwoods could be thinned to allow conifers to grow. Noxious weeds in riparian areas should be eliminated and replaced with native vegetation, such as conifers, willows, and native grasses to protect and enhance the stream channel.

Priority Streams for Instream Structures or Riparian Restoration

(1) Weaver Creek

The upper reaches of Weaver Creek are administered by the BLM. About 2.4 miles of the creek contain coho salmon and steelhead spawning and rearing habitat. Sediment and a lack of LWD were identified in the ODFW surveys. Identify sources of sediment and areas to place LWD or other structures in the stream.

(2) Slide Creek

A large percentage along Slide Creek is BLM-administered land. Slide Creek contains coho salmon and steelhead spawning and rearing habitat. Identify sources of sediment. Consider cooperative activities with private landowners to reduce bank erosion in Section 34.

(3) Upper South Myrtle Creek

The upper part of South Myrtle Creek is considered important for conducting restoration activities or placing structures in the stream because of the amount of BLM-administered land along the creek, coho salmon and steelhead spawning and rearing habitat, and gravel and large wood supplied by the Tater Hill slide. Identify areas to place LWD or boulders to trap gravels moving downstream from the Tater Hill slide to create spawning habitat and pools. Identify and evaluate riparian restoration areas.

(4) Louis Creek

Louis Creek is considered important to fisheries because of the BLM-administered land pattern and the coho salmon and steelhead spawning and rearing habitat. The PFC surveys indicate the stream had a downward trend. Identify causes and potential restoration opportunities.

(5) Upper North Myrtle Creek

Upper North Myrtle Creek is a candidate for placing structures in the stream because of the amount of BLM-administered land, coho salmon and steelhead spawning and rearing habitat, and it may be an important summer refuge for salmonids. Identify areas to place LWD to develop juvenile fish habitat and pools.

4. Aquatic Habitat Surveys

Aquatic habitat surveys have not been conducted on Curtin Creek, Lally Creek, Letitia Creek, Johnson Creek, Long Wiley Creek, Short Wiley Creek, Louis Creek, Cedar Hollow, School Hollow, Big Lick Creek, Little Lick Creek, and Ben Branch Creek. The priority for completing aquatic habitat surveys is based on the amount of BLM-administered land along the creek.

Curtin Creek and Johnson Creek would be high priorities for conducting aquatic habitat surveys because the streams are entirely on BLM-administered land. Lally Creek, Letitia Creek, Long Wiley Creek, Louis Creek, and Ben Branch Creek would be the next priorities because they have a medium to small amount of BLM-administered land. Short Wiley Creek, Cedar Hollow, School Hollow, Big Lick Creek, and Little Lick Creek would be the last priorities because they include little or no BLM-administered land.

Proper Functioning Condition or Pfankuch surveys have been completed on most of the stream reaches on BLM-administered land in the Myrtle Creek WAU but a few areas still need to be surveyed. Completed surveys may help when evaluating areas for restoration opportunities. The areas to be surveyed include Bilger Creek (Section 25, need a key to access private gate), Frozen Creek (Section 19, access denied by landowner), Lee Creek (Section 15 above the 28-4-15.0 road and Section 11), North Myrtle Creek (Sections 13 and 1), and Riser Creek (Sections 17 and 20).

5. Fish Presence, Use, and Population Data

Spawning surveys should be conducted in Lee Creek, Slide Creek, Weaver Creek, upper South Myrtle Creek, upper North Myrtle Creek, and Louis Creek where restoration activities (such as culvert replacement, road treatments, instream structures, and riparian treatments) are planned. Informal fish presence and spawning surveys should be conducted above and below culvert replacements, before and after the project is completed.

Snorkeling surveys should be conducted after juvenile salmonid rearing habitat improvement projects are completed. The snorkeling surveys would be used to evaluate juvenile fish use of newly created pools, backwater areas, and cover.

Electrofishing surveys for fish presence have been completed in most of the WAU. Some areas to conduct electrofishing surveys are listed in Table 45.

Table 45. Streams in the WAU to Consider Collecting Fish Presence Data.

Creek Name	Location
Bilger Creek	T28S, R3W, Section 25
Tributary of Bilger Creek	T29S, R3W, Section 3
Frozen Creek	T28S, R4W, Section 19
Tributaries of Slide Creek	T29S, R4W, Sections 3, 35, and 25
School Hollow	T29S, R4W, Section 9
Ben Branch	T29S, R4W, Sections 15 and 3
Tributary of North Myrtle Creek	T28S, R4W, Section 13
Tributary of Long Wiley Creek	T29S, R3W, Section 7
Letitia Creek	T29S, R3W, Section 17
Weaver Creek	T29S, R3W, Section 9 and T28S, R3W, Sections 28, 27, and 33
Tributaries of South Myrtle Creek	T28S, R3W, Section 36 and T28S, R2W, Section 31

6. Smolt Trapping

Continued operation of the Myrtle Creek smolt trap may help determine how restoration activities in the WAU are benefitting salmonid populations. Monitoring changes in smolt production in a basin may be the best way to measure habitat modification impacts. The smolt stage represents the culmination of freshwater life for anadromous fish. Therefore, creating habitat conditions that improve juvenile growth and survival should produce more smolts (Reeves et al. 1991).

The goal of smolt trap monitoring would be to document cause-and-effect relationships. Fisheries biologists estimate 10 to 12 years of data would be needed to document a statistically significant baseline (Reeves et al. 1991 and Everest et al.1991). In 20 to 30 years, monitoring data could be compared to the current data to determine fish abundance trends.

Smolt trap data has been used in Section 7 Consultation and environmental analyses to establish baseline information for effects analysis, watershed analysis, developing restoration projects, and prioritizing long-term restoration and timber sale plans. The data would also be used to list or delist fish species occurring in the Umpqua Basin. Population growth rates, densities, relative densities, species composition, and stock or recruitment curves could be developed using the smolt trap data. Growth rates can reflect differences in primary production and land management between stream systems. Determining species presence, population numbers, and what life stages occur in a stream would help when planning restoration activities.

7. Restoration Project Monitoring

Consider establishing photo points, transects, and longitudinal profiles before and after restoration projects. Consider monitoring annually to evaluate long-term changes in the stream.

E. Wildlife

1. Federally Threatened, Endangered, and Proposed Species

a. The Northern Spotted Owl

Northern spotted owl sites were ranked to provide management with a guide for planning and conducting activities around owl sites. When planning projects that manipulate suitable spotted owl habitat, project areas may be selected based on the ranking of owl sites in the Myrtle Creek WAU (see Table 46). The ranking was developed to evaluate the connectivity and fragmentation of northern spotted owl habitat and site history. The ranking can be used to locate project areas while considering the location of active northern spotted owl sites.

Table 46. Go to Ranking of Northern Spotted Owl Master Sites with Territory in the Myrtle Creek WAU (includes original and alternate sites).

Go to Ranking for Timber Harvesting		
Rank 1	Rank 2	Rank 3
0294	0295	0292
1811	0361	0293
1814	2204	0362
1984	2293	2086
2093		2091
2196		2197
2291		2295
2294		3097
2381		4366
		4576

Activities in the Matrix that modify or remove suitable owl habitat should be considered first in areas outside of known northern spotted owl territories. When planning to modify or remove suitable habitat within a northern spotted owl territory, sites ranked “1" should be considered first, "2" should be second, and "3" should be last.

b. Fender’s Blue Butterfly

The caterpillar of the Fender’s blue butterfly is closely association with Kincaid’s lupine and other lupine species. The Federally-administered land containing certain soil types have conditions to support Kincaid’s lupine habitat. Consider conducting surveys for the presence of Fender’s blue butterfly caterpillars where Kincaid’s lupine populations are discovered in the WAU.

2. Bureau Sensitive Species

a. The Peregrine Falcon

One occupied peregrine falcon site occurs in the WAU. Other potential sites also exist in the WAU. A Habitat Management Plan is being prepared and is expected to be completed in 2002. The occupied site and any future sites would be managed in accordance with the most current peregrine falcon habitat management plan.

b. The Northern Goshawk

One northern goshawk nest site occurs in the WAU. Consider evaluating habitat and conducting surveys to determine if other northern goshawks are present in the WAU. Follow management direction in the RMP to maintain 30 acre buffers of undisturbed habitat around active and alternate nest sites and restrict human activity within 0.25 miles of active sites between March and August or until the young have dispersed.

c. Bat Species

Coordinate and support research to determine what habitat elements are used by bat species in the WAU, in accordance with the National Memorandum of Understanding (MOU) with Bat Conservation International (USDI 1993).

One Townsend's big-eared bat site occurs at the Continental Mine in the WAU. The Continental Mine Bat Strategy is expected to be completed in 2002.

Consider leaving large diameter, green trees with deeply fissured bark, cavities or other defects to provide roosting habitat for bats.

d. Amphibians and Reptiles

Consider surveying for western pond turtles on large creeks and wetlands in the WAU.

Consider renovating ponds or wetlands lacking habitat elements. Consider removing non-native species from ponds or wetlands. Activities, such as recontouring the bottoms, planting native vegetation, removing bullfrogs and non-native fish, could be conducted at the same time as routine maintenance activities or culvert repairs.

3. Special Attention Species

a. Mollusks

Consider conducting general surveys for mollusks in the WAU. Surveys could be conducted in Riparian Reserves to document species presence or absence and adjacent to Riparian Reserves to evaluate impacts of habitat disturbance on specific mollusk sites.

Dispersal of smaller organisms may be maximized by retaining small patches of habitat in timber harvesting units. If these patches are close enough, species may recolonize the disturbed habitat after five or ten years when the regenerating seedlings would provide enough shade. In general, management for late seral characteristics retain the moist habitat mollusks use. In a late seral stand, maintaining tree species diversity (especially hardwood species), down woody debris amounts, and organic soil depth maintains the moisture regime and abundance and diversity of mollusks. Mollusk abundance may increase the available nutrients, vegetation growth rate, and moisture retention at a site.

Organic material does not accumulate on steep, rocky sites to suitable depths for use by mollusks. Primary decomposing organisms, including mollusks, prefer sites with suitable soil depths, litter, large woody debris, and moisture. Accumulations of organic debris hold water. Mollusk abundance and site productivity may be improved by capturing more organic material. Consider retaining down woody debris on steep, shallow soils. Consider maintaining down woody debris at right angles to the slope to catch and hold organic material on the site.

b. The Red Tree Vole

Consider conducting general surveys for red tree voles in the WAU. Follow the most recent protocol survey guides when conducting clearance surveys for red tree voles prior to implementing ground disturbing activities. The most recent protocol guides are included in IM-OR-2000-037.

4. Special Interest Species

a. Osprey

Continue monitoring known and potential nest sites.

b. Roosevelt Elk

Decreasing road density, closing roads, increasing cover, and creating or maintaining foraging habitat would benefit elk. The RMP identified the Deadman Mountain elk management area to provide limited disturbance by closing some roads. Part of this elk management area occurs in the WAU. Information about distribution and use of the WAU by elk would help with management of this species.

c. Neotropical Bird Species

Activities that modify habitat impact neotropical birds. This usually changes the bird species composition using a particular area. Broadcast burning, brushing, regeneration harvesting, and precommercial and commercial thinning 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 the impacts from management 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 August. However, most species have young capable of flying by the beginning of July or August. Consider implementing projects impacting nesting habitat before April 1 or after July 30 of any given year.

Consider including different prescriptions when brushing or thinning in Riparian Reserves. The different prescriptions could exclude Riparian Reserves from the activity or increase the number of shrubs and non commercial tree species that are retained.

Consider retaining brush and non commercial tree species that are not competing with the desired tree species. Some projects using these recommendations have been completed. The results on some of the projects should be reviewed and evaluated.

Communication and powerline towers may be a hazard to neotropical birds. Several towers are located in the WAU. Coordinate research to determine migratory pathways and monitor the effects of towers on neotropical birds, in accordance with the Oregon State Office MOU OR 930-9510. Utilize cooperating agency personnel to accomplish field work and analyze results.

Cavity nesting bird species use large green trees and snags as roost structures. Population trends of cavity nesting birds are unknown. Consider surveying for cavity nesting birds to determine population trends in the WAU. Consider leaving large diameter, green trees with deeply fissured bark, cavities or other defects to provide habitat for cavity nesting birds.

F. Plants

1. Special Status Species

Consider surveying for Special Status plant species and their habitat.

Consider maintaining or restoring the native plant diversity in the WAU.

Follow the management guidelines in the Conservation Strategy for Calochortus coxii.

Follow the management guidelines in the Conservation Strategy for Calochortus umpquaensis.

Follow the management guidelines in the recovery plan for Kincaid's lupine after it is completed by the USFWS.

2. Noxious Weeds

Consider conducting noxious weed inventories in the WAU.

Consider requiring equipment involving ground disturbing activities be cleaned before traveling onto BLM-administered lands.

Use biological control agents, where it is appropriate, on noxious weed infestations on BLM-administered lands. Priority noxious weeds are those considered to be Target Species on the Oregon Department of Agriculture "T" list, equivalent county lists, and as otherwise decided in consultation with BLM representatives. Maintain complete records of the biological control program.

Provide integrated noxious weed management including prevention/detection, education/awareness, inventory, planning, weed treatment/control, contract administration, monitoring, evaluation, and coordination.

Evaluate nonnative species for noxious weed characteristics and control while populations are small.

IX. Synthesis

Historic vegetation conditions consisted of prairies and savannahs in the lower elevations, which Native American Indians maintained by using fire. The upper elevations were hardwood or conifer dominated forests. In 1850, about five percent of the WAU consisted of prairies, with 20 percent in oak or conifer savannah/open woodland and 75 percent in closed forest (mainly conifer) conditions. The range of natural variability of late-successional forest was estimated to be between 45 and 75 percent of the WAU. Fire, land conversion (mainly from prairies to urban or agriculture), fire suppression, and timber harvesting influenced vegetation conditions.

The Bureau of Land Management administers approximately 41 percent of the Myrtle Creek WAU. About 59 percent of the WAU is privately owned (mainly in lower elevations of the WAU). Less than one percent of the WAU is administered by the USFS.

Approximately 11,466 acres (15 percent) of the WAU is in nonforested conditions, mainly agricultural. About two percent (approximately 1,618 acres) of the WAU is dominated by hardwoods. The rest of the WAU is considered to be conifer forests.

Currently, about 25 percent of the WAU is in late-successional forest conditions. The WAU would probably not return to the historic conditions or range of natural variability for late-successional forests. However, the amount of late-successional forests on BLM-administered land is within the range of natural variability and is expected to be maintained because 50 percent is in reserved land use allocations and about 56 percent of the BLM-administered land in the WAU is in late-successional forest conditions. About 52 percent of the Riparian Reserves are in late-successional forest conditions.

Approximately 17,972 acres out of the 18,105 acres of Category 1 Soils on BLM-administered land are granitic soils on slopes greater than 35 percent. Approximately 11,947 acres of BLM-administered land have slopes less than 35 percent and could be ground based harvested, which could potentially reduce soil productivity.

Streams on the 303(d) water quality limited list include North Myrtle Creek for habitat modification, Riser Creek for temperature, and South Myrtle Creek for temperature and flow modification. Other streams may have water quality concerns but are not on the 303(d) water quality limited list.

Coho salmon, which is on the list of Federal Threatened Species, occurs in the WAU. Aquatic habitat conditions in the WAU are rated as fair or poor by ODFW. Most of the low gradient fish-bearing stream reaches in the WAU are not along BLM-administered land. Adding LWD and reducing sediment entering streams could improve the aquatic habitat in upper North Myrtle, Buck Fork, Slide, and Riser Creeks. Curtin, Johnson, and upper South Myrtle Creeks may provide fish summer refuge. Weaver Creek could provide summer rearing habitat if the amount of sediment entering streams was reduced.

The northern spotted owl, which is on the list of Federal Threatened Species, occurs in the WAU. Fender's blue butterfly may occur in the WAU because the Kincaid's lupine, which it is dependent on, occurs in the WAU. Bureau Sensitive Species also occur in the WAU. Ownership pattern affects the vegetation conditions and wildlife habitat, which determine what species live in the WAU.

Five Special Status plant species occur in the WAU. Noxious weeds occur in the WAU and can affect native vegetation and habitat conditions. Himalayan blackberries and Scotch broom are the most wide spread noxious weeds in the WAU.

Drainage Rankings for Restoration

The watershed analysis team decided to rank the Drainages (7^{th} Field Watersheds) based on the values at risk, the amount of risk, and the potential for restoration to try to determine the need for restoration in each Drainage taking in to account the various resources (see Table 47). Each resource was to evaluate the Drainages and rank them as high (or a value of 3), medium (or a value of 2), or low (or a value of 1).

Just because a Drainage is given a high or value of 3 would not prevent resource use activities from being conducted in the Drainage. Revenue generating resource use activities (i.e. timber sales) could provide the funding for conducting some of the restoration activities.

Other factors may cause a Drainage ranked after another to be chosen for conducting restoration activities. However, the process shows the benefits and disadvantages of conducting restoration activities in one Drainage before another.

1. Silviculture

Potential commercial density management opportunities were ranked for both Drainages and Subwatersheds. The percentage of Federally-administered land, the ratio of stands between 30 and 120 years old in a Drainage to the total number of acres between 30 and 120 years old in the Subwatershed, and the number of acres older than 120 years old were used to determine the silviculture rankings. A numerical ranking was determined by multiplying the factors. The final rating includes both upland and riparian areas and older age classes. Drainages were considered a High priority if the Drainage numerical ranking was greater than 5 or the Subwatershed numerical ranking was greater than 15, a Medium priority if the Drainage ranking was less than 5 but the Subwatershed ranking was greater than 15, and a Low priority if the Drainage ranking was less than 5 and the Subwatershed ranking was less than 15.

2. Soils

Soils restoration priorities were based on the percentage of Category 1 soils, area less than 35 percent slope, and soils of concerns in each Drainage. Zero to 33 percent was assigned a value of 1, 34 to

66 percent was assigned a value of 2, and greater than 66 percent was assigned a value of 3. The values from each factor were added together to get a final value. Drainages with a final value of 3 or 4 were considered to be a Low priority, 5 and 6 were considered to be a Medium priority, and 7 and 8 were considered to be a High priority.

3. Hydrology

Hydrology restoration priorities were based on 303(d) stream listings, stream temperature exceeding the DEQ standard, PFC surveys indicating a downward trend, Pfankuch surveys indicating stream reaches were in poor condition, road decommissioning opportunities in Riparian Reserves, and the amount of BLM-administered land in a Drainage. Drainages were considered a High priority if three or more of these factors occurred, if two factors occurred the Drainage was considered a Medium priority, and the other Drainages were considered to be a Low priority.

4. Fish

The amount of BLM-administered land, fish use, habitat condition, and restoration potential were used to determine the fisheries restoration priorities. The fisheries ranking was subjective and the amount of BLM-administered land in each Drainage influenced the ratings in some of the other criteria.

5. Wildlife

The final rating for wildlife was based on combining the results of the evaluations for density management or opportunities to create snags and restoration treatments in early seral stands. The wildlife restoration priorities for density management or opportunities to create snags used the percent of Federally-administered land, the percent in Reserved Land Use Allocations, the percent of Reserved Federally-administered land at least 80 years old, the percent of Reserved Federally-administered land between 50 and 80 years old, the distribution of known owl territories, the amount of suitable habitat, and dispersal patterns. Restoration treatments in early seral stands considered the percent of Federally-administered lands in Reserved Land Use Allocations in the Drainage and the percent of the Federally-administered Reserved lands between 30 and 50 years old.

6. Plants

Restoration priorities were based on the occurrence of Special Status plant species or habitat in a Drainage. High priority Drainages had Federal Threatened or Special Status plant species with a completed conservation strategy occurring in the Drainage. Medium priority Drainages had the potential for Federal Threatened Species habitat or Special Status plant species to occur in the Drainage. The other Drainages were considered a low priority.

7. Roads

Road information for establishing restoration priorities were based on the TMO information in Appendix G, miles of roads and densities, road treatment recommendations to benefit the fisheries resource, experience, and knowledge of the watershed.

8. Noxious Weeds

The presence of Special Status plant species, relatively easy to control noxious weed problems, percent of BLM-administered land, and the presence of an ACEC/RNA were the criteria used for rating the Drainages based on noxious weed concerns.

Table 47. Drainage Rankings for the Myrtle Creek Watershed Analysis Unit.

Resource Rankings											
Drainage	Percent BLM	Silviculture	Soils	Hydrology	Fish	Wildlife	Botany	Roads	Noxious Weeds	Total	Final Rank
Lower North Myrtle Subwatershed											
Bilger Creek	26	1	1	2	1	2	3	1	3	14	Medium
Frozen Creek	21	1	2	1	1	1	2	1	3	12	Low
Lick Frontal	17	1	1	1	1	1	1	1	1	8	Low
Myrtle Creek	8	1	1	1	1	1	2	1	1	9	Low
North Myrtle Park	20	1	2	1	1	2	1	1	2	11	Low
Upper North Myrtle Subwatershed											
Buck Fork	30	2	2	3	3	3	1	2	2	18	Medium
Lee Creek	47	2	2	3	3	2	3	3	2	20	High
Lower Slide Creek	53	2	3	3	3	3	2	3	1	20	High
Middle North Myrtle	20	2	3	2	2	2	2	1	1	15	Medium
North Myrtle Frontal	26	2	1	3	1	1	1	1	3	13	Medium
North Myrtle Headwaters	54	3	2	2	3	2	3	2	3	20	High
Riser Creek	62	2	3	3	2	3	1	2	2	18	Medium
Upper Slide Creek	85	2	3	3	3	2	1	2	3	19	High

Table 47. Drainage Rankings for the Myrtle Creek Watershed Analysis Unit.

Resource Rankings											
Drainage	Percent BLM	Silviculture	Soils	Hydrology	Fish	Wildlife	Botany	Roads	Noxious Weeds	Total	Final Rank
Lower South Myrtle Subwatershed											
Ben Branch	39	1	3	2	2	2	1	1	2	14	Medium
Cedar Hollow	19	1	1	1	1	1	1	1	1	8	Low
Myrtle Links	22	1	2	1	1	1	2	1	1	10	Low
Pack Saddle	19	1	3	1	1	2	3	1	2	14	Medium
School Hollow	27	1	3	2	1	2	1	1	2	13	Medium
Short Course	12	1	3	1	1	1	1	1	1	10	Low
Upper South Myrtle Subwatershed											
Curtin Creek	100	3	3	3	2	1	2	2	3	19	High
Lally Creek	54	2	3	3	3	2	2	2	2	19	High
Letitia Creek	36	2	3	2	2	2	3	2	3	19	High
Lower Louis Creek	31	2	3	2	2	2	1	1	2	15	Medium
South Myrtle Headwaters	92	3	2	3	1	2	2	2	3	18	Medium
Upper Louis Creek	66	2	3	3	3	1	1	2	2	17	Medium
Weaver Creek	79	3	3	3	3	3	1	3	2	21	High
Wiley Creek	40	2	3	1	1	2	3	1	2	15	Medium

Definitions: High = 3, Medium = 2, and Low = 1
For Total Scores High = 19 -24, Medium = 13 -18, Low = 8 - 12

X. 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. Some implementation, effectiveness, and validation monitoring questions are addressed. Management actions on the Roseburg BLM District may be monitored prior to project initiation and following project completion, depending on the resource or activity being monitored.

Some key resource elements that may be monitored in the Myrtle Creek WAU are as follows:

A. All Land Use Allocations

Is the management action for the Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines being implemented as required?
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 Guidelines, RMP management direction, and Aquatic Conservation Strategy objectives?

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 Standard 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?

XI. 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.

Some data gaps identified in the watershed analysis include the condition of roads and culverts at stream crossings, water quality data of streams on BLM-administered land, stream type classifications, and if some Special Status Species occur in the WAU.

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.

Decommission - To remove elements of a road rerouting hillslope drainage and presenting slope stability hazards. The road would be closed to vehicles on a long-term basis, but may be used again in the future. The road would be prepared to avoid future maintenance needs. Exposed soils would be treated to reduce sedimentation. The road would be closed with a device similar to an earthen barrier (tank trap) or equivalent.

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.

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

Full Decommission - To remove elements of a road rerouting hillslope drainage and presenting slope stability hazards. Another term for this is hydrologic obliteration. Cross drains, fills in stream channels, and potentially unstable fill areas would be removed to restore natural hydrologic flow. The road would not require future maintenance.

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.

Geographic Information System (GIS) - 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.

Obliteration - Full site restoration. These roads would have drainage structures removed. Fill material used to construct the road would be excavated and placed on the subgrade to reestablish the original ground line (recontoured). Exposed soil would be revegetated with trees or other native plants.

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 United States Fish and 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 ½ 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
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Appendix B - References

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Appendix C
Fisheries

Table C-1. Summary Table of Current Conditions in the Myrtle Creek WAU.

Drainage Name Subwatershed Name	Road Density	Stream Density	Percent BLM Administered Land	Stream Crossing Density	Percent Forested Acres Less Than 30 Years Old (BLM)	Percent of Riparian Reserves at Least 80 Years Old
Bilger Creek	3.96	7.07	26	1.97	31	50
Frozen Creek	4.11	6.75	21	1.90	16	81
Lick Frontal	3.20	8.17	17	1.87	21	75
Myrtle Creek	5.52	6.19	8	2.84	0	65
North Myrtle Park	3.81	7.47	20	2.37	41	52
Lower North Myrtle Subwatershed	4.19	7.02	19	2.14	25	61
Buck Fork	5.00	8.15	30	2.01	41	15
Lee Creek	5.94	7.58	47	3.06	32	48
Lower Slide Creek	5.69	7.76	53	2.94	28	20
Middle North Myrtle	5.35	7.59	20	1.81	47	40
North Myrtle Frontal	3.93	5.95	26	2.96	0	81
North Myrtle Headwaters	3.93	7.04	54	1.22	31	54
Riser Creek	4.82	6.69	62	1.24	35	43
Upper Slide Creek	4.20	7.28	85	1.37	39	48
Upper North Myrtle Subwatershed	4.96	7.41	47	2.05	34	42
Ben Branch	3.40	8.06	39	2.13	50	39
Cedar Hollow	5.17	7.99	19	2.10	0	98
Myrtle Links	3.03	7.27	22	1.70	13	63
Pack Saddle	5.01	7.13	19	2.50	20	61
School Hollow	4.66	9.31	27	2.96	32	61
Short Course	4.77	7.04	12	2.56	16	61
Lower South Myrtle Subwatershed	4.37	7.70	21	2.39	25	59

Table C-1. Summary Table of Current Conditions in the Myrtle Creek WAU.

Drainage Name Subwatershed Name	Road Density	Stream Density	Percent BLM Administered Land	Stream Crossing Density	Percent Forested Acres Less Than 30 Years Old (BLM)	Percent of Riparian Reserves at Least 80 Years Old
Curtin Creek	3.93	5.88	100	1.90	13	77
Lally Creek	4.84	7.54	54	2.18	33	49
Letitia Creek	3.81	7.72	36	1.86	11	58
Lower Louis Creek	3.83	9.39	31	2.16	28	56
South Myrtle Headwaters	3.21	6.20	92	1.41	4	61
Upper Louis Creek	5.42	6.93	66	2.57	30	49
Weaver Creek	4.05	7.93	79	1.63	25	41
Wiley Creek	3.81	7.27	40	1.66	19	58
Upper South Myrtle Subwatershed	4.16	7.37	61	1.92	20	54
Myrtle Creek WAU	4.39	7.35	41	2.08	25	52

Table C-2. 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

Table C-3. Example of Biological Assessment Matrix of Factors and Indicators
Western Cascades Geology

FACTORS	INDICATORS	PROPERLY FUNCTIONING	AT RISK	NOT PROPERLY FUNCTIONING
Water Quality	Maximum Temperature	2nd through 4th order basins: < 66 degrees Fahrenheit. 5th order or larger basins: < 69 degrees Fahrenheit.	2nd through 4th order basins: 66 - 69 degrees Fahrenheit. 5th order or larger basins: 66 - 74 degrees Fahrenheit.	2nd through 4th order basins: $\geq$ 70 degrees Fahrenheit. 5th order or larger basins: > 74 degrees Fahrenheit.
	Sediment and Turbidity	< 12% fines (< 0.85 mm) in gravel, relatively low turbidity.	12 - 17% fines (< 0.85 mm) in gravel, moderate turbidity.	> 17% fines (< 0.85 mm) in gravels, high turbidity.
Habitat Access	Physical Barriers	No man-made barriers in watershed that prevent upstream and downstream passage of age 1+ salmonids.	Some man-made barriers in watershed prevent upstream or downstream passage of age 1+ salmonids.	Most or all man-made barriers in watershed prevent upstream or downstream passage of age 1+ salmonids.
Habitat Elements	Large Woody Debris **	> 60 pieces/mile, > 24" in diameter, > 50' length. Little or no evidence of stream clean-out or management related debris flows.	30 - 60 pieces/mile, > 24" in diameter, > 50' length. Some evidence of stream clean-out and/or management related debris flows.	< 30 pieces/mile, > 24" in diameter. > 50' length. Evidence of stream clean-out and/or management related debris flows is widespread.
	Substrate	Dominant substrate is gravel or cobble, with very little embeddedness.	Gravel and cobble are subdominant substrates, with moderate amounts of embeddedness.	Bedrock, sand, silt, or small gravel substrates are dominant. Or gravel/cobble substrate with large amounts of embeddedness.
	Pool Characteristics $\geq$ 3rd order	> 30% pool habitat by area. Little or no reduction of pool volume by fine sediment or unsorted substrates (as per District roadless area stream surveys).	< 30% pool habitat by area. Moderate reduction of pool volumes by fine sediment or unsorted substrates.	< 30% pool habitat by area. Large reduction of pool volumes by fine sediment or unsorted substrates.
	Off-Channel Habitat	Active side channels relatively frequent and a result of structural influence (large wood, nick point, etc.).	Relatively few active side channels or evidence of abandoned side channels related to management activities.	Few or no active side channels and evidence of numerous abandoned side channels related to past management activities. Or side channels being formed due to aggraded channel.
	Refugia	Habitat refugia exist and are adequately buffered. Existing refugia are sufficient in size, number, and connectivity to maintain viable populations or sub-populations.	Habitat refugia exist but are not adequately buffered. Existing refugia are insufficient in size, number, and connectivity to maintain viable populations or sub-populations.	Adequate habitat refugia do not exist.

Table C-3. Example of Biological Assessment Matrix of Factors and Indicators
Western Cascades Geology

FACTORS	INDICATORS	PROPERLY FUNCTIONING	AT RISK	NOT PROPERLY FUNCTIONING
Channel Condition and Dynamics	Width/Depth Ratio and Channel Type	W/D ratios and channel types are well within historic ranges and site potential in watershed. Rosgen Type — W/D Ratio A, E, G — <12 B, C, F — 12-30 D — >40	W/D ratios and/or channel types in portions of watershed are outside historic ranges and/or site potentials.	W/D ratios and channel types throughout the watershed are well outside of historic ranges and/or site potentials.
	Streambank Condition	Relatively stable banks. Few or no areas of active erosion.	Moderately stable banks. Some active erosion occurring on outcurves and constrictions.	Highly unstable stream banks. Numerous areas of exposed soil and stream bank cutting.
	Floodplain Connectivity	Off-channel areas are frequently hydrologically linked to main channel; overbank flows occur and maintain wetland functions, riparian vegetation, and succession.	Reduced linkage of wetland, floodplains, and riparian areas to main channel; overbank flows are reduced relative to historic frequency, as evidenced by moderate degradation of wetland and riparian vegetation function.	Severe reduction in hydrologic connectivity between off-channel, wetland, floodplain, and riparian areas; wetland extent drastically reduced and riparian vegetation function altered significantly.
Flow/Hydrology	Change in Peak/Base Flows	Timber harvest and roading history is such that little or no change to the natural flow regime has occurred.	Moderate amounts of timber harvest and roading have likely altered the flow regime to some extent.	Relatively high levels of timber harvest and roading have likely had a large effect on the flow regime.
	Drainage Network	Zero or minimum increase in drainage network density due to roads.	Moderate increases in drainage network due to roads.	Significant increases in drainage network density due to roads.
Watershed Conditions	Road Density and Location **	Road density < 2 miles/square mile, with no valley bottom roads.	Road density at 2 - 3 miles/square mile, with some valley bottom roads.	Road density > 3 miles/square mile, with many valley bottom roads.
	Disturbance History	< 5% ECA/decade (entire watershed) with no concentration of disturbance in unstable or potentially unstable areas, and/or Riparian Reserves; and for NWFP area (except AMAs), $\geq$15% retention of LSOG in watershed.	<5% ECA/decade (entire watershed) but disturbance concentrated in unstable or potentially unstable areas, and/or refugia, and/or Riparian Reserves; and for NWFP area (except for AMAs), $\geq$15% retention of LSOG in watershed.	>5% ECA/decade (entire watershed) and disturbance concentrated in unstable or potentially unstable areas, and/or refugia, and/or Riparian Reserves; does not meet NWFP standard for LSOG retention.
	Riparian Reserves **	Riparian Reserves are relatively intact, with >80% of these areas being in a late seral condition.	Riparian Reserves have been altered somewhat, with between 60-80% of these areas being found in a late seral condition.	Riparian Reserves have been substantially altered, with <60% of these areas being found in a late seral condition.
	Landslide Rates	Within 10-20% of historic, natural rates. Stream conditions not evidently altered due to management caused landslides.	Some subdrainages with >20% of landslides related to land management activities. Some stream conditions evidently altered by management related landslides.	Many subdrainages with >25% of landslides related to land management activities. Stream conditions obviously and/or dramatically altered by management related landslides.

Table C-4. Myrtle Creek Salmonid Smolt Trap Data Collected Between 1997 and 2000.

Year	Species	Number of Fish Captured	Estimated Population
2000	Chinook 0+	1,485	4,616
	Coho 0+	88	581
	Coho 1+	1,667	8,556
	Cutthroat 1+	3	
	Cutthroat 2+	14	
	Cutthroat 3+	23	
	Steelhead 1+	911	6,526
	Steelhead 2+	972	13,511
	Steelhead 3+	201	4,087
	Trout 0+	77	
1999	Chinook 0+	287	975
	Coho 0+	51	174
	Coho 1+	640	3,569
	Cutthroat 2+	5	
	Cutthroat 3+	19	
	Steelhead 1+	222	790
	Steelhead 2+	742	6,674
	Steelhead 3+	257	3,902
	Trout 0+	461	
1998	Chinook 0+	1,685	12,820
	Coho 0+	118	1,440
	Coho 1+	512	5,022
	Cutthroat 3+	7	
	Steelhead 1+	71	1,260
	Steelhead 2+	210	2,709
	Steelhead 3+	49	2,303
	Trout 0+	54	
1997	Chinook 0+	265	4,558
	Coho 0+	25	
	Coho 1+	38	1,332
	Cutthroat 3+	1	
	Steelhead 1+	6	
	Steelhead 2+	17	
	Steelhead 3+	9	
	Trout 0+	44	

Table C-5. ODFW Coho Salmon Spawning Data in the Myrtle Creek WAU.

Stream Name	Year Surveyed	Number of Spawning Adults
South Myrtle Creek	1996 and 1997	18
	1997 and 1998	1
	1998 and 1999	2
Ben Branch	1997 and 1998	0
Louis Creek	1996 and 1997	0
Long Wiley Creek	1997 and 1998	0
Weaver Creek	1997 and 1998	4
North Myrtle Creek	1981	1
	1982	1
	1983	0
	1984	1
	1985	1
	1986	1
	1987	1
	1988	2
	1989	13
	1990	1
	1991	14
	1992	1
	1993	1
	1994	8
	1995	4
	1996	3
	1997	1
	1998	0
	1998 and 1999	5

Table C-5. ODFW Coho Salmon Spawning Data in the Myrtle Creek WAU.

Stream Name	Year Surveyed	Number of Spawning Adults
Bilger Creek	1997 and 1998	7
Little Lick Creek	1997 and 1998	1
Frozen Creek	1997 and 1998	0
Slide Creek	1998 and 1999	0
Riser Creek	1998 and 1999	3
Lee Creek	1996 and 1997	11
Buck Fork Creek	1997 and 1998	1

Spawning data was not collected in 2000 because of the lack of precipitation and the unpredictability of the coho salmon run.

Table C-6. Summary of Proper Functioning Condition Surveys Conducted in the Myrtle Creek WAU.

Location	Survey Date	Reach Number	Rating	Comments
Curtin Creek Section 35	6/19/1997	1	PFC	Slight downcutting, adequate canopy
		1A	PFC	Poorly shaded, no floodplain, very stable stream channel, lined with boulders
		2	PFC	Floodplain inundation, LWD present with rootwads
		3	PFC	Vegetation indicates drying of soil, no water storage
Curtin Creek Section 36	6/19/1997	4	FAR-D	Thinned buffer causing drying of soil, thinning of riparian vegetation, potential for erosion in slumping soils
Johnson Creek Section 35	6/23/1997	1	FAR-D	Downcutting, no LWD or future recruitment, upstream harvest activities contributing sediment
		2	PFC	Some large conifer next to stream, steep valley sides are slumping, debris jams creating access to floodplain
South Myrtle Creek Section 35	8/9/1996	1	FAR-D	Mass wasting, sparse vegetation on steep slopes constrained by road, little LWD, channel widening, erodible soils
South Myrtle Creek Section 15	6/11/2001	1	FAR-D	Straightened channel, no access to floodplain, no LWD instream or adequate source, banks are stable
Tributary of South Myrtle Creek Section 11	6/12/2001	1	PFC	Some sediment, banks show some erosion-may be natural, needs more wood
		2	FAR-D	Erosion, cutbanks, no source of LWD, LWD not in stream channel - will continue to downcut
		3	FAR-D	Poor riparian vegetation, no LWD source, downcutting, no structure for energy dissipation

Table C-6. Summary of Proper Functioning Condition Surveys Conducted in the Myrtle Creek WAU.

Location	Survey Date	Reach Number	Rating	Comments
Louis Creek Section 29	10/25/1999	1	FAR-NA	Excessive sediment from road and harvest activity, downcutting, road encroachment
		2	FAR-D	No future recruitment or current instream LWD, road encroachment, upstream logging activity
Weaver Creek Section 4	8/9/1996	1A	PFC	Private ranch, large point bars, good debris jams, floodplain inundation, beaver activity
Weaver Creek Section 32	6/23/1997	1	FAR-D	No LWD recruitment, alder dominant riparian, some wood jams promoting floodplain inundation, banks susceptible to erosion
		2	FAR-D	Alder dominant, road encroachment, little structure, downcutting, bank erosion
Weaver Creek Section 28	6/24/1997	3	FAR-D	No large conifers in riparian, downcutting starting, little structure instream
		4	FAR-D	Thin canopy, slumping banks, no LWD recruitment
		5	PFC	Stable riparian area, closed canopy
		6	PFC	Debris jams dissipating energy
		7	PFC	Good shade, large conifer
Tributary of Weaver Creek Section 28	6/23/1997	1	FAR-D	Downcutting, bank slumping, alder dominant, road encroachment
		2	FAR-U	Some downcutting, future LWD potential, point bars forming, beaver activity
		3	PFC	Old-growth conifer in riparian, floodplain inundation, some instream LWD present
Tributary of Weaver Creek Section 27	6/23/1997	5	PFC	Root masses present to stabilize banks, old-growth stands, LWD present, point bars forming

Table C-6. Summary of Proper Functioning Condition Surveys Conducted in the Myrtle Creek WAU.

Location	Survey Date	Reach Number	Rating	Comments
Tributary of Weaver Creek Section 28	6/12/2001	1	FAR-U	No structure (vegetation, rocks, wood) to dissipate energy, poor riparian vegetation on banks, weak root masses, old debris torrent may be causing erosion-seems to be recovering
		2	FAR-NA	No energy dissipation structure, downcutting
Tributary of Weaver Creek Section 27	6/12/2001	3	FAR-U	Future source of LWD, riparian area widening
Letitia Creek Section 17	6/19/2001	1	FAR-U	Width to depth ratio too great, no old-growth trees in riparian area, deposition, cut down to bedrock, banks are stable
Lee Creek Section 15	5/21/2001	1	FAR-U	Beaver dams, entrenched, downcutting, new floodplain developing
Tributary of Lee Creek Section 21	5/21/2001	1	FAR-U	Some old-growth in riparian area, some LWD instream, road encroachment and culvert contributing sediment
		2	FAR-U	Lack diversity age/species in riparian vegetation, not adequate source of LWD, willow, beaver activity
		3	FAR-U	Some old-growth, not much LWD instream, not adequate energy dissipation
		2	FAR-D	Few pieces of wood instream, harvest upstream, downcutting has started
Riser Creek Section 19	10/25/1999	1	FAR-NA	Road encroachment, upland degradation, lacking riparian vegetation, minimal structure, some erosion and deposition
		2	FAR-D	Floodplain not inundated, stream widening, upland degraded, no wetland vegetation, downcutting, erosion

Table C-6. Summary of Proper Functioning Condition Surveys Conducted in the Myrtle Creek WAU.

Location	Survey Date	Reach Number	Rating	Comments
Slide Creek Section 25	10/28/1999	1	FAR- D	Excessive sediment from roads, slope failures, downcutting
		2	PFC	Sediment from road, not adequate source of LWD
		3	FAR-D	Riparian widening, erosion, downcutting from roads, little LWD
Slide Creek Section 35	6/6/2001	1	FAR-U	Midchannel bars, high embeddednesss, no LWD, point bars not re-vegetating, deposition
		2	FAR-NA	Riparian vegetation not protecting banks, not adequate LWD source, point bars not re-vegetating, erosion
		3	FAR-U	Excessive deposition, not adequate source of LWD
Ben Branch Section 15	6/11/2001	1	FAR-D	Downcut, young trees in riparian, some older trees for LWD recruitment, upstream harvest contributing sediment, BLM road contributing sediment- needs improvement
		2	FAR-U	Excessive deposition, the rest of the reasons are the same as Reach 1

PFC = Properly Functioning Condition
FAR-U = Functioning At Risk - Upward trend
FAR-NA = Functioning At Risk - Trend not apparent
FAR-D = Functioning At Risk - Downward trend

Table C-7. Summary of Pfankuch Surveys Conducted in the Myrtle Creek WAU.

Location	Survey Date	Reach Number	Rating	Comments
South Myrtle Creek Section 11	6/11/2001	1	Poor	Cutting, scour and deposition, steep bank slopes, some filling of pools
Tributary of South Myrtle Creek Section 11	6/12/2001	1	Fair	Cutting, adequate channel capacity, steep slopes, fair vegetation on banks, fair amount of scour and deposition
		2	Fair	Steep banks, cutting and deposition, scouring, some filling of pools
		3	Poor	Low bank slope, no mass wasting, some scour and deposition, head cutting, fair bank vegetation, heavy harvest activity upstream
Curtin Creek Section 35	4/13/1995	1	Good	Excellent vegetation cover and percent pool habitat
		2	Fair	Some high slope banks and mass wasting
		3	Good	Excellent vegetation cover and percent pools
		4	Fair	Poor bank rock content, some deposition
		5	Good	Excellent vegetation cover and percent pools
		6	Good	Excellent channel roughness and percent pools
		7	Fair	High slope banks, excessive deposition
		8	Good	Excellent steep pool habitat but some downcutting
		9	Fair	Excellent percent pool, water running over road instead of into culvert
		10	Fair	High sloped banks, four wheel drive road needs repair-is contributing sediment
		11	Fair	Natural falls - fish barrier
		12	Good	Lots of wood above bank, excellent channel roughness and percent pools
		13	Fair	Excellent wood above bank and percent pools, some headcutting, culvert needs repair, future LWD poor

Table C-7. Summary of Pfankuch Surveys Conducted in the Myrtle Creek WAU.

Location	Survey Date	Reach Number	Rating	Comments
Louis Creek Section 29	10/25/1999	1	Fair	Headcutting and deposition, culvert on 11.0 road contributing lots of sediment
		2	Fair	Headcutting and deposition, lots of fines, lacking LWD
Slide Creek Section 25	10/28/1999	1	Poor	See PFC survey comments in Table C-6
		2	Fair	See PFC survey comments in Table C-6
Tributary of Slide Creek Section 3	4/19/1996 through 4/22/1996	1	Poor	Significant downcutting, deposition of fines, small dam, steep slopes sloughing off
		2	Poor	Significant bank cutting, lacking LWD - no future recruitment, old logging road - no culvert, water running down road into Slide Creek
Riser Creek Section 19	10/25/1999	1	Fair	See PFC survey comments in Table C-6
		2	Poor	See PFC survey comments in Table C-6
Tributary of Riser Creek Section 19	4/18/1996	1	Fair	Downcutting, exposed banks, LWD jams, some good pools but filling with sediment
Tributary of North Myrtle Creek Section 1	4/10/1996 through 4/11/1996	1	Fair	Some downcutting, small woody debris
		2	Fair	Good shade and future LWD recruitment
		3	Fair	Downcutting, fines filling in pools
Tributary of North Myrtle Creek Section 31	4/10/1996 through 4/11/1996	4	Fair	Excessive fines, regeneration harvest on both sides
Tributary of North Myrtle Creek Section 7	4/10/1996 through 4/11/1996	5	Fair	Significant bank cutting, good percent pools but fines are filling
Tributary of Lee Creek Section 15	4/11/1996	1	Fair	Bank erosion and fines
		2	Fair	Significant bank cutting, some LWD - logging debris, some deep pools
		3	Fair	Significant bank cutting, fines

Table C-7. Summary of Pfankuch Surveys Conducted in the Myrtle Creek WAU.

Location	Survey Date	Reach Number	Rating	Comments
Tributary of Lee Creek Section 21	4/11/1996	4	Fair	Poor pool habitat - fines filling in, significant bank erosion, beaver activity
		5	Poor	Excessive bank cutting, downcutting and deposition, fines filling in pools, road 21.2 has sloughed off into stream - may fail
		6	Poor	Downcutting has created a three foot falls, fines
		7	Fair	Some downcutting with fines, bedrock dominated
Tributary of Lee Creek Section 11	4/11/1996	8	Poor	Some downcutting and deposition, future LWD poor
Tributary of Buck Fork Creek Section 17	5/22/1996	1	Fair	Downcutting, excessive sediment, some beaver activity
Bilger Creek Section 3	Not available	1	Fair	Significant downcutting, fines, small wood jams
Bilger Creek Section 35	Not available	2	Fair	Some downcutting, fines, many LWD jams, large boulders forming pools

Table C-8. Aquatic Habitat Benchmark Rating System.

Benchmark Criteria			Reach Number		
			Good	Fair	Poor
Pool Area (percent)			> 35	10-35	< 10
Pool Frequency (channel widths/pool)			5-8	9-20	>20
Residual Pool Depth (m)	small stream (less than 7 meter width)		> 0.5	0.2-0.5	<0.2
	medium stream (7 to 15 meter width)	gradient less than 3 percent	> 0.6	0.3-0.6	<0.3
		gradient greater than 3 percent	> 1.0	0.5-1.0	<0.5
	large stream (greater than 15 meter width)		> 1.5	0.8-1.5	<0.8
Complex Pools (number with wood complexity greater than 3/km)			> 2.5	1.0-2.5	<1.0
Width-to-depth Ratio (in riffles)			< 15	15-30	>30
Silt, Sand & Organics (percent area in riffles)			< 10	10-20	>20
Gravel (percent area in riffles)			≥ 35	15-34	<15
Shade (reach average percent)	stream width less than 12 meters		> 70	60-70	<60
	stream width greater than 12 meters		> 60	50-60	<50
LWD (pieces/100m)			> 20	10-20	<10
LWD (volume/100m)			> 30	20-30	<20
"Key" Pieces LWD (number/100m) (greater than 60 centimeter diameter and at least 10 meters long)			> 3	1-3	<1

Legend for the Aquatic Habitat Survey Data Tables in Appendix C.

Not Calculated	Poor	Fair	Good

Table C-9. Aquatic Habitat Survey Data on the Lower Portion of South Myrtle Creek.

Benchmark Criteria	Reach Number		
	1	2	3
Pool Area (percent)	24.4	13.5	19.7
Pool Frequency (channel widths/pool)	3.5	7.6	5.9
Residual Pool Depth (m) (pool depth - riffle depth)	0.6	0.7	0.6
Complex Pools (number with wood complexity greater than 3/km)	0	0	0
Width-to-depth Ratio (in riffles)	38.1	31.1	35.9
Silt, Sand, and Organics (percent area in riffles)	15.0	26.0	45.0
Gravel (percent area in riffles)	54.0	34.0	27.0
Shade (reach average percent)	66	64	63
LWD (pieces/100m)	2.2	6.6	8.9
LWD (volume/100m)	1.0	2.3	2.6
Key Pieces LWD (number/100m) (greater than 60cm diameter and at least 10m long)	0	0	0
The overall stream rating = poor.			

Table C-10. Aquatic Habitat Survey Data on the Upper Portion of South Myrtle Creek.

Benchmark Criteria	Reach Number								
	5	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Pool Area (percent)	29.7	32.1	5.9	9.9	24.0	56.2	10.6	8.7	49.7
Pool Frequency (channel widths/pool)	11.2	10.1	41.8	19.3	9.2	4.9	18	19.8	51.8
Residual Pool Depth (m) (pool depth - riffle depth)	0.7	0.9	0.6	0.6	0.4	0.6	0.5	0.3	2.1
Complex Pools (number with wood complexity greater than 3/km)	0	0	0	0	0	0	0	0	0
Width-to-depth Ratio (in riffles)	33.9	26.4	36.5	40.6	17.0	65.9	19.3	20.4	8.0
Silt, Sand, and Organics (percent area in riffles)	26.0	19.0	30.0	39.0	28.0	36.0	19.0	49.0	50.0
Gravel (percent area in riffles)	10.0	5.0	18.0	20.0	28.0	44.0	32.0	43.0	50.0
Shade (reach average percent)	75.0	73.0	71.0	75.0	80.0	80.0	85.0	86.0	72.0
LWD (pieces/100m)	1.9	2.1	5.8	6.6	27.8	12.1	8.8	32.7	39.0
LWD (volume/100m)	0.7	2.8	5.7	10.3	56.3	22.8	29.1	67.9	185.7
Key Pieces LWD (number/100m) (greater than 60cm diameter and at least 10m long)	0	0.1	0	0.3	3.2	0.7	1.2	1.1	2.2
The overall stream rating = fair.									

Table C-11. Aquatic Habitat Survey Data on Weaver Creek.

Benchmark Criteria	Reach Number			
	1	2	3	4
Pool Area (percent)	21.3	33.9	25.8	7.4
Pool Frequency (channel widths/pool)	12.3	7.6	7.4	56
Residual Pool Depth (m) (pool depth - riffle depth)	0.4	0.4	0.2	0.2
Complex Pools (number with wood complexity greater than 3/km)	0	0	0	0
Width-to-depth Ratio (in riffles)	29.3	47.6	21.4	14
Silt, Sand, and Organics (percent area in riffles)	29	35	31	33
Gravel (percent area in riffles)	23	33	32	31
Shade (reach average percent)	77	80	81	85
LWD (pieces/100m)	0.9	5.2	11.7	5
LWD (volume/100m)	0.5	21.2	52	38.6
Key Pieces LWD (number/100m) (greater than 60cm diameter and at least 10m long)	0	0.6	1.5	2.1
The overall stream rating = fair.				

Table C-12. Aquatic Habitat Survey Data on the Lower Portion of North Myrtle Creek.

Benchmark Criteria	Reach Number			
	1	2	3	4
Pool Area (percent)	35.0	41.9	44.1	58.4
Pool Frequency (channel widths/pool)	7.4	5.0	4.6	4.8
Residual Pool Depth (m) (pool depth - riffle depth)	0.5	0.6	0.6	0.6
Complex Pools (number with wood complexity greater than 3/km)	0	0	0.7	0.2
Width-to-depth Ratio (in riffles)	56.2	39.9	50.8	39.4
Silt, Sand, and Organics (percent area in riffles)	9.0	8.0	9.0	10.0
Gravel (percent area in riffles)	42.0	53.0	54.0	39.0
Shade (reach average percent)	77	72	63	54
LWD (pieces/100m)	0.4	1.2	2.1	3.1
LWD (volume/100m)	0.2	1.0	1.0	1.9
Key Pieces LWD (number/100m) (greater than 60cm diameter and at least 10m long)	0	0	0	0
The overall stream rating = fair.				

Table C-13. Aquatic Habitat Survey Data on Frozen Creek.

Benchmark Criteria	Reach Number			
	1	2	3	4
Pool Area (percent)	43.3	36.6	2.3	3.3
Pool Frequency (channel widths/pool)	11.1	34.3	104.9	305.7
Residual Pool Depth (m) (pool depth - riffle depth)	0.5	0.4	0.3	0.4
Complex Pools (number with wood complexity greater than 3/km)	0	0	0	0
Width-to-depth Ratio (in riffles)	36.4	20.1	15	23.1
Silt, Sand, and Organics (percent area in riffles)	21	31	50	59
Gravel (percent area in riffles)	64	56	36	32
Shade (reach average percent)	62	56	93	100
LWD (pieces/100m)	1.4	0.5	2.7	2.2
LWD (volume/100m)	0.6	0.1	8.3	25
Key Pieces LWD (number/100m) (greater than 60cm diameter and at least 10m long)	0	0	0	1.4
The overall stream rating = fair.				

Table C-14. Aquatic Habitat Survey Data on the West Fork of Frozen Creek.

Benchmark Criteria	Reach Number		
	1	2	3
Pool Area (percent)	16.9	0.9	0
Pool Frequency (channel widths/pool)	26.9	405.5	Not Calculated
Residual Pool Depth (m) (pool depth - riffle depth)	0.3	0.3	0
Complex Pools (number with wood complexity greater than 3/km)	0	0	0
Width-to-depth Ratio (in riffles)	25.5	Not Calculated	Not Calculated
Silt, Sand, and Organics (percent area in riffles)	12	5	Not Calculated
Gravel (percent area in riffles)	56	57	Not Calculated
Shade (reach average percent)	89	33	61
LWD (pieces/100m)	2.3	2.1	2.9
LWD (volume/100m)	1.1	4.8	9.3
Key Pieces LWD (number/100m) (greater than 60cm diameter and at least 10m long)	0	0.1	0.6
The overall stream rating = poor.			

Table C-15. Aquatic Habitat Survey Data on Bilger Creek.

Benchmark Criteria	Reach Number		
	1	2	3
Pool Area (percent)	1.5	13	1.7
Pool Frequency (channel widths/pool)	21.2	9.8	47.9
Residual Pool Depth (m) (pool depth - riffle depth)	0.2	0.4	0.3
Complex Pools (number with wood complexity greater than 3/km)	0	0	0
Width-to-depth Ratio (in riffles)	Not Calculated	36.7	10
Silt, Sand, and Organics (percent area in riffles)	Not Calculated	13	10
Gravel (percent area in riffles)	Not Calculated	29	33
Shade (reach average percent)	67	73	90
LWD (pieces/100m)	1.2	0.6	0.8
LWD (volume/100m)	0.8	0.7	1.6
Key Pieces LWD (number/100m) (greater than 60cm diameter and at least 10m long)	0	0	0.1
The overall stream rating = poor.			

Table C-16. Aquatic Habitat Survey Data on the Upper Portion of North Myrtle Creek.

Benchmark Criteria	Reach Number			
	5	6	7	8
Pool Area (percent)	42.3	31.3	14.6	Not Calculated
Pool Frequency (channel widths/pool)	6.1	10.1	15.6	0
Residual Pool Depth (m) (pool depth - riffle depth)	0.4	0.4	0.3	0
Complex Pools (number with wood complexity greater than 3/km)	0.3	1.6	0.5	0
Width-to-depth Ratio (in riffles)	42.5	25.9	25.1	Not Calculated
Silt, Sand, and Organics (percent area in riffles)	9.0	24.0	29.0	Not Calculated
Gravel (percent area in riffles)	35.0	22.0	36.0	Not Calculated
Shade (reach average percent)	59.0	54.0	95.0	100.0
LWD (pieces/100m)	4.2	14.7	9.1	2.6
LWD (volume/100m)	5.7	19.3	18.3	7.6
Key Pieces LWD (number/100m) (greater than 60cm diameter and at least 10m long)	0.1	0.2	0.6	0.3
The overall stream rating = fair.				

Table C-17. Aquatic Habitat Survey Data on Lee Creek.

Benchmark Criteria	Reach Number	
	1	2
Pool Area (percent)	38.5	48.7
Pool Frequency (channel widths/pool)	10.5	38.1
Residual Pool Depth (m) (pool depth - riffle depth)	0.4	0.3
Complex Pools (number with wood complexity greater than 3/km)	0.5	0
Width-to-depth Ratio (in riffles)	16.4	16.2
Silt, Sand, and Organics (percent area in riffles)	24	62
Gravel (percent area in riffles)	72	32
Shade (reach average percent)	85	81
LWD (pieces/100m)	2.6	7.2
LWD (volume/100m)	1.5	8.9
Key Pieces LWD (number/100m) (greater than 60cm diameter and at least 10m long)	0	0.1
The overall stream rating = fair.		

Table C-18. Aquatic Habitat Survey Data on Riser Creek.

Benchmark Criteria	Reach Number			
	1	2	3	4
Pool Area (percent)	89.8	97	84.5	0
Pool Frequency (channel widths/pool)	7.1	8.4	8.7	Not Calculated
Residual Pool Depth (m) (pool depth - riffle depth)	0.4	0.2	0.3	0
Complex Pools (number with wood complexity greater than 3/km)	1.1	0	0	0
Width-to-depth Ratio (in riffles)	17.4	16.7	18.3	Not Calculated
Silt, Sand, and Organics (percent area in riffles)	34	56	43	Not Calculated
Gravel (percent area in riffles)	65	35	45	Not Calculated
Shade (reach average percent)	75	39	71	100
LWD (pieces/100m)	10.3	10.6	8.7	7.9
LWD (volume/100m)	24	16.3	26.9	8.1
Key Pieces LWD (number/100m) (greater than 60cm diameter and at least 10m long)	0.8	0.3	1.0	0
The overall stream rating = fair.				

Table C-19. Aquatic Habitat Survey Data on Slide Creek.

Benchmark Criteria	Reach Number			
	1	2	3	4
Pool Area (percent)	55.3	63.9	91	25.4
Pool Frequency (channel widths/pool)	11.3	10.4	10.8	Not Calculated
Residual Pool Depth (m) (pool depth - riffle depth)	0.4	0.4	0.3	0.5
Complex Pools (number with wood complexity greater than 3/km)	0	0.9	0	0
Width-to-depth Ratio (in riffles)	14.7	20.2	20.8	10
Silt, Sand, and Organics (percent area in riffles)	25	33	52	79
Gravel (percent area in riffles)	66	63	47	21
Shade (reach average percent)	62	81	73	97
LWD (pieces/100m)	6.6	6.1	9	9
LWD (volume/100m)	3.7	9.3	15.3	6.9
Key Pieces LWD (number/100m) (greater than 60cm diameter and at least 10m long)	0.1	0.3	0.5	0.8
The overall stream rating = fair.				

Table C-20. Aquatic Habitat Survey Data on Buck Fork Creek.

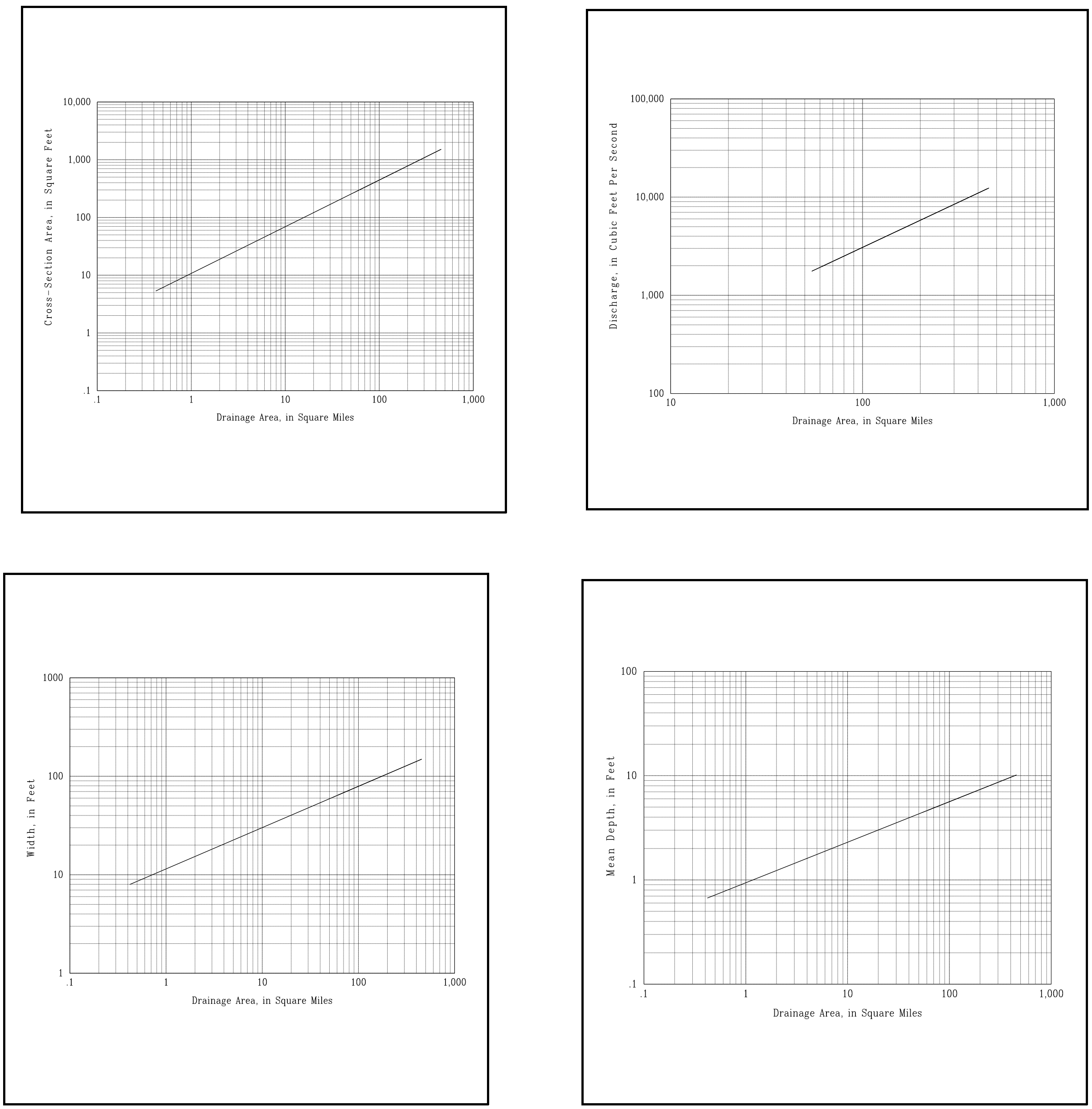
Benchmark Criteria	Reach Number			
	1	2	3	4
Pool Area (percent)	36.6	19.4	35.5	1.5
Pool Frequency (channel widths/pool)	10.8	12.3	17.8	376.6
Residual Pool Depth (m) (pool depth - riffle depth)	0.4	0.3	0.2	0.3
Complex Pools (number with wood complexity greater than 3/km)	1	0	0	0
Width-to-depth Ratio (in riffles)	19.2	9	Not Calculated	Not Calculated
Silt, Sand, and Organics (percent area in riffles)	35	17	49	62
Gravel (percent area in riffles)	44	78	39	54
Shade (reach average percent)	87	99	71	100
LWD (pieces/100m)	4	6.3	4.8	317.2
LWD (volume/100m)	4.9	8.9	4.4	38.6
Key Pieces LWD (number/100m) (greater than 60cm diameter and at least 10m long)	0.1	0.2	0.2	0.4
The overall stream rating = fair.				

Appendix D

Hydrology

Development of regional curves using Rosgen's Level II classification can be used to predict bankfull streamflow, mean depth, width, and cross-sectional area of ungaged streams (Rosgen 1996). Graph D-1 shows regional curves developed by hydrologists in the Roseburg BLM District using the Level II classification (Kuck 2000). The classification system can be used to evaluate the processes of river mechanics and develop dimensionless ratios. The classification system can also be used to determine the feasibility of restoration projects, what structures needed to enhance and promote channel stability, and the size of culverts or bridges to install.

Graph D-1. Regional Curves for the South Umpqua River Basin Using Drainage Area to Estimate Bankfull Cross-sectional Area, Discharge, Mean Depth, and Width.



Appendix E
Wildlife

Appendix E

Spotted owl site ranking and general suitable habitat evaluation are the two topics to consider when planning management activities affecting northern spotted owl suitable habitat. Habitat evaluation would include the timing of habitat disturbance and spatial distribution of seral age classes. The following steps would be used to evaluate how a management activity affects northern spotted owl suitable habitat.

A. Spotted Owl Site Ranking

1. Use the information in Table 39. Values given in Table 39 were from owl survey data and suitable habitat inventory data.

2. Table 39 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 total number of historic 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 differed 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 would 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" would be **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" would be considered **third**.

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

e. Sites with an occupancy ranking of "3" and history ranking of "2" would 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" would 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" would 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 value of "2" would 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" would be considered **ninth**.

j. Sites with more than 1,000 acres 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" would 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" would 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" would be considered **twelfth**.

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

4. Projects meeting criteria **a**, which is removing or modifying suitable spotted owl habitat outside of known provincial territories would 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" would be first, "two" would be second, and "three" would be last. Details of timing, location, and distance from core area would be determined by an ID Team and 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 of 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 would be considered in areas where Critical Habitat Units overlap Matrix lands.

Evaluation of the connectivity of suitable habitat would be conducted using aerial photographs of the WAU, seral age class maps, and ground inspections. 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 the older age classes, have small territories, or 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 would involve wildlife biologists, planning, and silviculture specialists.

1. Consider the ranking system. 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 site and LSR objectives. This data was presented in Table 39 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 areas where manipulation could increase the rate of stand development toward late-successional characteristics. On Matrix lands, the purpose may be to locate areas where manipulation may provide a functional forest corridor and coordinate the timing and spacing of timber harvesting 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 or decrease connectivity between suitable owl habitat and adjacent habitat, between the LSRs and Matrix, or between Connectivity/Diversity 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 the advantages or disadvantages of such a choice (in Matrix or LSR). This could lead to long-term connection of older forest stands across the landscape.

Table E-1. Special Status Wildlife Species in the Myrtle Creek WAU				
Species	**Status**	**Presence in District**	**District Monitoring Level**	**Expected in the WAU**
Vertebrates				
Fish				
Coastal Steelhead Trout (Onchorynchus mykiss ssp.)	FCO, V	D	3	Y
Coho Salmon (Onchorynchus kisutch)	FTO, C	D	3	Y
Green Sturgeon (Acipenser medirostris)	BTO, XC	U	1	N
Pacific Lamprey (Lampetra ayresi)	XC, BTO, V	D	3	Y
Umpqua Chub (Oregonighthys kalawatseti)	XC, SV, BTO	D	1	Y
Umpqua Basin Cutthroat Trout (Onchorynchus clarki)	FCO, V	D	3	Y
Amphibians				
Cascades Frog (Rana cascadae)	XC, BT, V	D	3	Y
Cascade Torrent Salamander (Rhyacotriton cascadae)	BT, V	N	3	N
Clouded Salamander (Aneides ferrous)	U, BTO	D	3	Y
Del Norte Salamander (Plethodon elongatus)	FPB, XC, V, BTO	D	3	N
Foothill Yellow-legged Frog (Rana boylii)	XCO, V, BTO	D	3	Y
Northern Red-legged Frog (Rana aurora aurora)	XC, U, BTO	D	3	Y
Oregon Slender Salamander (Batrachoseps wrighti)	BTO, V	N	1	N
Southern Torrent salamander (Rhyacotriton variegatus)	XCO, V, BTO	D	3	Y
Tailed Frog (Ascaphus truei)	XC, V, BT	D	3	Y
Reptiles				
California Mountain Kingsnake (Lampropeltis zonata)	V, BT	D	1	Y
Common Kingsnake (Lampropeltis getulus)	V, BTO	D	1	Y
Western Pond Turtle (Clemmys marmorata marmorata)	XC, C, BSO	D	3	Y
Sharptail Snake (Contia tenuis)	V, BT	D	3	Y
Birds				
Acorn Woodpecker (Melanerpes formicivorous)	BT	D	1	Y
Allen's Hummingbird (Selasphorus sasin)	BTO	U	1	Y
American peregrine falcon (Falco peregrinus anatum)	BS	D	3	Y
Bald Eagle (Haliaeetus leucocephalus)	FT, ST	D	1	Y
Bank Swallow (Riparia riparia)	BTO, U	D	1	Y
Blue-gray gnatcatcher (Polioptila caerulea)	BTO	D	3	S
Burrowing owl (Speotyto cunicularia)	BSO, XC, C	N	1	N
Common Nighthawk (Chordeiles minor)	BSO	D	1	Y
Downy Woodpecker (Picoides pubescens)	HI	D	3	Y
Flammulated Owl (Otus flammeolus)	C, BSO	N	1	N

Table E-1. Special Status Wildlife Species in the Myrtle Creek WAU				
Species	**Status**	**Presence in District**	**District Monitoring Level**	**Expected in the WAU**
Golden Eagle (Aquila chrysaetos)	HI	D	1	Y
Great Gray Owl (Strix nebulosa)	S&M, BT, V	D	3	Y
Harlequin Duck (Histrionicus histrionicus)	XC, BAO, U	D	1	S
Lewis' Woodpecker (Melanerpes lewis)	C, BSO	D	1	Y
Marbled Murrelet (Brachyramphus marmoratus marmoratus)	FT, ST, CH	D	1	N
Northern Goshawk (Accipiter gentilis)	XC, C, BSO	D	1	Y
Northern Spotted Owl (Strix occidentalis caurina)	FT, ST, CH	D	4	Y
Olive-sided Flycatcher (Contopus cooperi)	BTO, XC, V	D	3	Y
Oregon Vesper Sparrow (Pooecetes gramineus)	C, BSO	U	1	Y
Osprey (Pandion haliaetus)	HI	D	3	Y
Pileated Woodpecker (Dryocopus pileatus)	BT, V	D	3	Y
Purple martin (Progne subis)	C, BSO	D	3	Y
Streaked Horned Lark (Eremophila alpestris strigata)	BSO, CR	U	2	N
Western Bluebird (Sialia mexicana)	V, BT	D	3	Y
Western Least Bittern (Ixobrychus exiles hesperis)	BAO, XC, P	N	1	N
Willow Flycatcher (Empidonax traillii brewsteri)	XC, BT, V	D	1	Y
White-tailed Kite (Elanus leucurus)	BTO	D	1	Y
Mammals				
American Marten (Martes americana)	V, BTO	S	1	S
Black Bear (Ursus americanus)	Game	D	1	Y
Black-tailed Deer (Odocoileus hemionus columbianus)	Game	D	1	Y
Brazilian free-tailed Bat (Tadarida brasiliensis)	BAO	D	1	Y
Canada Lynx (Lynx canadensis)	FT	N	1	N
Columbian White-tailed Deer (Odocoileus virginianus leucurus)	FE, ST	D	3	Y
Fisher (Martes pennanti)	BSO, XC, CR	D	1	N
Fringed Myotis (Myotis thysanodes)	XC, V, BT, FPB	D	3	Y
Long-eared Myotis (Myotis evotis)	XC, BT, U, FPB	D	3	Y
Long-legged Myotis (Myotis volans)	XC, BT, U, FPB	D	3	Y
Mountain Lion (Felis concolor)	Game	D	1	Y
Pallid Bat (Antrozous pallidus)	V, BT	D	3	Y
Townsend's Big-eared Bat (Corynorhinus townsendii)	XC, C, BSO	D	3	Y
Red Tree Vole (Arborimus longicaudus)	S&M	D	3	Y
Ringtail (Bassariscus astutus)	BTO, U	S	1	Y

Table E-1. Special Status Wildlife Species in the Myrtle Creek WAU				
Species	**Status**	**Presence in District**	**District Monitoring Level**	**Expected in the WAU**
Roosevelt Elk (Cervus canadensis)	Game	D	1	Y
Silver Haired Bat (Lasionycteris noctivagans)	BTO, U	D	3	Y
Western Grey Squirrel (Sciurus griseus)	BTO, U	D	1	Y
Yuma Myotis (Myotis yumanensis)	XC, BTO	D	3	Y
White-footed vole (Arborimus albipes)	XC, BTO, U	S	1	N
Invertebrates				
Alsea Ochrotichian micro Caddisfly (Ochrotrichia alsea)	XCO, BTO	S	1	U
American Boreostolus Bug (Boreostolis americanus)	BTO	U	1	U
Ashlock-Obrien's Seed Bug (Malezonotus obrieni)	BTO	U	1	U
Blue-gray taildropper (slug)(Prophysaon coeruleum)	BTO	D	3	Y
Boreal Carduastethus Pirate Bug (Cardiastethus borealis)	BTO	U	1	U
Brown Juga (snail) (Juga sp. nov.)	BTO	U	1	U
California Floater (Anodonta californiensis)	BT, XC	S	1	S
California Giant Damselfly (Archilestes californica)	BTO	U	1	U
California Scutellarid Bug (Vanduzeeina borealis californicus)	BTO	U	1	U
Cascades Apatanian Caddisfly (Apatania tavala)	BTO, XCO	S	1	U
Cooley's Acalypta Lace Bug (Acalypta cooleyi)	BTO	U	1	U
Coronis Fritillary Butterfly (Speyeria coronis coronis)	BTO	U	1	U
Crater Lake Tightcoil (snail) (Pristiloma arcticum crateris)	S&M, BSO	D	1	Y
Dendrocoris Stink Bug (Dendrocoris arizonensis)	BTO	U	1	U
Douglas-fir Platylyngus Bug (Platylygus pseudotsugae)	BTO	N	1	N
Essig's Macrotylus Plant Bug (Macrotylus essigi)	BTO	U	1	U
Fender's Blue Butterfly (Icaricia icaroides fenderi)	FE	S	1	S
Fender's Rhyacophilan Caddisfly (Rhyocophila fenderi)	BTO	S	1	S
Foliaceous Lace Bug (Derephysia foliacea)	BTO	U	1	U
Franklin's bumblebee (Bombus franklini)	XCO, BSO	S	1	U
Garita Skipper Butterfly (Oarisma garita)	BTO	U	1	U
Gold-hunter's Hairstreak Butterfly (Satyrium auretorium)	BTO	U	1	U
Gray-Blue Butterfly (Agriades glandon podarce)	BTO	U	1	U
Green Sideband (snail) Monadenia fidelis beryllica)	BSO	S	3	N
Indian Ford Juga (snail) (Juga hemphilli ssp. nov.)	BSO	N	3	N
Indian Paintbrush Bug (Polymerus castilleja)	BTO	S	1	U
Insular Blue Butterfly (Plebejus saepiolus insulanus)	BSO	S	1	U
Lillianis Moss Bug (Acalypta lillianis)	BTO	U	1	U

Table E-1. Special Status Wildlife Species in the Myrtle Creek WAU				
Species	Status	Presence in District	District Monitoring Level	Expected in the WAU
Marsh Ground Beetle (Acupalpus punctulatus)	BTO	U	1	U
Marsh Nabid Bug (Nabicula propinqua)	BTO	U	1	U
Montane Bog Dragonfly (Tanypteryx hageni)	BTO	U	1	U
Mt. Hood Brachycentrid Caddisfly (Eobrachycentrus gelidae)	BTO, XCO	D	1	S
Oregon Acetropis Bug (Ceratpcapsus oregana)	BTO	U	1	U
Oregon Cave Amphipod (Stygobromus oregonensis)	BTO	U	1	U
Oregon Giant Earthworm (Driloleirus macelfreshi)	BSO, XCO	S	1	U
Oregon Halticotoma Plant Bug (Halticotoma sp. nov.)	BTO	U	1	U
Oregon Megomphix (Megomphix hemphilli)	S&M, BSO	D	3	Y
Oregon Shoulderband (snail) (Helminthoglypta hertleini)	S&M, BSO	D	3	Y
Oregon Trunk-inhabiting Plant Bug (Eurychilopterella sp. nov.)	BTO	U	1	U
Pale Teratocoris Sedge Bug (Teratocoris paludum)	BTO	U	1	U
Papillose Taildropper (slug) (Prophysaon dubium)	BTO	D	3	U
Piper's Carabid Beetle (Nebria piperi)	BTO	U	1	U
Pristine Spring Snail (Pristiloma hemphilli)	BTO	D	1	U
Rotund Lanx (snail) (Lanx subrotundata)	BSO	D	3	Y
Sagehen Creek Goeracean Caddisfly (Goeracea oregona)	BTO, XCO	S	1	Y
Salien Plant Bug (Criocoris saliens)	BTO	U	1	U
Schuh's Micranthia Shore Bug (Micracanthia schuhi)	BTO	U	1	N
Shiny Tightcoil (Pristiloma wascoense)	BTO	N	1	N
Siuslaw Sand Tiger Beetle (Cicindela hirticollis siuslawensis)	BTO	U	1	U
Siskiyou Copper Butterfly (Lycaena mariposa)	BTO	U	1	U
Siskiyou Hesperian (snail) (Vespericola sierranus)	BTO	N	1	N
Small Blue Butterfly (Philotiella speciosa)	BTO	U	1	U
Tombstone Prairie Farulan Caddisfly (Farula reapiri)	BTO, XCO	S	1	U
Travelling Sideband (snail) (Monadenia fidelis celethuia)	BSO	N	3	N
True Fir Pinalitus Bug (Pinalitus solivagus)	BTO	U	1	U
Umbrose Seed Bug (Atrazonotus umbrous)	BTO	U	1	U
Vernal Pool Fairy Shrimp (Branchinecta lynchi)	FT	U	1	U
Vertrees' ochrotichian micro caddisfly (Ochrotrichia vertreesi)	BTO, XCO	U	1	U
Western Chrosoma Bug (Chrosoma sp. nov.)	BTO	U	1	U
Western Ridge Mussel (Gonidea angulata)	BTO	D	1	N
Western Pearlshell (Margaritifera falcata)	BTO	D	1	Y

Status Abbreviations:	District 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	
XCO - Federal Species of Concern/Former Federal Candidate in Oregon	**Expected in Watershed Abbreviations:**
XC - Former Federal Candidate in Oregon and Washington	**U** - Unknown
CH - Critical habitat designated	**N** - Not Expected
SE - State Endangered	**Y** - Expected
ST - State Threatened	**Monitoring Level Used to Document Species**
C - ODFW Critical	**N** - No surveys done or planned
V - ODFW Vulnerable	**1** - Literature search only
P - ODFW Peripheral/Naturally Rare	**2** - One field search done
U - ODFW Undetermined	**3** - Some surveys completed
HI - Species of high interest in the District	**4** - Protocol completed
BS - Bureau Sensitive Species	
BSO - Bureau Sensitive Species in Oregon	
BA - Bureau Assessment Species in Oregon and Washington	
BAO - Bureau Assessment Species in Oregon	
BTO - Bureau Tracking Species in Oregon	
BT - Bureau Tracking Species	
S&M - Survey and Manage (ROD)	
The species status reflects interim guidelines from the Oregon State BLM Office IB-OR-2000-02 (January 25, 2000) March 9, 2000 R.H. Espinosa.	

** The column “Expected in Project Area” is given for future use. Specific project evaluation may use this for creating a list of species that may be found in a project area.

Table E-2. Wildlife Species of Concern Known or Suspected to Occur in the Myrtle Creek WAU with Riparian-Wetlands Habitat Relationships (From Northwest Habitat Institute Database 2001).

Species	Association	Activity	Comments
Amphibians			
Northwestern Salamander	Close	Feeds and Breeds	Requires ponds or stream backwaters for breeding
Pacific Giant Salamander	Close	Feeds and Breeds	Requires small to mid-sized streams with a streambed of gravel, boulders and large logs for breeding
Southern Torrent Salamander	Close	Feeds and Breeds	Requires very cold, clear seeps, springs, and small streams for breeding
Rough-skinned Newt	Close	Feeds and Breeds	Requires ponds or stream backwaters with abundant aquatic vegetation for breeding
Dunn's Salamander	General	Feeds and Breeds	Requires moist or wet rock outcrops, talus, gravel, boulders, or rock crevices
Tailed Frog	Close	Feeds and Breeds	Requires clear, cold steep-gradient streams for breeding
Birds			
Common Merganser	Close	Feeds and Breeds	Nests in tree cavities near large lakes or rivers
Northern Goshawk	General	Feeds	
Peregrine Falcon	General	Feeds	
Barred Owl	General	Feeds and Breeds	
Belted Kingfisher	Close	Feeds and Breeds	
Pileated Woodpecker	General	Feeds and Breeds	
Willow Flycatcher	Close	Feeds and Breeds	
Warbling Vireo	Close	Feeds and Breeds	
Purple Martin	General	Feeds and Breeds	
Tree Swallow	Close	Feeds and Breeds	Requires snags not far from open water for nesting
Northern Rough-winged Swallow	Close	Feeds and Breeds	Requires burrows in dirt banks, usually next to water, for nesting
Cliff Swallow	Close	Feeds and Breeds	Can nest anywhere rimrock, overhanging cliffs, buildings or bridges occur in close proximity to water
Barn Swallow	Close	Feeds and Breeds	Can nest anywhere buildings, bridges, or overhanging cliffs occur in close proximity to water
American Dipper	Close	Feeds and Breeds	

Table E-2. Wildlife Species of Concern Known or Suspected to Occur in the Myrtle Creek WAU with Riparian-Wetlands Habitat Relationships (From Northwest Habitat Institute Database 2001).

Species	Association	Activity	Comments
Yellow Warbler	Close	Feeds and Breeds	
Black-throated Gray Warbler	Close	Feeds and Breeds	
Common Yellowthroat	Close	Feeds and Breeds	
Wilson's Warbler	Close	Feeds and Breeds	
Yellow-breasted Chat	Close	Feeds and Breeds	
Lincoln's Sparrow	Close	Feeds and Breeds	
Bullock's Oriole	Close	Feeds and Breeds	
Purple Finch	Close	Feeds and Breeds	
Lesser Goldfinch	Close	Feeds and Breeds	
Mammals			
Fog Shrew	Close	Feeds and Breeds	
Pacific Shrew	Close	Feeds and Breeds	
Water Shrew	Close	Feeds and Breeds	Semi-aquatic, requires cold, clear water in small streams or ponds with abundant cover in the form of rocks or overhanging banks
Pacific Water Shrew	Close	Feeds and Breeds	Closely tied to water
Yuma Myotis	Close	Feeds and Breeds	More closely associated with water than other bat species. Uses caves, mines, loose bark, and bark crevices close to water
Townsend's Big-eared Bat	General	Feeds	
Brazilian Free-tailed Bat	Present	Feeds	
California Myotis	General	Feeds and Breeds	Uses rock crevices, hollow trees, mines or caves for breeding
Little Brown Myotis	General	Feeds and Breeds	Uses caves, mines, or hollow trees, often near water
Long-legged Myotis	General	Feeds and Breeds	Uses caves or mines as hibernacula. Uses hollow trees, loose bark or rock crevices for maternity colonies
Fringed Myotis	General	Feeds and Breeds	Requires caves, mines or rock crevices
Long-eared Myotis	General	Feeds and Breeds	Uses caves, mines, hollow trees, loose bark or rock crevices

Table E-2. Wildlife Species of Concern Known or Suspected to Occur in the Myrtle Creek WAU with Riparian-Wetlands Habitat Relationships (From Northwest Habitat Institute Database 2001).

Species	Association	Activity	Comments
Silver-haired Bat	General	Feeds	
Big Brown Bat	General	Feeds and Breeds	Requires snags, caves, mines, rock crevices, or bridges for breeding and roosting
Hoary Bat	General	Feeds	Requires trees for roosting, but forages in openings and at edges of forests
Pallid Bat	General	Feeds	
Mountain Beaver	Close	Feeds and Breeds	
American Beaver	Close	Feeds and Breeds	
Deer Mouse	Close	Feeds and Breeds	
Dusky-footed Woodrat	Close	Feeds and Breeds	
Western Red-backed Vole	General	Feeds and Breeds	
Red Tree Vole	Present	Feeds and Breeds	
Long-tailed Vole	Close	Feeds and Breeds	
Water Vole	Close	Feeds and Breeds	
Pacific Jumping Mouse	Close	Feeds and Breeds	
American Marten	Present	Feeds and Breeds	
Mink	Close	Feeds and Breeds	
Northern River Otter	Close	Feeds and Breeds	
Columbian White-tailed Deer	General	Feeds and Breeds	
Reptiles			
Western Pond Turtle	Close	Feeds and Breeds	

Table E-3. 1993 Age Class Distribution in the Myrtle Creek WAU. (Using Satellite Imagery Data).

	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 Acres
Bilger Creek	929	17	3,555	64	519	9	548	10	5,551
Frozen Creek	717	16	2,346	51	801	17	715	16	4,579
Lick Frontal	586	20	1,182	40	435	15	723	25	2,926
Myrtle Creek	2,043	51	1,206	30	343	9	429	11	4,021
North Myrtle Park	303	16	407	22	430	23	726	39	1,866
Lower North Myrtle Subwatershed	4,578	24	8,696	46	2,528	13	3,141	17	18,943
Buck Fork	87	3	754	25	1,288	43	852	29	2,981
Lee Creek	211	6	1,416	37	1,147	30	1,055	28	3,829
Lower Slide Creek	118	7	364	20	656	37	646	36	1,784
Middle North Myrtle	294	14	565	28	542	27	641	31	2,042
North Myrtle Frontal	114	21	66	12	162	30	196	36	538
North Myrtle Headwaters	144	4	2,113	52	700	17	1,127	28	4,084
Riser Creek	21	1	431	22	605	30	940	47	1,997
Upper Slide Creek	32	3	290	25	239	21	581	51	1,142
Upper North Myrtle Subwatershed	1,021	6	5,999	33	5,339	29	6,038	33	18,397
Ben Branch	33	3	188	16	500	43	430	37	1,151
Cedar Hollow	105	10	320	29	222	20	450	41	1,097
Myrtle Links	578	24	729	31	322	14	738	31	2,367
Pack Saddle	551	21	582	22	630	24	846	32	2,609
School Hollow	694	32	332	15	409	19	733	34	2,168
Short Course	986	37	591	22	410	15	664	25	2,651
Lower South Myrtle Subwatershed	2,947	24	2,742	23	2,493	21	3,861	32	12,043

Table E-3. 1993 Age Class Distribution in the Myrtle Creek WAU. (Using Satellite Imagery Data).

	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 Acres
Curtin Creek	9	0	248	14	565	31	996	55	1,818
Lally Creek	262	6	817	20	1,055	26	1,966	48	4,100
Letitia Creek	583	13	1,024	23	1,194	27	1,629	37	4,430
Lower Louis Creek	319	16	490	24	702	35	523	26	2,034
South Myrtle Headwaters	28	1	242	7	1,081	32	1,988	60	3,339
Upper Louis Creek	101	3	755	21	1,080	31	1,603	45	3,539
Weaver Creek	133	3	748	19	1,071	27	1,985	50	3,937
Wiley Creek	463	14	693	21	891	27	1,221	37	3,268
Upper South Myrtle Subwatershed	1,898	7	5,017	19	7,639	29	11,911	45	26,465
Myrtle Creek WAU	10,444	14	22,454	30	17,999	24	24,951	33	75,848

Table E-4. 1993 BLM Age Class Distribution in the Myrtle Creek WAU. (Using Satellite Imagery Data).

	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 Acres
Bilger Creek	61	4	931	65	197	14	237	17	1,426
Frozen Creek	38	4	513	54	109	12	283	30	943
Lick Frontal	21	4	120	24	72	15	282	57	495
Myrtle Creek	10	3	171	54	46	15	88	28	315
North Myrtle Park	13	3	101	27	92	24	175	46	381
Lower North Myrtle Subwatershed	143	4	1,836	52	516	14	1,065	30	3,560
Buck Fork	20	2	348	39	307	34	218	24	893
Lee Creek	40	2	717	39	414	23	646	36	1,817
Lower Slide Creek	19	2	165	17	337	36	424	45	945
Middle North Myrtle	15	4	198	47	80	19	125	30	418
North Myrtle Frontal	0	0	13	9	51	36	76	54	140
North Myrtle Headwaters	82	4	990	45	269	12	866	39	2,207
Riser Creek	13	1	252	21	264	21	699	57	1,228
Upper Slide Creek	28	3	228	23	171	18	548	56	975
Upper North Myrtle Subwatershed	217	3	2,911	34	1,893	22	3,602	42	8,623
Ben Branch	10	2	127	28	139	31	171	38	447
Cedar Hollow	2	1	19	9	48	23	138	67	207
Myrtle Links	19	4	151	29	87	17	265	51	522
Pack Saddle	50	10	119	24	56	11	270	55	495
School Hollow	36	6	130	22	122	21	298	51	586
Short Course	2	1	68	22	40	13	198	64	308
Lower South Myrtle Subwatershed	119	5	614	24	492	19	1,340	52	2,565

Table E-4. 1993 BLM Age Class Distribution in the Myrtle Creek WAU. (Using Satellite Imagery Data).

	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 Acres
Curtin Creek	9	0	248	14	565	31	996	55	1,818
Lally Creek	57	3	601	27	430	19	1,118	51	2,206
Letitia Creek	23	1	233	14	421	26	931	58	1,608
Lower Louis Creek	13	2	203	33	193	31	212	34	621
South Myrtle Headwaters	24	1	208	7	993	32	1,843	60	3,068
Upper Louis Creek	37	2	457	19	578	25	1,274	54	2,346
Weaver Creek	38	1	680	22	763	25	1,617	52	3,098
Wiley Creek	22	2	261	20	294	23	714	55	1,291
Upper South Myrtle Subwatershed	223	1	2,891	18	4,237	26	8,705	54	16,056
Myrtle Creek WAU	702	2	8,252	27	7,138	23	14,712	48	30,804

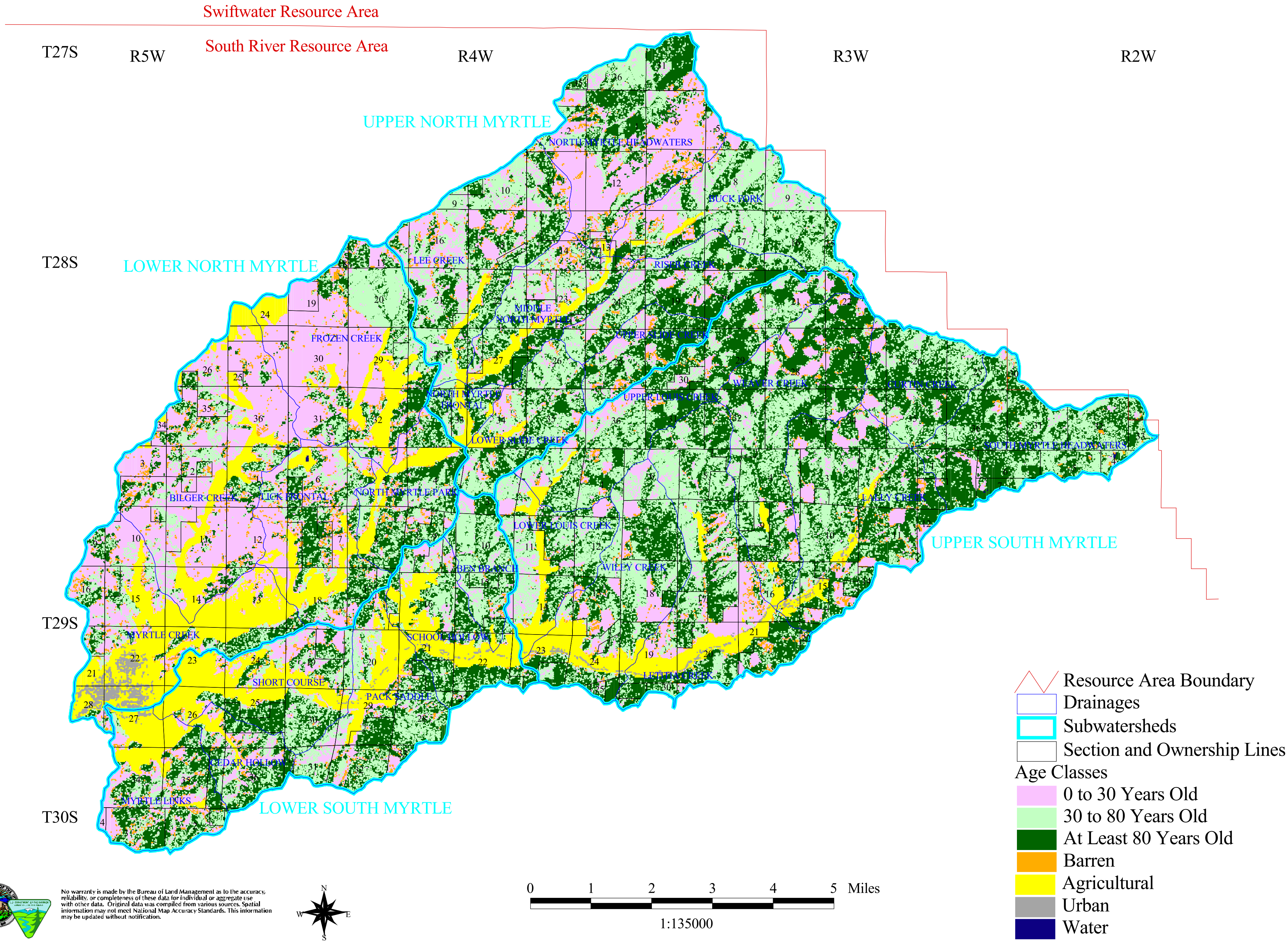
Table E-5. Comparison of 1993 Satellite Imagery and 2001 Operations Inventory Vegetation Data in the Myrtle Creek WAU.

Seral Stage	Age Class	1993		2001	
		Acres	Percent	Acres	Percent
Early	0 to 30 Years Old	22,454	30	13,365	18
Mid	30 to 80 Years Old	17,999	24	30,771	40
Late	At Least 80 Years Old	24,951	33	19,018	25
Nonforested	Nonforested	10,444	14	11,466	15
Hardwoods	Hardwoods	Not Determined	Not Determined	1,618	2
Total		75,848	100	76,238	100

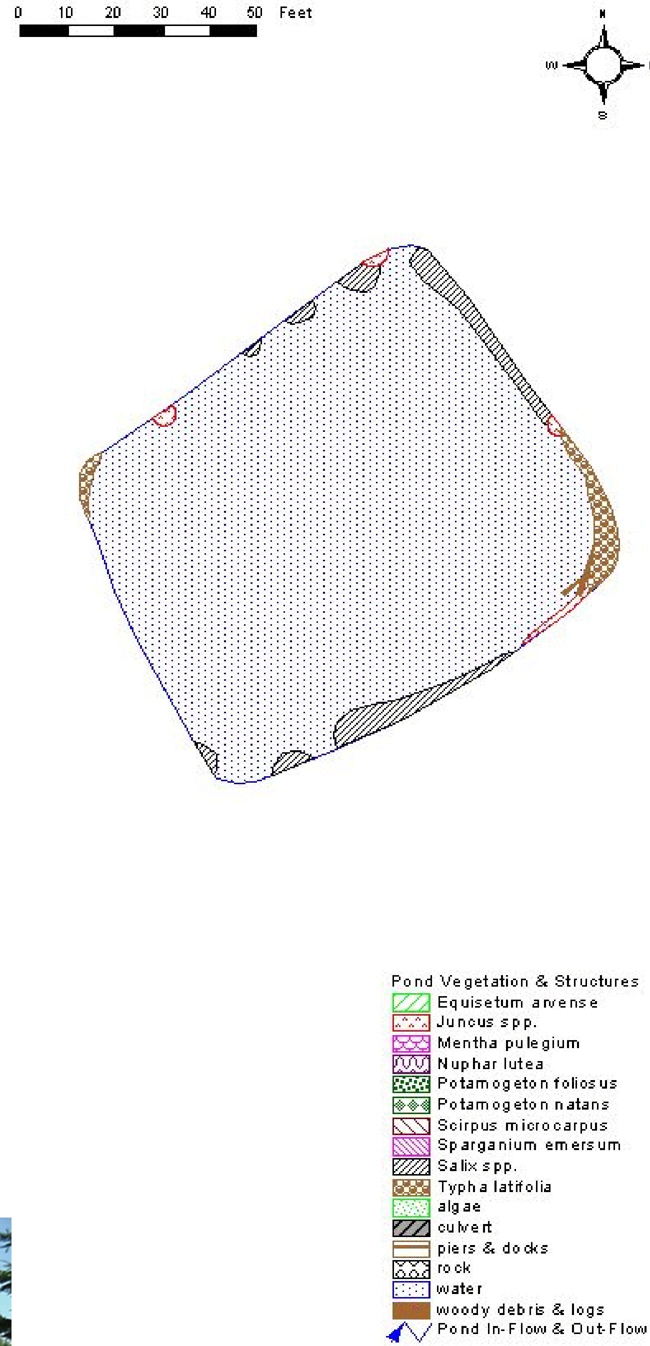
Table E-6. Comparison of 1993 Satellite Imagery and 2001 Operations Inventory Vegetation Data on BLM Administered Land in the Myrtle Creek WAU.

Seral Stage	Age Class	1993		2001	
		Acres	Percent	Acres	Percent
Early	0 to 30 Years Old	8,252	27	7,449	24
Mid	30 to 80 Years Old	7,138	23	5,331	17
Late	At Least 80 Years Old	14,712	48	17,592	57
Nonforested	Nonforested	702	2	612	2
Total		30,804	100	30,984	100

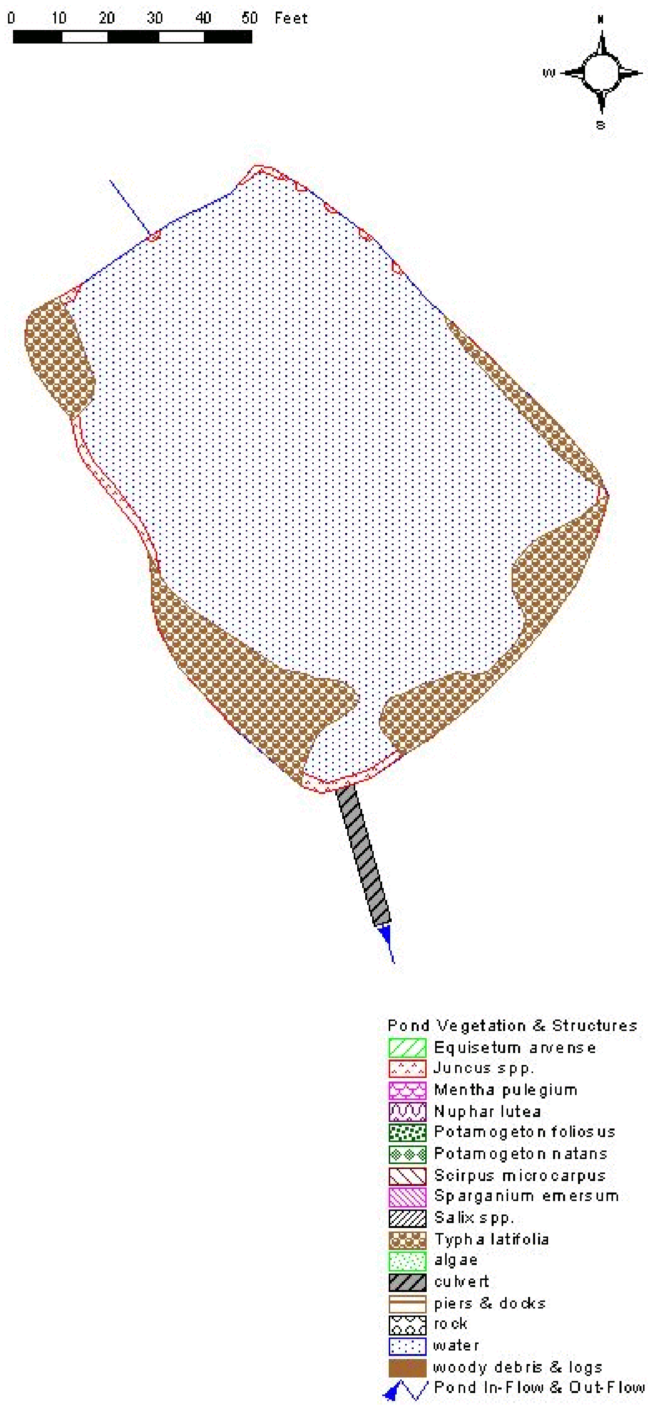
Map E-1. Myrtle Creek Watershed Analysis Unit
1993 Age Class Distribution (Using Satellite Imagery)



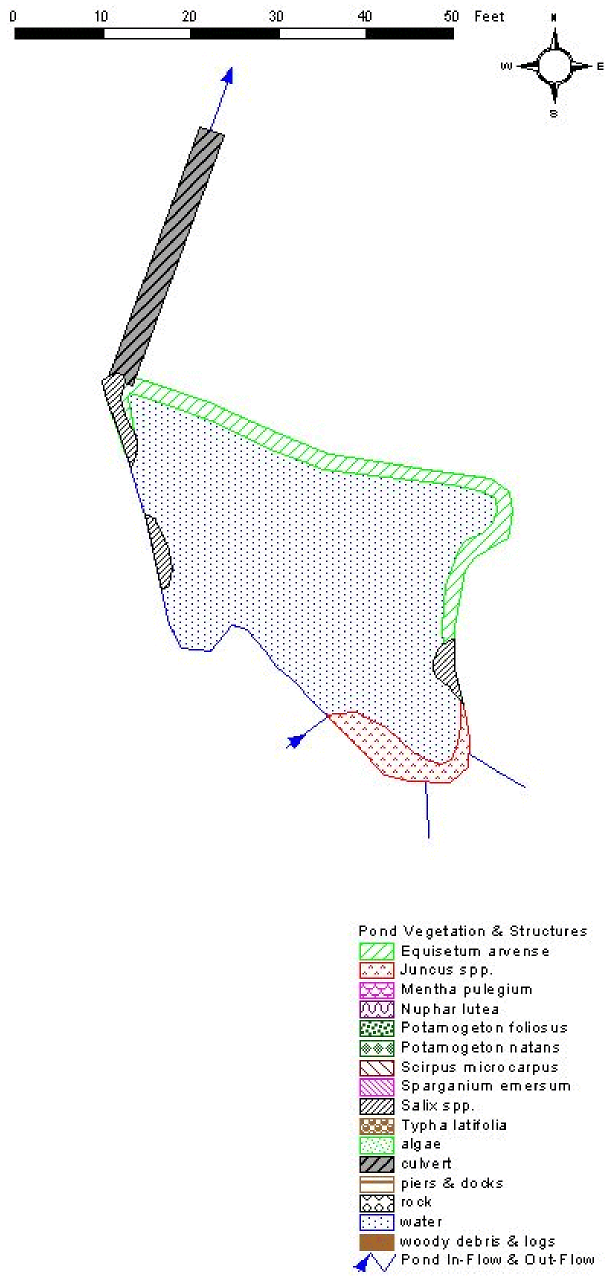
Pond Name: Red Top T29S-R02W-S04 **Survey Date:** July 21, 2000 **Surveyor:** Rex McGraw	
Pond Variable	0 (n=3)
Pond Morphology	
Surface Area	750 m^2 (8,066 ft^2)
Perimeter	104 m (340 ft)
SLD	1.07
Littoral Zone Depth	45 cm (18 in)
Water Chemistry	
Temperature	23º C (73º F)
pH	7.10
Conductivity	0.025 mS/cm
Macro-Invertebrate Indices (Pond Averages)	
Familial Richness (S_f)	5
Shannon Diversity (H)	1.515
Equitability (J)	0.941
Simpson's Diversity (D)	0.764
Abundance	4.000
Hilsenhoff Biotic Index	6.833
Vertebrate Species Detected	
Undetermined Fish Species	



Pond Name: Tres Santos T28S-R03W-S26 **Survey Date:** July 21, 2000 **Surveyor:** Rex McGraw	
Pond Variable	0 (n=4)
Pond Morphology	
Surface Area	909 m^2 (9,770 ft^2)
Perimeter	113 m (370 ft)
SLD	1.06
Littoral Zone Depth	28 cm (11 in)
Water Chemistry	
Temperature	24° C (75° F)
pH	7.46
Conductivity	0.045 mS/cm
Macro-Invertebrate Indices (Pond Averages)	
Familial Richness (S_f)	9
Shannon Diversity (H)	1.922
Equitability (J)	0.874
Simpson's Diversity (D)	0.819
Abundance	6.250
Hilsenhoff Biotic Index	7.760
Vertebrate Species Detected	
Yellow Bullhead (*Ictalurus natalis*) Red-Legged Frog (*Rana aurora*) Roughskin Newt (*Taricha granulosa*)	



Pond Name: White Rock T28S-R03W-S22 **Survey Date:** July 21, 2000 **Surveyor:** Rex McGraw	
Pond Variable	0 (n=3)
Pond Morphology	
Surface Area	107 m^2 (1,148 ft^2)
Perimeter	48 m (157 ft)
SLD	1.31
Littoral Zone Depth	54 cm (21 in)
Water Chemistry	
Temperature	18° C (65° F)
pH	6.58
Conductivity	0.044 mS/cm
Macro-Invertebrate Indices (Pond Averages)	
Familial Richness (S_f)	10
Shannon Diversity (H)	2.155
Equitability (J)	0.935
Simpson's Diversity (D)	0.873
Abundance	10.666
Hilsenhoff Biotic Index	6.593
Vertebrate Species Detected	
Northwestern Salamander (*Ambystoma gracile*)	



Appendix F
Plants

Table F-1 lists the Survey and Manage Species that occur in the Myrtle Creek WAU. A revised Survey and Manage list is expected to be released soon. Many of the species listed in Table F-1 were found in the proposed or designated ACEC/RNAs.

Table F-1. Survey and Manage Species Occurring in the Myrtle Creek WAU.

	Category	Number of Populations	Management
Vascular Plants			
Aster vialis	A	5	Pre-disturbance surveys
Cypripidium montanum	C	3	Pre-disturbance surveys
Bryophytes			
Buxbaumia viridis	D	1	Manage high priority sites
Fungi			
Bondarzewia mesenterica	B	1	Manage all known sites
Cantherelles subalbidus	D	2	Manage high priority sites
Clavariadelphus ligula	B	1	Manage all known sites
Clavariadelphus subfastigiatus	B	1	Manage all known sites
Clavariadelphus truncatus	B	4	Manage all known sites
Craterellus tubaeformis	D	4	Manage high priority sites
Galerina atkinsoniana	B	2	Manage all known sites
Galerina vittaeformis	B	2	Manage all known sites
Gomphus clavatus	B	1	Manage all known sites
Gomphus floccosus	B	2	Manage all known sites
Gyromitra infula	B	1	Manage all known sites
Helvella maculata	B	2	Manage all known sites
Hydnum umbilicatum	B	3	Manage all known sites
Mycena monticula	B	1	Manage all known sites
Otidea leprina	B	1	Manage all known sites
Otidea onotica	F	9	

Table F-1. Survey and Manage Species Occurring in the Myrtle Creek WAU.

	Category	Number of Populations	Management
Otidea smithii	B	1	Manage all known sites
Phaeocollybia attenuata	D	1	Manage high priority sites
Phaeocollybia californica	B	3	Manage all known sites
Plectania melistoma	F	1	
Ramaria celerivirescens	B	2	Manage all known sites
Ramaria cyaneigranosa	B	1	Manage all known sites
Ramaria spinulosa	B	1	Manage all known sites
Ramaria suecica	D	2	Manage all known sites
Rhizopogon truncatus	D	2	Manage high priority sites
Sarcosphaera eximia	B	1	Manage all known sites
Tremiscus helvelloides	B	3	Manage all known sites
Lichens			
Calicium abietinum	B	1	Manage all known sites
Calicium viride	F	3	
Chaenotheca furfuracea	F	2	
Collomia nigrescens	F	5	
Nephroma bellum	F	1	
Pannaria saubinettii	F	7	
Peltigera pacifica	E	1	Manage all known sites
Ramalina thrausta	A	3	Pre-disturbance surveys

Appendix G

Roads

Transportation Management Objectives

Transportation Management Objectives (TMO) are developed for all existing and newly constructed BLM controlled roads. Key items such as private land access, road stability, erosion potential, recreational needs, and specific resource management objectives were examined by an interdisciplinary team to identify the needs and objectives of each road segment.

Transportation Management Objectives document the classification of each road as arterial, collector, local, or resource. The road maintenance level and the recommended action for renovation, improvement, or closure are also documented. Transportation Management Objectives are developed or re-examined in conjunction with watershed analysis or watershed-based Environmental Assessments.

Some spur roads may not be included in the lists shown in this Appendix because road numbers have not been assigned to them. The un-numbered spur roads would be evaluated at the same time as numbered roads in a project area.

Table G-1. Roads in the Myrtle Creek WAU to Consider Decommissioning.

Road Number	Miles	Surface Type	Subwatershed
28-3-7.02A	0.08	Natural	Upper North Myrtle
28-3-8.02A	0.36	Rock	Upper North Myrtle
29-4-3.00A	0.55	Natural	Upper North Myrtle and Upper South Myrtle
28-2-32.03A	0.62	Natural	Upper South Myrtle
28-3-33.02A	0.50	Natural	Upper South Myrtle
29-3-15.02D	0.24	Natural	Upper South Myrtle
Total	2.35		

Table G-2. Roads in the Myrtle Creek WAU to Consider Decommissioning or Improving.

Road Number	Miles	Surface Type	Subwatershed
29-4-2.01B[1]	0.93	Rock	Upper North Myrtle
29-4-23.01B*	0.25	Natural	Upper South Myrtle
Total	1.18		

* = Road renovation planned under sold timber sale contract or planned timber sale EA not completed.
[1] = Part of this road segment may be decommissioned and part may be renovated or improved.

Table G-3. Roads Which Could Be Improved in the Myrtle Creek WAU.

Road Number	Miles	Surface Type	Subwatershed
28-4-17.00A	0.35	Natural	Lower North Myrtle
29-4-9.00A	0.64	Rock	Lower North Myrtle
27-4-35.03A	0.22	Natural	Upper North Myrtle
28-3-5.00A	1.48	Natural	Upper North Myrtle
28-3-5.01A	0.40	Natural	Upper North Myrtle
28-3-6.00B	0.30	Natural	Upper North Myrtle
28-3-7.00A	0.34	Natural	Upper North Myrtle
28-3-7.01A	0.35	Natural	Upper North Myrtle
28-3-8.01B	0.01	Natural	Upper North Myrtle
28-3-8.01D	0.25	Natural	Upper North Myrtle
28-3-17.00A	5.26	Rock	Upper North Myrtle
28-3-17.00B	0.14	Rock	Upper North Myrtle
28-3-17.01A	0.55	Rock	Upper North Myrtle
28-3-17.02A	0.82	Rock	Upper North Myrtle
28-3-19.00A*	0.31	Rock	Upper North Myrtle
28-3-20.00A	1.47	Rock	Upper North Myrtle
28-3-21.05A	0.19	Rock	Upper North Myrtle
28-3-22.01A	0.10	Rock	Upper North Myrtle
28-3-30.00A	0.23	Rock	Upper North Myrtle
28-3-30.01A	0.51	Rock	Upper North Myrtle
28-4-1.01A*	0.10	Rock	Upper North Myrtle
28-4-2.00D	0.03	Natural	Upper North Myrtle
28-4-5.00R	0.10	Natural	Upper North Myrtle
28-4-11.00A	1.55	Rock	Upper North Myrtle
28-4-11.01A	0.14	Rock	Upper North Myrtle

Table G-3. Roads Which Could Be Improved in the Myrtle Creek WAU.

Road Number	Miles	Surface Type	Subwatershed
28-4-11.02A	0.26	Rock	Upper North Myrtle
28-4-12.01B	0.92	Rock	Upper North Myrtle
28-4-13.01E	0.58	Rock	Upper North Myrtle
28-4-13.02B	1.02	Rock	Upper North Myrtle
28-4-13.02C	4.28	Rock	Upper North Myrtle
28-4-13.03A	1.55	Rock	Upper North Myrtle
28-4-13.04A	1.45	Rock	Upper North Myrtle
28-4-14.02A	0.21	Rock	Upper North Myrtle
28-4-14.03A	0.38	Rock	Upper North Myrtle
28-4-15.00A	1.36	Rock	Upper North Myrtle
28-4-16.01B	1.17	Rock	Upper North Myrtle
28-4-17.00A	0.35	Natural	Upper North Myrtle
28-4-20.00A	0.21	Rock	Upper North Myrtle
28-4-21.02B	0.14	Rock	Upper North Myrtle
28-4-21.04A	0.40	Rock	Upper North Myrtle
28-4-22.01B	0.17	Rock	Upper North Myrtle
28-4-22.01C	0.24	Rock	Upper North Myrtle
28-4-22.02A	0.14	Rock	Upper North Myrtle
28-4-23.00A	0.46	Rock	Upper North Myrtle
28-4-23.01A	0.19	Rock	Upper North Myrtle
28-4-23.02A	0.17	Rock	Upper North Myrtle
28-4-24.00C	0.33	Rock	Upper North Myrtle
28-4-24.01B	0.43	Rock	Upper North Myrtle
28-4-27.00A	0.48	Rock	Upper North Myrtle
28-4-28.00B	1.36	Rock	Upper North Myrtle

Table G-3. Roads Which Could Be Improved in the Myrtle Creek WAU.

Road Number	Miles	Surface Type	Subwatershed
28-4-34.00E	2.97	Rock	Upper North Myrtle and Upper South Myrtle
28-4-36.01B	0.16	Rock	Upper North Myrtle
29-4-3.01A	0.59	Rock	Upper North Myrtle
29-4-3.03A	0.38	Rock	Upper North Myrtle and Lower South Myrtle
29-4-27.03A	0.06	Rock	Lower South Myrtle
29-4-33.01A	0.27	Rock	Lower South Myrtle
30-5-1.00A	0.95	Rock	Lower South Myrtle
30-5-3.00A	0.36	Natural	Lower South Myrtle
30-5-3.00B	0.29	Natural	Lower South Myrtle
30-5-3.02A	0.22	Natural	Lower South Myrtle
30-5-14.00C	0.82	Natural	Lower South Myrtle
30-5-14.00D	0.50	Natural	Lower South Myrtle
28-2-32.01A*	2.97	Rock	Upper South Myrtle
28-2-32.01B	1.46	Rock	Upper South Myrtle
28-2-32.02A	0.56	Rock	Upper South Myrtle
28-2-32.04A	0.23	Rock	Upper South Myrtle
28-3-21.00A	0.70	Rock	Upper Southwatershed Myrtle
28-3-21.01A	0.27	Rock	Upper South Myrtle
28-3-21.02A	0.24	Rock	Upper South Myrtle
28-3-21.03A	0.16	Rock	Upper South Myrtle
28-3-21.04A	0.20	Rock	Upper South Myrtle
28-3-21.05A	0.19	Rock	Upper South Myrtle
28-3-21.06A	0.37	Rock	Upper South Myrtle

Table G-3. Roads Which Could Be Improved in the Myrtle Creek WAU.

Road Number	Miles	Surface Type	Subwatershed
28-3-23.00B*	0.33	Rock	Upper South Myrtle
28-3-25.00A	0.69	Rock	Upper South Myrtle
28-3-26.02A	1.31	Rock	Upper South Myrtle
28-3-27.00A	1.01	Rock	Upper South Myrtle
28-3-27.01A	0.30	Rock	Upper South Myrtle
28-3-28.00A	0.29	Rock	Upper South Myrtle
28-3-28.00B*	1.01	Rock	Upper South Myrtle
28-3-28.01A	0.13	Rock	Upper South Myrtle
28-3-28.01B	0.16	Rock	Upper South Myrtle
28-3-28.02A	0.32	Rock	Upper South Myrtle
28-3-30.00A	0.23	Rock	Upper South Myrtle
28-3-31.00A	0.35	Rock	Upper South Myrtle
28-3-31.00B	1.23	Rock	Upper South Myrtle
28-3-31.01A*	0.22	Rock	Upper South Myrtle
28-3-32.00A	2.03	Rock	Upper South Myrtle
28-3-32.02A	0.56	Natural	Upper South Myrtle
28-3-32.03A*	0.32	Rock	Upper South Myrtle
28-3-33.00B	2.71	Rock	Upper South Myrtle
28-3-33.01A	0.35	Rock	Upper South Myrtle
28-3-34.00A	0.34	Rock	Upper South Myrtle
28-3-34.01A	0.14	Rock	Upper South Myrtle
28-3-34.02A*	0.13	Rock	Upper South Myrtle
28-3-34.02B*	0.09	Rock	Upper South Myrtle
28-3-34.04A	0.26	Rock	Upper South Myrtle
28-3-34.06A*	0.45	Rock	Upper South Myrtle

Table G-3. Roads Which Could Be Improved in the Myrtle Creek WAU.

Road Number	Miles	Surface Type	Subwatershed
28-4-36.03A	0.75	Rock	Upper South Myrtle
29-2-4.00A	3.11	Rock	Upper South Myrtle
29-2-5.00A	0.18	Rock	Upper South Myrtle
29-3-4.00B	0.19	Natural	Upper South Myrtle
29-3-4.01C	0.74	Rock	Upper South Myrtle
29-3-9.00A*	0.74	Rock	Upper South Myrtle
29-3-9.00B*	2.55	Rock	Upper South Myrtle
29-3-9.01A	0.39	Natural	Upper South Myrtle
29-3-9.02A	0.40	Natural	Upper South Myrtle
29-3-9.03A*	0.29	Rock	Upper South Myrtle
29-3-11.00A*	3.04	Rock	Upper South Myrtle
29-3-11.02A	0.51	Rock	Upper South Myrtle
29-3-11.02B	0.47	Natural	Upper South Myrtle
29-3-11.03A	0.49	Rock	Upper South Myrtle
29-3-11.04A	0.42	Natural	Upper South Myrtle
29-3-15.01A	0.66	Rock	Upper South Myrtle
29-3-15.01C	0.93	Natural	Upper South Myrtle
29-3-15.04A	0.28	Rock	Upper South Myrtle
29-3-16.00E	1.91	Rock	Upper South Myrtle
29-3-20.00B	0.04	Natural	Upper South Myrtle
29-3-20.00D	0.07	Natural	Upper South Myrtle
29-3-20.02B	0.58	Natural	Upper South Myrtle
29-3-20.02D	0.07	Natural	Upper South Myrtle
29-3-29.03A	1.25	Rock	Upper South Myrtle
29-4-3.03A	0.38	Rock	Upper South Myrtle

Table G-3. Roads Which Could Be Improved in the Myrtle Creek WAU.

Road Number	Miles	Surface Type	Subwatershed
29-4-11.01B	4.42	Rock	Upper South Myrtle
29-4-23.01A1*	0.14	Rock	Upper South Myrtle
29-4-23.01A2*	0.17	Natural	Upper South Myrtle
30-3-6.00D	3.31	Rock	Upper South Myrtle
Total	92.45		

* = Road renovation planned under sold timber sale contract or planned timber sale EA not completed. Adds up to 12.18 miles.

Table G-4. Roads Considered Not Needing Treatment at This Time in the Myrtle Creek WAU.

Road Number	Miles	Surface Type	Subwatershed
28-4-8.03C	0.77	Rock	Lower North Myrtle
28-4-16.00A1	0.22	Rock	Lower North Myrtle
28-4-17.02A	0.13	Rock	Lower North Myrtle
28-4-21.00A	3.61	Rock	Lower North Myrtle
28-4-21.00B	0.98	Rock	Lower North Myrtle
28-4-21.03A	0.91	Rock	Lower North Myrtle
28-4-28.00A	1.71	Bituminous	Lower North Myrtle
28-5-25.00A	0.59	Rock	Lower North Myrtle
28-5-26.01A	0.34	Rock	Lower North Myrtle
28-5-34.00A	0.35	Rock	Lower North Myrtle
29-4-9.01A	0.14	Rock	Lower North Myrtle
29-4-9.02A	0.08	Rock	Lower North Myrtle and Lower South Myrtle
29-4-17.00A	0.83	Rock	Lower North Myrtle
29-4-17.00B	1.09	Rock	Lower North Myrtle
29-4-17.00D	0.71	Rock	Lower North Myrtle
29-4-20.00B	1.65	Rock	Lower North Myrtle
29-5-2.00A	1.66	Rock	Lower North Myrtle
29-5-2.02A	1.93	Rock	Lower North Myrtle
29-5-11.00A	0.83	Rock	Lower North Myrtle
29-5-11.00B	0.17	Rock	Lower North Myrtle
29-5-11.00D	0.24	Rock	Lower North Myrtle
29-5-11.00G	3.56	Rock	Lower North Myrtle
28-3-19.01A	0.11	Rock	Upper North Myrtle

Table G-4. Roads Considered Not Needing Treatment at This Time in the Myrtle Creek WAU.

Road Number	Miles	Surface Type	Subwatershed
28-3-19.01B	0.81	Rock	Upper North Myrtle
28-4-9.02A	0.22	Natural	Upper North Myrtle
28-4-11.03A	0.57	Rock	Upper North Myrtle
28-4-12.00B	0.09	Natural	Upper North Myrtle
28-4-13.00A	0.61	Rock	Upper North Myrtle
28-4-13.00B	0.21	Rock	Upper North Myrtle
28-4-13.00D	0.19	Rock	Upper North Myrtle
28-4-13.00F	0.35	Rock	Upper North Myrtle
28-4-13.00G	0.83	Rock	Upper North Myrtle
28-4-13.00I	0.94	Rock	Upper North Myrtle
28-4-13.01A	0.25	Rock	Upper North Myrtle
28-4-13.02A	0.41	Rock	Upper North Myrtle
28-4-14.01B	0.40	Rock	Upper North Myrtle
28-4-14.01C	0.52	Rock	Upper North Myrtle
28-4-15.01A	1.28	Rock	Upper North Myrtle
28-4-15.01C	0.17	Rock	Upper North Myrtle
28-4-15.01D	0.46	Rock	Upper North Myrtle
28-4-16.00A1	0.22	Rock	Upper North Myrtle
28-4-16.00A2	0.88	Rock	Upper North Myrtle
28-4-17.01A	0.56	Rock	Upper North Myrtle
28-4-21.00A	3.61	Rock	Upper North Myrtle
28-4-21.01A	0.66	Rock	Upper North Myrtle
28-4-21.02A	0.97	Rock	Upper North Myrtle
28-4-21.02C	0.35	Rock	Upper North Myrtle

Table G-4. Roads Considered Not Needing Treatment at This Time in the Myrtle Creek WAU.

Road Number	Miles	Surface Type	Subwatershed
28-4-22.00A	0.29	Rock	Upper North Myrtle
28-4-22.01A	0.25	Rock	Upper North Myrtle
28-4-25.00A	1.29	Rock	Upper North Myrtle
28-4-25.01A	0.13	Rock	Upper North Myrtle
28-4-25.02A	0.79	Rock	Upper North Myrtle
28-4-26.00B	1.90	Rock	Upper North Myrtle
28-4-27.00B	0.42	Rock	Upper North Myrtle
28-4-28.00A	1.71	Bituminous	Upper North Myrtle
28-4-28.00C	2.64	Rock	Upper North Myrtle
28-4-34.00A	1.70	Rock	Upper North Myrtle
28-4-34.00B	0.52	Rock	Upper North Myrtle
28-4-34.00C	1.70	Rock	Upper North Myrtle
28-4-34.00D	2.78	Rock	Upper North Myrtle
28-4-34.01A	1.16	Rock	Upper North Myrtle
28-4-34.01B	0.51	Rock	Upper North Myrtle
28-4-35.00A	0.29	Natural	Upper North Myrtle
28-4-35.01A	0.52	Rock	Upper North Myrtle
28-4-36.00C	0.18	Rock	Upper North Myrtle
29-3-11.01H	1.16	Rock	Upper North Myrtle
29-4-2.00E	1.63	Rock	Upper North Myrtle
29-4-2.01A	0.12	Rock	Upper North Myrtle
29-4-2.01C	0.76	Rock	Upper North Myrtle
29-4-3.02A	0.20	Rock	Upper North Myrtle
29-4-9.03B	0.35	Natural	Lower South Myrtle

Table G-4. Roads Considered Not Needing Treatment at This Time in the Myrtle Creek WAU.

Road Number	Miles	Surface Type	Subwatershed
29-4-17.00E	1.09	Rock	Upper North Myrtle and Lower South Myrtle
29-4-15.00A	0.55	Rock	Lower South Myrtle
29-4-15.00B	0.32	Rock	Lower South Myrtle
29-4-15.01A	1.22	Rock	Lower South Myrtle
29-4-15.01B	0.53	Rock	Lower South Myrtle
29-4-15.02A	0.48	Natural	Lower South Myrtle
29-4-17.00A	0.83	Rock	Lower South Myrtle
29-4-17.00B	1.09	Rock	Lower South Myrtle
29-4-17.00D	0.71	Rock	Lower South Myrtle
29-4-20.00A1	0.53	Bituminous	Lower South Myrtle
29-4-20.00A2	0.60	Rock	Lower South Myrtle
29-4-20.00B	1.65	Rock	Lower South Myrtle
29-4-20.00C	0.05	Rock	Lower South Myrtle
29-4-21.01B	0.47	Natural	Lower South Myrtle
29-4-21.02A	0.16	Natural	Lower South Myrtle
29-4-22.00A	0.57	Rock	Lower South Myrtle
29-4-22.00B	0.52	Rock	Lower South Myrtle
29-4-22.00D	0.71	Rock	Lower South Myrtle
29-4-31.00B	0.22	Natural	Lower South Myrtle
29-4-31.00C	0.13	Natural	Lower South Myrtle
29-4-35.00G	1.09	Rock	Lower South Myrtle
30-4-3.01C	1.53	Rock	Lower South Myrtle
30-5-3.01A	0.04	Natural	Lower South Myrtle

Table G-4. Roads Considered Not Needing Treatment at This Time in the Myrtle Creek WAU.

Road Number	Miles	Surface Type	Subwatershed
30-5-14.00B	0.01	Rock	Lower South Myrtle
28-2-32.00A	1.20	Bituminous	Upper South Myrtle
28-2-32.05A	0.29	Rock	Upper South Myrtle
28-3-19.01B	0.81	Rock	Upper South Myrtle
28-3-26.00A1	0.30	Rock	Upper South Myrtle
28-3-26.01A	0.39	Rock	Upper South Myrtle
28-3-26.01B	0.27	Rock	Upper South Myrtle
28-3-32.01A	0.48	Rock	Upper South Myrtle
28-3-33.00A	0.83	Rock	Upper South Myrtle
28-3-34.03A	0.68	Rock	Upper South Myrtle
28-3-34.05A	0.44	Rock	Upper South Myrtle
28-3-34.07A	0.44	Rock	Upper South Myrtle
28-3-35.00A	3.60	Bituminous	Upper South Myrtle
28-3-35.00B	0.60	Bituminous	Upper South Myrtle
28-3-35.02A	1.62	Rock	Upper South Myrtle
28-3-35.03A	0.23	Rock	Upper South Myrtle
28-3-35.04A	0.26	Rock	Upper South Myrtle
28-4-34.00D	2.78	Rock	Upper South Myrtle
28-4-36.00C	0.18	Rock	Upper South Myrtle
29-2-6.00A	1.63	Rock	Upper South Myrtle
29-2-7.00A	0.01	Rock	Upper South Myrtle
29-3-1.00A	0.18	Rock	Upper South Myrtle
29-3-1.01A	0.46	Rock	Upper South Myrtle
29-3-3.00A	2.39	Rock	Upper South Myrtle

Table G-4. Roads Considered Not Needing Treatment at This Time in the Myrtle Creek WAU.

Road Number	Miles	Surface Type	Subwatershed
29-3-5.00A	0.60	Rock	Upper South Myrtle
29-3-11.00B	1.73	Rock	Upper South Myrtle
29-3-11.00C	0.76	Rock	Upper South Myrtle
29-3-11.01A	0.18	Rock	Upper South Myrtle
29-3-11.01B	0.64	Rock	Upper South Myrtle
29-3-11.01C	3.92	Rock	Upper South Myrtle
29-3-11.01D1	0.72	Rock	Upper South Myrtle
29-3-11.01D2	0.97	Rock	Upper South Myrtle
29-3-11.01E	0.49	Rock	Upper South Myrtle
29-3-11.01F	0.30	Rock	Upper South Myrtle
29-3-11.01G1	0.46	Rock	Upper South Myrtle
29-3-11.01H	1.16	Rock	Upper South Myrtle
29-3-15.00A	0.15	Natural	Upper South Myrtle
29-3-15.02A	0.07	Rock	Upper South Myrtle
29-3-15.02C	1.00	Rock	Upper South Myrtle
29-3-15.03A	0.32	Rock	Upper South Myrtle
29-3-16.00A1	0.81	Bituminous	Upper South Myrtle
29-3-16.00A2	0.99	Rock	Upper South Myrtle
29-3-16.00B	0.92	Rock	Upper South Myrtle
29-3-16.00C1	1.03	Rock	Upper South Myrtle
29-3-16.00C2	1.64	Rock	Upper South Myrtle
29-3-16.00D	1.42	Rock	Upper South Myrtle
29-3-20.01C	0.07	Rock	Upper South Myrtle
29-3-20.01E	0.49	Rock	Upper South Myrtle

Table G-4. Roads Considered Not Needing Treatment at This Time in the Myrtle Creek WAU.

Road Number	Miles	Surface Type	Subwatershed
29-4-1.00A	0.56	Rock	Upper South Myrtle
29-4-1.00B	0.60	Rock	Upper South Myrtle
29-4-1.01A	0.34	Rock	Upper South Myrtle
29-4-1.02A	0.32	Rock	Upper South Myrtle
29-4-1.03A	0.31	Rock	Upper South Myrtle
29-4-2.00E	1.63	Rock	Upper South Myrtle
29-4-11.00A	3.70	Rock	Upper South Myrtle
29-4-11.00B	1.82	Rock	Upper South Myrtle
29-4-11.00C	2.11	Rock	Upper South Myrtle
29-4-11.01A	0.44	Rock	Upper South Myrtle
29-4-11.03A1	0.22	Natural	Upper South Myrtle
29-4-11.03A3	0.09	Natural	Upper South Myrtle
29-4-13.00A	0.22	Rock	Upper South Myrtle
29-4-13.01A	0.66	Rock	Upper South Myrtle
29-4-15.00A	0.55	Rock	Upper South Myrtle
29-4-15.00B	0.32	Rock	Upper South Myrtle
29-4-17.00E	1.09	Rock	Upper South Myrtle
Total	132.16		

Table G-5. Roads in the Myrtle Creek WAU That Have Been Improved.

Road Number	Miles	Year of Treatment	Surface Type	TMO Recommendation	Subwatershed
28-4-13.00A, B, F, G, H	2.97	1999	Rock	Improve	Upper North Myrtle
28-4-34.00A, B, C, D, E	6.50	1998	Rock	Maintain	Upper North Myrtle
29-4-2.00E	1.50	1998	Rock	Maintain/Improve	Upper South Myrtle
29-4-11.00A, B, C	5.00	2001	Rock	Improve/Maintain	Upper South Myrtle
Total	15.97				

Table G-6. Roads in the Myrtle Creek WAU That Have Been Decommissioned.

Road Number	Miles	Year of Treatment	Surface Type	TMO Recommendation	Subwatershed	In Tier 1 Key Watershed
28-3-35.01A	4.70	1998	Natural	Decommission	Upper South Myrtle	No
28-4-1.00A	0.44	1999	Natural	Decommission	Upper North Myrtle	No
28-4-1.01B	0.33	1999	Natural	Decommission	Upper North Myrtle	No
28-4-1.02A	0.10	1999	Natural	Decommission	Upper North Myrtle	No
Total	5.57					

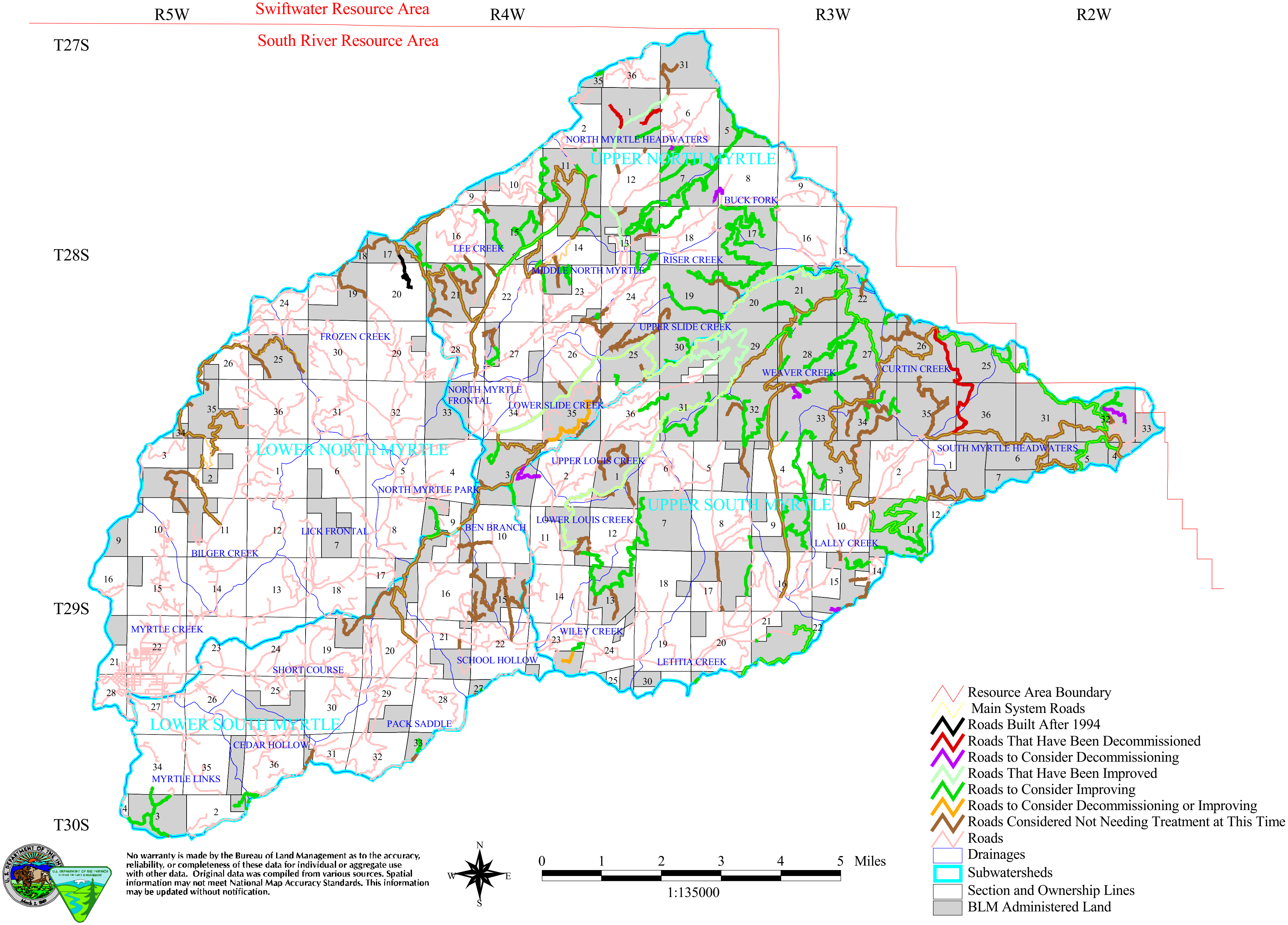
Table G-7. BLM Roads in the Myrtle Creek WAU That Have Been Built Since 1994.

Road Number	Miles	Year Constructed	Surface Type	Subwatershed
29-4-13.02	0.40	1997	Rock	Upper South Myrtle
Total	0.40			

Table G-8. Private Roads in the Myrtle Creek WAU That Have Been Built Since 1994.

Road Number	Miles	Year Constructed	Surface Type	Subwatershed
29-4-11.02	0.23	1998	Natural	Upper South Myrtle
29-4-11.03	0.14	1998	Natural	Upper South Myrtle
28-4-17.02	0.20	1999	Rock	Lower North Myrtle
28-4-27.01	0.15	2000	Rock	Upper North Myrtle
28-4-27.02	0.10	2000	Rock	Upper North Myrtle
28-4-21.05	0.20	2000	Rock	Upper North Myrtle
28-3-5.01	0.15	2000	Rock	Upper North Myrtle
29-4-15.04	0.15	2001	Rock	Lower North Myrtle
29-4-15.00	0.08	2001	Rock	Lower North Myrtle
28-3-6.00	0.20	2001	Natural	Upper North Myrtle
Total	1.60			

Map G-1. Myrtle Creek Watershed Analysis Unit Potential Road Treatment Opportunities



Appendix H

Aquatic Conservation Strategy and Riparian Reserves

Appendix H
Aquatic Conservation Strategy and Riparian Reserves

The four components of the Aquatic Conservation Strategy are Riparian Reserves, Key Watersheds, Watershed Analysis, and Watershed Restoration. The Aquatic Conservation Strategy (ACS) was developed to restore and maintain the ecological health of watersheds and aquatic ecosystems on public lands. The Aquatic Conservation Strategy seeks to prevent further degradation and restore habitat over broad landscapes as opposed to individual projects or small watersheds.

Aquatic Conservation Strategy objectives can be associated or linked with the National Marine Fisheries Service (NMFS) Matrix of Pathways and Indicators. The factors and indicators may relate to one or more of the nine ACS objectives. Including the NMFS factors and indicators in an ACS objective consistency discussion may provide a common link and logic track between the ACS objectives and the effects determination of a proposed project on Federally-listed fish species (i.e. Oregon Coast coho salmon).

When determining whether activities retard or prevent attainment of Aquatic Conservation Strategy objectives, the scale of analysis typically would be BLM analytical watersheds (Fifth Field Watershed) or similar units (USDI 1995). The time period would be defined as decades to possibly more than a century (USDA and USDI 1994b and USDI 1995).

ACS Objective 1. Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted.

Pathways/Indicators Used in BA Effects Matrix:

Habitat Elements/Off-Channel Habitat
Habitat Elements/Refugia
Channel Condition/Dynamics/Floodplain Connectivity
Watershed Conditions/Road Density and Location
Watershed Conditions/Disturbance History
Watershed Conditions/Riparian Reserves

ACS Objective 2. Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia. These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.

Pathways/Indicators Used in BA Effects Matrix:

Water Quality/Temperature
Water Quality/Chemical Contamination/Nutrients
Habitat Access/Physical Barriers
Habitat Elements/Off-channel Habitat
Habitat Elements/Refugia
Channel Condition/Dynamics/Floodplain Connectivity
Flow/Hydrology/Increase in Drainage Network
Watershed Conditions/Riparian Reserves

ACS Objective 3. Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.

Pathways/Indicators Used in BA Effects Matrix:

Habitat Elements/Substrate
Habitat Elements/Large Woody Debris
Habitat Elements/Pool Frequency
Habitat Elements/Pool Quality
Habitat Elements/Off-channel Habitat
Channel Condition/Dynamics/Width/Depth Ratio
Channel Condition/Streambank Condition
Channel Condition/Dynamics/Floodplain Connectivity
Watershed Conditions/Road Density and Location
Watershed Conditions/Riparian Reserves

ACS Objective 4. Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.

Pathways/Indicators Used in BA Effects Matrix:

Water Quality/Temperature
Water Quality/Sediment/Turbidity
Water Quality/Chemical Contamination/Nutrients
Watershed Conditions/Riparian Reserves

ACS Objective 5. Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.

Pathways/Indicators Used in BA Effects Matrix:

Water Quality/Sediment/Turbidity
Habitat Elements/Substrate
Habitat Elements/Pool Quality
Flow/Hydrology/Change in Peak/Base Flow
Flow/Hydrology/Increase in Drainage Network
Watershed Conditions/Road Density and Location
Watershed Conditions/Disturbance History
Watershed Conditions/Riparian Reserves

ACS Objective 6. Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected.

Pathways/Indicators Used in BA Effects Matrix:

Water Quality/Sediment/Turbidity
Habitat Access/Physical Barriers
Habitat Elements/Large Woody Debris
Habitat Elements/Pool Quality
Habitat Elements/Off-channel Habitat
Channel Condition/Dynamics/Floodplain Connectivity
Flow/Hydrology/Change in Peak/Base Flow
Flow/Hydrology/Increase in Drainage Network

ACS Objective 7. Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands.

Pathways/Indicators Used in BA Effects Matrix:

Channel Condition/Dynamics/Floodplain Connectivity
Flow/Hydrology/Change in Peak/Base Flow
Flow/Hydrology/Increase in Drainage Network

ACS Objective 8. Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability.

Pathways/Indicators Used in BA Effects Matrix:

Water Quality/Temperature
Water Quality/Sediment/Turbidity
Water Quality/Chemical Contamination/Nutrients
Habitat Elements/Substrate
Habitat Elements/Large Woody Debris
Habitat Elements/Pool Frequency
Habitat Elements/Off-Channel Habitat
Channel Condition/Dynamics/Width/Depth Ratio
Channel Condition/Streambank Condition
Channel Condition/Dynamics/Floodplain Connectivity
Watershed Conditions/Riparian Reserves

ACS Objective 9. Maintain and restore habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species.

Pathways/Indicators Used in BA Effects Matrix:

Water Quality/Temperature
Water Quality/Sediment/Turbidity
Water Quality/Chemical Contamination/Nutrients
Habitat Access/Physical Barriers
Habitat Elements/Substrate
Habitat Elements/Large Woody Debris
Habitat Elements/Pool Frequency
Habitat Elements/Pool Quality
Habitat Elements/Off-channel Habitat
Habitat Elements/Refugia
Channel Condition/Dynamics/Width/Depth Ratio
Channel Condition/Streambank Condition
Channel Condition/Dynamics/Floodplain Connectivity
Watershed Conditions/Riparian Reserves

Riparian Reserves are associated in the NMFS Matrix of Pathways and Indicators with seven of the nine Aquatic Conservation Strategy objectives. Riparian Reserves generally parallel the stream network, but include other areas necessary for maintaining hydrologic, geomorphic and ecological processes that directly affect streams, stream processes and fish habitats. Riparian Reserves are expected to provide benefits including:
- maintaining streambank integrity (ACS objectives 3, 8 and 9)
- maintaining and recruiting large woody debris and other vegetative debris to provide aquatic habitat and filter suspended sediments. The trapped sediments would absorb and store water. This water would be available during summer months to supplement low summer flows. (ACS objectives 3, 5, 6 and 8)
- the large woody debris would help regulate streamflows by dissipating energy, thus moderating peak streamflows and protecting the morphology of stream channels (ACS objectives 3, 8 and 9)
- providing a nutrient source and water for aquatic and terrestrial species (ACS objectives 2, 4, 8 and 9)
- maintaining shade and riparian climate (ACS objectives 2, 4, 8 and 9)
- providing sediment filtration from upslope activities (ACS objectives 5, 6, 8 and 9)
- enhancing habitat for species dependent on the transition zone between upslope and riparian areas (ACS objectives 1, 2, 4, 8 and 9)
- improving travel and dispersal corridors for terrestrial animals and plants and providing greater connectivity within the watershed (ACS objectives 1, 2, 3, 6 and 8)
- maintaining surface and ground water systems as exchange areas for water, sediment, and nutrients (ACS objectives 2, 4, 6 and 8)
- providing for the creation of and maintenance of pool habitat, both for frequency and quality (ACS objectives 3, 6, 8 and 9)
- providing lateral, longitudinal, and drainage network connections, which include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia (ACS objectives 1, 2, 6, 7, 8 and 9).

Appendix I

Timber Harvesting

Appendix I
Timber Harvesting

A long range timber harvesting plan has been initiated for the South River Resource Area. The timber harvesting planning went through a rigorous process to determine suitable timber harvesting locations. This process continues to be refined.

The first step in the selection process of potential harvest areas was to identify all available and suitable stands. Information from GIS was used to identify Matrix lands greater than 80 years old and not located in reserved areas, such as Riparian Reserves, LSRs, TPCC Nonsuitable Woodland areas, owl core areas, or other administratively withdrawn areas. The remaining available stands were identified as being potential harvest areas. Birthdates (Dk) in the Forest Operation Inventory (FOI) were used to determine which stands were greater than 80 years old.

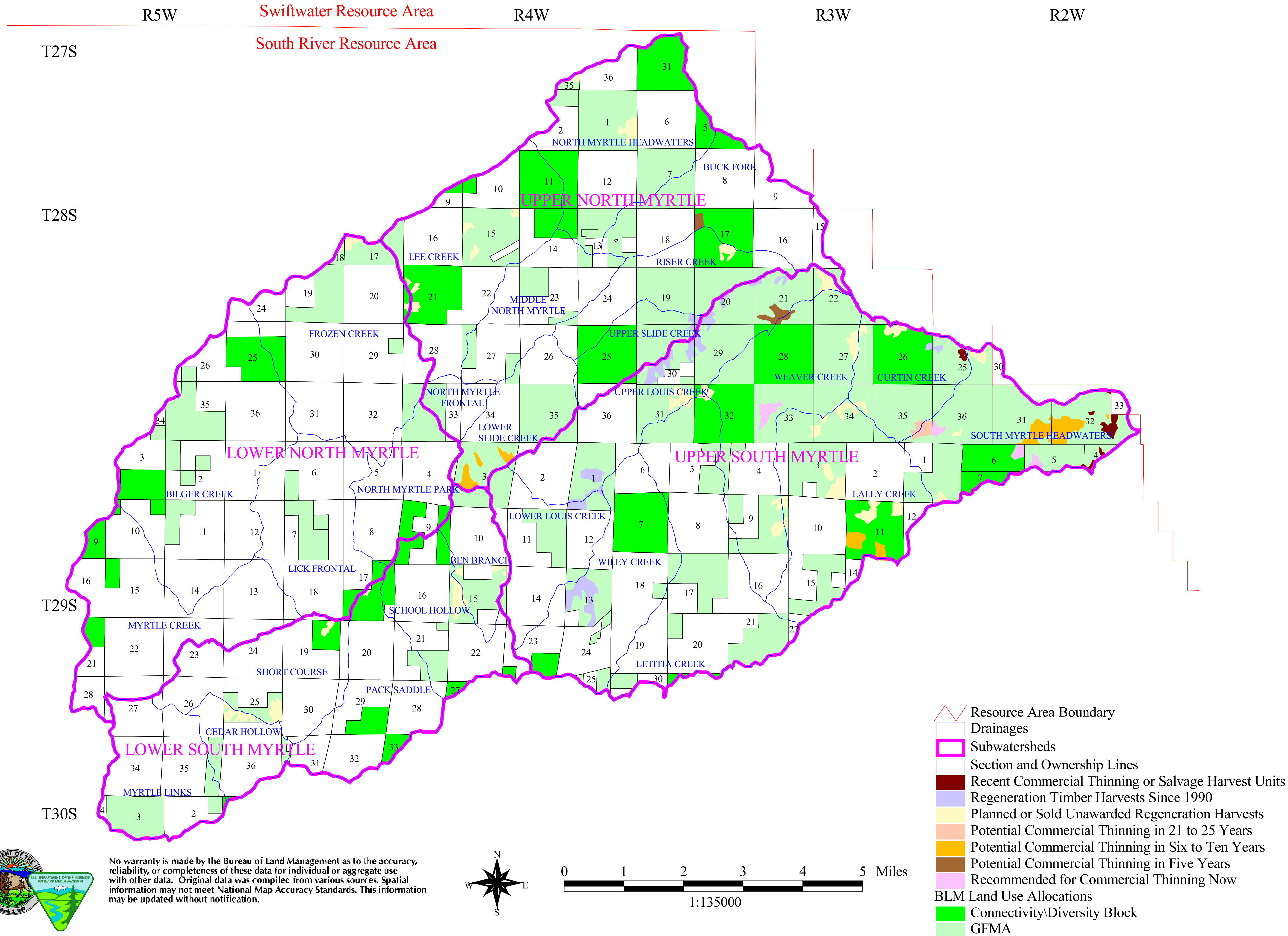
Interpretation of aerial photographs and GIS themes were used to identify suitable harvest areas and define logical unit boundaries. Unit boundaries were established within subwatershed (sixth field watershed) boundaries. Small areas (generally less than two acres) were not mapped as harvestable unless they could be harvested from an existing road. Some stands greater than 80 years old did not appear (as determined by aerial photograph interpretation) to have enough merchantable trees to make a viable unit after retention tree requirements were met. Those areas were not identified for harvesting at this time.

The identified harvest units were digitized into a GIS theme. The digitized harvest units were used to develop a timber sale plan through the year 2024 by attempting to balance timber harvesting equally across all watersheds in the South River Resource Area over time. The timber sale plan assumed timber harvesting would occur in each subwatershed at a level proportional to the number of acres currently available for timber harvesting, with one-third of the available acres in GFMA planned to be harvested in each of the first three decades. Timber harvesting of approximately 1,200 acres per decade was planned within Connectivity/Diversity Blocks in the resource area while maintaining 25 to 30 percent of each Connectivity/Diversity Block in late-successional forests.

Another step was to rank each subwatershed's relative importance to the terrestrial wildlife, hydrology, and fisheries resources. The goals were to identify subwatersheds or areas within a subwatershed where delaying timber harvesting would benefit a resource and what subwatersheds would be impacted the least by timber harvests. In general, subwatersheds with the least amount of BLM-administered land and the fewest available acres for timber harvesting were identified as the places to plan timber harvests first.

The latest step was to evaluate all available timber harvesting units previously identified where harvesting could occur with acceptable impacts to the wildlife, hydrology, and fisheries resources. Potential priority timber harvesting units were areas that did not have obvious conflicts with wildlife, fisheries, or hydrology and were considered to be physically harvestable (see Map I-1). Changes to unit size and shape would be anticipated after extensive field review. Other areas having some concern from wildlife, fisheries, or hydrology, generally, would be considered for timber harvesting after the priority areas. Although, occasions may occur where a lower priority area for timber harvesting may be harvested before a higher priority area, such as if including a lower priority unit in a sale would allow decommissioning of a road facilitating recovery of a larger area.

Map I-1. Myrtle Creek Watershed Analysis Unit
Potential BLM Harvest Areas



No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data was compiled from various sources. Spatial information may not meet National Map Accuracy Standards. This information may be updated without notification.

Appendix J

Soils

Characteristics of Soil Parent Material in the Myrtle Creek WAU.

Soil characteristics are divided into two groups, surface and subsoil layers. The surface soil layer includes the soil from the surface to a depth of twelve inches. The subsoil soil layer includes the soil from a depth of twelve inches to bedrock or to a depth of 60 inches. The layers are non-disturbed soil weighted averages by layer depth and percent of a soil type component. Soil depth and drainage are averaged using both soil layers.

Table J-1. Weighted Average Soil Characteristics by Parent Material.

Geologic Parent Material	Percent of WAU	Acres	Depth (Inches)	Drainage (Code)	Percent Clay Surface Layer	Percent Clay Subsoil Layer	K Factor Surface Layer	K Factor Subsoil Layer	Available Water Capacity Surface Layer (cm/cm)	Available Water Capacity Subsoil Layer (cm/cm)
Water	0.01	10								
Basalt	0.02	13	23.9	3.1	47.8	50.5	0.34	0.34	0.16	0.15
Clayey Alluvium	0.31	233	63.0	5.8	43.9	46.3	0.35	0.36	0.16	0.15
Mixed Alluvium	6.03	4,595	61.0	3.4	22.9	26.9	0.32	0.30	0.15	0.14
Conglomerate	2.86	2,182	27.1	3.0	14.8	17.8	0.31	0.32	0.10	0.09
Granodiorite	57.65	43,965	56.5	3.2	18.7	29.7	0.26	0.30	0.14	0.15
Metamorphic Rock	9.92	7,562	42.0	2.9	25.1	30.3	0.30	0.32	0.13	0.12
Sandstone and Siltstone	2.68	2,042	42.8	3.7	26.8	42.8	0.33	0.31	0.18	0.16
Sandstone, Siltstone, and Metamorphic Rock	11.07	8,441	45.5	3.1	27.9	32.5	0.31	0.32	0.14	0.14
Serpentinite and Peridotite	2.55	1,946	27.7	3.1	41.1	44.3	0.35	0.35	0.09	0.08
Serpentinized Rock	0.31	238	59.1	3.9	41.5	49.6	0.22	0.21	0.12	0.08
Volcanic Rock	5.76	4,390	57.2	3.5	28.2	35.5	0.25	0.26	0.14	0.14
Welded Tuff	0.55	417	21.5	3.0	13.4	13.4	0.27	0.28	0.08	0.08

Table J-1 (continued). Weighted Average Soil Characteristics by Parent Material.

Geologic Parent Material	Percent of WAU	Acres	Bulk Density Surface Layer (g/cm^3)	Bulk Density Subsoil Layer (g/cm^3)	Percent Organic Matter Surface Layer	Percent Organic Matter Subsoil Layer	pH Surface Layer	pH Subsoil Layer	Cation Exchange Capacity Surface Layer (meq/100g)	Cation Exchange Capacity Subsoil Layer (meq/100g)	Permeability Surface Layer (um/s)	Permeability Subsoil Layer (um/s)
Water	0.01	10										
Basalt	0.02	13	1.4	1.4	2.3	1.70	6.3	6.4	34.1	34.4	2.8	0.90
Clayey Alluvium	0.31	233	1.3	1.3	2.9	2.16	6.1	6.1	26.8	26.9	2.6	1.86
Mixed Alluvium	6.03	4,595	1.4	1.4	2.4	0.92	6.1	6.1	17.5	16.5	13.9	25.95
Conglomerate	2.86	2,182	1.4	1.4	1.0	0.39	6.1	5.7	8.2	8.1	26.5	26.29
Granodiorite	57.65	43,965	1.3	1.4	3.9	1.10	5.9	5.8	15.1	15.7	12.9	6.27
Metamorphic Rock	9.92	7,562	1.3	1.4	2.6	1.01	6.0	5.8	14.5	14.1	14.9	12.88
Sandstone and Siltstone	2.68	2,042	1.4	1.4	2.4	1.21	5.9	5.7	16.3	22.7	6.7	4.24
Sandstone, Siltstone, and Metamorphic Rock	11.07	8,441	1.4	1.4	2.3	1.37	5.7	5.5	16.2	16.0	6.1	3.47
Serpentinite and Peridotite	2.55	1,946	1.3	1.3	5.2	1.41	6.8	6.8	12.3	12.0	1.9	1.28
Serpentinized Rock	0.31	238	1.3	1.5	2.7	0.65	6.5	6.9	15.0	14.9	4.6	1.92
Volcanic Rock	5.76	4,390	1.3	1.3	4.8	1.86	5.3	5.1	12.9	12.6	11.0	9.38
Welded Tuff	0.55	417	1.4	1.4	1.7	0.53	5.8	5.8	11.3	9.8	12.1	12.12

The Natural Resources Conservation Service - National Soil Survey Handbook Part 618 - Soil Properties and Qualities section 430-VI-NSSH (1996) was the source for most of the following information.

Depth: Depths are from the soil surface to bedrock in inches.

Table J-2. Depth Codes and Description of What the Codes Mean.

Code	Description	Depth to Bedrock (inches)
RO	Rock Outcrop	0 - 4
SHV	Very Shallow	4 - 10
SH	Shallow	10 - 20
MD	Moderately Deep	20 - 40
DP	Deep	40 - 60
DPV	Very Deep	> 60

Drainage: An estimate of the natural drainage class or the prevailing wetness conditions of a soil.

Table J-3. Drainage Class Codes and Description of What the Codes Mean.

Code	Drainage Class	Depth to Water Table (inches)	Description
1	Excessively Drained	> 60	Water is removed from the soil very rapidly. Internal free water is very rare or greater than 60 inches deep. Soils are commonly coarse-textured and have very high saturated hydraulic conductivity or are very shallow.
2	Somewhat Excessively Drained	> 60	Water is removed from the soil rapidly. Internal free water is very rare or greater than 60 inches deep. Soils are commonly moderately coarse and coarse textured with high saturated hydraulic conductivity or are very shallow.
3	Well Drained	40 - 60	Water is removed from the soil readily but not rapidly. Internal free water is 40 to 60 inches deep. Wetness does not inhibit root growth for significant periods during most growing seasons.
4	Moderately Well Drained	20 - 40	Water is removed from the soil somewhat slowly. Internal free water is 20 to 40 inches deep and may be transitory through permanent. Soil is wet within the rooting depth for only a short time during the growing season. The soil has a moderately low or lower saturated hydraulic conductivity within the upper one meter.
5	Somewhat Poorly Drained	10 - 20	Water is removed from the soil slowly. Internal free water is ten to 20 inches and transitory to permanent. Mesophytic plant growth is restricted, unless the soil is artificially drained. The soil has a low or very low saturated hydraulic conductivity, a high water table, or water seepage.
6	Poorly Drained	0 - 10	Water is removed from the soil so slowly it is wet at or near the surface periodically during the growing season. Internal free water is zero to ten inches and common or persistent. Most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously wet above the top eight inches. The soil has a low or very low saturated hydraulic conductivity class.
7	Very Poorly Drained	above surface to 6	Water is at or near the soil surface during much of the growing season. Internal free water is zero to ten inches and is persistent or permanent. Most mesophytic crops cannot be grown unless the soil is artificially drained. Ponding occurs frequently.

Clay: Measured as soil grain size less than 0.002 mm in diameter percent by weight.

Table J-4. Percent of Clay by General Soil Type.

Clay Percent	General Soil Type
Less Than 15	Sandy
15 - 35	Loamy
Greater Than 35	Clayey

K Factor: The soil erodibility factor quantifies the susceptibility of a soil to detachment by water from the whole soil layer including coarse fragments (gravel, cobbles and stones). It is a quantitative value experimentally determined by applying a series of simulated rainstorms on freshly tilled plots. Soil erodibility factors can be estimated using a nomograph, which incorporates the relationships between five soil properties (1) percent silt plus very fine sand, (2) percent sand greater than 0.10 mm in diameter, (3) organic matter content, (4) structure, and (5) permeability. Rock fragment content is adjusted separately from the nomograph. The K factor value is lower when the rock fragment content is higher. Mineral soils with more organic matter content have lower K factor values. Soils with high silt or very fine sand content would have higher K factor values. Soils with small size particles and low structural aggregate stability have higher K factor values. Soils with low infiltration (water movement) into the soil have higher K factor values. Soils with low water storage capacity have higher K factor values. The K factor values obtained experimentally range from 0.02 to 0.69.

Table J-5. The K Factor Groups and Erodibility.

K Factor Groups	Erodibility
0.02 - 0.20	Low
0.21 - 0.31	Moderate
0.32 - 0.69	High

Available Water Capacity: Available Water Capacity is the volume of water available to plants if the soil, including coarse fragments, was at field capacity. It is commonly considered to be the amount of water held in the soil between field capacity and the wilting point, with corrections for salinity, coarse fragments, and rooting depth. Available water capacity classes are used as subjective ratings reflecting the sum of available water capacity in inches to some arbitrary depth. Class limits vary according to climate zone and the crops commonly grown in an area. Available Water Capacity is an important soil property used for developing water budgets, predicting droughtiness, designing drainage systems, protecting water resources, and predicting yields.

Bulk Density: Bulk Density is the oven-dried weight of soil material less than 2 mm in diameter per unit volume of soil at a water tension of 1/10 bar or 1/3 bar. Bulk density influences plant growth and engineering applications. It is used to convert measurements from a weight basis to a volume basis. Bulk density is an indicator of how well plant roots are able to extend into the soil. Bulk density is used to calculate porosity.

Table J-6. Particle Size Classes in Relation to Bulk Density and Root Growth.

Family Particle Size Class	Restriction - Initiation (grams per cm^3)	Root Limiting (grams per cm^3)
Sandy (Sandy)	1.69	> 1.85
Coarse Loamy (Loamy)	1.63	> 1.80
Fine Loamy (Loamy)	1.60	> 1.78
Coarse Silty (Loamy)	1.60	> 1.79
Fine Silty (Loamy)	1.54	> 1.65
Clayey (35 - 45% Clay)	1.49	> 1.58
Clayey (> 45 % Clay)	1.39	> 1.47

Organic Matter: Organic matter is the percent by weight of decomposed plant and animal residue, expressed as a weight percentage of soil material less than 2 mm in diameter. Organic matter influences the physical and chemical properties of soils in a greater proportion than the quantity of organic matter that is present (Brady 1974). It encourages granulation and good tilth, increases porosity, lowers bulk density, promotes water infiltration, reduces plasticity and cohesion, and increases the available water capacity. It has a high cation adsorption capacity and is important for pesticide binding. It furnishes energy to soil microorganisms. Organic matter releases nitrogen, phosphorous, and sulfur as it decomposes.

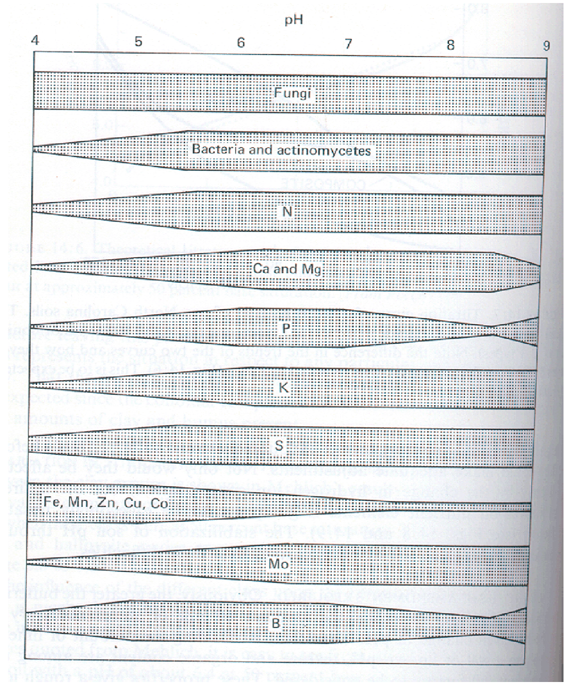
pH: Soil pH is a numerical expression of the relative acidity or alkalinity of a soil.

Figure J-1 shows the relationship in mineral soils between pH, microorganism activity, and the availability of plant nutrients. The wide portions of the bands indicate the pH when microbial activity and nutrient availability are the highest. Generally, pH ranging from six to seven promotes plant nutrient availability. If soil pH is optimum for phosphorus, other plant nutrients, if present in adequate amounts, would be available. Acidic soils (with a low pH) have less calcium, magnesium, and molybdenum and more aluminum, iron, and boron available. Acidic soils also have less nitrogen and phosphorus available and possibly more organic toxins. Alkaline soils are at the other extreme. Calcium, magnesium, nitrogen and molybdenum are more abundant and aluminum is not toxic with alkaline soils (soils with a high pH). Soils with a pH above 7.9 may have an inadequate availability of iron, manganese, copper, zinc, phosphorus, and boron. Highly alkaline or acidic soils can be very corrosive to steel. Acidic soils, with a pH less than 5.5, are likely to be highly corrosive to concrete. Alkaline soils, with a pH greater than 8.5, are susceptible to dispersion and piping may be a problem. Piping is when water flows through the subsoil, entraining soil material, resulting in the formation of tunnels (referred to as pipes).

Table J-7. Descriptions of pH Range of Values.

pH Values	Class Descriptor
1.8 - 3.4	Ultra acid
3.5 - 4.4	Extremely acid
4.5 - 5.0	Very strongly acid
5.1 - 5.5	Strongly acid
5.6 - 6.0	Moderately acid
6.1 - 6.5	Slightly acid
6.6 - 7.3	Neutral
7.4 - 7.8	Slightly alkaline
7.9 - 8.4	Moderately alkaline
8.5 - 9.0	Strongly alkaline
9.1 - 11.0	Very strongly alkaline

Figure J-1. Relationship in Mineral Soils Between pH, Microorganism Activity, and Plant Nutrient Availability (From Nature and Properties of Soils. 8th Edition. Nyle C. Brady 1974).



Cation Exchange Capacity: Cation Exchange Capacity (CEC) is expressed as meq/100 g of soil. Cation Exchange Capacity is a measure of the ability of a soil to retain cations, which may be plant nutrients. Soil particles are composed of silicate and aluminosilicate clay. These particles are negatively charged colloids. A cation is a positively charged ion, for example H+, Ca++, Mg++, K+, NH4+, Na+ are all cations. Cations are bound ionically to the surface of the negatively charged colloid particles. Cation Exchange Capacity increases as the clay and organic matter contents increase. Soils with a low Cation Exchange Capacity hold fewer cations and may require more frequent applications of fertilizer and amendments than soils having a high CEC.

Table J-8. Cation Exchange Capacity Values Associated with Soil Types.

Soil Type	Typical CEC Values (meq/100g of soil)
Sand	2 - 4
Loam	7 - 16
Clay	4 - 60
Organic	50 - 300

Permeability: Permeability enables water or air to move through the soil. Values are measured in micrometers per second or inches per hour. Permeability is used in soil interpretations to determine the suitability for irrigation, drainage systems, septic absorption fields, terraces, and other practices.

Permeability is affected by total pore space, pore shape, and distribution of pore size. Texture, density, organic matter content, mineralogy, structure, roots or absence of roots, and pore size are used to estimate permeability.

Table J-9. Relationship of Class Values to Permeability Classes.

Permeability Class	Class Values (inches per hour)	Class Values (um per second)
Very rapid	At Least 20	141 - 705
Rapid	6 - 20	42 - 141
Moderately rapid	2 - 6	14 - 42
Moderate	0.6 - 2	4 - 14
Moderately slow	0.2 - 0.6	1.4 - 4
Slow	0.06 - 0.2	0.42 - 1.4
Very slow	0.01 - 0.06	0.01 - 0.42
Impermeable	0.0 - 0.01	0.0 - 0.01

Saturated Hydraulic Conductivity: Saturated hydraulic conductivity (Ksat) is the preferred parameter for measuring a soils ability to transmit water. It is defined as the reciprocal, or inverse, of the resistance of the soil matrix to water flow measured in microns (micrometers) per second. Saturated hydraulic conductivity is affected by texture, structure, bulk density, surface area, and micromorphology.

Table J-10. Saturated Hydraulic Conductivity Classes.

Saturated Hydraulic Conductivity Class	Class Values (um per second)	Class Values (inches per hour)
Very High	$\geq$ 100	$\geq$ 14.17
High	10-100	1.417-14.17
Moderately High	1-10	0.141-1.417
Moderately Low	0.1-1	0.014-0.141
Low	0.01-0.1	0.001-0.014
Very Low	<0.01	< 0.001

Appendix K
Silviculture

Table K-1 contains a list of selected stands in the WAU that are between one and 120 years old. The Connectivity/Diversity Block (CON) units are up to 120 years old. The General Forest Management Area (GFMA) stands have either an overstory or understory up to 80 years old. These age classes contain stands having the greatest short term potential for treatment in Riparian Reserves and upland areas, as well as those that were previously treated. Stands that were precommercially thinned and/or fertilized are identified. Potential treatment units identified in field office activity plans are also indicated. The data are from the Microstorms database, five-year precommercial thinning plan, timber sale harvest plan, and EA # OR-100-98-11 (forest fertilization). Inclusion in the table does not necessarily imply a current treatment need. Site-specific evaluations would determine actual treatment needs.

Table K-1. Myrtle Creek WAU - Selected Forest Stands: Ages 0 to 120-years-old.

Key Number	LUA	T-R-S	Overstory Birthdate	Understory Birthdate	GLO Acres	Year PCTed	Year Fertilized	PCT Plan	Fertilization Plan	Commercial Thinning Plan
24079	CON	27S-03W-31	1965		3					
10291	CON	27S-03W-31	1970		27					
10292	CON	27S-03W-31	1970		24					
22631	CON	27S-03W-31	1988		56				X	
10304	GFMA	28S-02W-31	1890		2					
10305	GFMA	28S-02W-31	1890		96					
10313	GFMA	28S-02W-31	1890		52					
10311	GFMA	28S-02W-31	1930		26					
10316	GFMA	28S-02W-31	1930		22					
10314	GFMA	28S-02W-31	1950		58	1963	1985			
10315	GFMA	28S-02W-31	1960		5					
10318	GFMA	28S-02W-32	1940		7					
10322	GFMA	28S-02W-32	1940	1950	38	1979	1985			
10323	GFMA	28S-02W-32	1940		31					
10324	GFMA	28S-02W-32	1940	1950	65					

Table K-1. Myrtle Creek WAU - Selected Forest Stands: Ages 0 to 120-years-old.

Key Number	LUA	T-R-S	Overstory Birthdate	Understory Birthdate	GLO Acres	Year PCTed	Year Fertilized	PCT Plan	Fertilization Plan	Commercial Thinning Plan
10327	GFMA	28S-02W-32	1940		5					
10019	GFMA	28S-02W-32	1950		64	1978	1985			
10326	GFMA	28S-02W-32	1950		96	1963	1985			
10018	GFMA	28S-02W-32	1978		7					
12800	GFMA	28S-02W-32	1982		9	1997			X	
12809	GFMA	28S-02W-33	1979		20					
10345	CON	28S-03W-05	1973		10					
12810	CON	28S-03W-05	1989		33			X	X	
12811	CON	28S-03W-05	1989		16			X		
13760	CON	28S-03W-05	1989		9			X		
13761	CON	28S-03W-05	1989		6			X		
13762	CON	28S-03W-05	1989		17			X		
13709	CON	28S-03W-05	1990		29			X	X	
10351	GFMA	28S-03W-07	1930		7					
10362	GFMA	28S-03W-07	1970		24					
13441	GFMA	28S-03W-07	1970		31					
10364	GFMA	28S-03W-07	1975		14					
13443	GFMA	28S-03W-07	1975		19					
10361	GFMA	28S-03W-07	1976		15	1990	1990			
10357	GFMA	28S-03W-07	1988		14					
10358	GFMA	28S-03W-07	1988		10					

Table K-1. Myrtle Creek WAU - Selected Forest Stands: Ages 0 to 120-years-old.

Key Number	LUA	T-R-S	Overstory Birthdate	Understory Birthdate	GLO Acres	Year PCTed	Year Fertilized	PCT Plan	Fertilization Plan	Commercial Thinning Plan
12814	GFMA	28S-03W-07	1988		10			X	X	
13749	GFMA	28S-03W-07	1988		53			X		
13748	GFMA	28S-03W-07	1989		93				X	
12815	GFMA	28S-03W-07	1991		36			X		
10366	CON	28S-03W-17	1960		23	1974	1985			
10371	CON	28S-03W-17	1960		40	1974	1985			
10372	CON	28S-03W-17	1960		51	1974	1985			
10383	CON	28S-03W-17	1960		40					
10370	CON	28S-03W-17	1964		38					
10367	CON	28S-03W-17	1968		31	1983	1984			
10369	CON	28S-03W-17	1970		20					
10377	CON	28S-03W-17	1970		9					
12816	CON	28S-03W-17	1971		28					
10368	CON	28S-03W-17	1976		24					
10373	CON	28S-03W-17	1980		8					
13419	CON	28S-03W-17	1980		3	1995	1997			
10374	CON	28S-03W-17	1981		17	1990	1990			
10382	CON	28S-03W-17	1981		39	1990	1990			
13444	CON	28S-03W-17	1981		21	1990	1990			
12817	CON	28S-03W-17	1982		22	1995	1997			
13888	CON	28S-03W-17	1995		8					

Table K-1. Myrtle Creek WAU - Selected Forest Stands: Ages 0 to 120-years-old.

Key Number	LUA	T-R-S	Overstory Birthdate	Understory Birthdate	GLO Acres	Year PCTed	Year Fertilized	PCT Plan	Fertilization Plan	Commercial Thinning Plan
10386	GFMA	28S-03W-19	1970		49	1983	1985			
10390	GFMA	28S-03W-19	1970		4					
10391	GFMA	28S-03W-19	1970		3					
12818	GFMA	28S-03W-19	1973		46	1990	1990			
12819	GFMA	28S-03W-19	1978		18					
10387	GFMA	28S-03W-19	1981		9	1990	1990			
12820	GFMA	28S-03W-19	1981		26	1995	1997			
12821	GFMA	28S-03W-19	1986		21	1999			X	
13885	GFMA	28S-03W-19	1995		1					
13887	GFMA	28S-03W-19	1995		4					
13889	GFMA	28S-03W-19	1995		42					
13890	GFMA	28S-03W-19	1995		11					
13891	GFMA	28S-03W-19	1995		24					
10408	GFMA	28S-03W-20	1900		7					
10411	GFMA	28S-03W-20	1910		4					
10399	GFMA	28S-03W-20	1970		43					
10401	GFMA	28S-03W-20	1970		3					
10409	GFMA	28S-03W-20	1970		16					
10405	GFMA	28S-03W-20	1974		6					
14036	GFMA	28S-03W-20	1974		5					
14037	GFMA	28S-03W-20	1974		4					

Table K-1. Myrtle Creek WAU - Selected Forest Stands: Ages 0 to 120-years-old.

Key Number	LUA	T-R-S	Overstory Birthdate	Understory Birthdate	GLO Acres	Year PCTed	Year Fertilized	PCT Plan	Fertilization Plan	Commercial Thinning Plan
10412	GFMA	28S-03W-20	1976		21					
10413	GFMA	28S-03W-20	1978		7	1997			X	
13445	GFMA	28S-03W-20	1978		20	1999				
13446	GFMA	28S-03W-20	1978		20	1999				
13447	GFMA	28S-03W-20	1978		6	1999				
10415	GFMA	28S-03W-20	1980		10	1997			X	
12822	GFMA	28S-03W-20	1980		26	1995	1997			
10414	GFMA	28S-03W-20	1981		5	1991	1991			
13448	GFMA	28S-03W-20	1981		4	1990	1990			
13736	GFMA	28S-03W-20	1992		16			X		
13737	GFMA	28S-03W-20	1992		11			X		
13884	GFMA	28S-03W-20	1995		21					
13886	GFMA	28S-03W-20	1995		22					
10422	GFMA	28S-03W-21	1960		30					
10425	GFMA	28S-03W-21	1960		45					
10424	GFMA	28S-03W-21	1970		5					
10430	GFMA	28S-03W-21	1978		17	1999				
13449	GFMA	28S-03W-21	1978		15	1990	1990			
10419	GFMA	28S-03W-21	1979		30	1990	1990			
10431	GFMA	28S-03W-21	1979		11	1990	1990			
12823	GFMA	28S-03W-21	1979		13	1999				

Table K-1. Myrtle Creek WAU - Selected Forest Stands: Ages 0 to 120-years-old.

Key Number	LUA	T-R-S	Overstory Birthdate	Understory Birthdate	GLO Acres	Year PCTed	Year Fertilized	PCT Plan	Fertilization Plan	Commercial Thinning Plan
10432	GFMA	28S-03W-21	1980		29	1990	1990			
12824	GFMA	28S-03W-21	1982		9	1999			X	
13738	GFMA	28S-03W-21	1992		40			X		
13739	GFMA	28S-03W-21	1992		3			X		
10437	GFMA	28S-03W-22	1900		21					
10439	GFMA	28S-03W-22	1960		2					
10441	GFMA	28S-03W-22	1978		5	1990	1990			
10442	GFMA	28S-03W-22	1979		10	1990	1990			
12826	GFMA	28S-03W-22	1988		18				X	
13704	GFMA	28S-03W-22	1990		28				X	
13705	GFMA	28S-03W-22	1990		8			X		
13707	GFMA	28S-03W-22	1990		3				X	
13708	GFMA	28S-03W-22	1990		13			X		
12827	GFMA	28S-03W-22	1992		10			X		
13740	GFMA	28S-03W-22	1992		15			X		
10456	GFMA	28S-03W-25	1920		3					
10459	GFMA	28S-03W-25	1920		2					
14002	GFMA	28S-03W-25	1920		7					
14050	GFMA	28S-03W-25	1920		21					
14051	GFMA	28S-03W-25	1920		44					
14054	GFMA	28S-03W-25	1920		7					

Table K-1. Myrtle Creek WAU - Selected Forest Stands: Ages 0 to 120-years-old.

Key Number	LUA	T-R-S	Overstory Birthdate	Understory Birthdate	GLO Acres	Year PCTed	Year Fertilized	PCT Plan	Fertilization Plan	Commercial Thinning Plan
10469	CON	28S-03W-26	1880	1970	30		1990			
10056	CON	28S-03W-26	1890		5					
10464	CON	28S-03W-26	1890	1970	21					
10466	CON	28S-03W-26	1890		12					
10474	CON	28S-03W-26	1900		20		1990			
10462	CON	28S-03W-26	1910		11					
10467	CON	28S-03W-26	1920		7					
14059	CON	28S-03W-26	1920		8					
10471	CON	28S-03W-26	1970		1					
10472	CON	28S-03W-26	1970		9					
14060	CON	28S-03W-26	1970		4					
14061	CON	28S-03W-26	1970		8					
10477	CON	28S-03W-26	1978		11	1995	1997			
10489	GFMA	28S-03W-27	1900	1970	16					
10484	GFMA	28S-03W-27	1920		4					
10491	GFMA	28S-03W-27	1920		6					
13944	GFMA	28S-03W-27	1920		7					
10485	GFMA	28S-03W-27	1970		9					
10488	GFMA	28S-03W-27	1970		15	1990	1990			
10492	GFMA	28S-03W-27	1972		5					
10494	GFMA	28S-03W-27	1980		15	1995	1997			

Table K-1. Myrtle Creek WAU - Selected Forest Stands: Ages 0 to 120-years-old.

Key Number	LUA	T-R-S	Overstory Birthdate	Understory Birthdate	GLO Acres	Year PCTed	Year Fertilized	PCT Plan	Fertilization Plan	Commercial Thinning Plan
12833	GFMA	28S-03W-27	1988		37					
12837	GFMA	28S-03W-27	1988		8				X	
12834	GFMA	28S-03W-27	1991		13			X		
12835	GFMA	28S-03W-27	1992		8			X		
12836	GFMA	28S-03W-27	1992		2			X		
10498	CON	28S-03W-28	1900		5					
10501	CON	28S-03W-28	1920		31					
10505	CON	28S-03W-28	1920		24					
13943	CON	28S-03W-28	1920		16					
10497	CON	28S-03W-28	1950	1960	39					
10509	CON	28S-03W-28	1960		14					
10507	CON	28S-03W-28	1970		14					
10510	CON	28S-03W-28	1970		16					
10511	CON	28S-03W-28	1971		22	1991	1991			
10508	CON	28S-03W-28	1975		29	1990	1990		X	
10513	CON	28S-03W-28	1981		7	1991	1991			
12839	CON	28S-03W-28	1991		8			X		
12840	CON	28S-03W-28	1991		41			X		
12841	CON	28S-03W-28	1991		8			X		
12842	CON	28S-03W-28	1992		16			X		
13741	CON	28S-03W-28	1992		20			X		

Table K-1. Myrtle Creek WAU - Selected Forest Stands: Ages 0 to 120-years-old.

Key Number	LUA	T-R-S	Overstory Birthdate	Understory Birthdate	GLO Acres	Year PCTed	Year Fertilized	PCT Plan	Fertilization Plan	Commercial Thinning Plan
13742	CON	28S-03W-28	1992		16			X		
13743	CON	28S-03W-28	1992		31			X		
13744	CON	28S-03W-28	1992		19			X		
12843	CON	28S-03W-28	1993		20			X		
10522	GFMA	28S-03W-29	1966		20	1982	1984			
12845	GFMA	28S-03W-29	1974		7					
10526	GFMA	28S-03W-29	1975		37	1991	1991			
12844	GFMA	28S-03W-29	1977		35	1991	1991			
10524	GFMA	28S-03W-29	1978		29	1991	1991			
10523	GFMA	28S-03W-29	1981		18	1991	1991			
10525	GFMA	28S-03W-29	1981		26	1991	1991			
12846	GFMA	28S-03W-29	1981		23	1991	1991			
12847	GFMA	28S-03W-29	1987		34	1998			X	
13745	GFMA	28S-03W-29	1992		3			X		
13746	GFMA	28S-03W-29	1992		4			X		
13691	GFMA	28S-03W-30	1971		5					
10531	GFMA	28S-03W-30	1972		22	1991	1991			
13450	GFMA	28S-03W-30	1972		20	1991	1991			
13451	GFMA	28S-03W-30	1972		12	1991	1991			
13452	GFMA	28S-03W-30	1972		14	1991	1991			
12848	GFMA	28S-03W-30	1977		18	1991	1991			

Table K-1. Myrtle Creek WAU - Selected Forest Stands: Ages 0 to 120-years-old.

Key Number	LUA	T-R-S	Overstory Birthdate	Understory Birthdate	GLO Acres	Year PCTed	Year Fertilized	PCT Plan	Fertilization Plan	Commercial Thinning Plan
12850	GFMA	28S-03W-30	1986		6	1999			X	
12851	GFMA	28S-03W-30	1987		3	1998			X	
12849	GFMA	28S-03W-30	1988		46	1998			X	
10545	GFMA	28S-03W-31	1940		33					
10542	GFMA	28S-03W-31	1966		35	1982	1984			
10543	GFMA	28S-03W-31	1967		29	1982	1984			
10548	GFMA	28S-03W-31	1970		27	1982	1984			
10549	GFMA	28S-03W-31	1970		4					
12853	GFMA	28S-03W-31	1981		22	1998			X	
12854	GFMA	28S-03W-31	1981		11	1991	1991			
12855	GFMA	28S-03W-31	1981		9	1991	1991			
13692	GFMA	28S-03W-31	1981		1	1998			X	
12852	GFMA	28S-03W-31	1983		4				X	
12856	GFMA	28S-03W-31	1987		36	1997			X	
10557	CON	28S-03W-32	1940		51					
10563	CON	28S-03W-32	1940		67					
10565	CON	28S-03W-32	1940		7					
10569	CON	28S-03W-32	1940		6					
10561	CON	28S-03W-32	1950		24	1977	1984			
10562	CON	28S-03W-32	1950		14					
10560	CON	28S-03W-32	1966		3	1982	1984			

Table K-1. Myrtle Creek WAU - Selected Forest Stands: Ages 0 to 120-years-old.

Key Number	LUA	T-R-S	Overstory Birthdate	Understory Birthdate	GLO Acres	Year PCTed	Year Fertilized	PCT Plan	Fertilization Plan	Commercial Thinning Plan
10556	CON	28S-03W-32	1970		37	1982	1984			
10554	CON	28S-03W-32	1975		16					
10566	CON	28S-03W-32	1981		13	1995	1997			
10568	CON	28S-03W-32	1981		16	1998			X	
12857	CON	28S-03W-32	1981		8	1998			X	
12858	CON	28S-03W-32	1981		19	1995	1997			
13453	CON	28S-03W-32	1981		28	1991	1991			
12859	CON	28S-03W-32	1982		8	1991	1991			
10575	GFMA	28S-03W-33	1920		10					
10576	GFMA	28S-03W-33	1920		8					
10580	GFMA	28S-03W-33	1940		76					
10581	GFMA	28S-03W-33	1940		19	1979	1984			
10579	GFMA	28S-03W-33	1950		58	1979	1984			
10573	GFMA	28S-03W-33	1960		89	1977	1984			
10572	GFMA	28S-03W-33	1965		38	1983	1984			
10577	GFMA	28S-03W-33	1970		10	1990	1990			
10574	GFMA	28S-03W-33	1972		14	1983	1984			
13421	GFMA	28S-03W-33	1974		5					
10585	GFMA	28S-03W-33	1975		7					
10586	GFMA	28S-03W-33	1976		45	1998			X	
12860	GFMA	28S-03W-33	1992		19			X		

Table K-1. Myrtle Creek WAU - Selected Forest Stands: Ages 0 to 120-years-old.

Key Number	LUA	T-R-S	Overstory Birthdate	Understory Birthdate	GLO Acres	Year PCTed	Year Fertilized	PCT Plan	Fertilization Plan	Commercial Thinning Plan
10596	GFMA	28S-03W-34	1900		54					
10591	GFMA	28S-03W-34	1920		10					
10601	GFMA	28S-03W-34	1920		4					
13945	GFMA	28S-03W-34	1920		18					
10588	GFMA	28S-03W-34	1965		9	1983	1984			
10590	GFMA	28S-03W-34	1965		24					
12861	GFMA	28S-03W-34	1972		16	1990	1990			
13693	GFMA	28S-03W-34	1974		3					
10599	GFMA	28S-03W-34	1980		2	1990	1990			
12862	GFMA	28S-03W-34	1980		12	1995	1997			
12863	GFMA	28S-03W-34	1980		26	1995	1997			
12864	GFMA	28S-03W-34	1980		10	1990	1990			
13454	GFMA	28S-03W-34	1980		2					
13455	GFMA	28S-03W-34	1980		9	1990	1990			
12865	GFMA	28S-03W-34	1982		4	1995	1997			
13772	GFMA	28S-03W-34	1985		13					
13934	GFMA	28S-03W-34	1994		25					
13932	GFMA	28S-03W-34	1995		30					
13933	GFMA	28S-03W-34	1995		25					
13935	GFMA	28S-03W-34	1995		34					
13936	GFMA	28S-03W-34	1995		7					

Table K-1. Myrtle Creek WAU - Selected Forest Stands: Ages 0 to 120-years-old.

Key Number	LUA	T-R-S	Overstory Birthdate	Understory Birthdate	GLO Acres	Year PCTed	Year Fertilized	PCT Plan	Fertilization Plan	Commercial Thinning Plan
10609	GFMA	28S-03W-35	1950		44					
10614	GFMA	28S-03W-35	1950		42	1977	1984			
10613	GFMA	28S-03W-35	1960		6					
10607	GFMA	28S-03W-35	1978		32					
13457	GFMA	28S-03W-35	1978		14	1990	1990			
13458	GFMA	28S-03W-35	1978		16	1995	1997			
10615	GFMA	28S-03W-35	1979		12	1995			X	
10616	GFMA	28S-03W-35	1980		16	1990	1990			
13937	GFMA	28S-03W-35	1995		18					
10630	GFMA	28S-03W-36	1880	1950	20					
10629	GFMA	28S-03W-36	1900	1960	8					
10626	GFMA	28S-03W-36	1930		15					
10628	GFMA	28S-03W-36	1930		9					
10631	GFMA	28S-03W-36	1950		10	1977	1984			
10632	GFMA	28S-03W-36	1950		28					
10641	GFMA	28S-04W-01	1900	1940	10					
10645	GFMA	28S-04W-01	1910		11					
10642	GFMA	28S-04W-01	1950		4					
10647	GFMA	28S-04W-01	1960		58	1978	1985			
10650	GFMA	28S-04W-01	1960		13					
10646	GFMA	28S-04W-01	1970		45	1990	1990			

Table K-1. Myrtle Creek WAU - Selected Forest Stands: Ages 0 to 120-years-old.

Key Number	LUA	T-R-S	Overstory Birthdate	Understory Birthdate	GLO Acres	Year PCTed	Year Fertilized	PCT Plan	Fertilization Plan	Commercial Thinning Plan
10648	GFMA	28S-04W-01	1970		12					
10649	GFMA	28S-04W-01	1970		20					
13754	GFMA	28S-04W-01	1989		10				X	
13804	GFMA	28S-04W-01	1989		7					
10654	GFMA	28S-04W-02	1920		40					
10655	GFMA	28S-04W-02	1960		6					
10683	CON	28S-04W-09	1890		13					
10081	CON	28S-04W-10	1890		23					
10082	CON	28S-04W-10	1920		16					
10699	CON	28S-04W-11	1920	1920	16					
12875	CON	28S-04W-11	1967		32	1990	1990			
12876	CON	28S-04W-11	1975		20					
10706	CON	28S-04W-11	1978		30	1990	1990			
10708	CON	28S-04W-11	1979		22	1990	1990			
13461	CON	28S-04W-11	1988		21			X		
13462	CON	28S-04W-11	1988		36			X		
10692	CON	28S-04W-11	1989		31			X		
10694	CON	28S-04W-11	1989		14					
10705	CON	28S-04W-11	1989		20			X	X	
10709	CON	28S-04W-11	1989		22			X	X	
13463	CON	28S-04W-11	1989		11			X	X	

Table K-1. Myrtle Creek WAU - Selected Forest Stands: Ages 0 to 120-years-old.

Key Number	LUA	T-R-S	Overstory Birthdate	Understory Birthdate	GLO Acres	Year PCTed	Year Fertilized	PCT Plan	Fertilization Plan	Commercial Thinning Plan
13464	CON	28S-04W-11	1989		14			X	X	
13800	CON	28S-04W-11	1989		70			X		
13801	CON	28S-04W-11	1990		20			X		
13644	CON	28S-04W-11	1993		16			X		
10712	GFMA	28S-04W-13	1890		4					
10719	GFMA	28S-04W-13	1940		2					
10718	GFMA	28S-04W-13	1970		28					
13466	GFMA	28S-04W-13	1976		9	1990	1990			
12879	GFMA	28S-04W-13	1986		43	1998			X	
12877	GFMA	28S-04W-13	1988		17					
13750	GFMA	28S-04W-13	1990		94			X		
13802	GFMA	28S-04W-13	1990		4					
13826	GFMA	28S-04W-13	1990		10				X	
13423	CON	28S-04W-14	1975		7					
13803	CON	28S-04W-14	1991		77			X		
10725	GFMA	28S-04W-15	1880		13					
10728	GFMA	28S-04W-15	1890		54					
10733	GFMA	28S-04W-15	1967		22					
10727	GFMA	28S-04W-15	1970		25					
10734	GFMA	28S-04W-15	1970		21					
12880	GFMA	28S-04W-15	1982		6					

Table K-1. Myrtle Creek WAU - Selected Forest Stands: Ages 0 to 120-years-old.

Key Number	LUA	T-R-S	Overstory Birthdate	Understory Birthdate	GLO Acres	Year PCTed	Year Fertilized	PCT Plan	Fertilization Plan	Commercial Thinning Plan
12881	GFMA	28S-04W-15	1982		22	1995	1997			
12882	GFMA	28S-04W-15	1983		6					
13645	GFMA	28S-04W-15	1990		39					
13647	GFMA	28S-04W-15	1991		25			X		
13646	GFMA	28S-04W-15	1992		41					
13876	GFMA	28S-04W-17	1955	1983	26				X	
10738	GFMA	28S-04W-17	1960		21					
10750	GFMA	28S-04W-17	1975		24	1990	1990			
13877	GFMA	28S-04W-17	1994		36					
13878	GFMA	28S-04W-17	1994		27					
10093	GFMA	28S-04W-18	1940		3					
10775	CON	28S-04W-21	1960		19	1982	1985			
13521	CON	28S-04W-21	1967		28					
10774	CON	28S-04W-21	1970		40					
13520	CON	28S-04W-21	1971		25	1990	1990			
10771	CON	28S-04W-21	1979		43	1999				
13468	CON	28S-04W-21	1979		24	1990	1990			
10776	CON	28S-04W-21	1980		28	1999				
12887	CON	28S-04W-21	1980		14	1999				
12884	CON	28S-04W-21	1981		21	1995	1997			
12885	CON	28S-04W-21	1981		20	1995	1997			

Table K-1. Myrtle Creek WAU - Selected Forest Stands: Ages 0 to 120-years-old.

Key Number	LUA	T-R-S	Overstory Birthdate	Understory Birthdate	GLO Acres	Year PCTed	Year Fertilized	PCT Plan	Fertilization Plan	Commercial Thinning Plan
12886	CON	28S-04W-21	1981		13	1995	1997			
12888	CON	28S-04W-21	1983		2					
13648	CON	28S-04W-21	1991		21			X		
13649	CON	28S-04W-21	1994		24					
12889	GFMA	28S-04W-23	1982		14	1997			X	
12890	GFMA	28S-04W-23	1982		20	1997			X	
12891	GFMA	28S-04W-23	1983		15	1997			X	
12893	GFMA	28S-04W-23	1986		11					
12894	GFMA	28S-04W-23	1986		24					
12892	GFMA	28S-04W-23	1988		5	2002				
13865	GFMA	28S-04W-23	1992		12			X		
13866	GFMA	28S-04W-23	1994		23			X		
13867	GFMA	28S-04W-23	1994		17			X		
10780	CON	28S-04W-25	1970		12	1991	1991			
10786	CON	28S-04W-25	1970		49	1982	1985			
13469	CON	28S-04W-25	1971		26					
10787	CON	28S-04W-25	1972		21					
10789	CON	28S-04W-25	1981		25	1991	1991			
12897	CON	28S-04W-25	1981		16	1997			X	
12898	CON	28S-04W-25	1981		9	1998			X	
12895	CON	28S-04W-25	1982		31	1997			X	

Table K-1. Myrtle Creek WAU - Selected Forest Stands: Ages 0 to 120-years-old.

Key Number	LUA	T-R-S	Overstory Birthdate	Understory Birthdate	GLO Acres	Year PCTed	Year Fertilized	PCT Plan	Fertilization Plan	Commercial Thinning Plan
12896	CON	28S-04W-25	1982		15	1998			X	
12899	CON	28S-04W-25	1986		15	1999			X	
12900	CON	28S-04W-25	1986		35					
12901	CON	28S-04W-25	1986		13					
13638	CON	28S-04W-25	1986		45	2000				
12902	CON	28S-04W-25	1989		34	2000				
10795	GFMA	28S-04W-27	1920		4					
10793	GFMA	28S-04W-27	1930		7					
10797	GFMA	28S-04W-27	1940		5					
10796	GFMA	28S-04W-27	1950		68	1983	1985			
10799	GFMA	28S-04W-27	1970		35					
10801	GFMA	28S-04W-29	1920	1960	15					
10802	GFMA	28S-04W-29	1920	1960	7					
10803	GFMA	28S-04W-29	1920	1960	18					
10805	GFMA	28S-04W-33	1880		9					
10809	GFMA	28S-04W-33	1920	1940	9					
10813	GFMA	28S-04W-33	1940		5					
10807	GFMA	28S-04W-33	1960		19					
12904	GFMA	28S-04W-33	1960		6					
10826	GFMA	28S-04W-35	1930		7					
10820	GFMA	28S-04W-35	1940	1960	171					

Table K-1. Myrtle Creek WAU - Selected Forest Stands: Ages 0 to 120-years-old.

Key Number	LUA	T-R-S	Overstory Birthdate	Understory Birthdate	GLO Acres	Year PCTed	Year Fertilized	PCT Plan	Fertilization Plan	Commercial Thinning Plan
10822	GFMA	28S-04W-35	1950		6					
10815	GFMA	28S-04W-35	1960		6					
10819	GFMA	28S-04W-35	1960	1960	91					
10824	GFMA	28S-04W-35	1970		11					
10825	GFMA	28S-04W-35	1970		12					
12905	GFMA	28S-04W-35	1976		36					
12906	GFMA	28S-04W-35	1981		28					
12907	GFMA	28S-04W-35	1982		8					
12909	GFMA	28S-04W-35	1986		43					
12908	GFMA	28S-04W-35	1992		33			X		
10839	CON	28S-05W-25	1910		12					
10838	CON	28S-05W-25	1919		5					
13805	CON	28S-05W-25	1990		24	2001				
13807	CON	28S-05W-25	1992		46			X		
13808	CON	28S-05W-25	1992		32			X		
13809	CON	28S-05W-25	1992		18			X		
13806	CON	28S-05W-25	1993		78			X		
14083	CON	28S-05W-25	1997		2					
12910	GFMA	28S-05W-35	1982		37	1997			X	
12911	GFMA	28S-05W-35	1982		56	1997			X	
13872	GFMA	28S-05W-35	1993		24			X		

Table K-1. Myrtle Creek WAU - Selected Forest Stands: Ages 0 to 120-years-old.

Key Number	LUA	T-R-S	Overstory Birthdate	Understory Birthdate	GLO Acres	Year PCTed	Year Fertilized	PCT Plan	Fertilization Plan	Commercial Thinning Plan
13873	GFMA	28S-05W-35	1994		24			X		
13871	GFMA	28S-05W-35	1996		38					
10858	GFMA	29S-02W-04	1940		29					
14097	GFMA	29S-02W-04	1940		1					
10862	GFMA	29S-02W-04	1950		19					
14101	GFMA	29S-02W-04	1950		6					
12912	GFMA	29S-02W-04	1979		4					
10872	GFMA	29S-02W-05	1880	1940	54					
10873	GFMA	29S-02W-05	1940		49					
10875	GFMA	29S-02W-05	1950		30	1971	1985			
10874	GFMA	29S-02W-05	1960		24	1977	1985			
10870	GFMA	29S-02W-05	1973		24					
10868	GFMA	29S-02W-05	1976		10					
10883	CON	29S-02W-06	1930		10					
10879	CON	29S-02W-06	1950		18	1971	1985			
10880	CON	29S-02W-06	1950		18					
10884	CON	29S-02W-06	1967		16	1985	1985			
13470	CON	29S-02W-06	1973		20	1990	1990			
10888	CON	29S-02W-07	1967		12	1985	1985			
12978	GFMA	29S-03W-01	1983		11	1993	1997			
12979	GFMA	29S-03W-01	1983		29	1993	1997			

Table K-1. Myrtle Creek WAU - Selected Forest Stands: Ages 0 to 120-years-old.

Key Number	LUA	T-R-S	Overstory Birthdate	Understory Birthdate	GLO Acres	Year PCTed	Year Fertilized	PCT Plan	Fertilization Plan	Commercial Thinning Plan
11174	GFMA	29S-03W-03	1920	1950	24					
11178	GFMA	29S-03W-03	1930		35					
11180	GFMA	29S-03W-03	1930		4					
11177	GFMA	29S-03W-03	1968		20					
11181	GFMA	29S-03W-03	1970		8	1983	1984			
11183	GFMA	29S-03W-03	1971		17					
13497	GFMA	29S-03W-03	1971		19					
11182	GFMA	29S-03W-03	1974		37					
12980	GFMA	29S-03W-03	1977		20					
12981	GFMA	29S-03W-03	1992		38			X		
12982	GFMA	29S-03W-03	1992		11			X		
13938	GFMA	29S-03W-03	1995		3					
10109	GFMA	29S-03W-04	1940		11					
12983	GFMA	29S-03W-04	1981		6	1995	1997			
11188	GFMA	29S-03W-05	1940		8					
11190	GFMA	29S-03W-05	1940		3					
11185	GFMA	29S-03W-05	1960		5					
12984	GFMA	29S-03W-05	1981		26	1995	1997			
12985	GFMA	29S-03W-05	1981		20	1995	1997			
12986	GFMA	29S-03W-05	1981		13	1995	1997			
11193	CON	29S-03W-07	1940		82					

Table K-1. Myrtle Creek WAU - Selected Forest Stands: Ages 0 to 120-years-old.

Key Number	LUA	T-R-S	Overstory Birthdate	Understory Birthdate	GLO Acres	Year PCTed	Year Fertilized	PCT Plan	Fertilization Plan	Commercial Thinning Plan
11199	CON	29S-03W-07	1950		44					
12987	CON	29S-03W-07	1989		37			X		
12988	CON	29S-03W-07	1989		46	2000			X	
11204	GFMA	29S-03W-09	1940	1950	108					
11205	GFMA	29S-03W-09	1940	1950	24					
12989	GFMA	29S-03W-09	1940	1982	24					
11207	GFMA	29S-03W-09	1950		17					
12990	GFMA	29S-03W-09	1975		26					
11206	GFMA	29S-03W-09	1976		19					
12993	GFMA	29S-03W-09	1991		34			X		
12991	GFMA	29S-03W-09	1992		12			X		
12992	GFMA	29S-03W-09	1992		33					
11215	CON	29S-03W-11	1920		11					
11216	CON	29S-03W-11	1920		7					
11217	CON	29S-03W-11	1960		50	1976	1984			
11218	CON	29S-03W-11	1960		31	1976	1984			
11222	CON	29S-03W-11	1960		30	1982	1984			
11223	CON	29S-03W-11	1960		25					
11219	CON	29S-03W-11	1963		28					
11220	CON	29S-03W-11	1980		22	1997			X	
12994	CON	29S-03W-11	1980		45	1997			X	

Table K-1. Myrtle Creek WAU - Selected Forest Stands: Ages 0 to 120-years-old.

Key Number	LUA	T-R-S	Overstory Birthdate	Understory Birthdate	GLO Acres	Year PCTed	Year Fertilized	PCT Plan	Fertilization Plan	Commercial Thinning Plan
13498	CON	29S-03W-11	1980		13	1997			X	
13719	CON	29S-03W-11	1991		33			X		
13720	CON	29S-03W-11	1992		33			X		
13721	CON	29S-03W-11	1992		37			X		
11242	GFMA	29S-03W-15	1880	1950	52					
11249	GFMA	29S-03W-15	1930	1960	2					
11244	GFMA	29S-03W-15	1950	1960	20					X
11239	GFMA	29S-03W-15	1960		40					
13723	GFMA	29S-03W-15	1993		33			X		
11246	GFMA	29S-03W-15	1960		6					
12998	GFMA	29S-03W-15	1983		24	1993	1997			
12999	GFMA	29S-03W-15	1983		23	1993	1997			
13000	GFMA	29S-03W-15	1983		22	1993	1997			
13001	GFMA	29S-03W-15	1983		26	1993	1997			
13722	GFMA	29S-03W-15	1990		39					
13724	GFMA	29S-03W-15	1992		16					
11262	GFMA	29S-03W-17	1940		9					
11266	GFMA	29S-03W-17	1940	1960	9					
11257	GFMA	29S-03W-17	1950	1960	9					
11254	GFMA	29S-03W-17	1960		5					
11255	GFMA	29S-03W-17	1960	1960	5					

Table K-1. Myrtle Creek WAU - Selected Forest Stands: Ages 0 to 120-years-old.

Key Number	LUA	T-R-S	Overstory Birthdate	Understory Birthdate	GLO Acres	Year PCTed	Year Fertilized	PCT Plan	Fertilization Plan	Commercial Thinning Plan
11258	GFMA	29S-03W-17	1960		40					
11259	GFMA	29S-03W-17	1960		162					
11263	GFMA	29S-03W-17	1960		9					
11260	GFMA	29S-03W-17	1975		23					
10112	GFMA	29S-03W-18	1960	1960	6					
10113	GFMA	29S-03W-20	1880		15					
11270	GFMA	29S-03W-21	1930	1960	8					
11272	GFMA	29S-03W-21	1930		11					
11273	GFMA	29S-03W-21	1940		30					
11274	GFMA	29S-03W-21	1940	1960	4					
11279	GFMA	29S-03W-21	1960		24					
11271	GFMA	29S-03W-21	1964		40					
13002	GFMA	29S-03W-21	1988		20	2000				
13003	GFMA	29S-03W-21	1988		11					
13004	GFMA	29S-03W-21	1988		24	2000				
13833	GFMA	29S-03W-21	1992		15					
13016	CON	29S-03W-29	1988		37			X		
10120	GFMA	29S-03W-30	1930		4					
11372	GFMA	29S-04W-01	1962		27	1982			X	
11374	GFMA	29S-04W-01	1963		30	1982	1984			
11376	GFMA	29S-04W-01	1963		10					

Table K-1. Myrtle Creek WAU - Selected Forest Stands: Ages 0 to 120-years-old.

Key Number	LUA	T-R-S	Overstory Birthdate	Understory Birthdate	GLO Acres	Year PCTed	Year Fertilized	PCT Plan	Fertilization Plan	Commercial Thinning Plan
11377	GFMA	29S-04W-01	1963		22	1982	1984			
13504	GFMA	29S-04W-01	1963		29	1982	1984			
13505	GFMA	29S-04W-01	1963		14	1982	1984			
13981	GFMA	29S-04W-01	1963		10					
11371	GFMA	29S-04W-01	1964		39	1982	1984			
11369	GFMA	29S-04W-01	1970		17					
13036	GFMA	29S-04W-01	1986		23	1998			X	
13032	GFMA	29S-04W-01	1988		30					
13033	GFMA	29S-04W-01	1988		26	2002				
13035	GFMA	29S-04W-01	1988		16			X		
13034	GFMA	29S-04W-01	1990		5			X		
13037	GFMA	29S-04W-01	1991		50			X		
11388	GFMA	29S-04W-03	1920		11					
11382	GFMA	29S-04W-03	1960		60	1984	1985			
11383	GFMA	29S-04W-03	1960		78	1975	1985			
11384	GFMA	29S-04W-03	1960		39					
11387	GFMA	29S-04W-03	1960	1960	9					
11389	GFMA	29S-04W-03	1960		32					
13040	GFMA	29S-04W-03	1960		9					
11385	GFMA	29S-04W-03	1975		23					
13038	GFMA	29S-04W-03	1979		30	1995	1997			

Table K-1. Myrtle Creek WAU - Selected Forest Stands: Ages 0 to 120-years-old.

Key Number	LUA	T-R-S	Overstory Birthdate	Understory Birthdate	GLO Acres	Year PCTed	Year Fertilized	PCT Plan	Fertilization Plan	Commercial Thinning Plan
11391	GFMA	29S-04W-03	1980		15	1995	1997			
13039	GFMA	29S-04W-03	1980		17	1995	1997			
13041	GFMA	29S-04W-03	1980		19	1995	1997			
13042	GFMA	29S-04W-03	1980		11	1995	1997			
13650	GFMA	29S-04W-03	1992		18			X		
13651	GFMA	29S-04W-03	1992		25			X		
13652	GFMA	29S-04W-03	1992		18			X		
13653	GFMA	29S-04W-03	1992		13			X		
13654	GFMA	29S-04W-03	1992		46			X		
13655	GFMA	29S-04W-03	1993		32			X		
10123	GFMA	29S-04W-06	1900		4					
11394	GFMA	29S-04W-07	1900		146					
11398	GFMA	29S-04W-07	1900		24					
11399	GFMA	29S-04W-07	1900		7					
13756	GFMA	29S-04W-07	1900		12					
11396	GFMA	29S-04W-07	1940		26					
11406	CON	29S-04W-09	1890		40					
11407	CON	29S-04W-09	1940		13					
11409	CON	29S-04W-09	1975		15					
13507	CON	29S-04W-09	1975		16					
13508	CON	29S-04W-09	1975		19					

Table K-1. Myrtle Creek WAU - Selected Forest Stands: Ages 0 to 120-years-old.

Key Number	LUA	T-R-S	Overstory Birthdate	Understory Birthdate	GLO Acres	Year PCTed	Year Fertilized	PCT Plan	Fertilization Plan	Commercial Thinning Plan
13509	CON	29S-04W-09	1975		20					
11408	CON	29S-04W-09	1976		18					
13506	CON	29S-04W-09	1976		6					
13043	CON	29S-04W-09	1982		33	1993	1997			
13827	CON	29S-04W-09	1992		16			X		
13828	CON	29S-04W-09	1992		32			X		
13829	CON	29S-04W-09	1992		29			X		
13830	CON	29S-04W-09	1992		26			X		
11414	GFMA	29S-04W-11	1920	1950	37					
11413	GFMA	29S-04W-11	1940	1950	32					
11411	GFMA	29S-04W-11	1960		27					
11415	GFMA	29S-04W-11	1960		9					
13044	GFMA	29S-04W-11	1986		34					
11417	GFMA	29S-04W-13	1950		6					
11418	GFMA	29S-04W-13	1950	1960	98					
13976	GFMA	29S-04W-13	1950	1960	18					
13045	GFMA	29S-04W-13	1988		24			X		
13048	GFMA	29S-04W-13	1988		22					
13049	GFMA	29S-04W-13	1988		28			X		
13047	GFMA	29S-04W-13	1989		31			X		
13046	GFMA	29S-04W-13	1992		20			X		

Table K-1. Myrtle Creek WAU - Selected Forest Stands: Ages 0 to 120-years-old.

Key Number	LUA	T-R-S	Overstory Birthdate	Understory Birthdate	GLO Acres	Year PCTed	Year Fertilized	PCT Plan	Fertilization Plan	Commercial Thinning Plan
11427	GFMA	29S-04W-15	1920		20					
11428	GFMA	29S-04W-15	1930		5					
11432	GFMA	29S-04W-15	1960		38					
11430	GFMA	29S-04W-15	1971		7					
11433	GFMA	29S-04W-15	1973		48					
11429	GFMA	29S-04W-15	1976		3					
11435	GFMA	29S-04W-15	1980		35	1993	1997			
13777	GFMA	29S-04W-15	1982		18					
13050	GFMA	29S-04W-15	1983		16	1997			X	
13051	GFMA	29S-04W-15	1983		46				X	
13052	GFMA	29S-04W-15	1983		11	1997			X	
11438	CON	29S-04W-17	1890	1920	17					
11440	CON	29S-04W-17	1890		50					
11441	CON	29S-04W-17	1890	1930	5					
13053	CON	29S-04W-17	1975		44					
11439	CON	29S-04W-17	1986		61	2001			X	
13793	CON	29S-04W-17	1989		5	2001			X	
13832	CON	29S-04W-17	1991		37			X		
13831	CON	29S-04W-17	1995		26					
11445	CON	29S-04W-19	1880		89					
11446	CON	29S-04W-19	1950		18					

Table K-1. Myrtle Creek WAU - Selected Forest Stands: Ages 0 to 120-years-old.

Key Number	LUA	T-R-S	Overstory Birthdate	Understory Birthdate	GLO Acres	Year PCTed	Year Fertilized	PCT Plan	Fertilization Plan	Commercial Thinning Plan
13892	CON	29S-04W-19	1994		28					
13893	CON	29S-04W-19	1994		22					
11453	GFMA	29S-04W-21	1930		25					
11452	GFMA	29S-04W-21	1940	1960	6					
13054	GFMA	29S-04W-21	1980		18					
11458	CON	29S-04W-23	1900		33					
13055	CON	29S-04W-23	1972		41					
10126	GFMA	29S-04W-24	1920	1950	8					
10125	GFMA	29S-04W-24	1950		12					
10127	GFMA	29S-04W-24	1960	1960	5					
13058	CON	29S-04W-27	1984		40	1997			X	
11477	CON	29S-04W-29	1890		9					
11475	CON	29S-04W-29	1930		30					
11476	CON	29S-04W-29	1930		14					
11478	CON	29S-04W-29	1940		5					
11483	GFMA	29S-04W-31	1950		7					
11490	CON	29S-04W-33	1960		12					
13063	CON	29S-04W-33	1989		19					
13064	CON	29S-04W-33	1991		30					
10134	GFMA	29S-05W-02	1970		7					
10136	GFMA	29S-05W-02	1970		4					

Table K-1. Myrtle Creek WAU - Selected Forest Stands: Ages 0 to 120-years-old.

Key Number	LUA	T-R-S	Overstory Birthdate	Understory Birthdate	GLO Acres	Year PCTed	Year Fertilized	PCT Plan	Fertilization Plan	Commercial Thinning Plan
10135	GFMA	29S-05W-02	1977		13					
13067	GFMA	29S-05W-02	1977		29					
11495	CON	29S-05W-03	1890		5					
11498	CON	29S-05W-03	1890		131					
11502	CON	29S-05W-03	1890	1960	18					
11504	CON	29S-05W-03	1950		9					
11503	CON	29S-05W-03	1960		5					
11501	CON	29S-05W-03	1970		38					
11505	CON	29S-05W-03	1975		28					
11500	CON	29S-05W-03	1977		4					
10142	CON	29S-05W-10	1890		7					
10143	CON	29S-05W-10	1890		11					
10145	CON	29S-05W-10	1960		8					
10146	CON	29S-05W-10	1960		14					
11519	GFMA	29S-05W-11	1900	1960	11					
11512	GFMA	29S-05W-11	1960		7					
11513	GFMA	29S-05W-11	1960		48					
11514	GFMA	29S-05W-11	1960		10					
11515	GFMA	29S-05W-11	1960		25					
11517	GFMA	29S-05W-11	1960		5					
11520	GFMA	29S-05W-11	1960		11					

Table K-1. Myrtle Creek WAU - Selected Forest Stands: Ages 0 to 120-years-old.

Key Number	LUA	T-R-S	Overstory Birthdate	Understory Birthdate	GLO Acres	Year PCTed	Year Fertilized	PCT Plan	Fertilization Plan	Commercial Thinning Plan
11521	GFMA	29S-05W-11	1960		9					
11525	CON	29S-05W-15	1900		16					
11531	CON	29S-05W-21	1890		37					
11533	CON	29S-05W-21	1890		8					
11534	CON	29S-05W-21	1890		10					
11532	CON	29S-05W-21	1950		6					
11536	GFMA	29S-05W-25	1900		75					
11538	GFMA	29S-05W-25	1930		13					
11539	GFMA	29S-05W-25	1960		6					
11543	GFMA	29S-05W-35	1900		50					
11546	GFMA	29S-05W-35	1900	1960	25					
11547	GFMA	29S-05W-35	1900	1960	25					
11545	GFMA	29S-05W-35	1960		13					
13165	CON	30S-05W-01	1975		18					
10217	GFMA	30S-05W-02	1970		13					
10218	GFMA	30S-05W-02	1970		16	1982	1985			
13170	GFMA	30S-05W-02	1983		12					
11937	GFMA	30S-05W-03	1970		38					
11940	GFMA	30S-05W-03	1970		23					
13848	GFMA	30S-05W-03	1990		60					

Appendix L

Water Quality Restoration Plan

Water Quality Restoration Plan
Appendix to the Myrtle Creek Watershed Analysis
Myrtle Creek Watershed

Bureau of Land Management
Roseburg District Office

December 2003

Watershed at a Glance	
Watershed	Myrtle Creek: 76,265 acres Federally-Administered Land: 31,151 acres (41 percent)
Stream Miles*	Total: 875 Perennial: 177
Watershed Identifier	1710030211 (Hydrologic Unit Code)
303(d) Listed Parameters	Temperature, Habitat Modification, and Flow Modification
Beneficial Uses	Industrial, Mining, Public, and Domestic Water Supply, Irrigation, Livestock Watering, Water Contact Recreation, and Cold Water Biota (Salmonids Spawning and Rearing, Resident Fish and Aquatic Life)
Known Impacts	Wastewater Discharge, Agriculture, Timber Harvesting, Roads, Mining, and Water Withdrawals

*Data are from BLM GIS. Perennial streams are estimated to be at least third order streams.

List of Preparers

Lowell Duell - Hydrologist	BLM, Roseburg District
Paul Meinke - Watershed Analysis Coordinator	BLM, Roseburg District
Jim Harvey - Natural Resources Specialist	BLM, Roseburg District
Myrtle Creek Watershed Analysis Team	BLM, Roseburg District

Statement of Purpose

This water quality restoration plan is being prepared to meet the requirements of Section 303(d) of the 1972 Federal Clean Water Act.

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Water Quality Restoration Plan Element Location

A Table of Contents for location of the Oregon Department of Environmental Quality (ODEQ) elements within the Myrtle Creek Watershed Water Quality Restoration Plan (WQRP) is provided below:

Chapter 1 - Project Overview

Introduction

The area covered by this plan includes all Federally-administered land (see Table 1) in the Myrtle Creek Watershed managed by the Bureau of Land Management (BLM) following the Standards and Guidelines in the Northwest Forest Plan (NWFP) (USDA and USDI 1994). Private land within the area of this Water Quality Restoration Plan (WQRP) includes urban, agricultural, and forested lands. The private forested land is managed following the Oregon Forest Practices Act (OFPA). A subsequent Water Quality Management Plan (WQMP) will be written by the Oregon Department of Environmental Quality (ODEQ) to cover the private lands in the Myrtle Creek Watershed. The Myrtle Creek WQRP is intended to be adaptive in management implementation and includes the protocols described in the Forest Service and Bureau of Land Management Protocol for Addressing Clean Water Act Section 303(d) Listed Waters (USDA et al. 1999). It allows for future changes in response to new information. Information generated during development of the WQMP may indicate this WQRP for Federally-administered land needs to be revised.

Table 1. Land Ownership in the Myrtle Creek Watershed.

Ownership	Acres
Total	76,265
Federal	31,151
Private	45,112

The Myrtle Creek is a high value salmonid fish watershed in the Southern Oregon Coastal Basin. Despite habitat and flow modification, spawning coho salmon, fall chinook salmon, and winter steelhead return to Myrtle Creek every year. Anadromous and resident fish distribution are shown in Myrtle Creek Watershed Analysis (USDI 2002).

The Myrtle Creek Watershed covers approximately 76,265 acres (119 square miles) in southwestern Oregon and is a major tributary to the South Umpqua River. Some of the land along Myrtle Creek is flat and used for agricultural purposes. In the agricultural areas some tributaries of Myrtle Creek have been straightened or had their flow patterns altered. The native vegetation in the agricultural areas has been replaced with low growing vegetation, which generally are grasses. Riparian areas may have some deciduous trees (hardwoods) along the stream banks. The higher elevations of the watershed are a combination of Federally-administered and private forested land. Timber harvesting and road construction have probably affected channel complexity, water quality, and hydraulic processes in the watershed.

Location

The management area for this WQRP is the Myrtle Creek Watershed, one of thirteen Fifth Field Watersheds comprising the South Umpqua Subbasin. The South Umpqua Subbasin drains about 1,800 square miles. The Myrtle Creek Watershed covers about seven percent of the South

Umpqua Subbasin. Myrtle Creek flows out of the Cascade Mountains until it meets the South Umpqua River near Myrtle Creek, Oregon. The South Umpqua River meets the North Umpqua River near Roseburg, Oregon where they join to form the Umpqua River. Most of the Federally-administered land in the Myrtle Creek Watershed is managed by the Roseburg BLM District. However, a small amount of land is managed by the Umpqua National Forest in the eastern portion of the watershed. For analytical purposes, the area was divided into four subwatersheds and 27 drainages (see the Myrtle Creek Watershed Analysis, USDI 2002).

Ownership and Land Use Allocations

Lands administered by the BLM are managed according to the Land Use Allocations established by the Record of Decision and Roseburg District Resource Management Plan (RMP) (USDI 1995) and the Record of Decision (ROD) for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl (NWFP) (USDA and USDI 1994). Mapped Land Use Allocations for BLM land within the WQRP area include Connectivity/Diversity Blocks and General Forest Management Areas (GFMA). The analysis area does not contain a Tier 1 Key Watershed (as defined in the SEIS ROD). Riparian Reserves are superimposed upon the Land Use Allocations. Acreage by Land Use Allocation are presented in Table 2 and shown in the Myrtle Creek Watershed Analysis (USDI 2002).

Table 2. Acres and Percentage of Federally Managed Lands by Land Use Allocation.

Land Use Allocation	Acres in Roseburg District	Acres in Umpqua National Forest	Total Acres of Federally Managed Lands	Percent of Federally Managed Lands	Percent of Watershed Analysis Unit
Riparian Reserves	12,728	49	12,777	41	17
Other Reserved Areas (Owl Core Areas and TPCC Withdrawn Areas)	2,767	0	2,767	9	4
Connectivity/Diversity Blocks	4,505	0	4,505	14	6
General Forest Management Area (GFMA)	10,988	94 (Matrix)	11,082	36	15
Total	30,988	143	31,131	100	41

Matrix

The Matrix Land Use Allocation includes Federally-administered land outside of designated reserves. The Roseburg BLM District RMP divided Matrix into General Forest Management Areas (GFMA) and Connectivity/Diversity Blocks (CONN).

General Forest Management Areas (GFMA)

General Forest Management Areas would be managed on a regeneration harvest cycle of 80 to 110 years. A biological legacy of six to eight green trees per acre would be retained within harvest units.

Connectivity/Diversity Blocks (CONN)

Connectivity/Diversity Blocks would be managed on a 150 year area control rotation. Twelve to 18 green trees per acre would be retained within harvest units. Twenty-five to 30 percent of each Connectivity/Diversity Block would be maintained in late-successional forests at any point in time.

Current Conditions

The drainage density in the Myrtle Creek Watershed is 7.35 miles per square mile. First and second order streams consist of approximately 698 miles, which is about 80 percent of the stream miles in the watershed. These are generally steep headwater channels draining small areas. Many first and second order streams are intermittent in the late summer. The remaining 177 miles or 20 percent of stream miles are third order or larger streams, which usually flow all year.

Longitudinal profiles of streams are useful to compare morphology between stream reaches and from one stream to another. North and South Myrtle Creeks have average gradients less than one percent. These are low-energy depositional streams. In contrast, tributary streams have narrow canyons and steeper channel gradients. Tributary streams usually start below steeply sloped headwalls. These high-energy, erosional streams can transport large amounts of water and sediment. However, all streams contain low gradient reaches, which provide valuable aquatic habitat.

Listing Status

Beneficial water use within the watershed includes industrial, mining, public, and domestic water supply, irrigation, livestock watering, water contact recreation, and cold water biota (salmonid spawning and rearing, resident fish and aquatic life). Table 3 shows the parameters the ODEQ (1998) used to place the streams on the 1998 303(d) water quality limited list.

Table 3. Water Quality Limited 1998 303(d) Listings in the Myrtle Creek Watershed.

Name and Description	Parameter	Listing Criteria	Miles	Season	Beneficial Uses Affected
North Myrtle Creek Mouth to Headwaters	Habitat Modification	--	16.6	--	Resident Fish and Aquatic Life, Salmonid Spawning and Rearing
South Myrtle Creek Mouth to Headwaters	Temperature	Rearing Greater Than 17.8 ^{o}C (64 ^{o}F)	20.5	Summer	Resident Fish and Aquatic Life, Salmonid Spawning and Rearing
South Myrtle Creek Mouth to Weaver Creek	Flow Modification	--	14.6	--	Resident Fish and Aquatic Life, Salmonid Spawning and Rearing
Riser Creek Mouth to Headwaters	Temperature	Rearing Greater Than 17.8 ^{o}C (64 ^{o}F)	4.1	Summer	Resident Fish and Aquatic Life, Salmonid Spawning and Rearing

-- = No Data.

South Myrtle Creek water temperatures exceeded the ODEQ standard between June and September. The water quality limited status for temperature is located mainly along privately owned land, since there is very little Federally-administered land along South Myrtle Creek. Water temperature standards were also exceeded on Riser (see Tables 4 and 5). Data collected by the BLM show Buck Fork, Letitia, Louis (lower), North Myrtle (lower), Slide, and Weaver (lower) Creeks have also exceeded the water temperature standard. However, they are not on the water quality limited list for temperature, at this time. Locations of the water temperature monitoring sites are shown on Map 24 in the Myrtle Creek Watershed Analysis (USDI 2002). The purpose of this WQRP is to present information if Federally-administered lands are providing the coolest water possible downstream and how the BLM will address water temperature problems. The intention is to show to what extent water is being warmed and what factors are contributing to the warming on Federally-administered land.

Table 4. Water Temperature Data Collected by the Roseburg BLM District in the Myrtle Creek Watershed.

Stream Name	Years Data Were Collected	Upstream Drainage Area (Acres)	Elevation at Site (Feet)	Range of Seven-Day Maximum Temperatures (EC)	Maximum Number of Days Temperature Exceeded 17.8E C (Year)	Low Flow at Site for 2001 (cfs)
Buck Fork Creek	2001	2,950	1,145	18.7	24 (2001)	----
Curtin Creek	1994, 1996 to 1999	980	1,575	15.5 - 17.0	1 (1998)	----
Johnson Creek	1996 to 1999	800	1,575	15.0 - 17.3	0	----
Letitia Creek	2001	1,970	1,145	18.0	8 (2001)	0.14
Louis Creek (upper site)	1997 to 1999, 2001	1,180	1,600	14.6 - 16.7	0	----
Louis Creek (lower site)	2001	3,920	1,050	20.4	59 (2001)	0.41
North Myrtle Creek (upper site)	2000	1,690	1,390	16.0	0	----
North Myrtle Creek (middle site)	2000, 2001	3,900	1,140	16.8 - 19.1	24 (2000)	0.3
North Myrtle Creek (lower site)	2001	13,370	850	24.1	88 (2001)	----
Unnamed Tributary North Myrtle Creek	1999	985	1,160	16.4	0	----
Riser Creek	1997 to 1999, 2001	1,920	1,060	17.5 - 21.2	53 (1997)	0.1
Slide Creek (above Riser Creek)	1997 to 2000	1,030	1,060	16.7 - 18.5	31 (1997)	----
Slide Creek (middle site)	2000	3,540	985	18.3	14 (2000)	----
Slide Creek (lower site)	2000	3,970	930	19.7	40 (2000)	----
Slide Creek (near mouth)	2001	4,610	870	21.1	81 (2001)	0.25

Table 4. Water Temperature Data Collected by the Roseburg BLM District in the Myrtle Creek Watershed.

Stream Name	Years Data Were Collected	Upstream Drainage Area (Acres)	Elevation at Site (Feet)	Range of Seven-Day Maximum Temperatures (EC)	Maximum Number of Days Temperature Exceeded 17.8E C (Year)	Low Flow at Site for 2001 (cfs)
South Myrtle Creek (upper site)	1996 to 2000	3,370	1,565	16.7 - 18.8	23 (1998)	----
South Myrtle Creek (below Johnson Creek)	2000, 2001	5,180	1,530	17.1 - 19.3	8 (2001)	0.26
South Myrtle Creek (T29S, R3W, Sec. 11)	2000, 2001	6,410	1,360	19.0 - 19.1	17 (2000)	----
South Myrtle Creek (above Lally Creek)	2001	7,830	1,230	18.6	11 (2001)	0.66
South Myrtle Creek (lower site)	1994, 1995	28,330	840	20.2 - 22.5	56 (1994)	----
Weaver Creek (upper site)	1997 to 2001	2,500	1,470	16.5 - 17.6	5 (1998)	0.24
Weaver Creek (lower site)	2001	3,490	1,230	19.5	38 (2001)	0.41

Table 5. Summer Stream Temperature Data Summarized by Year Collected by the Roseburg BLM District in the Myrtle Creek Watershed.

Stream Name	Date	Maximum Temperature (EC)	Date	Minimum Temperature (EC)	ªT	Seven-Day Averages			Days Greater Than 17.8E C
						Date	Maximum	ªT (EC)	
Buck Fork Creek	08/10/01	19.4	06/04/01	8.9	5.7	08/09/01	18.7	3.8	24
Curtin Creek	07/21/94	17.4	10/16/94	7.0	2.6	07/22/94	16.5	1.9	0
Curtin Creek	07/29/96	17.0	09/23/96	8.6	2.3	07/27/96	16.8	1.4	0
Curtin Creek	08/06/97	16.1	06/06/97	9.8	2.3	08/05/97	15.5	1.4	0
Curtin Creek	07/28/98	18.0	06/17/98	9.5	2.5	07/26/98	17.0	1.7	1
Curtin Creek	08/28/99	16.1	06/09/99	6.9	2.5	08/26/99	15.6	1.0	0
Johnson Creek	07/29/96	17.5	09/23/96	8.4	2.5	07/27/96	17.3	1.6	0
Johnson Creek	08/14/97	15.4	06/06/97	9.5	2.2	08/14/97	15.0	1.0	0
Johnson Creek	07/28/98	17.3	06/17/98	8.9	2.7	07/26/98	16.5	1.8	0
Johnson Creek	08/28/99	16.4	06/09/99	7.2	2.3	08/26/99	15.8	1.0	0
Letitia Creek	08/12/01	18.5	05/17/01	8.8	6.1	08/12/01	18.0	3.2	8
Louis Creek (upper site)	07/21/97	15.1	06/22/97	9.6	2.6	07/23/97	14.6	2.0	0
Louis Creek (upper site)	07/28/98	16.7	06/17/98	9.0	2.8	07/26/98	15.7	2.0	0
Louis Creek (upper site)	08/28/99	15.3	10/16/99	6.4	2.5	08/26/99	14.8	1.2	0
Louis Creek (upper site)	08/10/01	17.1	06/04/01	7.5	5.0	08/12/01	16.7	3.2	0
Louis Creek (lower site)	08/10/01	21.0	05/17/01	8.7	7.3	08/12/01	20.4	4.3	59
North Myrtle Creek (upper site)	08/08/00	16.4	06/10/00	8.9	3.0	08/06/00	16.0	2.2	0
North Myrtle Creek (middle site)	08/08/00	19.6	06/10/00	9.7	5.8	08/06/00	19.1	4.4	24
North Myrtle Creek (middle site)	08/12/01	17.3	06/04/01	8.1	3.4	08/12/01	16.8	2.5	0
North Myrtle Creek (lower site)	08/10/01	24.9	06/04/01	11.2	7.6	08/12/01	24.1	6.7	88
Unnamed Tributary to North Myrtle Creek	08/28/99	17.0	10/17/99	5.7	3.1	08/26/99	16.4	1.9	0
Riser Creek	08/06/97	20.8	06/08/97	13.1	4.3	08/04/97	20.1	3.7	53
Riser Creek	07/28/98	22.2	09/11/98	9.7	4.8	07/27/98	21.2	3.3	51
Riser Creek	08/10/99	19.2	10/17/99	5.8	4.1	07/12/99	18.5	3.2	45
Riser Creek	08/10/01	18.3	09/07/01	10.1	4.5	08/10/01	17.5	2.2	5
Slide Creek (above Riser Creek)	08/06/97	19.3	09/07/97	12.4	4.7	08/06/97	18.5	3.9	31
Slide Creek (above Riser Creek)	07/28/98	15.4	06/17/98	9.3	2.6	07/26/98	14.9	1.6	0
Slide Creek (above Riser Creek)	08/10/99	17.2	10/17/99	5.4	3.9	07/31/99	16.7	2.8	0
Slide Creek (above Riser Creek)	08/08/00	17.7	09/10/00	10.1	3.3	08/07/00	17.3	2.4	0
Slide Creek (middle site)	07/31/00	19.0	09/10/00	10.7	3.8	08/07/00	18.3	2.6	14
Slide Creek (lower site)	07/31/00	20.4	09/09/00	10.7	5.7	08/06/00	19.7	4.2	40
Slide Creek (near mouth)	8/10/01	21.8	5/19/01	9.4	8.7	08/12/01	21.1	4.5	81
South Myrtle Creek (upper site)	07/29/96	18.3	09/22/96	9.2	3.4	07/27/96	18.0	2.5	5
South Myrtle Creek (upper site)	08/14/97	18.0	06/08/97	9.6	3.5	08/07/97	17.5	3.1	2
South Myrtle Creek (upper site)	09/01/98	19.3	06/17/98	9.3	5.6	09/03/98	18.8	4.5	23
South Myrtle Creek (upper site)	08/28/99	17.2	06/09/99	7.0	3.3	08/25/99	16.7	1.7	0
South Myrtle Creek (upper site)	08/08/00	17.9	06/11/00	9.1	3.0	08/06/00	17.5	2.3	1
South Myrtle Creek (below Johnson Creek)	08/08/00	17.7	06/11/00	8.1	3.7	08/06/00	17.1	3.1	0
South Myrtle Creek (below Johnson Creek)	08/10/01	19.3	05/17/01	7.6	4.4	08/12/01	18.7	3.4	8
South Myrtle Creek (T29S/R3W-11)	08/08/00	19.7	06/11/00	9.3	4.8	08/06/00	19.0	3.8	17
South Myrtle Creek (T29S/R3W-11)	08/10/01	19.7	05/17/01	7.7	5.3	08/12/01	19.1	3.7	14
South Myrtle Creek (above Lally Creek)	08/10/01	19.2	06/04/01	8.1	5.0	08/12/01	18.6	3.2	11

Table 5. Summer Stream Temperature Data Summarized by Year Collected by the Roseburg BLM District in the Myrtle Creek Watershed.

Stream Name	Date	Maximum Temperature (EC)	Date	Minimum Temperature (EC)	ªT	Seven-Day Averages			Days Greater Than 17.8E C
						Date	Maximum	ªT (EC)	
South Myrtle Creek (lower site)	07/21/94	24.1	10/13/94	7.5	5.2	07/21/94	22.5	3.7	56
South Myrtle Creek (lower site)	07/28/95	21.0	06/21/95	10.0	4.6	07/20/95	20.2	2.6	38
Weaver Creek (upper site)	08/06/97	17.3	06/06/97	9.5	3.3	08/08/97	16.5	2.7	0
Weaver Creek (upper site)	07/28/98	18.6	06/17/98	9.0	3.4	07/26/98	17.6	2.5	5
Weaver Creek (upper site)	08/28/99	17.6	06/09/99	6.8	3.7	08/26/99	16.9	2.2	0
Weaver Creek (upper site)	08/08/00	17.7	06/10/00	9.0	3.6	08/07/00	17.2	2.5	0
Weaver Creek (upper site)	08/12/01	18.0	06/04/01	7.7	4.5	08/12/01	17.6	2.6	2
Weaver Creek (lower site)	08/12/01	20.0	05/17/01	7.9	7.3	08/12/01	19.5	3.7	38

Definitions:
ªT = Highest value of daily difference between the maximum and minimum temperature for the season.
Seven-Day Maximum = Average value of daily maximum temperatures for the highest seven consecutive days.
Seven-Day Minimum = Average value of daily minimum temperatures for the same seven days.
Seven-Day ªT = Average of the daily difference between the maximum and minimum temperatures for the same seven days.

Seasonal Variation in Temperature and Flow

Stream temperature and flow vary seasonally and annually. Water temperatures are cool during the winter months but can exceed the state standard during the summer when streamflows are lowest and solar radiation and air temperatures are the highest. Normally stream temperatures increase in July and August when flows are receding but are not at their lowest flow level. However, maximum temperatures may occur earlier in the summer on streams with little shade (Johnson and Jones 2000). Water temperature data collected by BLM personnel in the Myrtle Creek Watershed were found to be highest during July and August when streamflows were lowest (see Table 5).

Minimum Flows

Streamflow normally decreases until September or October. The two-year recurrence interval, seven-day low flow for South Myrtle Creek near Myrtle Creek is 1.6 cfs (0.036 cfs per square mile) and for North Myrtle Creek near Myrtle Creek it is 2.0 cfs (0.037 cfs per square mile) (Wellman et al. 1993). The minimum discharge recorded between 1955 and 1972 on South Myrtle Creek near Myrtle Creek was 0.2 cfs on August 2, 1961. The minimum discharge between 1955 and 1986 on North Myrtle Creek near Myrtle Creek was no flow at times in July 1973 and August 1977. Low flows generally reflect annual precipitation levels with higher summer flows in wetter years and lower summer flows in drier years. Some variation in low flow from year to year is typical of streams in the Myrtle Creek Watershed. Summer streamflows are produced by the release of subsurface water. This is primarily dependent upon soil type, soil depth, and porosity. Generally, the soils and geology in the watershed do not allow subsurface water retention during the summer.

Timeline for Implementation

The problems leading to water quality limitations and 303(d) listing have accumulated over many decades. Natural recovery and restorative management actions to address these problems will occur over an extended period of time. The first priority is to correct the causes of the problems to avoid additional degradation. This has largely been accomplished through the use of Best Management Practices (BMPs). The second priority is to address the symptoms of the problems. This is accomplished through restorative management actions. Implementation will be continued until the restoration goals, objectives, and management actions described in this WQRP are achieved. The Aquatic Conservation Strategy contained in the NWFP describes restoration timeframes. The ACS seeks to prevent further degradation and restore habitat over broad landscapes as opposed to individual projects or small watersheds. Because it is based on natural disturbance processes, it may take decades, possibly more than a century to achieve objectives.

The South River Resource Area has completed an aquatic restoration assessment. This assessment discusses the restoration needs and ways to address those needs. In addition, the resource area has initiated a programmatic environmental assessment for implementing restoration projects within the next five to ten years.

Responsible Parties

Participants in this plan for Federally-administered lands include the BLM and ODEQ. The BLM is the lead agency in this plan because the BLM manages a large percentage of land in this watershed. Federal land managers agreed that the Federal agency managing the most land within a watershed would be the lead agency for completing a WQRP.

A summary Water Quality Management Plan (including information from this WQRP) for Myrtle Creek will be developed by ODEQ with assistance from the Oregon Department of Forestry (ODF) and the Oregon Department of Agriculture (ODA). The Oregon Water Resources Department (OWRD) may be a participant in the implementation and monitoring components of the Water Quality Management Plan (WQMP). The WQMP will address private forest, agricultural, and non-resource lands.

The ODF is the Designated Management Agency (DMA) regulating water quality on non-Federal forest lands. The Oregon Board of Forestry in consultation and with the participation and support of ODEQ has adopted water protection rules in the form of Best Management Practices (BMP) for forest operations. These rules are implemented and enforced by ODF and monitored to assure their effectiveness. The ODF and ODEQ will jointly demonstrate how the Oregon Forest Practices Act (OFPA), forest protection rules (including the rule amendment process), and BMPs adequately protect water quality.

Reasonable Assurance of Implementation

The BLM is responsible for creating and implementing public land management plans for lands under their jurisdiction. The plans are required to comply with the Clean Water Act and state environmental protection programs. These plans fully address water quality and provide the foundation for long term restorative processes that are passive in nature. These plans also protect overall water quality through Best Management Practices (BMPs) that guide land management activities including restoration and rehabilitation.

The BLM works cooperatively with other interested parties in the watershed. This includes watershed councils, other government agencies, and private entities. The problems affecting water quality are widespread. Activities need to be coordinated with other parties to accomplish watershed restoration.

Public Involvement

The SEIS ROD for the NWFP (USDA and USDI 1994) was signed in April 1994, following extensive public review. Watershed analysis is a required component (in certain situations, such as in Key Watersheds) of the Aquatic Conservation Strategy (ACS) under the NWFP. This WQRP is a procedural step that focuses on water quality using elements of the NWFP. It tiers to and appends the Myrtle Creek Watershed Analysis (USDI 2002). The watershed analysis describes the current conditions in the watershed in order to develop the appropriate context upon which this WQRP can base conclusions regarding BLM's ability to meet water quality requirements on Federally-administered lands.

The ODEQ procedure for public input offers a 30-day public comment period prior to submission of a WQMP to the Environmental Protection Agency (EPA). The ODEQ will provide appropriate public notice requesting comments on the information contained in the WQMP and state the document is pending submission to EPA. The public notice would provide people an opportunity to submit written or oral comments. A public hearing would be held if submitted comments indicate significant public interest, written requests from ten or more people are received, or an organization representing at least ten people requests a public hearing.

Chapter 2 - Condition Assessment/Problem Description

Parameter 1. Stream Temperature

Introduction/Listing Validation

For stream temperature, the affected beneficial uses are resident fish and aquatic life and salmonid fish spawning and rearing. Salmonid fish species require specific water temperatures at various stages of their fresh water life (ODEQ 1998b).

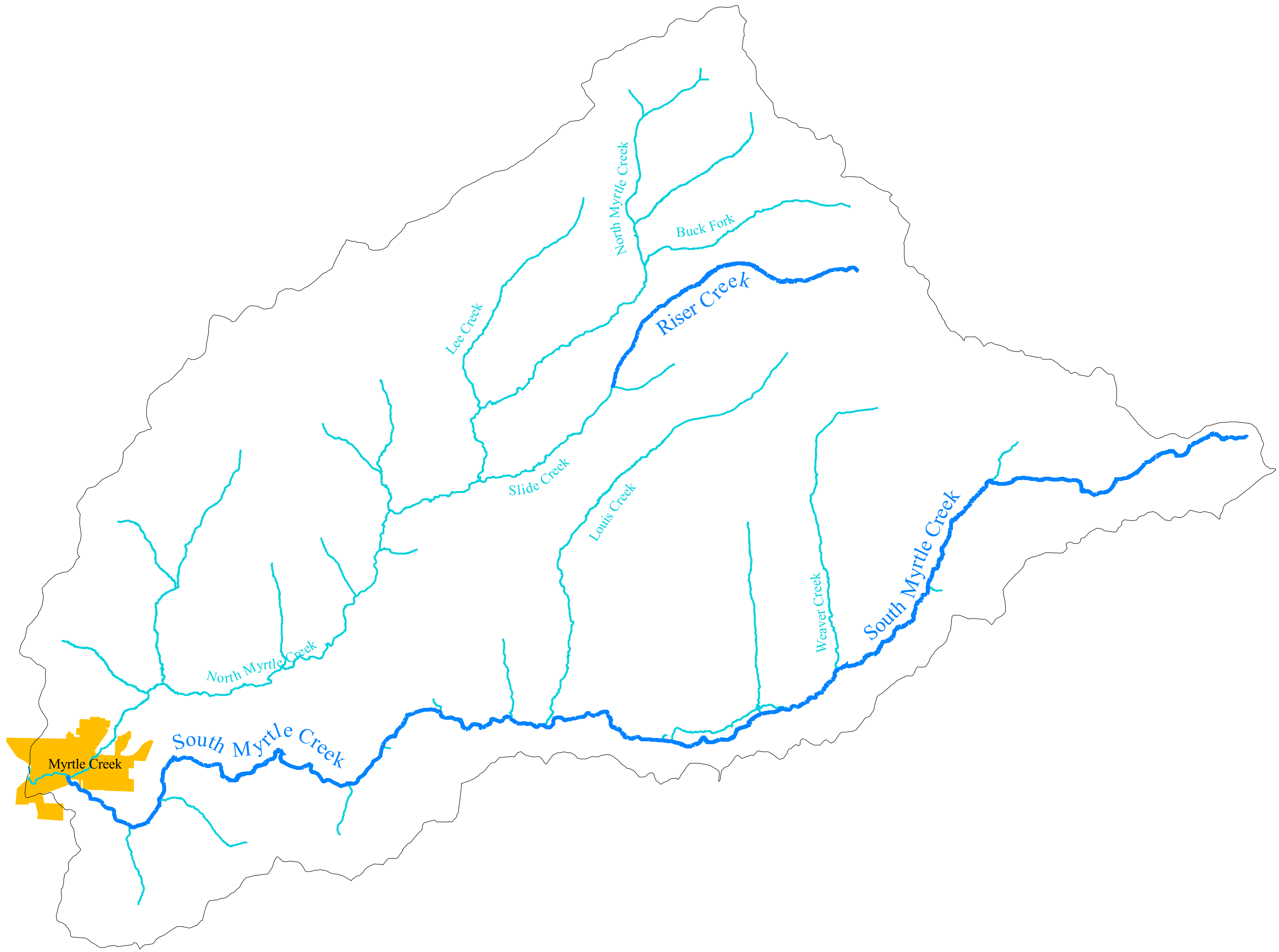
The Oregon water quality standard [OAR 340-41 – (basin) (2) (b)] that applies to the Umpqua Basin is:

> Standards applicable to all basins (adopted as of 1/11/96, effective 7/1/96):
> Seven (7) day moving average of daily maximum shall not exceed the following values unless specifically allowed under a Department-approved basin surface water temperature management plan:
>
> 17.8° C (64° F) Rearing (June 1 to September 14)
> 12.8° C (55° F) during times and in waters that support salmon spawning, egg incubation, and fry emergence from the egg and from the gravels (September 15 to May 31).

A stream is listed as water quality limited if there is documentation the moving seven-day average daily maximum temperature exceeds the appropriate standard. This represents the warmest seven-day period (usually occurring from late July to early September) and is calculated by a moving average of the daily maximum temperatures. The time period of interest for rearing is June 1 through September 14. Streams on the water quality limited list for temperature in the Myrtle Creek Watershed include South Myrtle Creek and Riser Creek (see Table 3 and Figure 1). The BLM collected summertime stream temperature data in the Myrtle Creek Watershed from 1994 to 2001 (see Tables 4 and 5). Locations of the water temperature monitoring sites are shown on Map 24 in the Myrtle Creek Watershed Analysis (USDI 2002). Data collected by the BLM show Buck Fork, Letitia, Louis (lower), North Myrtle (lower), Slide, and Weaver (lower) Creeks have also exceeded the water temperature standard (see Tables 4 and 5).

Stream temperature is driven by the interaction of many variables, such as stream channel characteristics. Streams with narrow channels tend to have cooler stream temperatures. A stream with a gentle gradient is typically wide, shallow, and has a slow velocity, which contributes to increased stream temperatures. Energy exchange may involve solar radiation, longwave radiation, evaporative heat transfer, convective heat transfer, conduction, and advection (Lee 1980 and Beschta and Weatherred 1984). For a stream with a given surface area and stream flow, an increase in the amount of heat entering a stream from solar radiation would produce a proportional increase in stream temperature (Brown 1972). Solar radiation is the most important radiant energy source heating streams during the day (Brown 1983).

Figure 1. Myrtle Creek Watershed Streams on the 1998 303(d) List of Water Quality Limited Streams for Exceeding the Water Temperature Standard



0 1 2 3 4 5 Miles

1:130000

Myrtle Creek Watershed Boundary
Temperature - 303(d) Listed
Fourth Order and Larger Streams

Management activities that decrease riparian shade and contribute to the introduction of bedload sediment, which results in increased width to depth ratios and stream surface area, can increase the amount of solar radiation intercepted by a stream. Water withdrawals during the summer may also increase the effect solar radiation has on water temperatures as demonstrated by Brown's equation (Brown 1972). This WQRP was developed to address stream shade, flow, and stream channel morphology as factors affected by land management activities that may contribute to elevated water temperature in the Myrtle Creek Watershed.

Disturbance of the riparian area and stream channel from landslides and floods can also increase the amount of solar radiation intercepted by a stream. However, these are considered natural processes and are "expected" change agents considered by the ACS (USDA and USDI 1994). The changes in riparian vegetation caused by landslides and floods will likely fluctuate within the range of natural variability for this watershed. Such an analysis is considered to be outside the scope of this assessment. This WQRP focuses on areas where Federal land management activities have influenced natural disturbance and affected water quality.

Temperature Factor 1. Stream Shade

Riparian vegetation can effectively reduce the total daily solar heat load. Without riparian vegetation, most incoming solar energy would be available to heat the stream. The shadow model (Park 1993) was used to estimate the amount of existing shade in riparian areas along perennial streams in the Myrtle Creek Watershed. Modeling parameters included active channel width, vegetative overhang, riparian tree height, shade density, and stream orientation. Active channel width, vegetative overhang, and the distance from the tree to the stream channel were calculated based on stream order or derived from field observations. Only data on BLM-administered lands were verified in the field. Data were not collected on private lands. Target shade was determined by using reference stream reaches. These reference stream reaches had trees in the riparian areas that were at the site potential tree height (which is considered to be the average maximum height and average maximum shade possible given site conditions). The number of years required for riparian vegetation to provide target shade was calculated based on the estimated number of years it would take trees to reach the site potential tree height. North Myrtle and South Myrtle Creeks were included in the assessment because they could influence water temperature in the South Umpqua River.

Stream channel shade changes as forest stands grow. The target shade value is calculated based on site characteristics and site potential tree height. Target shade values represent the maximum potential stream shade. Tables 6 and 7 display the existing and target shade values for Federally-administered and all lands in the Myrtle Creek Watershed. The type of disturbance listed was commonly "harvest", which means timber harvesting. Fire disturbance may have reduced shade in some areas of the watershed but fire was not listed separately. Other natural processes that may reduce shade in riparian areas include drought, insect damage, disease, and blow down. Shade along some portions of North Myrtle and South Myrtle Creeks has been reduced by agriculture and human settlement.

In the Myrtle Creek Watershed, the greatest loss of shade on Federally-administered lands is due to the harvest of trees in the riparian area. Based on the percent of stream miles and amount of shade loss, the North Myrtle Headwaters and South Myrtle Headwaters Drainages would be priority areas to conduct shade restoration activities on Federally-administered lands in the watershed (see Table 6). The decreased amount of shade on Federally-administered lands in these two Drainages probably had a small-to-moderate affect on increasing stream temperature within the Myrtle Creek Watershed.

Table 6. Current Shade Conditions and Potential Recovery on Federally-Administered Lands in the Myrtle Creek Watershed.

Subwatershed Drainage	Miles of Stream	Percent Existing Shade	Percent Probable Target Shade	Percent Difference Between Target and Existing Shade	Type of Disturbance	Years to Shade Recovery[1]
Upper North Myrtle 6th Field Totals	**2.1**	**80.6**	**95.5**	**-14.9**	**Harvest**	**40**
North Myrtle Headwaters	2.1	80.6	95.5	-14.9	Harvest	40
Middle North Myrtle	NA	NA	NA	NA	NA	NA
North Myrtle Frontal	NA	NA	NA	NA	NA	NA
Lower North Myrtle 6th Field Totals	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**
North Myrtle Park	NA	NA	NA	NA	NA	NA
Lick Frontal	NA	NA	NA	NA	NA	NA
Myrtle Creek	NA	NA	NA	NA	NA	NA
Lower South Myrtle 6th Field Totals	**0.1**	**80.5**	**89.9**	**-9.4**	**Harvest**	**24**
Myrtle Links	NA	NA	NA	NA	NA	NA
Short Course	NA	NA	NA	NA	NA	NA
Pack Saddle	NA	NA	NA	NA	NA	NA
School Hollow	0.1	80.5	89.9	-9.4	Harvest	24
Upper South Myrtle 6th Field Totals	**5.1**	**85.3**	**95.7**	**-10.5**	**Harvest**	**20**
Wiley Creek	NA	NA	NA	NA	NA	NA
Letitia Creek	NA	NA	NA	NA	NA	NA
Lally Creek	0.9	82.7	96.3	-13.6	Harvest	40
Curtin Creek	0.9	82.7	96.3	-13.6	Harvest	40
South Myrtle Headwaters	3.3	86.7	95.4	-8.7	Harvest	8

1. Years to Recovery uses the weighted average tree height with DEQ's site index scale for trees in the riparian area to determine the number of years needed to reach the target height.
NA = Federally-administered land does not occur along perennial stream channels in the Drainage.

Table 7. Current Shade Conditions and Potential Recovery for All Lands in the Myrtle Creek Watershed.

Subwatershed Drainage	Miles of Stream	Percent Existing Shade	Percent Probable Target Shade	Percent Difference Between Target and Existing Shade	Type of Disturbance	Years to Shade Recovery[1]
Upper North Myrtle 6th Field Totals	**9**	**69.0**	**93.3**	**-24.3**	**Harvest**	**49**
North Myrtle Headwaters	3.9	70.5	94.8	-24.4	Harvest	40
Middle North Myrtle	3.8	71.3	92.3	-21.0	Harvest	56
North Myrtle Frontal	1.3	58.1	91.3	-33.3	Harvest	56
Lower North Myrtle 6th Field Totals	**9.2**	**52.5**	**90.5**	**-37.9**	**Harvest**	**45**
North Myrtle Park	3.1	49.6	90.3	-40.7	Harvest	56
Lick Frontal	1.8	54.5	90.5	-36.0	Harvest	40
Myrtle Creek	4.3	53.9	90.6	-36.6	Harvest	40
Lower South Myrtle 6th Field Totals	**9.6**	**48.5**	**89.4**	**-40.9**	**Harvest**	**67**
Myrtle Links	1.9	48.0	88.5	-40.5	Harvest	72
Short Course	3.9	54.8	90.5	-35.7	Harvest	56
Pack Saddle	1.7	48.6	89.3	-40.8	Harvest	72
School Hollow	2.1	36.8	87.9	-51.1	Harvest	80
Upper South Myrtle 6th Field Totals	**12.5**	**67.7**	**93.5**	**-25.8**	**Harvest**	**50**
Wiley Creek	2.1	46.6	90.3	-43.6	Harvest	72
Letitia Creek	3.1	50.8	89.8	-39.0	Harvest	72
Lally Creek	3.9	75.8	96.5	-20.7	Harvest	56
South Myrtle Headwaters	3.4	86.8	95.5	-8.7	Harvest	8

1. Years to Recovery uses the weighted average tree height with DEQ's site index scale for trees in the riparian area to determine the number of years needed to reach the target height.

Summary and WQRP Targets

The NWFP provides Standards and Guidelines for the removal of trees in Riparian Reserves on Federally-administered land (USDA and USDI 1994). Current management activities are designed not to decrease the amount of shade covering stream channels. Thinning in Riparian Reserves may decrease stream shade in some areas during the first few years. However, these activities are designed to promote the growth of riparian trees and decrease the number of years to shade recovery. The data in Table 8 are an average of the amount of shade on North Myrtle and South Myrtle Creeks on Federally-administered lands in the watershed. Shade recovery on Federally-administered land in the watershed is expected to occur in about 26 years. However, some areas will take longer while other areas currently have the optimum amount of shade. Infrequent natural disturbances, such as floods and landslides, may affect shade recovery.

Table 8. Summary of Riparian Shade Conditions and Potential Recovery on Federally-Administered Lands in the Myrtle Creek Watershed.

Percent Existing Shade	Percent Probable Target Shade	Percent Difference Between Target and Existing Shade	Type of Disturbance	Years to Shade Recovery[1]	Proposed Treatments
84	96	-12	Harvest	26	Follow the Aquatic Conservation Strategy for Management Activities in Riparian Reserves Adjacent to Perennial Streams.

1. Years to Recovery uses the weighted average tree height with ODEQ's site index scale for trees in the riparian area to determine the number of years needed to reach the target height.

Temperature Factor 2. Flow

The temperature change produced by a given amount of heat is inversely proportional to the volume of water heated, such as the water in a stream (Brown, 1983). Water temperature in a stream with less flow will increase faster than a stream with more flow, if all other channel and riparian characteristics are the same.

Stream temperatures in the Myrtle Creek Watershed can be affected by groundwater flows. Groundwater input has the tendency to cool streamflow. The groundwater may come from fractured bedrock or deep soils that produce sustained summer flows. Shallow soils have low water storage capacities and contribute less to summer flows. Melting snow may also contribute to summer flows and cool stream temperatures. Groundwater inflow tends to cool summer stream temperatures and augment summertime flows. Reducing or eliminating groundwater inflow allows streams to become warmer. Water withdrawals are discussed in the flow modification parameter section. No Federal water withdrawals are affecting stream temperatures in the Myrtle Creek Watershed.

Temperature Factor 3. Stream Channel Morphology

While solar radiation and flow influence stream temperature, stream channel morphology can also affect stream temperature. Streams that are narrow and have a high percentage of their streambed dominated by cobble and gravel are affected less than wide channels that are dominated by bedrock. Large wood helps create stream channel morphology. Obstructions created by large wood allows gravel to be deposited. Gravel helps decrease thermal loading by reducing the amount of water exposed to direct solar radiation because some of the water flowing under the gravel. The removal of large wood has affected stream channel morphology. The large wood held the alluvial material in place, preventing the stream channels from down cutting and widening, which can increase stream temperatures. Stream morphology is discussed more in the habitat modification parameter section.

Management Actions

The NWFP Standards and Guidelines require Riparian Reserves along streams. Riparian Reserve widths, described in the ACS portion of the Standards and Guidelines, are based on the site potential tree height (160 feet in the Myrtle Creek Watershed) or a minimum slope distance, whichever is greatest, unless described otherwise in a watershed analysis. Timber harvesting in Riparian Reserves is allowed under certain conditions, such as when catastrophic events result in degraded riparian conditions or when thinning, salvaging, or fuelwood cutting would help attain ACS objectives. In addition, silvicultural practices to control stocking, re-establish and manage stands, and acquire desired vegetation characteristics be necessary to achieve ACS objectives.

Management activities to influence the amount of shade could include allowing riparian vegetation to grow to provide the target shade value and using silvicultural practices to meet ACS objectives. The watershed analysis recommends the following in Riparian Reserves:

- Thinning in Riparian Reserves to maintain or enhance the growth of conifers,
- Thinning in Riparian Reserves that are overstocked (due to fire suppression) to reduce fire hazard and loss of ecological function,
- Planting understocked Riparian Reserves to restore hardwood and conifer species,
- Fertilizing in Riparian Reserves to improve stand nutrition and accelerate tree and stand growth to develop late-successional conditions.

Areas to focus on might include:

- Dense stands,
- Dense stands with an elevated risk of catastrophic fires and loss of ecological function,
- Understocked stands that would provide the greatest benefit to streams on the water quality limited list for exceeding the water temperature standard.

Parameter 2. Habitat Modification

Introduction/Listing Validation

The beneficial uses affected by habitat modification include resident fish and aquatic life and salmonid fish spawning and rearing. The Oregon water quality standards that apply are:

> The creation of tastes or odors or toxic or other conditions that are deleterious to fish or other aquatic life, or affect the potability of drinking water, or the palatability of fish or shellfish shall not be allowed [OAR 340-41 – (basin)(2)(i)],

or:

> Waters of the State shall be of sufficient quality to support aquatic species without detrimental changes in the resident biological communities [OAR 340-41-027].

A stream is listed as water quality limited if there is documentation that habitat conditions are a limitation to fish or other aquatic life. North Myrtle Creek is listed for habitat modification (see Table 3 and Figure 2). North Myrtle Creek was listed because the Oregon Department of Fish and Wildlife (ODFW) aquatic habitat surveys indicated habitat conditions were a limitation to fish or other aquatic life.

The ODFW Aquatic Habitat Inventory (AHI) data and macroinvertebrate data collected by the BLM were used to document overall channel conditions and the biological potential of fish-bearing stream reaches in the watershed. The ODFW AHI surveys indicated many of the second through fifth order streams in the watershed do not meet the Large Woody Debris (LWD) Frequency (four or more functional key pieces of wood per 100 meters for 50 percent of the stream length) used by ODEQ to list a stream as water quality limited for habitat modification. Functional key pieces of wood are defined as at least 33 feet (10 meters) in length and 24 inches (0.6 meters) in diameter. A functional key piece of wood is defined as large woody debris with an adequate length and diameter to be stable in a stream channel. Five of the eight surveyed reaches on North Myrtle Creek do not meet the Oregon Coast Salmon Restoration Initiative (CSRI) key LWD criteria used by ODEQ (see Table 9). Therefore, the listing of North Myrtle Creek appears to be valid for habitat modification based on key LWD frequency.

Two of the eight surveyed reaches on North Myrtle Creek do not meet the CSRI Pool Frequency criteria (less than nine channel widths between pools for 60 percent of the stream length) used by ODEQ (see Table 9). Low pool frequency was identified by ODEQ as one of the causes for including North Myrtle Creek on the water quality limited list for habitat modification.

Figure 2. Myrtle Creek Watershed Streams on the 1998 303(d) List of Water Quality Limited Streams for Habitat Modification

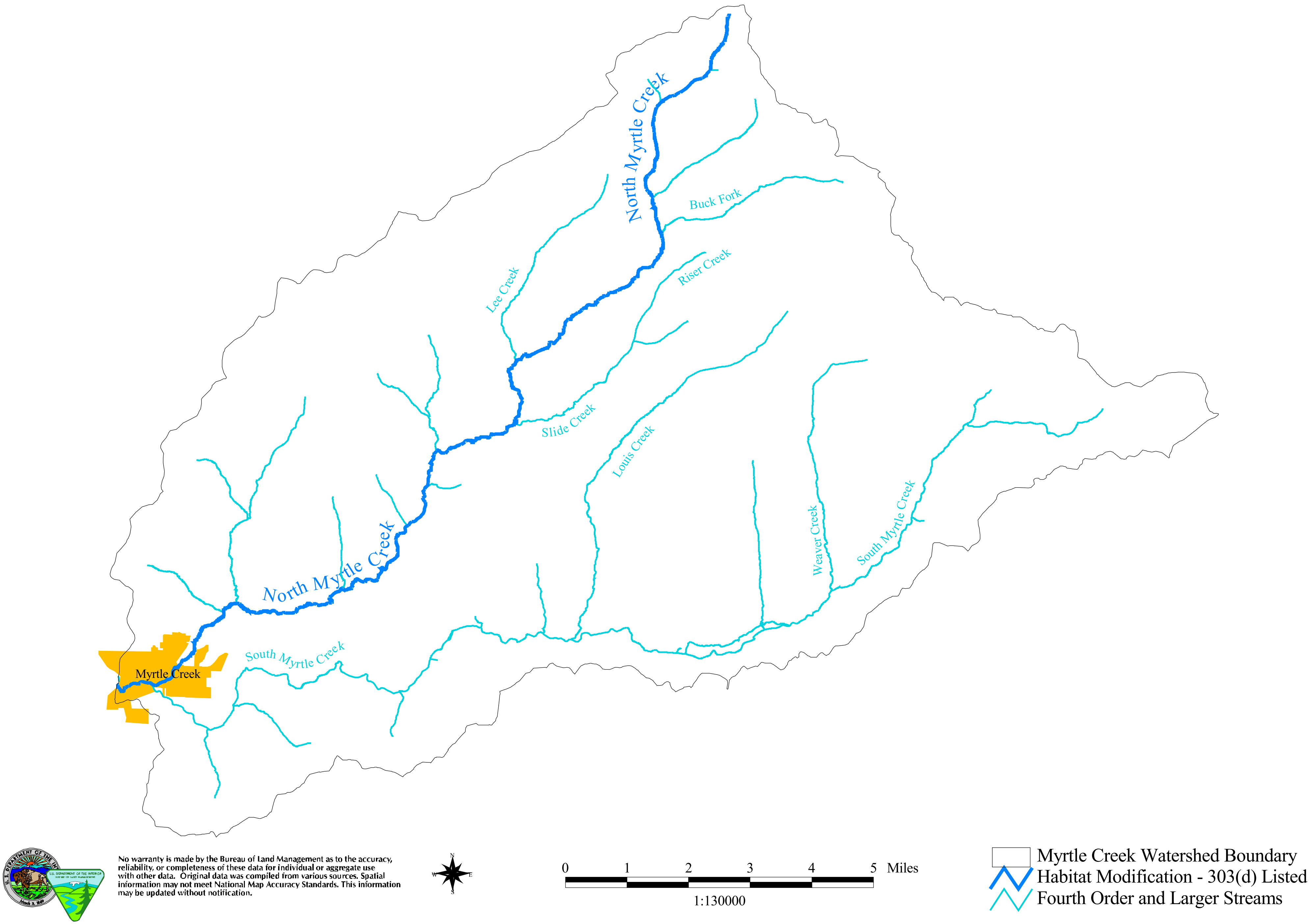


Table 9. Summary of ODFW Habitat Data Used by ODEQ to Place North Myrtle Creek on the Water Quality Limited List for Habitat Modification.

Stream Name	Reach Number	Large Woody Debris Frequency per 100 Meters (CSRI Standard = At Least 4 per100 Meters)	Pool Frequency, Channel Widths Between Pools (CSRI Standard = Less Than 9)
North Myrtle Creek	1	0.4	7.4
	2	1.2	5.0
	3	2.1	4.6
	4	3.1	4.8
	5	4.2	6.1
	6	14.7	10.1
	7	9.1	15.6
	8	2.6	0

Aquatic Habitat Inventory

The analysis of stream survey data for this WQRP concentrated on five attributes at the stream reach scale: 1) percent pool area, 2) riffle width/depth ratio, 3) riparian vegetation size, 4) pieces of large wood, and 5) key pieces of large wood. All of these attributes, except for riparian vegetation size, have been accepted by Federal and State teams in Oregon as core attributes needed to assess stream conditions. In addition, they are included in the Interagency Aquatic Database and GIS, which is a compilation of stream surveys from various agencies in Oregon. These attributes are inventoried by the Forest Service, BLM, and ODFW following similar protocols. Riparian vegetation size is discussed in this WQRP because of important relationships between aquatic and riparian functions.

Data collected in the ODFW AHI can be used to identify the components that may limit the aquatic habitat and 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) to rank aquatic habitat conditions. The BAT consists of fisheries biologists from the Southwest Regional Office of the ODFW, Coos Bay BLM District, Roseburg BLM District, Umpqua National Forest, and Pacific Power. This group of local fisheries biologists addresses and resolves local questions and problems associated with the fisheries resource in the Umpqua Basin. The matrix designed by the BAT provides a framework to easily and meaningfully categorize habitat condition. This matrix is not intended to reflect quality of the habitat condition of each stream reach but to summarize the overall condition of the surveyed reaches. The matrix consists of four rating categories Excellent, Good, Fair, and Poor. How the ratings correlate with the National Marine Fisheries Service (NMFS) Matrix are shown in Table 10. The NMFS Matrix is used during Section 7 consultation with NMFS to determine the effects of a land management action on fisheries and fish habitat.

Table 10. Comparison of the Aquatic Habitat Ratings (AHR) to the NMFS Matrix Ratings.

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

The ODFW conducted Aquatic Habitat Inventories on ten streams in the Myrtle Creek Watershed. Most of the 50 stream reaches identified in the inventories were rated as being in fair condition (see Table 11). One stream reach (on South Myrtle Creek) was rated as good, two of the stream reaches were not rated, 30 were rated as fair, and 17 were rated as poor. The lack of LWD seemed to be the limiting factor in most of the stream reaches. Sediment in fish spawning habitat, hardwood dominated riparian areas, the lack of large conifers available for future recruitment of LWD, low percent pool area, and the lack of shade contributing to higher stream temperatures were other limiting factors in some of the stream reaches.

Table 11. Summary of ODFW Survey Data in the Myrtle Creek Watershed

Stream	Reach	% Pool Area	Residual Pool Depth	Riffle W/D Ratio	% Fines in Riffles	% Gravel in Riffles	Riparian Vegetation	Riparian Vegetation Size	LWD Pieces per 100m	Key LWD Pieces	Aquatic Habitat Rating (AHR)
Bilger Creek	1	1.5	0.2	30	0	0	Mature Deciduous	Large	1.2	0	Poor
	2	13	0.4	36.7	13	29	Mature Deciduous	Large	0.6	0	Poor
	3	1.7	0.3	10	10	33	Mature Deciduous	Large	0.8	3	Fair
Buck Fork Creek	1	36.6	0.4	19.2	35	44	Deciduous	Medium	4	4	Fair
	2	19.4	0.3	9	17	78	Mixed Large Conifer/Deciduous	Large	6.3	3	Fair
		35.5	0.2	8.6	49	39	Mixed Conifer/Deciduous	Medium	4.8	1	Poor
	4	1.5	0.3	20	62	38	Conifers	Medium	317.2	3	Fair
Frozen Creek	1	43.3	0.5	36.4	21	64	Shrubs	Shrubs	1.4	0	Fair
		36.6	0.4	20.1	31	56	Shrubs	Shrubs	0.5	0	Fair
	3	2.3	0.3	15	50	36	Mixed Conifer/Deciduous	Medium	2.7	0	Fair
	4	3.3	0.4	23.1	59	32	Large Conifers	Large	8.3	24	Fair
Lee Creek	1	38.5	0.4	16.4	24	72	Mixed Conifer/Deciduous	Medium	2.6	0	Fair
3		48.7	0.3	16.2	62	32	Mature Conifers	Large	7.2	3	Fair
North Myrtle Creek	1	35	0.5	56.2	9	42	Large Deciduous	Large	0.4	0	Poor
		41.9	0.6	39.9	8	53	Large Deciduous	Large	1.2	1	Fair
2		44.1	0.6	50.8	9	54	Large Deciduous	Large	2.1	0	Poor
		58.4	0.6	39.4	10	39	Large Deciduous	Large	3.1	0	Poor
		42.3	0.4	42.5	9	35	Mature Conifers	Large	4.2	1	Poor
		31.3	0.4	25.9	24	22	Deciduous	Medium	14.7	8	Fair
2		14.6	0.3	25.1	29	36	Deciduous	Medium	9.1	7	Poor
	8	--	0	–	--	--	--	–	2.6	24	Poor

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Table 11. Summary of ODFW Survey Data in the Myrtle Creek Watershed

Stream	Reach	% Pool Area	Residual Pool Depth	Riffle W/D Ratio	% Fines in Riffles	% Gravel in Riffles	Riparian Vegetation	Riparian Vegetation Size	LWD Pieces per 100m	Key LWD Pieces	Aquatic Habitat Rating (AHR)
Riser Creek	1	89.8	0.4	17.4	34	65	Mature Conifers	Large	10.3	15	Fair
		97	0.2	16.7	56	35	Shrubs	Shrubs	10.6	3	Fair
		84.5	0.3	18.3	43	45	Conifers	Medium	8.7	31	Fair
		–	–	–	--	--	Conifers	Medium	7.9	0	Poor
Slide Creek	1	55.3	0.4	14.7	25	66	Deciduous	Medium	6.6	1	Fair
	2	63.9	0.4	20.2	33	63	Mixed Large Conifer/Deciduous	Large	6.1	6	Fair
		91	0.3	20.8	52	47	Large Conifers	Large	9	9	Fair
		25.4	0.5	10	79	21	Mature Conifers	Large	9	14	Fair
2 South Myrtle Creek	1	24.4	0.6	38.1	15	54	Large Deciduous	Large	2.2	0	Poor
3		13.5	0.7	31.1	26	34	Large Deciduous	Large	6.6	1	Fair
4		19.7	0.6	35.9	45	27	Deciduous	Medium	8.9	1	Fair
	4	--	--	--	--	--			--	--	--
		29.7	0.7	33.9	26	10	Deciduous	Medium	1.9	0	Poor
3	6	--	--	--	--	--			--	--	--
4	7	32.1	0.9	26.4	19	5	Mixed Large Conifer/Deciduous	Large	2.1	3	Fair
	8	5.9	0.6	36.5	30	18	Deciduous	Medium	5.8	1	Poor
2	9	9.9	0.6	40.6	39	20	Mixed Large Conifer/Deciduous	Large	6.6	2	Poor
3	10	24	0.4	17	28	28	Mixed Large Conifer/Deciduous	Large	27.8	47	Fair
		56.2	0.6	65.9	36	44	Mature Conifers	Large	12.1	2	Fair
5		10.6	0.5	19.3	19	32	Old-growth Conifers	Large	8.8	29	Fair
	13	8.7	0.3	20.4	49	43	Old-growth Coniferous	Large	32.7	18	Fair

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Table 11. Summary of ODFW Survey Data in the Myrtle Creek Watershed

Stream	Reach	% Pool Area	Residual Pool Depth	Riffle W/D Ratio	% Fines in Riffles	% Gravel in Riffles	Riparian Vegetation	Riparian Vegetation Size	LWD Pieces per 100m	Key LWD Pieces	Aquatic Habitat Rating (AHR)
		49.7	2.1	8	50	50	Old-growth Coniferous	Large	39	6	Good
West Fork of Frozen Creek	1	16.9	0.3	25.5	12	56	Mixed Large Conifer/Deciduous	Large	2.3	0	Fair
		0.9	0.3	10	5	57	Deciduous	Medium	2.1	1	Poor
	3	–	–	–	–	--	Old-growth Conifers	Large	2.9	5	Poor
Weaver Creek	1	21.3	0.4	29.3	29	23	Mixed Conifer/Deciduous	Medium	0.9	0	Poor
		33.9	0.4	47.6	35	33	Mixed Conifer/Deciduous	Medium	5.2	32	Fair
	3	25.8	0.2	21.4	31	32	Mixed Large Conifer/Deciduous	Large	11.7	25	Fair
14	4	7.4	0.2	14	33	31	Mature Conifers	Large	5	33	Fair

-- = no data available

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Individual Attribute Discussion

Large Wood

Large woody debris is an important part of stream morphology. Large woody debris traps and stores sediment and organic material (which are important to aquatic species) and dissipates stream channel energy. Energy dissipation in a stream with adequate amounts of large wood varies greatly along the channel length and results in a channel form that is diverse. This channel form diversity is displayed by the frequent occurrence of pools, with scour occurring at stable LWD sites, rather than along the entire reach. Scouring can lead to channel incision, unstable banks, bank erosion, channel widening, and loss of channel complexity and habitat diversity (Montgomery and Buffington 1993). The presence of LWD in a system may also decrease peak flow magnitude and lengthen the time when the peak flow occurs (decreases the flashiness).

Past management practices, such as stream cleaning, road construction, and salvaging activities in riparian areas, left many streams lacking in LWD. The early seral vegetation along many of the streams does not allow the recruitment of LWD. The removal of large wood from the stream and potential woody debris from the riparian area had the greatest direct impact on stream channel morphology in the Myrtle Creek Watershed.

Most of the anadromous fish-bearing stream reaches surveyed by ODFW in the watershed are deficient in LWD. The low frequency and volume of instream wood has resulted in fewer pool habitats for fish. The lack of instream large wood has, in most instances, negatively altered stream channel dynamics, such as bedload transport and stream substrate distribution. Other stream channel characteristics impacted by the lack of LWD include stream channel sinuosity, streambank stability, and floodplain interaction. Limiting a stream's ability to overflow onto the floodplain during high stream flow events inhibits stream channel hydraulics and channel dynamics. Normally, these conditions cause the channelization of stream flow and channel incision. Bureau of Land Management survey crews observed many streams on BLM-administered land in the Myrtle Creek Watershed are incised and disconnected from their floodplain.

Channel Complexity (Pools)

Research has demonstrated that channel complexity, especially slow water habitat, is a major limiting factor of fresh water habitat for coho salmon (Dolloff 1986). Pool habitat is an essential habitat component for rearing salmonids. Pools are most productive when large wood is present. Large woody debris provides cover in the summer and winter and velocity refuges during floods. Fish population surveys found the most coho salmon in slow water areas, pools behind beaver dams, and channel spanning pools (State of Oregon 1997).

Complex channels have higher proportions of slow water habitat created by LWD, meanders, and beaver activity (Meehan 1991). Although no direct links between pools and sedimentation have been found, studies indicate excessive sedimentation may play a role in reducing pool depth and frequency (Lisle and Hilton 1992).

Width to Depth Ratio

Increased channel widths have been attributed to changes in the stream flow regime due to timber harvesting, road construction, and simplification of the stream channel by the removal of LWD from the channel and the riparian area (Dose and Roper 1994). Peak flows can introduce sediment into the channel from upslope and upstream and can simplify the channel by rearranging instream structures. Excess sediment delivery to streams usually changes stream channel characteristics and channel configuration. These changes in the stream channel decrease the depth, number of pool habitats, and space available for rearing fish (Meehan 1991). These changes in channel condition may have contributed to the decline of anadromous salmonid stocks in the Myrtle Creek Watershed.

The ODFW habitat survey data (see Table 11) shows that most stream reaches surveyed in the Myrtle Creek Watershed had riffle width to depth ratios ranging from excellent to poor, with an average rating of fair. About one-half of all reaches were rated as fair or poor. The criteria for the Aquatic Habitat Rating are shown in Table 12. The data indicates channel widening may have occurred in some stream reaches in the Myrtle Creek Watershed.

Table 12. Aquatic Habitat Rating System.

Rating Category	% Pool Area	Pool Frequency (Riffle Widths Between Pools)	Riffle W/D Ratio	% Fines in Riffles	Riparian Vegetation Size (≥ 50 cm DBH/305m)	LWD Pieces per 100m	Key LWD Pieces per 100m ≥ 60 cm Diameter
Excellent	$45	--	#10	#1	--	$30	--
Good	31-44	# 8	11 to 20	2 to 7	--	20-29	$ 4
Fair	16-30	--	21-29	8 to 14	--	11 to 19	--
Poor	#15	--	$30	$15	--	#10	--

-- = No Data

Riparian Vegetation Size

The historical condition of the riparian zone along the upper portions of North Myrtle and South Myrtle Creeks probably favored conditions typical of old-growth forests found in the Pacific Northwest. Mature trees probably provided more shade along North Myrtle and South Myrtle Creeks and their tributaries than current conditions. In addition, streambanks would have been protected by the massive root systems of mature trees.

Management activities in the watershed have been extensive since the early 1900s. Timber harvesting practices often removed standing trees, instream wood, and downed wood lying on floodplains. The ODFW aquatic habitat inventory data classified riparian vegetation size as shrubs or medium sized trees on about 40 percent of the stream reaches surveyed.

Biological Assessment

Aquatic macroinvertebrates are the primary food source for young salmonids and are an essential component of the food web in western Oregon streams. Many macroinvertebrates are sensitive to physical and chemical changes in habitat and indicate habitat conditions throughout their entire life cycles. Consequently, they are useful indicators of cumulative stress to aquatic systems.

Much of the land along South and North Myrtle Creeks is flat and has been converted to agricultural use. In the agricultural areas many of the tributaries have been straightened. Riparian areas may have a thin buffer of deciduous trees along the streambanks. Landscape changes may adversely impact aquatic life in the adjacent streams.

Macroinvertebrate community status is one accepted ODEQ 303 (d) listing criteria for determining impairment of aquatic life uses where habitat conditions may be limiting, including the listing parameters of habitat modification, flow modification, sedimentation, and biological criteria. Macroinvertebrates are not used as 303 (d) listing criteria for temperature. However, habitat modification often causes increased stream temperatures, which may stress aquatic communities.

Macroinvertebrates were collected at twelve BLM stream temperature monitoring stations in the watershed in 2001. The data are shown in Figures 3 and 4 and summarized in Table 13. The macroinvertebrate Level III protocols described in the "Oregon Plan for Salmon and Watersheds: Water Quality Monitoring Guidebook. Version 2.0" were used for the field and laboratory procedures. Macroinvertebrates were collected using a d-frame kicknet with a 30 centimeter opening and a 500 micron mesh net. Samples were collected from representative riffle habitats within the sampled reach. Sampling in riffle habitats allows the best comparisons between streams and analyses of long term trends because riffles usually have the highest diversity of invertebrate species.

The Oregon DEQ Level III Biotic Index (BI) for macroinvertebrates was used to evaluate trends in the composition of the invertebrate community. The index was developed for western Oregon and is a composite of various metrics which measure macroinvertebrate community characteristics known to change because of human activities, such as total taxa richness, mayfly richness, and the number of sediment intolerant taxa. The BI indicates no impairment when the value is greater than 39 (maximum score is 50), slight impairment when the value is between 30 and 39, and moderate impairment when the value is between 20 and 29. Other habitat information was gathered using the EPA Rapid Habitat Assessment techniques described in Barbour et al. (1999).

The BI data indicated eight sites have slight impairment and four sites have moderate impairment. Moderate impairment may justify listing a waterbody as water quality limited. The four moderately impaired streams include lower Weaver Creek, lower Louis Creek, lower North Myrtle Creek, and Slide Creek (near the mouth). These sites have the lowest BI and habitat scores and have the highest number of days above the temperature standard (17.8^{o} C).

Figure 3. Comparison Between the Habitat Scores and the Biotic Index in 2001.

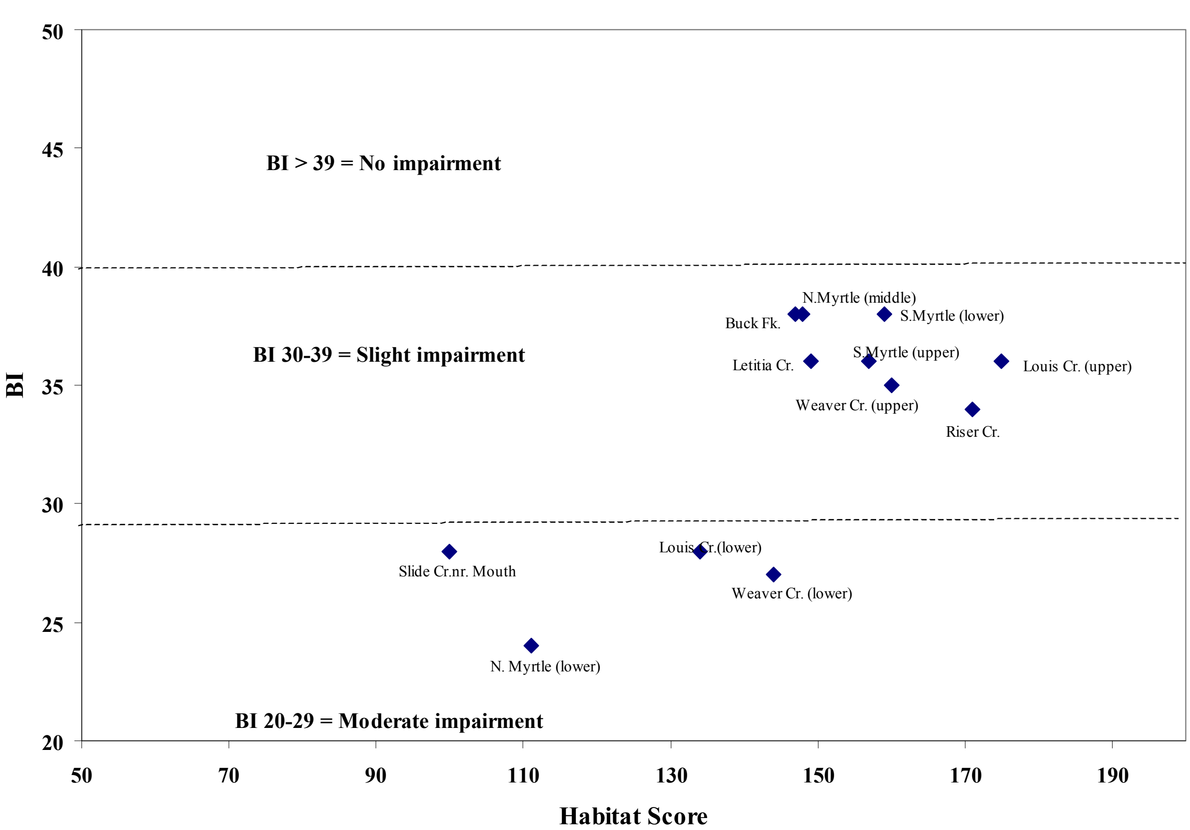


Figure 4. Comparison Between the Maximum Days Over 17.8 Degrees Celsius and the Biotic Index in 2001.

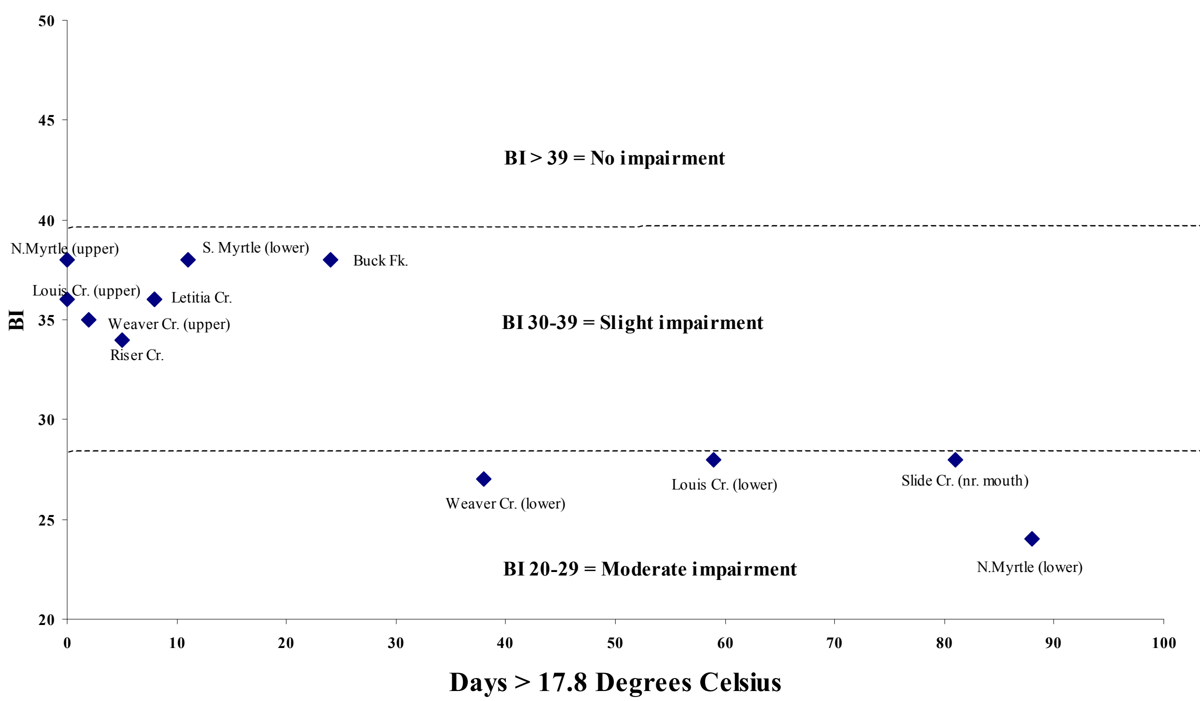


Table 13. Comparison of the Biotic Index, Habitat Score, and the Number of Days Stream Temperature Exceeded 17.8 Degrees Celsius at Macroinvertebrate Collection Sites in the Myrtle Creek Watershed.

	Biotic Index	Habitat Score	Days over 17.8° C
South Myrtle Creek Subwatershed			
South Myrtle Creek (lower)	38	159	11
South Myrtle Creek (upper)	36	157	8
Letitia Creek	36	149	8
Louis Creek (upper)	36	175	0
Weaver Creek (upper)	35	160	2
Louis Creek (lower)	28	134	59
Weaver Creek (lower)	27	144	38
North Myrtle Creek Subwatershed			
North Myrtle Creek (middle)	38	148	0
Buck Fork Creek	38	147	24
Riser Creek	34	171	5
Slide Creek	28	100	81
North Myrtle Creek (lower)	24	111	88

Moderate biological impairment recorded at the lower North Myrtle Creek site supports the current 303(d) habitat modification listing for the lower portion of North Myrtle Creek up to the middle site. Land ownership upstream of the lower North Myrtle Creek site is predominantly private. The Slide Creek (near the mouth) site also scored as moderately impaired. Both sites were qualitatively judged habitat limited because of suboptimal stable substrate available for colonization (i.e. cobble, boulders, instream woody debris), stream substrates embedded approximately forty percent, and channel alteration.

Embeddedness can adversely affect macroinvertebrate diversity and abundance and successful salmonid spawning and rearing (Meehan 1991, Chapman and McLeod 1987, and Welch 1980). Embeddedness describes the degree large particles (boulders, rubble, gravel) are surrounded or covered by fines and is detrimental to aquatic invertebrates (MacDonald et al. 1991). Human activities frequently increase surface erosion and fine particles downstream from source areas. The distribution of macroinvertebrate taxa is determined to a large extent by substrate type (Minshall 1984). Many macroinvertebrates found in undisturbed montane watersheds require relatively clean substrates with some free space underneath and between rocks. This interstitial living space is used to escape predators and high stream velocities as place attachment sites and provide feeding sites where organic material is produced or retained.

Macroinvertebrate sampling stations were not located in the reach of South Myrtle Creek listed for flow modification (mouth to Weaver Creek) because of access difficulties. However, two sites were sampled on South Myrtle Creek above Weaver Creek at locations which drain predominately BLM-administered lands. The BI values for these sites were 38 and 36, which indicates slight impairment (see Figures 3 and 4). The BI values at lower Louis Creek and lower Weaver Creek indicated moderate biological impairment (see Figures 3 and 4). The upper Louis Creek and upper Weaver Creek sites, which drain primarily BLM-administered lands, had BI values eight points higher (see Table 13). This relation between upper and lower sites corresponds with decreased habitat scores and increased number of days temperatures exceeded 17.8^{o} C. The values may be related to more intensive land use in the lower portions of the drainages. Table 14 compares the results between macroinvertebrate sampling and the water quality limited stream segments.

Table 14. Comparison Between Macroinvertebrate Sampling and Water Quality Limited Streams.

Listed Segment	303 (d) Listed Parameter	Biotic Index	Impairment
North Myrtle Creek (mouth to headwaters)	Habitat Modification	Middle Site = 38	Slight
		Lower Site = 24	Moderate
Riser Creek	Temperature	One Site = 34	Slight
South Myrtle Creek (mouth to Weaver Creek)	Flow Modification	No Sites	
South Myrtle Creek (mouth to headwaters)	Temperature	Upper Site = 36	Slight
		Lower Site = 38	Slight

Results of the macroinvertebrate sampling indicate that lower Louis Creek, lower Weaver Creek, and Slide Creek could be water quality limited for biological criteria. However, the data was collected in 2001, during a drought year. Sampling during a year with a normal amount of precipitation may produce different results. It is possible that unusually low streamflows, either through physical or temperature controls, eliminated or altered emergence times of invertebrates resulting in a overall decline in the Biotic Index.

Management Actions

Protective and restorative management actions would be used to achieve water quality and fish habitat goals. Protective actions are the cessation of human activities that cause habitat modification or prevent recovery. They include maintaining LWD in stream channels and allowing riparian vegetation to grow. These protective actions would improve large wood recruitment and bank stabilization.

Restorative actions recover aquatic processes and functions. Thinning in Riparian Reserves would promote large conifer growth. Placing large wood in streams would actively restore the aquatic habitat. Reducing the amount of sediment entering streams would focus on the source and placing structures in streams would address the symptoms. Placing large wood in streams will be done as opportunities occur and based on an assessment of local conditions (where it historically accumulated, where downed wood is readily available, where habitat is needed, and in depositional stream reaches).

Restorative measures to address the temperature listings will also improve aquatic habitat. Table 15 provides a summary of habitat elements, affected processes, and management actions. The table shows a particular management action can affect numerous processes and that it is important actions occur in both the upland and riparian areas.

Table 15. Habitat Elements, Affected Processes, and Potential Management Activities to Restore Aquatic Habitat.

Habitat Element	Affected Process	Management Actions	
		Upland	Riparian
Water Temperature	Riparian canopy closure		Maintain effective stream buffers. Apply silviculture treatments to maintain or enhance tree growth or diversity in riparian areas.
	Sedimentation	Locate and avoid unstable areas. Decommission or improve roads.	Decommission or improve roads.
	Increased peak flows and channel scour	Maintain canopy closures. Decommission or improve roads.	Maintain effective stream buffers.
	Instream wood		Add large wood to streams.
Flow	Bank erosion and channel scour	Maintain canopy closures.	Add wood to streams.
	Stream extension and road ditch lines	Decommission or improve roads.	Decommission or improve roads.
Stream Structure	Stream cleaning		Add large wood to streams.
	Bank erosion and increased peak flows	Maintain canopy closures. Decommission or improve roads.	Apply silviculture treatments to maintain or enhance tree growth or diversity in riparian areas.
	Riparian harvest		Apply silviculture treatments to maintain or enhance tree growth or diversity in riparian areas.

Parameter 3. Flow Modification

Introduction/Listing Validation

The primary beneficial uses affected by flow modification are resident fish and aquatic life and salmonid spawning and rearing. Flow modification refers to human-caused reductions in instream flows that creates a limitation to fish or other aquatic life. According to ODEQ listing criteria, the human contribution is evidence of water rights and diversions above or in the stream segment (ODEQ 1998b). The applicable water quality standard is:

> Waters of the state shall be of sufficient quality to support aquatic species without detrimental changes in the resident biological communities.

Water withdrawn during summer low flows may decrease available habitat for aquatic life, increase water temperatures and pH, and decrease dissolved oxygen. Conversely, additional flow should benefit these other listed parameters and improve habitat quality for aquatic life (see Temperature Factor 2). Effective water quality restoration is directly related to the ability to keep water in stream channels and will be unattainable without sufficient flows (USDA et al. 1999).

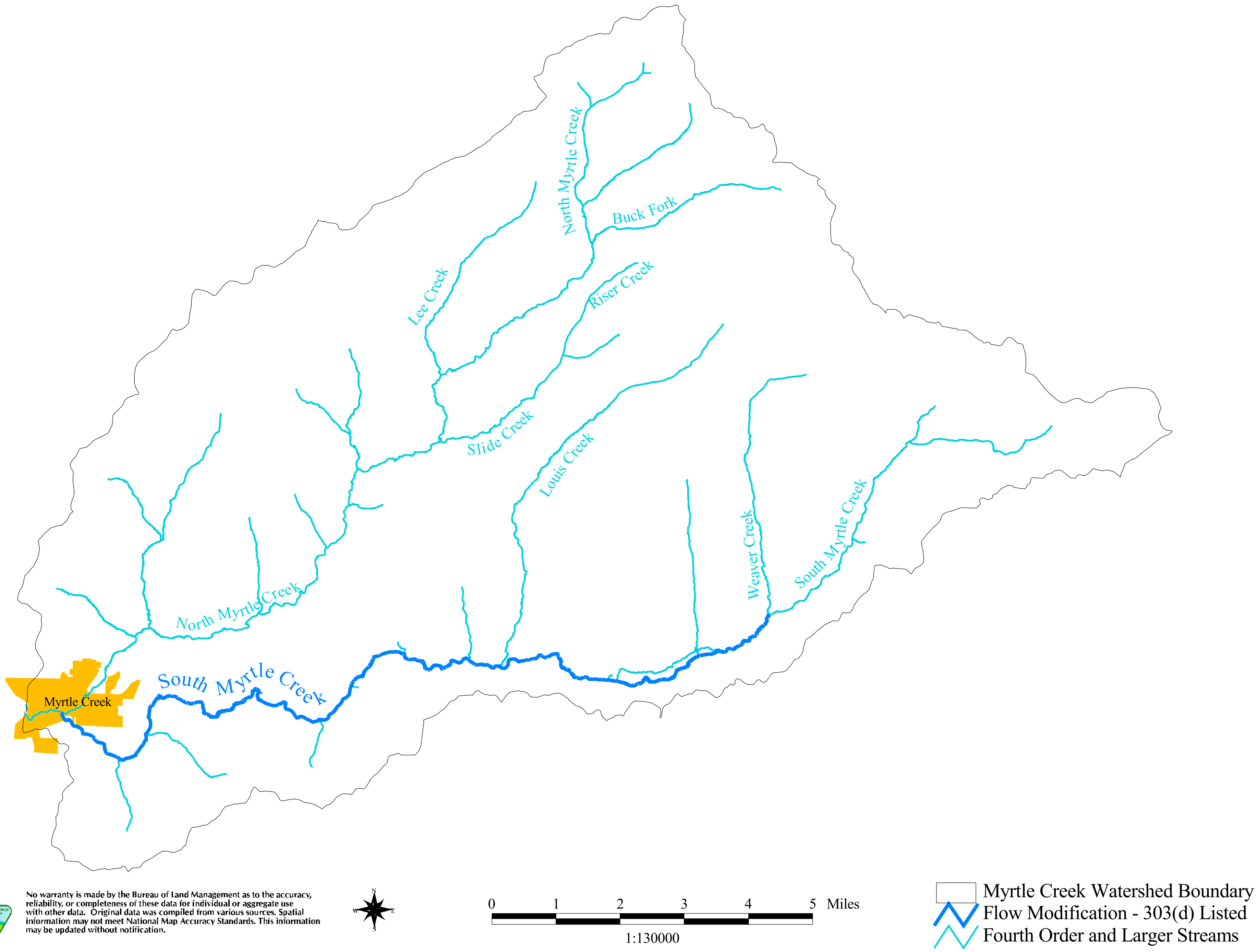
South Myrtle Creek is listed for flow modification from the mouth to Weaver Creek (see Table 3 and Figure 5). United States Geological Survey (USGS) flow data was used to place this segment on the 303(d) list (ODEQ 1998). These data show that instream water rights are not met during part of the year. Supporting data for the listing includes a 1992 ODFW report, which states sea-run cutthroat trout and coho salmon have severely depressed populations because of low flows and flow alteration from water withdrawals. The listing appears valid because flow data shows minimum instream flows designed to protect beneficial uses are not met in some years.

Summer flows may be diminished by irrigation withdrawals. This assumption could be verified by collecting summer flow data. Consumptive use may be lowering summer stream levels and is one important element in explaining summer temperature increases in lower South Myrtle Creek.

Changes in channel morphology (F channel types) and channel complexity decrease summer flows because these changes decrease water storage. Water withdrawals also decrease summer flows. These factors contribute to higher summer stream temperatures.

Removal of forest vegetation has been shown to increase low flows by reducing evapotranspiration (Harr and McCorison 1979). Species conversion from conifers to hardwoods (such as red alder) can decrease summer low flows because red alder species transpires more water during the summer than conifers. However, water loss in streams because of species conversion has not been studied in this watershed.

Figure 5. Myrtle Creek Watershed Stream Segments on the 1998 303(d) List of Water Quality Limited Streams for Flow Modification



No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data was compiled from various sources. Spatial information may not meet National Map Accuracy Standards. This information may be updated without notification.

Existing Water Rights

There are 558 appropriated water right permits totaling approximately 55 cubic feet per second (cfs) of streamflow in the watershed. Seventeen permits for water diversion or storage total 35 acre feet. Water withdrawal is significant when compared to instream summer low flows in South Myrtle Creek. The water is used for domestic, irrigation, livestock, industrial, municipal, fish, mining, and forest management purposes. The largest use of appropriated water rights in this watershed is for irrigation.

Instream Water Rights and Low Flows

The OWRD established two instream water rights on the South Umpqua River because summer low flows may be further reduced by human water withdrawals. In order to provide for adequate flows that support beneficial uses, minimum instream flows were designated for reaches of the Umpqua River (Douglas County Watermasters Office, personal communication, 2002). The first instream water right at the mouth of the South Umpqua River established by OWRD has a priority date of March 26, 1974. Table 16 lists minimum instream flows that must be maintained at the mouth of the South Umpqua River. When flows fall below these levels upstream consumptive water users with water rights after March 26, 1974 are restricted, except for domestic water use or irrigation of up to one-half acre gardens. The second water right at the mouth of the South Umpqua River is 60 cfs was established (year round) on October 24, 1958. When flows fall below this volume, at this point in the river (any time of the year), upstream consumptive water users with water rights after that date are restricted.

Table 16. Monthly Minimum Instream Flows in Cubic Feet per Second (cfs) at the Mouth of the South Umpqua River for the Priority Date of March 26, 1974.

December Through April	May	June	July	August	September	October 1 Through 15	October 16 Through 31	November
350	275	225	150	90	90	90	300	400

Flows below those listed for instream rights, and the subsequent restriction of water use, occur frequently during summer in the watershed (Williams, personal communication, 2000). Water in the South Umpqua River is over-appropriated and, according to state law, no new water rights are being allocated except where public interest in those uses is high and uses are conditioned to protect instream values (OAR 690-410-070).

Streamflow Restoration Plan

The Oregon Water Resources Department (OWRD) in cooperation with ODFW has developed a Streamflow Restoration Plan for the Umpqua Basin. Smaller basins inside the Umpqua Basin were prioritized by biological needs for additional flow and existing opportunities for restoring instream flows. The plan recommends a complete inventory of water rights, improving efficiency, a coordinated enforcement plan, education, additional monitoring and other measures to increase summer flows.

BLM Water Rights and Water Use

Most streams in the higher elevations of this watershed are not impacted by irrigation withdrawals. However, water may be withdrawn from streams in the higher elevations for road maintenance and fire protection. The state requires reporting yearly water use for these activities. Individual project permits are required in some instances. No water was used by the BLM in the watershed in 2000. The BLM has one water right in the watershed located in T28S, R3W, Section 22 (Certificate 69066). The water right is for 0.13 acre/feet of storage in a pump chance. The water is used for forest management activities including fire suppression and road maintenance.

Management Actions, Goals and Objectives

Work with the OWRD and the local Watermaster to maintain flows that support beneficial uses in the watershed.

Support the Streamflow Restoration Plan. This would involve continuing to report water use, examining more efficient use of water by the BLM in the watershed, and reporting illegal water diversions on BLM-administered lands to OWRD. The OWRD has full authority over water rights in the state including those on BLM-administered lands.

Continue measuring low summer flows, in conjunction with stream temperature measurements, on tributaries draining BLM-administered lands in the watershed. Long term monitoring can help identify trends in summer low flows and may discover unauthorized diversions.

Chapter 3 - Recovery Goals, Objectives, and Restoration Plan

Recovery goals and plans associated with this WQRP are designed to maintain components of the ecosystem currently functioning and improve sites showing the greatest potential for recovery in the shortest amount of time. This WQRP maximizes recovery while minimizing expensive and ineffective restoration treatments.

The objective of this plan is to prescribe activities to meet water quality standards, where they are not being met. When the water quality standards are met, beneficial uses for the Umpqua Basin under Oregon Administrative Rules (OAR) 340-41-362 will be protected.

The recovery of habitat conditions in the Myrtle Creek Watershed are dependent, in part, on implementation of the Roseburg BLM District Resource Management Plan. However, since 59 percent of the watershed is privately owned, habitat recovery would require involvement by private owners in cooperative restoration plans. Recovery projects on Federally-administered lands will follow the Standards and Guidelines in the NWFP to meet the ACS objectives. This includes designating Riparian Reserves and some silvicultural work to reach vegetative potential most rapidly. Some instream large tree placement may be beneficial where favorable channel and riparian conditions exist.

Restoration Plan to Achieve Objectives

The following Standards and Guidelines in the NWFP, some of which are summarized in Table 17, will be used to attain the goals of the Myrtle Creek WQRP:

Stream Temperature - Shade

Aquatic Conservation Strategy - B-9 to B-11, C-30
Riparian Vegetation - B-31
Riparian Reserves - B-12 to B-17 and ROD 9
Watershed Restoration - B-30 to B-34

Stream Temperature - Channel Form

Aquatic Conservation Strategy - B-9 to B-11, C-30
Riparian Vegetation - B-31
Riparian Reserves - B-12 to B-17 and ROD 9
Watershed Restoration - B-30 to B-34
Roads - B-31, C-32, 33
Instream Habitat Structures - B-31

Habitat Modification

Aquatic Conservation Strategy - B-9 to B-11, C-30
Riparian Vegetation - B-31
Riparian Reserves - B-12 to B-17 and ROD 9
Watershed Restoration - B-30 to B-34
Roads - B-19, B-31 to B-33
Instream Habitat Structures - B-31

Flow Modification

Aquatic Conservation Strategy - B-9 to B-11, C-30
Roads - B-31, C-32, 33

Adaptive Management, Review, Prioritization, and Revision

Monitoring will provide information whether Standards and Guidelines are being followed and actions prescribed in the WQRP are achieving the desired results. In addition to the monitoring identified in Chapter 4 of the WQRP, Resource Management Plan (RMP) monitoring occurs annually to assess implementation of Standards and Guidelines. Information obtained from both monitoring sources will determine whether management actions need to be changed. The monitoring plan will be evaluated periodically to assure the monitoring remains relevant and will be adjusted as appropriate.

Maintenance of Effort Over Time

In the 1994 Record of Decision, the Secretary of Agriculture and the Secretary of the Interior jointly amended current planning documents with the Land Use Allocations and Standards and Guidelines of the NWFP. The Roseburg District RMP incorporated the final Land Use Allocations and Standards and Guidelines. The RMP can be revised if resource or management conditions change.

Assessing the Potential for Recovery of Water Quality

Recovery of riparian areas, stream channels, and aquatic habitat requires a base condition with adequate vegetation, channel form, and LWD to dissipate stream energy associated with high stream flows. The potential for recovery on BLM-administered lands will be assessed using watershed analysis and information stored on GIS as a first step in determining the feasibility of restoration and recovery.

Restoration in the Myrtle Creek Watershed will be both active and passive (see Table 17). Growth of vegetation on floodplains is important to recovery. The overall goal is to improve pool frequency, large wood, riffle width/depth ratio, and riparian vegetation conditions from the present poor and fair ratings to fair and good ratings using the ODFW benchmarks. These attributes are used to measure if and when the stream is nearing its biological potential for supporting aquatic and riparian species, including anadromous and resident fish. These attributes and benchmarks should be validated with subsequent inventory and monitoring work in the watershed. The attributes and benchmarks would be refined to suit the range of conditions expected in the stream channels as more is learned about the watershed.

Table 17. Active and Passive Restoration in the Myrtle Creek Watershed.

Element	Goals	Passive Restoration	Active Restoration
Temperature - Shade Component	Achieve maximum shading possible per segment. Margin of Safety: Recognize wildfire and flood effects to riparian vegetation.	Let riparian vegetation grow to reach potential.	Prescriptions to increase or maintain growth rates and insure long term health.
Temperature - Channel Form Component	Reestablish historic channel form, focusing on reducing width/depth ratios. Reduce sediment inputs to the stream channel. Increase wood-to-sediment ratio during mass failures.	Allow natural channel evolution to continue (time required varies with channel type). Allow historic mass wasting sites to re-vegetate. Maintain Riparian Reserves for slope stability. Maintain Riparian Reserves for potential large wood and slope stability.	Place large wood to manipulate channel form. Minimize failures through stability review and land reallocation, if necessary. Insure unstable sites retain large wood to increase wood-to-sediment ratio. Decommission, obliterate, or improve roads that are sediment sources. Reconstruct roads to reduce erosion, channel network extension, diversion potential, and accommodate a 100 year flood event. Riparian prescriptions to increase or maintain growth rates and vegetation diversity.

Table 17. Active and Passive Restoration in the Myrtle Creek Watershed.

Element	Goals	Passive Restoration	Active Restoration
Habitat Modification	Increase size and number of large wood pieces in the channel. Reestablish historic channel form, focusing on reducing width/depth ratios and increasing the volume and frequency of pools. Restore channel and floodplain connections. Reduce sediment input to stream channels.	Allow large wood to remain in channel and maintain Riparian Reserves for potential large wood. Allow natural channel evolution to continue. Maintain Riparian Reserves for slope stability.	Riparian prescriptions to increase or maintain vegetation growth rates and diversity. Place large wood in channels to manipulate channel form. Decommission, obliterate, or improve roads that are sediment sources. Reconstruct roads to reduce erosion, channel network extension, diversion potential, and accommodate a 100 year flood event.
Flow Modification	Maintain optimum flows for fish. Maintain minimum flows for fish passage.		Improve efficiency of water use by BLM. Enforce existing regulations - report illegal water diversions from BLM administered lands. Monitor low summer flows, on tributaries that drain BLM administered lands to establish trends.

Restoration Prioritization and Funding

Restoration funds received by the Roseburg BLM District are dependent on the amount of money appropriated each year. Restoration funds for activities on BLM-administered land are mainly available through the NWFP Jobs-In-The-Woods program. The District prioritizes projects based on if they are located in a Key Watershed and the resource benefits the project provides. The State Office evaluates the submitted projects and prioritizes the projects at the State level using similar criteria.

The Myrtle Creek Watershed is not a key watershed. The Roseburg BLM District will seek funds for implementing and monitoring components of this WQRP. However, due to the limitations of the Federal budget process, the funds cannot be guaranteed. As part of the Clean Water Action Plan, the State of Oregon began an interagency effort that identifies high priority watersheds in need of restoration and protection as part of the Unified Watershed Assessment. It is possible that funding associated with the Clean Water Action Plan could be pursued to carry out protection and restoration actions in the Myrtle Creek Watershed. Efforts will be made to apply for grants through the Clean Water Action Plan and Oregon Watershed Enhancement Board (OWEB).

Douglas County funds received through section 103 of the "Secure Rural Schools and Community Self-Determination Act of 2000" (P.L. 106-393) is another potential funding source, which began in fiscal year 2001. Title II of the Act allows the county to spend a portion of these funds for restoration projects on Federally-administered and non-Federal lands.

Recovery to Full Physical and Biological Potential

Current stream and riparian habitat conditions in the Myrtle Creek Watershed are discussed in previous sections. Even if changes in land management practices and comprehensive restoration are initiated, it is possible that all degraded aquatic systems will not completely recover within the next 100 years (USDA et al. 1993). It is estimated aquatic habitat recovery to full biological potential in this watershed will take more than 100 years. The estimate accounts for some variability in recovery based on current aquatic and riparian conditions and natural foreseeable events (floods or fires).

Many interrelationships exist between riparian and floodplain vegetation, summer stream temperatures, sediment storage and routing, and the complexity of habitats in the Myrtle Creek Watershed. Large mature conifers or hardwoods would continue to be rare on private lands, particularly agricultural lands, within the watershed unless major changes in land uses or land use regulations occur. The agricultural lands include streams with low gradients that have a high biological potential for salmon. Improving or maintaining the number of large trees on upstream public lands would not directly benefit the habitat on private lands but would have indirect impacts, such as decreased sediment delivery and cooler stream temperatures.

Generally, in transport or steeper reaches of the watershed, the aquatic and riparian habitat are in fair to good condition. Downstream, in lower gradient stream reaches, aquatic and riparian habitat is in poor to fair condition. The low gradient reaches are generally not located on Federally-administered lands.

Stream shade recovery will occur quicker than habitat recovery. Habitat recovery and sediment storage and routing in the channel will recover to an optimum range of conditions with the maturation of riparian trees. A mature riparian forest will provide shade, increase bank and channel stability, decrease channel width, and increase pool depths. Lower summer water temperatures and higher quality habitat conditions for salmonids will be created by the maturation of riparian forests, addressing road-related problems, and reduced amount of timber harvesting under the NWFP.

Margin of Safety

The Clean Water Act requires a margin of safety (MOS). A margin of safety is to account for uncertainty in available data or in the actual effect activities will have on load reductions and water quality.

Assumptions

Natural Fire Disturbance

The Myrtle Creek Watershed has a variable fire history. The lower elevations burned more frequently than the higher elevations of the watershed. Recovery of riparian vegetation in areas disturbed by fire and flood may be interrupted by future events. This is a conservative assumption that does not account for fire suppression as a management tool. Fire suppression has reduced the number of acres burned by wildfire in riparian areas.

Channel Form Recovery

Stream habitat surveys, conducted by ODFW, measured channel widths in the Myrtle Creek Watershed. Increased channel widths are probably contributing to elevated stream temperatures. Channel recovery was not considered when projecting shade recovery values. Narrower channels will allow stream temperatures to decrease. Restoration activities will also lead to channel recovery by decreasing the amount of sediment entering streams. Improved pool frequency conditions will help restore the groundwater and floodplain connection and increase the groundwater and stream interaction with an expected increase in cool water refugia. Increased amounts of LWD will reduce flow velocity and bed and bank shear stress. Increased channel stability and bank building processes will help restore channel width/depth conditions. The improved temperatures and channel widths were not included in the shade recovery values.

Riparian Restoration

Riparian restoration will increase storage capacity for subsurface and groundwater inflow. Two benefits that have not been included in the shade recovery values are groundwater inflow cooling stream temperatures directly by the mass transfer of energy and groundwater inflow increasing streamflow and maintaining stream temperatures.

Timber Harvesting on Private Land

Fifty-nine percent of the watershed is privately owned. Some of the private lands are managed for timber production. The assessment of private lands in this watershed is beyond the scope of this WQRP. The WQMP prepared by ODEQ will decide how to determine the shade recovery expected, as well as, the site potential for recovery on private lands. While Standards and Guidelines on Federally-administered land establish wider stream shade buffers than the Oregon Forest Practices Act, the Oregon Forest Practices Act guidelines do offer some stream shade protection.

A statewide demonstration of the Oregon Forest Practices Act's ability to protect water quality is expected to address the specific parameters affected by forest management practices (temperature, sediment and turbidity, aquatic habitat modification, and biological criteria). The schedule and other requirements for addressing these parameters are included in the ODEQ/ODF Memorandum of Understanding (MOU) of May 16, 1998.

Riparian Reserves

The Standards and Guidelines for Riparian Reserve widths on fish bearing streams are used to protect fish habitat and other riparian dependent species and resources. The additional protection for the other species and resources provides an additional margin of safety for fish and stream protection.

Chapter 4 - Monitoring Plan

The NWFP provides the framework[1] to accommodate a nesting of geographic scales (region, province, subbasin, watershed, and site) in a manner that allows localized information to be compiled and summarized in a broader context. Monitoring at all scales should:

- Detect changes in ecological systems from both individual and cumulative management actions and natural events
- Provide a basis for natural resource policy decisions
- Provide standardized data
- Compile information systematically
- Link overall information management strategies for consistent implementation
- Ensure prompt analysis and application of data in the adaptive management process
- Distribute results in a timely manner

The NWFP monitoring provides a framework for three types of monitoring (implementation, effectiveness, and validation) to meet objectives and evaluate the efficacy of management practices. The Roseburg BLM Resource Management Plan (RMP) contains a monitoring plan that addresses implementation, effectiveness, and validation monitoring. It includes statements of expected future conditions and outputs along with key questions and specific monitoring requirements (USDI 1995, page 84 and Appendix I, page 189).

Implementation monitoring is meant to ensure that management actions are following the prescribed management direction. The Roseburg District Annual Program Summary and Monitoring Report tracks how management actions are being implemented according to standard and guidelines. It also outlines the progress of watershed restoration work. Roseburg BLM produces this document yearly and it shows the success and progress of implementing water quality related objectives.

Effectiveness monitoring answers the question of whether or not prescribed management actions meet the desired objectives. For aquatic and riparian objectives (including water quality) this will provide the necessary information to evaluate natural conditions, ranges, and distributions of water quality parameters and watershed processes, and the dominant processes determining their distribution and trends. Inventory and monitoring will help identify sources and causal factors for water quality and watershed condition. The goal is to improve prescribed management actions and achieve the goals of the standards and guidelines. If results of monitoring indicate existing management practices are not achieving water quality objectives, plan amendments may be done to provide for new actions. The amendment process includes programmatic compliance with NEPA and other environmental laws.

Validation monitoring, the testing of basic assumptions, will be accomplished through formal research. The Roseburg District could be involved in some of this research but most likely would defer to larger scale efforts.

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[1] Final Supplemental Environmental Impact Statement, Appendix I

The NWFP calls for an interagency monitoring network using a common design framework and common indicators. The Aquatic/Riparian Effectiveness Monitoring Plan (AREMP), which was approved March 12, 2001 and published in 2003 (Reeves et al. 2003) is a broad based tool spanning the NWFP area for meeting this need. The Aquatic/Riparian Effectiveness Monitoring Plan will provide information in a decade or more at the province scale. In the adaptive management process, adjustments would take place as the result of feedback from action-based planning, monitoring, researching, and evaluation.

Key questions from the effectiveness and validation monitoring section of the Roseburg RMP provide a framework to address water quality and aquatic issues (USDI 1995, Appendix I, pages 191, 196, and 198). These questions are valid for the life of the RMP however they would need to be revisited if a new planning document were adopted. The following are a sample of monitoring questions that could be answered through AREMP or by other means initiated by the Roseburg District:

- Is the health of Riparian Reserves improving?
- Are the management actions that are designed to rehabilitate Riparian Reserves effective?
- Are State water quality criteria being met? When State water quality criteria are met, are the beneficial uses of riparian areas protected?
- Are prescribed Best Management Practices maintaining or restoring water quality consistent with basin specific State water quality criteria for protection of specified beneficial uses?
- Is the ecological health of the aquatic ecosystems recovering or sufficiently maintained to support stable and well-distributed populations of fish species and stocks?
- Is fish habitat in terms of quantity and quality of rearing pools, coarse woody debris, water temperature, and width to depth ratio being maintained or improved as predicted?
- Are desired habitat conditions for listed, sensitive, and at-risk fish stocks maintained where adequate, and restored where inadequate?

The Roseburg District is developing a water quality/aquatics monitoring strategy. This strategy will provide the framework for how to answer monitoring questions, what tools to use for answering these questions, as well as for coordinating with other agencies within the Umpqua Basin to monitor aquatic and riparian issues. The AREMP may be incorporated into this strategy for answering some of the above questions and providing feedback for changes in management. Completion of this strategy is expected sometime in 2004.

Over the last several years the Roseburg District has cooperated with ODEQ, ODFW, and the Umpqua Basin Watershed Council in monitoring efforts. The following is a summary of the types of monitoring completed over the last several years:

- Stream Temperature – Approximately 150 Sites
- Macroinvertebrate Sampling - Approximately 20 Sites
- Riparian and Stream Condition Classification – 50 to 100 Stream Miles

The Roseburg District will continue to cooperate with these types of efforts and with other agencies as needed. The Roseburg District monitoring strategy will guide future monitoring efforts.

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