U.S. Department of the Interior
Bureau of Land Management

Roseburg District Office
777 N.W. Garden Valley Blvd
Roseburg, Oregon 97470

April 2002

Upper Umpqua Watershed Analysis
Version 3.0

BLM/OR/WA/EA-02/018+1792

Upper Umpqua Watershed Analysis

Fifth Field Watershed
HUC #17100302

Roseburg District BLM
& Coos Bay District BLM

Updated as of
April 2002
Version 3.0

<u>Core Team Members</u>

Steve Bell	Transportation Management Specialist
AC Clough	Fisheries Biologist
Dan Couch	Team Lead
Dan Cressy	Soils Specialist
Craig Ericson	GIS, ARC-INFO Specialist
Elizabeth Gayner	Wildlife Biologist
Al James	Silviculturist
Steve Kropp	Hydrologist
Ron Murphy	Recreation Specialist (Social Assessment)
Jeanne Standley	Special Status Plant Specialist
Jeffrey Wall	Team Lead Assistant

<u>Consulting Team Members</u>

Isaac Barner	Archaeologist
Kevin Cleary	Fire Specialist
Pete Howe	Engineer
Frank Price	Coos Bay Watershed Analysis Coordinator

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1 OVERVIEW OF UPPER UMPQUA WATERSHED

A. Previous Assessments and General Description

This watershed assessment is one of many assessments that have taken place within the Upper Umpqua Fifth Field Watershed. This assessment is meant to bring all the previous separate assessments together into one document. Other assessments that cover portions of the Upper Umpqua are listed in the Overview and Botany Appendix. The South Coast – Northern Klamath Late-Successional Reserve Assessment (LSRA), completed in May of 1998, guides management activities for the Late-Successional Reserves within Upper Umpqua.

This iteration of Upper Umpqua Watershed Analysis will encompass most of the above referenced analyses and will cover the entire fifth field watershed, which is the Umpqua River drainage area from the confluence of the North and South Umpqua to the confluence of Umpqua with Elk Creek (near the city of Elkton).

Size and Location: The Umpqua River system includes the North, South, and lower Umpqua River, which encompasses approximately 4,680 square miles and flows 200 miles from the Cascade crest through the Oregon Coast Range to the Pacific Ocean. The Upper Umpqua fifth field watershed drains an area of approximately 169,470 acres (265 square miles) and stretches approximately 25 miles in the direction of flow from south to north. This fifth field watershed is a combination of frontal and discrete subwatersheds located in the western part of the Umpqua Valley. The watershed starts in the south, at the confluence of the North and South Umpqua Rivers (River Forks Park), west of the city of Roseburg approximately five miles (Figures 1-1, 1-2). The northern edge of the watershed is at the confluence of the Umpqua and Elk Creek near the city of Elkton. Except for the flows from Calapooya Creek, the watershed stream system mostly consists of sixth order and smaller streams that flow into the main stem Umpqua River.

Specific Description: Upper Umpqua consists of eight sixth field subwatersheds, including (from south to north): Umpqua Frontal, Hubbard Creek, Cougar, Rader Wolf, Lost Canyon, Yellow Creek, McGee Creek, and Mehl Creek (Figure 1-4, Table 1-2). Elevations range from 140 feet at the confluence of Elk Creek and the Umpqua River near Elkton in the north portion of the watershed, to 2,840 feet in the southern portion of the Hubbard Creek drainage (Sec. 31, T26S, R7W) (Figures 1-2, 1-4). The Regional Ecosystem Office is in the process of revising the subwatershed names to be more representative of the creeks and features within each subwatershed. Table 12-1 in Hydrology Appendix shows the proposed name changes.

Climate and Vegetation: Average annual rainfall ranges from 45 to 50 inches depending on the elevation. Precipitation predominantly occurs in the form of rain for elevations below 2,000 feet and rain/snow mix for elevations above 2,000 feet. Late and mid-seral forests dominate the majority of the watershed (Figure 3-2).

People and Recreation: State Highway 138 follows the Umpqua River throughout this watershed and is a major connector route between the Oregon coast and the Umpqua Valley. There are many recreation opportunities including fishing, boating, camping, picnicking, hiking, mountain biking and sight seeing. The major recreation developments are shown in Figure 2-1.

B. Ownership and Federal Land Use Allocations

Roseburg and Coos Bay BLM Districts manage approximately 58,700 acres (35%) of the Upper Umpqua watershed. The major private landowners are shown in the following Table 1-1. Figure 1-4, Tables 1-2 and 1-3, and Charts 1-1 and 1-2 show the breakdown of federally administered and private land.

Table 1-1 Upper Umpqua Prominent Private Landowners

Prominent Private Landowners	Acres
Roseburg Resources Co.	19,692
Hallie Ford	12,347
Seneca Jones Timber Co.	6,448
Weyerhaeuser Co	6,008
Rocking C Ranch	4,107
Carol Whipple	2,784
Kesterson et. al.	2,320
Lone Rock Timber Co.	2,049
Juniper Properties LMTD Partnership	1,900
TOTAL	57,655

For the federally administered lands the following is a description of the relevant resource management plan (RMP) land use allocations, which includes both the Roseburg and Coos Bay Districts' RMPs (Figure 1-4, Table 1-3, Chart 1-2).

1. Late-Successional Reserve

The management objectives for Late-Successional Reserve (LSR) are intended to benefit a diversity of old-growth obligate species. Figure 1-4 and Table 1-3 show where and to what extent this land use allocation occurs within Upper Umpqua and show the portions of LSR #263 and #264 that occur in this watershed as defined by the LSRA. Figure 3-3 and Table 3-6 show all BLM reserves, including the above Late-Successional Reserves, by forest seral age classes.

2. Riparian and Other Reserves (BLM)

The Riparian and Other Reserves shown on Figure 1-4 and Table 1-3 include Riparian Reserves, unmapped pre-1994 northern spotted owl (NSO) core areas, a marbled murrelet core area, designated habitat areas such as bald eagle habitat, and areas withdrawn because they are considered not suitable as defined by the timber production capability classification (TPCC).

The Riparian Reserves were established on federal lands as one component of the Aquatic Conservation Strategy to protect the health of the aquatic system and its dependent species and provide incidental benefits to upland species. The reserves were designated to help maintain and restore riparian structures and functions, benefit fish, riparian-dependent wildlife and botanical species, enhance habitat conservation for organisms dependent on the transition zone between uplands and riparian areas, improve travel and dispersal corridors for terrestrial animals and plants, and provide for greater connectivity of late-successional forest habitat (ROD, B-13).

The following Riparian Reserve widths were used for estimating the total amount of Riparian Reserves: 180 feet (55 meters) for intermittent, non-fish bearing streams and 360 feet (110 meters) for fish bearing streams. Actual intermittent streams are unmapped in this analysis (although some data is available). Streams were classified as fish bearing based on fish presence/absence inventories and undocumented professional observations. Actual projects would use on-the-ground stream information to establish Riparian Reserves.

There are 119 known northern spotted owl activity centers within Upper Umpqua. Many of these sites are scattered throughout Late-Successional Reserves on BLM. Ten residual habitat areas were established in this watershed under the Northwest Forest Plan (NFP). These are areas sized at about 100 acres, located around pre-1994 nesting owls, and are expected to provide some protection for suitable owl nesting groves. They are not, in themselves, expected to be capable of supporting pairs of nesting owls, but rather provide nesting habitat in the future while the surrounding forest stands mature.

Areas designated as not suitable for timber production (TPCC withdrawn) are much smaller and scattered.

3. Connectivity (BLM)

The objective of the Connectivity land use allocation is commercial harvest on a 150-year cycle while providing a bridge between larger blocks of old-growth stands and Riparian Reserves. This provides habitat for breeding, feeding, dispersal, and movement of old growth-associated wildlife. Upper Umpqua contains approximately 830 acres of Connectivity. Figure 3-3 and Table 3-7 show the forest age classes within this land use allocation.

4. General Forest Management Area (GFMA) (BLM)

The objective of these lands is to manage on a regeneration harvest cycle of 60 to 110 years, leaving a biological legacy of six to eight trees per acre to assure forest health. Approximately 6,480 acres of GFMA occur in Upper Umpqua. Figure 3-3 and Table 3-8 shows the forest age classes within this land use allocation.

5. Congressionally Reserved (Myrtle Island Research Natural Area)

Myrtle Island was designated as a Research Natural Area (RNA) in 1981. The 28-acre island was designated to preserve an old-growth stand of California bay-laurel (*Umbellularia californica*) and scattered Douglas-fir (*Pseudotsuga menziesii*) (Franklin 1972). A management plan was completed in 1983 (USDI-BLM 1983). The management plan describes the location, physical characteristics, management objectives, constraints, protection of resources and restoration consultation initiation. Myrtle Island is located in the Umpqua River in T24S R7W Sections 20 and 21 (Figure 1-4). The island surface is constantly changing due to deposition and erosion during seasonally high water. The most notable feature of the island is the old-growth forest on the highest terraces of the island. The RNA is protected against activities that directly or indirectly modify ecological processes so the area is of value for observation and research. (USDI-BLM 1983).

C. Management Direction and Key Questions

1. Upcoming Decisions Expected In Upper Umpqua

Within the next five to ten years, it is likely that the Swiftwater Field Manager will need to be involved in some aspect of decision making with the following general areas. These areas have been used to help guide the key questions, the information to answer those questions, and the resulting recommendations.

- Noxious weed control
- Commercial thinning in GFMA & Connectivity
- Regeneration harvest in GFMA & Connectivity
- Density management in Late-Successional and Riparian Reserves for fish & wildlife objectives
- In stream fish habitat enhancement
- Road rehabilitation/restoration (decommission or treatment candidates)
- Culvert replacement or removal for fish passage or have high risk of failure
- Urban interface fire prevention projects
- Recreation/restoration potential with land exchanges/conservation easements
- Development of a Water Quality Management Plan and strategic monitoring

A major assumption in the development of these key questions is that the Roseburg District Resource Management Plan (RMP) has given some prescriptive measures through the landscape land use allocations. Because the RMP sets standards and guidelines on each land use allocation and the kinds of activities that can occur in those land uses, this watershed analysis seeks to provide information to guide decision making within those overarching planning parameters. Guided by the above potential decision making areas, the key questions below seek to further focus the kinds of information that will be the most helpful.

2. Upper Umpqua Watershed Key Questions

Human Uses (Ron Murphy/Isaac Barner)

1. What cultural resources and potential resources are present in the watershed and how will they be managed with associated future human activities?

2. What are the current recreation uses and trends of the Upper Umpqua watershed? Human use categories include:

- Rafting/Boating (Commercial & Non-Commercial)
- Recreation Sites/Facilities
- Trail Use (Hiking & Mountain Biking)
- Fishing
- Wildlife Viewing

3. Where are the developed and undeveloped human uses on federal, state, and county lands within the watershed?

4. What are the public concerns/values that are pertinent to the watershed and who are the people/groups most closely associated with and potentially concerned about the watershed?

Vegetation (Al James, Kevin Cleary, Jeanne Standley)

<u>Risk/Hazard of Fire</u>

1. How has fire historically influenced this ecosystem?

2. What risk is the current fuels condition posing?

3. What is the feasibility of reintroducing fire into the ecosystem?

<u>Vegetation</u>

1. What is the current *and past* distribution of each seral stage (acres & %) by each landowner?

2. Where are opportunities within the next 5-10 years for BLM commercial thinnings in GFMA & Connectivity?

Special Status Plants, Non-native Species and Noxious Weeds

1. Describe any Special Status Plant or Survey and Manage species that have been discovered within the watershed, their habitat, abundance and distribution.

2. What are the relative abundance, distribution, and trends of non-native plants and noxious weeds?

Wildlife Habitat And Species (Liz Gayner)

1. What is the occurrence of federally listed terrestrial species and their designated core areas under the RMP? What is the occurrence of bureau-sensitive (S&M, state listed) terrestrial species?

2. What wildlife objectives can be obtained through management in Late-Successional and Riparian Reserves?

3. What are the management implications of federally listed species within Upper Umpqua?

Geology and Soils (Dan Cressy/Steve Bell)

Topography/Landslide and Debris Flow Analysis

1. What is the relative landslide potential (hazard) based on slope class, geology, soils and landform features? What management activities most contribute to this risk? What erosion processes are dominant in the watershed and where are the general risk areas? To what magnitude do the erosion processes contribute sediment in the watershed?

2. Where are the locations, stratified by relative degree of magnitude for sources of sediment and their proximity/relationship to adjacent streams?

3. What is the relationship between sedimentation and fish species and their habitat within the watershed?

Roads

1. What are the stratified road characteristics and recommendations according to character of road ditch, cut and fill erosion classes, road surfacing material, number, type, and condition of stream crossings, and other characteristics that influence erosion rates and sediment delivery to streams?

2. Where are road erosion and stability problems most likely to impact aquatic resources?

Water Quality and Hydrology (Steve Kropp)

1. What are the important hydrologic and morphologic features of the main stem Umpqua River in this watershed?

2. What is the current list of 303(d) water quality limited streams and how are federal activities and plans affecting these streams? Where has monitoring taken place, what data is available, and what commitments does BLM make toward future monitoring?

Fish and Aquatic Habitat (Chip Clough/Steve Kropp)

Fisheries Distribution/Species Occurrence/Abundance

1. What is the known current distribution of fish species within the watershed (e.g., map of fish distribution by species) including federally listed, candidate aquatic species, their critical habitat, and Essential Fish Habitat?

2. What are the known barriers (natural and human created) to fish migration and their locations within the watershed? What is the relative mileage of potential fish habitat above these created barriers that is not currently accessible by anadromous fish?

3. What is the total estimated fish habitat for salmonids?

Aquatic Habitat

1. How are stream and riparian habitats distributed throughout the analysis area?

2. To what extent are the lower gradient stream reaches properly functioning or degraded, and how have instream and off-stream habitats and biological communities been affected by management activities using ODFW aquatic habitat inventory data as an indicator?

3. What other aquatic habitats may require special protection (wetlands, wet meadows, ponds and lakes, floodplains, secondary channels, large main stem gravel bars) and how are they distributed throughout the analysis area?

4. What are the past and current riparian vegetation age classes on federal lands?

5. To what extent are roads altering or affecting the hydrologic regime of the watershed and/or displacing riparian habitat?

6. What riparian and stream enhancement has occurred in the past and how effective were those restoration efforts?

7. Where are riparian stand enhancements (silvicultural treatments) and instream restoration activities most likely to be most beneficial?

8. What monitoring data is available and what additional information is needed and why?

Upper Umpqua 5th Field Watershed Location Map

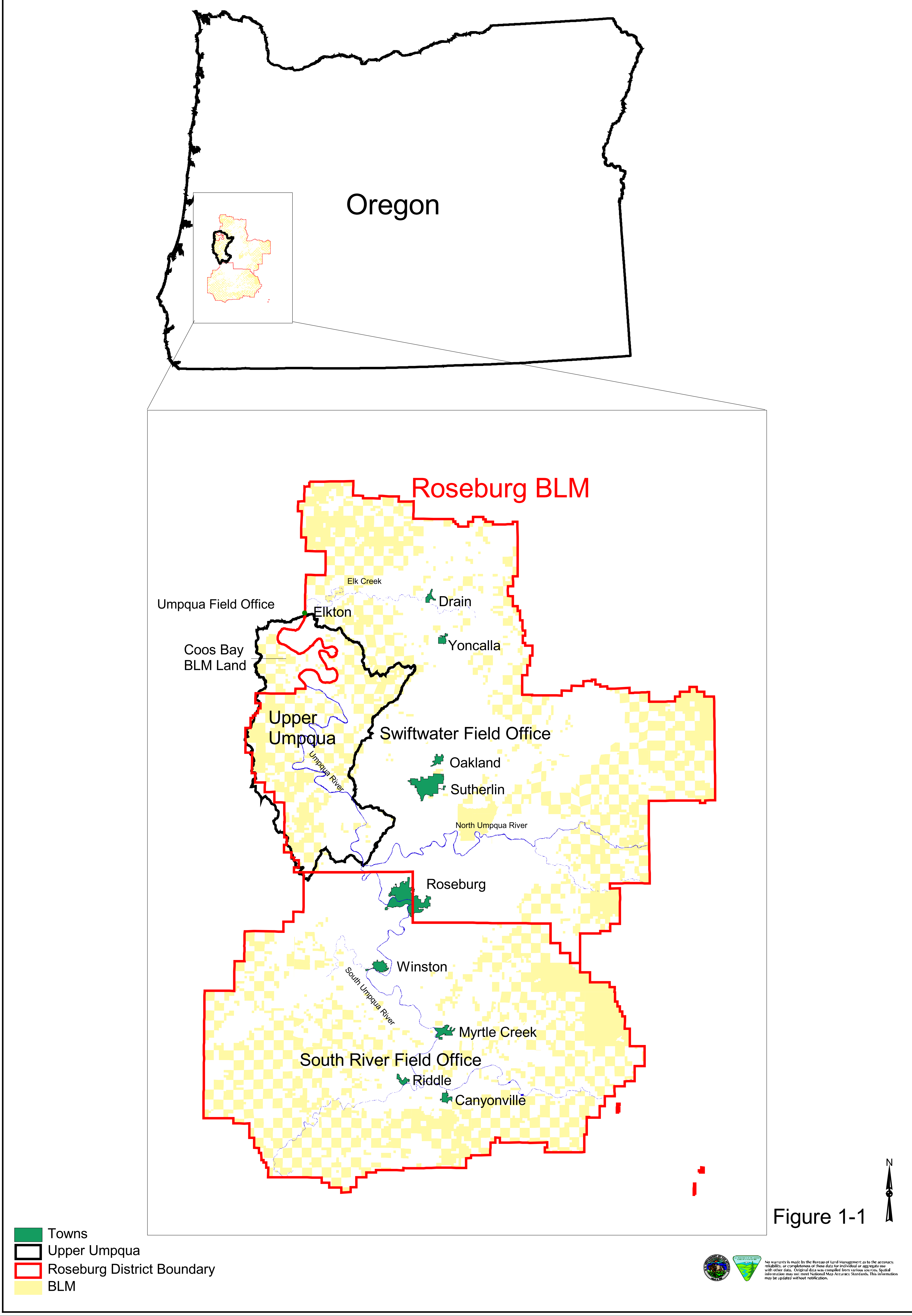
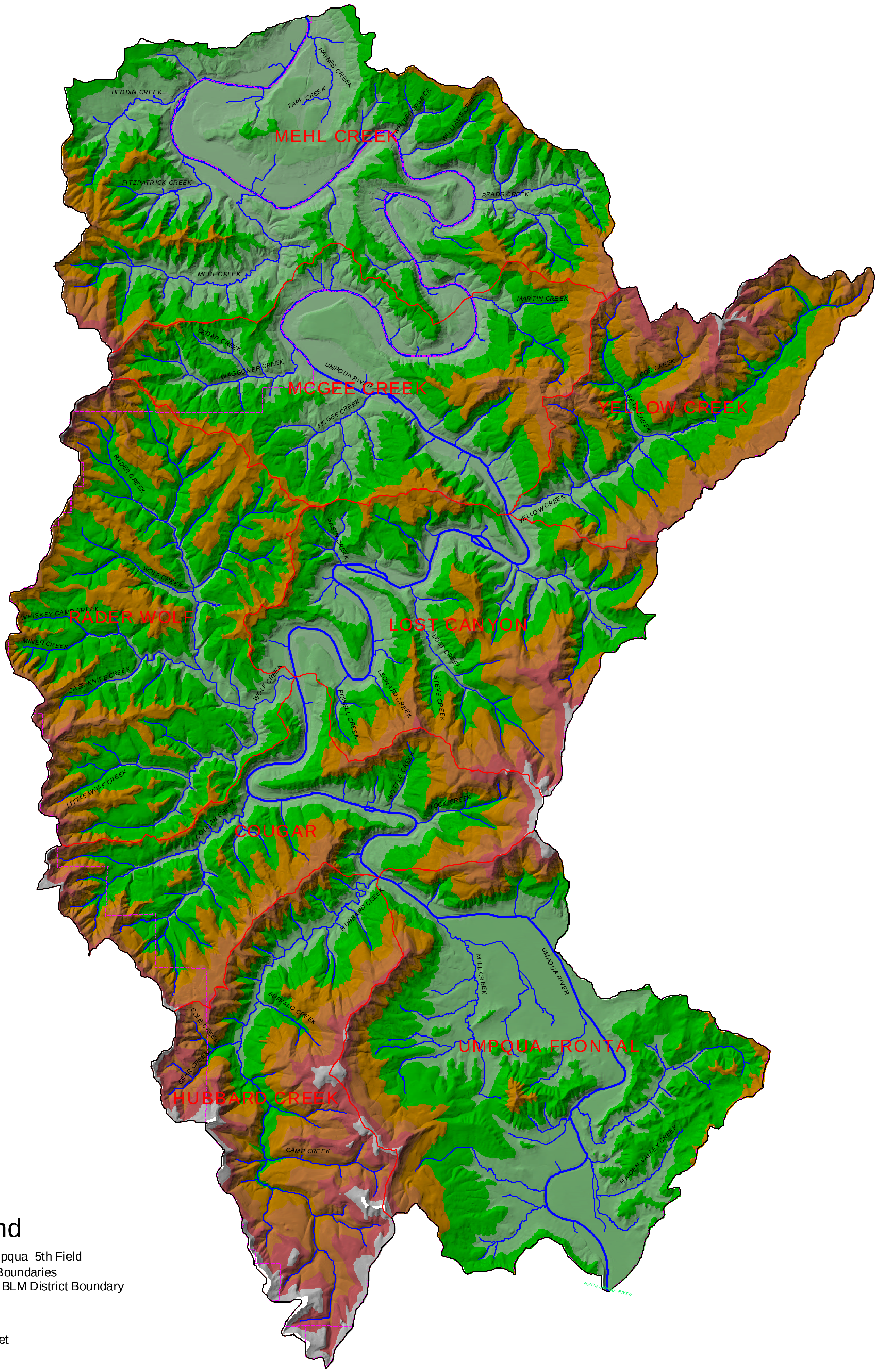


Figure 1-1

Upper Umpqua
Elevation and Major Streams



Legend

- Upper Umpqua 5th Field
- 6th Field Boundaries
- Roseburg BLM District Boundary
- T-R
- Streams

Elevation in Feet

- 70 - 300
- 301 - 600
- 601 - 900
- 901 - 1100
- 1101 - 1500
- 1501 - 1900
- 1901 - 2200
- 2201 - 2500
- 2501 - 2781

1 0 1 2 Miles

N

Figure 1-2

Upper Umpqua
Aerial Photo

Black and White Photo - 1994
Color Photo - 1999

Figure 1-3

Upper Umpqua
Land Use Allocation

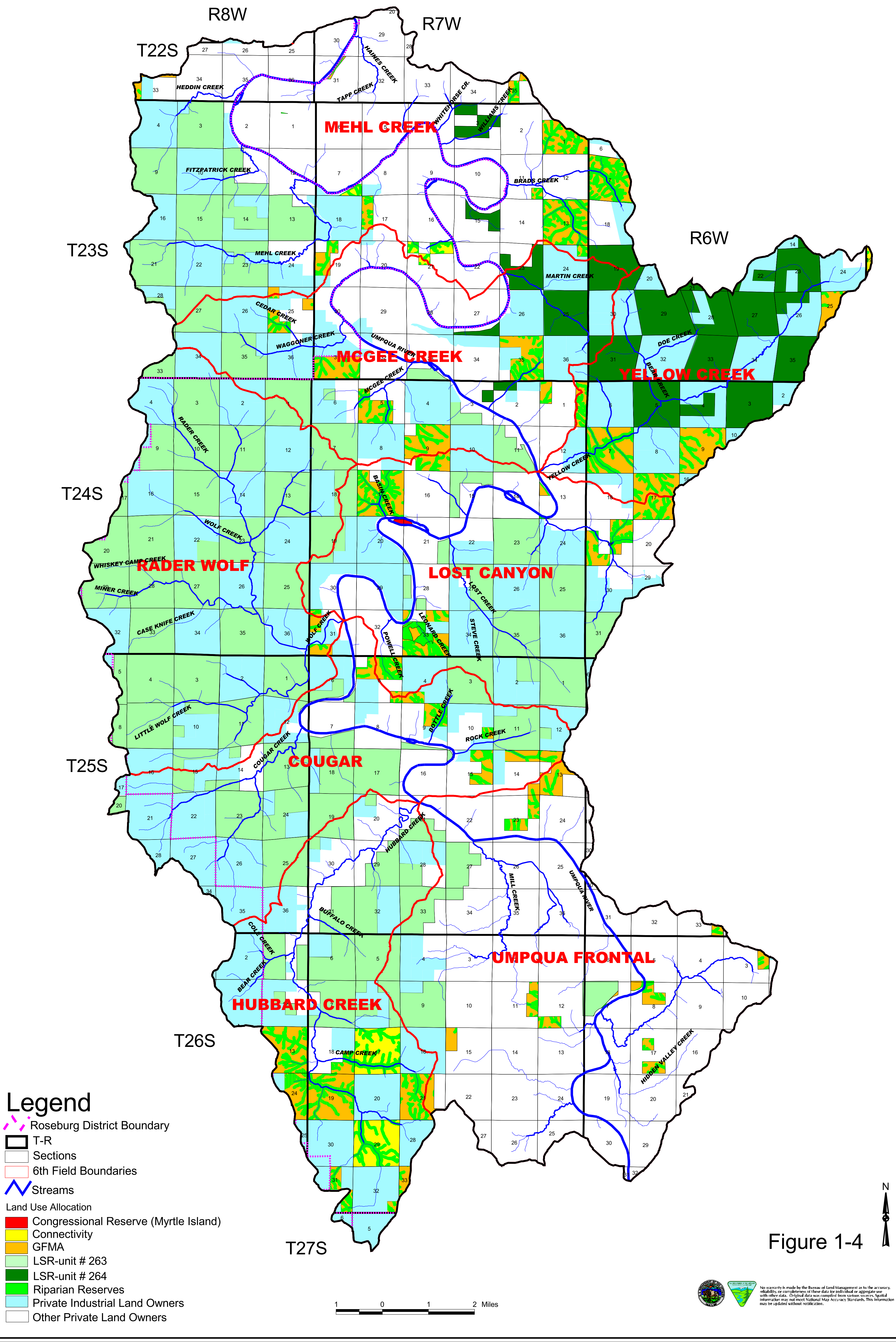


Figure 1-4

Table 1-2 Upper Umpqua, Public and Private Lands

	BLM		Private Lands		TOTAL
Subwatersheds	acres	%	acres	%	**ACRES**
Cougar	6,176	38.4%	9,922	61.6%	16,098
Hubbard Creek	7,797	45.6%	9,286	54.4%	17,083
Lost Canyon	6,980	35.0%	12,948	65.0%	19,928
McGee Creek	5,502	27.5%	14,536	72.5%	20,038
Mehl Creek	7,500	24.2%	23,531	75.8%	31,031
Rader Wolf	14,263	60.6%	9,277	39.4%	23,540
Umpqua Frontal	3,083	10.9%	25,148	89.1%	28,231
Yellow Creek	7,408	54.7%	6,135	45.3%	13,543
TOTAL	58,709	34.6%	110,783	65.4%	169,492

Chart 1-1 Upper Umpqua, Public and Private Lands

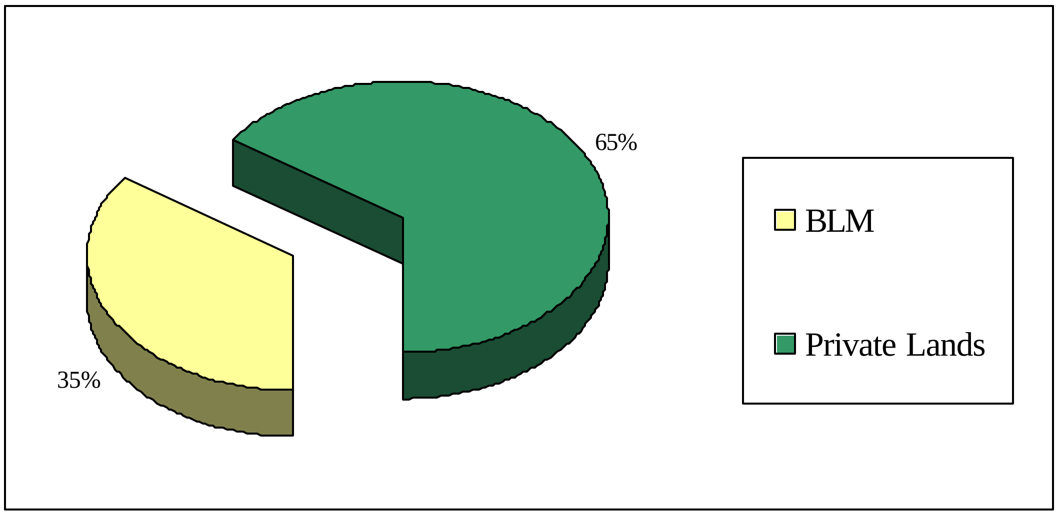
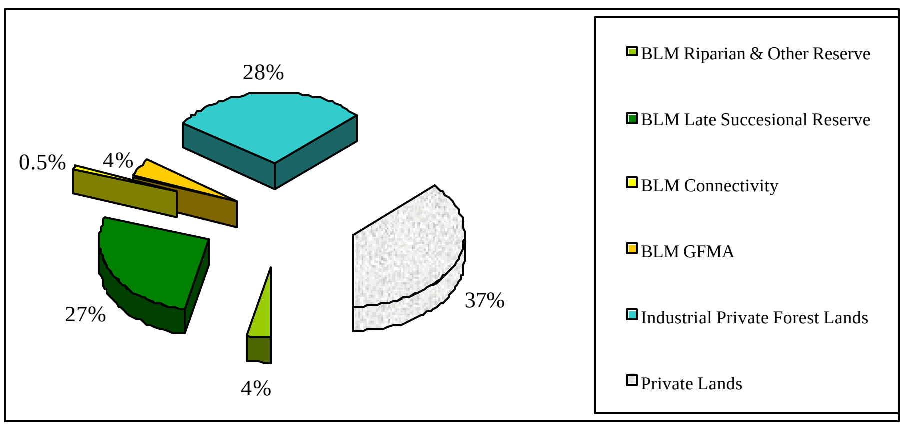


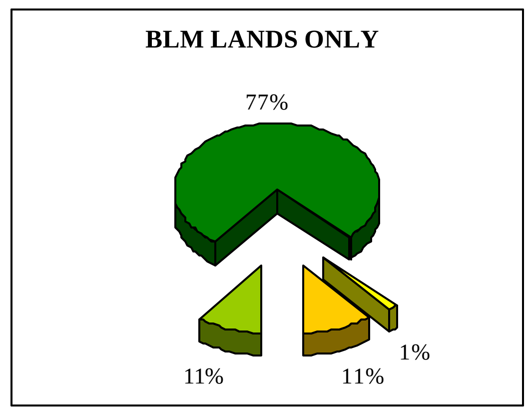
Table 1-3 Upper Umpqua BLM Land Use Allocations and Private Lands

	BLM Riparian & Other Reserves*		BLM Late Successional Reserve		BLM Connectivity		BLM GFMA		Industrial Private Forest Lands		Private Lands		TOTAL
Subwatersheds	acres	%	acres	%	acres	%	acres	%	acres	%	acres	%	**ACRES**
Cougar	362	2.2%	5,374	33.4%	0	0.0%	440	2.7%	6,406	39.8%	3,516	21.8%	16,098
Hubbard Creek	1,605	9.4%	4,353	25.5%	712	4.2%	1,127	6.6%	7,770	45.5%	1,516	8.9%	17,083
Lost Canyon	1,133	5.7%	4,770	23.9%	0	0.0%	1,077	5.4%	6,337	31.8%	6,611	33.2%	19,928
McGee Creek	744	3.7%	3,753	18.7%	13	0.1%	992	5.0%	6,817	34.0%	7,719	38.5%	20,038
Mehl Creek	1,258	4.1%	5,267	17.0%	71	0.2%	904	2.9%	5,069	16.3%	18,462	59.5%	31,031
Rader Wolf	37	0.2%	14,131	60.0%	0	0.0%	95	0.4%	9,146	38.9%	131	0.6%	23,540
Umpqua Frontal	383	1.4%	1,936	6.9%	0	0.0%	764	2.7%	921	3.3%	24,227	85.8%	28,231
Yellow Creek	726	5.4%	5,571	41.1%	31	0.2%	1,080	8.0%	5,748	42.4%	387	2.9%	13,543
TOTAL	6,248	3.7%	45,155	26.6%	827	0.5%	6,479	3.8%	48,214	28.4%	62,569	36.9%	169,492

* Includes Congressionally Reserved Myrtle Island

Chart 1-2 Upper Umpqua BLM Land Use Allocations and Private Lands





2 HUMAN USES

A. Historic Human Uses

The Umpqua River has been a major transportation corridor cutting through the Coast Range for as long as people have lived in this region. The Umpqua Indians lived along the main stem of the river from Scottsburg to the north and south forks. The wide river terraces, which later drew ranchers to this area, were also appealing to prehistoric peoples. The Umpqua Indians depended on a wide variety of subsistence activities during the year. They hunted for deer and elk, fished the river for salmon and freshwater species, and gathered food like camas and berries. Undoubtedly, areas within the watershed were used for their subsistence activities.

In general, the major cultural resources in the Upper Umpqua watershed, both historic and prehistoric, are associated with the riverside terraces and broad flats that run through the central portion of the watershed. Additional resources, primarily from the historic era, are found in the smaller drainages that feed the main stem of the Umpqua River.

Eight prehistoric sites, two prehistoric isolates, and 23 historic sites are currently recorded within the watershed. Four of the prehistoric sites and both of the isolates are located on BLM land. The other four prehistoric sites are on private property. The historic-era sites are all on private property and are derived from Douglas County's Historic Resource Register. Only one of the four BLM sites has been evaluated, and it has been found to be eligible for listing on the National Register of Historic Places.

The recorded prehistoric sites within the watershed are essentially of two types - riverside terraces and rock shelters very close to the river. There are currently no recorded prehistoric sites in the uplands. The rock shelters, one of which contains pictographs, probably represent seasonal camps. The terrace sites include two villages, one seasonal camp, and an interment site.

The recorded historic sites within the watershed date from the 1820s to the 1930s. The earliest sites, Fort McKay and Fort Umpqua, are associated with fur trapping. Several sites relate to the period of initial settlement in the 1850s and 1860s. Additional sites are associated with agricultural developments between 1870 and the beginning of World War I. Two sites are related to Depression-era agricultural activities.

A number of unrecorded sites, both historic and prehistoric, are also located within the watershed, but have not been formally documented. Unrecorded prehistoric archaeological sites are known to be present on privately owned riverside terraces. This information is derived from local historians and collectors. GLO cruise books indicate the presence of a number of cabins in the Wolf Creek drainage, on both private and BLM land. The GLO records also indicate a number of farms and industrial sites in the Lost Canyon subwatershed, as well as a few other sites scattered throughout the larger watershed. The nature and condition of these sites is unknown at this time.

The earliest Euro-American outpost in the region was built on the bottomland along the south bank of the Umpqua River, across from the mouth of Elk Creek. The Hudson's Bay Company began this encampment, known as Fort Umpqua, in 1836, and was it used until 1851, as a base camp by fur traders and other explores. With the Donation Land Claims in 1850, many of the wide river terraces along the bottomland near Elkton became the first settlements in Southwest Oregon. Reported 19^{th} and early 20^{th} century historic resources include an abandoned coal mine, partially built railroad and tunnels, numerous trails and an early wagon road (Figure 2-1).

B. Current Recreation Uses and Trends

The Upper Umpqua Watershed Analysis Area offers visitors a variety of recreation opportunities. This area contains two types of recreation management areas: 1) the Umpqua River Special Recreation Management Area (SRMA), a 21-mile long corridor (Figure 2-1) that receives intensive recreation management and requires greater managerial investments and 2) the Swiftwater Extensive Recreation Management Area (ERMA), which is all other lands within the watershed analysis area that are not included in the SRMA corridor. This is an area where visitors have less development, more dispersed use opportunities and minimal regulatory constraint.

The recreation activities that occur within in the SRMA & ERMA classifications are: fishing, camping, boating, picnicking, hiking, horseback riding, tour and mountain biking, driving for pleasure, viewing scenery, gathering forest products, wildlife observation, hunting, and driving recreational vehicles on and off highways.

1. Umpqua River Special Recreation Management Area (SRMA)

The Umpqua River Special Recreation Management Area is 21 miles long (seven miles BLM and 14 miles private) and is a half-mile wide. The total land base is approximately 2,240 acres of BLM and 6,720 acres of private land. Developed sites within the SRMA consist of the Tyee Recreation Site, the Miner-Wolf Watchable Wildlife Site, and the Osprey Boat Ramp. Each season, BLM employees and volunteers document the number of recreation visitors to the SRMA. This use count is documented in the Recreation Management Information System (RMIS), a national BLM information database. For the past five seasons the use trends were as follows:

1997 - 23,380 visitors
1998 - 23,800 visitors
1999 - 26,200 visitors
2000 - 26,724 visitors
2001 - 29,300 visitors

The following recreation activities are the most prominent activities in the SRMA:

Angling: Fishing is a popular activity within the Umpqua River portion of the SRMA. Here anglers fish for spring and fall chinook salmon, winter and summer steelhead trout, small mouth bass, and shad. The favorite method is angling from a driftboat. Bass is the most popular fish sought by anglers each season. Anglers usually launch from James Wood Boat Ramp (Douglas County) or Osprey Boat Ramp (BLM), and drift the river to Yellow Creek (Douglas County Parks), which is the main take-out. Other popular methods or crafts used for angling include: bank fishing, canoes, fishing tubes and jet boats in the winter months.

Boating: Boaters use an assortment of crafts while floating the Umpqua River section of the SRMA. Commercial outfitters use self-bailing paddle rafts and rowing frame rafts, data-rafts, cat-yaks and inflatable kayaks. Commercial and private anglers use driftboats, fishing tubes, and jet boats. Private recreationists have used rafts, inflatable kayaks, inner tubes, and air mattresses primarily during the summer months.

Picnicking: The Madison Wayside site is maintained by Douglas County Parks.
The BLM's two areas for picnicking include the Tyee Recreation Site and the Miner-Wolf Recreation Site.

Camping: The Tyee Recreation Site (BLM) is located on the main stem of the Umpqua River. The campground and day-use area are the main public recreation sites in the area. The site has a campground with fifteen campsites, a day-use area, and a group pavilion with a 50-person capacity. All facilities are disabled accessible. Trends for the past five years in the RMIS report shows a 20% increase in use from approximately 5,700 visitors in 1997 to 6,800 visitors in 2001. The primary types of visitors are anglers who fish the main Umpqua River. Other campground visitors include: hunters, family groups, vacation travelers and summer water-play enthusiasts. The small size of this recreation site limits the number of people that this area can accommodate during peak-use on summer weekends between July and August. Since 1998 the recreation site has been open to year-round use to accommodate the public need.

The proposed Eagleview group-use campground is scheduled to begin development in 2003 with completion scheduled in 2004. This group reservation area will help alleviate some of the overcrowding of the Tyee Recreation Site. This site will feature 10 campsites, a 50-person use pavilion, a riverview trail, two accessible restrooms, and a campground host to monitor use and provide public assistance. The campground is located one mile west of the Tyee Recreation Site and will provide additional public access to the river.

Water Play: Popular seasonal activities on the Umpqua River, include rafting, tubing and swimming (with or without flotation devices). Commercial whitewater outfitters use the Umpqua River through the SRMA for three different trips which include: 1) Umpqua Landing to the Osprey Boat Ramp, 2) from Osprey Boat Ramp to Yellow Creek, and 3) from Yellow Creek to the Big K Ranch. Several swimming holes are located within the watershed. Ledges on Yellow Creek are used for jumping and diving into river pools. Cougar Creek also has a popular swimming hole and is shown in the RMP as a potential trail development site.

Proposed Trails: The RMP lists several trails for potential development within the SRMA. The **Cougar Creek Trail** would provide a half-mile trail to a swimming site. Access across private land would be required. The **Eagleview Trail** would provide a one-mile trail between Tyee Recreation Site and the proposed Eagleview Group Reservation Area. An easement to cross private land would be required for development of this trail.

2. Extensive Recreation Management Area (ERMA)

All lands outside of the SRMA (Figure 2-1) are considered to be within the Extensive Recreation Management Area (ERMA). The Upper Umpqua Watershed Analysis Area portion of the Swiftwater ERMA is 167,230 acres. In addition to dispersed recreation opportunities this extensive area features several recreation highlights, which includes the Miner-Wolf Trail, the Hubbard Creek proposed Off Highway Vehicle (OHV) Area, and the Loon Lake Back Country Byway proposal.

Trails: The **Miner-Wolf Watchable Wildlife Site** has the only existing developed trail in the ERMA. This 1,400 foot disabled accessible trail features self-guided interpretive posts (brochure needed), a vehicle parking area, a vault toilet, interpretive signs, several benches, and a picnic site. The proposed **Tyee Mountain Trail** would provide a hiking trail near Rock Creek.

Back Country Byway: A portion (25 miles) of the Loon Lake (RMP proposed) backcountry byway is found within the Upper Umpqua Watershed Analysis Area. The purpose of this program is to identify and publicize scenic driving opportunities on less traveled roads through BLM-administered lands. Currently the Loon Lake corridor is not being studied for a byway designation.

River Recreation: River use in the ERMA (outside of the 21-mile Umpqua River Special Recreation Management Area) is also a very popular activity. Here anglers fish for all the species shown in the SRMA section, but the number of anglers are less. The favorite method is angling from a drift-boat. Bass is the most popular species sought by anglers in this area. Boat ramps that are found in the ERMA include: the River Forks Park, Cleveland Rapids, and Hestnes Landing. Other popular methods or crafts used for angling include: bank fishing, canoes, fishing tubes and jet boats in the winter months.

The ERMA is also a popular area for water play. Commercial whitewater outfitters use the Umpqua River through the ERMA for two trips: 1) Cleveland Rapids to Umpqua Landing, and 2) Yellow Creek to Elkton. Floatation devices (rafts, inner-tubes, and air mattresses) are commonly used on the river.

The town of Elkton holds the Annual Bass Tournament during the Labor Day Weekend. This event allows 24 bass boats to compete in a two-day tournament. Anglers fish for bass on the Umpqua River from the Big K Ranch to Elkton during this event.

3. Private Recreation – Big K Ranch

Located in the northern part of the watershed, this 2,500-acre facility caters to approximately 2,000 people each year. The ranch offers patrons the opportunity to venture on mountain bike rides, raft trips on the main Umpqua, trail hikes and horse rides with your own horses. Each season they have mountain bike races for 150 participants, nationally American Motorcycle Association (AMA) sanctioned motorcycle races, and the opportunity to participate in the local bass tournament.

4. Hubbard Creek Off-Highway Vehicle (OHV) Area

The Hubbard Creek OHV area, as defined by the RMP, is approximately 11,700 acres and mostly falls within the boundaries of the Upper Umpqua Watershed Analysis Area (Figure 2-2). The area is very popular and is currently used by all three recreation vehicle classes, Class I (ATV), Class II (4x4), and Class III (motorcycle).

During the Hubbard Creek Fire in 1965, dozer roads were built to help fight the fire and provide access for equipment. After the fire, natural surface roads were built to provide logging haul routes for the burned timber. Other natural surface roads in the area were designed for power line and rock quarry access. All of the natural surface roads and trails within this 11,700-acre area receive OHV use. The OHV public is limited to existing roads and trails (RMP 1995), but due to the lack of proper OHV design, there are multiple maintenance and environmental problems associated with this use. Most of the ruts and erosion damage occur during the wet season (October through June). Heavily used areas have become dangerous to recreational riders due to the very deep eroded ruts in the travel way (Morgan 2002).

In 1993/94 the BLM and OHV user groups met to assess the possibility of developing the Hubbard Creek Area for OHV use (Figure 2-1, 2-3). The BLM team followed the National Environmental Protection Act (NEPA) processes by implementing the initial scoping process that included public meetings and comment periods. During this step in the process, all interested groups and adjoining landowners were invited to a public meeting held on December 7, 1993, at the Roseburg BLM Office. Approximately 50 people attended the meeting. The tone of the meeting and follow-up comments suggested that the adjoining landowners (four timber companies) did not want to participate in managing OHV use because they were not in the recreation business. Due to the lack of support at that time, the idea of creating a management plan was set aside.

The Hubbard Creek Watershed Analysis (May 1995) identified several roads that had severe erosion problems due to OHV use. Two of these roads were decommissioned to discourage OHV use, however, OHV activity still occurs on both roads and the erosion problems still exist.

In 1997, the Roseburg District BLM completed an OHV Implementation Plan for the entire district as required in the BLM manual and in the RMP. This implementation plan provides guidance in implementing OHV designations made through the Record of Decision and RMP, June 1995. This implementation plan is valid except for a portion that state law changed in 1998. According to this law, OHVs can now travel on all BLM natural and gravel roads without a registered license.

The U.S. Department of the Interior, BLM, created a National Management Strategy for Motorized Off-Highway Vehicle Use on Public Lands in 2001. This document provides a proactive approach to determine and implement better on-the-ground motorized OHV management solutions. It is designed to conserve soil, wildlife, water quality, and heritage resources while providing for appropriate motorized recreational opportunities. It provides agency guidance and offers recommendations for future actions to improve motorized vehicle management.

C. Visual Resource Management (VRM)

The RMP has designated how BLM-administered lands will meet the appropriate visual quality objectives. Figure 2-3 shows the types of Visual Resources Management Classes within the Upper Umpqua and the following are their definitions:

VRM I, preserve the existing character of the landscape.
VRM II, retain the existing character of the landscape.
VRM III, partially retain the existing character of the landscape.
VRM IV, allow modifications of the existing character of the landscape.

Upper Umpqua Recreation

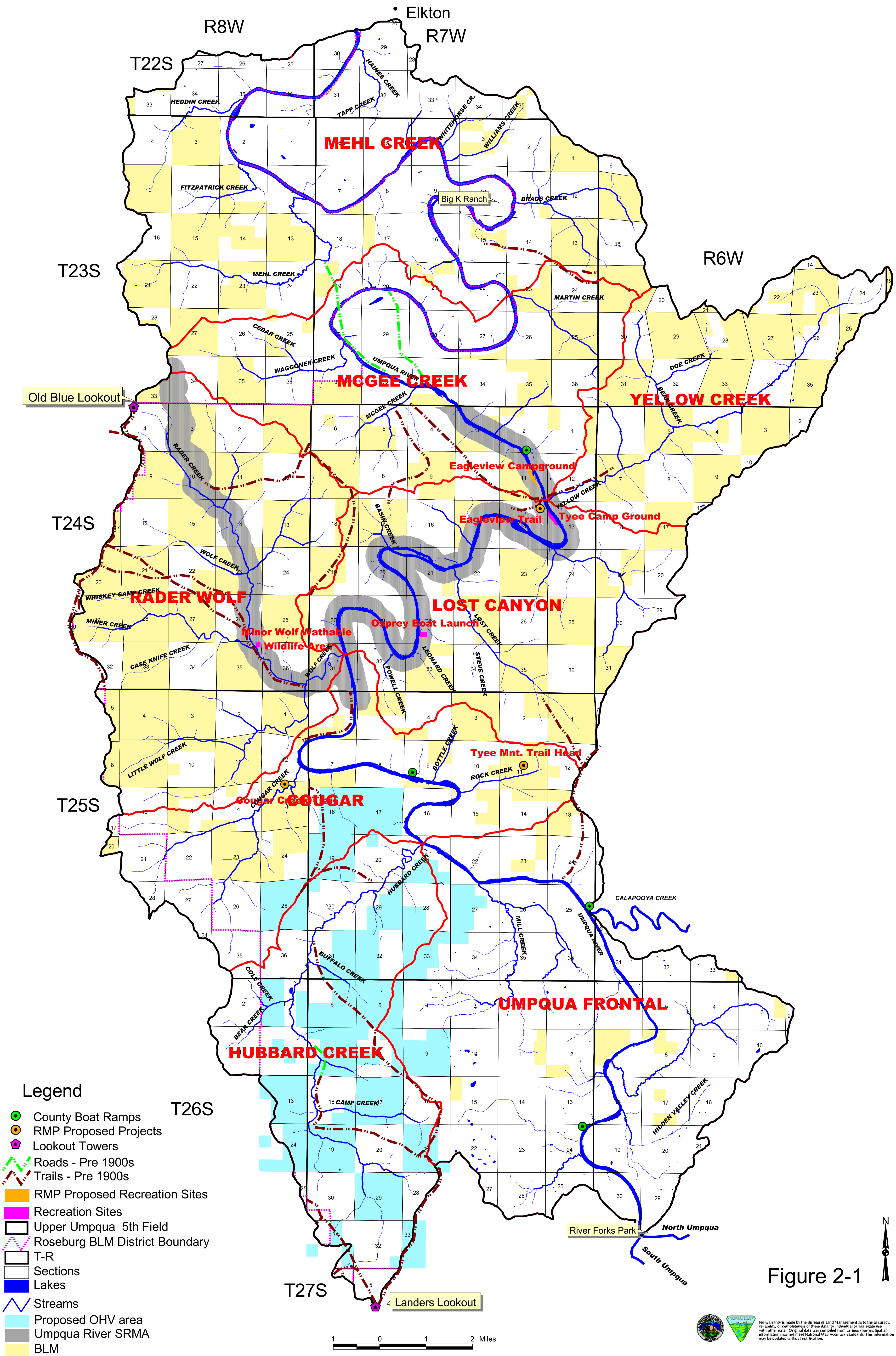
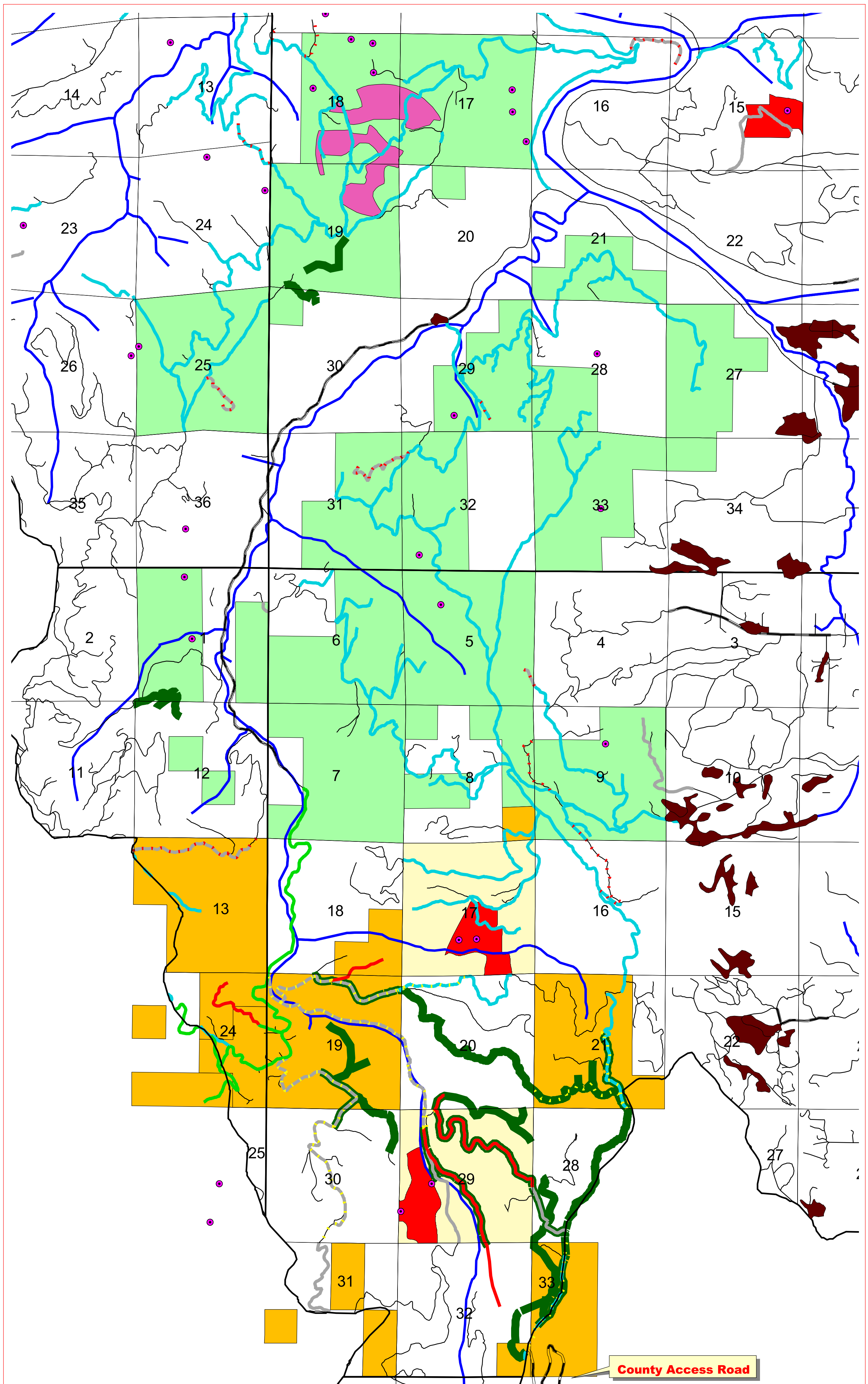
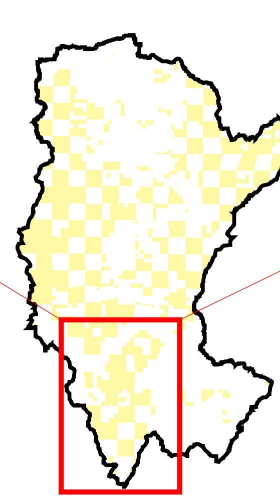


Figure 2-1

Upper Umpqua
Proposed Off Highway Vehicle Area





Legend

Kincaid's Lupine Potential Habitat
Northen Spotted Owl Activity Centers

Roads * Certain roads may have several attributes
- Future Decommission Candidates
- Future Improvement Candidates
- Past Decommissioned Roads
- Past Improvement Roads
- Gravel, Paved, Pit Run or Sandstone Surface Roads
- Natural Surface Roads
- High Erosion Roads
- Private Roads
- County Roads

Fish Distribution
Northern Spotted Owl Core Areas
Marbled Murrelet Occupied Areas

Federal Land Use Allocations
- Connectivity
- GFMA
- LSR

N

Figure 2-2

Upper Umpqua
Visual Resources

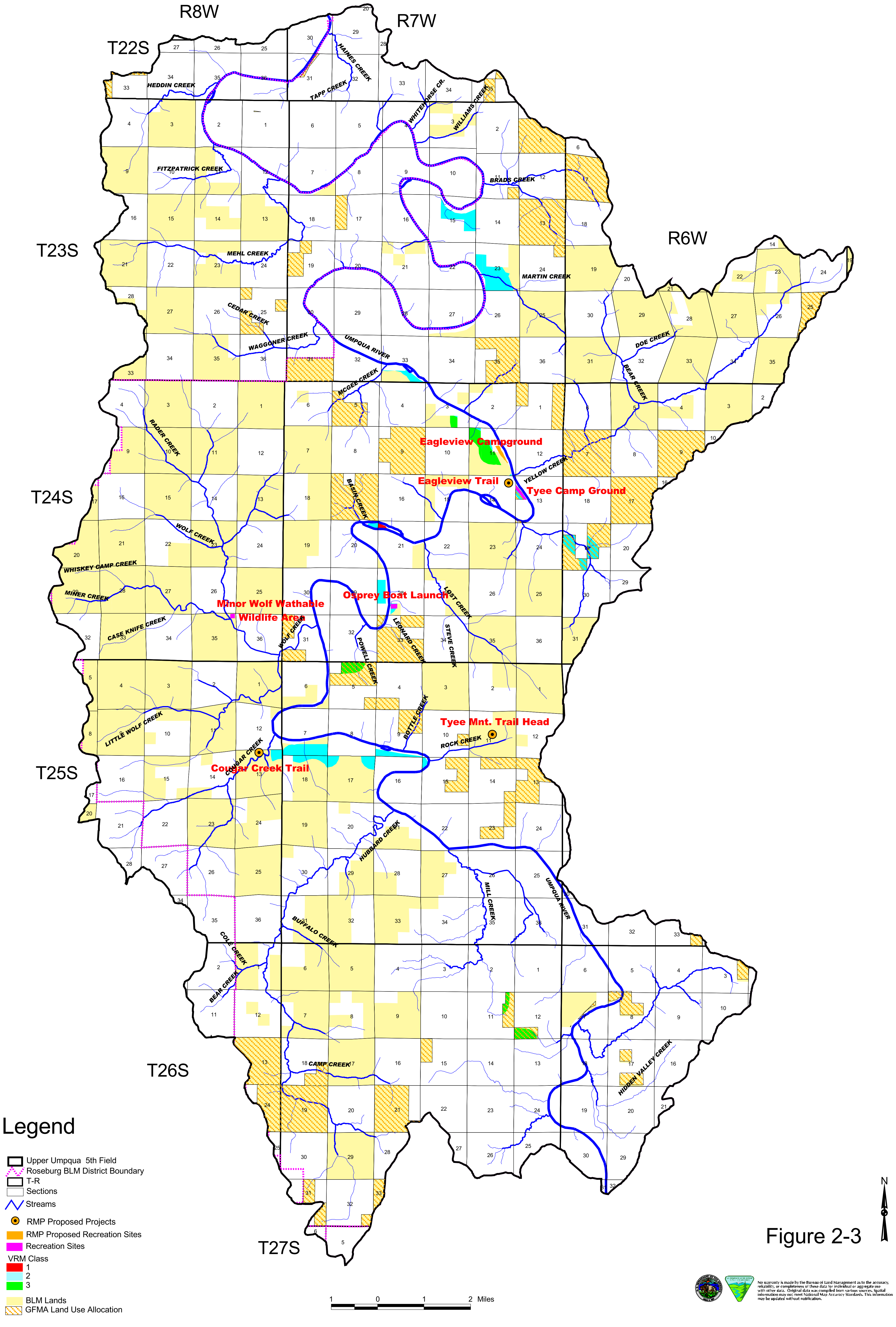


Figure 2-3

3 VEGETATION

A. Fire History

Upper Umpqua covers a large block of land that is intermingled with BLM public lands, industrial forest property, and large parcels of private ranch lands. The public lands managed by BLM are within the Coast Range Physiological Province. These public lands account for 35% of the watershed and include Late-Successional Reserve areas #263 and #264, as well as scattered matrix parcels (Figure 1-4, Tables 1-1 and 1-2, and Chart 1-2). These areas were analyzed in the South Coast - North Klamath Late-Successional Reserve Assessment (LSRA) conducted by a joint BLM - USFS team. The LSRA was completed in May 1998, and was developed to provide supplemental management guidance for all portions of public lands within the Southwest Oregon assessment area. This document recommends management and treatment activities. It also provides extensive fire/fuel information.

1. Fire Regime

Fire history is evident in nearly every naturally occurring forest stand in western Oregon. Fire has been the most important disturbance factor in northwest forests for centuries. Forest structure and species composition is dependant on the frequency and intensity of past fires. Only in recent times has logging and road building replaced fire as the leading disturbance agent.

Fire regimes are a function of fire frequency and fire intensity and are often given fire severity ratings. As part of the LSRA analysis, fire histories were investigated for three subwatersheds within the assessment area. The Tioga Creek LSR #261 had average fire frequencies at the drainage scale calculated between 50 and 75 years (prior to the advent of fire suppression). Upper Umpqua LSR #263 is located in close proximity to the Tioga Creek area, only 12 air miles away. The LSRA indicates that these adjacent areas can be expected to have very similar fire frequencies. Perhaps more telling is the frequency of the more destructive stand-replacement fire events. In the Southwest Oregon assessment area, the time since the last major stand-replacement fires range from 31 years for the Oxbow Burn area to more than 439 years for one site in the South Tioga Creek headwaters. Based on a broad analysis of changes in forest age classes between 1850 and 1940 in the Oregon Coast Range, Teensma (1991) concluded that stand-replacing fires occurred irregularly, at intervals from 150 to 350 years. Teensma speculated that many of the fires were of human origin, both prior to and during European settlement. Upper Umpqua Watershed has a high severity regime, with irregularly occurring stand-replacement events at intervals of up to 350 years.

In 1914 an Oregon state map was developed to show areas of commercial timber, non-timbered areas, and lands that had been burned over in large fires occurring during the turn of the century. Approximately half of all lands in Upper Umpqua were considered suitable for commercial timber and over 40% of the remaining acres were classified as brush or non-timbered. Over 16,000 acres or 14% of all timbered acres in the watershed were classified as “burned areas”.

Many of these areas were impacted by high severity fires prior to that time as evidenced by the lack of tree regeneration. Many of these fires occurred in the mid to late 1800s and around the turn of the century. These large fires impacted a high percentage of the Pacific Northwest during the same time frame and during a time when little or no fire suppression occurred.

2. Fire Occurrence

Fire frequency is based on the number of fire starts in the analysis area. DFPA and BLM records from 1967 through 2001 show 58 wildfires occurring on BLM-managed lands during that period. Many more wildfires occurred on private and industrial forest lands.

Table 3-1 Summary of BLM Fires within Upper Umpqua from 1967 to 2001

Cause of fire	Number of fires	% of total fires
Lightning	37	64%
Logging	7	12%
Human	9	16%
Other	5	8%

Over this 35-year period, lightning was the predominant fire cause (64%), with logging and human causes responsible for the other fires. Lightning occurrence levels for the BLM lands are considered low, on average only 1 fire per year resulted from this ignition source. Because of rapid initial attack by the DFPA, the majority of all fires were confined to less than 1 acre in size. The largest fire was 29 acres on BLM ground resulting from an escaped slash burn.

DFPA records for a 25-year period beginning in 1967 show 164 additional fires occurring on private lands in the watershed. "Human caused and miscellaneous fires" accounted for 77% of these private fire starts, lightning caused fires were only 13% of the total. On average, approximately eight fires per year occurred on all lands in the watershed.

3. Fire Risk

Wildfire presents the greatest risk of late-successional habitat loss within the LSRA. The LSRA reports there is presently a moderate-to-high fire hazard level in LSR #264 and the eastern portion of LSR #263. The report goes on to say, "Fine fuel levels are the primary concern. Fires have been suppressed for much of this century. Stand density and associated live and dead fuels have accumulated to a point that they are often outside the range of 'historic' variability."

For these LSRs, it appears that the "historic" fire return interval was on the order of 30-80 years (Agee 1993). Much of the private timberland, particularly small ownerships near the valley floor, has been recently harvested. Typically, very little slash disposal was done on these lands. Until decomposition occurs, this hazard will remain. Silvicultural activities such as density management, release treatments, and stand maintenance have added to the fuel loadings. In general, fuels generated from these activities have not been treated.

In addition to increased fuels, there are numerous sources of ignition including rural residences, recreational activities such as dispersed camping and hunting, an extensive road system, and ongoing forest management (logging and silvicultural operations). Because these LSRs have relatively short fire return intervals, there is a concern that developing stands with late-successional characteristics and maintaining them over the long-term will be difficult. Stands with short fire return intervals (generally southerly aspects) are at greatest risk of loss. Because of the increased fuel loadings, characteristics of fires in these LSRs are changing. Before intensive fire suppression, fires tended to be of lower intensity and more frequent. Fire suppression as well as some management treatments has caused fuels to build up so fires now tend to be less frequent but burn at a higher intensity. High intensity fires are a greater risk for late-successional habitat loss. Because of the intermixed private-public lands within Upper Umpqua, BLM will continue to exercise a full suppression policy in fighting wildfires. Human caused uncontrolled fires and the build-up of untreated slash and debris are the biggest threat to the LSRs.

B. Historic and Current Vegetation

1. Stand Structure Classification and Seral Stage

Figures 3-1 through 3-3, which represents broad vegetative classifications, come from three different data sources. The following describes the classifications based on their common vegetative structural and compositional characteristics. These classifications are slightly different than the definitions in the Roseburg and Coos Bay Districts' RMPs. However, the following definitions are meant to help simplify the analysis:

> **Early seral** is the time when the available growing space is occupied and shared by many species of plants. These early plants are sometimes referred to as pioneers, and may be short- or long-lived. In plantations these early plants compete with trees and are often removed as part of management. Conifers become established and eventually expand to exclude many of the early plants so that eventually competition is primarily between trees. In general, for the purposes of this analysis, stand age for early seral is considered to be less than 30 years, and the average diameter of trees is less than 10 inches.

Mid-seral forest stands begin when trees and/or other plants have captured all of the available growing space. They are most often characterized as even aged or *single-cohort* forest stands and are defined as all the trees that have resulted after a single disturbance event (Oliver et al. 1990). The area is fully occupied and new plants will normally not invade unless there is further disturbance. The dominant plants are competing with each other for the available growing space, often forming a continuous closed canopy that allows very little light to reach the soil surface. Shade intolerant trees that are not in a dominant canopy position begin to die out and there are fewer shrubs, herbaceous plants and grasses. Growing space becomes available slowly as trees die from competition, and tree growth rates decline. In general for the purposes of this analysis, mid-seral stands range in age from about 30 to 80 years, and the diameters of trees average from about 10 to over 20 inches.

Stand differentiation often begins in the mid-seral stage of development. In natural stands differences in the age, size, and genetic potential of trees, micro site, and the abundance and arrangement of plants leads towards stand differentiation. There are nearly always individual or grouped larger and older trees mixed with smaller trees and shrubs. Canopy gaps allow for shrubs, hardwoods and conifer regeneration.

In managed plantations, trees are more uniform in size, age, spacing, and genetic potential. Other plants are often excluded as part of management. It is more likely that the trees in these stands will all grow up together and reach a condition where competition between trees results in substantially reduced growth. It probably takes much more time for stands in this condition to differentiate. These are stands where density management may be needed to meet the objectives of the current Resource Management Plan.

Late seral as defined by both Roseburg and Coos Bay Districts' RMPs would be very similar to the description above for mid-seral. However, natural unmanaged stands tend to start differentiating into *multi-cohort* forest stands around the age of 80 years. Managed stands that have not been treated (thinned) tend to remain *single-cohort* forest stands up until 100 years of age. For the purposes of this analysis, 'late seral' will refer to stands greater than 80 years of age with stand characteristics as defined below.

Late seral (Mature seral as defined by the RMP) is mostly *multi-cohort* forest stands where minor disturbance events have created openings in a patch-like nature and younger cohorts exist interspersed with older cohorts. With current managed landscapes, unharvested areas most often characterize these stands. The following define their major characteristics:

-*Deep multiple canopy layers*: This characteristic may not often occur in our area because of the nature of Douglas-fir and the frequency of fire. Two or more canopy layers exist when shade tolerant tree species become established and grow in the understory.

-*Diverse tree size, form and condition*: Trees are not evenly spaced and may exist in clumps, and tree size and forms are affected by this variable distribution and density. Trees that are open grown typically have large diameter stems and full crowns. Tall, cylindrical stems with narrow crowns are found when trees grow close together. Large, old conifers are present. Many of the oldest conifers are fire scarred and hollow, have broken tops, and contain heart and butt rots.

-*Canopy gaps and natural openings*: Late-successional forests contain openings. The degree to which a stand is open, and the size and spatial arrangement of openings depend on the processes that create them. Stand age, frequency and intensity of fire, disease, insects, wind, and soil movement all have an effect.

-*Large snags in various stages of decay*: Fire, insects and disease are primarily responsible for the creation of large snags. This is a highly variable characteristic. Some large snags are present in late-successional forests even when fires occur frequently.

-*Coarse woody debris*: The processes that create snags also create coarse woody debris. The amount that exists may depend on the frequency and intensity of fire.

-*Species diversity*: Species diversity is high in late seral forests, many of which are difficult to inventory and describe. The late seral stage includes areas of early and mid-seral development interspersed.

Unmanaged stands 80 years of age and older are considered late seral. These are naturally occurring stands that contain most, if not all, of the characteristics that define late seral forest.

2. Data Sources and Their Resolution for Representing Seral Age Classes

The three data sources as shown on Figures 3-1 through 3-3 include the 1936 Vegetation Layer (Forest Resources of the Douglas-fir Region), the 1997 Interagency Vegetation Mapping Project (IVMP), and the BLM's Forest Operations Inventory (FOI). The data allows the vegetation to be grouped into the early, mid, and late seral age classes for comparison purposes, however these data sources have differing degrees of detail and resolution.

During the 1920s and 1930s, H. J. Andrews and R. W. Cowlin conducted surveys to obtain information about the Douglas-fir region. From that survey information and data, in 1936 a map was produced, later published in 1940, and was called Forest Resources of the Douglas-fir Region (USDA Miscellaneous Publication 389). Areas were viewed and surveyed from several vantage points to determine forest type boundaries and represented broad categories of the forest landscape in the late 1930s. Portions of this map have been digitized, attributed and included in the BLM Roseburg District GIS system. The map gives descriptions of forest types in Douglas County in terms of diameter class and species. The diameter classes were correlated to seral age classes based on "The Yield of Douglas-fir in the Pacific Northwest" by Richard E. McArdle. Thus for the 1936 data, the diameter class of 0 to 6 inches was correlated to forest stands that are between 0 and 30 years of age (Early Seral), 6 to 20 inches with 31 to 100 years (Mid-seral), and greater than 20 inches were correlated to forest stands of greater than 100 years (Late Seral). Conditions described from the 1936 map (Figure 3-1) were used to approximate natural conditions prior to major human-related timber harvesting in the watershed. The Roseburg District silviculturist (Craig Kintop) recently compared the 1936 late seral age class to 1954 forest type maps in the Myrtle Creek watershed. The 1954 maps classified forest types with much greater detail. He found that up to 20% of what the 1936 maps classified as late seral age classes actually represent early or mid-seral age classes (less than 100 years of age) based on comparisons with the 1954 forest type map.

The 1997 Interagency Vegetation Mapping Project (IVMP) provides a representation of vegetation age classes across all ownerships within the Upper Umpqua watershed (Figure 3-2, Tables 3-3 and 3-4). IVMP is a joint Forest Service/BLM project that derives a 25-meter pixel-based vegetation map from 1997 satellite imagery. The vegetation map has been classified into categories according to the Interagency Vegetation Standards that were adopted by the Interagency Advisory Committee.

The Forest Operations Inventory (FOI) gives a more detailed description of age classes on BLM lands (Figure 3-3, Tables 3-5 through 3-8, and Charts 3-4 through 3-7) because it is based on field data as well as aerial photo inventories. A quick comparison of Tables 3-3 (IVMP data) and Table 3-5 (FOI data) shows that the late seral age class appears to be accurately represented by the IVMP data since there is only a 145-acre difference in the total late seral acres on BLM lands out of approximately 32,000 acres. However, the IVMP data appears to over represent the mid-seral acres and thus under represent the early seral acres. The IVMP mid-seral data shows Upper Umpqua to have 22,595 acres compared to 11,914 acres in the mid-seral (31 to 80 year) age class for the FOI data. Since IVMP data is based on satellite imagery, reflective properties from vegetation, and algorithms predicting the type and diameter of the vegetation, it is possible that the transition from early to mid-seral conifer diameter classes are harder to predict by the current IVMP algorithms. IVMP data is primarily useful for cumulative effects analysis that includes public and private lands.

3. Unmanaged Forest Stand Development

Fire and other disturbances lead to regeneration of Douglas-fir by removing the overstory shade and creating a bare mineral seedbed. If not for naturally occurring stand-replacing fires, the forest would consist predominantly of shade tolerant conifers. McArdle (1949) described Douglas-fir forests of the Pacific Northwest that originated following severe fires as uniform and even-aged, often unbroken over thousands of acres; others are small patches surrounded by timber of another age, or rarely are a composite of several age classes. More recent studies in coastal old-growth forests show a range of age that spans hundreds of years, with the growth rates of individual trees indicating stand densities of about 40 to 50 trees per acre (Tappeiner 1997). The term *even-aged* probably does not accurately define most natural stands. A better term may be *single cohort* and is defined as all the trees that have resulted after a single disturbance event (Oliver et al. 1990).

Within the last 200 years, fire has been an important disturbance factor for unmanaged forest stands in Upper Umpqua. Following a major fire event, the openings created are rapidly reestablished with the plants that existed prior to the disturbance. Roots and seeds that survive the fire in the soil sprout and germinate soon after. Adjacent plants shed seed on these areas, and the process of regeneration begins. The progression is not so much a well-defined succession of new plants as it is a reoccurrence of the previously established plants. The length of time required for Douglas-fir to reestablish and dominate is variable and dependent on seed sources and the degree to which the site is occupied by other plants. Other disturbances that add to plant diversity include wind, root diseases, insect outbreaks, floods, ice storms and landslides. These disturbances create canopy openings that may range from less than an acre to over thousands of acres. (Spies and Franklin 1989). Within Upper Umpqua, the majority of forest stands that are greater than 60 years of age on BLM lands resulted from major fire events.

4. Managed Forest Stands

Management of forests has replaced fire as the dominant disturbance regime. Logging, road building and planting have converted much of the original forest into young Douglas-fir plantations. To some extent clear cutting and burning mimics a major disturbance event, but there are many differences. A network of logging roads is needed for logging, reforestation, and forest protection. Except in the cases where wood product market forces made it unprofitable to remove certain types of timber, prior to the Northwest Forest Plan most of the merchantable material was removed in the harvest operation. The limbs and tops of trees are often burned following harvest to create openings for planting seedlings and to reduce the fire hazard. Typically between 450 and 650 seedlings per acre are planted in order to have 250 to 300 trees per acre at the first commercial entry. Pre-commercial thinning is often required about 15 years after planting. Past management plans were designed to produce stands that were uniform and even-aged. There are fewer dead and defective trees and less coarse woody debris in managed stands than what is normally found in unmanaged stands.

The majority of the early and mid-seral forest stands described above resulted from clear-cut harvesting prior to 1995. It is estimated that 25,000 acres of BLM lands were clear-cut harvested, the vast majority of these occurring between 1945 and 1995. Since 1995 approximately 290 acres of BLM lands have been regeneration harvested and approximately 60 acres have been commercially thinned.

5. Current Conditions and Arrangement of Forest Stands

Within Upper Umpqua, private lands are interspersed with federal lands throughout the watershed. Most of the private lands are managed as tree farms to produce wood fiber on forest rotations of between 40 and 50 years. On BLM lands natural stands are interspersed with younger, managed plantations.

Figures 3-2 and 3-3, Tables 3-2 and 3-3, and Chart 3-3 show an approximation of changes from historic to current vegetation. As can be seen from the percentages, approximately 20% of the late seral forests have been converted to mid-seral, and hardwoods appear to have increased by approximately 4%. Overall, it appears that forested lands have remained about the same.

Figure 3-3 shows the BLM forest inventory in three broad age classes. Stands greater than 80 years of age are considered late seral. These older stands can vary greatly in structure and composition and function like old growth. The only management that has occurred in these stands is occasional roadside salvage and fire suppression. Within Upper Umpqua, approximately 31,896 acres of BLM lands are considered late seral (Figure 3-3, Tables 3-5 through 3-8).

Forests on BLM lands that are less than 80 years of age are, for the most part, managed stands. Mid-seral stands between the ages of 30 and 80 make up about 11,900 acres. Most of these stands were established following clear cutting practices of the mid 1900s. Stands less than 31 years of age are considered early seral and amount to about 13,900 acres (Table 3-5).

There is an investment in managed stands that includes all or some of the following: reforestation and plantation maintenance, pre-commercial thinning, and fertilization and pruning. The majority of the managed stands are fairly uniform Douglas-fir plantations that were designed to support a commercial thinning.

On BLM lands, about 2,800 acres have been pre-commercially thinned to an average of 209 crop trees per acre. These stands typically include additional trees including hardwoods that don't count as crop trees. About 1,260 acres have been fertilized and about 700 acres have been commercially thinned.

C. Vegetative Trends Based on Land Management Objectives

Based on data listed above, approximately 22,000 acres on BLM lands could potentially benefit from some sort of density management within the next ten years. Allowing these stands to self-thin will result in trees with small live crowns, weak stems, and poorly developed root systems. Tall skinny trees are susceptible to wind throw and more likely to break under snow loads. Trees that have developed over long periods of competitive stress are more likely to be killed by insects and disease (Waring 1985), (Smith, 1962). Stands left in this condition are slow to respond to improved growing conditions and never attain potential growth rates, (Oliver, 1990), (Smith, 1962). When this process occurs in managed stands of Douglas-fir, down wood and snags are made up predominantly of the smaller trees. Accumulations of dead wood consisting of small trees increases fire intensity and rate of spread. The risk of stand damage from fire is increased (Waring, 1985), (Graham, 1999).

Charts 3-1 and 3-2 show a comparison in a Coastal Oregon Productivity Enhancement Program study area of live crowns in young managed stands eight years after different thinning treatments. The untreated stands show little understory diversity and very small crowns.

Untreated stands are at a greater risk for damage from insects, fire and strong winds. It is likely that the plan objectives will not be met in the near term for untreated stands. The return on the investment to produce these stands at commercial thinning densities will also be lost.

Land use allocations under the NFP have a direct bearing on the type and timing of silvicultural treatments. Treatment priorities and prescriptions within the Late-Successional and Riparian Reserves are described in the South Coast - Northern Klamath Late-Successional Reserve Assessment (LSRA). Priority is given to stands that have been regenerated following past timber harvest. Density management (tree thinning) treatments in stands less than 90-years old to maintain or accelerate stand development toward achievement of late-seral characteristics is recommended. A standard prescription is outlined under Desired Conditions (page 82 of the LSRA). A similar prescription may be necessary in the Riparian Reserves. Thinning of early and mid-seral forest stands within the Matrix lands to meet the timber objectives of the plan is also recommended.

Chart 3-1 COPE Report Research, Forest Stands BEFORE Thinning

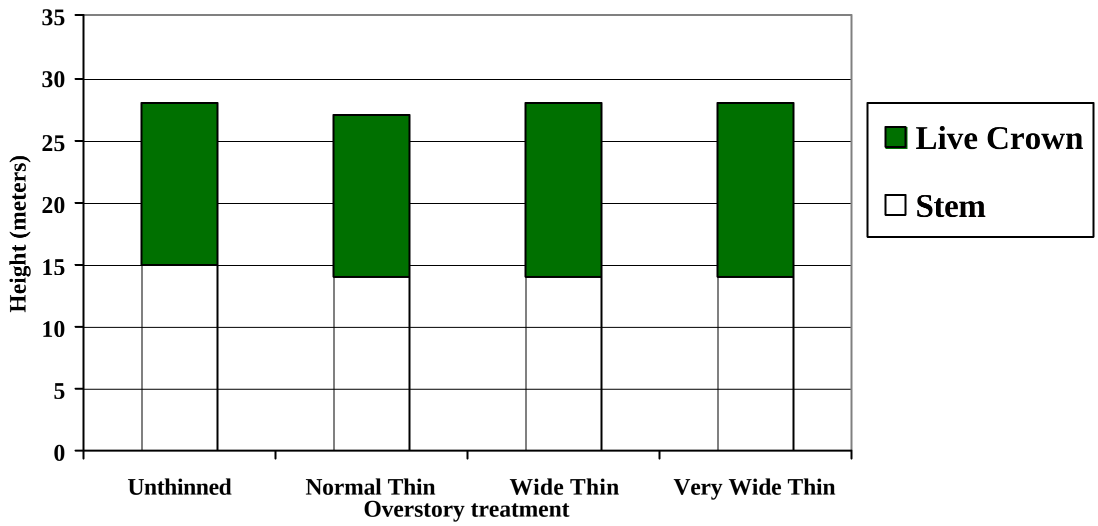
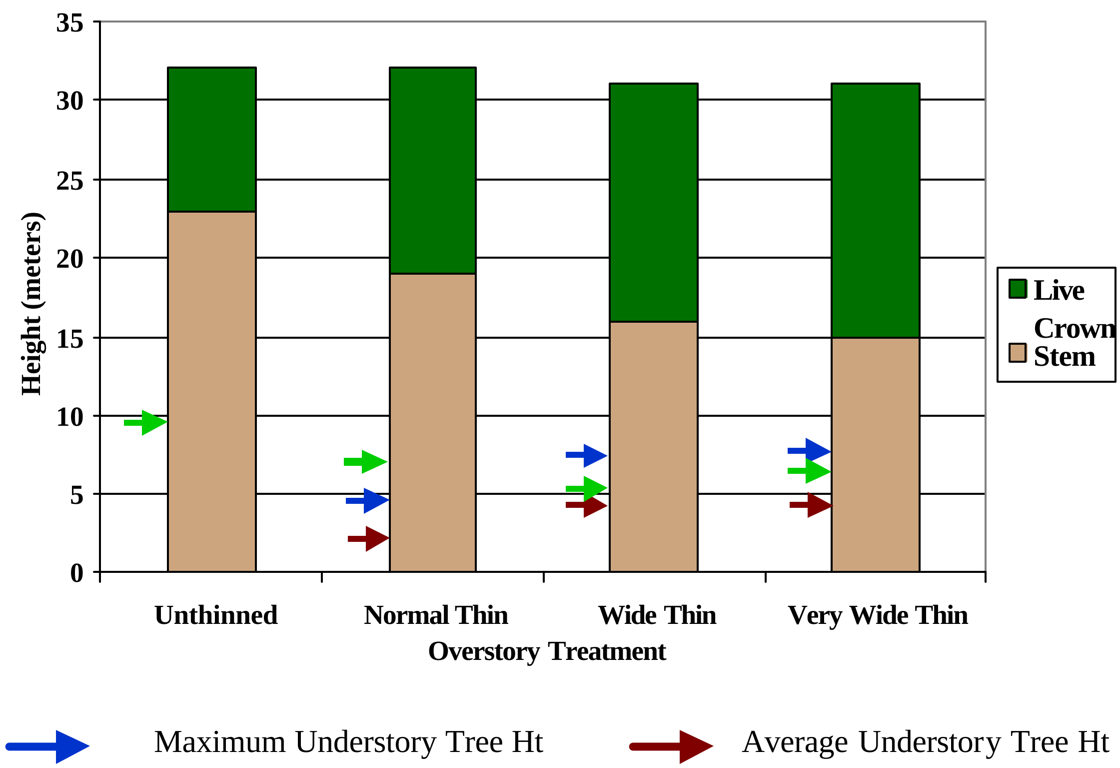


Chart 3-2 COPE Report Research, Forest Stands 8 Years AFTER Thinning



D. Botany

1. Special Status Species - Botany

Special Status Species (SSS) plants include vascular plants, bryophytes (liverworts and mosses), fungi and lichens in the following categories: Federal Listed, Federal Proposed, Federal Candidate, State Listed, Bureau Sensitive, Assessment, and Tracking Species. On the Roseburg District, there are two Federal Listed Species, no Federal Proposed or Federal Candidates, five State Listed, 18 Bureau Sensitive, 24 Assessment and 34 Tracking Species.

There are currently 50 sites of SSS plants known on BLM-managed lands within Upper Umpqua and seven sites within one air mile of the watershed boundary. These sites were identified primarily through pre-project surveys. The Coos Bay District reported no known sites of SSS plants. There has been no attempt to conduct comprehensive botanical surveys throughout the watershed.

a) Federally Listed Species

Kincaid's lupine *(Lupinus sulphureus var kincaidii*) is federally listed as "Threatened". The plant itself has not been identified in Upper Umpqua, but the watershed is within the range of the species and there is potential habitat for this species in the watershed. Potential habitat was assigned based on the soil type of known sites throughout the range of this species. The soils list was updated March 1, 2002. Based on that list, there are 3,757 acres of potential habitat in the watershed, nine acres of which are on BLM-managed lands (Figure 3-4).

b) State of Oregon Listed, Bureau Sensitive, Assessment and Tracking Species

One population of wayside aster *(Aster vialis*), a State Threatened, Bureau Sensitive and Survey and Manage species, is known to occur within the watershed. This site is on non-BLM land along County Road 33, adjacent to Myrtle Island Research Natural Area.

Wayside aster inhabits coniferous forests at elevations below 3,200 feet. It typically occurs on dry upland sites dominated by Douglas-fir and is usually accompanied by Pacific madrone, golden chinkapin and Oregon white oak (USDA/USDI 1998). The species also occurs "along the edge of forests in partial sun." (Special Status Plants of the Roseburg District, 1991). Populations of wayside aster occur on sites in all stages of succession, from recent clear-cuts to mature forest. Preferred habitat for this species is believed to be open coniferous forest, sustained by frequent fire (USDA/USDI 1998). Wayside aster may occur elsewhere in the watershed. On BLM lands, suitable habitat will be inventoried prior to activities that may have a "significant effect" on the species.

Five other SSS, California maiden-hair (*Adiantum jordanii*), saw-toothed sedge (*Carex barbarae*), firecracker plant (*Dichelostemma ida-maia*), Umpqua phacelia (*Phacelia verna*), and rabbit ears *(Otidea leporina)* are known to occur on BLM managed lands within the watershed.

All are Tracking Species and management for them is discretionary. One other Tracking Species, Imperial Lewisia (*Lewisia cotyledon var. howellii*) is known within one mile of the watershed boundary. Table 9-1 in the Overview and Botany Appendix provides a summary of SSS sites known on the district and within the watershed.

2. Survey and Manage Bryophyte, Lichen, Fungi and Plant Species

The original Survey and Manage (S&M) list from the Northwest Forest Plan and Roseburg District ROD/RMP was amended in 2001. The list from the Record of Decision and Standards and Guidelines for Amendments to the S&M, Protection Buffer, and other Mitigation Measures Standards and Guidelines (US Departments of Agriculture and Interior, 2001) was used to analyze the species present and management category. Data collected on categories that no longer exist will not be discussed here.

In the Roseburg District, 71 S&M species have been recorded at 1,277 sites. S&M species found on BLM managed lands in the Roseburg District include two vascular plant species, five bryophyte species, 16 lichen species and 48 fungi species.

Twenty-one S&M species were recorded on BLM-managed land at 76 sites in the Upper Umpqua Watershed, including 18 bryophyte sites, 12 lichen sites and 46 fungi sites. The species reported include one bryophyte species, six lichen species and 14 fungi species. Sites were detected during general surveys of LSRs, Myrtle Island RNA and pre-project surveys for commercial thinning. No sites are known on the Coos Bay District portion of the watershed (see Table 9-2, Overview and Botany Appendix).

Surveys and management are based on the assigned categories of letters A through F. Pre-disturbance surveys are required for species in Categories A and C. At this writing, there are 14 species requiring pre-disturbance surveys that could occur in Upper Umpqua (Figure 3-4). Roseburg District has developed a pre-field form with these species and it is revised annually. Only one of those species, *Ramalina thrausta*, has been found at three sites on BLM-managed lands in Upper Umpqua. Two of the sites are on Myrtle Island (T.24S., R.7W., Sec. 20) and one in the SE1/4 of the SE1/4 of T 25S R8W Sec 1 (Figure 3-4). These sites are in low elevation old-growth Douglas-fir within quarter mile of the main Umpqua River. A second species, wayside aster (*Aster vialis*), was identified on non-federal land in Upper Umpqua.

S&M species will undergo annual species review, where species may be moved from one category to another, other species may be added or removed from the list. Although surveys are not required for species in other S&M categories, additional species may be located during required surveys. Strategic surveys for S&M species have been conducted on Current Vegetation Survey (CVS) plots. A subset of the CVS plots was selected for these surveys. Some results of the surveys are not yet available; however, the pilot study on the Roseburg District had 3 plots in Upper Umpqua. One species (*Ramalina thrausta*) has been reported from those plots. Table 9-3 in the Overview and Botany Appendix summarizes the current knowledge about S&M species within Upper Umpqua.

3. Noxious Weeds

Noxious weeds are non-native invasive plants specified by law as being especially undesirable, troublesome, and difficult to control. They have invaded and become firmly established on public and private land throughout the Roseburg and Coos Bay Districts. Serious economic and ecological impacts have already occurred and are expected to increase if prevention and control measures are not taken. The objective of the Roseburg District weed control program is to:

> (1) maintain established noxious weed populations below the level that causes either undue and unnecessary environmental degradation or impairs the public land's economic productivity, and
> (2) eradicate invading noxious weeds before they become established on public lands (USDI, 1995).

Noxious weed lists have been established by the Oregon Department of Agriculture and Douglas County. The 2001 noxious weed list for Oregon has 100 plants listed and categorized by relative abundance and management strategy. The list for Douglas County was patterned after the state list and contains 46 species known and 8 species likely to occur in the county. Thirty-five of those species have been found on BLM-managed lands in the Roseburg District. All 35 of those are likely to occur within Upper Umpqua. At this writing, 27 of those species have been noted in Upper Umpqua. The majority of weed species reported for this watershed were detected during a botanical survey of Myrtle Island (Thompson, 2001). See Table 9-4, Weeds Known to Occur in Upper Umpqua in the Overview and Botany Appendix.

a) Weed Prevention and Control in Upper Umpqua

Noxious weeds are classified into two primary lists, A and B. "A" list weeds are new invaders. They occur in small enough infestations that eradication or containment is possible. Some of these weeds are not yet known, but their presence in adjacent areas make future occurrence likely. "B" list noxious weeds are common and well established. Eradication on a large scale is not likely. Containment is possible in some cases and is encouraged. Where these are not feasible, biological control agents may be introduced to slow the spread of infestation. From the A and B lists, a third list is compiled and designated "T". These noxious weeds are "targeted" for control in a specific area. See the Douglas County Noxious Weed Policy and Weed List in the Overview and Botany Appendix.

For BLM-managed lands there are three priorities:

1. Prevent new invaders
2. Eradicate new invaders before they become established
3. Control established infestations

Two new invaders on both the “A” and “T” lists were reported on private land in Upper Umpqua. Wooly distaff thistle was reported in T.26S., R.6W.. Gorse was reported in T.25S. R.7W., Sec. 8 and T.26S. R.7W., Sec. 11. One other “T” list weed, yellow starthistle, has been found in Myrtle Island (T.24S. R.7W., Sec. 21). The most likely new invaders that have not been documented in the watershed are in Table 9-5 in the Overview and Botany Appendix. The other 26 known noxious weeds are on the “B” list. The management strategy for “B” list noxious weeds is containment and limiting new infestations from becoming established. Three “B” list weeds (Spanish broom, Japanese knotweed and rush skeletonweed) are thought to be new invaders in the watershed. The primary strategy for new invaders is eradication before establishment. For other “B” list weeds on BLM-managed lands, the first priority is control of established infestations in “areas adjacent to agricultural lands, major reservoirs and natural bodies of water, perennial waterways and major BLM and privately-owned roads.” (USDI, 1995).

Noxious weed control has been initiated at several sites within the watershed (Figure 3-5). Ongoing manual treatments at Myrtle Island RNA (T.24S. R.7W., Secs. 20, and 21) control Scotch broom, Himalayan blackberry, yellow starthistle, rush skeletonweed and purple loosestrife. On Bullock Road (T.24S. R.7W., Sec. 3) biological, mechanical and chemical treatments have been used to control bull thistle, Canada thistle, slender-flowered thistle and Italian thistle. Scotch broom has been hand pulled annually since 1998 at Eagleview Group Use Campground (T.24S. R.7W., Sec. 11). Scotch broom is the most reported noxious weed in Upper Umpqua. It is also the noxious weed with the highest documented economic impact in the state (Radke, 1999). Scotch broom was actively treated by BLM on 73 miles of roadside and 20 acres of forestland in Upper Umpqua in 2001. In 2000, 21 acres of Scotch broom were actively treated and in 1999, 10 acres were actively controlled. The primary method of controlling Canada thistle, bull thistle, tansy ragwort, meadow knapweed, Scotch broom, purple loosestrife and St. Johnswort is biological. Biological control agents (primarily insects) for these species have been released and become widespread and well established throughout the Roseburg and Coos Bay Districts. Biological control agents feed on target plants and reduce their ability to spread but very rarely eliminate the infestation. No effort has been made to quantify the extent or control achieved by biological control agents in this watershed.

b) Invasive Species in Upper Umpqua

There are 155 non-native species that have been documented in Upper Umpqua. Most of those species are invasive, under the right conditions. One example is parrotfeather (Myriophyllum aquaticum). It has been proposed for listing on the Oregon noxious weed list, is known to damage coho rearing habitat (Sytsma, 2001), and is a known noxious weed in Washington (USDA PLANTS database 2001). In 2001, it was discovered at the Osprey Boat Ramp (T.23S. R.7W., Sec. 23) and Myrtle Island. Invasive species will be managed like noxious weeds. A risk assessment will be conducted on newly discovered invasive plants on high priority sites. Recommendations for treatment will be formulated in consultation with Oregon Department of Agriculture. Since parrotfeather is a new invader with a high likelihood of spread into uninfested areas, the half-acre infestation was hand pulled three times in 2001.

BLM has a strategic plan for managing noxious weeds that is based on adequate inventories. Most of Upper Umpqua has not been inventoried. Without inventories and risk assessments, weed control needs to focus on prevention of new infestations, previously treated sites, biological control, and new invaders.

4. Port Orford Cedar Root Disease

Port Orford cedar (*Chamaeyparis lawsoniana*) grows only in the extreme southwest portion of the Upper Umpqua watershed on private lands, and in extremely small numbers (less than six known trees). These particular trees are healthy, located on the ridge top along the watershed boundary, and are part of a much larger population that naturally occurs in the Arrow and Cedar Creek drainages to the west. This tree species can become infected with a root pathogen (*Phytophthora lateralis*), which is primarily transported via water in streams and mud on vehicles.

The above described trees grow chiefly next to private road No. 25-8-1.0 and the root disease is known to occur in the vicinity to the west. If these trees were to die from the root disease, it would have virtually no effect on its larger population in a genetic or ecological context. This road, moreover, is gated and its use is usually prohibited during wet periods. It is also rocked, lessening the possibility of vehicles picking up mud.

Upper Umpqua Vegetation - 1936

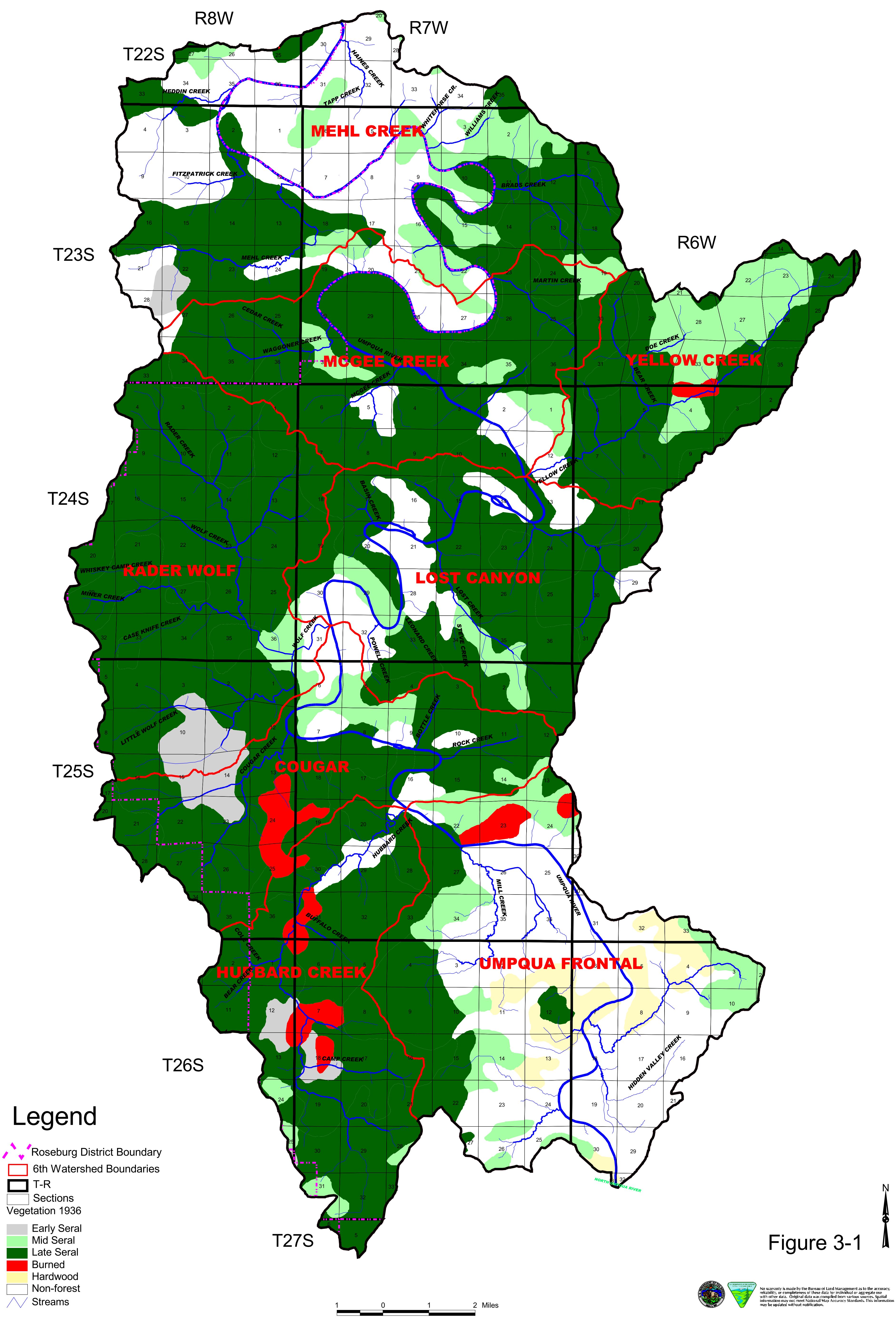


Figure 3-1

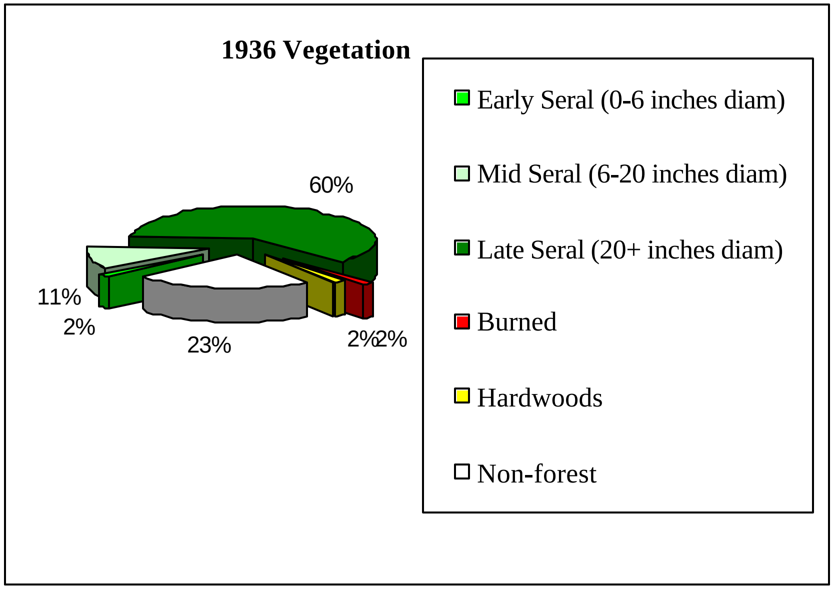
Table 3-2 Upper Umpqua, 1936 Vegetation – Federal and Private Lands

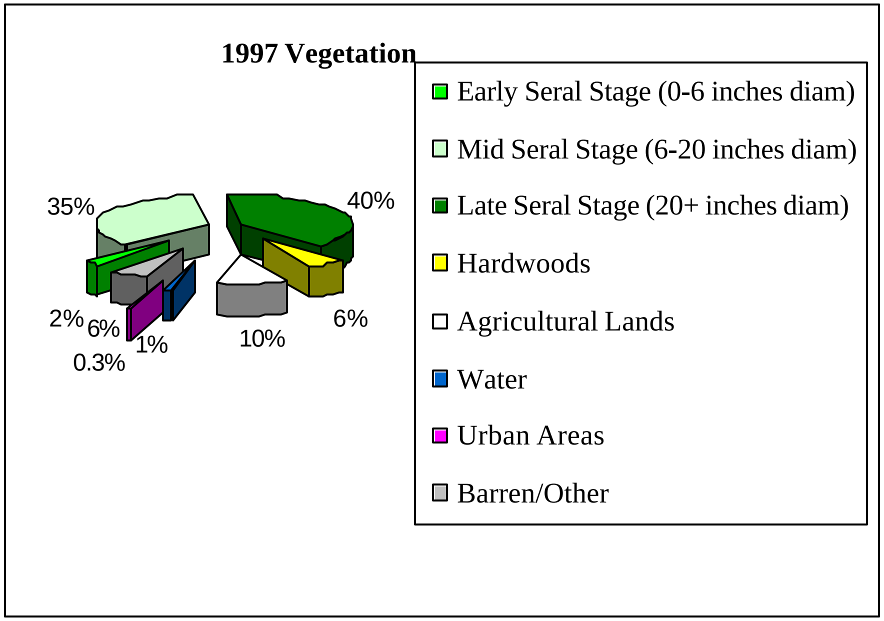
	Total		Federal		Private	
Vegetation Class	acres	%	acres	%	acres	%
Early Seral (0-6 inches diam)	3,171	2%	1,529	0.9%	1,642	1.0%
Mid Seral (6-20 inches diam)	18,696	11%	5,616	3.3%	13,080	7.7%
Late Seral (20+ inches diam)	102,269	60%	46,266	27.3%	56,003	33.0%
Burned	2,756	2%	1,319	0.8%	1,437	0.8%
Hardwoods	3,260	2%	426	0.3%	2,834	1.7%
Non-forest	39,306	23%	3,532	2.1%	35,774	21.1%
TOTAL	**169,458**		**58,688**	**34.6%**	**110,770**	**65.4%**

Table 3-3 Upper Umpqua, 1997 Vegetation – Federal and Private Lands

	Total		Federal		Private	
Vegetation Class	acres	%	acres	%	acres	%
Early Seral Stage (0-6 inches diam)	3143	2%	1167	0.7%	1976	1.2%
Mid Seral Stage (6-20 inches diam)	58771	35%	22595	13.3%	36176	21.4%
Late Seral Stage (20+ inches diam)	66806	39%	32041	18.9%	34765	20.5%
Hardwoods	9924	6%	1318	0.8%	8605	5.1%
Agricultural Lands	17727	10%	71	0.0%	17656	10.4%
Water	2067	1%	35	0.0%	2032	1.2%
Urban Areas	452	0.3%	7	0.0%	446	0.3%
Barren/Other	10535	6%	1418	0.8%	9118	5.4%
TOTAL	**169426**		**58652**	**34.6%**	**110774**	**65.4%**

Chart 3-3 Upper Umpqua Vegetation Comparison, 1936 to 1997





Upper Umpqua 1997 Vegetation

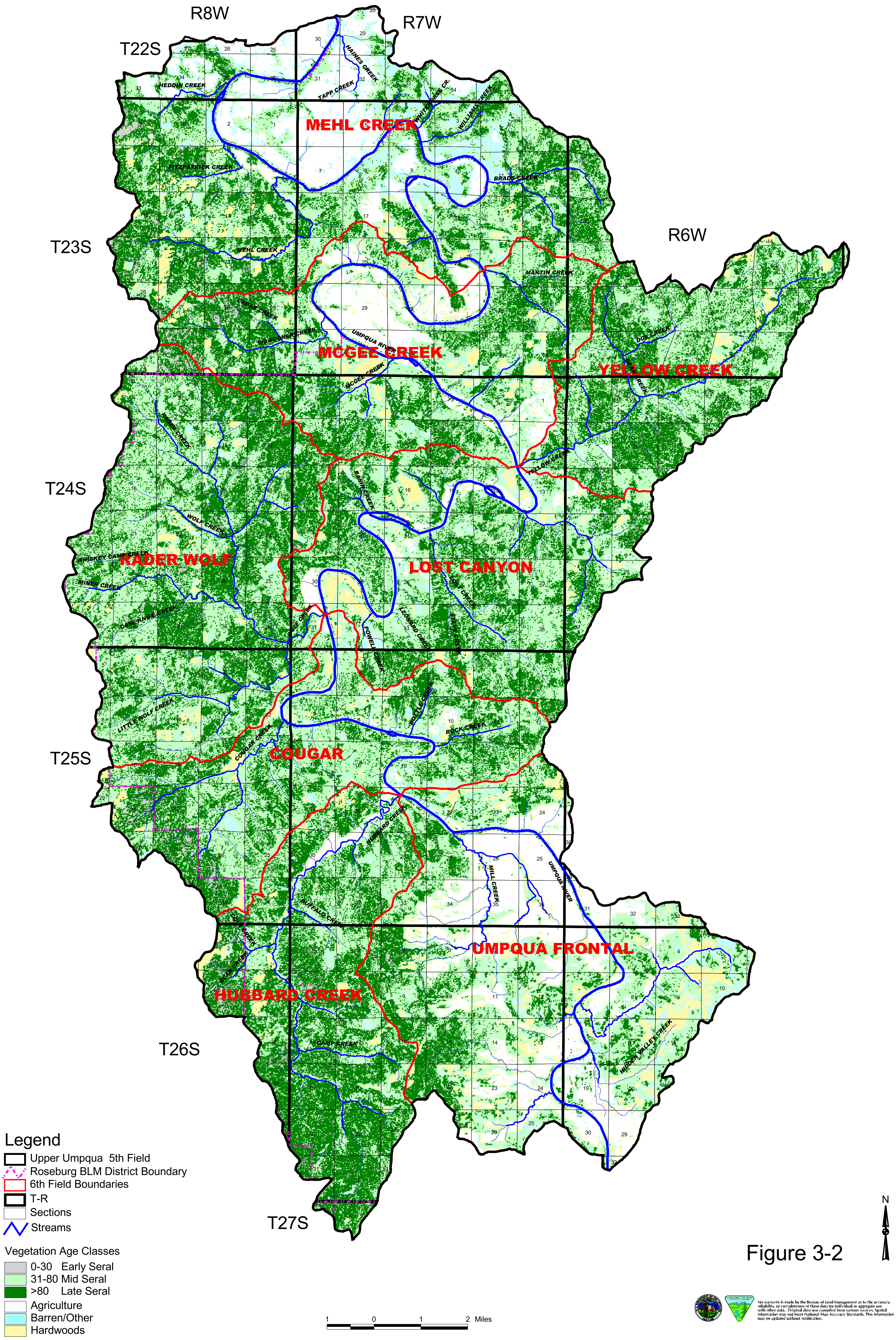


Figure 3-2

Table 3-4 Upper Umpqua 1997 Vegetation by Subwatershed (acres & %)

Vegetation Class	MEHL CREEK	MCGEE CREEK	YELLOW CREEK	RADER WOLF	LOST CANYON	COUGAR	HUBBARD CREEK	UMPQUA FRONTAL	TOTAL
	acres	acres	acres	acres	acres	acres	acres	acres	acres
Early Seral	567	424	213	514	194	428	666	137	3143
Mid Seral	8850	6476	5810	10319	7134	5746	9739	4661	58735
Late Seral	9916	7630	6762	11565	9268	7825	5489	8306	66761
Hardwoods	1516	1309	378	626	1190	742	569	3585	9914
Agricultural Lands	5849	2751	65	31	623	193	270	7934	17716
Water	628	368	1	3	382	248	1	436	2067
Urban Areas	47	81	0	0	31	0	0	292	452
Barren/Other	3608	987	295	479	1096	907	331	2821	10524
TOTAL	**30981**	**20026**	**13524**	**23537**	**19918**	**16088**	**17065**	**28172**	**169312**

Vegetation Class	MEHL CREEK	MCGEE CREEK	YELLOW CREEK	RADER WOLF	LOST CANYON	COUGAR	HUBBARD CREEK	UMPQUA FRONTAL	TOTAL
	%	%	%	%	%	%	%	%	%
Early Seral	2%	2%	2%	2%	1%	3%	4%	0%	2%
Mid Seral	29%	32%	43%	44%	36%	36%	57%	17%	35%
Late Seral	32%	38%	50%	49%	47%	49%	32%	29%	39%
Hardwoods	5%	7%	3%	3%	6%	5%	3%	13%	6%
Agricultural Lands	19%	14%	0%	0%	3%	1%	2%	28%	10%
Water	2%	2%	0%	0%	2%	2%	0%	2%	1%
Urban Areas	0.2%	0.4%	0.0%	0.0%	0.2%	0.0%	0%	1.0%	0.3%
Barren/Other	12%	5%	2%	2%	6%	6%	2%	10%	6%

Upper Umpqua
LSR, Connectivity and GFMA
BLM Forest Age Classes

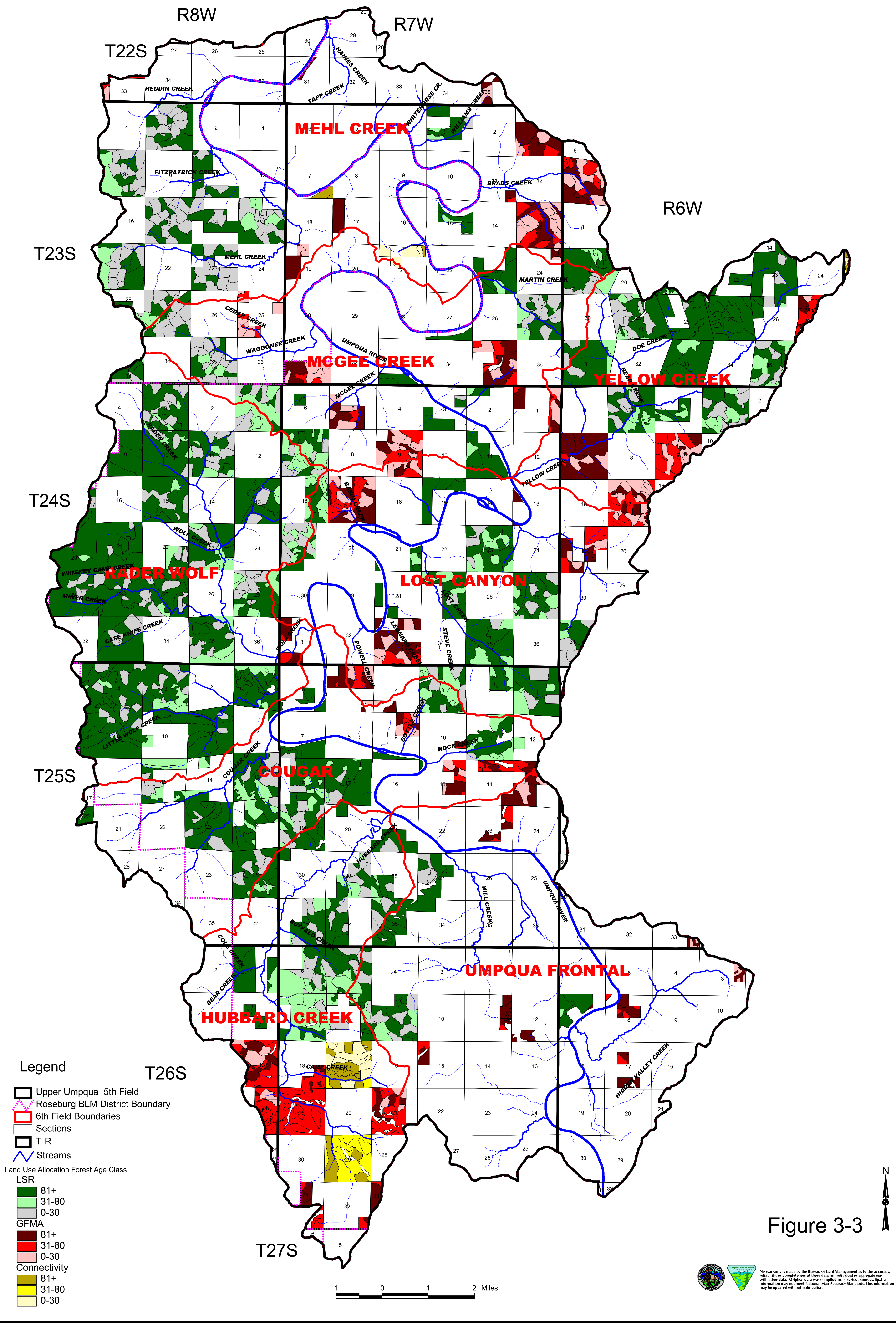
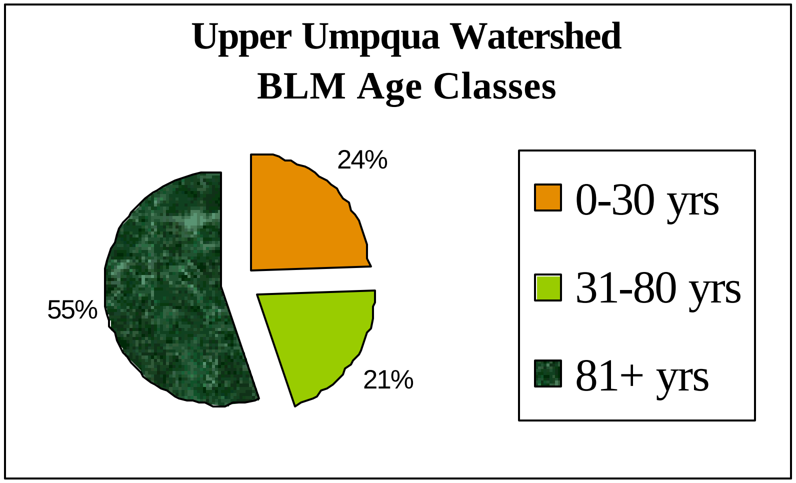


Figure 3-3

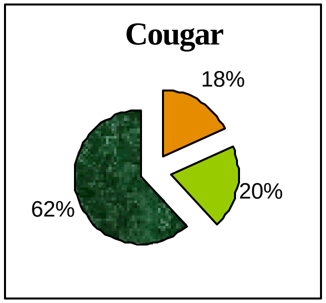
Table 3-5 Upper Umpqua ALL BLM, Forest Age Classes

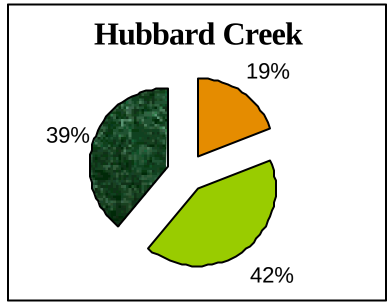
	Acres & % of Watershed by Age Class						TOTAL
Subwatersheds	0-30 yrs	%	31-80 yrs	%	81+ yrs	%	**ACRES**
Cougar	1075	18%	1200	20%	3646	62%	5921
Hubbard Creek	1457	19%	3183	42%	2993	39%	7633
Lost Canyon	1552	22%	1727	25%	3656	53%	6935
McGee Creek	1933	35%	910	17%	2613	48%	5456
Mehl Creek	3087	42%	1066	15%	3186	43%	7339
Rader Wolf	2762	19%	2176	15%	9302	65%	14240
Umpqua Frontal	531	19%	397	14%	1870	67%	2798
Yellow Creek	1489	20%	1255	17%	4630	63%	7374
TOTAL	13886	24%	11914	21%	31896	55%	57696

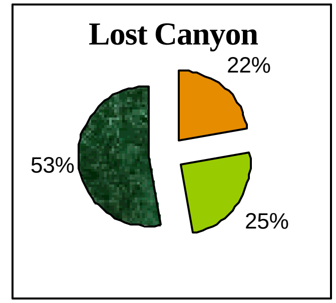
Chart 3-4 Upper Umpqua Forest Age Classes, All BLM Lands Watershed/Subwatershed

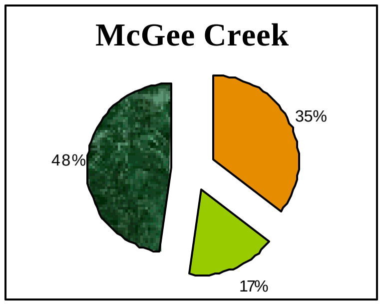


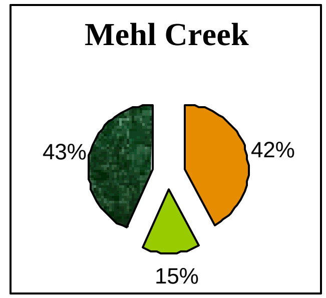
Subwatersheds

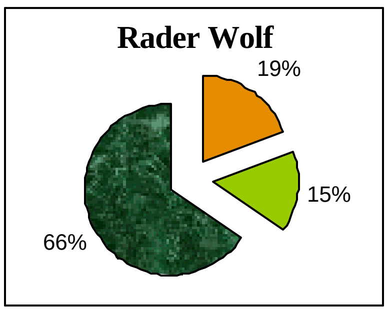


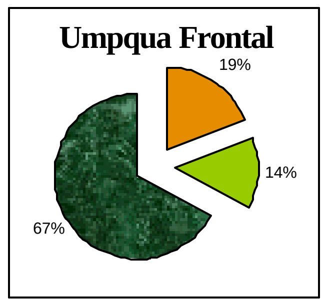












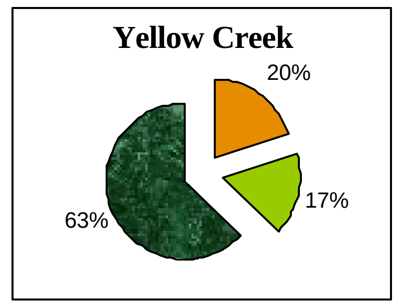


Table 3-6 Upper Umpqua ALL BLM RESERVES, Forest Age Classes

	Acres & % of Watershed by Age Class						TOTAL
Subwatersheds	0-30 yrs	%	31-80 yrs	%	81+ yrs	%	**ACRES**
Cougar	1008	18%	1070	19%	3456	62%	5534
Hubbard Creek	1194	20%	2087	36%	2569	44%	5850
Lost Canyon	1219	21%	1483	25%	3163	54%	5865
McGee Creek	1490	33%	696	16%	2287	51%	4473
Mehl Creek	2769	43%	907	14%	2724	43%	6400
Rader Wolf	2762	20%	2143	15%	9240	65%	14145
Umpqua Frontal	432	20%	246	12%	1445	68%	2123
Yellow Creek	1135	18%	921	15%	4225	67%	6281
TOTAL	12009	24%	9553	19%	29109	57%	50671

Chart 3-5 Upper Umpqua Forest Age Classes within BLM Reserves

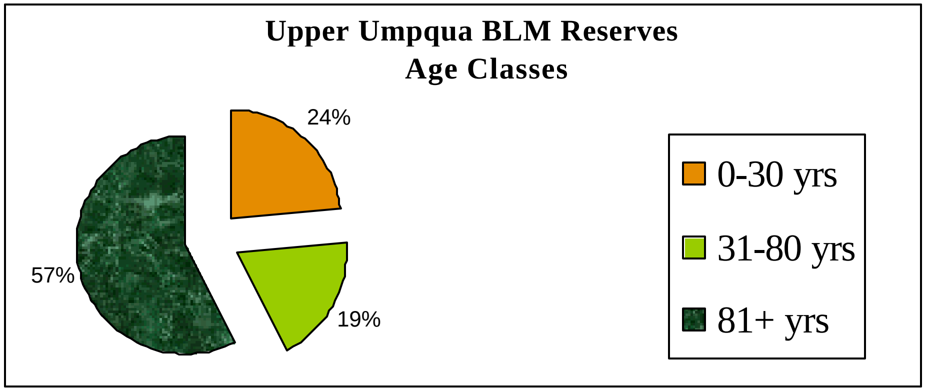


Table 3-7 Upper Umpqua BLM Connectivity, Forest Age Classes

	Acres & % Watershed by Age Class						TOTAL
Subwatersheds	0-30 yrs	%	31-80 yrs	%	81+ yrs	%	ACRES
Cougar							0
Hubbard Creek	181	26%	312	45%	201	29%	694
Lost Canyon							0
McGee Creek							0
Mehl Creek	39	100%	0		0	0%	39
Rader Wolf							0
Umpqua Frontal							0
Yellow Creek	15	100%	0	0%	0	0%	15
TOTAL	235	31%	312	42%	201	27%	748

Chart 3-6 Upper Umpqua Forest Age Classes within BLM Connectivity

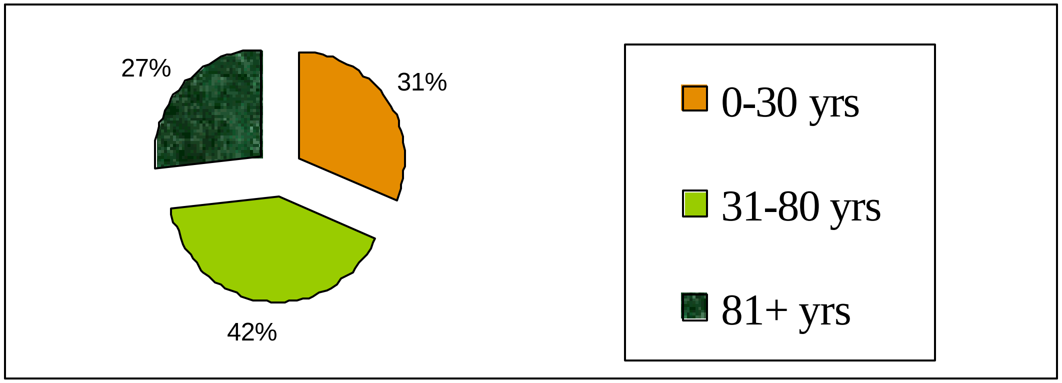
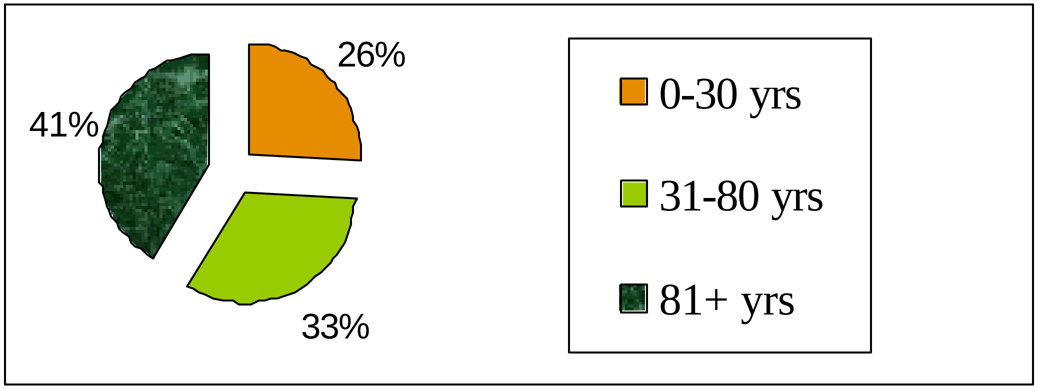


Table 3-8 Upper Umpqua BLM GFMA, Forest Age Classes

	Acres & % Watershed by Age Class						TOTAL
Subwatersheds	0-30 yrs	%	31-80 yrs	%	81+ yrs	%	**ACRES**
Cougar	67	17%	130	34%	190	49%	387
Hubbard Creek	82	8%	784	72%	223	20%	1089
Lost Canyon	333	31%	244	23%	493	46%	1070
McGee Creek	443	45%	214	22%	326	33%	983
Mehl Creek	279	31%	159	18%	462	51%	900
Rader Wolf	0	0%	33	35%	62	65%	95
Umpqua Frontal	99	15%	151	22%	425	63%	675
Yellow Creek	339	31%	334	31%	405	38%	1078
TOTAL	1642		2049		2586		6277

Chart 3-7 Upper Umpqua Forest Age Classes within BLM GFMA



Upper Umpqua
Potential Lupine Habitat and Survey and Manage

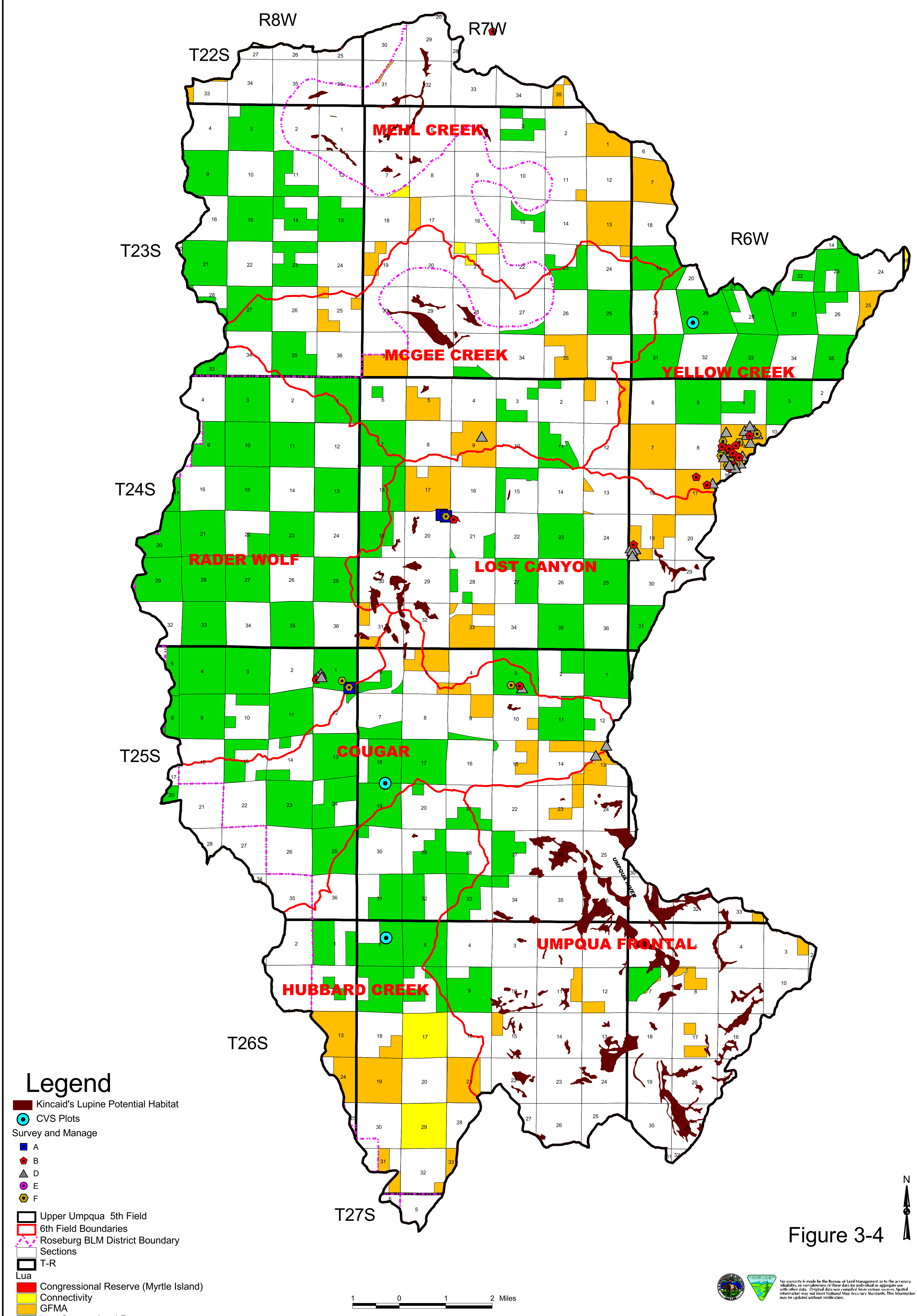


Figure 3-4

Upper Umpqua
Noxious Weed Control

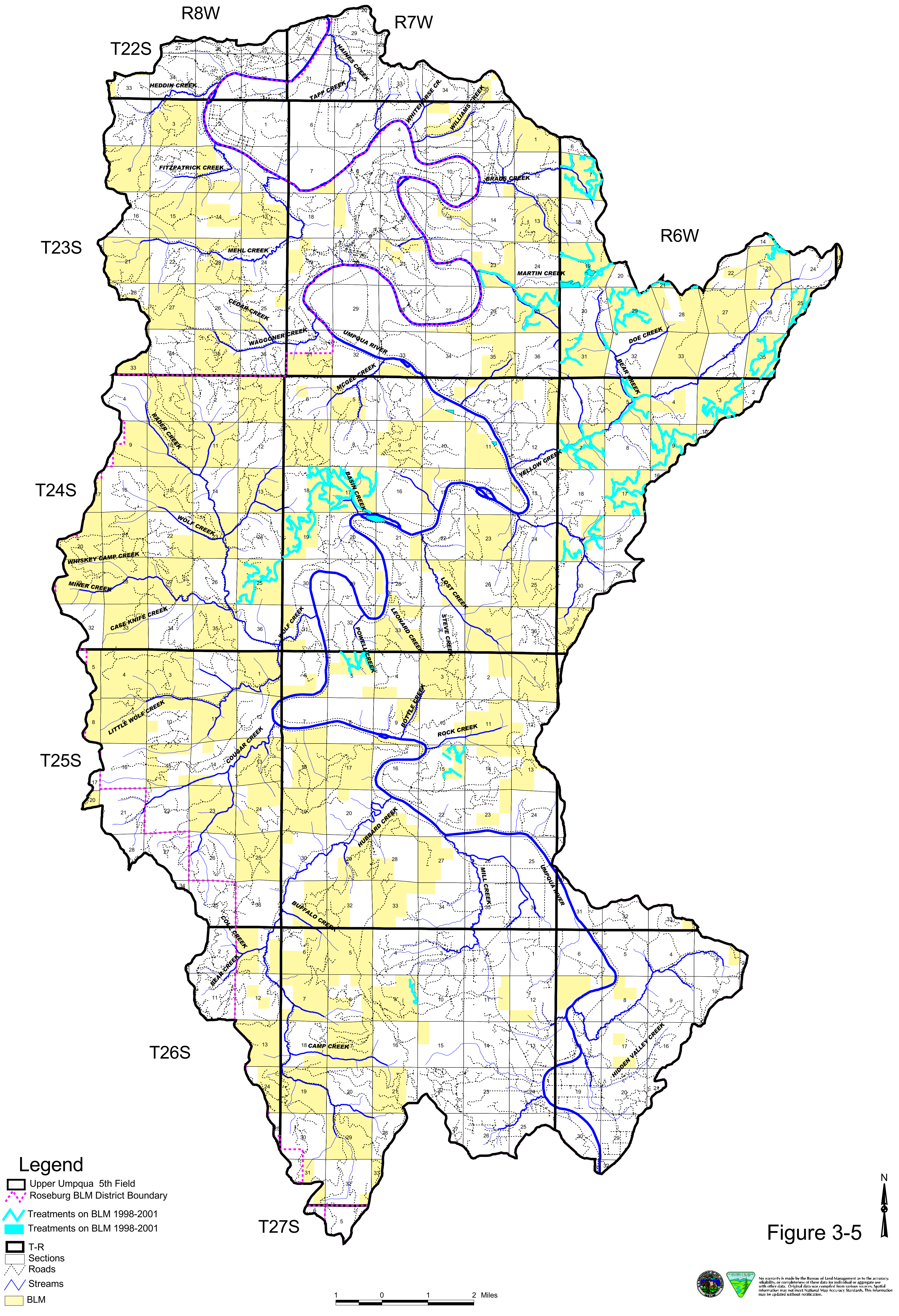


Figure 3-5

4 WILDLIFE HABITAT AND SPECIES

A. Management of LSR and Riparian Reserves for Wildlife Objectives

The management direction outlined in the Northwest Forest Plan (NFP) is specifically intended to benefit a diversity of wildlife species, especially those associated with older forests. Late-seral forests are important to many species because of the variety of microclimates and special habitats that exists within these forests. Habitat requirements for the late-successional forest species can vary significantly by species.

Because the NFP addresses broad issues concerning wildlife habitat, it is believed that the overall diversity of wildlife species across the Coast Range and within this watershed will be maintained. Some of the NFP objectives to benefit wildlife species include: (1) maintaining a functional, interactive, late-successional and old-growth ecosystem, (2) providing connectivity between LSRs and providing habitat for a variety of organisms associated with both late-successional and younger forests, (3) enhancing and maintaining biological diversity and ecosystem health to contribute to healthy wildlife populations, (4) protecting special habitats, and (5) protecting, managing, and conserving Special Status Species. The success of the NFP, with respect to achieving wildlife objectives, is dependent on the integrity and composition of the reserve system, the Riparian Reserves, the LSR, and connectivity systems and other reserves designated for special status species, and natural areas.

Of the approximate 230 species of terrestrial wildlife that occur in the watershed, approximately 160 species use late-successional or old growth and/or riparian habitats, including 29 species of reptiles and amphibians, 80 species of birds, and 48 species of mammals. Sixteen of these species are Special Status Species (Wildlife Appendix).

The criteria for developing appropriate habitat management treatments to meet wildlife objectives within Late-Successional and Riparian Reserves are described in *The South Coast-Northern Klamath Late-Successional Reserve Assessment* (LSRA). This analysis, of the Upper Umpqua watershed, focuses primarily on density management stands (early and mid-seral forest as described in the Vegetation Section) within the watershed. The LSRA specifically addresses habitat management within areas requiring density management. Within these stands, structural components of LSRs and Riparian Reserves are typically even-aged, single canopied stands lacking vegetative diversity, structural diversity, snags, and coarse woody debris (CWD). Treatments within these stands would improve the integrity and functionality of these reserves for terrestrial wildlife species. Implementation of treatments would help treated stands reach desired stand characteristics more rapidly.

For this analysis, late-successional will be used to define both mature and old-growth seral stages of forest development (stands greater than 80-years of age). The 1997 IVMP vegetation data was used to determine the amount of late-successional habitat. There are approximately 66,800 acres of late-successional habitat in the watershed, 32,041 acres (48 percent) are on federal lands and 34,765 acres are on private lands (Table 3-3). Approximately, 29,100 (57 percent) of late-successional habitat on BLM are protected in reserves (LSR, Riparian and other reserves) (Table 3-6).

1. Late Successional Reserves

The LSR system was established to provide for a wide variety of late-successional-associated species, from highly mobile vertebrate species like the spotted owl to species with limited mobility and more restricted home ranges such as mollusks. Goals of the LSR are to protect and enhance conditions of late-successional and old-growth forest ecosystems; and to create and maintain biological diversity associated with native species and ecosystems. Important attributes benefiting late seral ecosystems, which can be influenced by management actions include: stand composition (species, density, and size), legacy wood (snags and CWD), and disturbance processes (fire, wind, or disease). The LSRA outlines the management priorities and guidelines for treatment that interdisciplinary teams need to consider when evaluating projects within LSRs. Management priorities within LSRs include: (1) enlarging existing interior late-successional habitat blocks, (2) improving habitat connections within LSRs, (3) maintaining and improving connectivity habitat between LSRs, and (4) creating additional large blocks of late-successional habitat where they are absent.

Portions of LSR #263 and #264 occur in this watershed (Figure 1-4). The LSRA has identified LSR #263 as being one of the highest priority LSR units for management actions. This LSR unit is one of the largest LSR units (60,599 acres) within the LSR system; thus providing greater opportunities to either increase or develop large contiguous stands of interior late-successional habitat. Approximately 62 percent of LSR #263 occurs in this watershed. The LSRA has ranked LSR #264 as a medium priority LSR based on its significantly smaller acreage (12,396 acres), thus having proportionately less opportunity to develop large blocks of contiguous interior late-successional habitat. However, LSR #264 maintains a north-south LSR link in the Coast Range, and in conjunction with LSR #263, may also provide for some connection east to LSR #222 in the Cascades Province. Approximately 30 percent of LSR #264 occurs in this watershed (Figure 1-4).

2. Riparian Reserves

As described in the Overview, Riparian Reserves were designated to help provide dispersal opportunities for late-seral associated and riparian dependent species. Many terrestrial wildlife species rely on the riparian habitat for forage, nesting/breeding habitat, and cover. The presence of a variety of overstory and understory vegetative layers and downed wood produces the typically cooler and moister microhabitats, which many terrestrial organisms prefer. These microhabitats near, at, and below ground level are important for the survival of many amphibian species. Riparian Reserves may also serve as natural corridors or migration routes and as connecting corridors between areas of suitable habitats in fragmented environments. Approximately 6,250 acres of the reserve system within the watershed are BLM Riparian and other reserves (Table 1-3, Figure 1-4).

B. Special Status Species - Wildlife

Approximately 230 terrestrial vertebrate species occur within the Upper Umpqua watershed of which 33 are classified as Special Status Species. Special Status Species, as also described above under Botany, include Federally Threatened (FT), Federally Endangered (FE), Federally Proposed for Listing (P), Bureau Sensitive (BS), Bureau Assessment (BA), or Oregon state listed species (Wildlife Appendix). The 24 Bureau Tracking (BT) species are not considered to be Special Status Species, but are listed in the Wildlife Appendix for reference. Other species of interest are Special Attention Species (Survey and Manage Species) in the Northwest Forest Plan or Oregon Department of Fish and Wildlife (ODFW) priority species. Species that are of special interest to the general public or other agencies (i.e., ODFW) include elk, bats, wild turkey, osprey, raptors, and neotropical birds.

Those species that are most relevant to management within the Upper Umpqua watershed are addressed in this section. Brief discussions about the remaining Special Status Species and species of interest can be referenced in the Wildlife Appendix.

1. Federally Threatened and Endangered and Proposed Species

Four terrestrial species known to occur on 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), marbled murrelet (*Brachyramphus marmoratus*) (FT), northern spotted owl (*Strix occidentalis caurina*), and Columbian white-tailed deer (*Odecoilus virginianus leucurus*) (FE, PD). The Roseburg BLM District occurs within the suspected ranges of the Canada lynx (*Lynx canadensis*) (FT), the Fender's Blue butterfly (*Icaricia icarioides fenderi*) (FE), and the vernal pool fairy shrimp (*Branchinecta lynchi*) (FT), but their occurrence has not been documented.

a) Northern Spotted Owl

This watershed is part of the Tyee demography study area, which has been monitored intensively since 1988. Individual northern spotted owl sites may have been followed since 1985, or before. There are 57 Master Sites, which include 119 known northern spotted owl activity centers, in the Upper Umpqua watershed (Figure 4-1). Under the Northwest Forest Plan, ten residual habitat areas were established (972 acres) within the watershed. Five spotted owl residual habitat areas and 15 Master Sites occur outside, but within 1.5 miles of the watershed boundary.

The presence of barred owls (*Strix varia*) within this watershed is of concern and may pose a genetic and competitive threat to spotted owls (Taylor and Forsman 1976, Hamer 1988, Dunbar et al. 1991). Surveys on the Roseburg District have shown that when barred owls move into a known spotted owl site, the spotted owls abandon the area. A barred owl was first detected in the watershed in 1983. Currently, there are 12 known barred owl sites in this watershed, of which four of these sites are located within historical spotted owl Master Sites. Management implications of barred owl effects on spotted owls are currently being researched.

Within the home range radius of any northern spotted owl site, the LSRA treatment guidelines set a management objective to maintain or enhance the ability of spotted owls to use their home range and to provide their life requirements to survive and reproduce. The guidelines emphasized the need for treatments in managed plantations and thinned stands (early and mid-seral age classes). They also discuss the importance of maintaining the following habitat features: roosting and foraging habitat, connectivity habitat, nesting or potential nesting structures, snags, and CWD (LSRA pp. 70-71).

The Endangered Species Act describes northern spotted owl habitat in three different categories: Suitable, Dispersal, and Critical Habitat. Table 4-1 gives a summary of the amount of that habitat within Upper Umpqua.

Table 4-1 Upper Umpqua, Acres of Suitable, Dispersal, and Critical Spotted Owl Habitat

Suitable habitat	Dispersal Habitat	Critical Habitat
31,896	11,914	57,561

(1) *Suitable Habitat*

Roseburg BLM District biologists identified forest habitat important to the northern spotted owl on BLM-administered lands. This inventory used on-the-ground knowledge, inventory descriptions of forest stands, and known characteristics of the forest structure and was placed in GIS. Four habitat types were described and labeled. Habitat 1 (HB1) describes forest stands that provide nesting, foraging, and resting. Habitat 2 (HB2) describes forest stands that provide foraging and resting components. A few of these stands also contain nesting components. Habitat 1 and 2 together are considered to be suitable northern spotted owl habitat and is estimated to be close to 31,900 acres on BLM-administered lands (Table 4-2). Habitat 3 (HB3) refers to forest stands that have the potential within 50 years to develop into suitable Habitat 2. This habitat type (25,986 acres, Table 4-2) would mostly consist of early and mid-seral stands on BLM lands. Habitat 4 (HB4) refers to areas that would not develop into suitable habitat in the foreseeable future. Table 4-2 shows the number of acres present and Figure 4-1 shows the distribution for these four habitats within the watershed. Approximately 29,100 acres of suitable northern spotted owl habitat are protected in BLM reserves.

Table 4-2 Upper Umpqua, Acres of Spotted Owl Habitat Types on BLM Land

Habitat 1	Habitat 2	Habitat 3	Habitat 4
25,703	6,251	25,986	769

(2) *Dispersal Habitat*

Dispersal habitat refers to forest stands that provide cover, roosting, foraging, and dispersal components northern spotted owls use while moving from one area to another (Thomas et al. 1990, USDI 1992a, and USDI 1994). For this analysis, forested stands greater than 30 years of age are considered dispersal habitat. There are 11,914 acres of dispersal habitat within the watershed (derived from Table 3-5). Approximately 9,550 acres of dispersal habitat are within the reserve system (derived from Table 3-6).

(3) *Critical Habitat*

Approximately 57,560 acres have been designated as critical habitat for the recovery of the northern spotted owl within the watershed (Fed. Reg. 1992) (Figure 4-1). Designated Critical Habitat includes the primary constituent elements that support nesting, roosting, foraging, and dispersal of the northern spotted owl. Designated Critical Habitat also includes habitat that is currently unsuitable, but has the capability of becoming suitable habitat in the future. Of the critical habitat, approximately, 36,000 acres are Late-Successional Reserves (LSR), approximately 1,120 acres are BLM matrix (Connectivity or GFMA) lands and the remaining 21,160 acres are private lands. BLM management actions are not expected to result in destruction or adverse modification of critical habitat containing primary constituent elements. Potential impacts to unsuitable designated critical habitat also need to be evaluated on a site-specific basis to determine effects to critical habitat.

b) Marbled Murrelet

Information about the biology and inland nest sites indicates the marbled murrelet is unlikely to be found more than 50 miles from the Oregon coast (USDA and USDI 1994a, and USDI 1992c). The Marbled Murrelet Recovery Plan identified Conservation Zones 1 and 2, extending to a distance of 0-35 miles and 35-50 miles from the Oregon coast, respectively. The western portion of the Upper Umpqua watershed is located within Zone 1 (0-35 miles from the ocean), while the remaining portion of the watershed is within Zone 2 (35-50 miles from the ocean) (Figure 4-2). Any forested area within 50 miles of the ocean containing a residual tree component, small patches of residual trees, or one or more platforms is potential murrelet habitat (Pacific Seabird Group [PSG] 2000). The Swiftwater Resource Area has surveyed, or is surveying, approximately 62 sites for the presence of marbled murrelets within the watershed. Marbled murrelets have been detected at nine sites.

Detection is defined as the observation, either visual or auditory, of one or more birds during a survey. An occupied site is where marbled murrelets have been observed exhibiting sub-canopy behaviors, which are behaviors that occur at or below the forest canopy and that strongly indicate that the site has some importance for breeding (PSG 2000). Five occupied sites have been located and four sites had murrelet detections within the watershed. Four of the occupied sites occur in LSR and one occurs in Matrix on federal lands. The one documented occasion of nesting on the Roseburg BLM District occurs within this watershed. The known nest site occurs within the marbled murrelet Zone 1, and the remaining four occupied sites occur within Zone 2 and are within one mile of the Umpqua River (Figure 4-2). The occupied site furthest inland is located approximately 37 miles from the ocean. Table 4-5 provides a summary of the status of marbled murrelets within the watershed.

All known occupied marbled murrelet sites known to occur on the Roseburg District, occur within the Upper Umpqua watershed. Occupied sites are protected with a 0.5-mile radius buffer. One occupied site occurs on Matrix lands and will be managed as an unmapped LSR, protected with a 0.5-mile radius buffer (USDI 1995).

The LSRA has identified LSR #263 as one of the more important LSRs within the LSR network, due to the percentage of suitable habitat for marbled murrelets within the LSR, the largest continuous habitat blocks, and its close proximity to the ocean (within Zone 1). Density management treatments within these areas need to promote stand characteristics preferred by murrelets. Most of the remaining late-successional and old-growth forest within Zone 1 occurs on federal lands.

(1) *Suitable Habitat*

Suitable habitat for the marbled murrelet includes mature and old-growth coniferous forests, and younger coniferous forests that have suitable nest structures (PSG 2000). For this analysis, marbled murrelet suitable habitat includes those stands that are 80 years or older using FOI vegetation data. This analysis is an underestimate of suitable habitat due to the younger coniferous forests that are less than 80 years old, but have a residual habitat component that have suitable nest structures. Approximately 31,900 acres of suitable marbled murrelet habitat occurs on BLM-administered lands (Table 3-5). Of that acreage, 14,660 acres occur within Zone 1.

(2) *Critical Habitat*

Within this watershed, 45,154 acres have been designated as Critical Habitat for the recovery of the marbled murrelet (CHU-OR 04) (FR 61:26256-26320) (Figure 4-2). Designated critical habitat includes the primary constituent elements (defined in table below) that support nesting, roosting, and other normal behaviors that are essential to the conservation of the marbled murrelet. Designated critical habitat also includes habitat that is currently unsuitable, but has the capability of becoming suitable habitat in the future. BLM management actions are not expected to result in destruction or adverse modification of critical habitat containing primary constituent elements. Potential impacts to unsuitable designated critical habitat also need to be evaluated on a site-specific basis to determine effects to critical habitat. Within areas that are currently unsuitable, management activities need to focus on the development of future nesting habitat, and should speed the development of attributes important to marbled murrelets (i.e., large limbs for nesting platforms) that are characteristic of older forests.

All marbled murrelet critical habitat within the watershed is located on federal lands. Critical habitat has been identified as those acres of suitable habitat (and for this analysis includes stands > 80 years of age based on FOI vegetation data) plus that forested habitat within 0.5 miles that is currently unsuitable but is at least 50 years of age (50 years of age at which dominant trees within a stand should reach 100 feet in height – approximately half site potential) (FR 61:26264). Suitable habitat accounts for 36,420 acres of the marbled murrelet critical habitat in the watershed (Table 4-3). Approximately 22,800 acres of designated critical habitat are located in Zone 1 and 22,350 acres are located in Zone 2.

Table 4-3 Suitable and Critical Habitats for Marbled Murrelet within Upper Umpqua

Suitable Habitat with Primary Constituent Elements[1]	Habitat with Secondary Constituent Elements[2]	Critical Habitat
33,228	3,192	45,154

1. Primary constituent elements of suitable nesting habitat within designated critical habitat include: (1) individual trees with potential nesting platforms, and (2) forested areas within 0.5-miles of individual trees with potential nesting platforms, and that have a canopy height of at least one-half the site-potential tree height (FR 61:26264).
2. Secondary constituent elements include habitat that is currently unsuitable but is at least 50 years of age.

c) American Bald Eagle

Information collected during annual inventories (1972 to 2001) by Isaacs and Anthony (2001) of known bald eagle breeding territories in Douglas County, Oregon listed nine territories within the Upper Umpqua watershed. Six of these territories are located on federal lands and three are located on private lands. Mid-winter surveys and aerial surveys of nest sites are completed annually, as part of a long-term monitoring effort in Oregon and Washington.

There are approximately 3,360 acres designated for bald eagle habitat management, within the watershed, under the Umpqua River Corridor Habitat Management Plan (HMP) (USDI 1985). The goal of this plan is to "…protect, improve, and perpetuate the integrity of…nesting territories." This HMP encompasses most federal land along the main stem Umpqua River, which would be from the town of Elkton to the confluence of the North and South Umpqua Rivers (Figure 4-3).

Habitat along the major river corridors will be managed to develop or maintain forest structure needed to support nesting and foraging activities. Known and future occupied territories will be protected under management guidelines outlined in the Northwest Forest Plan and Umpqua River Corridor Habitat Management Plan. Management guidelines include: (1) maintaining or attaining stand characteristics preferred by bald eagles, (2) avoiding disturbance within 0.5 miles of active nest sites from February 15 to August 31, and (3) provide an appropriate level of fire protection on lands managed for bald eagles and restrict the use of insecticides within 0.5 miles of bald eagle sites.

2. State of Oregon Listed Species

There are 14 terrestrial wildlife species listed as threatened or endangered by the State of Oregon. The marbled murrelet, spotted owl, and bald eagle are also federally listed. The peregrine falcon is no longer Federally Endangered but is listed as endangered by the State of Oregon and is discussed in the Wildlife Appendix.

3. Bureau Sensitive Species

Bureau Sensitive designation includes species that could easily become endangered or extinct in a state. They are restricted in range and have natural or human-caused threats to survival. Bureau Sensitive species are not federally or state-listed, but are eligible for federal or state listing or candidate status. Bureau manual 6840 policy requires that any Bureau action will not contribute to the need to list any of these species. There are six Bureau Sensitive vertebrate species occurring within the Upper Umpqua watershed. These species include western pond turtle, peregrine falcon, northern goshawk, purple martin, fisher, and Townsend's big-eared bat, and are discussed in the Wildlife Appendix.

4. Survey and Manage Species

Survey and Manage Species are those species that are closely associated with late-successional or old-growth forests whose long-term persistence is of concern. Standards and guidelines have been designed as part of the Northwest Forest Plan to provide for the persistence of these late-successional and old-growth forest related species. Six terrestrial wildlife Survey and Manage Species occur on the Roseburg District, including three mollusk species, Del Norte salamander (*Plethodon elongates*), red tree vole (*Phenacomys longicaudus*), and great gray owl (*Strix nebulosa*) (Wildlife Appendix). The red tree vole and Oregon Megomphix (*Megomphix hemphilli*) (mollusk species) are known to occur and have management implications within Upper Umpqua.

a) Oregon Megomphix

The Oregon Megomphix is a snail that occurs in moist conifer/hardwood forests within the Coast Range of Oregon. A big-leaf maple (*Acer macrophyllum*) component and an abundance of sword-fern on forested slopes and terraces seem characteristic of this snail's microhabitat (BLM 1999). Based on direction contained in the Record of Decision, Oregon Megomphix sites known as of September 30, 1999, require management. There are seven known Oregon Megomphix sites that require management within this watershed. These sites are located within two proposed regeneration harvest sales (three at Powell Creek and three at Tyee Mountain) and one proposed commercial thinning (Gallagher). These sites will be managed to conserve or develop favorable habitat components.

b) Red Tree Vole

The red tree vole is an arboreal rodent, which depends on conifer tree canopies for nesting, foraging, travel routes, escape cover, and moisture (Carey 1991). Douglas-fir needles provide the primary food and building materials for nests (Biswell et al. 2000). Red tree voles (Huff et al. 1992) also eat Sitka spruce, western hemlock, and grand fir needles. Old-growth Douglas-fir forests are considered to be optimal habitat for the red tree vole (Carey 1991). Red tree voles also occur in young and mid-seral forest stands and have been found in stands as young as 15 years of age on the Roseburg District. Because this species may have limited dispersal ability across the landscape, red tree voles were rated as highly vulnerable to geographic isolation or local extirpations of populations due to habitat fragmentation or loss (Huff et al. 1992). Conifer forest habitat conditions for this species is expected to improve within the LSR system as young stands age and canopy closure reaches 60 percent or more (LSRA). The red tree vole is currently under status review.

For this analysis, late and mid-seral forest stands are considered to be red tree vole habitat. Based on the 1997 IVMP data, there are approximately 125,580 of red tree vole habitat on both private and federal lands within the watershed (Table 3-3). Thirty-one percent (51,882 acres) of the stands are on BLM-administered land, of which 38,662 acres are protected in reserves. The current management guidelines for the red tree vole include surveying and managing high priority red tree vole sites when found (ROD 2001). Surveys are to be conducted prior to any habitat-disturbing activities. For BLM lands, a minimum ten-acre, no-harvest buffer is required around established nest sites.

Recently, the Gallagher commercial thinning was proposed and surveyed for red tree voles. Approximately 300 acres of mid-seral forest stands were originally proposed for thinning. Initial red tree vole surveys found approximately 13 established nest sites. Continued surveys would likely have found other nest sites. The initial sites required ten-acre, no-harvest buffers and essentially prevented the ability to manage these mid-seral stands. Similar results would be expected in the estimated 11,900 acres of mid-seral forest stands in this watershed under the current red tree vole management guidelines.

C. Desired Future Conditions of LSRs and Riparian Reserves

Desired future conditions for LSRs and Riparian Reserves are described in detail within the LSRA. The LSRA describes stand selection criteria and treatment recommendations needed to attain desired stand conditions. Depending upon the effectiveness of initial treatments, future treatments may be implemented to reach desired stand characteristics more rapidly.

Desired future conditions of the LSRs can be achieved by applying various management treatments to restore and maintain important LSR attributes. These attributes include: canopy complexity, variability in tree size and spacing, vegetative species diversity and structural characteristics, and CWD and snags. Stand management to obtain LSR attributes needs to focus on early and mid-seral forest stands. The LSRA (pp. 77-86) describes the silvicultural actions for attainment of late-successional habitat conditions in density management stands. Silviculture treatments of plantations and thinned stands can accelerate the development of young stands into multi-layered stands with large trees, structural diversity, and diverse plant species (see the moderate to heavy thinning shown in Chart 3-2). Management treatments within Riparian Reserves would be similar to management treatments implemented in LSRs, focusing on recruitment of snags and CWD, promoting vegetative diversity, and increasing structural diversity within the reserve system.

The LSRA identifies average values for snags and CWD abundance in naturally regenerated stands (LSRA pp. 28-31, Tables 8 through 11). Table 4-4 summarizes that information.

As can be seen from Table 4-4, the average amount of CWD in natural mid-seral forest stands is estimated at 1,102 cubic feet per acre. Information collected during the Gallagher Ridge commercial thinning proposal shows what may be typical CWD characteristics and variability in managed mid-seral forest stands throughout Upper Umpqua. As can be seen in Table 4-5, the type and amount of CWD varies greatly from stand to stand. Girdling and leaving some mid-seral trees to recruit CWD could be part of the treatment design in some stands while removing all thinned trees may be part of the design in other stands.

Table 4-4 Structural Components of Naturally Regenerated Douglas-fir Forests

		Young (40-80 yrs)	Mature (80-195 yrs)	Old Growth (195+ yrs)
Downed Wood (>4 in. dia. at the large end; all decay classes)		1,102 cu. ft./ac. (525-1,979)	1,731 cu. ft./ac. (300-3,162)	3,262 cu. ft./ac. (1,382-5,141)
Snags (>4 in. diameter and > 4 ft. tall)	**20+ in. diameter**	7 per ac. (3-31)	7 per ac. (0-14)	7 per ac. (4-10)
	20+ in. dia. and 16+ ft. tall	2 per ac. (0-4)	2 per ac. (0-7)	3 per ac. (2-6)
	< 20 in. dia.	48 per ac. (26-70)	53 per ac. (1-105)	17 per ac. (14-20)

Table 4-5 Gallagher Ridge CWD Amounts and Classes

	CWD Cubic Feet/ Acre by Decay Class	
Stand #	Decay Class 3	Decay Class 4
1	46	2,522
2	84	1,956
3	344	1,646
4	55	382
5	66	476

Stand management within the reserve system (whether needing artificial reforestation and/or subsequent maintenance or release treatments to more rapidly reach late-successional conditions, or to protect site quality) would benefit terrestrial wildlife that are dependent on late-successional or old-growth ecosystems. There are currently 21,562 acres of LSR and Riparian Reserve (Table 3-6) in the watershed that are currently not in a late-successional or old-growth condition, but are capable of developing into those conditions. Functional habitat as described above for late-successional related species is more important than stand age. Creating functional habitat is possible in the next few decades in the mid-seral forest age classes.

Upper Umpqua
Northern Spotted Owl Sites and Designated Critical Habitat

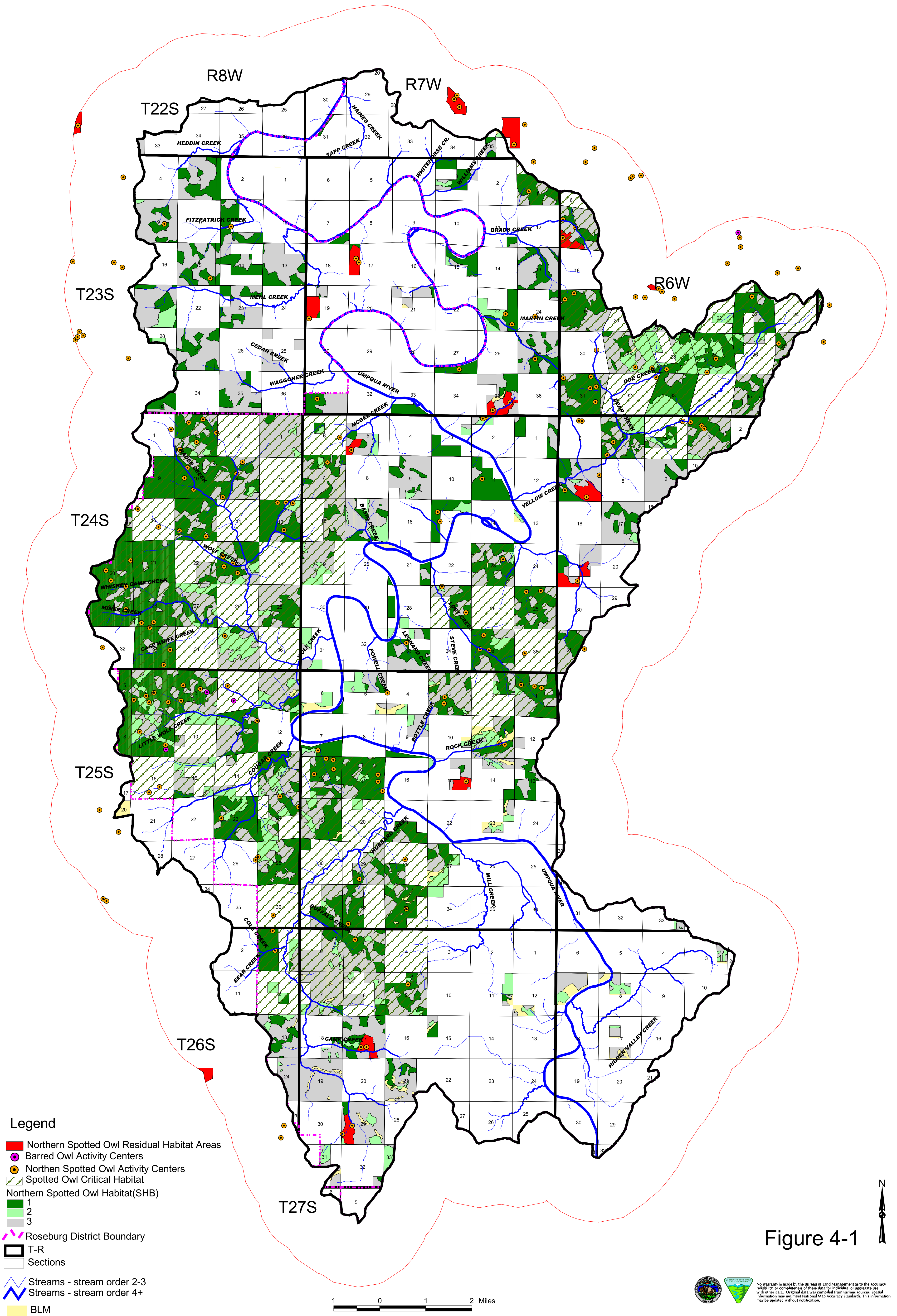


Figure 4-1

Upper Umpqua
Marbled Murrelet Occupied Areas and Designated Critical Habitat

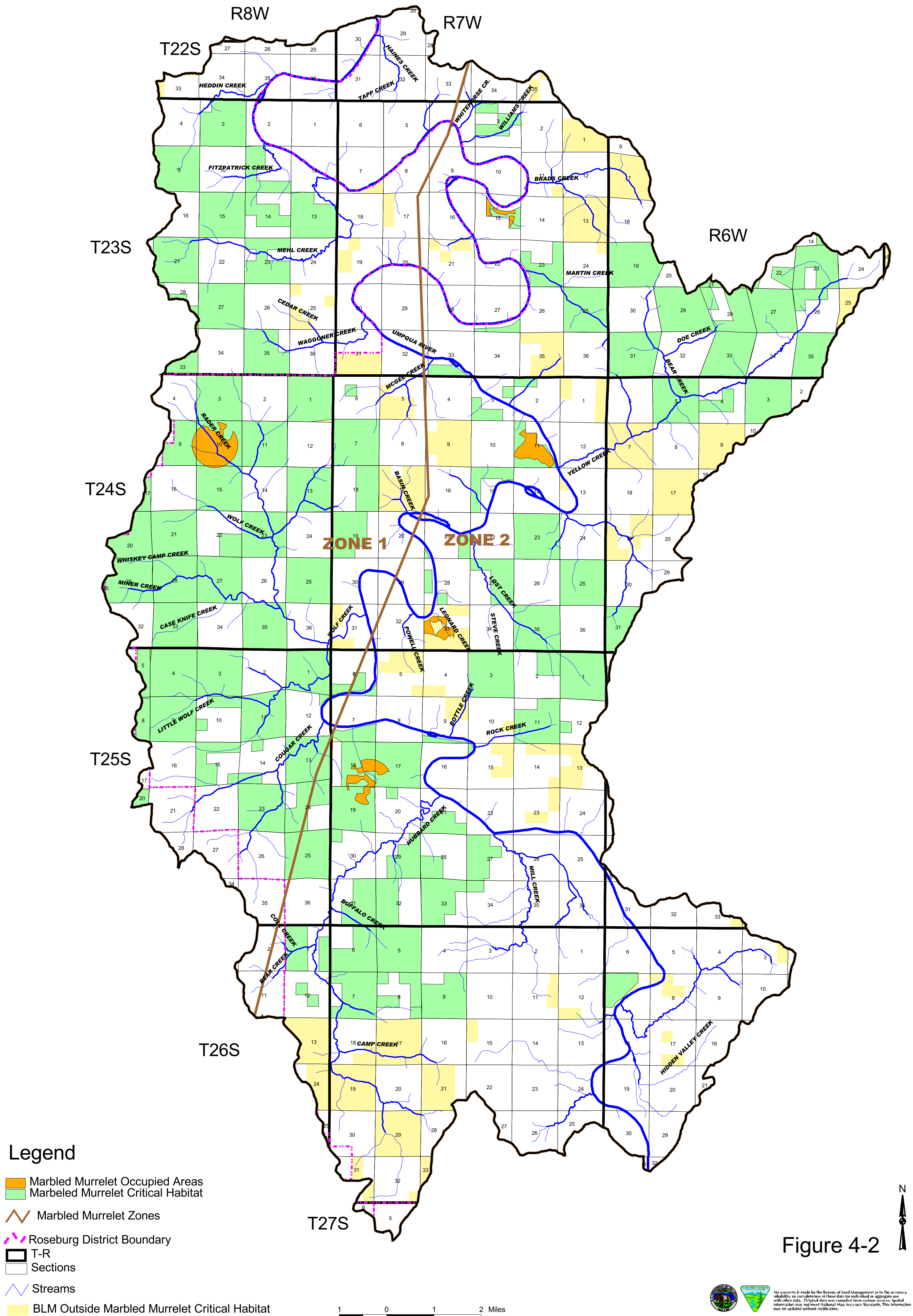
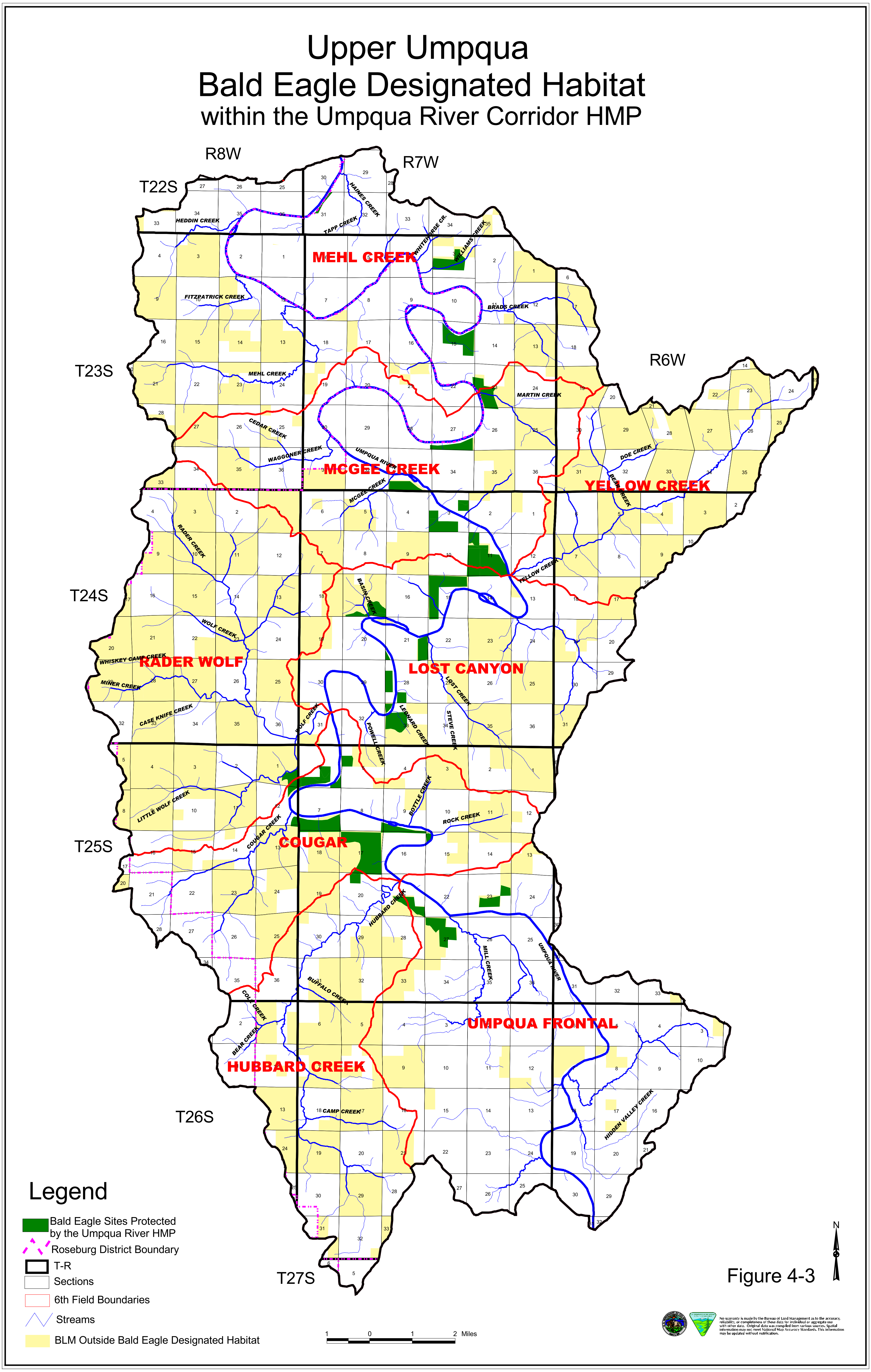


Figure 4-2

Table 4-6 Marbled Murrelet Status within Upper Umpqua

Site	T-R-S	Subwatershed	Status	Distance from Ocean (miles)[3]	Land Use Allocation when Discovered
Brads Creek	23S-7W-15	Mehl Creek	Occupied[1]	35.7	LSR
CaseKnife	24S-8W-29	Rader Wolf	Presence[2]	29.0	LSR
Eagleview	24S-7W-11	McGee Creek	Occupied	37.4	LSR
Leonard Creek	24S-7W-33	Lost Canyon	Occupied	36.0	Matrix
Lower Miner Creek	22S-8W-27	Rader Wolf	Presence	31.2	LSR
Miner Creek	24S-8W-28	Rader Wolf	Presence	29.9	LSR
Rader Creek	24S-8W-10	Rader Wolf	Occupied- Nest found in 1992	30.4	LSR
Rattlesnake	25S-7W-18	Cougar	Occupied	35.5	LSR
Tyee Bridge	25S-7W-5	Cougar	Presence	35.3	Matrix

1. Occupied status is defined at a site when subcanopy behavior is observed, which are behaviors that occur at or below the forest canopy. Subcanopy behavior strongly indicates that the site has some importance for breeding.
2. Presence status is defined at a site when auditory detections were observed, or when birds were observed flying above the forest canopy. Above-canopy flights indicate possible occupancy of a site (PSG Marbled Murrelet Survey Protocol).
3. Distances from the ocean were determined using Arcview, from the point of observation to the coast, via the shortest straight-lined distance.


Upper Umpqua
Bald Eagle Designated Habitat
within the Umpqua River Corridor HMP
R8W
R7W
R6W
T22S
T23S
T24S
T25S
T26S
T27S
MEHL CREEK
MCGEE CREEK
YELLOW CREEK
RADER WOLF
LOST CANYON
COUGAR
UMPQUA FRONTAL
HUBBARD CREEK
Legend
Bald Eagle Sites Protected by the Umpqua River HMP
Roseburg District Boundary
T-R
Sections
6th Field Boundaries
Streams
BLM Outside Bald Eagle Designated Habitat
Miles
Figure 4-3

5 GEOLOGY and SOILS

A. Characterization

1. Topography and Geology

Upper Umpqua topography is highly variable. It ranges from broad flood plains and terraces along the mostly unconfined Umpqua to very steep, highly dissected terrain with confined stream channels. Figure 5-1 and Table 5-1 give a good overview of slope distribution. The area of the steeper slopes (steep to extremely steep) is somewhat understated because of limitations in using 10 meter digital elevation model (DEMs). A greater proportion of the steeper slopes are above 75 percent, especially in terrain where rock outcrops are major components.

Table 5-1 Slope Distribution using 10 meter DEMs

SLOPE CLASS	SLOPE RANGE	ACRES	PERCENT of AREA
Umpqua River and ponds	Level	4,100	2.4
Nearly level to gentle	0 to 30 percent	90,300	53.4
Moderate	30 to 60 percent	55,400	32.8
Steep to extremely steep Steep Very steep Extremely steep	> 60 percent 60 to 75 percent 75 to 90 percent > 90 percent	19,200	11.4

About 6,600 acres (3.9 percent) of the watershed falls in an elevation band above 2,000 feet and is considered the transient snow zone where rain-on-snow events are most likely with implications for slope instability. Most of this area occurs in the Hubbard Creek drainage, Tyee Mountain area and the Yellow Butte area. Figure 1-2 is a relief map that highlights the areas above 2,000 feet.

Nine geologic units occur within Upper Umpqua as mapped in the State Geologic Map (Figure 5-2). The basement rocks are the volcanics of the Roseburg Formation in the eastern part of the Umpqua Frontal drainage. Forming progressively younger units deposited over the Roseburg volcanics are the sandstones, siltstones and mudstones of the Roseburg, Lookingglass, Flournoy, Tyee, Elkton and Bateman Formations. The sedimentary rock formations are comprised of varying sequences of sandstone, siltstone and mudstone with varying degrees of cementation and resistance to weathering and erosion. Much of the rugged terrain is attributable to the erosion resistance of many of the sandstones. Strongly cemented, massive strata of the Tyee sandstones are notable cliff formers. A very high percentage of the rock strata dip a mild three to fifteen degrees due to deformational forces. These formations and the other units are described in greater detail in the Geology and Soils Appendix.

2. Geomorphology and Soils

The sediments for the sandstones and siltstones originated primarily from the Klamath Mountains to the south. Subsequent uplift and dissection resulted in the southern Coast Ranges of today. Figures 5-1 and 5-2 summarize the geology, topography, soils and erosion/mass wasting processes within the following five geomorphic units.

The steep Tyee/Bateman geomorphic unit (17 percent of watershed)**:** Rapid moving debris avalanches, debris flows and dam-break floods are a dominant erosion process in this geomorphic unit. Landslides and debris flows sometimes block channels that touch off large dam-break floods. The topography consists primarily of steep to extremely steep mountain slopes (60 to greater than 100 percent) that are deeply dissected with closely spaced swales. Knife ridge noses commonly separate these swales. The swales commonly culminate in their upper ends in moisture converging headwalls. These headwalls often comprise the steepest portion of these mountain slopes. The soils are typically loamy with high amounts of gravel and are shallow to moderately deep (10 to 40 inches) over hard bedrock. Deep soils can be locally common in colluvium at the base of slopes, in swale bottoms and in hollows (a slope stability consideration). The most common points of origin for the rapid moving landslides are concave slope positions including headwalls, hollows and swales, inner gorge slopes and slope breaks. The steepness of slope, particularly on moisture converging (concave) positions, the low degree of bedrock fracturing, and the low cohesion of the soils are important factors contributing to these landslides. Narrow bench features are scattered throughout this unit, breaking up some steep slopes.

The moderately sloped Tyee/Bateman geomorphic unit (36 percent of watershed)**:** The topography consists primarily of gentle and moderately steep (10 to 60 percent) mountain slopes that are not as highly or as deeply dissected as the above geomorphic unit. Parts of this topography are ancient deep-seated rockslides and slump/earth flow topography. In many areas, delineations of this geomorphic unit alternate in a linear fashion with delineations of the steep unit at ridge tops and canyon bottoms. This pattern seems to occur where the direction of the dip of the geologic strata remains nearly the same over a large area. This suggests that geologic structural controls (slopes closely aligned with the dip direction tend to be the moderately sloping unit, while slopes aligned in the opposite direction tend to be steep. This pattern is evident looking at the slope map (Figure 5-1) and is most striking in an east-west transect from NE Umpqua Frontal to northern Hubbard Creek to Cougar Creek. The soils are typically moderately deep to very deep (20 to greater than 60 inches), well drained, over soft to somewhat hard, brittle bedrock. Debris avalanches and debris torrents are less common than the above geomorphic unit. However, the deeper, more cohesive soils are prone to slumps and earth flows, especially at seeps and at inner gorges of streams.

The Elkton geomorphic unit (25 percent of watershed)**:** The unit consists primarily of gentle to moderately steep, moderately dissected terrain (10 to 60 percent slopes) dominated by siltstones. This terrain is interrupted at intervals by steep gorges of higher-order streams and by steep slopes of resistant sandstone caps along some ridgelines. The canyons of some of the higher-order streams have cut into the underlying Tyee Formation. Ancient deep-seated rockslides and slump/earth flow topography seem to be more common. In siltstone-dominated areas, the soils are typically moderately deep to very deep (20 to greater than 60 inches over soft brittle bedrock). The deeper, more cohesive soils are prone to slumps and earth flows, especially at seeps and inner gorges of streams.

Garden Valley hills (14 percent of watershed)**:** Lumped together in this unit are the Lookingglass, Flournoy and Roseburg Formations. The unit consists primarily of dissected hills of gentle to moderately steep slopes (10 to 60 percent) with a scattering of steeper slopes and rock outcrop. The soils and slope instability of the Lookingglass and Flournoy Formations are similar to the Tyee and Bateman Formations. Poorer drainage is more common, however. Slumps and earth flows are the main forms of slope instability.

Flood plains, alluvial terraces and alluvial fans along the Umpqua River (6 percent of watershed)**:** The unit is composed primarily of flood plains of geologically recent alluvium that are generally unconfined on one or both sides of the Umpqua River and terraces of older alluvium on the higher positions. Slopes are primarily level to 12 percent. Generally, the lower flood plains are sandy to loamy, the upper flood plains are loamy and the terraces are clayey. Most positions are well drained.

B. Upper Umpqua Prominent Erosion Processes

1. Historic Landslides and Erosion Processes - Natural and Management Related

Within Upper Umpqua, Figure 5-3 and Charts 5-1 and 5-2 give chronological relationships about landslide magnitude and management relationships for the period of approximately 1955 to 1999. This information was derived from an aerial photograph landslide inventory done by the Swiftwater soil scientist as well as an inventory completed by Coos Bay District BLM for those portions of the Mehl and McGee Creek drainages. A more detailed explanation of the Swiftwater landslide inventory analysis as well as its limitations is covered in Geology and Soils Appendix.

1950 - 1970
The disturbance history of Upper Umpqua on forestlands managed for wood products has a pattern similar to the other watersheds. The fifties and sixties were periods of high levels of road construction and logging. Many arterial roads were typically located along and just above the major creeks. Spurs were often built into the bottom of side drainages where downhill logging or tractor logging would occur as far up slope as logging equipment could reach. Many

mid-slope and ridge top haul roads were also built for cable and tractor operations and were typically unsurfaced, on steep grades, and lacked adequate drainage. Side casting of cut material on steep slopes, a common practice, often fell directly into intermittent or permanent streams or later failed. Machinery operating in drainage bottoms was also common. Almost all forested lands that were harvested on slopes less than 40 percent were tractor yarded during this era. This resulted in a high density of skid trails with variable degrees of compaction. Some tractor yarding took place on slopes up to 70 percent or more. This resulted in a less dense pattern of skid trails. However, it necessitated a high percentage of skid trails being bladed, many with cuts of 10 feet or more. In many cases, the trails went directly up the slope with little attention given to adequate drainage. Spot field checks have shown most skid trails and primitive haul roads created trough-like conditions that channeled water. Compaction, mechanical soil removal and erosion of topsoil caused by tractor yarding, reduced long–term soil productivity. Approximately 9,650 acres of BLM lands were harvested during this period and it is estimated that 30% was tractor yarded.

Both natural and management related landslides produced large amounts of sediment during this era (Figure 5-3). The bulk of the major debris avalanches and debris flows occurred in uncut forests during high intensity storms. Most of these occurred during the December 1964 flood event. The hardest hit was the western Cougar Creek drainage. Landslides were of greatest magnitude during the December 1964 flood event in the higher elevations along Bateman Ridge and Rattlesnake Ridge. This suggests rain-on-snow was a possible factor. During the later part of the sixties and in 1970, conditions were relatively dry and landslide activity decreased. The acres per year depicted in Chart 5-1 for the 1955 – 1970 period would actually be higher if it were not for the late sixties dry period.

Forest management activities contributed to an increased level of landslides during this era. Roadside cast on steep slopes commonly traveled far down slope into drainages and the overloading often caused major debris avalanches that would occasionally develop into debris flows when they entered channels. Poor road drainage features and drainage alterations, due to cut slope failures that buried ditch lines, were contributors. During this period, the Gallagher Canyon debris avalanche/debris flow/dam break flood was the largest road-related landslide that initiated on BLM surface (T.24S. R.6W., Sec. 17). Major harvest-related landslides were almost as common as the major road-related slides. The largest harvest-related landslide that initiated on BLM surface (T.26S. R.8W., Sec. 13) began as a large debris avalanche during the December 1964 flood event. It generated into an extremely large debris flow/dam-break flood in a second order stream and reached 3,000 feet into Hubbard Creek. Its total run out length was about 10,700 feet and covered about 14 acres.

During this period management related landslide frequencies (Chart 5-2) were about twice that of current rates. Much of the initial road system within this watershed was created during this era. Based on visual interpretation of aerial photos, the then newly constructed roads and skid trails were estimated to be 10 to 100 times greater than current levels. Based also on known practices at the time as well as on-the-ground observation of legacy roads and skid trails, it is expected that sedimentation rates were substantially elevated above natural background levels in comparison to current sedimentation rates.

1971 - 1983
During this period, rainfall was 10 inches above average for four years and contributed to a high incidence of road and harvest related landslides. Major debris flows/dam-break floods occurred in Cougar, Rader and Lost Creeks. Most of the major arterial roads were in place and the level of road construction declined. New road locations were mostly confined to upper slope and ridge top positions. However, many of the roads were being constructed with poor drainage features and lower standards as described above. Roads constructed from previous periods also had many locations primed to fail. As a result, road related landslide frequencies increased compared to the previous decade (Chart 5-2).

Major landslides in uncut forest declined sharply. It is thought that the December 1964 flood event from the previous decade contributed to this decline. The amount of uncut forest area had also been reduced due to harvesting and may partially explain the decline (smaller sample size). Many forested sites with a build up of unconsolidated, low cohesion soils in swales, hollows and headwalls were primed to fail prior to 1964. Since the 1964 event triggered landslides in many of these forested sites, they were in a more stable configuration for high intensity storm events of the 1971 – 1983 era.

1984 - 1994
From 1984 to 1994 landslides dramatically declined in numbers. Road related-slides identified in the inventory declined 82 percent from the previous period. Only three very large landslides were identified in the landslide inventory for this period. One natural slow moving, deep-seated landslide (slump/earth flow or rock slide) that first appeared on the 1965 aerial photos (possible December 1964 flood event) grew to extremely large proportions by 1989. It is located in BLM old-growth forest in the Rader-Wolf drainage (T.25S. R.8W. Sec. 3), in the Elkton formation. It is still growing and has been a persistent source of sediment into a tributary of Little Wolf Creek. This particular landslide accounts for almost all of the uncut forest landslides in Chart 5-2. There were no other extremely large landslides for the period. Near average precipitation from 1984 to 1989 and drought in 1990, '91, '92 and '94, better road construction practices, continued trend to road ridge-top positions and an overall decline in road construction and harvesting were likely important factors in overall landslide decline. Another important factor in the decline was the maturing of the existing road system, which included the previous failing of primed locations, the settling of road fills, and the vegetation of cuts and fills.

Surface erosion and sedimentation declined during this period. Unlike the previous periods, sediment-choked riparian zones or raw stream banks were not distinguishable on the aerial photos. Field observations in the McGee and Waggoner Creeks watersheds in 1993 and 1994 found little of the stream bank surfaces stripped of vegetation due to seasonal high flows. A high percentage of the old roads and skid trails observed in the field no longer received vehicle traffic, were in a state of healing, and had minor erosion. However, erosion problems were still evident on a fair percentage of roads, which included an estimated 80 miles of BLM roads. Erosion was highest for the steeper–graded, natural-surfaced roads built on deeper, finer textured soils (primarily in the Elkton Formation and the gentle to moderate slopes of the Bateman and Tyee Formations). This was especially true for roads receiving winter traffic.

1995 - 1999
A series of exceptionally wet years with high intensity storms and increases in road construction and harvesting primarily on private lands saw a three fold increase in landslide activity (on a per year basis) over the previous period. The exceptional high intensity November 1996 storm was followed by intense precipitation in December 1996 and January 1997. The November storm produced record 24-hour precipitation totals but it was not a rain-on-snow event in the watershed.

Although the erosion and mass wasting from previously built BLM roads within the Upper Umpqua was higher than in the past decade, it was not near the magnitude of those of the fifties through 1983 (based on aerial photo interpretation). Often BLM road damage was created when landslides plugged culverts. Harvest-related landslides were down a little from the 1971 through 1983 period.

The one very large landslide and the two extremely large landslides identified in the survey were all harvest-related. One of those extremely large ones originated in a 1990 - 1991 BLM clear-cut as a debris avalanche in the Lost Creek Drainage (T.25S. R.7W., Sec. 3) and became debris flow/dam-break flood combination. Its run out distance was about 7,900 feet. It began at the zone of convergence of a large, steep Tyee headwall at the inception of a first order stream. Possible conditions contributing to failure include the upper part of the headwall being of shallow soils and rock outcrop, and the soils at the zone of convergence being deep. While still in this first order stream, the debris flow cut through 900 feet of old-growth riparian habitat before blocking the flow of a second order tributary of Lost Creek and generating a dam-break flood.

This period saw an increased number of uncut forest-related landslides but at a lower level than the 1955 to 1970 period. It did include a number of large landslides. Fifty percent of the inventoried landslides reached streams in the 1995 to 1999 period. These landslides, especially the larger ones, have not healed yet and are most likely a current source of sediment in the streams (Figure 5-4). Stream channels affected by these events are still adjusting to the input of fine sediment.

Landslides and Compaction/Erosion Processes Summary

As stated in the Vegetation section, approximately 25,000 acres of BLM lands were harvested from 1945 to 1995 and it is estimated that 60% was tractor yarded. Dense patterns of skid trails covered most tractor-yarded ground and are an indication of compaction, mechanical soil removal and erosion of topsoil. This resulted in decreased long-term soil productivity in those areas. Recovery of this productivity loss has been a slow process.

The Upper Umpqua landslide inventory shows that natural landslides within Upper Umpqua and the sediment they produce occur in large pulses that correspond to intense storm events with high amounts of precipitation. There are periods with little landslide activity during dry years in contrast to large pulses during wet years (Chart 5-1). The intervals between these large pulses are directly related to the return intervals of the large storm events. Under natural forest conditions, large short-term effects are normally confined to a few areas at any one time during those large pulses and leave a larger percentage of the watershed in a more healed state.

The inventory shows that past timber harvest and road construction have increased the frequency and distribution of landslides. In a review of past landslide studies, Swanson in 1977 found in the Mapleton Ranger District an increase in the landslide erosion rate by a factor of 1.9 going from unmanaged forest to clear-cuts in most land types. The factor increased to 4.0 in the most prone landslide type. A Ketcheson field study of a small watershed unaffected by roads found a 3.7 times increase in clear-cuts over undisturbed forest. In the Oregon Coast Range (H. J. Andrews Experimental Forest), Dryness (1967) found that 72 percent of landslides greater than 100 cubic yards that occurred during the 1964-65 season were road related. The ODF 1996 storms study found differences in landslide frequency according to forest age groupings. Landslide frequencies were highest in the 0 to 9 year age class followed by the mature forest class (100 years +) and lowest in the 10 to 100 year age class. Tree spacing may account for the differences in landslide frequencies between the 10 to 100 year age class and the 100 year + age class (ODF Issue Paper, 2001).

On balance, shallow, rapid moving landslides, debris flows and associated dam-break floods have been the biggest contributors of sediment to the watershed in the last 45 years. There have been large pulses of sediment from this source depending on the mix of weather and management. Locally, deep-seated landslides can be the biggest factor (the forest-related one in the Little Wolf drainage being an example). Surface erosion from road and trail prisms probably has been the second biggest contributor on balance.

Roads were the biggest management-related landslide risk in the fifties through early eighties. The magnitude of road-related landslides have since dropped by a factor of at least three, partly because of better road locations and better construction and maintenance practices. Another reason for the drop is the decline in landslides on older roads after the more unstable portions failed. Portions of these legacy roads are still at risk of failing, particularly during future high intensity storm events. Table 5-2, Chart 5-5, and Figure 5-5 below show roads that were treated or decommissioned to reduce landslide risks and/or sedimentation since 1995. Most of these roads were identified as needing correction in previous watershed analyses. Table 5-2 and Chart 5-5 also show BLM road miles that are a higher priority to be corrected because of their current landslide risk or sedimentation problems.

Harvest-related landslides have decreased to a lesser extent (about 30%) from the earlier periods. Better harvest practices and re-entries into old harvest units that achieved higher stability from past landslides are likely factors. In 1995 the Northwest Forest Plan (NFP) began to be implemented on federal lands. As noted in the Vegetation Section, on average, 40 acres per year of BLM forestlands were regeneration-harvested since 1995. Under the NFP, these harvests maintained forest buffers around riparian and potential landslide areas where landslides are a threat to streams. This is compared to an estimated 500 acres of BLM clear-cut harvesting per year between 1945 and 1995.

2. Current Conditions and Future Trends

a) Landslides

The trend in erosion and mass wasting in the past 45 years has fluctuated, but overall it has been a downward trend. Variations in precipitation amounts and intensities are the main cause for the fluctuations in landslides. The main factors in the downward trend are better management practices, a decrease in clear-cutting of old-growth, and overall higher stability due to previously primed areas failing over the past five decades.

Landslides have covered roughly one percent of Upper Umpqua in the past 45 years. Based on estimates from the aerial photo inventory, about 50% of the landslides reached streams. A higher percentage of the larger landslides reached third order and greater streams (Chart 5-3). Few of their scars are still contributing sediment to streams in appreciable amounts (based on aerial photo interpretation, some field observations and based on the analysis done in the Tom Folly Watershed analysis). Most of the landslides still contributing appreciable sediment to streams likely occurred in the moist 1995 - 1999 period (Chart 5-4). Included in the landslides contributing sediment is the extremely large and growing slump-earth flow in the Little Wolf drainage (T.25S. R.8W., Sec. 3).

Debris flows and dam-break floods (both natural and management-related) that first appeared in the 1960s have had substantial widespread effects on the streams in Upper Umpqua. Short-term effects include a large infusion of fines into the system. Long-term effects include channel incision, the removal or addition of large woody debris and rock fragments, the removal of standing conifers that are replaced with alder, and the deposits which bury pools and channels and which act as a reservoir of fine material as channel baselines are reestablished.

Debris flow/dam-break flood tracks identified in the inventory were superimposed on stream segments that were given a need-for-restoration rating in the Aquatic Habitat and Associated Species section. The results are mixed (see Geology and Soils Appendix, Tables 11-5 and 11-6). In some cases (Upper Cougar Creek and its west fork, a portion of Lost Creek and Waggoner Creek), the larger sized debris flows/dam-break flood activity in the past 45 years contributed to stream structure conducive for fish habitat. In other stream reaches (Hubbard Creek, Rader Creek and a major tributary, a portion of Lost Creek, and Case Knife Creek), the larger sized debris flows/dam-break flood events appear to have contributed to existing poor stream structure. However, this second conclusion is clouded by possible management influences apart from the debris flow/dam-break flood events. Stream cleaning practices of woody debris in the past may account for some of the lack of stream structure. The smaller-sized debris flow activity appears to have had a more neutral effect.

The Oregon Department of Forestry has refined their high landslide risk categories of the sandstone and siltstone formations of the Coast Range (includes Tyee, Bateman, Flournoy, Lookingglass and the sedimentary formations of the Roseburg Formation). Based on their November 1996 storm study, these high-risk sites now include:

- Any slope (excluding competent rock outcrops) steeper than 75%
- Headwalls or draws steeper than 65%
- Portion of landslide-prone terrain determined by geotechnical specialists and confirmed by ODF to be likely initiation sites of rapidly moving landslides.

In the high-risk areas, debris flows can be fairly common after high intensity storms and occur at lower frequencies after moderate storms. The concentrations of red on the slope map (Figure 5-1) are representative of ODF's high-risk areas and where most inventoried landslides are located.

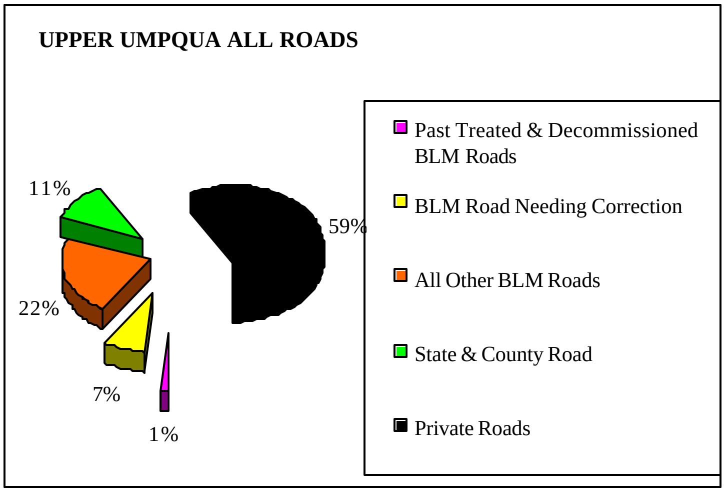
b) Roads

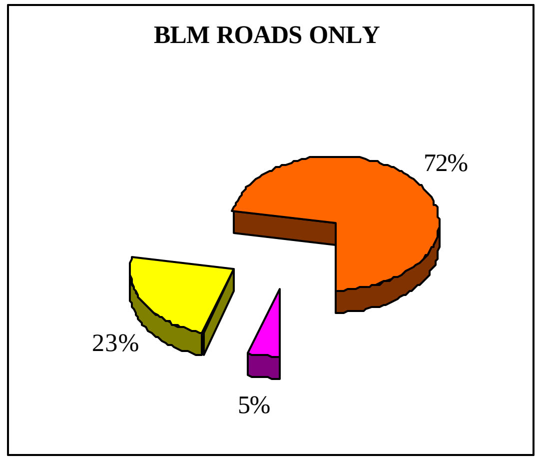
The following Table 5-2 summarizes the amount of roads within Upper Umpqua by subwatershed. It includes BLM road miles that have been treated or decommissioned to lower the risk of landslides or reduce sediment as well as identified roads with problems needing to be corrected. Table 5-3 shows the estimated miles of BLM roads that are asphalted, rocked, and naturally surfaced.

Table 5-2 Miles of Road Categories within Upper Umpqua

	Past BLM Road Corrections		BLM Roads	BLM	State & County	Private	TOTAL ROAD
Subwatersheds	Treated	Decom	Need Correction	Roads	Roads	Roads	Miles
Cougar	0.0	0.0	2.5	33	10	52	96
Hubbard Creek	4.3	4.3	11.6	44	6	54	105
Lost Canyon	0.0	0.0	7.1	42	19	72	133
McGee Creek	6.0	0.6	12.6	46	25	77	147
Mehl Creek	0.0	0.0	19.5	49	31	178	258
Rader Wolf	0.0	1.5	15.7	90	0	49	139
Umpqua Frontal	0.0	0.0	2.6	12	28	138	178
Yellow Creek	0.0	0.0	9.8	43	0	30	73
TOTAL	10.3	6.4	81.4	358	120	651	1,128

Chart 5-5 Upper Umpqua Road Categories





Factors affecting erosion levels are soil depth, texture, road gradient, spacing of cross drains and traffic levels. The road segments with the highest erosion are generally those that cut through deep soils (bedrock not reached), have high silt content, are natural-surfaced, are on moderate to steep grades (above 10 percent) and get more than occasional vehicle traffic. Ruts eroding down to greater than two feet do occur under these conditions. About 80% of the BLM roads identified as needing corrections occur in the Elkton and the moderately sloped Tyee/Bateman geomorphic units that have the deeper soils and high silt content.

Slope position of roads (lower, middle upper/ridge top) is another important factor on effect to streams. Lower slope position roads in riparian areas of higher order streams generally have the highest effects to water quality. The natural-surfaced roads in Williams and Brads Creeks, and the rocked segments in Bear (Yellow Ck. Drainage) and Hubbard Creeks comprise most of the BLM roads in need of correction in lower slope positions. Mid-sloped roads just above or intersecting first order streams are current sources of chronic sediment. Although upper slope or ridge top roads are not sources of chronic sediment to streams, some of these roads are at risk of developing major landslides that can produce a large amount of short and long-term sediment. Existing roads are currently contributing low levels of chronic sediment to streams relative to the fifties through mid eighties. Fifteen miles of the natural-surfaced roads identified as needing correction are estimated to be chronic sources of sediment to streams (derived from Table 5-4).

Table 5-3 Total Miles of BLM Road Surfacing Categories

	TOTAL BLM ROADS, SURFACE TYPES		
Subwatersheds	**Natural**	**Rocked**	**Paved**
Cougar	5	28	1
Hubbard Creek	13	31	0
Lost Canyon	7	35	0
McGee Creek	8	33	5
Mehl Creek	10	30	9
Rader Wolf	15	64	11
Umpqua Frontal	2	8	2
Yellow Creek	10	32	1
TOTAL	70	260	27

Table 5-4 Miles of BLM Road Needing Correction by Surfacing Categories

	BLM ROADS NEED CORRECTION, SURFACE TYPES		
Subwatersheds	**Natural**	**Rocked**	**Paved**
Cougar	1.8	0.3	
Hubbard Creek	7.1	3.4	
Lost Canyon	4.2	2.6	
McGee Creek	2.7	9.5	
Mehl Creek	7.9	10.7	0.3
Rader Wolf	8.7	5.2	
Umpqua Frontal	2.0	0.0	
Yellow Creek	3.3	6.4	
TOTAL	37.7	38.1	0.3

The area with the highest concentration of road erosion and sedimentation problems is the south portion of the Hubbard Creek subwatershed in the gentle to moderately-sloped Tyee. It long has been a popular area for recreation off-road vehicle use. Many old skid trails and natural-surfaced logging roads receive frequent use during the wet season months. The results over time have been many segments with severely eroded and rutted surfaces and with deeply entrenched roadbeds (roadbeds situated below the natural surface on both sides). On one 15 percent grade, drainage travels down an entrenchment for over 3,000 feet before finding an outlet. Each time this roadbed is used during the wet season, a heavy amount of sediment travels down the roadbed, roughly measured during a 1993 storm to be at a rate of 380 pounds an hour. As entrenchments get deeper, the ability to correct drainage problems becomes increasingly more difficult. The forest floor effectively filters the sediment where drainage can exit onto it. There are no figures about how much sediment is reaching streams.

As summarized in Table 5-2 above, three road mitigation projects were completed in the southern portion of Hubbard Creek (Figure 5-5). In 1990 the lower part of the 26-7-19.1 road on BLM surface was rocked and a spur road decommissioned to decrease sedimentation into Hubbard Creek. The segment of the 26-7-7.0 road in section 29 was blocked to traffic (ATVs and dirt bikes have been getting around the tank trap barrier). The 26-7-29.0 road has been part of a popular loop that has one lengthy steep grade. This road and several others (BLM 26-7-19.2 and BLM 26-7-19.4) were subsoiled and waterbarred around 1997. In addition, the BLM 26-7-19.0 road was improved and a spur decommissioned in conjunction with the Hubbard Creek Thinning. Segments on seven roads in the southern Hubbard Creek drainage are listed as needing correction (Figure 8-2).

Sediment production and landslide risks from the BLM and BLM-private shared roads will likely continue to decline as road drainage issues and surfacing problems are corrected. The Management Opportunities section below has identified problem roads that are candidates for treatments to reduce their risks. Correction of these 81 miles of BLM roads would have the greatest effect at reducing BLM's management-related contributions to sedimentation.

Upper Umpqua
Slope Classification

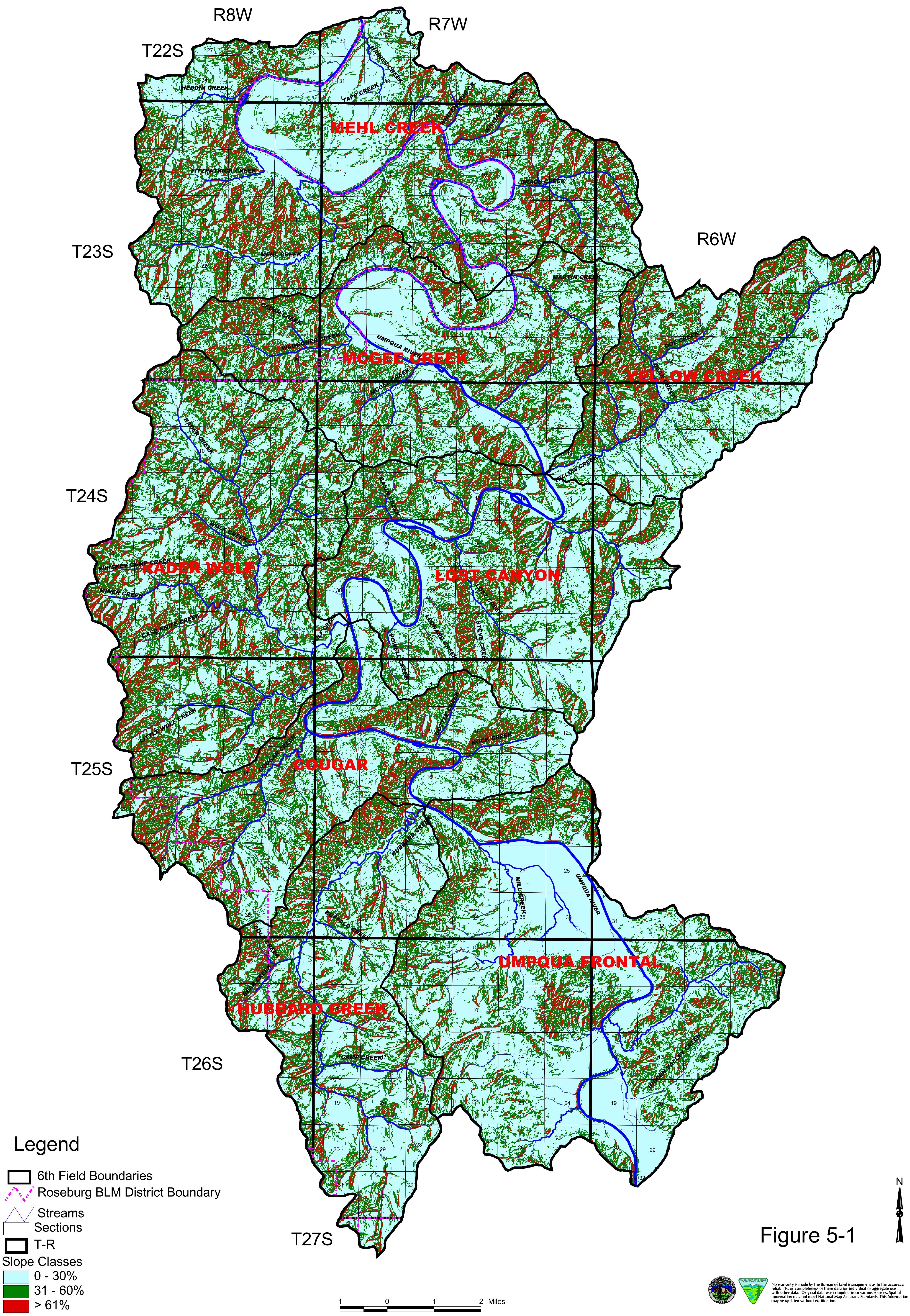


Figure 5-1

Upper Umpqua
Geologic Formations

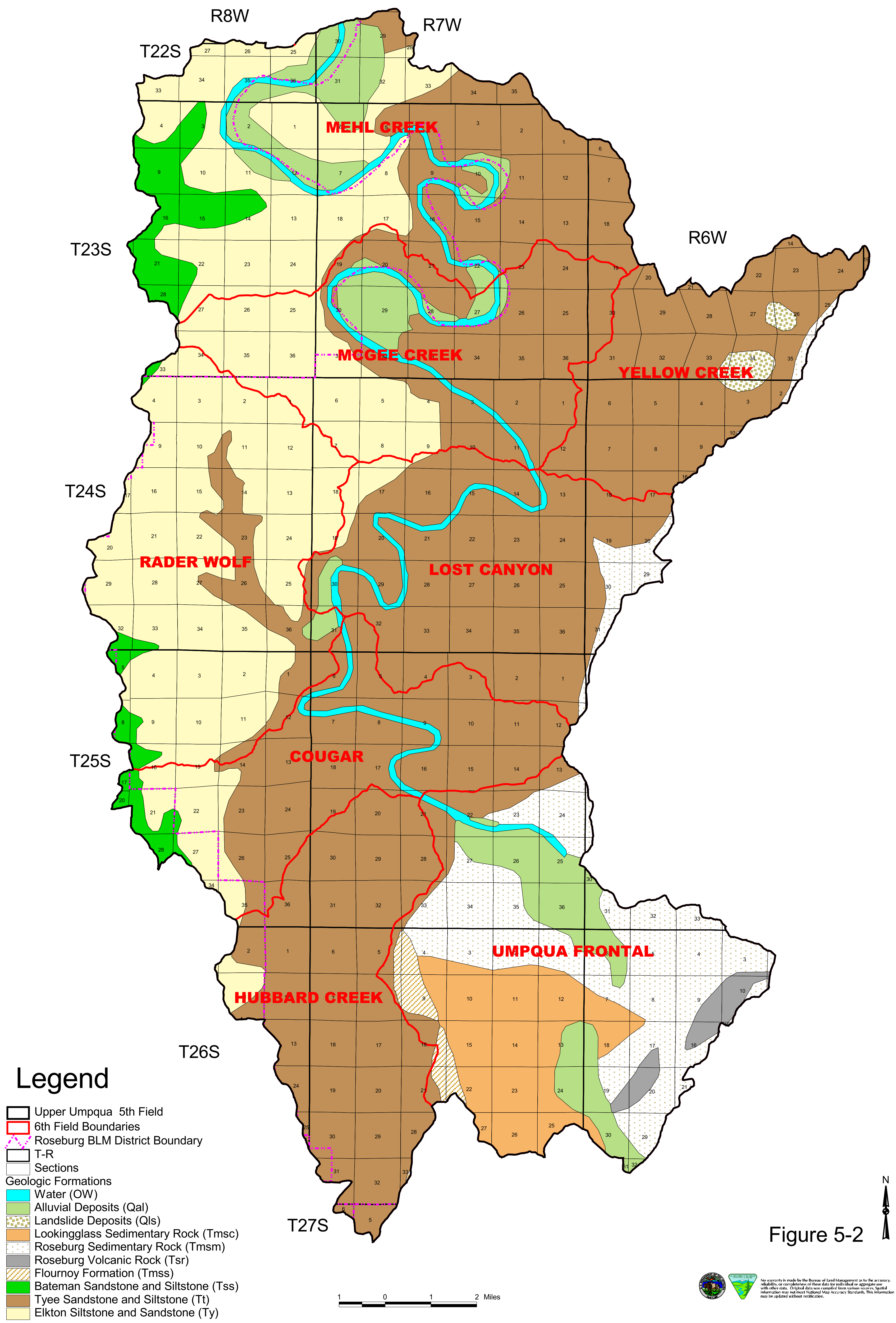


Figure 5-2

Upper Umpqua
Landslides Size and Debris Flow Paths

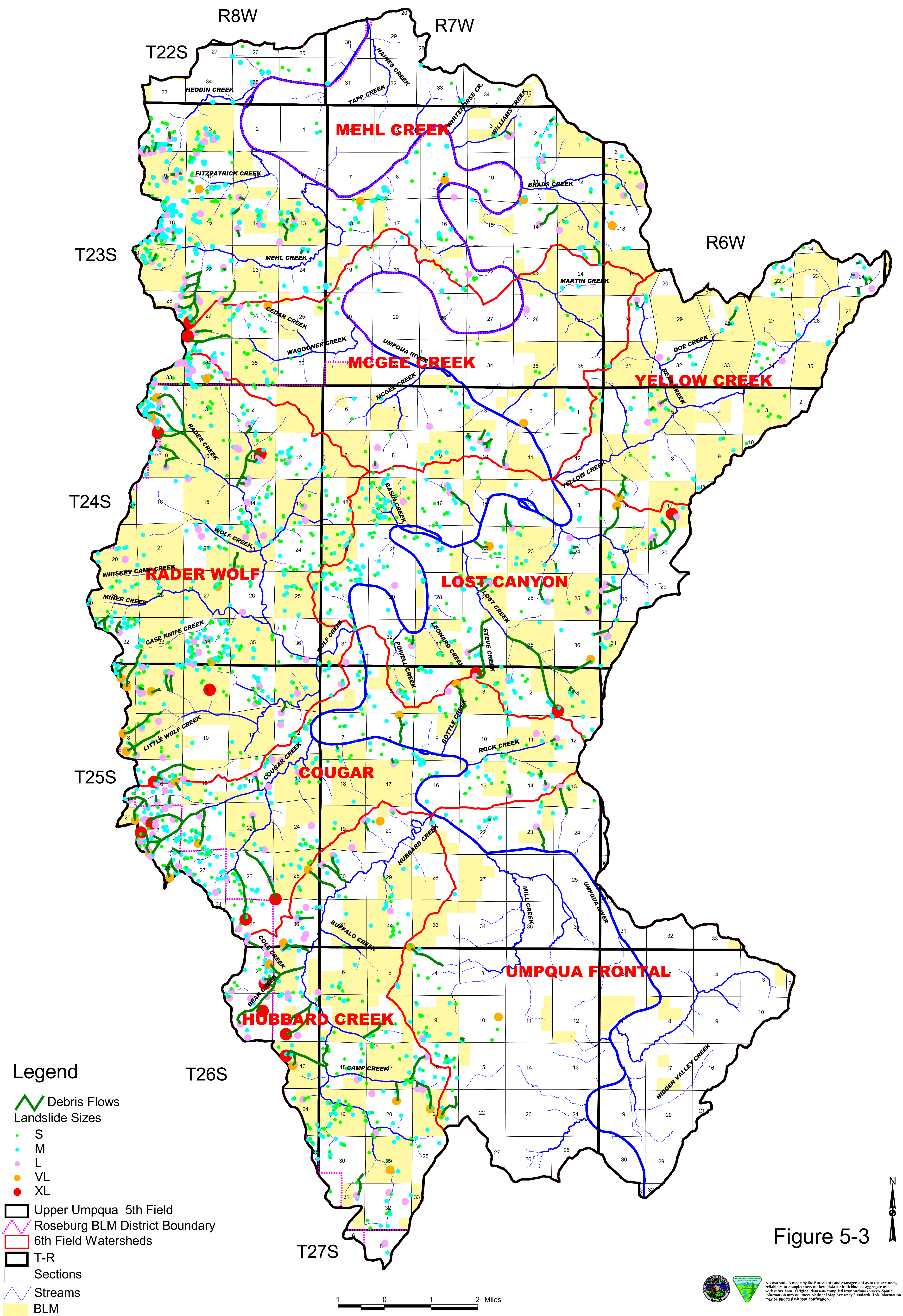


Figure 5-3

Chart 5-1 Size Class Chronology of Landslides in Upper Umpqua

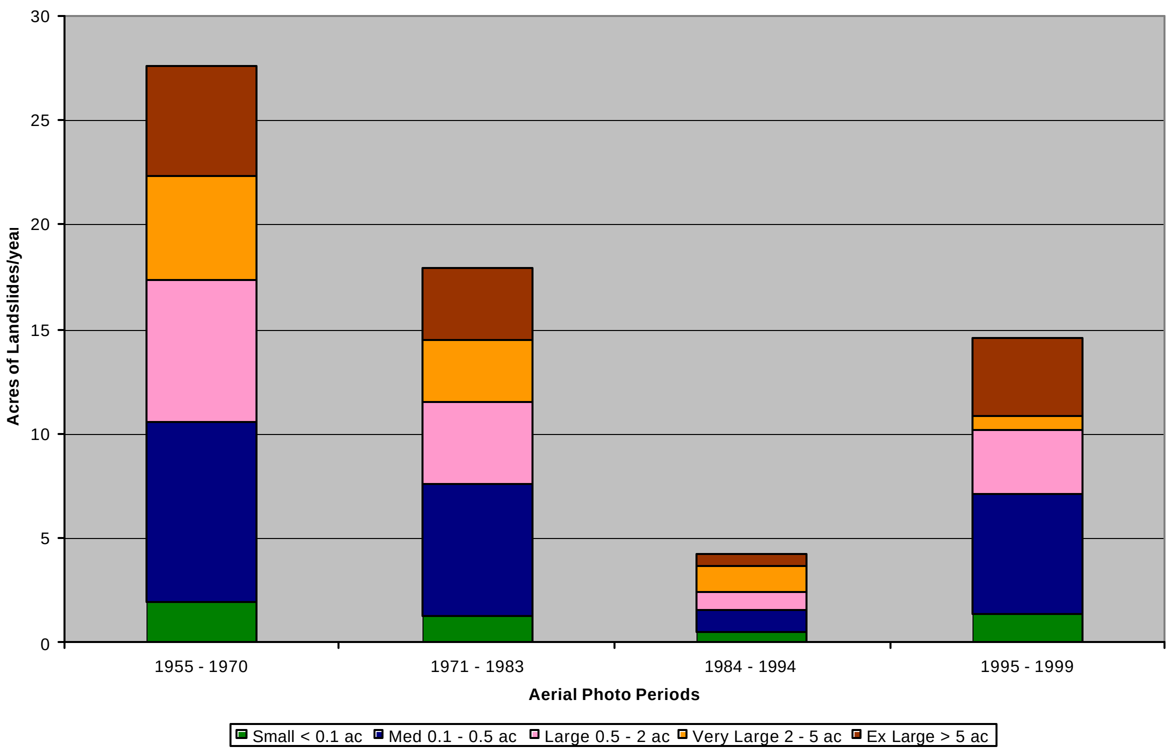


Chart 5-2 Chronology of Landslide and Management Relationships in Radar-Wolf, Cougar and Hubbard Creek Subwatersheds

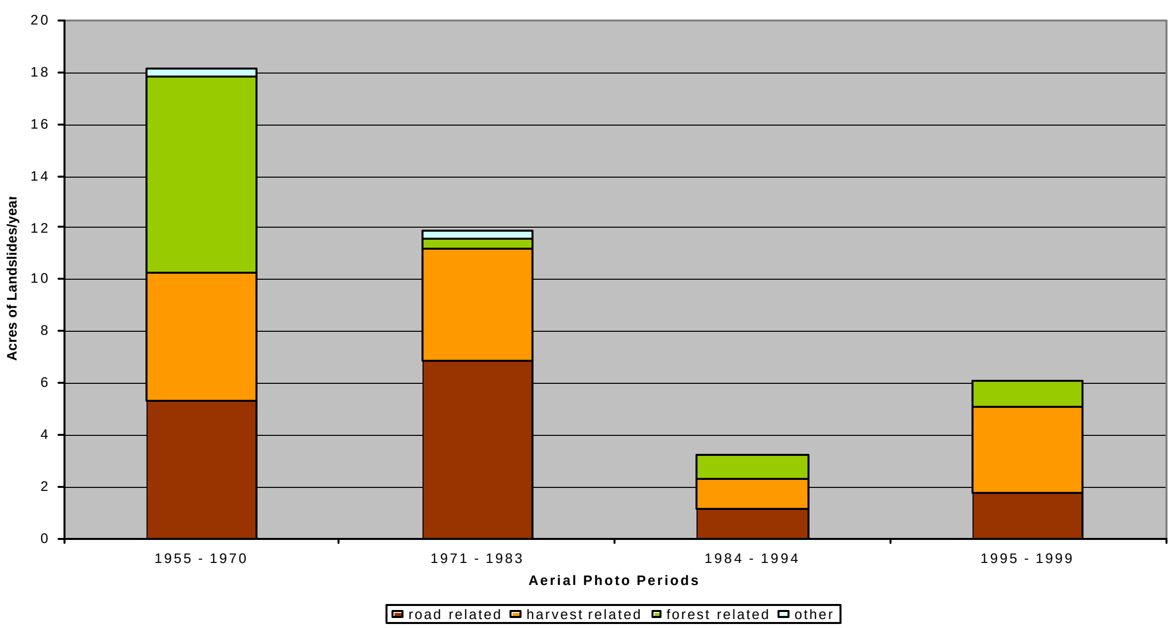


Chart 5-3 Highest Order Stream Reached by Landslides in Upper Umpqua

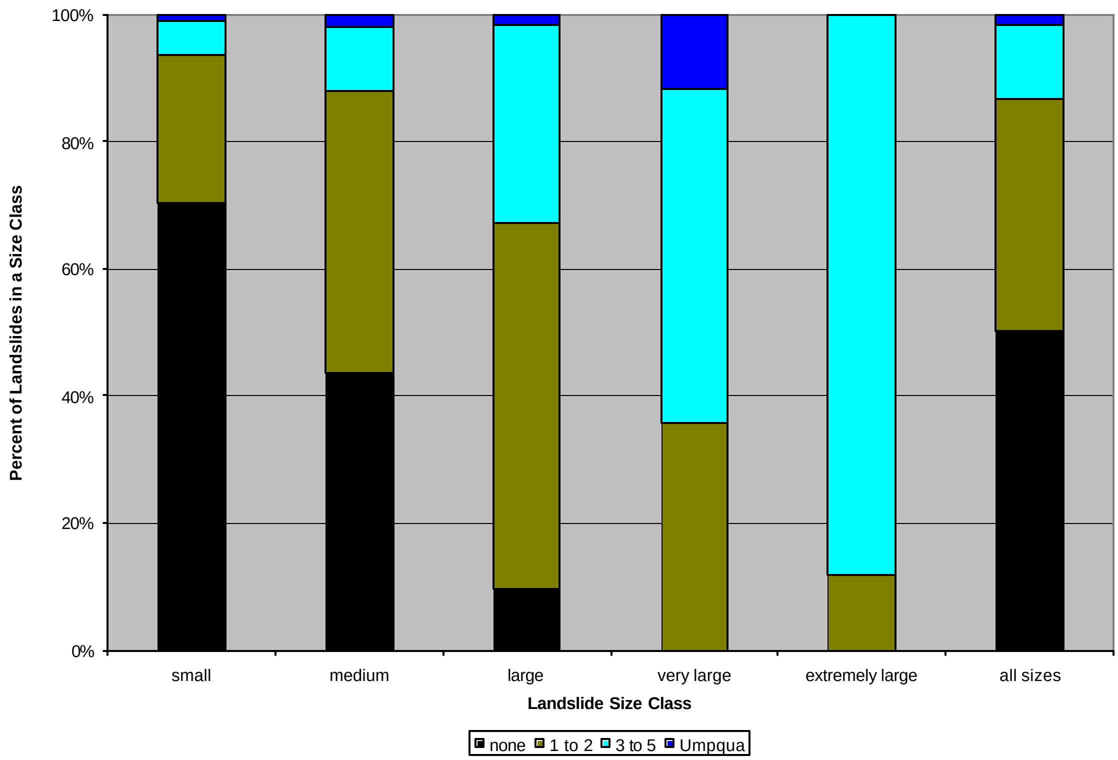
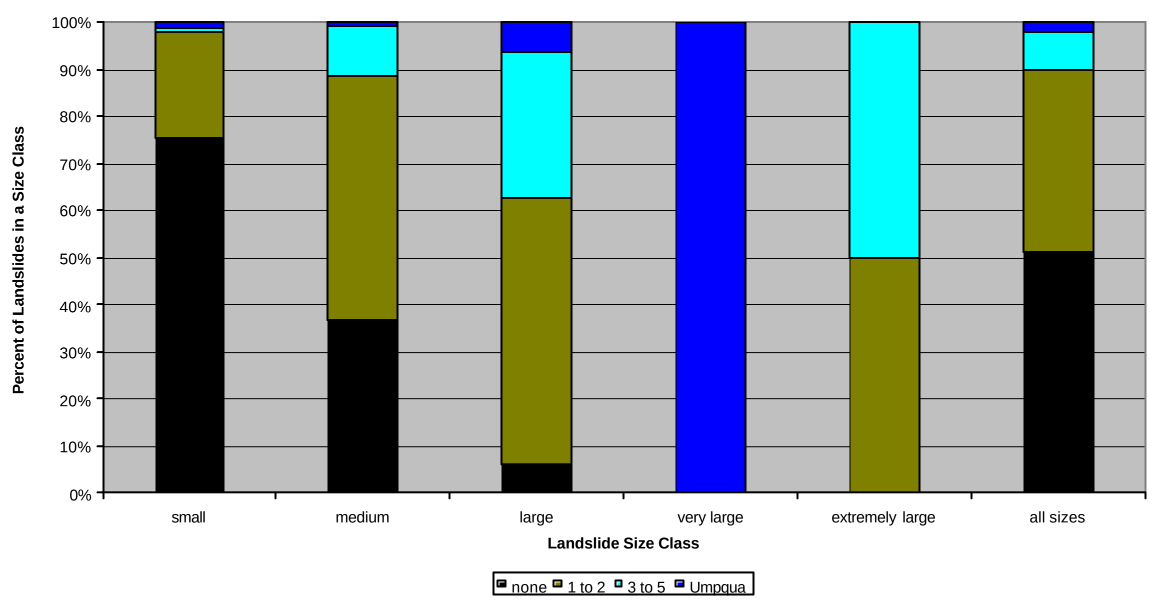


Chart 5-4 Highest Order Stream Reached by 1995-1999 Landslides



Upper Umpqua
Landslides Since 1995 Causing Sedimentation

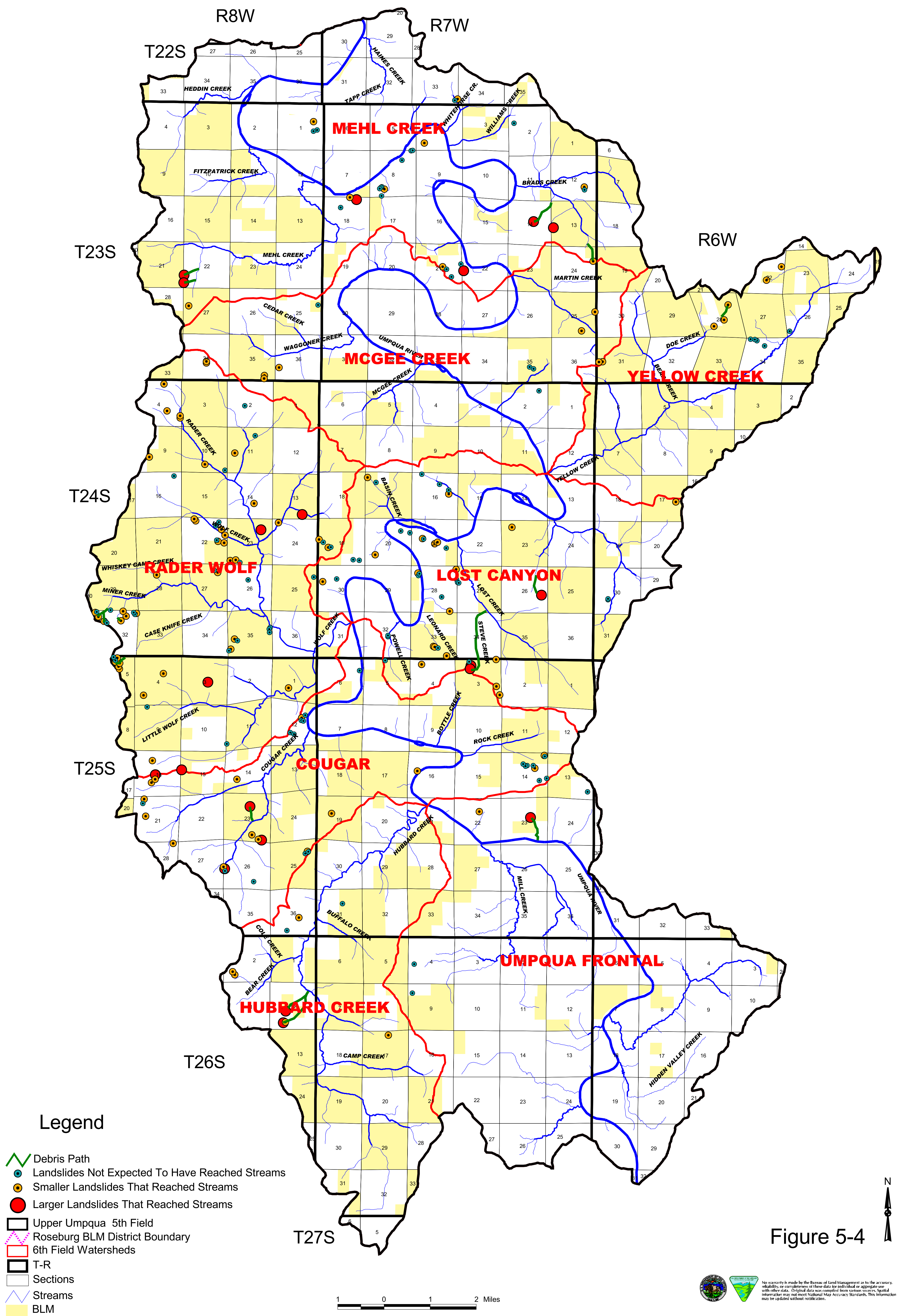


Figure 5-4

Upper Umpqua
Roads Treated or Decommissioned Since 1995

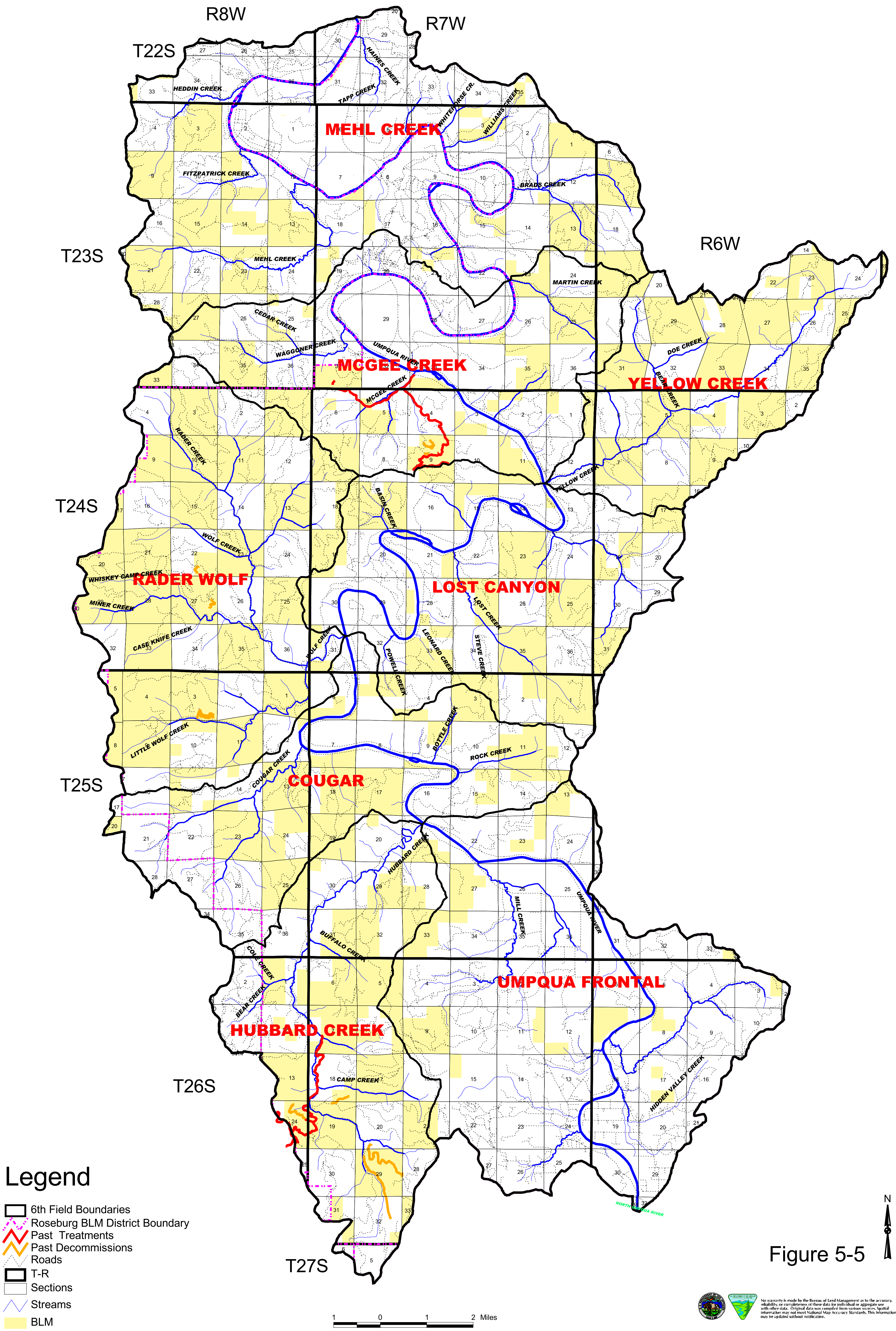


Figure 5-5

6 HYDROLOGY AND WATER QUALITY

A. Hydrologic Characteristics

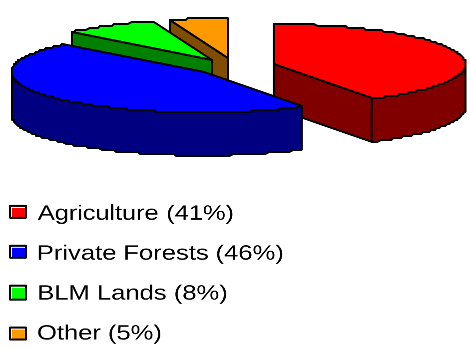
1. Main Stem Umpqua River

The Upper Umpqua watershed drains 265 square miles of land. The North and South Umpqua Rivers converge at the southern boundary of this watershed at River Forks Park becoming the Umpqua River. The northern boundary of this watershed is at the confluence of Elk Creek near the town of Elkton. The Umpqua River Basin above the confluence of Elk Creek drains a total 3,684 square miles of land and contains approximately 15,000 miles of streams.

The main stem of the Upper Umpqua River is a generally unconfined but deeply incised ninth order river, with an average gradient of approximately 1.4 percent and very little obvious side channel habitat. The alluvial valley width is highly variable, averaging approximately 1,000 feet but reaching a maximum of two miles in width within the vicinity of T.23S. R.7W., Sec. 29. Over ninety percent of the floodplain is in private ownership. Approximately 40% of the floodplain has been converted for agriculture (Chart 6-1).

Information concerning the distribution or condition of instream habitat units within the main stem Upper Umpqua is currently unavailable. Off channel features including secondary channels, backwater pools and wetlands are not evident in aerial photos.

Chart 6-1 Main Stem Ownership Within 500 feet of River



2. Tributary Streams

Of the major tributaries within the Upper Umpqua watershed, Hubbard Creek is the largest sixth order stream. The lower portion of Wolf Creek (below Little Wolf) is the only other sixth order stream reach. Calapooya Creek, a seventh order discreet fifth field watershed, is the only other tributary contributing flows to the Upper Umpqua between River Forks Park and Elkton (Figure 6-1). Bear, Brads, Cougar, Little Canyon, Little Wolf, McGee, Mill, Rader, Waggoner and Yellow Creeks are fifth order streams. A break down of stream miles and their location within Upper Umpqua is shown in Chart 6-2, Table 6-1 and Figure 6-1.

Chart 6-2 Upper Umpqua Distribution of Streams (Percent by Length)

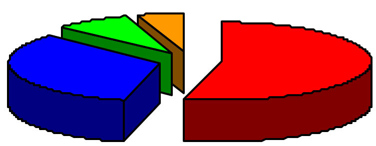


Table 6-1 Upper Umpqua Stream Miles by Subwatershed and Stream Order

	MEHL CREEK	MCGEE CREEK	YELLOW CREEK	RADER WOLF	LOST CANYON	COUGAR	HUBBARD CREEK	UMPQUA FRONTAL	TOTAL
Stream Miles stream order 1	165	99	73	77	69	72	91	86	732
Stream Miles stream order 2	65	42	29	38	28	27	29	34	292
Stream Miles stream order 3	31	17	9	19	18	13	19	29	155
Stream Miles stream order 4-6	22	9	14	23	7	8	16	12	110
Umpqua River stream order 9	18	12	0	0	12	9	0	13	64
TOTAL	301	179	125	157	134	129	155	174	1353

B. Water Quality

1. 303D (d) Listed Parameters

The main stem Umpqua River and several tributaries within the Upper Umpqua fifth field watershed have been placed on the Oregon 303(d) list due to documented violations of water quality standards (Figure 6-2, Table 6-2, DEQ, 1998a). The affected beneficial uses are resident fish and aquatic life, and salmonid fish spawning and rearing habitat.

Water quality standards for the Umpqua Basin require that the seven (7) day moving average of the daily maximum water temperature shall not exceed 17.8 degrees Celsius (C). A stream is listed as temperature limited when the moving seven (7) day maximum average violates the standard. A stream is listed as flow modified when: (a) "fish species have declined due to water quality conditions," (b) statistical summaries of stream flow based on actual flow measurements show that target instream flows "are not frequently being met," *and* (c) there is an identified "human contribution to the reduction of instream flows below acceptable level indicated." A stream is listed as habitat modified when data indicate: "fish species have declined due to water quality conditions" *and* "habitat conditions that are a significant limitation to fish or other aquatic life as documented through a watershed analysis or other published report which summarizes the data and utilizes standard protocols, criteria and benchmarks (e.g., those currently used and accepted by Oregon Fish and Wildlife or Federal agencies (PACFISH))." Streams may also be listed as flow or habitat-modified if multi-metric indices indicate that aquatic macroinvertebrate assemblages are within less than 60% of reference community scores (DEQ, 1998b).

Listing criteria for bacteria require that the geometric mean of fecal coliform bacteria not exceed "200 per 100 milliliters or more than 10 percent of the samples". To be listed, there must also be "a minimum of at least two exceedences [that] exceed 400 per 100 milliliters for the season of interest." Because this listing is most likely related to failed septic systems, sewage treatment plant practices, and agricultural grazing practices, and because BLM has no known point sources within Upper Umpqua, the discussion about this listing is in the Hydrology Appendix.

Table 6-2 Upper Umpqua River 303(d) Listings

Location		Parameter(s)
Umpqua River	Little Mill Creek to North/South Fork	Bacteria, Flow Modification, Rearing Temperature
Hubbard Creek	Mouth to Headwaters	Habitat Modification
Little Wolf Creek	Mouth to Headwaters	Rearing Temperature
Miner Creek	Mouth to Headwaters	Rearing Temperature
Rader Creek	Mouth to Headwaters	Rearing Temperature
Wolf Creek	Mouth to Headwaters	Rearing Temperature, Habitat Mod
Yellow Creek	Mouth to Headwaters	Rearing Temperature

2. Stream Temperatures – Natural and Management Influences and Future Trends

Stream temperatures vary naturally depending on geographic location and elevation. Temperatures also fluctuate naturally over time with variations in climate and precipitation.

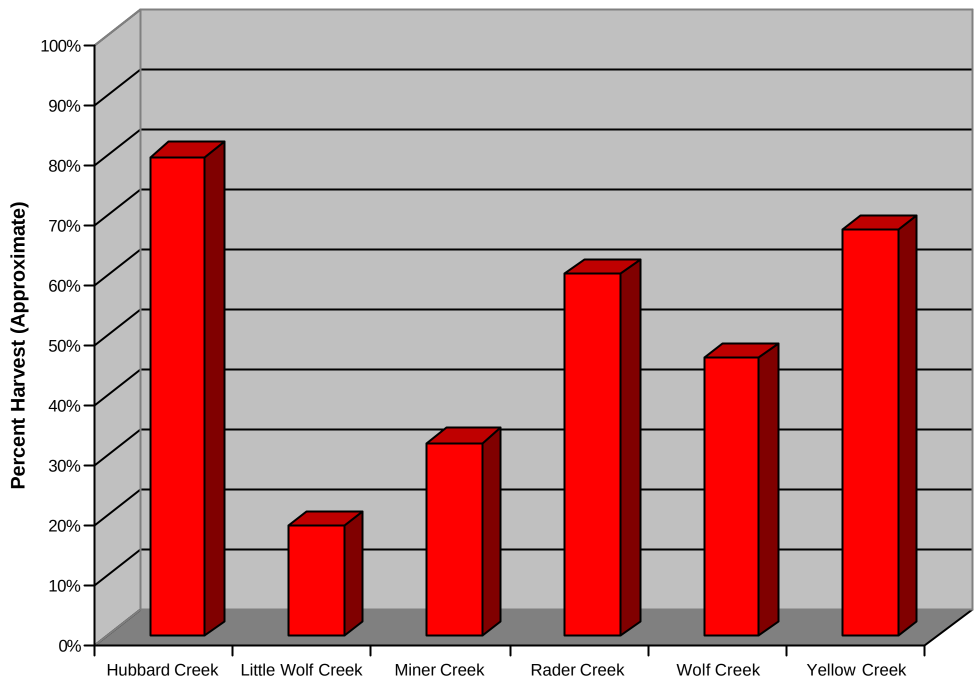
The BLM does not monitor water temperatures within the main stem of the Umpqua River. However, the Umpqua Watershed Council monitored the temperature of the main stem above McGee Creek last year. The Council reported a 7-day maximum of 26.4°C on 08/01/00. Point measurements taken in the main stem last year indicated temperatures of 22.8°C below the Calapooya confluence and 25.0°C at Elkton (with measurements taken approximately an hour and a half apart on July 24, 2001 at 10:00 AM and 11:24 AM, respectively). As stated previously, the main stem Umpqua River above Elkton drains 3,684 square miles. Since this watershed occupies only about 7% of that area, with BLM and industrial private forested-lands (Table 1-2 and Chart 1-2) occupying even less (about 5%), it is unlikely that timber harvest within Upper Umpqua has impacted flow or temperature regimes within the mainstem.

BLM monitors temperatures in tributary streams that flow through BLM lands. The mix of both private and public land management policies influence temperatures at these monitoring sites. All monitored tributaries have violated the State temperature standard (7-day maximum of 17.8 degrees Celsius or 64 degrees Fahrenheit) within the last five years. Table 6-3 summarizes stream temperatures monitored in tributaries on BLM lands.

Timber harvest along streams (removal of the riparian canopy) can cause an increase in the solar radiation flux across the water surface and a corresponding increase in peak stream temperatures during the summer, beyond the natural range of variability. Beschta et. al. (1987) demonstrated that complete removal of the forest canopy in the Pacific Northwest can increase the peak daily stream temperature by between 3-8°C during the summer. Removal of the forest canopy may also decrease the minimum nighttime temperature in the winter by allowing more radiation heat loss (MacDonald, et. al., 1991). Recent studies have suggested that changes in channel morphology may also cause stream temperatures to change. Stream temperatures may not return to pre-logging levels until the stream banks become re-vegetated and the input of short-wave radiation is reduced to pre-logging levels (MacDonald, et. al., 1991; Moring, 1975; Holtby, 1988).

Harvest intensity was evaluated by calculating the percent harvest within 200 feet of either side of each listed stream. First and second order segments are not expected to greatly affect stream temperatures in lower reaches and were ignored for the purpose of this analysis. BLM Forest Inventory Operations (FOI) data was used to estimate the riparian forest birth year for BLM-administered lands falling within 200 feet of listed streams. Stands with birth years prior to 1945 are assumed to be unharvested. Although Table 3-3 above shows that approximately 42% of the forest stands on private lands are in mid or late seral classes, it was assumed for analysis purposes that ninety percent of private riparian forests will be harvested within the next 10 years. Analysis results (Chart 6-3) suggest that Little Wolf Creek, the stream with the highest average 7-day maximum temperature (20.5°C), also contains the highest percentage of late seral timber (82%). Miner Creek, with an average 7-day maximum temperature of 19°C, also has a relatively high percentage of late seral timber along its margin (70%). Available data in general suggest that tributaries within the Upper Umpqua are naturally warm and may regularly exceed State temperature criteria, even in the absence of any harvest.

Chart 6-3 Estimated Percent Harvest Within 200 feet of Listed Tributaries



Stream temperatures are influenced by current practices on private forestlands and residential properties. Because the majority of the riparian forests within BLM-administered portions of the Riparian Reserves are already late-successional, stream temperature regimes are not expected to greatly change in the future.

3. Flow Modification

The mainstem Umpqua River within this watershed is listed for flow modification (Figure 6-2). Causes of flow modification may include consumptive withdrawals, flow regulation at storage dams, and the effects of land use activities on storm water runoff, infiltration, storage and delivery. Commercial and domestic withdrawals are common along the Umpqua River. As stated above, because the mainstem Umpqua River (above Elkton) drains such a large area and because BLM and private forest harvest influences within the watershed is so small (about 5%), it is unlikely that timber harvest within the Upper Umpqua watershed greatly impact flows within the mainstem river.

4. BLM Commitments to Monitoring and Water Quality

Figure 6-2 shows where past monitoring sites have been conducted by BLM, DEQ and/or the Umpqua Basin Watershed Council. The Roseburg BLM District hydrologist and fish biologist at this writing are in the process of developing a district monitoring strategy. This strategy will integrate the various overlapping agencies interested in monitoring and may change whether monitoring information will be collected at the sites shown in Figure 6-2 in the future. The plan is to be more strategic in the types and amount of monitoring information collected. The Swiftwater Resource Area expects to complete the monitoring strategy sometime in October 2002.

C. Upland Tributary Hydrology

Although seventh field tributary stream flows have not been gauged, there is evidence that previous management has heavily influenced stream channels throughout the Upper Umpqua. Most third and forth order streams in the watershed show evidence of recent bank scour, widening and degradation (downgrading). This trend may be due in part to elevated peak flows. Increased peak flows can cause changes in physical stream dimensions, planform, and microhabitat characteristics. Mechanisms that may alter flows include: loss of vegetative cover, compaction of soils due to the roads and skid trails, conversion of sub-surface flow to surface flow by road cut-banks, and the extension of the stream network by road ditch lines and culverts (Coffin and Harr, 1992; Jones and Grant, 1996; King and Tennyson, 1971; Megahan, 1971; Wemple, et. al., 1996).

Many tributaries within the Upper Umpqua have also been cleaned and/or salvage logged, but consistent records of stream cleaning operations were not kept. Because the effects of cleaning and salvage logging operations are difficult to separate from the effects of elevated peak flows, it is difficult to quantify the extent to which elevated peak flows have impacted instream or off-channel habitat.

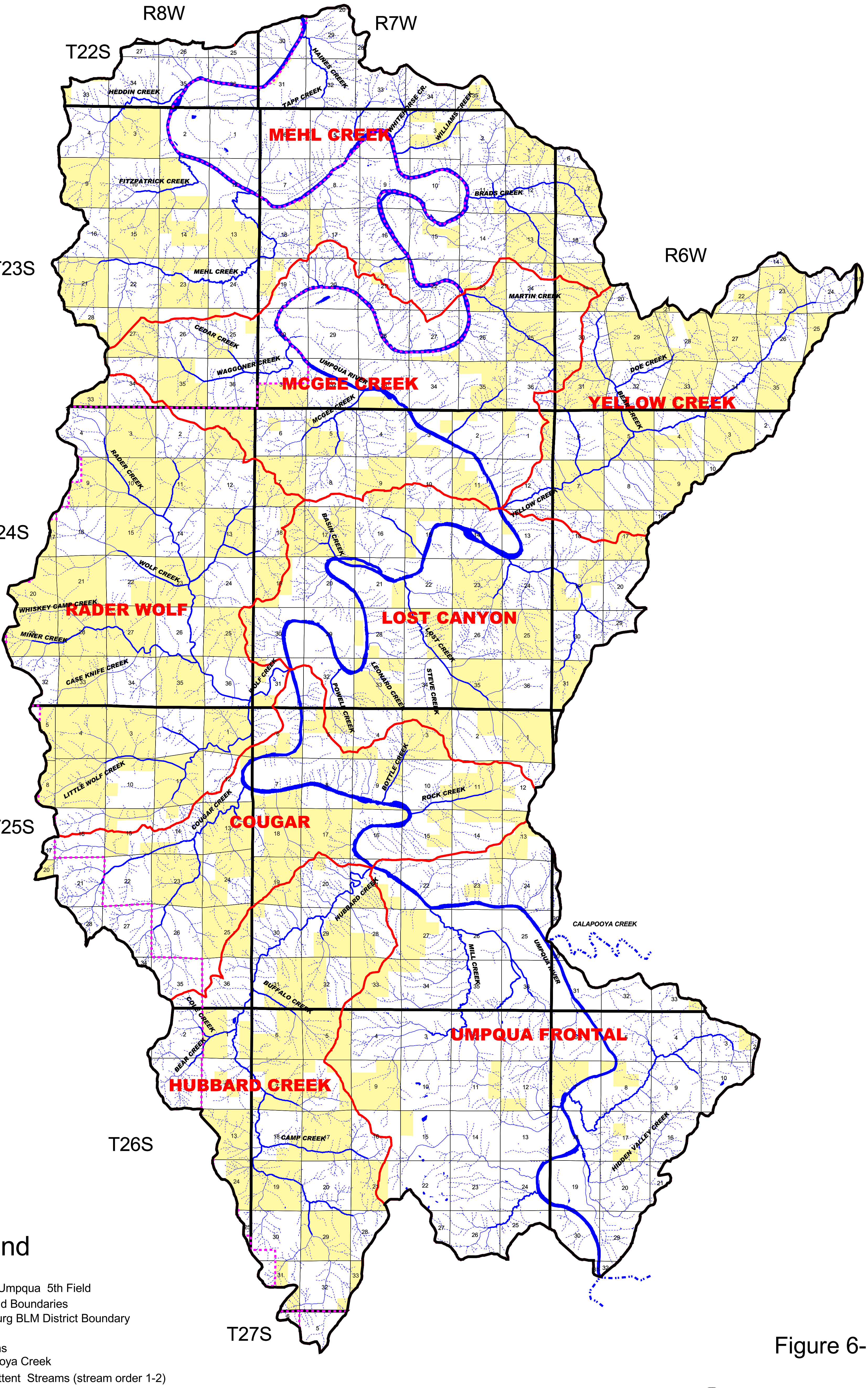
Road systems can indirectly impact stream and riparian habitat networks by diverting subsurface flow, increasing runoff and peak flows during storm events, and increasing sediment delivery to streams. If roads are located within the floodplain, they can also directly displace riparian habitat.

Roads have displaced riparian habitat in a number of streams. As an indicator of the extent to which roads have displaced or impacted riparian and stream habitat, roads lying *within 150 feet of selected stream segments* were mapped and tallied. Riparian-zone road densities (in road miles per stream mile) were calculated for each major stream system in the development of the instream and off-channel enhancement priorities discussed in the Aquatic Habitat and Associated Species section below. A more detail stream reach-by-reach summary of road densities is given in the Hydrology Appendix (Table 12-3).

Although future land management actions implemented under the Northwest Forest Plan (NFP), best management practices are likely to have less of an impact on peak flows than historical practices. Relationships between road densities, harvest activities and stream flows are generally complicated and difficult to characterize. For example, Harris (1977) found that clear-cutting in the Alsea River Basin (western Oregon) increased measured peak flows by 20%, while Jones and Grant (1996) found that forest harvesting increased peak flows in the H. J. Andrews Experimental Forest by as much as 50% in small basins and by as much as 100% in larger basins. In one of the watersheds located within H. J. Andrews, Harr and others (1982) found no significant change in the magnitude or timing of peak stream flows following clearcutting. Risley (1994) concluded that the effect that clear-cutting might have on peak stream flows appear to be related primarily to the harvest practices employed (e.g. yarding techniques, and road design and maintenance). Harr (1979) came to similar conclusions in a study of three types of harvest units (clear-cut, 50% shelterwood retention, and 30% aggregated retention) in the Coyote Creek watershed of the Umpqua River Basin.

Thomas and Megahan (1998), in a re-analysis of the H. J. Andrews data, found that effects of timber harvest on peak flow are the greatest for smaller flood events (recurrence interval of two years or less), and undetectable for larger events (greater than two-year recurrence intervals). This finding is worth noting, because one to two-year events play a dominant role in shaping channel morphology and transporting sediment. Because the above relationships are complex, they are difficult to apply to the Upper Umpqua. On a regional scale, Northwest Forest Plan monitoring and adaptive management programs should provide the information necessary to answer these questions.

Upper Umpqua
Streams and 6th Field Subwatersheds

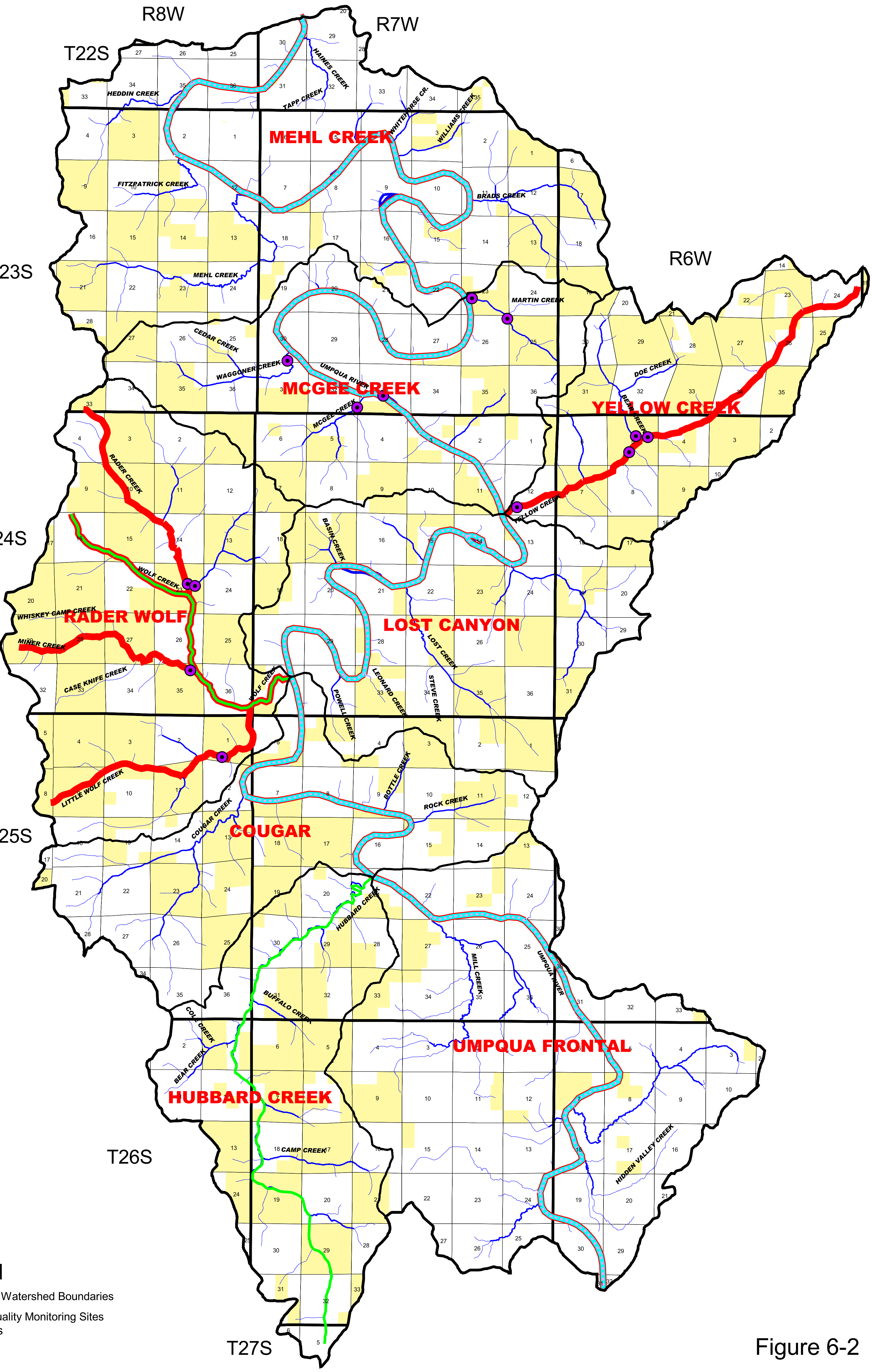


Legend

- Upper Umpqua 5th Field
- 6th Field Boundaries
- Roseburg BLM District Boundary
- T-R
- Sections
- Calapooya Creek
- Intermittent Streams (stream order 1-2)
- Streams
- Lakes
- BLM

Figure 6-1

Upper Umpqua
303D Listed Streams and Monitoring Sites



Legend
- 6th Field Watershed Boundaries
- Water Quality Monitoring Sites

303D Listings
- Bacteria
- Habitat
- Flow
- Temperature
- T-R
- Sections
- Streams
- BLM

Figure 6-2

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 6-3 Upper Umpqua Tributary Stream Temperature Summary

Site Name	7-Day averages			Days >
	Date	Maximum	D T	17.8 C
Bear Creek	08/13/97	16.9	2.6	0
	07/26/98	18.0	2.2	6
	07/27/96	18.6	2.6	11
	08/26/99	16.8	1.8	0
	08/03/00	17.5	2.3	2
Little Canyon Creek	08/01/00	19.7		
Little Wolf Creek	07/25/98	20.9	3.8	42
	07/28/92	19.9		
	07/18/95	20.6	3.9	49
	07/27/96	22.3	3.9	40
	07/12/99	18.9	4.3	41
Martin Creek	07/29/98	20.4	3.7	38
	08/01/00	18.3	2.7	12
	08/25/99	17.4	2.2	3
McGee Creek	07/31/00	18.5		
Miner Creek	07/27/96	20.4	2.9	26
	07/19/92	18.6		
	07/19/95	18.9	2.4	22
	08/26/99	18.2	2.0	11
Rader Creek	08/15/92	20.3		
	07/27/96	19.3	2.6	20
	07/19/95	18.3	2.2	14
	08/26/99	18.0	2.0	5
Upper Martin	07/26/98	17.5	2.7	4
Rader Tributary (No. 1)	08/14/92	18.7		
	07/19/95	18.5	2.5	16
	07/26/96	19.7	3.3	18
	08/05/97	17.7	2.8	7
	07/12/99	17.4	4.1	2
Yellow Creek at mouth	08/01/00	22.8		
Yellow Creek above Bear	08/13/97	18.7	3.2	30
	07/25/98	19.3	3.1	24
	07/27/96	20.2	3.0	24
	08/26/99	17.9	2.1	10
	08/01/00	19.2	3.2	20
Yellow Creek below Bear	08/01/00	20.0		
Waggoner Creek	08/01/00	23.3		

7 AQUATIC HABITAT AND ASSOCIATED SPECIES

A. Aquatic Species, Presence and Distribution

1. Fish Distribution

Figure 7-1 shows fish distribution by stream name within Upper Umpqua. This map is based on the most current stream surveys as compiled by the Oregon Department of Fish and Wildlife, and on visual presence/absence surveys conducted by BLM Fisheries Biologists. Whiskey Camp Creek has not been surveyed, however, because this area contains low gradient streams and an un-disturbed riparian area, it has the most potential for having rearing and spawning habitat present among the un-surveyed streams.

Fish species present within Upper Umpqua are shown in Table 7-4**.** This information is based on fish caught in rotary screw traps operated in tributaries near the upper (Big Tom Folley) and lower (Calapooya Creek) extents of the watershed and by incidental observations by BLM personnel during stream surveys within the watershed. The distribution of green sturgeon (*Acipenser medirostris*) within the Umpqua River is expected to be as far up-river as Elkton (Dave Harris, ODFW personal communication 2001). However, tributaries to the Umpqua River within Upper Umpqua do not support habitat for the green sturgeon.

Upper Umpqua Watershed has two unique fisheries habitat types that support different species and life stages of fish. The tributaries to the Main Umpqua (e.g., Wolf, Cougar, Hubbard, Yellow and Lost Creeks) contain spawning and rearing habitat for low to mid water velocity dependant fish species. These include coho salmon, chinook salmon (rearing), steelhead trout, cutthroat trout, pacific lamprey, and resident non-game fish species (dace and sculpin). These tributaries are important in the overall high production rates for these species.

The mainstem of the Umpqua River is important for chinook salmon spawning and rearing. Oregon Department of Fish and Wildlife's (ODFW) tag program at Sawyer's Rapids indicates that approximately 50% of the coho and chinook adult salmon tagged stay within the mainstem Umpqua River and its tributaries. Other species found here include the northern pike minnow, American shad, and sucker species. During the warmer summer months, this habitat also provides refugia for some of the previously mentioned tributary-spawned species. During years of low flows, fish move down from the tributaries into the mainstem. When the rains bring water levels back up, these fish return to the habitat found in these smaller tributaries.

2. Listed Fish Species

The National Marine Fisheries Service (NMFS) designated the Oregon Coast coho salmon (*Oncorhynchus kisutch*) Evolutionary Significant Unit as a threatened species (Federal Register, Vol. 63, No. 153/Monday, August 10, 1998/Rules and Regulations). This listing was set aside by order of Judge Michael Hogan of the United States District Court for the District of Oregon, in September of 2001. In review of Judge Hogan's ruling, the Ninth Circuit Court of Appeals issued a stay on December 14, 2001. The current listed status of the Oregon Coast coho remains as threatened until conclusion of the Ninth Circuit Court of Appeals review.

The Umpqua River cutthroat trout (*Oncorhynchus clarki clarki*) was previously listed as endangered (61 FR 41414, August 9, 1996). The National Marine Fisheries Service delisted the species on April 19, 2000, with concurrence from the U.S. Fish and Wildlife Service (Federal Register, Vol. 65, Number 81/Wednesday, April 26, 2000). The delisting was based on the determination that the species was not an Evolutionary Significant Unit (ESU), but a part of the larger Oregon Coast cutthroat trout ESU. The U.S. Fish and Wildlife Service (Federal Register, Vol. 65, Number 81/Wednesday, April 26, 2000) and NMFS have listed the Oregon Coastal cutthroat trout as a candidate species under the Endangered Species Act (Federal Register, Vol. 64, No. 64/Friday, April 5, 2000), and transferred jurisdiction on any final listing and responsibilities for consultation to the FWS (Federal Register, Vol. 65, No. 78/Friday, April 21, 2000). The FWS, as the regulatory agency for Oregon Coast cutthroat trout, does not require ESA review for this candidate species.

The National Marine Fisheries Service proposed the Oregon Coast steelhead (*Oncorhynchus mykiss)* for listing, as a candidate for threatened species designation under the Endangered Species Act (Federal Register, Vol. 63, No. 53/Thursday, March 19, 1998/Rules and Regulations). As of February 2002, there has been no change in the species status. NMFS does require ESA review of Oregon Coast steelhead as a candidate species.

3. Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) requires federal action agencies to consult with the Secretary of Commerce via the National Marine Fisheries Service regarding any action or proposed action authorized, funded, or undertaken by the agency that may adversely affect essential fish habitat (EFH) identified under the MSA. The Magnuson-Stevens Act defines adverse effects as any impact, which reduces the quality and/or quantity of essential fish habitat. Adverse effects include direct, indirect, site-specific or habitat-wide impacts, including individual, cumulative or synergistic consequences of actions. EFH habitat is habitat that is currently available or was historically available to Oregon Coast coho or Chinook salmon. For planning purposes, Figure 7-1 indicates current habitat associated with anadromous salmonids appropriate for initial EFH determinations.

B. Aquatic Habitat, Current and Historical Data and Perspectives

1. Survey Data Related to Stream Reaches

The river basin systems within the Upper Umpqua watershed originate in numerous steep, headwater streams that are fed by snowmelt, rain events or ground water springs. Although these streams may not be specifically addressed through ODFW Aquatic Habitat Surveys or inhabited by fish, they are important because they carry cool water, nutrients, and organic matter downstream. These first order streams come together to form larger streams (second order) with gradients low enough for some fishes (sculpin, dace, etc.), but not usually anadromous species. It is within the third order streams and larger streams that the habitat has developed for spawning and as nurseries for the larger fish species such as salmon and trout (salmonid) species.

Between 1991 and 1995, the Oregon Department of Fish and Wildlife (ODFW), through the Umpqua Basin Watershed Council, conducted aquatic habitat surveys for 37 fish bearing streams within the Upper Umpqua. The Aquatic Habitat Appendix provides a summary of those surveys. The surveys provide necessary data used to identify habitat protection and stream enhancement opportunities. By using individual reach data, the aquatic habitat may be assessed on the presence, absence, or quality of certain habitat components such as shade, large wood, and pools. Analysis of the survey data provides a starting point to guide managers toward the best stream reaches for enhancement activities.

Table 7-1 compares stream miles in categories important to fish within the Upper Umpqua by subwatershed with stream miles surveyed by ODFW. Figure 7-2 shows where ODFW-surveyed streams occur within Upper Umpqua. These surveys capture most of the important fish rearing and spawning habitat within the Upper Umpqua watershed tributaries.

Table 7-1 Upper Umpqua Stream Categories by Subwatershed

	MEHL CREEK	MCGEE CREEK	YELLOW CREEK	RADER WOLF	LOST CANYON	COUGAR	HUBBARD CREEK	UMPQUA FRONTAL	TOTAL
Total Stream Miles stream order 3	31	17	9	19	18	13	19	29	155
Total Stream Miles stream order 4-6	22	9	14	23	7	8	16	12	110
Total Stream Miles order 3 with <=6% stream gradient	14	7	2	10	4	2	5	23	67
Total Stream Miles order 4-6 with <=6% stream gradient	17	7	10	21	6	7	11	10	89
Stream Order 3, Miles ODFW Habitat Surveys	1.9	2.4	1.9	4.9	1.7	1.8	3.2	0	18
Stream Order 4-6, Miles ODFW Habitat Surveys	14.3	6.5	11.8	20.6	5.3	7.0	13.5	0	79

Six percent stream gradient was used as a maximum indicator for the presence of salmonid spawning and rearing habitat within the Upper Umpqua watershed. This was assessed through review of various literature, observations of BLM and ODFW fisheries biologist, and analysis of water velocity as a component of water volume, stream width, depth, sediment, and gradient. The above-referenced table illustrates that the higher proportion of potential fisheries habitat resides within the fourth to sixth order streams. The table also indicates that the majority of information available from the ODFW surveys is also within the larger order stream systems.

The most dominant species of fish within the watershed are the salmonids. Salmonids (Salmonidae) include all species of salmon, trout, whitefish, and graylings. In the Umpqua Basin, only salmon and trout are present. The various salmonid life cycles within the Upper Umpqua are noted in Aquatic Habitat Appendix Table 13-2. Due to the diverse habitat requirements of the salmonid life cycle, the presence, absence and diversity of these species within the watershed provides a dynamic indicator of the health of the aquatic habitat.

A typical life cycle of an anadromous salmonid consists of several stages, each with different habitat requirements. Habitat features that effect migrating salmonids are water depths and velocities; water quality; cover from predators; and full or partial barriers. Substrate composition, cover, water quality, and water quantity are important habitat elements for salmonids before and during spawning. Important elements for rearing habitat for newly emerged fry and juvenile salmonids are quantity and quality of suitable habitat (overhanging vegetation, undercut banks, submerged boulders and vegetation, etc.); abundance and composition of food (primarily macro-invertebrates); and water temperature.

2. Road Related and Natural Barriers to Aquatic Passage

Various culvert conditions that can block fish passage may consist of one or more of the following: water velocity too great; water depth in culvert too shallow; no resting pool below culvert; and/or jump too high. (Evans and Johnston 1980.) In a joint study by The Oregon Department of Forestry and Oregon Department of Fish and Wildlife, single vertical jumps of above 12 inches could be barriers to adult salmon and above 6 inches for juvenile salmonids.

Within the BLM road system of the Upper Umpqua watershed, there are approximately 32 culverts identified that are restricting access to anadromous fisheries habitat. Figure 7-3 shows where these culverts are and the low gradient (<=6%) stream reaches above those culverts. Seven are total barriers preventing access to approximately 4.2 miles of potential fish habitat. The remaining fish barrier culverts are partial barriers to adult passage and/or total fish passage barriers to juvenile salmonids. According to Table 7-2, the 32 fish barrier culverts within the watershed restrict access to approximately 31 miles of potential fish habitat most of which occurs in the Rader Wolf subwatershed.

Table 7-2 Potential Fish Habitat Above Culvert Barriers

Subwatersheds	Miles
Cougar	0.1
Hubbard Creek	5.1
Lost Canyon	2.7
McGee Creek	2.4
Mehl Creek	0.4
Rader Wolf	19.9
Umpqua Frontal	0.6
Yellow Creek	0.0
TOTAL	31

In addition to the fish barrier culverts, there are numerous natural barriers that limit anadromous fisheries habitat access within the watershed. Waterfalls, debris jams, and excessive water velocities may impede migrating fish. Falls, that are insurmountable at one time of the year may be passed by migrating fish at other times when flows have changed. Information for the Natural Barriers Figure referenced above is derived from Oregon Department of Fish and Wildlife 1997 publication for anadromous fish obstacles >1.5 meters. This information is summarized to specifically address tributaries within Upper Umpqua in the Aquatic Habitat Appendix (Figure 13-1 and Table 13-1).

3. Historical Stream/Riparian Enhancement Projects

Stream and riparian enhancement projects have been conducted within Upper Umpqua since as early as the 1960s. Many of these projects were for road improvement, culvert replacement and road decommission activities. Although these activities provide functional enhancements to the riparian system through reduction in sediment (fines) inputs and improving fish passage and habitat, many of these projects were not previously identified as stream enhancement projects. The following information is a compilation of the known enhancement projects.

Case Knife and Miner Creek junction culvert placement 1974 -1975

Cougar Creek stream clearance project 1971
Cougar Creek culvert replacement 1994 - 1995

East Fork Radersp? Creek stream clearance project (date unknown)
East Fork Rader Creek natural bottom arch culvert placement 1964 – 1966
East Fork Rader Creek culvert replacement 1994 – 1995

Little Wolf Creek fish ladder:
- blasted an approx. 150’ reach of falls that had an approx. 14’ rise 1972
- constructed a concrete fish ladder 1976

Little Wolf Creek concrete weir by culvert 1974

Wolf Creek - several in-stream projects inclusive of up-stream V weirs, cabled logs and rocks & root wads. Projects completed by BLM and Umpqua Fishermen's Association 1990 - 1994

The above projects were accomplished prior to the completion of ODFW Aquatic Habitat Surveys so that the analysis of the survey data will include whatever habitat may have been created by the above projects. Anecdotal observations of the Wolf Creek enhancement projects would support the hypothesis that the structures originally placed on bedrock have accumulated gravel and sediment pockets.

C. Aquatic Habitat Assessment

1. Habitat Analysis Key Components Description

Reference sites increase our understanding of the complex interactions between streamside vegetation, channel characteristics, and aquatic habitats. They provide fundamental information on types of processes, functions, and desired future conditions of intact riparian systems (National Academy of Science, Upstream 1996). Because many of the riparian plant communities within the Upper Umpqua have been affected by past land-use practices, reference sites consisting of ecologically intact and functional aquatic-riparian systems were identified. Approximately 20 stream reaches were found within the watershed and adjacent watersheds that met reference conditions. A map of where these stream reaches occur is provided in the Aquatic Habitat Appendix (Defining Instream and Off-Channel Habitat Enhancement Opportunities: A Stochastic Multi-Attribute Prioritization Model). These stream reaches were selected based on the absence of roads within old-growth riparian areas, as well as lack of any other evidence of human disturbance.

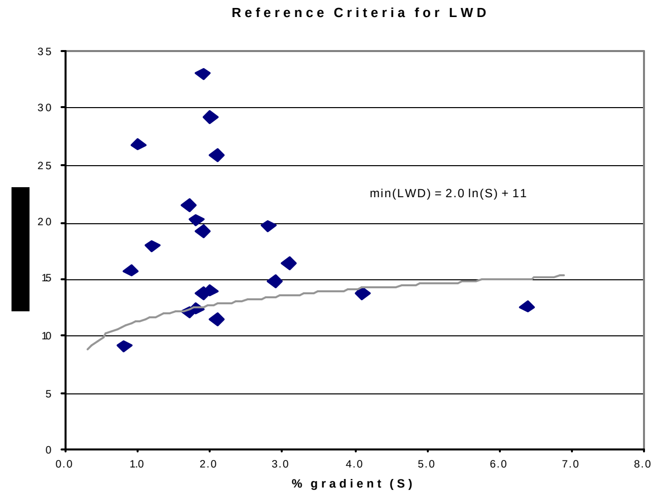
There are many factors within the aquatic eco-system that have direct and indirect impacts on salmonid habitat functions. In order to determine the extent of disturbance and/or degradation, the ODFW Aquatic Habitat Surveys were summarized using five different metrics: Large Woody Debris (LWD) Deficit, Riffle Suitability Habitat, Pool Area, Recruitment Index, and a Channel Incision Index.

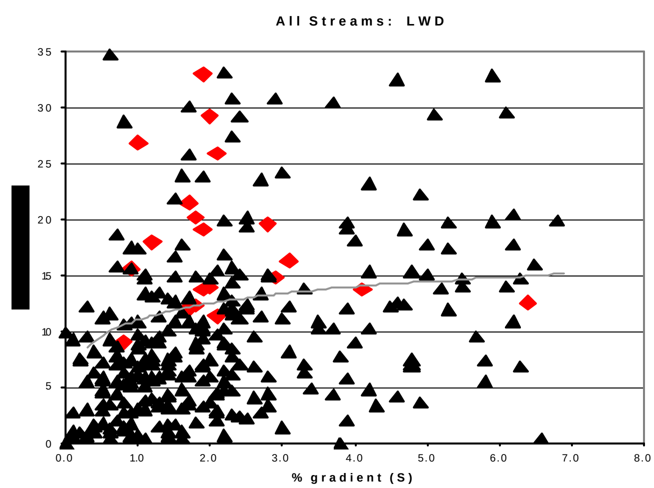
a) Riparian and Instream Woody Debris and Recruitment Potential

Large woody debris is a key component of aquatic habitat. Large woody debris, especially trees that have fallen into the stream with root wads still anchored to the stream bank, provides physical structure that creates pools and undercut banks, deflects and breaks up stream flow, and stabilizes the stream channel. Although logjams sometimes block spawning migrations of adult salmon, debris usually aids migration by creating pools and cover where salmon can rest and conserve energy for spawning. By forming small dams, debris helps to prevent spawning gravels from washing downstream. For juveniles, the slack water around debris offers good opportunities for drift feeding, and debris provides essential cover from predators and from freshets of autumn and winter (Murphy and Meehan, 1991). Large conifers are generally more resistant to rot and are preferable to hardwoods. This allows for a longer time frame for the tree to be effective in interacting with the stream channel.

The following Chart 7-1 compares the average amount of large wood within reference stream reaches to all the surveyed tributaries within Umpqua River Basin Coast Range. The aquatic habitat survey data indicates that most of the tributaries within Upper Umpqua are lacking large woody debris. A similar process is used for each of the metrics examined.

Chart 7-1 Comparison of LWD in Reference and Umpqua Basin Coast Streams



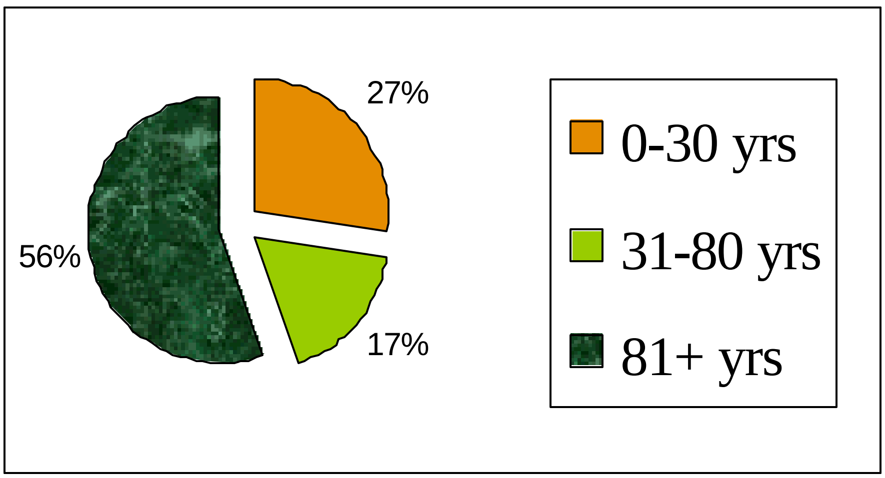


The lack of large wood can be attributed to past logging practices and the fisheries "stream cleaning" ideology of the 1960s, 1970s, and 1980s. In addition, between 1970 and 1980, most timber sales included provisions to clear the streams of all logs in order to benefit fish passage. Many of the Riparian Reserves were harvested before receiving the Reserve designation instituted by the Aquatic Conservation Strategy (1994). Table 7-3 and Chart 7-2 gives a picture of the amount of riparian vegetation by seral age class within 200 feet of streams on BLM lands. Approximately 44% of streamside forest vegetation is younger than 80 years. Because of the importance of the large wood component in providing habitat structure for fisheries, the lack of large wood within the Upper Umpqua stream corridors is an indicator of lost aquatic habitat structure. Therefore, components of the analysis used to evaluate the Upper Umpqua stream reaches included Large Woody Debris (LWD) and a Recruitment Index proportional to the number of large (>24" DBH) conifers per stream mile.

Table 7-3 BLM Forest Classes within 200 Feet of Streams by Subwatershed

	Acres & % of Watershed by Age Class						TOTAL
Subwatersheds	0-30 yrs	%	31-80 yrs	%	81+ yrs	%	**ACRES**
Cougar	499	21%	409	17%	1459	62%	2367
Hubbard Creek	761	22%	1274	37%	1395	41%	3430
Lost Canyon	835	29%	732	25%	1318	46%	2885
McGee Creek	912	39%	268	11%	1160	50%	2339
Mehl Creek	1417	44%	347	11%	1481	46%	3244
Rader Wolf	1261	24%	572	11%	3485	66%	5318
Umpqua Frontal	173	21%	81	10%	554	69%	807
Yellow Creek	622	19%	445	13%	2267	68%	3334
TOTAL	6479	27%	4127	17%	13118	55%	23724

Chart 7-2 Upper Umpqua BLM Forest Classes within 200 Feet of Streams



b) Pool and Riffle Condition Indices

A riffle habitat index was derived from ODFW data specific to percent gravel and fines within each stream reach. The percent gravel is not only important to the spawning potential of the reach, but riffles are an important part of the macroinvertebrate habitat essential for juvenile development. Pool habitat within the stream reaches is important to adult migration and juvenile rearing. The Pool Index was calculated by ODFW data on percentage of pool within the reach and by stream gradient for the reach.

c) Channel Incision Index

Channel Incision Index is used to calculate other important characteristics to salmonid habitat and stream functions that are related to the connectivity of the stream reach to the floodplain. These characteristics consist of the percent bank erosion (stream function and turbidity input), and the average vertical distance to top of stream bank (indicator of erosion and lack of connectivity to the floodplain and side channels).

2. Upper Umpqua Aquatic Habitat Assessment Model Overview

ODFW Aquatic Habitat Survey data for each reference stream reach was summarized into the five components referenced above and analyzed by a computer model to calculate a variable baseline for each component (see Aquatic Habitat Appendix). All the stream reaches within the Upper Umpqua were then compared to the referenced baseline. The greater the deviation from the reference baseline, the higher the score rating based from 1 to 10 because of the greater "Need for Action." For example, the less LWD in the stream reach compared to the reference streams, the higher the need for action and resultant high score.

A particular concern in evaluating an enhancement project is to identify those areas that need to be enhanced and then determine what the potential is for enhancement. A detailed analysis was performed to evaluate which stream reaches were in need of action (see Aquatic Habitat Appendix). However, in many situations, reaches have been degraded beyond a practicable point of enhancement. To evaluate which stream reaches would be maximized through enhancement projects, the potential of each reach was assessed by the stream reach's existing characteristics and potential for improvement. Six components were established to evaluate the reach potential: Riparian Habitat Density, Riparian Road Density, Percent Secondary Channels, Floodplain Connectivity Index, Hardwood Mix Index, and Percent Harvest.

The following data sources were used to describe Habitat Potential: ODFW Aquatic Habitat Survey data were used to determine the presence of secondary channels and to calculate floodplain connectivity metrics; FOI was used to calculate the percent riparian harvest; a soil saturation model was used to estimate the Riparian Habitat Density; and the BLM General

Transportation (GTRN) spatial coverage was used to calculate the Riparian Road Density. Habitat Potential is assumed to improve as the combined score increases. For example, the lower the road density within a given stream reach, the higher the potential for enhancement and resultant score.

a) Riparian Habitat Density and Floodplain Connectivity Index

The Riparian Habitat Density and Floodplain Connectivity Index is directly linked to the previously noted Channel Incision Index for the Need For Action evaluation. The Riparian Habitat Density assesses the reach's current and historic connection to hydric soils and hydrophic vegetation. Along with the Floodplain Connectivity Index, these components evaluate the potential of the incised channel to be reconnected with floodplain and wetland areas, which are critical for nutrient input for the aquatic habitat and salmonid rearing potential.

b) Percent Secondary Channels

Salmonids, especially the juveniles, use the space available in side channels for rearing. Mundie and Traber (1983) found higher densities of steelhead and coho salmon in side channel pools than are commonly found in the main channels of Pacific coastal streams. Peterson (1982a, 1982b) reported coho salmon moving into side-channel pools for winter (Bjornn and Reiser, 1991). The Upper Umpqua analysis specifically evaluates the percent of secondary channels per stream mile. This component combined with the Riparian Habitat Density and Floodplain Connectivity Index mentioned above provide the primary stream function elements necessary for rearing habitat.

c) Riparian Road Density

Roads crossing streams can also be barriers that stop landslide material from being distributed downstream. This prevents the low crossing stream from recruiting gravels, cobbles, and coarse woody debris from high gradient streams and headwall areas (Jones, et. al., 2000). Roads constructed within the floodplain displace riparian habitat, and can restrict the natural sinuosity of the stream. In addition, the compaction of the roadbed typically restricts riparian vegetation recruitment. Due to the above effects, roads within the riparian area of a stream have a negative impact on the proper functioning condition of a stream channel. The Riparian Road Density component evaluates the miles of roads within 150 feet of the stream based on GTRN coverage.

d) Percent Harvest within 200 Feet of Streams

The Percent Harvest component is based on BLM vegetation data (FOI) within 200 feet of streams. The amount of vegetation on BLM lands by subwatershed is characterized above in Table 7-3. The model assumes that 90% of riparian vegetation on private is harvested (20' riparian no-cut buffer).

3. Aquatic Habitat Assessment Results

Separate scores reflecting the restoration potential and the need for action were calculated for each stream reach within the analysis area using the component indices and methods described above. Final candidate physical habitat enhancement sites are those with the highest combined habitat potential and need for action. Preferred candidate reaches (totaling 30 stream miles) are displayed in Table 8-3 and Figure 8-3. The stream reaches indicated as high priority sites for physical habitat rehabilitation are those reaches that have the highest need and highest potential for enhancement. Reference reaches within Upper Umpqua are indicated in green on Figure 8-3.

Upper Umpqua Fish Distribution

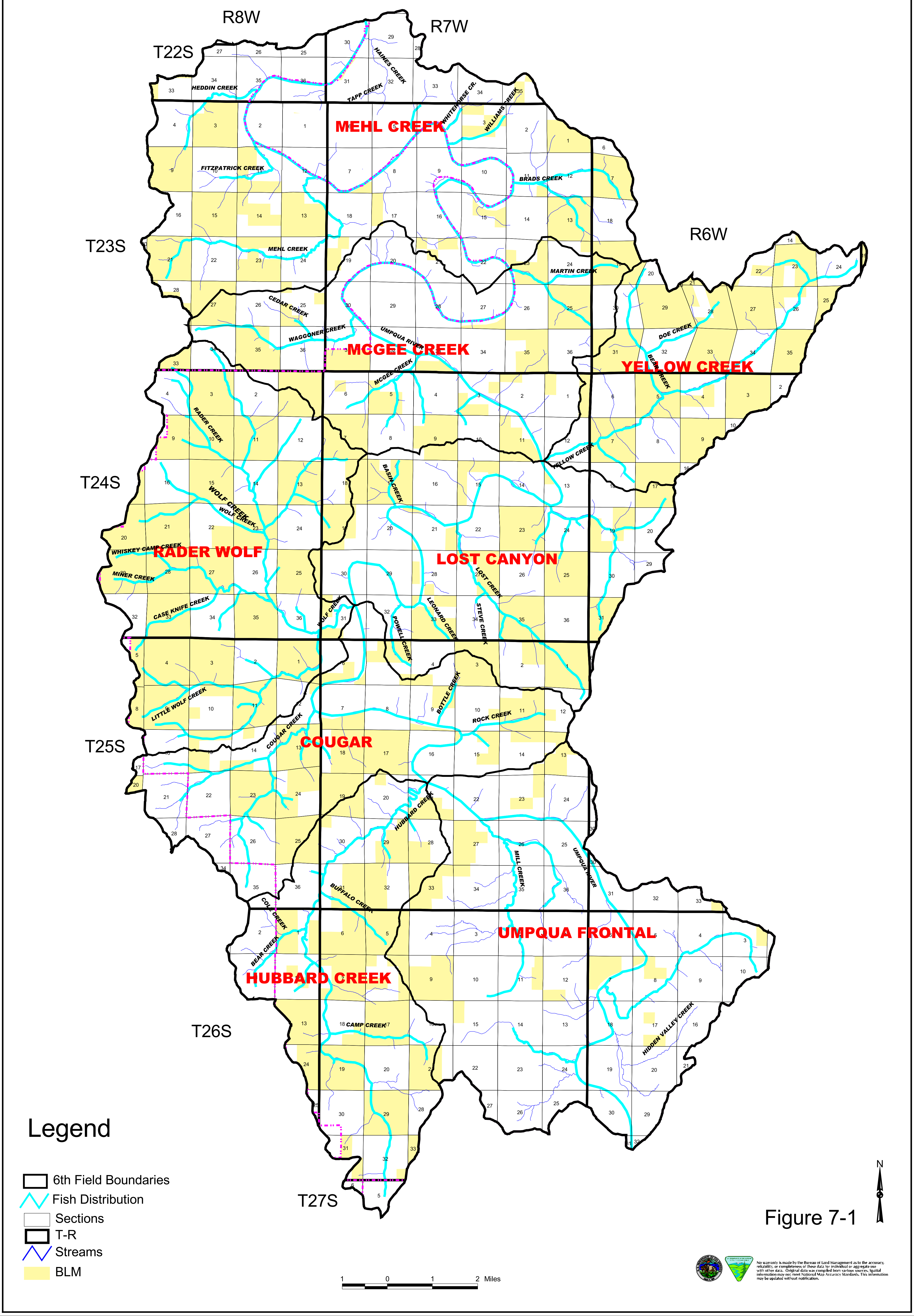


Figure 7-1

Table 7-4 Fish Species Present in Upper Umpqua

Native species	
Common name	*Scientific name*
Steelhead/rainbow trout	*Oncorhynchus mykiss*
Coho salmon	*O. kisutch*
Chinook salmon	*O. tshawytscha*
Coastal cutthroat trout	*O. clarki clarki*
Pacific lamprey	*Lampetra tridentata*
River lamprey	*Lampetra ayresi*
Western brook lamprey+	*Lampetra richardsoni*
American shad	*Alusa sapidissima*
Umpqua chub	*Oregonichthuys kalawatseti*
Sculpin*	*Cottus sp.*
Redside shiner	*Richardsonius balteatus*
Umpqua dace	*Rhinicthys cataractae*
Speckled dace	*Rhinicthys osculus*
Long nose dace	*Rhinicthys cataracatae*
Umpqua pikeminnow	*Ptychocheilus umpquae*
Largescale sucker	*Catostomus macrocheilus*
Brown bullhead	*Ameiurus nebulosus*
Small mouth bass	*Micropterus dolomieu*
Mosquitofish	*Gambusia affinis*
Fathead minnow	*Pimephales promelas*
Bluegill	*Lepomis macrochirus*

* There are numerous members of the sculpin family suspected to be found within this watershed.

\+ The habitat in this watershed is capable of supporting this lamprey species. There have not been any confirmed sightings, but it is very probable that they occur within the Upper Umpqua watershed.

Upper Umpqua
ODFW Surveyed Streams

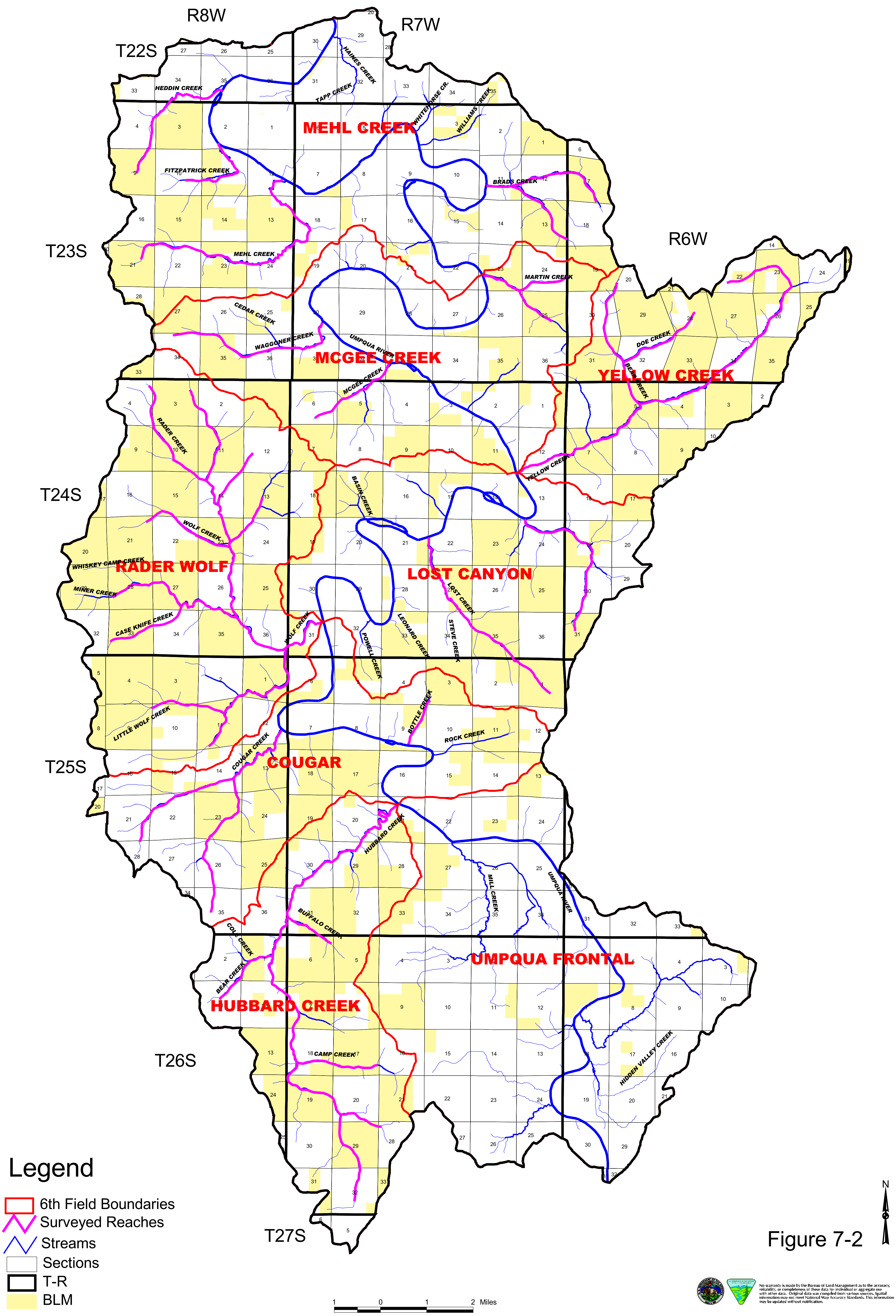


Figure 7-2

Upper Umpqua
Low Gradient Fish Habitat Above Culvert Barriers

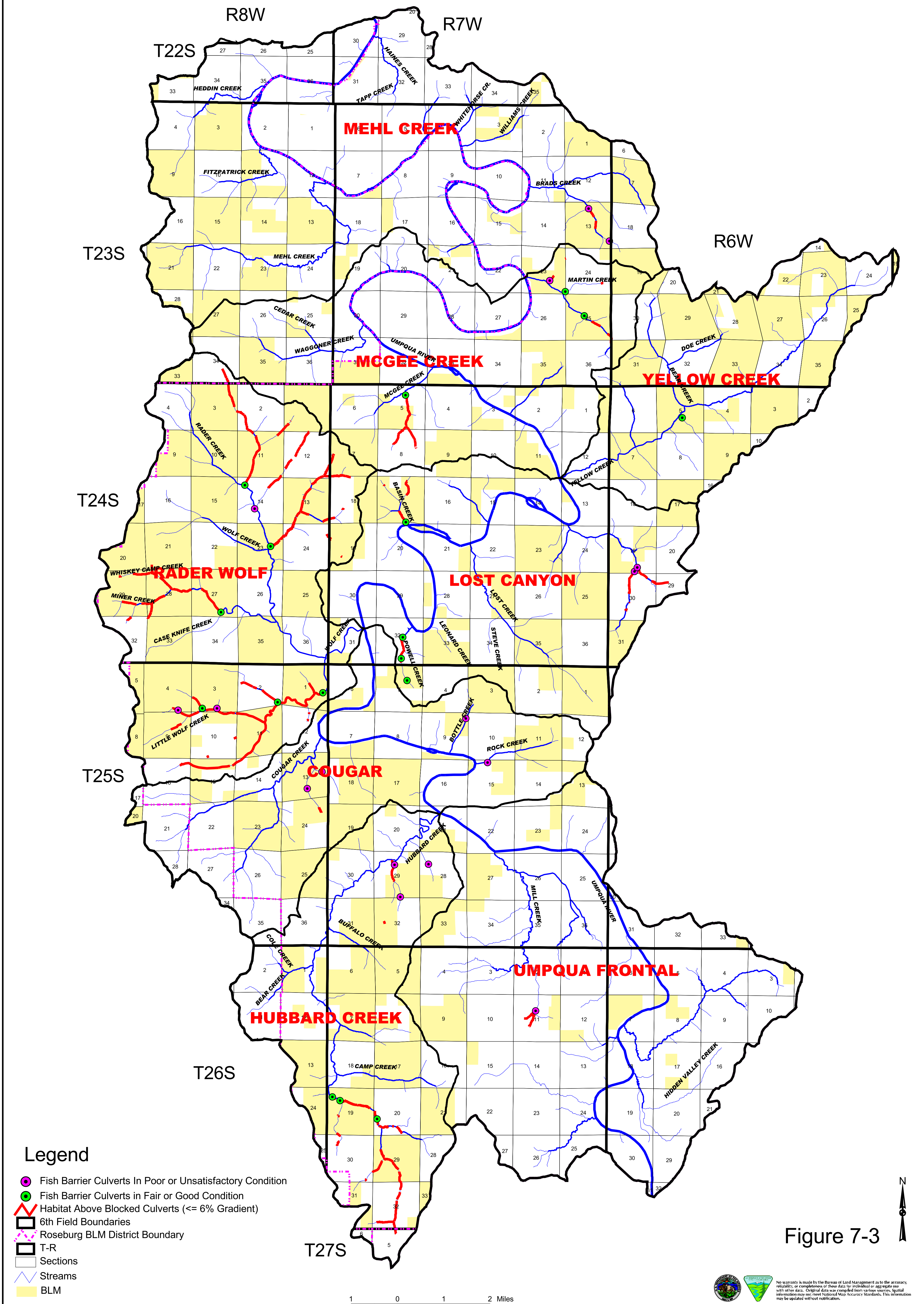


Figure 7-3

8 Management Opportunities

The Roseburg and Coos Bay Districts' RMPs provide land use allocations with fairly prescriptive management direction. The following management opportunities are meant to stay true to the intent of those land use allocations while also providing further direction that would enhance the allocation's objectives and maintain and restore the overall ecosystem within the Upper Umpqua watershed. Environmental Assessments (EA) will address follow-up actions that may be implemented in response to the management opportunities described below. The EA would disclose the potential impacts of these projects and be made available for public comment and review.

A. Hubbard Creek OHV Area

The unsupervised use that occurs in the Hubbard Creek OHV area has contributed to severe erosion and sediment problems on unsurfaced roads and trails. The total extent and type of impacts is only partially known. A complete inventory of the area would provide the necessary data for the development of a management plan. A feasibility study would establish a database on the Geographical Information System (GIS) and provide knowledge of the area that could be used to help design an OHV trail system for the entire 11,681-acre area. The data elements of this assessment would consist of the following:

- Determine the essential parcels of private land needed to create an OHV trail system. Prioritize key parcels of private land for landowner cooperation, exchange, acquisition, or easement.

- Map all current travel routes, natural roads and trails used by OHV recreationists on private and BLM lands.

- Use the Global Position System (GPS) to develop an inventory that shows the location of travel routes, erosion problem areas, special interest areas, and other environmental concerns. Overlay GPS information on aerial photos.

- Create a baseline photo inventory of environmental problem areas in the Hubbard Creek OHV Area. Photos can be used to show change over time on roads, trails, impacts to BLM lands, and other environmental concerns.

- Use the recommendations above to answer the following questions to determine if a managed OHV area at Hubbard Creek is feasible.

What role will private land play in the development of an OHV trail system? Are easements, exchange or acquisition an option? Can BLM offer an OHV trail system without crossing private lands?

Can a trail system be developed for this OHV area? Can this trail system be designed for all OHV users and meet the needs of all three classes, 4x4s, quad runners, and motorcycles?

What are the current impacts on special status species?

Currently, OHV users have developed all existing trails. Which trails should be decommissioned? Which decommissioned trails should be re-opened to create loop routes for ATV, motorcycle, and mountain bike use?

Should existing play areas be allowed? Is there a need to develop new play areas? Is there a need for high impact areas?

What mitigation measures will be necessary to alleviate environmental concerns and damage? Can a heavily used OHV trail system be maintained to meet environmental objectives?

Who would maintain an elaborate trail/road system? Would funding be available for future maintenance?

The Oregon State Parks has funding available for OHV and ATV (Quad runner) trail planning, design, development, maintenance. Is there a need for an ATV (Quad runner) trail system?

How and to what extent should we monitor OHV use? Is funding available for monitoring? What level of monitoring is necessary if an OHV trail system is developed?

Is it better to separate uses and provide a trail system for each OHV class? Can partnerships with all three classes be developed?

What role will the timber companies play in the process? Remember the timber companies bottom-line as stated during the scoping process in 1994, "we are not in the recreation business"!!!

Where is the starting point for attaining OHV user cooperation to prevent vandalism? What needs to be done to prevent the **attitude**, where riders show a reckless disregard for the environment? Is it necessary to provide challenges for all levels of experience- beginner, intermediate, expert?

Can trails be developed in Late-Successional Reserves?

B. Vegetative Treatments for Commercial and Wildlife Objectives

The young 30 to 60 year age managed stands in all Land Use Allocations including the Riparian Reserves are a high priority for density management treatments. Managing young mid-seral stands would meet silvicultural objectives by maintaining conditions for growth, allowing for the development of large diameter trees in the shortest period of time possible. Expanding and improving interior habitat conditions; and improving connectivity habitat between LSR units and late-successional habitat within the watershed would also meet wildlife and botany objectives.

From a silvicultural perspective, a general prescription for thinning early and mid-seral forest stands would include the following: Maintain the dominant tree species at free-to-grow densities while also protecting the residual old-growth trees, large snags, and coarse woody debris. Pre-commercial thinning would retain between 150 and 300 of the largest, best-formed trees per acre. Ideally, trees would be retained based on species and size with little or no emphasis given to spacing. In practice, a spacing guide is used because it is the most efficient way to administer a contract and keep track of the number of trees per acre. Commercial thinning would always retain the desired trees regardless of spacing. Uniform spacing as a guide in commercial thinning has the potential for reducing growth and yield, and is usually less beneficial to wildlife. Leaving clumps of dominant trees and creating small openings has the potential for maximizing timber yields, at the same time, stand attributes such as hardwoods and shrubs are maintained. Clumps of retained dominant trees may be more wind firm, and can be used to surround and protect snags, coarse woody debris, survey and manage species, and advance regeneration. There would be between 50 and 100 dominant trees per acre retained.

Figure 8-1 is a map of stands where density management is necessary to meet the forest plan objectives for commercial as well as wildlife objectives. The highest priority would be given to stands in the 40 to 59 year age classes. These are managed stands of Douglas-fir that are currently overly dense and growth rates are declining. The stands that are 60 years and older are, for the most part, natural stands that currently contain many of the features found in old-growth forest. For this reason these stands are at a lower priority for treatment.

There are currently almost 6,000 acres that need density management treatments now, and another 5,000 acres that will need treatment within the next ten years. Because of the high number of acres within the watershed that would benefit from density management treatments at this time, it is recommended that at least 1,000 acres per year be treated for the next 10 years. The following are high priority stands for treatment within the next ten years: Upper Hubbard Creek, T.26S. R.7W., Secs. 5,6,7,8,13,19, 21 and 29; McGee Creek, T.24S. R.7W., Secs 7 and 9; and Basin Creek, T.24S. R.7W., Secs. 17 and 18. Second priority stands are found in Wolf Creek/Rader Creek and between Bottle Creek and Yellow Creek. Third priority stands are those that are shown in the 30-year age class currently 30 to 35 years of age. Treatments in the areas prioritized above would also help meet wildlife and botany objectives by creating late-successional characteristics in these stands.

Currently, established survey protocols and management of the red tree vole has restricted or prevented density management within mid-seral stands. Regular occurrence of active red tree vole sites within young stands, in addition to no harvest buffers, has eliminated these areas from stand management. Thus, opportunities for density management treatments to meet commercial and wildlife objectives have been limited. As an example, the forest stands on Gallagher Ridge are also a high priority for commercial thinning. However, the proposed thinning failed due to the numbers of red tree voles and other Survey and Manage species found. If the status of red tree vole or other Survey and Manage species is changed, then this area should be revisited.

1. Late-Successional Reserves

To improve or maintain the functionality of late-successional habitat, management strategies to meet LSR, wildlife, and botany objectives within this watershed would include: maintaining interior late-successional habitat conditions, maintaining connectivity between habitats and LSR units, and creating additional large blocks of late-successional habitat where they are absent. To meet specific wildlife objectives, management treatments need to focus on (1) shaping the overstory by maintaining or speeding up diameter growth rates, (2) controlling crown depth and crown closure, (3) creating gaps and providing opportunity for understory regeneration, and (4) recruitment of snags and CWD. Treatments would be site specific, based on the components that are lacking on the site in consideration and what wildlife and botany objectives need to be met. Consider timing and placement of treatments in order to minimize the disturbances to special status species and critical habitat.

The LSRA outlines the treatment guidelines for northern spotted owl home ranges (pp. 70-71). The management objective within the home range radius of any northern spotted owl site in a LSR is to maintain or enhance the ability of spotted owls to use their home range and to provide their life requirements to survive and reproduce.

a) Interior Habitat

Maintaining interior habitat protects a variety of microclimate conditions and special habitats important to many late-successional species. Management strategies to retain interior habitat conditions are discussed in the LSRA (p. 69). In summary, the LSRA states that care needs to be used when treating stands adjacent to late-successional forests in order to maintain interior habitat conditions. During the planning process, stands need to be evaluated to determine their relationship to its adjacent late-successional habitat (i.e. the younger stand canopy is tall enough to connect with the canopy of the adjacent late-successional stand). Management prescriptions designed to avoid creating abrupt edges between treatment stands and adjacent late-seral habitat, are expected to minimize impacts to interior habitat. Treatments could include: feathering the edge by varying cutting intensity near stand edges, avoiding or reducing the number of patch openings near edges, placement of unthinned patches to interior habitat, or combinations of these treatments (Chen et al. 1992, Chen 1995).

The LSRA has identified LSR #263 as one of the more important LSRs within the LSR network, due to the percentage of suitable habitat for the marbled murrelet within the LSR, largest continuous habitat blocks, and its close proximity to the ocean (Zone 1). Density management of mid-seral forest stands needs to occur within this LSR in order to promote stand characteristics preferred by murrelets, particularly within Zone 1 and along the Umpqua River Corridor. Reduction in stand density would increase the development of large trees creating suitable habitat more quickly.

Treatments within small patches of younger stands, surrounded by late seral stands, would meet wildlife and LSR objectives by creating late-successional characteristics more rapidly within these younger stands and by maintaining and enlarging existing interior late-successional habitat. High priority stands that could be treated to strengthen interior habitat are mid-seral stands located within the Rader Wolf, McGee Creek, Hubbard Creek and Mehl Creek subwatersheds. Second priority stands are located in the Cougar, Lost Canyon and Yellow Creek subwatersheds. The west portion of the Mehl Creek subwatershed contains primarily early seral and late seral stands. When the early seral stands reach the mid-seral age class, these stands would be high priority for density management in order to expand interior habitat and improve connectivity in the north portion of LSR #263.

b) Connectivity

Maintaining connectivity within and between LSRs is critical to their functionality. Movement of animals both within the LSR and between LSRs is important to maintain genetic and demographic integrity. The LSRA defines connectivity habitat as stands greater than 40 years of age (LSRA p.67). The LSRA has identified that the two LSRs within this watershed have a moderate to high likelihood of becoming isolated if connectivity between habitats is not maintained.

One objective of the Matrix land-use allocations described in the RMP is to provide connectivity habitat between LSRs. Within Matrix lands on BLM, forested lands make up approximately 6,277 acres on GFMA and 748 acres on Connectivity within the watershed (Tables 3-7 and 3-8). Table 3-7 shows that approximately 300 acres of Connectivity/Diversity Blocks and 2,050 acres of GFMA are within the 30 to 80 year age class and are candidates for density management.

Density management treatments within mid-seral stands in LSR and Matrix could improve habitat connections between LSR units and late-successional habitat by providing more dispersal opportunities for late-successional species. Management prescriptions within connectivity habitat need to be designed to insure that the connectivity function of an area is maintained. When connectivity is not maintained at the stand level, a site-specific analysis needs to indicate that connectivity habitat is not limiting in the surrounding area, and will not be limiting following treatment. Consider the quality, quantity, and spatial arrangement of connectivity habitat when evaluating treatment sites. To improve connectivity within the watershed, high priority stands for treatment are located in the following subwatersheds: Hubbard Creek, Yellow Creek (particularly in T.24S. R.6W., Secs. 3, 9, 17, and 19), Lost Canyon (T.24S. R.6W., Secs. 17 and 19), and Mehl Creek (T.23S. R.8W., Secs. 9, 13, 21, and 35), Rader Wolf (T.24S. R.8W., Secs. 1, 25, and 35 and T.24S. R.7W., Secs. 7, 18, and 19), and McGee Creek. Management treatments within these areas could also improve and expand interior habitat conditions.

2. Riparian Reserves

Riparian Reserves not only function to provide habitat for riparian-dependent species, but are also expected to function as connectivity and dispersal habitat for late-successional species. Riparian reserves lacking late-successional components would benefit from density management treatments. The Riparian Reserves would be thinned to allow greater amounts of light and growing space for large conifers and hardwoods, provide for snags and CWD now and in the future, and enhance understory development. Spacing would be variable to select trees of a particular species or growth form, and would be diameter based. Not all of the smaller diameter merchantable trees would be removed. Very few of the larger diameter trees would be removed. Retention trees would be clumped, and canopy gaps would be enlarged. On average about 100 square feet of basal area per acre would be retained.

A riparian management zone would vary in width along all streams. Density management would occur within this zone, but no trees would be removed. When a stand is deficient in CWD, trees could be girdled or felled to release selected trees and create CWD. These are also areas that could include over-dense patches by design to allow slower natural mortality through self-thinning to occur. The width of the riparian management zone is variable and dependant on site conditions and resource objectives.

The presence of a variety of overstory and understory vegetative layers and downed wood and snags provide habitat for a large number of terrestrial wildlife species. In Riparian Reserves where levels of these components are below those of unmanaged stands, projects to increase the levels may be appropriate. Assess current and potential future condition of coarse wood and snags in order to determine the appropriate amount of management needed within the treatment site. The LSRA identifies average values for snags and CWD abundance in naturally regenerated stands (pp. 28-31, Tables 8 through 11). Table 4-4 above summarized that information. Within the Riparian Reserve area outside of the riparian management zone, the plan to create and enhance accumulations of CWD would follow the LSRA recommendation and example (pp. 87 - 91).

C. Noxious Weed Management Opportunities

With much of the potential recreation and forest treatment potential listed above, integrating noxious weed management will be helpful for controlling current infestations. The following guidelines are meant to help for specific areas within Upper Umpqua:

- Continue eradication of Scotch broom at Eagleview campground site. Evaluate treatments of meadow knapweed prior to construction.
- Conduct inventory and risk assessment on recreation sites within the Umpqua River Special Recreation Management Area. Evaluate control of noxious weeds that limit access or recreational opportunities.
- Monitor parrotfeather at Osprey Boat Ramp and Myrtle Island. Continue dialog with Oregon Department of Agriculture on recommended treatment.
- Include weed inventory and risk assessment in base inventories for Hubbard Creek Off Highway Vehicle Area.
- Continue treatments on Myrtle Island RNA to protect the values for which the RNA was established.
- Continue treatments on Bullock Road to prevent infestation of adjacent agricultural land. Consider selling or exchanging this parcel of pastureland.
- Conduct pre-project inventories and risk assessments for noxious weeds prior to ground-disturbing or site-altering activities (BLM manual 9015). Implement appropriate prevention and control measures as outlined in the Roseburg District Integrated Weed Control Plan EA and Partners Against Weeds.
- When practical, initiate dialog with adjacent landowners about cooperative weed control efforts.

D. Geology and Soils

1. Toward Decreasing Landslide Frequency and Sedimentation

The Geology and Soils analysis shows that Upper Umpqua has some unique geology that are naturally prone to landsliding through debris flow and dam-break flood processes. It shows that landslide frequencies from the 1950s to the 1980s were at a higher level than naturally occurred because of land management activities. The analysis also suggests that landslide frequencies have been declining because of the changes in management practices. However, the analysis shows that some roads from past decades were built with sidecast on steeper slopes, with inadequate drainage, and in higher landslide risk locations. As a result, these roads still have a high risk of creating landslides in the future. To further decrease the rate of landslides as well as sedimentation within Upper Umpqua, BLM roads were inventoried for their relative landslide risk as well as their current contribution as a chronic source of sediment. Figure 8-2 and Tables 8-2 and 8-3 represent those BLM roads where the highest priority risks or problems exist and need to be corrected. This road list only represents an initial assessment for candidate roads and will be further refined. These roads represent approximately 23% of the BLM controlled road system and approximately 7% of the entire road system within Upper Umpqua (Chart 5-5).

Engineers and an interdisciplinary (ID) team will be able to use the list of roads from Tables 8-2 and 8-3 to develop more site-specific road fixes. These fixes will also need to be coordinated with the Hubbard Creek OHV Area inventory and resulting plans. A further step in this process is for the engineers and the ID team to refine which roads would be proposed to Douglas Fire Protection Association (DFPA) and Right-of-Way (R/W) permittees for decommissioning. This process allows DFPA and R/W permittees to give their feedback for roads that they need for current and future access. Because some decommission candidate roads have high value for their use, it is expected that they may be treated to reduce the risks but maintained as open. An environmental assessment will also allow the public an opportunity to comment on a final list of roads proposed for decommissioning.

Definitions for Tables 8-1 and 8-2

Surface Type

- ABC = Aggregate Base Course
- ASC = Aggregate Surface Course
- PRR = Pit Run Rock
- GRR = Grid Rolled Rock
- NAT = Natural Surface Material or Dirt

Control = Ownership of the road

- BL = BLM Ownership
- PB = Private Ownership of Base Road, BLM Ownership of Improvements
- BP = BLM Ownership of Base Road, Private Ownership of Improvements
- PV = Private Ownership

Reason = Reason for the road treatment/decommission recommendation

- FSH = Fisheries/Aquatic Potential Impacts
  (This reason is related to how stream crossings, road drainage, and erosion concerns are or could potentially impact fish and aquatics.)
- WLD = Wildlife concerns
  (This reason is related to minimizing disturbance in an elk calving area.)

2. Toward Reducing Chronic Sediment in the Hubbard Creek Subwatershed

The Geology and Soils analysis showed that the combination of natural surfaced roads and uncontrolled off-highway vehicle (OHV) use in the Hubbard Creek area has contributed to an elevated amount of sediment to the stream system. Current estimates show that approximately 13 miles of road are naturally surfaced within Hubbard Creek and 7.1 miles of these roads produce chronic sediment and are identified as needing correction (Tables 5-3 and 5-4). The roads and trails used by OHVs are thought to be more extensive than what the current GIS inventory shows. As suggested in the Human Uses section, the roads and trails need to be inventoried, placed in GIS, and evaluated as part of a larger management plan for OHV use with part of the goal of that plan to reduce chronic sedimentation from the BLM roads.

In the interim, drainage relief structures could be installed and drainage areas hardened where feasible on the naturally surfaced portions of the 26-7-19.1 road in Section 19. Any sites yielding high levels of sediment to streams that are identified in a survey of the OHV trail and road network could also be ameliorated. Segments of the 26-7-7.0 road may fit this description.

3. Landslide Inventory and Management Interactions

Use the landslide inventory in conjunction with stream habitat surveys to build on understanding how historical debris flows and dam-break floods effect the short and long-term water quality and stream structure/fish habitat. The knowledge gained would help assess risks to water quality and fish habitat in future projects where there is higher potential for debris flows and dam-break floods. Landslide debris flow processes play a prominent role in this watershed. Large woody debris, rock, and gravels from landslides and debris flows can serve as important sources of sediment and large woody debris to stream habitat-forming processes. Roads in this watershed can actually prevent these materials from reaching the lower gradient streams that are important for fish spawning and rearing. The debris from future landslides caught on roads is an opportunity for placement back in the stream channels rather than stockpiled at waste sites where they do not benefit fisheries.

E. Instream and Aquatic Habitat Enhancement

Based on the modeled habitat data described above and in the Aquatic Habitat Appendix, Figure 8-3 gives prioritized guidance of the stream reaches that have the greatest potential to benefit from physical habitat enhancement activities. Table 8-3 below shows the preferred candidate stream reaches. The prioritized stream reaches represent approximately 30 miles of streams out of the 97 surveyed miles and out of the total 265 miles of third through sixth order stream reaches within Upper Umpqua (Tables 6-1 and 7-1). Field investigations are necessary before modeled recommendations are included in any final action plan. Important logistical considerations, including access, ownership or right-of-way issues, or the availability of logs or nearby trees for placement in the stream, are not taken into account. Issues related to habitat connectivity or the restoration and preservation of interconnected priority subwatersheds are also not considered here.

Upper Umpqua Candidate Forest Treatments

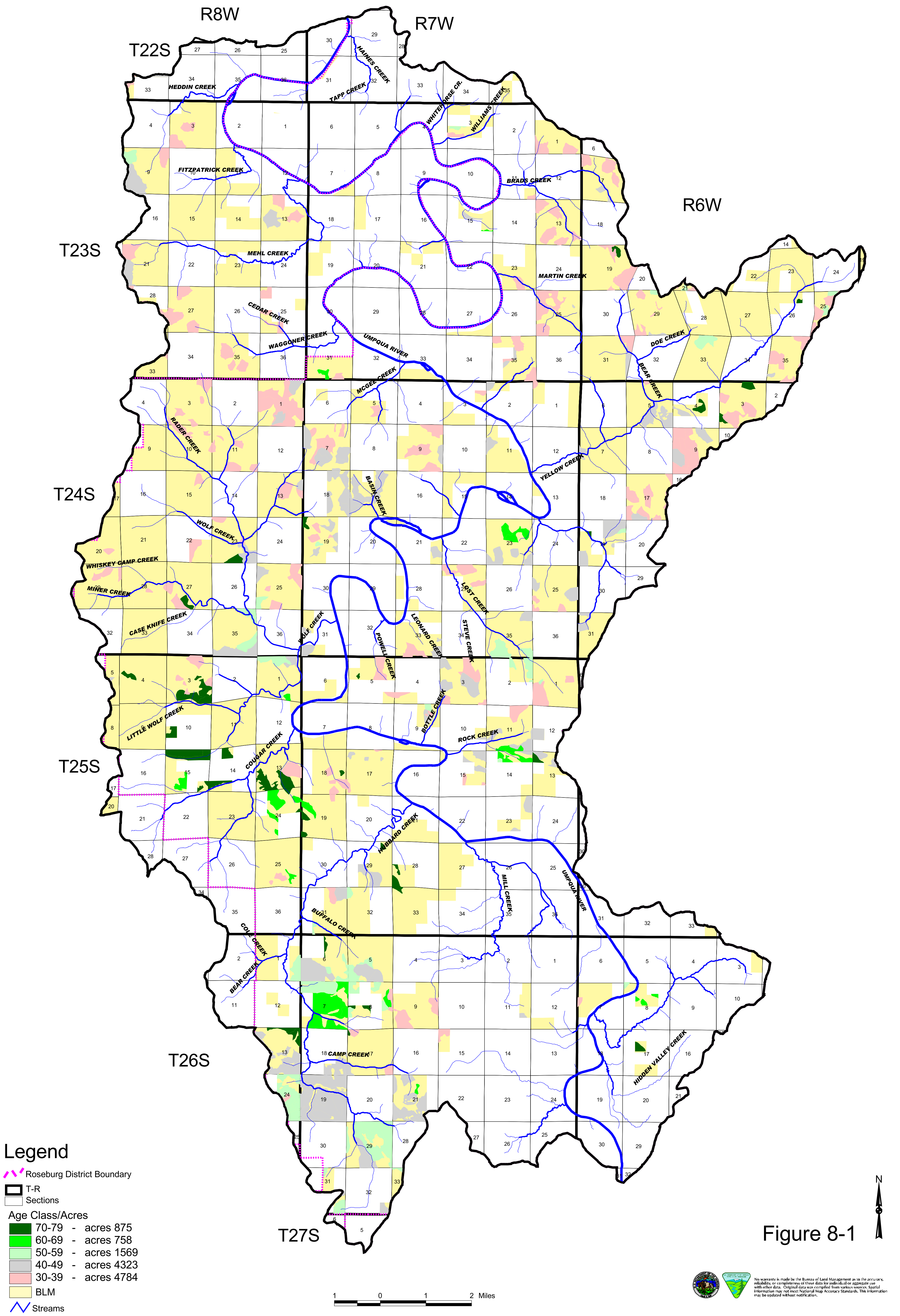


Figure 8-1

Upper Umpqua
Roads Treatment Candidates and Culvert Priorities

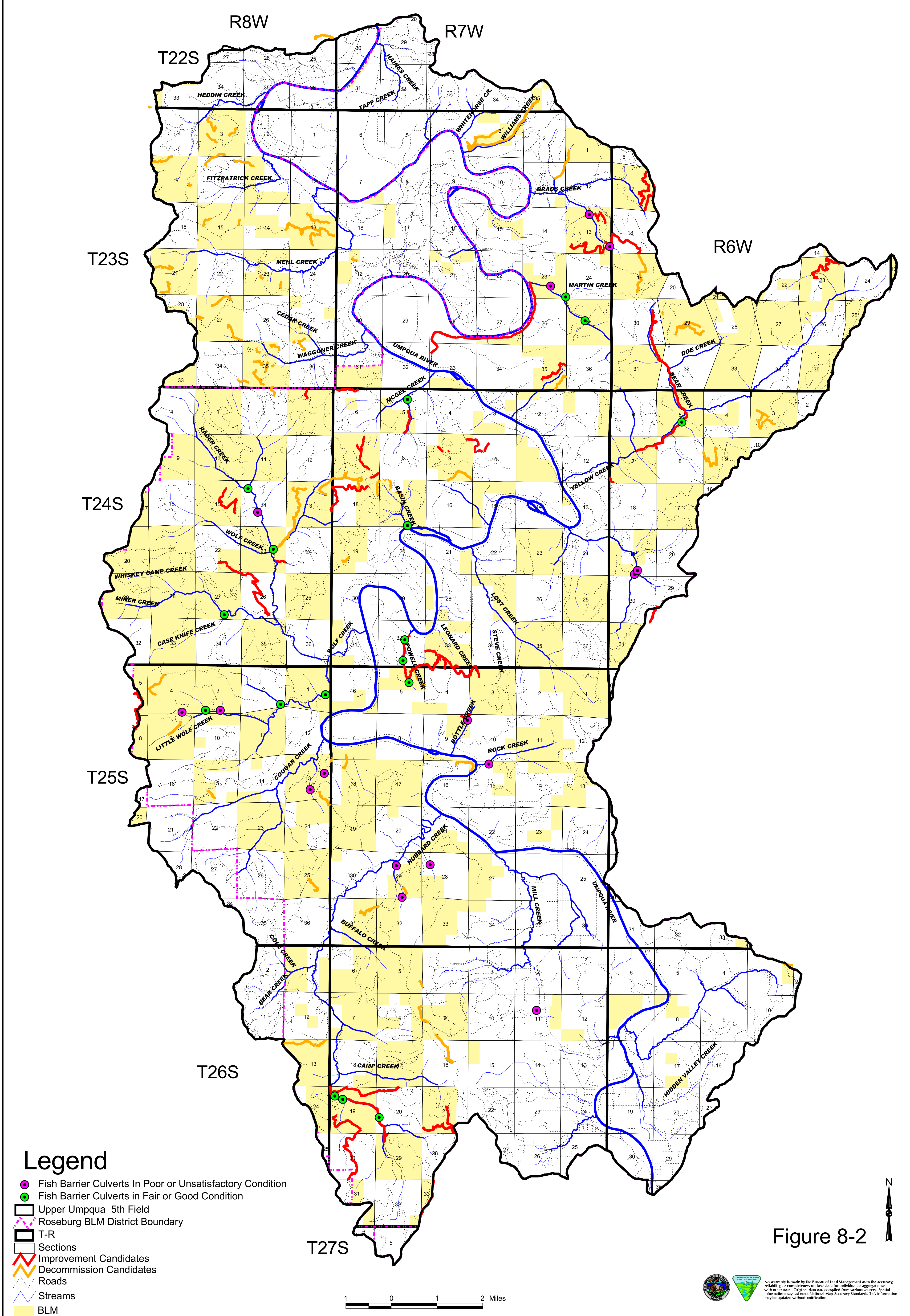


Figure 8-2

Table 8-1 Upper Umpqua Road Treatment Candidates

Road ID/ Subwatershed	Control	Surface Type	Reason	Miles
25 S 07 W 10.00	BLM	ACS	ADM	0.3
Cougar	Subwatershed Total			0.3
25 S 07 W 29.00	BLM	NAT	FSH	0.2
25 S 07 W 32.00	BLM	NAT	FSH	0.7
26 S 07 W 07.00	BLM	ASC	ADM	2.0
26 S 07 W 19.00	BLM	NAT	ADM	2.6
26 S 07 W 19.01	BLM	NAT	ADM	2.1
26 S 07 W 20.01	PB	ASC	ADM	0.6
Hubbard Creek	Subwatershed Total			8.2
24 S 06 W 29.01	BLM	ASC	ADM	0.1
24 S 07 W 32.01	BLM	NAT	ADM	0.4
24 S 07 W 32.02	BLM	ABC	ADM	3.9
24 S 07 W 33.01	BLM	NAT	ADM	0.3
24 S 07 W 33.03	BLM	NAT	ADM	0.2
Lost Canyon	Subwatershed Total			4.8
23 S 07 W 32.01	PVT	ASC	ADM	0.9
23 S 07 W 33.01	BLM	ASC	ADM	3.7
23 S 07 W 36.01	BLM	ASC	ADM	0.8
24 S 07 W 05.00	PVT	ASC	ADM	0.5
24 S 07 W 07.00	BLM	NAT	ADM	0.6
24 S 07 W 07.02	BLM	NAT	ADM	0.4
24 S 07 W 09.02	BLM	ASC	ADM	0.2
24 S 07 W 33.00	BLM	ASC	ADM	0.6
24 S 08 W 01.06	BLM	NAT	ADM	0.3
McGee Creek	Subwatershed Total			8.0
23 S 06 W 07.00	BLM	ABC	ADM	1.2
23 S 06 W 07.02	BLM	ASC	ADM	0.6
23 S 07 W 13.02	BLM	ASC	ADM	1.7
23 S 07 W 13.04	BLM	NAT	ADM	0.2
23 S 07 W 13.05	BLM	NAT	ADM	0.4
Mehl Creek	Subwatershed Total			4.2
24 S 07 W 07.00	BLM	ASC	ADM	0.0
24 S 07 W 17.02	PB	NAT	ADM	1.8
24 S 08 W 23.00	BLM	NAT	ADM	0.3
24 S 08 W 23.06	BLM	NAT	ADM	1.3
24 S 08 W 35.01	BLM	ASC	ADM	2.5
24 S 10 W 29.00	BLM	ASC	ADM	0.3
No Road #	BLM	NAT	MNT	1.1
Rader Wolf	Subwatershed Total			7.2
26 S 07 W 33.00	BLM	NAT	ADM	0.3
Umpqua Frontal	Subwatershed Total			0.3
23 S 06 W 23.00	BLM	ASC	ADM	1.4
24 S 06 W 08.00	BLM	ASC	ADM	0.1
24 S 07 W 12.00	BLM	NAT	ADM	0.2
24 S 07 W 13.00	PB	ASC	ADM	4.2
Yellow Creek	Subwatershed Total			5.9
TOTAL				38.8

Table 8-2 Upper Umpqua Road Decommission Candidates

Road ID/ Subwatershed	Control	Surface Type	Reason	Miles
25 S 07 W 16.04	BLM	NAT	FSH	0.6
25 S 07 W 18.02	BLM	NAT	FSH	0.4
25 S 07 W 18.03	BLM	NAT	FSH	0.1
25 S 07 W 19.00	BLM	NAT	FSH	0.5
25 S 08 W 15.02	BLM	NAT	FSH	0.3
25 S 08 W 25.00	BLM	NAT	FSH	0.0
Cougar	Subwatershed Total			1.8
25 S 08 W 25.00	BLM	NAT	FSH	0.4
26 S 07 W 29.00	BLM	NAT	ADM	0.2
26 S 07 W 33.00	BLM	NAT	ADM	0.7
26 S 08 W 12.00	BP	CSS	FSH	1.1
Hubbard Creek	Subwatershed Total			2.4
24 S 07 W 16.00	BLM	NAT	FSH	0.7
24 S 07 W 17.02	BLM	NAT	FSH	0.5
24 S 07 W 18.04	BLM	NAT	FSH	0.4
25 S 07 W 05.03	BLM	NAT	FSH	0.5
Lost Canyon	Subwatershed Total			2.1
23 S 06 W 18.03	BLM	NAT	FSH	0.4
23 S 08 W 25.03	BLM	NAT	FSH	0.1
23 S 08 W 27.00	BLM	NAT	FSH	0.6
23 S 08 W 34.04	BLM	ASC	FSH	0.3
23 S 08 W 35.00	BLM	ASC	FSH	0.3
23 S 08 W 35.01	BLM	ASC	FSH	0.2
23 S 08 W 35.02	BLM	NAT	FSH	0.3
23 S 08 W 35.03	BLM	ASC	FSH	0.4
23 S 08 W 35.04	BLM	ASC	FSH	0.3
23 S 08 W 35.09	BLM	ASC	FSH	0.2
23 S 08 W 35.10	BLM	ASC	FSH	0.1
23 S 08 W 36.03	BLM	ASC	FSH	0.5
23 S 08 W 36.06	BLM	NAT	FSH	0.1
24 S 07 W 02.01	BLM	NAT	FSH	0.5
24 S 08 W 02.06	BLM	ASC	FSH	0.3
McGee Creek	Subwatershed Total			4.2

Road ID/ Subwatershed	Control	Surface Type	Reason	Miles
22 S 07 W 20.00	BLM	NAT	FSH	1.1
23 S 06 W 18.03	PB	ASC	ADM	1.8
23 S 07 W 04.02	BLM	NAT	FSH	2.1
23 S 07 W 11.02	BLM	NAT	FSH	0.8
23 S 07 W 13.01	BLM	NAT	FSH	0.3
23 S 07 W 19.00	BLM	NAT	FSH	0.2
23 S 08 W 03.02	BLM	ASC	FSH	0.3
23 S 08 W 03.03	BLM	ASC	FSH	0.5
23 S 08 W 03.04	BLM	ASC	FSH	0.3
23 S 08 W 09.00	BLM	NAT	FSH	0.5
23 S 08 W 09.04	BLM	ASC	FSH	0.1
23 S 08 W 10.05	BLM	ASC	FSH	0.6
23 S 08 W 10.06	BLM	ASC	FSH	0.5
23 S 08 W 12.00	BLM	NAT	FSH	1.2
23 S 08 W 13.00	BLM	ASC	FSH	0.4
23 S 08 W 13.01	BLM	ASC	FSH	0.7
23 S 08 W 13.02	BLM	ASC	FSH	0.2
23 S 08 W 13.03	BLM	NAT	FSH	0.5
23 S 08 W 15.00	BLM	BST	FSH	0.3
23 S 08 W 15.01	BLM	ASC	FSH	0.1
23 S 08 W 16.01	BLM	NAT	FSH	0.0
23 S 08 W 21.01	BLM	ASC	FSH	0.6
23 S 08 W 21.02	BLM	ASC	FSH	0.4
23 S 08 W 21.05	BLM	ASC	FSH	0.1
23 S 08 W 23.03	BLM	ASC	FSH	0.2
23 S 08 W 23.07	BLM	ASC	FSH	0.1
23 S 08 W 27.01	BLM	ASC	FSH	0.6
23 S 08 W 27.02	BLM	ASC	FSH	0.3
Mehl Creek	Subwatershed Total			14.8

Road ID/ Subwatershed	Control	Surface Type	Reason	Miles
23 S 08 W 34.04	BLM	ASC	FSH	0.0
24 S 07 W 18.02	PB	NAT	FSH	1.9
24 S 08 W 13.00	BLM	NAT	FSH	0.3
24 S 08 W 19.00	BLM	NAT	FSH	0.2
24 S 08 W 23.02	BLM	NAT	FSH	1.8
25 S 08 W 01.01	BLM	ASC	FSH	0.6
25 S 08 W 04.00	BLM	ASC	FSH	0.7
25 S 08 W 09.00	BLM	CSS	FSH	0.6
25 S 08 W 09.01	BLM	CSS	FSH	0.5
25 S 08 W 09.03	BLM	NAT	FSH	0.2
Rader Wolf	Subwatershed Total			6.8
26 S 06 W 03.00	BLM	NAT	FSH	0.1
26 S 07 W 09.00	PB	NAT	FSH	1.0
26 S 07 W 09.01	BLM	NAT	FSH	0.2
26 S 07 W 09.04	BLM	NAT	FSH	0.5
Umpqua Frontal	Subwatershed Total			1.8
23 S 06 W 29.00	BLM	ASC	FSH	0.8
23 S 06 W 29.03	BLM	NAT	FSH	0.8
23 S 06 W 29.05	BLM	NAT	FSH	0.1
24 S 06 W 03.00	BLM	NAT	FSH	1.0
24 S 06 W 03.01	BLM	NAT	FSH	0.2
24 S 06 W 09.00	BLM	NAT	FSH	1.2
Yellow Creek	Subwatershed Total			3.9
TOTAL				37.8

Upper Umpqua
Instream and Off-Channel Physical Habitat Enhancement Candidates

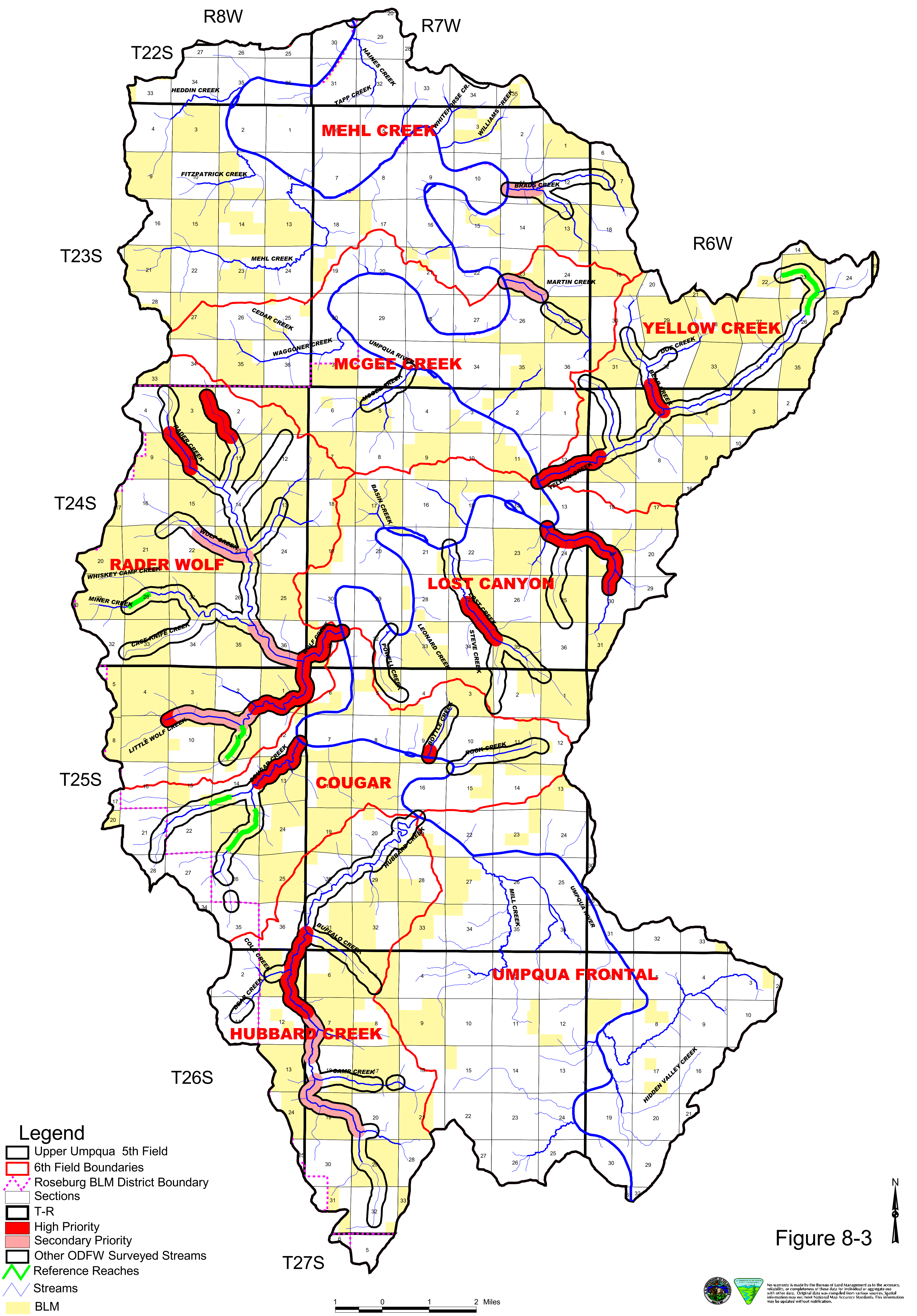


Figure 8-3

Table 8-3 Prioritized Enhancement Stream Reaches

Stream Name	ODFW Reach ID
Highest Priority	
Bear Creek	1
Cougar Creek	1
Little Wolf Creek	1
Little Wolf Creek	2
Little Wolf Creek	4
Lost Creek	3
Rader Creek	3
Rader Creek Trib #3	3
Wolf Creek	1
Yellow Creek	1
Secondary Priority	
Bottle Creek	1
Brads Creek	1
Hubbard Creek	3
Hubbard Creek	4
Hubbard Creek	6
Little Canyon Creek	1
Little Canyon Creek	2
Little Wolf Creek	3
Martin Creek	1
Wolf Creek	2
Wolf Creek	4

9 OVERVIEW AND BOTANY APPENDIX

A. Previously Completed Watershed Assessments for Portions of Upper Umpqua

-Hubbard Creek Watershed Analysis, May 8, 1995, Roseburg District.
This included the Hubbard Creek subwatershed on the southwest side of the Upper Umpqua fifth field watershed.

-Middle Umpqua Frontal Watershed Analysis, June 22, 1995, Roseburg District.
This included portions of the McGee Creek and Mehl Creek subwatersheds on the northwest side of the Upper Umpqua fifth field watershed.

-Rader-Wolf-Cougar Watershed Analysis, September 20, 1996, Roseburg District.
This included Rader-Wolf and Cougar subwatersheds on the western side of the Upper Umpqua fifth field watershed.

-Upper Middle Umpqua Subwatershed Watershed Analysis, September 30, 1997, Coos Bay District.
This included portions of the McGee Creek and Mehl Creek subwatersheds within the Coos Bay District on the northwest side of the Upper Umpqua fifth field watershed.

-Elkton-Umpqua WAU, June 1998, Roseburg District.
This included four subwatersheds (McGee Creek, Mehl Creek, Yellow Creek, and Lost Canyon) on the north side of the Upper Umpqua fifth field watershed.

-Upper Umpqua 5th Field Watershed (From the city of Elkton to the Convergency of the North and South Umpqua HUC #1710030302), 2nd Iteration, August 1998.
This second iteration summarized some specific passive and active restoration information and attempted to tie the above analyses together into one document.

Table 9-1 Upper Umpqua, Special Status Species

Common Name	Status	Habitat	Sites on District	Sites in UUWA	Habitat in UUWA
Kincaid's lupine	Federal Threatened	Woods, Meadows	6	0	Yes
Wayside Aster	State Threatened Bureau Sensitive	Woods	11	1	Yes
California Maiden-hair	Tracking Species	Rock Outcrops Riparian	1	1	Yes
Saw-toothed Sedge	Tracking Species	Wet Meadows Riparian	2	2	Yes
Firecracker plant	Tracking Species	Woods Meadows	67	36 (5 more within 1 mile)	Yes
Umpqua Phacelia	Tracking Species	Rock outcrops	86	11 (3 more within 1 mile)	Yes
Imperial Lewisia	Tracking Species	Rock outcrops	4	0 (1 within 1 mile)	Yes
Rabbit Ears	Tracking Species	Coniferous forest	11	4	Yes

Table 9-2 Upper Umpqua S&M Bryophyte, Lichen, Fungi and Plant Species

Group	Scientific Name	Category	Sites in UUWA	Sites in Roseburg District
Bryophyte	*Buxbaumia viridis*	D	18	128
Fungi	*Cantharellus subalbidus*	D	8	25
Fungi	*Cantharellus tubaeformis*	D	3	43
Fungi	*Chalciporus piperatus*	D	2	2
Fungi	*Clavaridelphus ligula*	B	1	2
Fungi	*Clavaridelphus truncatus*	B	4	12
Fungi	*Gomphus clavatus*	B	1	4
Fungi	*Gyromitra infula*	B	1	8
Fungi	*Hydnum umbilicatum*	B	3	52
Fungi	*Otidea leporina*	B	4	11
Fungi	*Otidea onotica*	F	14	108
Fungi	*Phaeocollybia spadicea*	B	1	2
Fungi	*Pithya vulgaris*	D	2	10
Fungi	*Sarcosphaera exima*	B	1	14
Fungi	*Tremiscus helvelloides*	B	1	16
Lichen	*Collema nigrescens*	F	4	19
Lichen	*Dermatocarpon luridum*	B	1	1
Lichen	*Pannaria saubinetii*	F	2	36
Lichen	*Peltigera pacifica*	E	1	8
Lichen	*Ramalina thrausta*	A	3	15
Lichen	*Usnea longissima*	F	1	5

Table 9-3 Upper Umpqua, Summary of S&M Species by Category

Category	A	B	C	D	E	F
# of Species	1	10	0	5	10	4

Table 9-4 Weeds Known to Occur in Upper Umpqua

Common Name	Scientific Name	Control Rating	New Invader in UUWA
Bull thistle	***Cirsium vulgare***	**B***	
Burnweed	***Erectities minima***	**B**	
Canada thistle	***Cirsium arvense***	**B***	
English ivy	***Hedera Helix***	**B**	
Field bindweed	***Convolvulvus arvensis***	**B***	
French broom	***Genista monspessulana***	**B**	**Yes**
Giant horsetail	***Equisetum telmateia***	**B**	
Gorse	***Ulex europaeus***	**A, T**	**Yes**
Himalayan blackberry	***Rubus discolor***	**B**	
Italian thistle	***Carduus pycnocephalus***	**B***	
Japanese knotweed	***Polygonum cuspidatum***	**B**	**Yes**
Johnsongrass	***Sorghum halapense***	**B**	
Meadow knapweed	***Centaurea debeauxii***	**B***	
Medusahead rye	***Taeniatherum caput-medusae***	**B**	
Milk thistle	***Silybum marianum***	**B***	
One-seeded hawthorne	***Crataegus monogyna***	**B**	
Pennyroyal	***Mentha pulegium***	**B**	
Poison hemlock	***Conium maculatum***	**B**	
Purple loosestrife	***Lythrum salicaria***	**B***	
Quackgrass	***Agropyron repens***	**B**	
Rush skeletonweed	***Chondrilla junceum***	**B**	**Yes**
St. Johnswort	***Hypericum perforatum***	**B***	
Scotch broom	***Cytisus scoparius***	**B***	

Slender-flowered thistle	***Carduus tenuiflorus***	**B***	
Spanish broom	***Spartium junceum***	**B**	**Yes**
Tansy ragwort	***Senecio jacobaea***	**B***	
Wooly distaff thistle	***Carthamus lanatus***	**A, T**	**Yes**
Yellow nutsedge	***Cyperus esculentus***	**B**	
Yellow starthistle	***Centaurea solstitialis***	**B, T**	**Yes**

***Biological Control Agents are present and the primary control on these species**

Table 9-5 Most Likely New Invaders in Upper Umpqua Watershed

Common Name	**Scientific Name**	**Control Rating**
Buffaloburr	***Solanum rostratum***	**A,T**
Diffuse knapweed	***Centaurea diffusa***	**A,T**
French broom	***Genista monspessulana***	**B**
Parrots feather	***Myriophyllum aquaticum***	**Proposed**
Portuguese broom	***Cytisus striatus***	**A,T**
Spiny cocklebur	***Xanthium spinosum***	**B**
Spotted knapweed	***Centaurea debeauxii***	**A, T**

B. Douglas County Noxious Weed Policy and Weed List

"Noxious Weed" is a legal definition for non-native plants that are particularly aggressive, invasive and difficult to control. One or more of the following can describe them:

- They cause economic losses to agricultural and horticultural industries.
- They endanger native flora and fauna by encroaching in wild lands.
- They hamper the enjoyment and full use of recreation sites.
- They are poisonous, injurious or otherwise harmful to humans and animals.

Because these plants cause economic, ecological and other damage, an integrated control program that includes biological, chemical, cultural, manual and mechanical control techniques are recommended for all noxious weeds.

Weed Control Ratings

The following list and its subsets (A, B & T lists) are based on the classification system developed by the Oregon Department of Agriculture.

"A" List

These noxious weeds occur in small enough infestations that eradication or containment is possible in the county. Some of these weeds are not yet known in Douglas County but their presence in adjacent counties make future occurrence likely.

Intensive control of these infestations is highly recommended.

"B" List

These noxious weeds are common and well established in Douglas County. Eradication at the county level is not likely. Containment is possible in some cases and is encouraged. Where these are not feasible, biological control agents may be introduced to slow the spread of the invaders.

Intensive control is recommended on small isolated infestations. Eradication is not likely or feasible on widespread infestations, but control, especially along travel routes is encouraged. In other areas, biological control agents may be introduced to reduce the spread of the infestation.

"T" List

These noxious species are priority weeds "targeted" for control at the county level. All "T" list weeds are found on the "A" or "B" lists.

Douglas County Noxious Weeds

"T" List

These are priority weeds "targeted" for control at the county level. Report known sites.

Common Name	Scientific Name
Blueweed	*Echium vulgare*
Buffaloburr	*Solanum rostratum*
Diffuse knapweed	*Centaurea diffusa*
Gorse	*Ulex europaeus*
Leafy spurge	*Euphorbia esula*
Portugese or striated broom	*Cytisus striatus*
Spotted knapweed	*Centaurea maculosa*
Whitetop or Hoary cress	*Cardaria draba*
Woolly distaff thistle	*Carthamus lanatus*
Yellow starthistle	*Centaurea solstitialis*

"A" List

These occur in small enough infestations that eradication or containment is possible in the county. Some of these are not yet known in Douglas County but are in adjacent counties.

Common Name	Scientific Name	Not Yet Known
Biddy-biddy	*Acaena novae-zelandiae*	*
Blueweed	*Echium vulgare*	
Buffaloburr	*Solanum rostratum*	
Diffuse knapweed	*Centaurea diffusa*	
Dyers woad	*Isatis tinctoria*	*
Gorse	*Ulex europaeus*	
Iberian starthistle	*Centaurea iberica*	*
Leafy spurge	*Euphorbia esula*	
Musk thistle	*Carduus nutans*	*
Perennial pepperweed	*Lepidium latifolium*	*
Portugese or striated broom	*Cytisus striatus*	
Purple starthistle	*Centaurea calcitrapa*	*
Russian knapweed	*Centaurea repens*	*
Scotch thistle	*Onopordum acanthium*	
Spotted knapweed	*Centaurea maculosa*	
Squarrose knapweed	*Centaurea virgata*	*
Velvetleaf	*Abutilon theophrasti*	
Whitetop or Hoary cress	*Cardaria draba*	
Woolly distaff thistle	*Carthamus lanatus*	
Yellow or common toadflax	*Linaria vulgaris*	

* = Currently unknown in County

"B" List

These are common and well established in Douglas County. Eradication is not likely. Containment is possible in some cases and is encouraged. Where it is not feasible, biological control agents may be introduced to slow the spread of the invaders.

Common Name	Scientific Name	Biocontrols
Bull thistle	*Cirsium vulgare*	⊛
Burnweed or Coast fireweed	*Erechtites minima*	
Canada thistle	*Cirsium arvense*	⊛
Dodder	*Cuscuta ssp.*	
English or One seeded hawthorn	*Crataegus monogyna*	
English Ivy	*Hedera helix*	
Eurasian watermilfoil	*Myriophyllum spicatum*	
European beach grass	*Ammophila arenaria*	
Field bindweed	*Convolvulus arvensis*	⊛
French broom	*Genista monspessulana*	
Giant horsetail	*Equisetum telmateia*	
Himalayan blackberry	*Rubus discolor*	
Italian thistle	*Carduus pycnocephalus*	⊛
Japanese knotweed	*Polygonum cuspidatum*	
Johnsongrass	*Sorghum halepense*	
Malta starthistle, tocalote	*Centaurea melitensis*	
Marestail, Horseweed	*Conyza canadensis*	
Meadow knapweed	*Centaurea pratensis*	⊛
Medusahead rye	*Taeniatherum caput-medusae*	
Milk thistle	*Silybum marianum*	⊛
Pennyroyal	*Mentha pulegium*	
Poison hemlock	*Conium maculatum*	⊛
Puncturevine	*Tribulus terrestris*	⊛
Purple loosestrife	*Lythrum salicaria*	⊛
Rush skeletonweed	*Chondrilla juncea*	⊛
Scotch broom	*Cytisus scoparius*	⊛
Slender-flowered thistle	*Carduus tenuiflorus*	⊛
Spanish broom	*Spartium junceum*	
Spiny cocklebur	*Xanthium spinosum*	
St. Johnswort	*Hypericum perforatum*	⊛
Sulfur cinquefoil	*Potentilla recta*	
Tansy Ragwort	*Senecio jacobaea*	⊛
Yellow nutsedge	*Cyperus esculentus*	
Yellow starthistle	*Centaurea solstitialis*	⊛

⊛ = Biocontrols available in Oregon

10 WILDLIFE APPENDIX

Additional Special Status Species and Special Attention Species

A. *Federally Threatened and Endangered Species*

1. Columbian White-tailed Deer

The Upper Umpqua watershed is within the historic and current Columbian white-tailed deer (*Odocoilus virginianus leucurus*) distribution range (USDI 1983, and USDA and USDI 1994a). Currently, the Columbian white-tailed deer is known to occur within the Hubbard Creek and Umpqua Frontal subwatersheds (ODFW pers. comm.). The historic optimum Columbian white-tailed deer habitat in the watershed has been impacted to some extent by human development. Bureau of Land Management administered land in the watershed is not considered to be important for the recovery of the Columbian white-tailed deer.

2. Canada Lynx

The Canada lynx (*Lynx canadensis*) was listed as a Federal Threatened species on March 24, 2000 (FR 65:16051-16086). In the Pacific Northwest, Canada lynx are associated with high elevational localities primarily east of the Cascade crest (Survey Protocol for Lynx, USDI and USDA, 1998). A self-sustaining resident lynx population does not exist in Oregon but individual animals are present (Verts and Carraway 1998). The Upper Umpqua watershed is located outside of the range of the Canada lynx.

3. Fender's Blue Butterfly

The Fender's Blue butterfly (*Icariacia icarioides fenderi*) was listed as a Federal Endangered species on January 25, 2000 (FR 65(16):3875-38901). This butterfly is currently restricted to the WillametteValley (ONHP 1998). The caterpillar of the Fender's Blue butterfly is dependent on a few species of lupine, especially Kincaid's lupine (*Lupinus sulphurous* ssp. *kincaidii*), as a source of food.

Kincaid's lupine is primarily restricted to native upland prairie habitats in the Willamette Valley (FR 65(16):3875-38901). There is potential for Kincaid's lupine to occur in the watershed where conditions are similar to those in the Willamette Valley. Kincaid's lupine has been located, within the Umpqua Valley and South River Resource Area, in modified or relic prairie habitat. The suspected presence of Kincaid's lupine means Fender's blue butterfly could also occur in the watershed. However, it is unknown if the Fender's Blue butterfly is present in the Upper Umpqua watershed. Kincaid's lupine populations discovered should be monitored to detect the presence of Fender's blue butterfly caterpillars.

4. Vernal Pool Fairy Shrimp

The vernal pool fairy shrimp (*Branchinecta lynchi*) inhabits temporary pools of water in grass or mud bottomed swales (USDI 1994). The known distribution range is restricted to the Central Valley in California. The vernal pool fairy shrimp has been documented occurring on the Medford BLM District. It is unknown if the vernal pool fairy shrimp is present on the Roseburg BLM District. Private lands in the valleys of the watershed may have habitat, temporary water pools, which could be used by this shrimp species. The vernal pool fairy shrimp is not expected to occur on BLM-administered lands in the watershed.

B. Bureau Sensitive Species

1. Western Pond Turtle

The Western pond turtle (*Clemmys marmorata*) is an aquatic freshwater species, living in a variety of habitats including ponds, streams and rivers. Western pond turtles originally ranged from northern Baja California, Mexico, north to the Puget Sound region in Washington. Their current distribution includes the Columbia River Gorge and the inland valleys between the Coast Range and Cascade Mountains. Threats to native turtles include habitat alteration, predation on young turtles by exotic bullfrogs and fishes, drought, local disease outbreaks and fragmentation of remaining populations. Western pond turtles require water to live and eat, and favor habitat with large amounts of emergent logs or boulders for basking. Habitat surrounding the aquatic habitat is also important for nesting (Brown et al. 1995). The Western pond turtle has been documented during surveys (USFS) and incidental finds (ODFW 1999) in the watershed, primarily on private land along the mainstem Umpqua River and adjoining creeks.

2. Peregrine Falcon

Peregrine falcons (*Falco peregrinus*) utilize cliff systems and rock outcrops for nesting. No known historic peregrine falcon sites occur within the watershed. Individual peregrine falcons have been observed throughout the watershed. The closest known nest site occurs in the Wardton subwatershed, directly south of the Upper Umpqua watershed. There is limited cliff or rocky outcrop habitat scattered throughout the watershed, which may provide nesting opportunities. A cliff system located along Martin Creek within the McGee Creek subwatershed was surveyed for peregrine falcons in 2000. This cliff system was determined to be unoccupied by peregrine falcons.

The peregrine falcon has been delisted and is no longer considered a Federal Endangered species under the Endangered Species Act of 1973, as amended (FR 64(164): 46542-46558). The peregrine falcon is now considered to be a Bureau Sensitive species. Its status will be reevaluated after five years of monitoring, in 2004. Management guides include managing known and potential nesting cliffs to maintain site integrity. Sites occupied in the future will have seasonal disturbance restrictions of one-quarter mile or greater. Projects that require disturbance, such as blasting, within one mile of any high potential habitat discovered in the future, should be surveyed before project initiation. Pesticides that have a negative effect on prey species or their habitat will not be applied within two miles of an active site (RMP 1994).

3. Northern Goshawk

Historic literature and current geographic distribution suggests the northern goshawk (*Accipiter gentiles*) would not be expected to occur in most of the Roseburg BLM District. However, the northern goshawk has been documented throughout the WAU.

There are two known northern goshawk territories (Rader Creek-T.24S. R.8W., Sec. 10 and Miner Creek –T.24S. R.8W., Sec. 28) in the watershed. Both nest sites are located in old-growth stands within LSR. There have been additional sightings of northern goshawk throughout the watershed. Consider follow-up surveys on goshawk sightings by evaluating habitat and conducting surveys to determine if goshawks are nesting within the watershed. Protect known and future nesting territories with 30-acre buffers around active and alternative nest sites (RMP 1994). Restrict human activity and disturbance within 0.25 miles of active sites from March 1 to August 31, or until the young have dispersed. A resource area biologist should determine if seasonal restrictions may be waived.

4. Purple Martin

The purple martin (*Progne subis*) is an uncommon migrant and local breeding summer resident in Oregon. The western population of the purple martin was once fairly common in western Oregon (USFWS 1985). Purple martins nest in cavities and under natural conditions, nest in woodpecker holes in dead trees. Purple martins will also use nest boxes or gourds for nesting. Forest management practices, such as suppression of fire and clear-cutting without snag retention, significantly reduced natural nesting habitat. The Guidelines for Management of the Purple Martin in the Umpqua Valley (ODFW 1998) was developed to increase the purple martin population in the Umpqua River basin by establishing new colonies with a nest box program centered on local creeks, ponds, and reservoirs. The purple martin is known to occur within the watershed and has been observed at five sites in 2001. Management practices creating snags in open areas would benefit this species.

5. Fisher

The fisher (*Martes pennanti*) is very rare in Oregon. Most of the sightings are in the Coast and Cascade mountains. Fishers primarily use mature closed-canopy coniferous forests with some deciduous component, frequently along riparian corridors (Csuti et al. 1998). Habitat loss and trapping have nearly extirpated this species from Oregon. The status of fisher is unknown within the watershed.

6. Townsend's Big-eared Bat

Townsend's big-eared bat (*Corynorhinus townsendii*) is a relatively rare species with declining populations in Oregon. The species are known to occur in forested habitats west of the Cascade Mountains. The presence of suitable roost sites is more important than the vegetation type in determining the distribution of this bat (Csuti et al 1998). These bats are strongly associated with caves and mines and are extremely sensitive to disturbance. When Townsend's big-eared bats are found occupying caves or mines on federal land, the appropriate state agency should be notified and management prescriptions for that site should include special consideration for potential impacts on this species (ROD/ Standards and Guidelines, pp. 37-38). There are currently no known roost sites within the watershed. The status of Townsend's big-eared bat is unknown within the watershed.

C. Bureau Assessment Species

Three terrestrial animal species on the Roseburg BLM District are considered to be Bureau Assessment (BA) species. Bureau Assessment species are not included as federal or state listed species but are of concern in Oregon or/and Washington. The three species include the Brazilian free-tailed bat (*Tadarida brasiliensis mexicana*), Harlequin Duck (*Histrionicus histrionicus*, breeding population), and Western Least Bittern (*Ixobrychus exilis hesperis*). These three species are not known to occur within the Upper Umpqua watershed.

D. Survey and Manage Species

1. Mollusks

a) Oregon Shoulderband

Oregon Shoulderband (*Helminthoglypta hertleini*) is a snail that is known to occur in southern Oregon and is suspected to occur as far north as Douglas County, Oregon. Habitat for this species is generally associated with, though not restricted to, talus and other rocky substrates. Other habitat components may include rock fissures or large woody debris sites. The Roseburg District is required to conduct pre-disturbance surveys for the Oregon Shoulderband within the South River Resource Area (USDA and USDI 2001). This snail species is not expected to occur within the watershed.

b) Crater Lake Tightcoil

The known range of the Crater Lake Tightcoil (*Pristiloma arcticum crateris*) occurs in the Cascades, south of Crater Lake, Klamath County, Oregon. It may occur throughout the Oregon Cascades in widely scattered populations. This snail is generally associated with moist conifer forests and among mosses and other vegetation near wetlands, springs, seeps, and riparian areas.

Status of the Crater Lake Tightcoil is unknown within the watershed. Pre-disturbance surveys for the Crater Lake Tightcoil are required on Roseburg BLM-administered lands located east of Interstate 5 (USDA and USDI 2001). This snail species is not expected to occur within the watershed.

2. Del Norte Salamander

The Del Norte salamander (*Plethodon elongates*), a Survey and Manage species, is known to occur on the Roseburg BLM District. The Del Norte salamander uses forested talus habitat, rocky substrates in hardwood forests, and riparian areas. Other habitat features include cool, moist conditions with moss and fern ground cover, lichen downfall, deep litter, and cobble dominated rocky substrates (IB-OR-96-161 Protocols for Survey and Manage Amphibians and BLM-IM-OR-2000-004, Survey and Manage Survey Protocols- Amphibians v. 3.0). Protocol states that habitat within 25 miles of a known Del Norte salamander site must be surveyed. The Upper Umpqua watershed falls just outside 25 miles of the farthest north extent of the Del Norte salamander range.

3. Great Gray Owl

Within the range of the northern spotted owl, the great gray owl (*Strix nebulosa*) is most common in lodgepole pine forests adjacent to meadows. However, it is also found in other coniferous forest types (USDA and USDI 2001). Specific mitigation measures for the great gray owl are provided in the ROD, Attachment 1- Standards and Guidelines for Former Protection Buffer Species (USDA and USDI 2001). The great gray owl has been documented as occurring on the Roseburg BLM District but is not expected to occur in the Upper Umpqua watershed.

E. 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. 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 in Oregon was estimated to be 7,000 animals (Graf 1943). Elk numbers and distribution changed as people settled in the region. Over time, elk habitat areas shifted from the historical distribution to “concentrated populations centers which occur as islands across forested lands of varying seral stages.” Information about the historical distribution of elk within the Upper Umpqua watershed is not available. Due to the increased number of people, road construction, home construction, and timber harvesting, it is suspected the elk population had declined as reported in other parts of the region (Brown 1985).

The number of Roosevelt elk in the Upper Umpqua watershed is 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. Cover includes large shrub, open sapling, closed sapling, and mature or old-growth old-growth forest habitat (Brown 1985).

The Upper Umpqua watershed includes one of three elk management areas (Tyee) identified in the Roseburg District Proposed Resource Management Plan (USDI 1994). However, management direction for these elk management areas was not discussed in the Roseburg District ROD/RMP (USDI 1995).

2. Bat Species

Presence and abundance of bats within this watershed is unknown due to few known site locations and lack of survey information for these species. Five bat species of concern (Appendix 4-2), such as Yuma myotis (*Myotis yumanensis*), long-legged myotis (*Myotis volans*, and fringed myotis (*Myotis thysanodes*), are all likely to occur in late-seral forest within the watershed. Structural features of older forest stands, including large snags, tree deformities, prominent flaking bark, and thick foliage are known to provide suitable roosting sites for some of these species. These bats may forage over a variety of habitat types, particularly in riparian areas with adjacent late-seral habitat. In riparian habitats, insects associated with nearby water sources can provide good foraging habitat in close proximity to roosting sites. Considering the association of these species with late-seral forests, snags, and riparian areas, it is likely that these species are very sensitive to forest management practices. Management recommendations are provided in the ROD - Appendix 1 (USDA and USDI 2001) to provide additional protection for roost sites for bats including the fringed myotis, silver-haired bat (*Lasionycteris noctivagans*), long-eared myotis (*Myotis evotis*), long-legged myotis, and pallid bat (*Antrozous pallidus*).

3. Wild Turkey

The historic distribution range 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 wild 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). The oak savannahs present in the lower elevations of the watershed are mostly on private land. Bureau of Land Management administered land would not play a major role in maintaining turkey populations in the watershed. However, some turkeys may use BLM-administered lands that are adjacent to the agricultural and hardwood areas on private land.

4. **Osprey**

The Osprey (*Pandion haliaetus*) is a migratory species that breeds in Oregon. Osprey is a bird of prey whose diet consists primarily of fish. As a result, it nests in areas within easy reach of lakes and rivers. It requires suitable nest sites such as large, dead trees or artificial nesting platforms. Osprey nesting habitat is present along the Umpqua River, which flows through the middle of the watershed. In 1981-82, 17 artificial nests and five perch trees were installed along the Umpqua River by BLM biologists, between Scottsburg and Roseburg. Surveys during the breeding season show osprey using both natural and artificial nest platforms within the watershed. Currently, there are 30 known osprey nest sites known to occur in the watershed. In 2001, osprey occupied 19 of these nest sites.

5. **Raptors**

Raptors are birds of prey, which includes eagles, hawks, kites, falcons, and owls. Eighteen raptor species, three falcon species, and six owl species occur or could potentially occur within the watershed in various habitat types. Known and future raptor nest sites, not protected by other management recommendations, will be protected under the RMP by providing suitable habitat buffers and seasonal disturbance restrictions (RMP 1994).

6. **Neotropical Bird Species**

Bird species that migrate and spend the winter south of the North American Continent are considered to be 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 from 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 significant increasing trends (Sharp 1990). Including all species showing declines, increases, or almost statistically significant trends, there are 33 species decreasing and 12 species increasing in number in Oregon (Sharp 1990).

The Upper Umpqua watershed supports populations of Neotropical bird species. The watershed provides suitable habitat for Neotropical species known to nest in the Roseburg BLM District. The hardwoods, shrubs, and conifers function as breeding, feeding, and resting habitat for many Neotropical birds.

Partner's In Flight, a coalition of state and federal agencies, private agencies and organizations, and academia-developed conservation plans to ensure long-term maintenance of healthy populations of native landbirds. *The Conservation Strategy for Landbirds in Coniferous Forests* *of Oregon and Washington* and *The Conservation Strategy for Landbirds in Lowlands and Valleys of Western Oregon and Washington* provide recommendations intended to guide planning efforts and actions of land managers. In addition, the *Guide for Assessing the Occurrence of Breeding Birds in Western Riparian Systems* (BLM, 1999) provides a tool to help construct a standard for western riparian bird communities, and to determine what breeding birds could be, or should be, on a given site.

Table 10-1 Terrestrial Wildlife Special Status Species, Presence or Expected Presence in Upper Umpqua

Species	Status	Historic Occurrence in Watershed	Current Occurrence in Watershed	Habitat Requirements	Micro Habitat
AMPHIBIANS					
Cascade Torrent (Seep) Salamander (*Rhyacotriton cascadae*)	BT, XC, V	No	No	Rocky streams, lakes, and seeps in Conifer or Alder forests	Flowing water over rocks, splash zone of streams, spray zone of waterfalls
Cascades Frog (*Rana cascadae*)	BT, XC, V	No	No	Lakes, ponds, streams in meadows above elevations of 2600 feet	Muddy or silty substrate of shallow waters
Clouded Salamander (*Aneides Ferreus*)	BTO, U	Yes	Yes	Forested Habitats	Coarse wood debris/talus
Del Norte Salamander (*Plethodon elongatus*)	BTO, XC, V	No	No	Late-successional conifer forests	Rock rubble and talus slopes
Foothill Yellow-legged Frog (*Rana boylii*)	BTO, XC, V	Yes	Yes	Low gradient streams/ponds	Gravel/cobbles, riparian
Northern Red-legged Frog (*Rana aurora aurora*)	BTO, XC, U	Yes	Yes	Low gradient streams/ponds	Aquatic vegetation
Oregon Slender Salamander (*Batrachoseps wrighti*)	BTO, U	No	No	Late-successional conifer forests	Bark, moss, rocks, logs
Southern Torrent (Seep) Salamander (*Rhyacotriton variegatus*)	BTO, XC, V	Yes	Yes	Springs and streams	Riparian/wetland, CWD
Tailed Frog (*Ascaphus truei*)	BT, XC, V	Yes	Yes	High gradient, perennial streams	Cobbles/boulders, riparian
REPTILES					
California Mountain Kingsnake (*Lampropeltis zonata*)	BT, V	No	No	Pine forests, oak woodlands, chaparral	Rotting logs, loose soil
Common Kingsnake (*Lampropeltis getulus*)	BTO, V	Yes	Yes	Grassland, mixed oak woodlands	Riparian
Sharp-tailed Snake (*Contia tenuis*)	BT, V	Yes	Yes	Forested Habitats	CWD, talus, riparian
Western Pond Turtle (*Clemmys marmorata*)	BSO, XC, CR	Yes	Yes	Ponds, low gradient rivers	CWD, rocks, riparian
BIRDS					

Acorn Woodpecker (*Melanerpes formicivorus*)	BT	Yes	Yes	Mixed oak woodlands	
Allen's Hummingbird (*Selasphorus sasin*)	BTO	No	No	Coastal scrub, riparian near coniferous forests	
American Peregrine Falcon (*Falco peregrinus anatum*)	BS, SE	Yes	Yes	Cliffs, rock outcrops	
Arctic Peregrine Falcon (*Falco peregrinus tundrius*)	BS, SE	No	No	Cliffs, rock outcrops	
Bald Eagle (*Haliaeetus leucocephalus*)	FT, ST	Yes	Yes	Late-successional conifer forests	Large diameter trees/snags
Bank Swallow (*Riparia riparia*)	BTO	No	No	Open habitats	Dirt embankments
Great Gray Owl (*Strix nebulosa*)	BT, V	No	No	Coniferous forests	
Harlequin Duck (*Histrionicus histrionicus*) (breeding population)	BAO, XC, U	No	No	Streams associated with forests within the Cascade Mountains	
Marbled Murrelet (*Brachyramphus marmoratus*)	FT, ST	Yes	Yes	Late-successional conifer forests	Large diameter trees/limbs, platforms
Mountain Plover (*Charadruis montanus*)	FPT	No	No	Upland habitats	Open plains
Northern Goshawk (*Accipiter gentilis*)	BSO, XC, CR	Yes	Yes	Mature and older conifer forests	
Northern Spotted Owl (*Strix occidentalis caurina*)	FT, ST	Yes	Yes	Mature and older conifer forests	Large diameter trees/snags, cavities
Olive-sided Flycatcher (*Contopus cooperi*)	BTO, XC, V	Yes	Yes	Coniferous forests	Uneven canopy with snags and tall trees
Oregon Vesper Sparrow (*Pooecetes gramineus affinis*)	BSO, CR	Yes	Yes	Open habitats	
Pileated Woodpecker (*Dryocopus pileatus*)	BT, V	Yes	Yes	Forests 40 years and older	Snags, CWD
Purple Martin (*Progne subis*)	BSO, CR	Yes	Yes	Grasslands, brushlands, open woodlands	Snag cavities
Streaked Horned Lark (*Eremophila alpestris strigata*)	BSO, CR	No	No	Open habitats	Sparse vegetation
Western Bluebird (*Sialia mexicana*)	BT, V	Yes	Yes	Open habitats	Tree cavities
Western Least Bittern (*Ixobrychus exilis hesperis*)	BAO, XC, P	No	No	Freshwater marshes	Aquatic vegetation

White-tailed Kite (*Elanus leucurus*)	BTO	No	No	Open habitats, riparian	Trees or tall shrubs
Willow Flycatcher (*Empidonax traillii brewsteri*)	BT, XC, V	Yes	Yes	Riparian, edges of forest clearings	Willows, brushy vegetation
MAMMALS					
American Marten (*Martes americana*)	BTO, V	Yes	Unknown	Late-successsional forest	
Brazilian Free-tailed Bat (*Tadarida brasiliensis*)	BAO	No	No	At low elevations where climatic conditions are warm	Caves/mines, snags, buildings
Columbian White-tailed Deer (*Odocoileus virginianus leucurus*)	FE, V	Yes	Yes	Bottomlands, oak/hardwood forests	
Fisher (*Martes pennanti*)	BSO, XC, CR	Yes	Yes	Late-successional conifer forests	
Fringed Myotis (*Myotis thysanodes*)	BT, XC, V	Yes	Yes	Late-successional conifer forests, associated with water	Caves/mines, bridges, rock crevices
Long-eared Myotis (*Myotis evotis*)	BT, XC, U	Yes	Yes	Late-successional conifer forests, associated with water	Caves/mines, bridges, snags
Long-legged Myotis (*Myotis volans*)	BT, XC, U	Yes	Yes	Late-successional conifer forests, associated with water	Caves/mines, bridges, loose bark, rock crevices
Pallid Bat (*Antrozous pallidus*)	BT, V	Yes	Yes	Ponderosa pine, oak woodlands	Buildings, bridges, snags
Ringtail (*Bassariscus astutus*)	BTO, U	Yes	Yes	Coniferous fores ts, mixed woodlands	Vertical structure to habitat, streams and rivers
Silver-haired Bat (*Lasionycteris noctivagans*)	BTO, U	Yes	Yes	Late-successional conifer forests, associated with water	Caves/mines, bridges, loose bark, rock crevices, snags
Townsend's Big-eared Bat (*Corynorhinus townsendii*)	BSO, XC, CR	Yes	Unknown Probable	Late-successional conifer forests	Caves/mines, buildings, bridges
Western Gray Squirrel (*Sciurus griseus*)	BTO, U	Yes	Yes	Oak/hardwood forests, conifer forests, riparian	Broad-leafed component in habitat
White-footed Vole (*Phenacomys albipes*)	BTO, XC	Yes	Yes	Riparian habitats within conifer forests	Small clearings supporting growth of forbs
Yuma Myotis (*Myotis yumanensis*)	BTO, XC	Yes	Yes	Late-successional conifer forests, assoc iated with water	Caves/mines, bridges, buildings, snags

Status abbreviations: FE--Federal Endangered, FT--Federal Threatened, SE--State Endangered, ST--State Threatened, XC--Former Federal Candidate, CR--ODFW Critical, V--ODFW Vulnerable, P--ODFW Peripheral/Naturally Rare, U--ODFW Undetermined, BS-- Bureau Sensitive in Oregon and Washington, BSO– Bureau Sensitive in Oregon, BA – Bureau Assessment Species in Oregon and Washington, BAO–Bureau Assessment Species in Oregon, BT–Bureau Tracking in Oregon and Washington, BTO--Bureau Tracking in Oregon

11 GEOLOGY AND SOILS APPENDIX

Table 11-1 Upper Umpqua Geology

GEOLOGIC UNIT (youngest to oldest) and map symbol[1]	ACRES	PERCENT of AREA	BRIEF CHARACTERIZATION
Umpqua River and ponds OW	4,053	2.4	
Landslide Debris Qls and Alluvium Qal	11,480	6.8	
Bateman Formation Tss	4,613	2.7	Dominantly thick-bedded to cross-bedded micaceous sandstone with minor sequences of siltstone; locally coal bearing and carbonaceous
Elkton Formation Ty	42,177	25.0	Dominantly micaceous siltstones with minor sequences of sandstones; sandstone caps are along Bateman Ridge and its side ridges
Tyee Formation Tt	84,081	49.7	Rhythmically bedded micaceous sandstones and siltstones; sandstones dominate. Forms cliffs where cementation is strong and bedding massive.
Flournoy Formation Tmss	1,091	0.65	Similar to the Tyee Formation. Overall cementation is weaker and sandstone bedding finer.
Lookingglass Formation Tmsc	7,303	4.3	Rhythmically bedded sandstones and siltstones, underlain locally by basal conglomerate.
Roseburg sedimentary rocks Tmsm	13,057	7.7	Rhythmically bedded marine sandstones, siltstones and mudstones derived from volcanic rocks.
Roseburg volcanics Tsr	1,158	0.69	Basement rock of submarine basalt.

[1] **Geology:** The letter symbols are what appear on the State Geologic map (**Figure 5-3**)

A. Landslide Inventory Discussion

To understand the historical account in the next section, this section provides a brief analysis of the two landslide inventories covering the Upper Umpqua watershed. One was done by the Coos Bay watershed analysis coordinator and covered the Coos Bay District in the NW part of the WAU. The Roseburg soil scientist completed an inventory for most of the watershed (excluded is the NW part of the Mehl Creek drainage and about two-thirds of Umpqua Frontal drainage). The locations and approximate sizes of the landslides is the only data that was obtained from the Coos Bay inventory, so most of the statistical analysis involves just the Roseburg survey. There are many limitations to aerial photo inventories. Undercounting, especially where there are forest canopies, is one major limitation. Another limitation is large holes in coverage for certain photo flights. Slumps with limited displacements are most often missed (fresh slump scarps must be large enough or the body of the slump broken up enough for detection). Because of all the limitations, the inventories do not accurately portray absolute numbers of landslides. They also do not give an accurate comparison between the frequency of the forest-related and management-related landslides. Even comparing the frequencies of road and harvest-related landslides is difficult because of the different sets of limitations in identifying these management-related landslides. Aerial photo landslide inventories have their greatest value in giving a sense of relative magnitude and impacts of the rapidly moving landslides (primarily debris avalanches, torrents/debris flows and rapid earth flows) have from period to period and from area to area. A more comprehensive accounting for the limitations are given at the end of this section. Aerial Photo coverage was available for the years 1959, '64, '65, '70, '78, '83, '89, '94 and '99 for the Roseburg survey. The landslides mapped occurred over a period of about 45 years. Aerial Photo coverage was available for the years 1952, '70, and '92 for the Coos Bay survey.

Geology: The state geology map used in this watershed analysis (Figure 5-3) serves as a good general overview of the Upper Umpqua Watershed's geology but is not real accurate at the scales being used. Its two main deficiencies in trying to do the landslide analysis is that it understates the area in the Bateman Formation along the western fringes of the watershed and it misses some of the fingers of the Tyee Formation extending into the Elkton Formation. The effect is that the Bateman landslides would be significantly undercounted; the Tyee landslides would be somewhat undercounted: and the Elkton landslides would be significantly overcounted. The geologic map of the southern Tyee Basin by Alan and Wendy Niem used in the Elkton-Umpqua iteration is more accurate. In that watershed analysis, the following results were obtained:

Bateman... 12.6 landslides/1000 acres
Tyee...........6.9 landslides/1000 acres
Elkton..........4.6 landslides/1000 acres
Roseburg.... 3.7 landslides/1000 acres

Visual inspection indicates that the steep Bateman probably had the highest incidence of landslides, followed closely by the steep Tyee, then the Elkton, and the moderately steep Bateman/Tyee. The Bateman Formation might have a higher incidence of landslides than the Tyee Formation because of overall steeper slopes, less cemented bedrock and some cross bedding. Shallow translational landslides and debris flows are most common on these two formations. The Elkton Formation has a considerably lower percentage of steeper slopes. Where there are concentrations of steeper slopes (primarily pitch scarps and inner gorges of streams), the incidence of landslides can be comparable to the steep Bateman and Tyee Formations. The higher percentage of deeper, clayey soils over siltstone make the Elkton Formation more subject to deep-seated slumps and earth flows than the other formations.

Landslide areas and size: All of the landslides were placed into size classes based on total disturbance (zones of depletion + zones of accumulation). The calculated areas expressed in acres represent the actual-sloped surfaces of the landslides, and not the horizontal plane over them. This was done to more accurately portray extent and the amounts of materials moved (since landslides on steep slopes appear smaller by as much as 30 percent on maps). Any landslide less than 0.03 acres was not mapped. Estimating volumes of materials moved was not attempted because of a lack of data on average depths for the different size classes and difficulties in determining the extent of the zones of depletion. For torrents and dam break floods, determining amounts of streambed and bank scour was not possible. It can be assumed that average depths increase with size class increase and that larger landslides move proportionately more material than smaller landslides than area comparisons alone would indicate.

Table 11-2 Size Class Distribution in the Roseburg Landslide Survey

Size Class	Range	No. of Landslides Identified
Small (S)	0.03 to 0.1 acres	865
Medium (M)	0.1 to 0.5 acres	946
Large (L)	0.5 to 2.0 acres	202
Very large (VL)	2.0 to 5.0 acres	39
Extremely large (XL)	greater than 5.0 acres	17
All size classes	0.03 to greater than 5.0 acres	2069

Over the 45-year span of the survey, identified landslides covered about 0.8 percent of the WAU. Assuming significant undercounts, the real figure would be somewhat more. Chart 5-1 addresses chronology. The level of landslides correlates well with periods of high intensity storms, well above average precipitation, the level of forest management and the management standards/practices of the time. The1955 to1970 period was clearly the most active period, largely due to a huge spike created presumably by the December 1964 flood event (captured on 65 photos). This more than offset the sparse landslide activity from the relatively dry 1965 to 1970 years. Landslide activity dropped, but remained at high levels from 1971 to 1983. Landslide activity dropped dramatically from 1984 to 1994. This correlates with the near normal precipitation of 1984 to 1989 and the four drought years from 1990 to 1995, with the cessation of the practice of sidecasting on steep slopes during road construction, and with a reduction of road building (most arterial haul roads had been built by this time). The above normal precipitation years of 1995 to 1999 (including the large November 1996 storm event) saw a significant spike in landslides, but less than the 1971 to 1983 period which also experienced intense storm events. When considering only the very large and extremely large landslides, the 1995 to 1999 period saw a reduction in activity of 60 percent from that of 1955 to 1970 and of 33 percent from 1971 to 1983, even though harvest activity was increasing again. There are several possible reasons:

1. Improved management over the early periods.
2. Much reduced road construction over the early periods.
3. Increasing stability of old sidecast roads over time as the most unstable locations fail and as improved drainage features are installed.
4. A very high percentage of timber harvests are reentries of second growth. During the first entry failures often occurred at the more unstable sites, probably increasing the overall stability in the majority of cases.

Topographic Position: Chart 5-2 gives the break down between landslide size and topographic position (concave vs. planar/convex). About two-thirds of the identified landslides initiated on concave (moisture converging) slope positions. These include headwalls, swale bottoms, stream channels, hollows and broadly concave slopes outside of these other features. The remainder of the landslides were initiated on planar and convex slopes. A high percentage (82 percent) of the larger landslides originated on the concave positions. Other types of topographic position that show higher incidences of landslides are **steep** inner gorge slopes and at slope breaks where the upper slope is substantially less.

Management relationships: Chart 5-3 gives the management relationships chronology for the combined Rader-Wolf, Cougar and Hubbard Creeks 6th fields. The table below gives individual trends for forest, harvest and road-related landslides. Each row adds up to 100.

Table 11-3 Chronology of Landslide - Management Relationships in the Combined Rader-Wolf, Cougar, and Hubbard Creek Subwatersheds

	Acres of landslides/year for individual period **Summation of the four period's acres of landslides/year**			
	1955 to 1970	1971 to 1983	1984 to 1994	1995 to 1999
Forest-related	80.0	4.3	3.9	11.7
Harvest-related	35.6	31.6	8.3	24.5
Road-related	35.3	45.3	7.8	11.6

Most of the land in Rader-Wolf and Cougar was still in uncut forest for the 1955 to 1970 period. A number of large-to-extremely large forest-related landslides (torrents and dam break floods accounted for largest portion) occurred in the 1950s and during the 1964 flood event. Forest related-landslide acreage accounted for 42 percent of the total for these three subwatersheds. They dropped off dramatically for subsequent periods. The declines were tied to increasingly less uncut forest over time and perhaps to the possible uniqueness of the 1964 flood event for the entire 45-year span. Nearly all of these forest-related landslides for this period originated in the higher elevations along Rattlesnake Ridge and Bateman Ridge (1600 to 2100 feet), particularly in headwall positions. Was rain-on-snow a factor here?

The magnitude of harvest-related landslides was about the same for the two earliest periods, but dramatically dropped during the period of improving management and relatively low precipitation 1984-94 and snapped back to 71 percent of the level of the earliest two periods for the wet 1995 to 1999 period. The road-related landslides took the same large drop in the 1984 to 1994 period but only snapped back to 29 percent of the level of the two earliest periods from 1995 to 1999. This data indicates significant improvement in road condition and management. Landslides in small numbers occurred on pasture land for the 45-year period.

Debris flow/torrents and dam-break floods:

A debris flow is a highly mobile slurry of soil rock and vegetation that can travel great distances. Confined channels in **steep**, dissected terrain that contain a lot of debris are most susceptible to debris flows (Oregon Dept. of Forestry, 2001). Debris flows normally initiate in stream channels with gradients greater than 35 percent and most often deposit their entrained material when gradients decrease below 6 percent or when they reach a channel junction of that which is greater than 70 degrees (Benda and Cundy, 89). Debris flows are initiated by liquifaction of landslide debris as they enter channels. Erosion of additional sediment and organic debris in small and steep (first- and second-order channels) can increase the volume of the original landslide by 1000 percent or more, enabling the debris flows to become more destructive as their volumes increase with distance traveled (Earth Systems Institute). In the past, debris flows were called torrents. Dam-break floods are dams of organic debris that can be initiated by landslide or debris flow deposition into narrow valley bottoms. The failure of such a dam can release a small flood wave that may destroy riparian vegetation and cause significant local erosion. These dams can migrate downstream by the push of the flood waves, growing and entraining more material into the dams, thereby increasing the magnitude of subsequent flood pulses and erosion (Earth Systems Institute).

Debris flows have been common in the WAU during the last 45 years (about 20 percent of all landslides inventoried). A number of the larger ones were probably debris flow/dam-break flood combinations. The longest one was 11,500 feet in length (Lost Creek in the 1970s). The largest one covered 13 acres (major tributary of Cougar Creek during the 1964 flood event). The most common topographic position for the initiation of the largest events was steep headwalls. The largest concentrations were near or along the western border of the WAU in the Bateman and Tyee Formations. Figure 5-4 maps the earth flow/dam-break flood runout tracks. Table 11-4 below gives the breakdown by size class and management.

Table 11-4 Debris Flow/Dam-Break Flood Statistics - Roseburg Landslide Survey

Size Class	Number of Debris Flows/Dam-Break Floods					Percent of all land-slides in a size class
	Forest	Harvest	Road	Other	Total	
small (S)	1	20	4	2	27	3.1
medium (M)	22	114	67	4	207	21.9
large (L)	22	50	53	4	129	63.9
very large (VL)	6	10	13	1	30	76.9
extremely large (XL)	6	6	4	0	17	94.1
all Sizes	57	200	140	11	410	19.8 (all classes)

A good percentage of the larger debris flows and dam-break floods (20 percent) occurred in uncut forest. Most of these likely occurred during large, high intensity storms, particularly those of the 1964 flood event. The road- and timber-harvest related ones are evenly split in the larger size classes. All but one of the extremely large landslides were debris flows and dam-break floods. The larger debris flows/dam-break floods would remove all trees along creeks in swaths as wide as 200 feet. Pure stands of red alder commonly grew back in the tracks.

Stream segments ranked for restoration needs in the hydrology section were correlated with debris flow/dam-break flood events identified in the inventory to determine possible connections. Fines were excluded because they are a short-term effect that would mask possible long-term benefits of other factors in the ranking such as large woody debris.

Table 11-5 Stream Reaches Rated for Restoration Needs that were Affected by Debris Flows and Dam-break Floods During the Period Covered by the Roseburg Landslide Inventory

Drainage	Creek	Segment	Approximate Years of Events (19xx)	Stream Gradient	Level of Debris Flow Activity	Stream Restoration Need for Action (numerical rating in parenthesis)
Cougar	Cougar	71	82 - 83	Low	High	Low (1 - 3)
	Cougar	72	82 - 83	Low/mod	High	Low (1 - 3)
	Cougar	73	82 - 83	Moderate	High	Moderate (4 - 6)
	West Fork Cougar	351	59 - 65 & 82 - 83	Low/mod	High	Low (1 - 3)
	Bottle	2	65	Moderate	Moderate	Moderate (4 - 6)
Hubbard	Hubbard	129	65 & 97	Low	High	Mod High (7 - 8)
	Hubbard	130	65	Low	High	Mod High (7 - 8)
	Camp	56	65	Low	Moderate	Moderate (4 - 6)
	Hubbard	57	65	Low/mod	Moderate	Moderate (4 - 6)
	Hubbard	120	65	Low	Moderate	Mod High (7 - 8)
Lost Canyon	Lost	Lower 163 & 164	78	Moderate	High	Low (1 - 3)
	Lost	Lower 63	95 - 99	Low	High	Low (1 - 3)
	Unnamed	143	55 - 59	Low	Moderate	Moderate (4 - 6)
	Little Canyon	144	95	Moderate	Moderate	Moderate (4 - 6)
McGee	Waggoner	281	82 - 83	Moderate	High	Low (1 - 3)
Rader-Wolf	Rader	219	78 - 83	Low	High	Mod High (7 - 8)
	Rader	220	82 - 83	Moderate	High	High (9)
	Major trib	360	65 - 69)	Low	High	Mod High (7 - 8)
	Case Knife	59	65	Moderate	Moderate	Mod High (7 - 8)

Table 11-6 below correlates the level of debris flow/dam-break flood activity (subjective moderate or high ranking) with the need for restoration ranking, fines excluded as a factor.

Table 11-6 Debris Flow/DBF - Stream Restoration Needs Correlation

Level of Debris Flow/DBF Activity	Need for Stream Restoration Ranking			
	Low (1 - 3)	Moderate (4 - 6)	Mod high (7 - 8)	High (9)
Moderate	0	5	2	0
High	6	1	4	1
Mod + High	6	6	6	1

Where there were moderate levels of debris flow/dam-break flood activity, the need-for-restoration ranking is solidly in the moderate ranges. Where there were high levels of activity, the need-for-restoration ranking is weighted heavily in the low and moderately high portions. The only high ranking is associated with high activity. Interpretation is difficult since all of the management influences are not known. For example, how much woody debris in channels was produced during harvesting and from what channel segments was woody debris intentionally removed? Conclusions: Moderate levels of debris flow activity might have generally had a more neutral effect. The indication is strong that recent (last 45 years) high levels of debris flow/dam-break flood activity commonly contributed to good stream structure (Cougar Creek and its west fork, Lost Creek and Waggoner Creek). They also may have commonly contributed to long-term negative effects to stream structure (Hubbard Creek, Rader Creek and major tributary and Case Knife Creek), but this conclusion is clouded by possible management influences separate from the debris flow/dam-break flood events. No correlation with stream gradient is evident.

Highest order of stream reached by landslides: This category is meant to give a rough sense of impact to stream structure and water quality. It counts the landslides, which are judged by aerial photo interpretation to have directly reached streams. If the track of a landslide reached a stream (determined by aerial photo interpretation), the order of stream was noted at its furthest extent. Landslides whose tracks stopped short of streams, but could have bled sediment into a stream, were not counted as reaching a stream. The breakdown by size class is given in Chart 5-4. Overall, about 50 percent of all inventoried landslides did not reach streams. As anticipated, a high percentage of the larger landslides (92 percent) reached streams. While only 10 percent of the small and medium landslides reached third-order and higher streams, 37 percent of the “large”, 64 percent of the “very large” and 88 percent of the “extremely large” landslides reached third-order and higher streams.

The rate of healing of landslide scars was explored in the Tom Folly landslide inventory. Many landslide scars were completely vegetated over (as viewed from the aerial photographs) five to six years after occurrence. Some ground-truthing revealed greatly reduced levels of erosion on most scars six years later. Zones of accumulation would heal faster than the zones of depletion. With few exceptions, unvegetated scars were virtually unnoticeable on the aerial photographs 25 years after occurrence. Based on this information, the recent landslides (about 1995 to present) would account for a very large percentage of sediment still being produced from landslide scars. Table 11-7 gives a comparison between the drainages of the magnitude of landsliding that impacted streams for the 1995 to 1999 period. The extremely large slump-earth flow in Rader-Wolf, which was still growing, is included in the figures. Only about 75 percent of Mehl Creek and about 25 percent of Umpqua Frontal were inventoried.

Table 11-7 1995 to 1999 Landslides that Reached Streams - Roseburg Landslide Survey

Drainage	Number of Landslides in a Size Class					
	Small	Medium	Large	Very Large	Extremely Large	All sizes
Cougar Creek	2	8	3	0	0	13
Hubbard Creek	5	0	1	0	1	7
Lost Canyon	5	12	2	0	1	20
McGee Creek	3	3	0	0	0	6
Mehl Creek	2	5	5	1	0	13
Rader-Wolf Creek	7	31	4	0	1	43
Umpqua Frontal	0	1	1	0	0	2
Yellow Creek	1	4	0	0	0	5
Total	25	64	16	1	3	109

Limitations of Roseburg Landslide Inventory: There are a number of limitations associated with aerial photo landslides inventories. In this inventory the number of landslides from about 1955 to 1999 were on balance undercounted. The number of landslides not counted probably is considerable. The number of features that were in reality not landslides but were counted as such, are probably relatively few (probably less than five percent of the total).

<u>Limitations in counting landslides:</u>

1. Incomplete coverage of aerial photo flights and missing photos.

Table 11-8 Percent Aerial Photo Coverage (Rough Ocular Estimate)

6th Field Drainages	Aerial Photo Year								
	1959	1964	1965	1970	1978	1983	1989	1994	1999
Cougar Creek	90	50	95	100	90	100	100	100	100
Hubbard Creek	40	0	90	95	90	100	100	100	100
Lost Canyon	90	90	95	100	90	100	100	100	100
McGee Creek	70	90	5	100	90	100	100	80	100
Mehl Creek	5	55	0	60	65	70	70	60	65
Rader-Wolf	60	90	60	100	90	100	100	100	100
Umpqua Frontal	60	0	100	100	100	100	100	100	100
Yellow Creek	3	95	30	100	97	100	100	100	100

2. A percentage of the smaller landslides that occur shortly after a photo flight has been flown, become vegetated- before the next flight occurs and are missed. A percentage of the larger slides and debris flow/dam-break flood tracks that occur shortly after a photo flight has been flown, become partially vegetated- (usually the zones of accumulation) before the next flight occurs and are assigned a size class smaller than what they actually are. The longest period of time between flights was eight years (1970 to 1978).

3. Some of the large landslides in closed or near-closed canopy forests have likely been missed. A high percentage of small and medium landslides in these settings have likely been missed.

4. In areas with high densities of skid trails and earth moving disturbances by tractors (mostly the earlier periods), some landslides can closely mimic the appearance of one of these man-made disturbances and not be counted as a landslide and, on the flip side, a man-made disturbance can closely resemble a landslide and get counted as one.

5. Determining if failures occurred in fresh sidecast was often difficult. The lighting from the sun has to be at the right angle to being able to see landslide scarps and tracks cut into it. Often, sidecast that traveled far down slope during construction had the appearance of a landslide. In this inventory there were many close calls, especially on the 1970 photos were many new side cast roads on steep ground first appeared. Probably the landslides in sidecast that were missed were higher in number than sidecast wrongly identified as having failed.

6. Most small road cut slope failures were likely missed. Determining which large road cut features were purely the result of construction and which had subsequent failure scars was sometimes difficult.

7. Nearly all deep-seated slumps, where there was very little vertical displacement and little breakup of the slump blocks, would have been missed. Slow moving earth flows would be missed also. Secondary rapid landslides breaking off these earth flows and slumps would be observable.

Limitations in determining management relationships:

1. Determining whether a landslide is harvest or road/trail-related when it lies just below the road/trail prism on the natural contour was difficult. Was road/trail-drainage a factor in the failure or would the failure have occurred anyway under harvest conditions even if the road/trail had not been there? As a rule of thumb, any landslide within 100 feet of the road/trail prism that originated on natural surface was given a dual designation of Harvest/Road or Harvest/Trail. The dual designations amounted to 5.5 percent of the total harvest and road-related landslides. For statistical calculations, half of these dual designations were tallied as harvest-related and the other half as road-related.

2. A small number of identified landslides (twelve) within the forest might have been influenced by salvage/high-grading skid trails. Because of the difficulty to clearly see what the situation was through the canopy (for example, was there actually a trail there or was the trail capable of channeling water and then discharging this drainage at one point?), all of these landslides were just designated as forested-related.

Limitations in determining the highest order of stream reached:

1. Determining where a first order stream began in a swale was often difficult. Dual designations of no stream reached/first order streams reached were given to those landslides of high uncertainty (116 landslides). For statistic calculations, half of these dual designations were tallied as no stream reached and the other half as first order stream reached.

2. For a small number of landslides, there was difficulty determining whether a stream was second or third order. For statistic calculations, half of these dual designations were tallied as second-order stream reached and the other half as third-order stream reached.

12 HYDROLOGY APPENDIX

Table 12-1 Regional Ecosystem Office Subwatershed Proposed Name Changes

Current Name	REO Proposed Name
Cougar	Cougar Creek
Hubbard Creek	Hubbard Creek
Lost Canyon	Lost Creek
McGee Creek	McGee Creek
Mehl Creek	Mehl Creek
Rader Wolf	Wolf Creek
Umpqua Frontal	Upper Umpqua
Yellow Creek	Yellow Creek

The mainstem Umpqua River is also listed for bacteria (Figure 6-2). Continuous fecal coliform data for the Umpqua River is not available. Point sampling has been inconsistent and available data is generally insufficient to determine whether violations have occurred in any given year. However, extremely high fecal coliform counts have been observed in the Umpqua River (Table 12-1). The values displayed are the seven highest sampled values within the Upper Umpqua for the period of record, and are not typical or necessarily indicative of any spatial or temporal trend. Actual maximum coliform concentrations were probably higher than those reported below.

Table 12-2 Highest Known Fecal Coliform Concentrations

Station	Sample Date	Observed Organisms per 100 mL
Umpqua River below Little Canyon Creek	10/17/67	7000
Umpqua River below Calapooya Creek	4/25/83	2400
	11/26/84	2400
	11/18/91	1600
	9/29/86	1100
Umpqua River near Elkton	10/25/82	1500
	12/10/96	1020

Table 12-3 Riparian Road Densities for Selected Stream Reaches

Stream Name	Reach	Road Density (mi/mi)
BEAR CREEK	1	0.0
BEAR CREEK	2	0.1
BOTTLE CREEK	1	0.1
BOTTLE CREEK	2	0.0
BRADS CREEK	1	0.8
BRADS CREEK	2	0.0
BRADS CREEK TRIB A	1	0.6
BRADS CREEK TRIB A	2	0.1
BRADS CREEK TRIB A	3	0.5
BUFFALO CREEK	1,2	0.7
CAMP CREEK	1	0.7
CAMP CREEK	3	1.1
CASE KNIFE CREEK	1	1.2
CEDAR CREEK	1	0.9
COUGAR CREEK	1	0.2
COUGAR CREEK	2	0.1
COUGAR CREEK	3	0.0
COUGAR CREEK	4	0.7
COUGAR CREEK	6	0.3
COUGAR CREEK TRIB. #1	1	0.0
COUGAR CREEK TRIB. #1	2	0.6
COUGAR CREEK TRIB. #1	3	0.3
COUGAR CREEK TRIB. #1	4	0.2
COUGAR CREEK TRIB. #1	5	0.1
DOE CREEK	1	0.4
FITZPATRICK CREEK	1	0.2
FITZPATRICK CREEK	2	0.7
HUBBARD CREEK	1	0.3
HUBBARD CREEK	2	0.9
HUBBARD CREEK	3	0.2
HUBBARD CREEK	4	0.6
HUBBARD CREEK	5	0.8
HUBBARD CREEK	6	0.4
HUBBARD CREEK	7	0.1
HUBBARD CREEK	8	0.1
HUBBARD CREEK TRIB. #1	1	0.3
LITTLE CANYON CREEK	1	0.2
LITTLE CANYON CREEK	2	0.0
LITTLE WOLF CREEK	1	0.4
LITTLE WOLF CREEK	2	0.5
LITTLE WOLF CREEK	3	0.4
LITTLE WOLF CREEK	4	0.6
LITTLE WOLF CREEK TRIB #1	1	0.4
LOST CREEK	1	0.0
LOST CREEK	2	0.8
LOST CREEK	3	0.3

LOST CREEK	4	1.0
MARTIN CREEK	1	0.7
MARTIN CREEK TRIB. #1	2	0.0
MCGEE CREEK	1	0.3
MCGEE CREEK	2	0.2
MEHL CREEK	1	0.6
MEHL CREEK	2	0.0
MEHL CREEK	3	0.0
MINER CREEK	1	0.6
MINER CREEK	2	0.6
MINER CREEK	3	0.3
RADER CREEK	1	0.4
RADER CREEK	2	0.4
RADER CREEK	3	0.1
RADER CREEK	4	0.1
RADER CREEK TRIB #1	1	0.0
RADER CREEK TRIB #2	1	0.5
RADER CREEK TRIB #3	1	0.9
RADER CREEK TRIB #3	2	0.8
RADER CREEK TRIB #3	3	0.1
WAGGONER CREEK	1	0.0
WAGGONER CREEK	2	0.0
WAGGONER CREEK	3	0.1
WAGGONER CREEK	4	0.2
WOLF CREEK	1	0.1
WOLF CREEK	2	0.0
WOLF CREEK	3	0.3
WOLF CREEK	4	0.2
WOLF CREEK	5	0.0
WOLF CREEK	6	0.0
YELLOW CREEK	1	0.9
YELLOW CREEK	2	0.2
YELLOW CREEK	3	0.1
YELLOW CREEK	4	0.0
YELLOW CREEK	5	0.0

13 AQUATIC HABITAT APPENDIX

A. Summary Of ODFW Surveyed Streams In Upper Umpqua

Cougar:

(1) Cougar Creek

ODFW Survey September 6 – 15, 1994

22 Tributaries, Stream Order 3 (BLM/GIS Stream Order 5), Basin Area 21.85 km^2. 8.36 km surveyed in 7 reaches. Fish were noted in 5.74 (3" trout). Beaver activity was noted in reaches 2, 3, 5 & 6. Three pools greater than 1 meter in depth were noted in the survey in reaches 1 & 6. Approximately 70% is BLM ownership. Land use is timber.

(2) Cougar Creek Tributary #1

ODFW Survey October 10 – 11, 1994

5 Tributaries, Stream Order 2 (BLM/GIS Stream Order 4), Basin Area 9.65 km^2. 4.69 km surveyed in 4 reaches. Fish were noted in 4.17 km (5" cutthroat). Beaver activity was noted in reach 1. One pool greater than 1 meter in depth was noted in reach 2. Approximately 15% is BLM ownership. Land use is timber.

(3) Bottle Creek

ODFW Survey July 10, 1996

2 Tributaries, Stream Order 2 (BLM/GIS Stream Order 4), Basin Area 4.18km^2. 1.7 km surveyed in 2 reaches. Fish were noted in 1.65 km (3" fish). Beaver activity was noted in reach 1. No pools were noted. Many natural fish passage barriers were noted. Approximately 50% is BLM ownership. Land use is timber and agriculture.

(4) Rock Creek – ODFW survey not done. Approximately 70% BLM ownership.

Hubbard Creek:

(1) Buffalo Creek

ODFW Survey September 1 - 9, 1994

6 Tributaries, Stream Order 2 (BLM/GIS Stream Order 4), Basin Area 4.2 km^2. 2.48 km surveyed in 3 reaches. Fish were noted in 1.35 km (fry). Old beaver activity was noted in reaches 1 & 2. No pools greater than 1 meter in depth. Approximately 90% of the creek is BLM ownership. Land use is timber. Medium wood in stream.

(2) Camp Creek

ODFW Survey September 12, 1994

5 Tributaries, Stream Order 2 (BLM/GIS Stream Order 4), Basin Area 5.4 km^2. 2.93 km surveyed in 3 reaches. Fish were noted to 2.41 km (fry). Beaver activity was noted in reaches 2 & 3. No pools of 1 meter or greater. Approximately 80% of the creek is BLM ownership. Land use is timber. Medium wood in stream.

(3) Days Creek

ODFW Survey not done – 0% BLM ownership.

(4) Bear Creek

ODFW Survey September 8 - 12, 1994

8 Tributaries, Stream Order 3 (BLM/GIS Stream Order 5), Basin Area 6.2 km^2. 2.85 km surveyed in three reaches. Fish were noted in 0.78 km (fry). Beaver activity was noted in reaches 2 & 3. Two pools of 1 meter or greater. Approximately 40% of the creek is BLM ownership. Land use is primarily timber with some rural residential in first portion of the creek.

(5) Hubbard Creek

ODFW Survey August 15 – 31, 1994

72 Tributaries, Stream Order 4 (BLM/GIS Stream Order 6), Basin Area 67.0 km^2. 23.66 km surveyed in nine reaches. Fish were noted to 19.27 km (fry). Beaver activity was noted in all but reach 3 & 4. Reach 1-5 had 43 pools of 1 meter or greater. Approximately 15% of the creek is BLM ownership. Land use within reaches 1 - 4 is rural residential and/or agriculture. The remainder of the land use is second-growth timber.

(6) Rock Creek

ODFW Survey not initiated– 15% BLM ownership.

(7) Tributary #1 (located at upper portion of Hubbard Creek)

ODFW Survey September 14, 1994

4 Tributaries, Stream Order 2 (BLM/GIS Stream Order 4), Basin Area 3.4 km^2. 1.67 km surveyed in 2 reaches. Fish were noted in 0.2 km (fry). Beaver activity was noted in reach 2. No pools greater than 1 meter. Approximately 10% of the creek is BLM ownership. Land use is timber.

Lost Canyon:

(1) Basin Creek – ODFW survey not done. Approximately 100% BLM ownership.

(2) Leonard Creek – ODFW survey not done. Approximately 95% BLM ownership.

(3) Little Canyon Creek

ODFW Survey September 16 – 21, 1994

7 Tributaries, Stream Order 2 (BLM/GIS Stream Order 5), Basin Area not indicated. 5.9 km surveyed in 4 reaches. Fish were noted in 5.01 (1"Fry). Beaver activity was noted in reach 1. 1 pool was noted in reach 1. Approximately 10 % is BLM ownership. Land use is timber with some residential in reach 1.

(4) Lost Creek

ODFW Survey September 22 – 29, 1994

12 Tributaries, Stream Order 3 (BLM/GIS Stream Order 4), Basin Area 18.93 km^2. 8.1 km surveyed in 6 reaches. Fish were noted in 6.01 (3" Trout). Beaver activity was noted in reaches 1, 2, 3 & 4. 3 Pools were noted (reaches 1, 2 & 5). Approximately 85% is BLM ownership. Land use is timber with some residential in reaches 1 & 2.

(5) Powell Creek - ODFW survey notinitiated. Approximately 45% BLM ownership.

(6) Steve Creek - ODFW Survey not initiated– 10% BLM ownership.

McGee Creek:

(1) Cedar Creek – ODFW Survey not initiated. Coos Bay BLM District.

(2) Martin Creek

ODFW Survey September 7 – 12, 1994

3 Tributaries, Stream Order 3 (BLM/GIS Stream Order 4), Basin Area 10.04 km^2. 3.37 km surveyed in 3 reaches. Fish were noted in 2.13 km (fish). Beaver activity was noted in reaches 1 & 2. One pool of 1 meter or greater. Approximately 50% of the creek is BLM ownership. Land use is timber.

(3) Martin Creek Tributary #1

ODFW Survey October 13, 1994

2 Tributaries, Stream Order 2 (BLM/GIS Stream Order 4), Basin Area 5.4 km^2. 1.83 km surveyed in 2 reaches. Fish were noted in 0.29 (fish). Beaver activity was noted in reach 2. No pools noted. Approximately 95% of the trib is BLM ownership. Land use is timber.

(4) McGee Creek – Coos Bay BLM District

ODFW Survey June 26 –27, 1995

11 Tributaries, Stream Order 3 (BLM/GIS Stream Order 5), Basin Area 14.0 km^2. 4.2 km surveyed in 4 reaches. Fish were noted in 2.78 km (sm trout fry). Beaver activity noted in reaches 2 – 4. No pools noted. Approximately 10% of creek is BLM ownership. Land use is timber and some agriculture.

(5) Waggoner Creek – Coos Bay BLM District.

ODFW Survey August 30 – September 6, 1994

16 Tributaries, Stream Order 3 (BLM/GIS Stream Order 5), Basin Area 15.33 km^2. 6.7 km surveyed in 5 reaches. Fish were noted in 5.57 km (fish). Beaver activity was noted in reaches 1, 2 & 3. Two pools, 1 meter or greater, were noted (reaches 2 & 3). Land use is primarily timber with agriculture in reach 1.

Mehl Creek:

(1) Brads Creek

ODFW Survey August 8 – 26, 1993

6 Tributaries, Stream Order 3 (BLM/GIS Stream Order 5), Basin Area 16.5 km^2. 4.53 km surveyed in 3 reaches. Fish were noted in 3.41 km (fish). Noted that the only barriers to fish passage are beaver dams and gradient. Beaver activity was noted in reach 2. Five pools (beaver pool) greater than 1 meter in depth in reach 2. Approximately 40% of the stream is BLM ownership. Land use is agriculture with some timber.

(2) Brads Creek Tributary A

ODFW Survey August 27 – 31, 1993

3 Tributaries, Stream Order 2 (BLM/GIS Stream Order 4), Basin Area 7.4 km^2. 2.9 km surveyed in 4 reaches. Fish were noted in 0.48 (fish). Noted that there was a 2-meter bedrock step at 0.18, salmonids were noted at 0.42. Beaver activity was noted in reach 2. No pools were noted. Approximately 80% is BLM ownership. Land use is timber with some agriculture.

(3) Fitzpatrick Creek – Coos Bay District

ODFW Survey September 13 –15, 1994

7 Tributaries, Stream Order 3 (BLM/GIS Stream Order 4), Basin Area 8.20 km^2. 3.1 km surveyed in 3 reaches. Fish were noted in 2.51 km (fish). Beaver activity was noted in all reaches. No pools were noted. Approximately 20% of the stream is BLM ownership. Land use is timber.

(4) Haines Creek

ODFW Survey not initiated– 15% Coos Bay BLM ownership.

(5) Heddin Creek – Coos Bay District

ODFW Survey September 19 – 22, 1994

9 Tributaries, Stream Order 2 (BLM/GIS Stream Order 4), Basin Area 10.74 km^2. 5.2 km surveyed in 5 reaches. Fish were noted in 4.71 km (fish). Beaver activity was noted in reach 5. 3 pools of 1 meter or greater. Approximately 5% of creek is BLM ownership. Land use is timber/agriculture.

(6) Mehl Creek – Coos Bay District

ODFW Survey September 26 & October 5, 1994

23 Tributaries, Stream Order 3 (BLM/GIS Stream Order 4), Basin Area 22.96 km^2. 11.0 km surveyed in 4 reaches. Fish were noted in 8.84 km (cutthroat). Beaver activity was noted in reach 4. No pools were noted. Approximately 25% is BLM ownership. Land use is timber.

(7) Tapp Creek

ODFW Survey not initiated– 0 % BLM ownership.

(8) Whitehorse Creek

ODFW Survey not initiated – 5 % BLM ownership.

(9) Williams Creek

ODFW Survey not initiated – 80 % BLM ownership.

Rader Wolf:

(1) Case Knife Creek

ODFW Survey August 19, 1991

4 Tributaries, Stream Order 2 (BLM/GIS Stream Order 3), Basin Area 5.5 km^2. 2.4 km surveyed in 1 reach. Fish were noted in 2.4 km (12cm trout). Beaver activity was noted. No pools were noted. Approximately 50% is BLM ownership. Land use is timber.

(2) Little Wolf Creek

ODFW Survey August 20 – 27, 1991

13 Tributaries, Stream Order 3 (BLM/GIS Stream Order 5), Basin Area 23 km^2. 8.2 km surveyed in 4 reaches. Fish were noted in 8.1 km (fish). Beaver was noted in reaches 1 - 3. 1 pool was noted in reach 2. Approximately 90% is BLM ownership. Land use is second-growth timber.

(3) Little Wolf Creek Trib. #1

ODFW Survey August 28, 1991

3 Tributaries, Stream Order 2 (BLM/GIS Stream Order 4), Basin Area 6.5 km^2. 1.7 km surveyed in 1 reach. Fish were noted in .5 km (fish). Beaver activity noted. No pools noted. Approximately 100% BLM ownership.

(4) Miner Creek

ODFW Survey August 14 – 16, 1991

19 Tributaries, Stream Order 3 (BLM/GIS Stream Order 4), Basin Area 21km^2. 6.1 km surveyed in 3 reaches. Fish were noted in 6.0km (3 trout 8-10cm). Beaver activity was noted in first two reaches. No pools noted. Approximately 100% is BLM ownership. Land use is timber.

(5) Rader Creek

ODFW Survey June 20 – July 8, 1991

19 Tributaries, Stream Order 4 (BLM/GIS Stream Order 6), Basin Area 27.5 km^2. 6.1 km surveyed in 4 reaches. Fish were noted in 5.8 (fish). Beaver activity was noted in the first three reaches. 3 pools were noted within the first reach. Approximately 90% is BLM ownership. Land use is timber.

(6) Rader Creek Trib. #1

ODFW Survey July 31, 1991

8 Tributaries, Stream Order 3 (BLM/GIS Stream Order 5), Basin Area 9.0 km^2. 1.7 km surveyed in 1 reach. Fish were noted in 1.5 km (fish). Beaver activity was not noted. No pools were noted. Approximately 90% is BLM ownership. Land use is timber.

(7) Rader Creek Trib. #2

ODFW Survey July 29, 1991

1 Tributary, Stream Order 1 (BLM/GIS Stream Order 3), Basin Area 3.5 km^2. 2.0 km surveyed in 1 reach. Fish were noted in 1.9 km (10cm fish). Beaver activity was noted in reach. No pools were noted. Approximately 5% is BLM ownership. Land use is timber.

(8) Rader Creek Trib. #3

ODFW Survey July 15 – 18, 1991

8 Tributaries, Stream Order 2 (BLM/GIS Stream Order 4), Basin Area 8.0 km^2. 4.0 km surveyed in 3 reaches. Fish were noted in 3.9 (2 10cm fish). Beaver activity was noted in all reaches. 2 pools were noted. Approximately 65% is BLM ownership. Land use is timber.

(9) Rader Creek Trib. #3A

ODFW Survey July 26, 1991

1 Tributary, Stream Order 1 (BLM/GIS Stream Order 3), Basin Area 1.0 km^2. 0.78 km surveyed in 1 reach. Fish were noted in 0.67 km (4cm fish). Beaver activity was not noted. No pools were noted. Approximately 100% is BLM ownership. Land use is timber.

(10) Rader Creek Trib. #3B

ODFW Survey July 23, 1991

1 Tributary, Stream Order 1 (BLM/GIS Stream Order 3), Basin Area 0.5km^2. 0.36 km surveyed in 1 reach. Fish were noted in 0.36km (15-18cm fish). Beaver activity was not noted. No pools were noted. Approximately 3% is BLM ownership. Land use is timber.

(11) Rader Creek Trib. #4

ODFW Survey July 11, 1991

2 Tributaries, Stream Order 2 (BLM/GIS Stream Order 4), Basin Area 1 km^2. 0.90 km surveyed in 1 reach. Fish were noted in 0.76km (fish). Beaver activity was not noted. No pools were noted. Approximately 100% is BLM ownership. Land use is timber.

(12) Rader Creek Trib. #5

ODFW Survey July 9, 1991

2 Tributaries, Stream Order 2 (BLM/GIS Stream Order 4), Basin Area 1.0km^2. 0.228 km surveyed in 1 reach. Fish were noted in 0.14 (2-5cm fish). Beaver activity was not noted. No pools were noted. Approximately 5% is BLM ownership. Land use is timber.

(13) Rader Creek Trib. #6

ODFW Survey July 9, 1991

1 Tributary, Stream Order 1 (BLM/GIS Stream Order 3), Basin Area 0.5km^2. 0.264km surveyed in 1 reach. Fish were noted in 0.13km (6-2cm fish). Beaver activity was not noted. No pools were noted. Approximately 0% is BLM ownership. Land use is timber.

(14) Whiskey Camp Creek

ODFW Survey not done – 100% BLM ownership.

(15) Wolf Creek

ODFW Survey August 5 – 13, 1991

95 Tributaries, Stream Order 4 (BLM/GIS Stream Order 6), Basin Area 96.5 km^2. 10.4 km surveyed in 6 reaches. Fish were noted in 10.37 km (3-5cm fish). Beaver activities was note in all reaches. 7 pools were noted in the first 3 reaches. Approximately 45% is BLM ownership. Land use is timber and some agriculture in reach 1.

Umpqua Frontal:

(1) Hidden Valley Creek – ODFW survey not initiated. Approximately 0% BLM ownership.

(2) Mill Creek – ODFW survey not initiated. Approximately 5% BLM ownership.

Yellow Creek:

(1) Bear Creek

ODFW Stream Survey July 14 – 19, 1994

3 Tributaries, Stream Order 2 (BLM/GIS Stream Order 4), Basin Area 12.81 km^2. 4.71 km in 4 reaches. Fish were noted in 2.64 km. (fry). Beaver activity was noted in reaches 1, 2, & 3. Two pools noted in reach 2. Approximately 40% is BLM ownership. Land use is timber production.

(2) Doe Creek

ODFW Stream Survey July 20 – 21, 1994

2 Tributaries, Stream Order 2 (BLM/GIS Stream Order 4), Basin Area 5.53 km^2. 3.29 km in 4 reaches. Fish were noted in 2.64 km. (trout 3"). Beaver activity was noted in reach 1. No pools were noted. Approximately 10% is BLM ownership. Land use is timber.

(3) Yellow Creek

ODFW Stream Survey June, 20 – July 13, 1994

14 Tributaries, Stream Order 3 (BLM/GIS Stream Order 5), Basin Area 52.71km^2. 17.1 km in 6 reaches. Fish were noted in 15.39 km. (trout 2"). Beaver activity was noted in reaches 1 - 5. No pools were noted. Approximately 40% is BLM ownership. Land use is timber with some residential in lower portion.

Table 13-1 Umpqua Basin Anadromous Fish Obstacles

Code Sheet

The following report was compiled in 1997 by the Oregon Department of Fish and Wildlife and identifies various steps within the Upper Umpqua watershed that create obstacles for anadromous fish. Steps are abrupt, discrete breaks in channel gradient. Steps are usually much shorter than the channel width. However, they are important, discrete breaks in channel gradient with a slope of 10->100%. Only steps >= 1.5 meters were included in this report. Steps are classified by the type of structure forming the step.

SR	Step over BedRock (includes hardpan and clay steps)
SB	Step over Boulders
SC	Step over face of a Cobble bar
SL	Step over Log(s), branches
SS (BP)	Step over a Beaver dam
SS (CC)	Step from a Culvert Crossing
SS (DP)	Man-made step that forms a Dammed pool
CR	Cascade over Bedrock
CB	Cascade over Boulders
FL	Fish ladder present

CREEK	INDEX #	REACH	REACH LENGTH (km)	UNIT #	UNIT TYPE	HEIGHT (m)	DISTANCE (km)
HEDDIN	47126	1	0.684	*	*	*	*
		2	0.613	*	*	*	*
		3	1.001	*	*	*	*
		4	1.369	*	*	*	*
		5	1.506	269	SS(BP)	2	3.78

				325	SB	2.5	4.53
			5.173				
FITZPATRICK	47125	1	1.031	*	*	*	*
		2	1.612	201	SR	2.1	2.47
		3	0.409	236	SR	1.5	2.94
				241	SR	20	3.03
				243	SR	10	3.05
			3.052				
MEHL	47124	1	0.865	*	*	*	*
		2	4.774	*	*	*	*
		3	3.262	*	*	*	*
		4	2.014	*	*	*	*
			10.915				
BRADS	47450	1	0.997	*	*	*	*
		2	2.519	254	SS(BP)	1.5	3.04
		3	1.017	296	SL	1.7	4.24
			4.533				
BRADS TRIB. #1	47451	1	0.306	19	SR	2	0.18
		2	1.207	99	SB	3	1.28
		3	0.761	*	*	*	*
		4	0.631	147	SB	1.8	2.3
			2.905				

MARTIN	47123	1	1.503	*	*	*	*
		2	0.678	*	*	*	*
		3	1.192	*	*	*	*
			3.373				
MARTIN TRIB. #1	47122	1	0.577	11	SR	10	0.29
		2	1.457	*	*	*	*
			2.034				
WAGGONER	47121	1	0.872	7	SR	1.5	0.1
		2	1.592	134	SR	1.5	2.26
		3	2.427	234	SS(BP)	2	3.68
				258	SR	7	4.07
				293	SR	1.5	4.47
		4	1.095	*	*	*	*
		5	0.711	*	*	*	*
			6.697				
MCGEE	47324	1	0.588	*	*	*	*
		2	1.569	*	*	*	*
		3	1.42	169	SL	1.8	2.37
				171	SL	1.6	2.4
				247	SL	1.9	3.07
				280	SL	1.6	3.5
		4	0.622	*	*	*	*
			4.199				
YELLOW	47127	1	2.343	*	*	*	*

		2	5.804	*	*	*	*
		3	2.008	*	*	*	*
		4	1.35	*	*	*	*
		5	3.699	*	*	*	*
		6	1.205	868	SR	3.5	15.02
				911	SR	1.8	15.63
				943	SR	1.8	16.06
			16.409				
BEAR	47128	1	0.886	*	*	*	*
		2	2.152	*	*	*	*
		3	0.732	*	*	*	*
		4	0.942	*	*	*	*
			4.712				
DOE	47129	1	0.957	*	*	*	*
		2	1.07	118	SC	1.9	1.99
		3	0.494	148	SB	3	2.49
		4	0.765	*	*	*	*
			3.286				
LITTLE CANYON	47130	1	3.102	*	*	*	*
		2	0.958	*	*	*	*
		3	1.16	*	*	*	*
		4	0.635	*	*	*	*
			5.855				
LOST	47131	1	1.852	*	*	*	*

		2	0.605	*	*	*	*
		3	1.629	*	*	*	*
		4	1.732	*	*	*	*
		5	0.795	*	*	*	*
		6	0.961	*	*	*	*
			7.574				
WOLF	47482	1	2.144	*	*	*	*
		2	2.211	*	*	*	*
		3	2.389	*	*	*	*
		4	1.28	*	*	*	*
		5	1.578	*	*	*	*
		6	0.825	*	*	*	*
			10.427				
LITTLE WOLF	47495	1	4.379	*	*	*	*
		2	0.556	*	*	*	*
		3	2.703	*	*	*	*
		4	0.55	*	*	*	*
			8.188				
LITTLE WOLF TRIB. #1	47496	1	1.756	*	*	*	*
			1.756				
MINER	47483	1	2.716	*	*	*	*
		2	2.354	*	*	*	*
		3	0.988	*	*	*	*

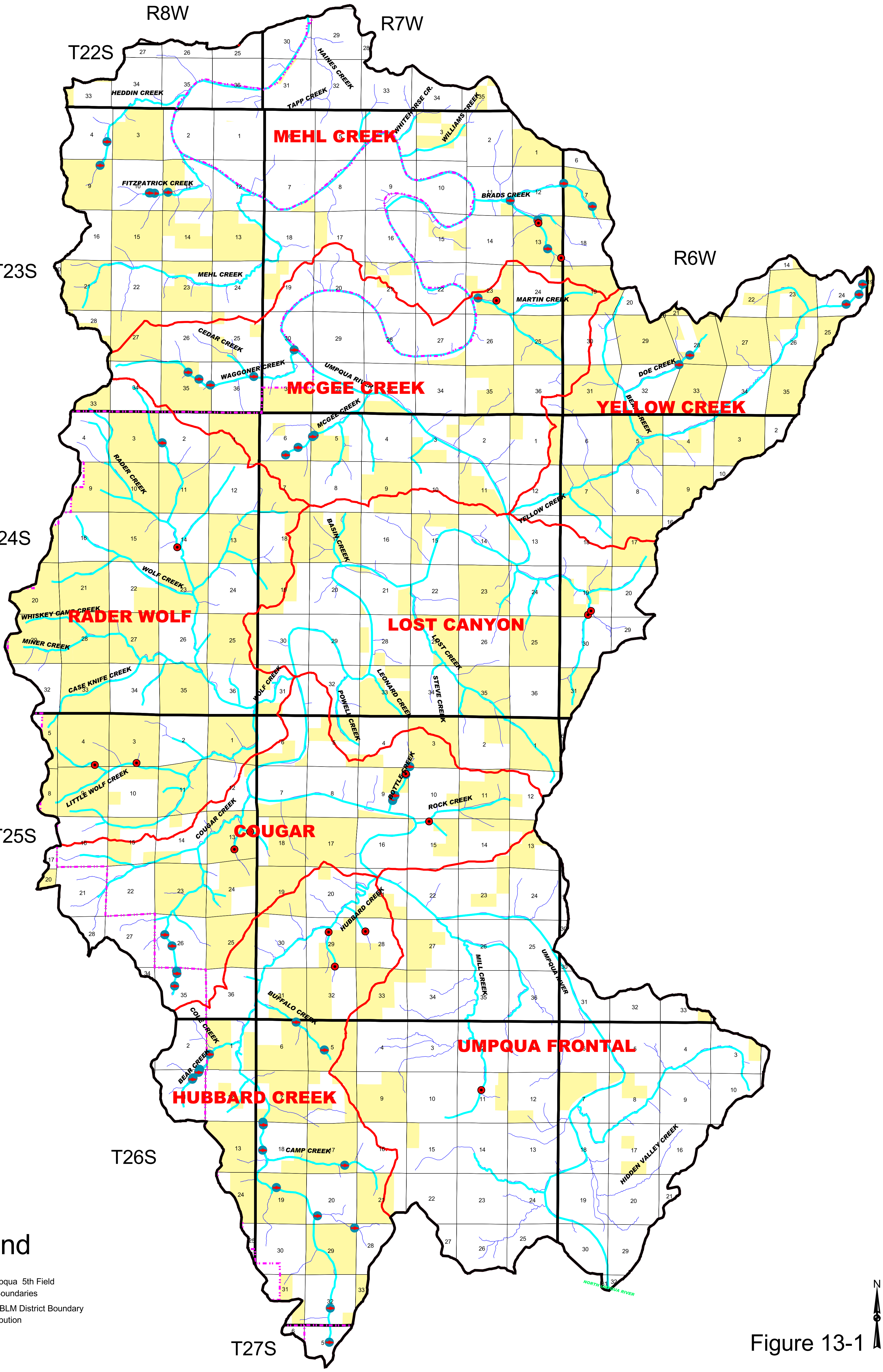
			6.058				
CASE KNIFE	47494	1	2.387	*	*	*	*
			2.387				
RADER	47475	1	1.608	*	*	*	*
		2	1.91	*	*	*	*
		3	1.288	*	*	*	*
		4	1.208	*	*	*	*
			6.014				
RADER TRIB. #1	47481	1	1.669	*	*	*	*
			1.669				
RADER TRIB. #2	47480	1	2.039	*	*	*	*
			2.039				
RADER TRIB. #3	47479	1	1.576	*	*	*	*
		2	0.453	*	*	*	*
		3	2.003	186	SS(BP)	1.5	2.99
			4.032				
RADER TRIB. #3A	47484	1	0.782	*	*	*	*
			0.782				
RADER TRIB. #3B	47489	1	0.362	*	*	*	*

			0.362				
RADER TRIB. #4	47478	1	0.898	*	*	*	*
			0.898				
RADER TRIB. #5	47476	1	0.228	*	*	*	*
			0.228				
RADER TRIB. #6	47477	1	0.264	*	*	*	*
			0.264				
COUGAR	47132	1	2.431	*	*	*	*
		2	1.122	*	*	*	*
		3	2.35	*	*	*	*
		4	0.856	394	SL	2	6.53
		5	0.892	410	SB	1.8	6.86
				447	SS(BP)	2.5	7.65
		6	0.217	449	SS(BP)	2	7.67
		7	0.493	464	SL	1.9	7.97
			8.361				
COUGAR TRIB. #1	47133	1	0.637	*	*	*	*
		2	1.067	*	*	*	*
		3	0.994	*	*	*	*
		4	1.99	*	*	*	*
			4.688				

BOTTLE	47763	1	0.154	*	*	*	*
		2	1.563	25	SL	1.5	0.4
				27	SR	3	0.41
				37	SL	2.5	0.58
				74	SS(CC)	2	1.32
				90	SS(CC)	2.5	1.65
			1.717				
HUBBARD	47134	1	3.763	*	*	*	*
		2	4.44	*	*	*	*
		3	3.735	*	*	*	*
		4	1.85	405	SR	1.7	13.45
				410	SR	1.7	13.48
		5	1.395	466	SL	1.5	14.8
		6	3.546	534	SR	1.7	16.52
		7	2.183	*	*	*	*
		8	1.991	774	SB	2.6	21.89
		9	0.76	901	SL	2.5	23.57
			23.663				
HUBBARD TRIB. #1	47135	1	0.429	4	SB	2.1	0.05
		2	1.241	99	SB	1.7	1.48
			1.67				
BEAR	47136	1	0.894	*	*	*	*
		2	1.43	92	SB	1.5	1.15
				132	SB	2	1.75
				134	SR	7.5	1.77

				136	SR	1.8	1.78
				148	SR	2.8	2.03
				150	SR	3	2.05
		3	0.525	*	*	*	*
			2.849				
BUFFALO	47137	1	1.062	*	*	*	*
		2	0.717	83	SB	3.3	1.4
				87	SB	1.5	3.3
		3	0.697	*	*	*	*
			2.476				
CAMP	47138	1	2.093	*	*	*	*
		2	0.614	146	SB	2.1	2.64
		3	0.22	*	*	*	*
			2.927				

Upper Umpqua
ODFW and BLM Observed Road Related and Natural Fish Barriers



Legend

- Upper Umpqua 5th Field
- 6th Field Boundaries
- Roseburg BLM District Boundary
- Fish Distribution
- Sections
- T-R
- Streams
- BLM
- BLM database fish blockage culverts
- ODFW database fish barriers

1 0 1 2 Miles

N

Figure 13-1

Table 13-2 Salmon Life Cycle

WHERE ARE THE SALMON, WHEN? GENERALIZED LIFE HISTORY PATTERNS OF SALMON, STEELHEAD, AND TROUT IN THE PACIFIC NORTHWEST*									
	Adult Return	**Spawning Location**	**Eggs in Gravel ****	**Young in Stream**	**Freshwater Habitat**	**Young Migrate Downstream**	**Time in Estuary**	**Time in Ocean**	**Adult Weight (Avg.)**
COHO	Oct-Jan	coastal streams, shallow tribs.	Oct-May	1+yrs	tributaries, mainstem, slack water	Mar-Jul (2nd yr.)	few days	2 yrs	5-20 lb (8)
CHINOOK		main stem large and small rivers			main stem-large and small rivers		days-months	2-5 yrs	
spring	Jan-Jul		Jul-Jan	1+yrs		Mar-Jul (2nd yr.)			10-20 lb (15)
summer	Jun-Aug		Sep-Nov	1+yrs		Spring (2nd yr.)			10-30 lb (14)
fall	Aug-Mar		Sep-Mar	3-7 months		Apr-Jun (2nd yr.)			10-40 lb
CUTTHROAT (Coastal-Sea Run)	Jul-Dec	tiny tributaries of coastal streams	Dec-Jul	1-3 yrs (2 Avg.)	tributaries	Mar-Jun (2nd-4th yr.)	less than one month	0.5-1 yrs	0.5-4 lb (1)
STEELHEAD***		tributaries, streams & rivers			tributaries		less than one month	1-4 yrs	
winter	Nov-Jun	Nov-Jun	Feb-Jul	1-3 yrs		Mar-Jun (2nd-5th yr.)			5-28 l b(8)
spring	Feb-Jun	Feb-Jun	Dec-May	1-2 yrs		Spr & Sum (3rd-4th yr.)			5-20 lb
summer(Col. R)	Jun-Oct	Jun-Oct	Feb-Jun	1-3 yrs		Mar-Jun (of 3rd-5th yr.)			5-30 lb (8)
summer(coastal)	Apr-Nov	Apr-Nov	Feb-Jul	1-2 yrs		Mar-Jun (of 2nd-5th yr.)			5-30 lb (8)

* There is much variation in life history patterns--each stream system having fish with their own unique timing and patterns of spawning, growth, and migration. Ask a local biologist about the specific patterns of the fish in your streams and update this chart for your area.

** The eggs of most salmonids take 3-5 months to hatch at the preferred water temperature of 50-55 degrees F; Steelhead eggs can hatch in 2 months.

*** Steelhead, unlike salmon and cutthroat trout, may not die after spawning. They can migrate back out to sea and return in later years to spawn again.

Adapted by Pacific States Marine Fisheries Commission. Sources: Ocean Ecology of North Pacific Salmonids, Bill Pearcy, University of Washington Press, 1992 Fisheries Handbook of Engineering Requirements and Biological Criteria, Milo Bell, U.S. Army Corps of Engineers, 1986; Adopting A Stream; A Northwest Handbook, Steve Yates, Adopt-A Stream Foundation, 1988.

B. Defining Instream and Off-Channel Habitat Enhancement Opportunities: A Stochastic Multi-Attribute Prioritization Model

Developed by:
Stephen Kropp, U. S. BLM Roseburg District

1. Introduction

Decision models can play an important role in facilitating the identification of potential project sites in that they require clear choices of decision parameters, objectives and criteria. Models also help to ensure that decision criteria are unbiased and applied consistently across the entire landscape or area of analysis.

There are at least two critical factors to consider in the development of any habitat restoration plan:

A. The location, distribution, and connectivity *high potential* or *high value habitats*. Certain habitat types (riparian areas, wet areas, or low gradient streams) may be more important to conserve and/or restore than others, either because they are relatively rare, or provide potentially *suitable habitat* for rare, endangered or threatened species.

B. The *need for action,* which is a function of both:
- the site condition, or the extent to which the site currently provides suitable habitat for the full range of species that are native to that site, and
- the site's ability to recover on its own.

The *aquatic habitat potential* of a given site is defined as the site's long-term potential to support a diverse assemblage of native aquatic and/or riparian dependent flora and fauna. Many of the most valuable riparian and aquatic habitats in the Upper Umpqua have been developed for residential housing or agriculture, so that unmanaged or undisturbed habitats of this type merit particular attention.

Models that attempt to define suitable habitats for individual species of concern (i.e., PHABSIM and related models) are heavily data dependent and of limited use in predicting general patterns of habitat suitability for multiple species on a watershed scale. In the Umpqua Basin, data describing the distribution of fish and riparian dependant species of wildlife are generally "hit and miss." In many cases, areas that are classified as "cold spots" may simply be areas that have never been surveyed. In addition, centers of species richness often do not overlap, or overlap only slightly (Noss, et. al., 2001), so that restoration plans that depend too heavily on species distribution data are likely to ignore many unsurveyed species. Because it is impossible to model habitat suitability or potential for every aquatic and riparian dependant species of concern, surrogates or proxy measures of site potential are necessary. A generalized (non species-specific) habitat and project prioritization model is therefore proposed.

2. Model Formulation

Stream reaches are prioritized for physical habitat enhancement by assigning a prioritization score to each reach. The prioritization score (R') is expressed as a function of both the long-term habitat potential and the need for action:

$$R' = 10\text{th quantile } (R)$$
$$R = N'^{\,(P'^{\wedge}F1)}$$

where:

R = raw prioritization score
P = long-term habitat potential
N = need for action
F1 = subjective calibration constant

and P', R' and N' are adjusted scores (re-calculated to fall on a scale of 1-10). Although the choice of F1 is subjective, its value is probably close to 1.3. The double exponential relationship between R, N and P helps to ensure that those areas with the highest potential are prioritized above areas that are heavily degraded, provided that some need for action exists. The long-term habitat potential, P, and the need for action, N, are defined as follows:

$$\begin{aligned} P = \; & c_1 \cdot f\,(\text{riparian habitat index}) + \\ & c_2 \cdot f\,(\text{riparian road index}) + \\ & c_3 \cdot f\,(\%\text{ secondary channels}) + \\ & c_4 \cdot f\,(\text{floodplain connectivity}) + \\ & c_5 \cdot f\,(\text{hardwoods mix index}) + \\ & c_6 \cdot f\,(\text{percent harvest}) \end{aligned}$$

$$\begin{aligned} N = \; & c_7 \cdot g\,(\text{LWD deficit}) + \\ & c_8 \cdot g\,(\text{riffle habitat index}) + \\ & c_9 \cdot g\,(\text{pool area}) + \\ & c_{10} \cdot g\,(\text{recruitment index}) + \\ & c_{11} \cdot g\,(\text{channel incision}) \end{aligned}$$

where:

$$f(p_i) = [50 - (10 - p_i)^{F2}]/5$$

$g(n_i) = n_i^{F2}/5$

and

c_1 - c_{11} = user defined weighting coefficients
F2 = subjective calibration constant
n_i, p_i = component indices

Repeated trials suggest that F2 is probably close to 1.7 (see Section 7 for more information on model calibration procedures).

The functions f(x) and g(x) are nonlinear *value functions* that take into account the fact that marginal preferences for individual values (i.e., old growth) tend to decline as they approach 100%, holding other values constant. This is almost always true. If it were not, then there would be no need to consider more than one decision parameter.

This approach virtually guarantees that all decision criteria will be satisfied to some extent, but does not *require* certain criteria be met *at any cost*. Rather, marginal decisions regarding the importance of particular weighting criteria are made within the context of their effects on other decision parameters. Thresholds may still be defined for certain parameters if desired. Because large woody debris replacement is the primary method of physical habitat enhancement, an option to specify a lower LWD deficit threshold is provided in the model. If the user specifies a threshold, the prioritization score is adjusted according to the following equation:

$$R'_{ADJ} = R' \div \left[10 - \left(\frac{9}{D_{MIN}} \right) \cdot D \right]$$

where:

R'_{ADJ} = adjusted prioritization score
D = large woody debris deficit
D_{MIN} = user specified threshold

Any project prioritization process requires decisions about which specific attributes of the ecosystem will be analyzed. These decisions are guided by ***two primary criteria:***

A. Consistent and reliable attribute data must be available for most of the streams within the study area.

B. The attribute must be capable of successfully distinguishing degraded streams from relatively undisturbed (reference) streams.

Proposed component indices (described in Sections 4 and 5 below) were identified that satisfy both of these criteria (see Karr, 1999).

3. Reference Sites

Reference site data forms the basis for many of the empirical relationships presented below. Reference site selection criteria should be as general as possible, and based primarily on disturbance history (percent harvest, road density, and so on) so that reference site selection criteria do not influence empirically-derived site characterization criteria. Because many otherwise unmanaged streams in the region have been cleaned and/or salvage logged, however,

Figure 1. Physical Reference Site Locations

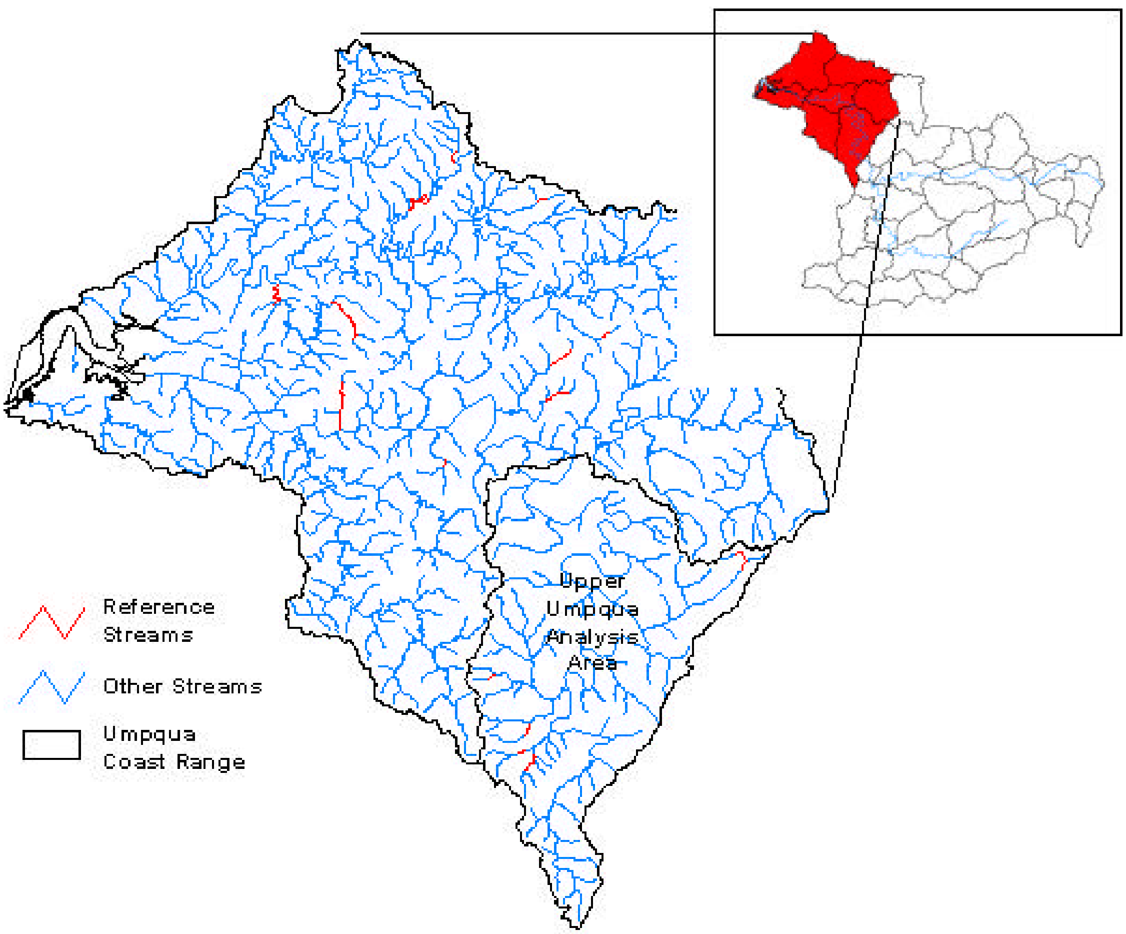


Table 1. Reference Site Selection Criteria

Parameter	Selection Criteria
Percent Harvest (within 200 feet of stream)	< 30%
Riparian Road Density	< 0.3 mi/mi
Width:?Depth Ratio	< 40
Percent Pools	> 10% and < 70%
Percent Fines	< 70%
Percent Gravel	> 20%
Total Pieces LWD	> 5 per 100 m
Percent Bank Erosion	< 30%

Table 2. Physical Reference Sites

Stream Name	Reach ID
Cougar Creek	3
Cougar Creek Trib. #1	2
Halfway Creek	5
Little Mill Creek	1
Little Paradise Creek	3
Little Wolf Creek Trib #1	1
Lutsinger Creek	4
Miner Creek	3
North Sister Creek	4
Paradise Creek	5
Paradise Creek	6
Wasson Creek	8
Wasson Creek Trib #2	1
Wasson Creek Trib #2	2
Wasson Creek Trib #2	3
West Fork of Smith River	3
West Fork of Smith River	6
Yellow Lake Creek	5
Yellow Creek	5

selection criteria based upon percent harvest (or riparian road density) alone are insufficient for the purpose of defining reference sites. Selected reference site selection parameters and criteria are shown in Table 1.

Data for approximately 400 stream reaches throughout the western half of the Umpqua Basin, from Sutherlin to the Coast, were examined. A total of nineteen reaches met these criteria. These reaches are listed in Table 2 and Figure 1.

4. Habitat Potential

Because stream morphology is heavily influenced by alluvial valley characteristics (flood-prone width and terrace height, overstory species composition, backwater and off-channel habitat features, and so on), the long-term aquatic habitat potential is closely tied to that of the riparian zone. Where lotic systems have been heavily degraded by past management practices, the long-term habitat potential of the stream itself may be further limited as a result of changes in certain fundamental fluvial processes and attributes. For example, forestland management practices of the past often involved extensive clearcutting, tractor yarding and road building within the riparian corridor, and the removal of large woody debris from the stream channel. These activities often caused streams to downcut, widen, and then aggrade, eventually leading to the formation of a new and smaller floodplain terrace below the previous alluvial valley floor. This model of channel response is typical of stream channels with cohesive banks that have been subjected to these kinds of practices (Schumm, et. al., 1984; Simon, 1989, 1995). The active channel may remain wider for a considerable length of time (Dose, 1994), while the lower floodplain terrace may be significantly reduced in size (or even absent) and thus more frequently inundated. In channels that have undergone this pattern of response, the true "riparian habitat" (periodically inundated habitat capable of supporting hydrophytic or facultative wetland species) may be greatly reduced relative to its former potential.

Riparian Habitat Index

The actual extent of the riparian zone varies throughout the stream network, generally increasing downstream as the stream gradient decreases and the valley widens. SINMAP, an ArcView GIS extension that facilitates terrain stability modeling, was used by Pack et. al. (2001) to map areas where water is likely to accumulate, based on topography (drainage area and slope). The methods used by Pack et. al. were employed to model wet habitats throughout the analysis area. The model was calibrated to known alluvial valley widths (measured in the field) along several streams of different orders and gradients.

The long-term riparian habitat potential was estimated for each Oregon Department of Fish and Wildlife (ODFW) surveyed stream reach by calculating the area within 800 feet of the stream classified as saturated or perennially wet. For A/L < 0.5, the *riparian habitat index* is equal to:

$$RHI = 20 \cdot \left(\frac{A}{L} \right)$$

where A is the total area classified as saturated or perennially wet, and L is the reach length. Where A/L > 0.5, RHI = 10. As with all other indices in this section, the habitat potential declines as the index value (RHI) approaches zero.

Riparian Road Index

Roads regularly cross riparian areas or follow streams, and often serve as migration corridors for noxious weeds. Roads running through riparian areas also displace habitat and can disrupt hydrologic and subsurface (hyporheic) processes, alter stream morphology, and reduce opportunities for restoring off-channel features such as backwater ponds or secondary channels. Roads lying within 150 feet of streams were mapped using Bureau of Land Management spatial transportation data (GTRN). For RD ≤ 2, the r*iparian road index* is given by:

$$RRI = 10 - 10 \cdot \left(\frac{RD}{2} \right)$$

where RD is the road density (mi/mi). For RD > 2, RRI = 0.

Percent Secondary Channels

Secondary channels were mapped by the Oregon Department of Fish and Wildlife (ODFW) for most low gradient streams within the analysis area, and reported in units of miles of per mile. For PSC ≤ 0.1, the o*ff channel habitat index* is given by:

$$OCI = 100 \times PSC$$

where PSC is the percent secondary channels (mi/mi). For PSC > 0.1, OCI = 10.

Floodplain Connectivity

Direct measures of floodplain connectivity include the degree of channel incision, and the height of the lower floodplain terrace above the active channel bed. Bank erosion is also used here as an indirect indicator that the channel is down-cutting and/or widening. All three of these parameters were consistently evaluated by ODFW for all surveyed stream reaches and were combined to develop a floodplain connectivity index. The *floodplain connectivity index* is expressed as:

$$FCI = 10 - \left[2.5 \cdot \left(\frac{BE}{99.3} \right) + 2.5 \cdot \left(\frac{TH}{4.8} \right) + 5 \cdot \left(\frac{BH}{2.3} \right) \right]$$

where:

BE = percent bank erosion
TH = lower floodplain terrace height
BH = average vertical distance to top of streambank

These parameters are internally weighted (as indicated above) based upon their ability to separate degraded streams from relatively unmanaged streams.

Percent Harvest

The riparian habitat potential of a given reach may be compromised if past harvest practices have displaced critical overstory species or altered understory species diversity. Riparian structural diversity, tree species composition, and understory shrub and herb diversity have not been systematically surveyed within the Upper Umpqua.

Overstory stand size classes within the riparian zone on BLM-administered lands were estimated from Forest Operations Inventory (FOI) birth year data, using 200-foot buffers on all stream reaches to define riparian zones (Appendix A). Because most of the timber with 200 feet of the stream on private lands (typical buffer width is 20 feet) has been harvested or is scheduled for harvest, 90% harvest was assumed for any privately owned portions of the riparian corridor. For BLM-administered lands, stands with a birth year (BK) prior to 1945 are assumed to be unmanaged. The index is calculated as:

$$HI = (1 - PH) \cdot 10$$

where PH is the percentage of the riparian corridor that has been clearcut.

5. Need for Action

Many of the larger 3rd, 4th and 5th order streams within the Upper Umpqua were cleaned and/or salvage logged and are physically impaired (lack microhabitat diversity). Many of these streams are probably structurally dependant on large woody debris. Large woody debris replacement may accelerate the recovery of desirable habitat features within some of these streams. Low gradient stream reaches (defined here as those tributary stream reaches with an average gradient of 7% or less) are more likely to be structurally dependant on large woody debris than higher gradient streams (Hogan, et. al., 1996).

Physical habitat surveys have been conducted for most low streams within the Umpqua Coast Range.

Large Woody Debris Deficit

The physical condition of the channel is represented by its departure from reference conditions (defined based on surveys conducted in areas that have been unimpacted by management activities). Reference sites identified within the western half of the Umpqua Basin are listed above in Section 3. Reference site surveys indicate that there may be a variable threshold LWD count (total number of pieces per 100 meters) that varies as a function of stream gradient. The relationship appears to be best represented by an equation of the form:

$$LWD_{min} = k_1 \ln(S) + k_2$$

where S is the average stream gradient and k_1 and k_2 are constants. A regression performed on available reference data from the Umpqua Coast Range estimate the coefficient k_1 at 2.0 and k_2 at 11.

Streams that do not meet these minimum criteria are considered to be LWD deficient. The *large woody debris deficit* is given by:

$$D = \left(1 - \frac{LWD}{LWD_{min}}\right) \cdot 10$$

Riffle Habitat Index

Two separate parameters were used to evaluate the condition of the channel substrate: i) the percent gravel, and ii) the percent fine material (sands, silts and clay) present within riffle habitat units. Reference data for low gradient, 3rd, 4th and 5th order streams suggest that riffles contain, on average (depending on channel gradient), at least 25% gravel. The gravel content appears to be consistently greater than 25% across a variety of relatively low gradient reference streams.

Fine sediment appears to vary as a function of stream gradient. Streams are assumed to fall within the natural range of variability if the following criterion is met:

$$F < F_{max} = 57 - 27.9 \ln(S)$$

Scores were assigned to surveyed reaches based on their departure from defined reference criteria:

$$RHI = 10 - \frac{(100 - PEF)}{25} + \frac{(100 - PGD)}{16}$$

where PEF is the percent excess fines and PGD is the percent gravel deficit. Data was obtained from ODFW.

Pool Area

Pool area in low gradient reference streams within the western portion of the Umpqua Basin appears to vary (in part) as a function of stream gradient. The following functional form is proposed for expressing this relationship:

$$PA = k_1 - k_2S$$

where PA is the percent pool habitat, S is the stream gradient, and k_1 and k_2 are constants. Regressions based on reference data suggest $k_1 = 46$ and $k_2 = 3.8$. Although the spread is fairly wide at +25/-15 percentage points, almost half the streams within the study area fell outside of this margin of error. The measure was therefore retained as an indicator metric. A pool habitat index was calculated for each stream reach based on how close the pool frequency fell to the estimated regression line, beyond the specified margin of error. The index is calculated as follows:

$PA\ -15 < PA - PA_R < 25$, then
$PI = 10$, otherwise

$$PI = (|PA_R + 5 - PA| - 20)/3.5$$

where:

S = stream gradient
PA = percent pool area
$PA_R = 46 - 3.8S$ = reference

Recruitment Index

For this analysis, the *recruitment index* is assumed to be directly proportional to the number of large (> 24” diameter) conifers per stream mile (N), and is based upon surveys conducted by ODFW:

$$RI = 10 - N/2$$

If N > 20, then RI was set equal to 0.

Channel Incision

This metric is similar to the floodplain connectivity metric but ignores the vertical distance to the lower floodplain terrace:

$$CII = \left[5 \cdot \left(\frac{BE}{99.3}\right) + 5 \cdot \left(\frac{BH}{2.3}\right)\right]$$

where:

BE = percent bank erosion
BH = average vertical distance to top of streambank

6. Other Parameters Considered but Not Used

Hardwoods provide important habitats for many riparian dependent species of wildlife (TFW, 1988), and are commonly more abundant in riparian than upland areas. Preliminary analyses indicate that the hardwood-to-conifer ratio (measured as the total number of hardwood stems divided by total conifer stems larger than 50 cm DBH) in relatively unmanaged (reference) areas may fall anywhere between zero and two. However, the ratio did not demonstrate any significant relationship to other measures of riparian habitat or floodplain connectivity. There may be too many other variables that influence the hardwood:conifer ratio (or too little data) to define meaningful characterization criteria for this metric.

The bankfull width:depth ratio was also considered but demonstrated no relationship to other channel condition metrics or indices. Further, the bankfull width:depth ratio was unsuccessful in separating managed sites and unmanaged sites, so this metric was rejected.

7. Calibrating the Model to Professional Expectations

Any theoretical model must be calibrated, and prioritization models are no exception. Individual impressions based on field experience are often inconsistent and dependant on the amount of time spent at each site, each individual observer's background and purpose in visiting the site. When the expectations of multiple professionals are combined, however, field observations and professional experience can play a very important role in testing model assumptions. As the initial model is tested and results are analyzed, the initial parameters and/or prioritization criteria are typically modified until either:

A. A majority of modeled recommendations conform to combined professional expectations, or

B. A sub-sample of site-specific recommendations are sufficiently investigated to satisfy the concerns of the review team.

Table 3. Weighting Criteria	
Parameter	c_i
riparian habitat index	3
riparian road index	2
% secondary channels	2
floodplain connectivity	1
hardwoods mix index	0
percent harvest	1
LWD deficit	3
riffle habitat index	2
pool frequency	2
recruitment index	1
channel incision	1

Areas that have been previously identified by various specialists as high priorities within the Upper Umpqua include Cougar Creek, Little Wolf Creek, portions of Yellow Creek (above Bear Creek), the lower portions of Martin Creek, Lower Wolf Creek, and Lost Creek (below the upper North Fork). Weighting coefficients were adjusted and results were examined until a majority of modeled recommendations conformed to professional expectations. The following values were recommended for the Upper Umpqua analysis area, with D_{MIN} set to 20%.

8. Incorporating Uncertainty

Uncertainty is inherent in almost every aspect of the decision-making process, and deterministic models that search for only one, single *optimal* solution are of very limited use and can produce confusing or misleading recommendations. This is especially true where subjective weighting coefficients are used, and where the optimal solution is particularly sensitive to one attribute or another (as is often the case). A method of modeling complex decisions involving multiple objectives and a very large number of smaller, incremental choices (in this case, which reaches to target for physical habitat enhancement) is presented in Kropp (1998). The method involves modeling the probability that each incremental choice (stream reach) will be included in the preferred alternative given the uncertainties involved in defining relationships between subjective values, and the uncertainties associated with all of the associated logistical constraints.

Table 4. Variable Range Coefficients	
Parameter	c_i
riparian habitat index	2-4
riparian road index	1-3
% secondary channels	1-3
floodplain connectivity	1-2
hardwoods mix index	0-1
percent harvest	1-2
LWD deficit	2-4
riffle habitat index	1-3
pool frequency	1-3
recruitment index	1-2
channel incision	1-2

For example, the decision of how to weight the relative impacts of past harvest vs. the impacts of road building on the long-term habitat potential is essentially a subjective decision. Rather than fixing the weighting coefficients associated with these attributes, we represent the weighting coefficients as uniform probability distributions, so that those areas *most likely to be included* in the preferred alternative under a wide range of possible weighting scenarios can be identified (see Table 2). Logistical uncertainties may also incorporated into the model. The result is a sub-set of decisions (stream reaches) that are most likely to be favored given the full range of logistical and other constraints one might face (at least to the extent that they can be anticipated).

There are many advantages to allowing value-based parameters to vary within specified limits. Defining attribute weighting schemes too narrowly can unnecessarily limit the information the model is capable of providing. Seldom are the relative weights of conflicting natural resource values readily obvious or clearly defined. Relaxing the weights imposed on individual attributes or indices even slightly can create tremendous flexibility in identifying a range of alternatives that satisfy both known and unknown constraints, including site access constraints. A Monte Carlo sampling algorithm was employed to predict the probability that individual reaches would be included among the top 20 candidate restoration sites.

9. Results

A total of 2,000 trial runs were performed using the variable range criteria specified in Table 4. Those sites with the highest mean R' values are shown below. Those sites most likely to be included in the preferred alternative are shaded.

Table 5. Preferred Habitat Enhancement Sites			
Stream	Reach	$\overline{R'}$	P(R' > 7.5)
Bear Creek	1	9	1.00
Bottle Creek	1	9	0.95
Brads Creek	1	8	0.58
Cougar Creek	1	10	1.00
Hubbard Creek	3	9	1.00
Hubbard Creek	4	9	0.85
Hubbard Creek	6	7	0.40
Little Canyon Creek	1	8	0.91
Little Canyon Creek	2	10	1.00
Little Wolf Creek	1	9	0.97
Little Wolf Creek	2	7	0.33
Little Wolf Creek	3	8	0.81
Little Wolf Creek	4	9	0.91
Lost Creek	3	10	1.00
Martin Creek	1	8	0.55
Rader Creek	3	9	1.00
Rader Creek Trib #3	3	10	1.00
Wolf Creek	1	10	1.00
Wolf Creek	2	8	0.63
Wolf Creek	4	8	0.77
Yellow Creek	1	9	0.97

10. Other Considerations

The method presented here should be viewed only as a *screening tool* for identifying streams most likely to benefit from physical habitat enhancement activities. Field investigations are necessary before modeled recommendations are included in any final action plan. Most of the streams included in this analysis were surveyed prior to the 1996 flood, and conditions have probably changed since then. In addition, local habitat conditions often vary considerably over the length of any given reach. Important logistical considerations, including access, ownership or right-of-way issues, or the availability of logs or nearby trees for placement in the stream, are not taken into account in this appendix. Neither are issues related to habitat connectivity, or the restoration and preservation of interconnected, priority sub-watersheds.

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