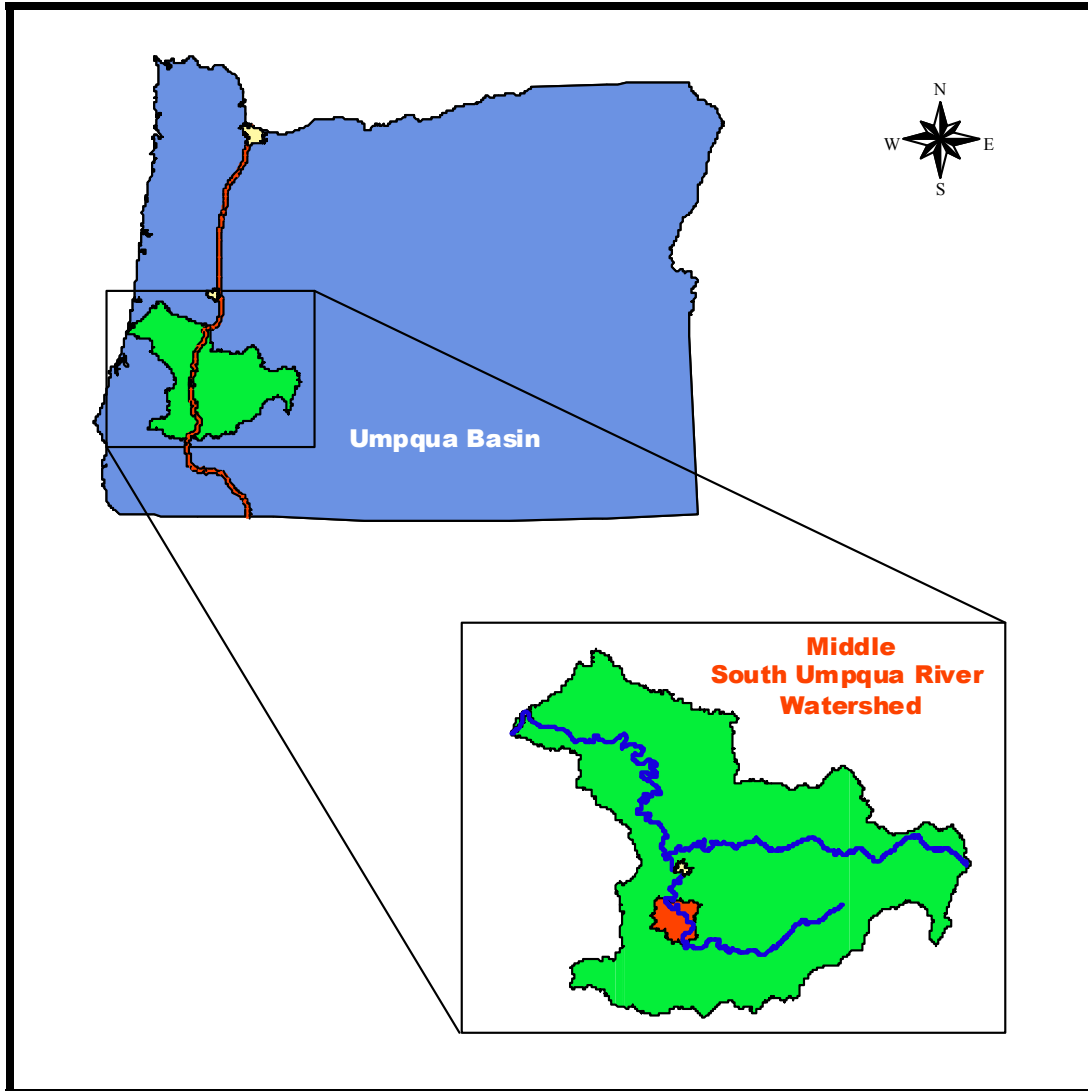


Middle South Umpqua

Watershed Assessment and Action Plan



Prepared by Nancy A. Geyer for the
Umpqua Basin Watershed Council



July, 2003



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July, 2003

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Table of Contents

Lists of Photographs, Maps, Figures, and Tables	4
Acronym List	7
Forward	8
1. Introduction	9
1.1. Purpose and development of the watershed assessment	9
1.1.1. The Umpqua Basin Watershed Council.....	9
1.1.2. The watershed assessment and action plan.....	9
1.1.3. Assessment development.....	10
1.2. Watershed description.....	10
1.2.1. Location, size, and major features	10
1.2.2. Ecoregions.....	11
1.2.3. Topography	12
1.2.4. Geology.....	14
1.2.5. The Middle South Umpqua Watershed stream network.....	18
1.2.6. Climate.....	19
1.2.7. Vegetation.....	21
1.3. Land use, ownership, and population	22
1.3.1. Land use and ownership.....	22
1.3.2. Population and demographics	24
2. Past Conditions	28
2.1. Pre-settlement: Early 1800s	28
2.1.1. Indian lands	28
2.1.2. European visitors	30
2.2. Settlement period: Late 1840s to the 1890s.....	31
2.2.1. Early settlement	31
2.2.2. Gold mining	32
2.2.3. Mercury mining	33
2.2.4. Nickel mining.....	33
2.2.5. Agriculture	33
2.2.6. Commercial fishing.....	33
2.2.7. Logging.....	34
2.2.8. Transportation.....	34
2.3. Onset of the modern era: Early 1900s to the 1960s.....	35
2.3.1. Transportation.....	35
2.3.2. Logging.....	36
2.3.3. Mercury mining	37
2.3.4. Nickel mining / copper and zinc mining.....	38
2.3.5. Hatcheries	38
2.3.6. Agriculture	39
2.4. Modern era: 1970s to the present.....	39
2.4.1. Logging.....	39
2.4.2. Mining.....	40
2.4.3. Dam construction	41

2.4.4. Tourism	41
2.4.5. Settlement patterns and urbanization	41
2.4.6. Douglas County population growth	42
2.5. History of the Middle South Umpqua Watershed	42
2.5.1. Middle South Umpqua historical timeline	42
2.5.2. Middle South Umpqua population	44
2.5.3. 1900 forest conditions	45
2.5.4. Historical fish use	46
2.6. Historical references	47
3. Current Conditions.....	50
3.1. Stream function.....	50
3.1.1. Stream morphology.....	50
3.1.2. Stream connectivity	58
3.1.3. Channel modification.....	60
3.1.4. Stream function key findings and action recommendations	62
3.2. Riparian zones and wetlands.....	63
3.2.1. Riparian zones.....	63
3.2.2. Wetlands	67
3.2.3. Riparian zones and wetlands key findings and action recommendations	72
3.3. Water quality.....	73
3.3.1. Stream beneficial uses and water quality impairments	73
3.3.2. Temperature	75
3.3.3. Surface water pH.....	79
3.3.4. Dissolved oxygen.....	80
3.3.5. Nutrients.....	81
3.3.6. Bacteria	82
3.3.7. Sedimentation and turbidity	83
3.3.8. Toxics.....	95
3.3.9. Water quality key findings and action recommendations	98
3.4. Water quantity.....	100
3.4.1. Water availability	100
3.4.2. Water rights by use	101
3.4.3. Streamflow and flood potential.....	101
3.4.4. Water quantity key findings and action recommendations	104
3.5. Fish populations.....	104
3.5.1. Fish presence.....	104
3.5.2. Fish distribution and abundance	105
3.5.3. Fishing.....	111
3.5.4. Salmonid population trends	111
3.5.5. Fish populations key findings and action recommendations	112
4. Current Trends and Potential Future Conditions	113
4.1. Overview.....	113
4.2. Stakeholder perspectives.....	113
4.2.1. The City of Winston.....	113
4.2.2. The City of Myrtle Creek.....	116
4.2.3. Agricultural landowners.....	117

4.2.4. Family forestland owners.....	120
4.2.5. Industrial timber companies.....	123
4.2.6. The USDI Bureau of Land Management.....	125
4.2.7. Oregon Department of Environmental Quality.....	128
5. Landowner perspectives	131
5.1. Overview.....	131
5.2. Landowner interviews.....	132
6. Action Plan.....	140
6.1. Property ownership and restoration potential	140
6.2. Middle South Umpqua Watershed key findings and action recommendations.....	141
6.2.1. Stream function.....	141
6.2.2. Riparian zones and wetlands.....	142
6.2.3. Water quality.....	143
6.2.4. Water quantity.....	145
6.2.5. Fish populations	146
6.3. Specific UBWC enhancement opportunities	146
References	148
Appendices	151
Appendix 1: Additional geological information for western Oregon and for the Middle South Umpqua Watershed.....	152
Appendix 2: Census area locations and Douglas County data.	161
Appendix 3: 1968 streamflow and temperature measurements.....	164
Appendix 4: Stream habitat surveys.	165
Appendix 5: Land use classifications for the ODFW stream habitat surveys.	167
Appendix 6: Riparian vegetation and features.....	169
Appendix 7: Riparian buffer width.....	172
Appendix 8: Riparian cover.....	175
Appendix 9: Water availability graphs	178
Appendix 10: Water use categories.	180
Appendix 11: Middle South Umpqua Watershed anadromous salmonid distribution by species.....	181
Acknowledgements.....	185

Lists of Photographs, Maps, Figures, and Tables

Photographs

Photo 5-1: Gravel mine along the South Umpqua River during high water.....	134
Photo 5-2: Gravel mine by the South Umpqua River during normal flows.	135

Maps

Map 1-1: Location of the Middle South Umpqua Watershed.....	11
Map 1-2: Ecoregions of the Middle South Umpqua Watershed.....	12
Map 1-3: Percent slope for the Middle South Umpqua Watershed.....	13
Map 1-4: Elevation of the Middle South Umpqua Watershed.	14
Map 1-5: Physiographic provinces of the Middle South Umpqua Watershed.	15
Map 1-6: Middle South Umpqua geologic units and faults.....	17
Map 1-7: Major streams of the Middle South Umpqua Watershed.....	18
Map 1-8: Transient snow zone in the Middle South Umpqua Watershed.....	21
Map 1-9: Land use in the Middle South Umpqua Watershed.	22
Map 1-10: Land ownership in the Middle South Umpqua Watershed.	23
Map 1-11: Parcel size distribution for the Middle South Umpqua Watershed.....	24
Map 1-12: Population distribution within the Middle South Umpqua Watershed.	25
Map 2-1: 1900 vegetative patterns for the Middle South Umpqua Watershed.	46
Map 3-1: Stream gradients for the Middle South Umpqua Watershed.	51
Map 3-2: Streams surveyed in the Middle South Umpqua Watershed.....	54
Map 3-3: Road and stream crossings in the Middle South Umpqua Watershed.	60
Map 3-4: Dominant riparian vegetation for the Middle South Umpqua Watershed.	65
Map 3-5: Riparian buffer widths for the Middle South Umpqua Watershed.	66
Map 3-6: Percent cover for the Middle South Umpqua Watershed.....	67
Map 3-7: Locations of Middle South Umpqua Watershed roads within 200 feet of a stream.....	87
Map 3-8: Locations of Middle South Umpqua Watershed roads within 200 feet of a stream and on slopes that are greater than 50%.	88
Map 3-9: Debris flow potential within the Middle South Umpqua Watershed.....	89
Map 3-10: Hydrologic soils map of the Middle South Umpqua Watershed.	91
Map 3-11: K class distribution within the Middle South Umpqua Watershed.....	92
Map 3-12: Wildfire location, year, and size in the Middle South Umpqua Watershed....	95
Map 3-13: Anadromous salmonid distribution within the Middle South Umpqua Watershed.	106
Map 3-14: Potential resident and anadromous salmonid habitat in the Middle South Umpqua Watershed.....	107
Map 3-15: Middle South Umpqua Watershed coho spawning survey locations.....	108
Map 4-1: Location of BLM administered lands in the Middle South Umpqua Watershed.	125
Map 5-1: Phase II watershed assessment and action plan areas.	131
Map 6-1: Ownership size by acre for the Middle South Umpqua Watershed.....	141

Figures

Figure 1-1: Average minimum and maximum temperature for Riddle (station #7169) averaged from 1961 through 2002. 19

Figure 1-2: Annual precipitation for Riddle (station #7169). 20

Figure 1-3: Mean monthly precipitation for Riddle (station #7169) averaged from 1900 through 2001. 20

Figure 2-1: Population growth in Douglas County from 1860 through 2000. 42

Figure 2-2: Middle South Umpqua population from 1860 through 2000. 45

Figure 3-1: Seven-day moving average maximum temperature trends for the South Umpqua River within the Middle South Umpqua Watershed. 77

Figure 3-2: Seven-day moving average maximum temperature trends for Middle South Umpqua Watershed tributaries. 77

Figure 3-3: pH levels for Middle South Umpqua Watershed monitoring sites. 80

Figure 3-4: Water availability in the Kent Creek WAB (#319). 100

Figure 3-5: Mean monthly water flow for the South Umpqua River at Brockway (gauge #14312000). 102

Figure 3-6: Annual average flow and peak flow for the South Umpqua River at Brockway (gauge #14312000). 103

Figure 3-7: Middle South Umpqua Watershed coho spawning surveys from 1998 through 2000. 109

Figure 3-8: Aerial fall chinook counts for the Middle South Umpqua Watershed and for the entire South Umpqua River. 110

Figure 3-9: Aerial fall chinook count, redd count, and estimated total adult fish population for the South Umpqua River. 111

Tables

Table 1-1: Acres and percent of the Middle South Umpqua Watershed within each ecoregion. 12

Table 1-2: Relative geologic time scale (most recent to oldest – top to bottom). 16

Table 1-3: Percent of landholdings by parcel size for the Middle South Umpqua Watershed. 24

Table 1-4: General demographic characteristics and housing from the 2000 Census for the Middle South Umpqua Watershed. 26

Table 1-5: 2000 Census information for education, employment, and income for the Middle South Umpqua Watershed. 27

Table 2-1: Name, location, and storage capacity of Umpqua Basin dams built since 1960. 41

Table 2-2: Estimated number of adult anadromous salmonids (1972). 47

Table 3-1: Middle South Umpqua Watershed stream miles within each gradient class. . 51

Table 3-2: Channel habitat types within the Middle South Umpqua Watershed. 53

Table 3-3: Stream habitat survey benchmarks. 55

Table 3-4: Riparian zone classification for the Middle South Umpqua Watershed. 64

Table 3-5: Beneficial uses for streams surface waters in the Umpqua Basin. 74

Table 3-6: ODEQ water quality-limited stream segments in the Middle South Umpqua Watershed. 75

Table 3-7: Number of days and percent of days for which seven-day moving average maximum temperatures exceeded 64°F in the Middle South Umpqua Watershed. .	78
Table 3-8: Miles and percent of Middle South Umpqua Watershed roads by class.....	86
Table 3-9: Hydrologic soil groups.....	90
Table 3-10: Dominant land use and estimated percent impervious area for seven cities in the central Umpqua Basin.....	94
Table 3-11: Number of acres and burn piles for which permits were issued from 1998 through 2001 in the Middle South Umpqua Watershed.	94
Table 3-12: Effects of chlorine on fish and aquatic life.....	97
Table 3-13: Water rights by use for the South Umpqua River and tributaries within the Middle South Umpqua Watershed.....	101
Table 3-14: Miles of road per square mile for surfaced and unsurfaced roads in the Middle South Umpqua Watershed.....	103
Table 3-15: Fish species with established populations or runs within the Middle South Umpqua Watershed.....	105
Table 3-16: Miles of stream supporting anadromous salmonids in the Middle South Umpqua Watershed.....	106
Table 3-17: Angler numbers, hours, and catches for the Middle South Umpqua Watershed.	111
Table 4-1: Number of Umpqua Basin 303(d) listed streams by parameter.....	129

Acronym List

BLM	Bureau of Land Management
Cfs	Cubic feet per second
DFPA	Douglas Forest Protective Association
GIS	Geographic information system
NTU	Nephelometric turbidity units
ODEQ	Oregon Department of Environmental Quality
ODF	Oregon Department of Forestry
ODFW	Oregon Department of Fish and Wildlife
OWEB	Oregon Watershed Enhancement Board
OWRD	Oregon Water Resources Department
TMDL	Total maximum daily load
TSZ	Transient snow zone
UBWC	Umpqua Basin Watershed Council
USDI	United States Department of the Interior
USGS	United States Geological Survey
WAB	Water availability basin

Forward

We often hear the term “watershed” these days. We all live within a watershed. Fish habitat and water quality can be affected by the watershed’s condition and by the activities within it. All of us depend upon the water that flows from our watershed. But what exactly is a watershed?

A watershed is the area of land where all surface and groundwater drains into the same body of water, such as a river, wetland, or the ocean. Watersheds can be many millions of acres like the Colombia River Basin, or less than a dozen acres for a single small stream. Since the term “watershed” can be used for drainage areas of any size, the US Geological Survey (USGS) has divided watersheds into distinct units, or “fields,” based on size. Sizes range from multi-million acre first-field watersheds to seventh-fields that can be less than 3,000 acres.

For this assessment, the most important fields are third-field and fifth-field watersheds.¹ Third-field watersheds are large river basins. The Umpqua River Basin includes the South, North, and main Umpqua Rivers, as well as Smith River, and has roughly the same boundary as Douglas County. Third-field watersheds are usually referred to as “basins,” and in this document “basin” will be used to refer to the Umpqua Basin third-field watershed. Fifth-field watersheds have become the standard size used for research and projects by a variety of agencies and organizations. Therefore, it is convenient for fifth-field watershed to be the unit usually referred to herein by the term “watershed.” Watersheds are around 40,000 to 120,000 acres, and there are 33 fifth-fields in the Umpqua Basin.

Although the borders of the watersheds are standardized, the names are not. Different organizations and agencies may call the watersheds by different names, but, in general, all watersheds are named for the creek or the section of stream into which all tributaries drain.² For example, the Calapooya Creek Watershed includes all land that drains into Calapooya Creek or its tributaries. A very large stream, such as the South Umpqua River, is usually separated into multiple fifth-field watersheds.

All watersheds have their own features, challenges, and potential. The conditions in one watershed may not reflect the conditions in a neighboring watershed. This assessment evaluates the unique past, present, and potential future conditions of the Middle South Umpqua Watershed in terms of fish habitat and water quality.

¹ Fourth-field watersheds refer to sub-basins. Just as there are three main rivers in the Umpqua Basin, there are also three fourth-field watersheds, or sub-basins: the Umpqua River fourth-field watershed, the North Umpqua River fourth-field watershed, and the South Umpqua River fourth-field watershed.

² When one watershed does not encompass the entire drainage area, such as with a river or large creek, names reflect the relative location of the watershed along the main stem. Upper South Umpqua would be near the headwaters of the South Umpqua River, while Middle Cow Creek is somewhere in the middle of Cow Creek.

1. Introduction

The introduction provides a general description of the watershed in terms of its natural and human-made features, ownership and current land uses, and the communities within the watershed. Information in sections 1.2 and 1.3 was compiled from the following sources: *The Oregon Watershed Assessment Manual* (Watershed Professionals Network, 1999), the *Lower South Umpqua Watershed Analysis* (USDI Bureau of Land Management, 2000), and the *Middle South Umpqua Watershed Analysis* (USDI Bureau of Land Management, 1999). Additional information is from the following sources' databases: The Oregon Climate Service, the US Census Bureau, and the Douglas County Assessor.

Key Questions

- What is the Umpqua Basin Watershed Council?
- What is the purpose of the watershed assessment and action plan document?
- How was the watershed assessment developed?
- Where is the Middle South Umpqua Watershed and what are its defining characteristics?
- What are the demographic, educational, and economic characteristics of Middle South Umpqua Watershed residents?
- What is land ownership, use, and parcel size within the watershed?

1.1. Purpose and development of the watershed assessment

1.1.1. The Umpqua Basin Watershed Council

The Umpqua Basin Watershed Council (UBWC) is a non-profit, non-government, non-regulatory charitable corporation that works with willing landowners on projects to enhance fish habitat and water quality in the Umpqua Basin. The council has its origins in 1992 as the Umpqua Basin Fisheries Restoration Initiative (UBFRI) and was changed to the UBWC in May of 1997. Three years later, the council was incorporated as a non-profit organization. The UBWC's 16-member Board of Directors represents resource stakeholders in the Umpqua Basin. The board develops localized and basin-wide fish habitat and water quality improvement strategies that are compatible with community goals and economic needs. Activities include enhancing salmon and trout spawning and rearing grounds, eliminating barriers to migratory fish, and conducting workshops with landowners and residents about fish habitat and water quality issues in their areas. Depending on the need, the UBWC will provide direct assistance to individuals and groups, or coordinate cooperative efforts between multiple partners over a large area.

1.1.2. The watershed assessment and action plan

The Middle South Umpqua Watershed Assessment has two goals:

- 1) To describe the past, present, and potential future conditions that affect water quality and fish habitat within the Middle South Umpqua Watershed; and
- 2) To provide a research-based action plan that suggests voluntary activities to improve fish habitat and water quality within the watershed.

The action plan developed from findings in chapter three is a critical component of the assessment. The subchapters include a summary of each section's key findings and a list of action recommendations developed by UBWC staff, landowners, and restoration specialists. Chapter Six is a compilation of all key findings and action recommendations and includes a summary of potential UBWC Middle South Umpqua Watershed enhancement opportunities. Activities within the action plan *are suggestions for voluntary projects and programs*. The action plan should not be interpreted as landowner requirements or as a comprehensive list of all possible restoration opportunities.

1.1.3. Assessment development

This document is the product of a collaborative effort between the UBWC and Middle South Umpqua Watershed residents, landowners, and stakeholders. Members of the UBWC staff assembled information about each assessment topic and compiled the data into graphic and written form.³ Landowners and other interested parties met with Nancy Geyer of the UBWC staff to review information about the Middle South Umpqua Watershed and offered comments and suggestions for improvement opportunities.

The Middle South Umpqua Watershed assessment meetings were held in conjunction with Lower South Umpqua assessment meetings.⁴ Landowners and residents of both groups met 12 times from September, 2001 through January, 2003. A total of 53 people attended one or more meetings, with an average of 9.7 participants per meeting. Meeting participants included farmers and ranchers, family forestland owners, industrial timber company employees, city officials, city residents, and Bureau of Land Management personnel.

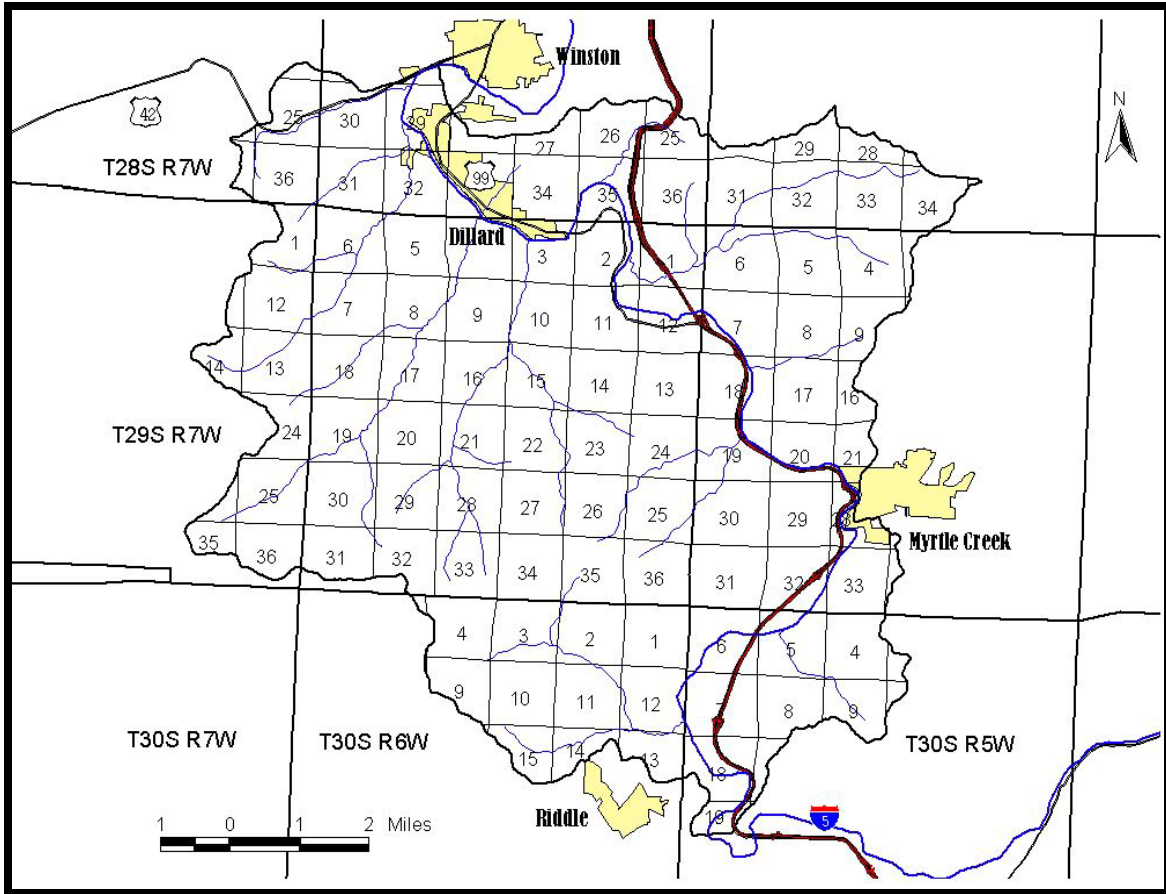
1.2. Watershed description

1.2.1. Location, size, and major features

The Middle South Umpqua fifth-field watershed is located in Douglas County, Oregon, and is 59,441.4 acres in size. The watershed stretches a maximum of 10.9 miles east to west and 10.6 miles north to south (see Map 1-1). Three major roads transect the watershed: Interstate Five (I-5), Highway 99, and Highway 42. There is no incorporated city that is entirely within the watershed. A small portion of western Myrtle Creek falls within the watershed boundary, and do all of the Dillard and Tri-City areas (Tri-City is located south of Myrtle Creek along I-5).

³ Unless otherwise indicated, Nancy Geyer and Heidi Kincaid of the Umpqua Basin Watershed Council developed all text, tables, maps, and figures.

⁴ The Lower South Umpqua Watershed Assessment and Action Plan (Geyer, 2003) is available from the UBWC.



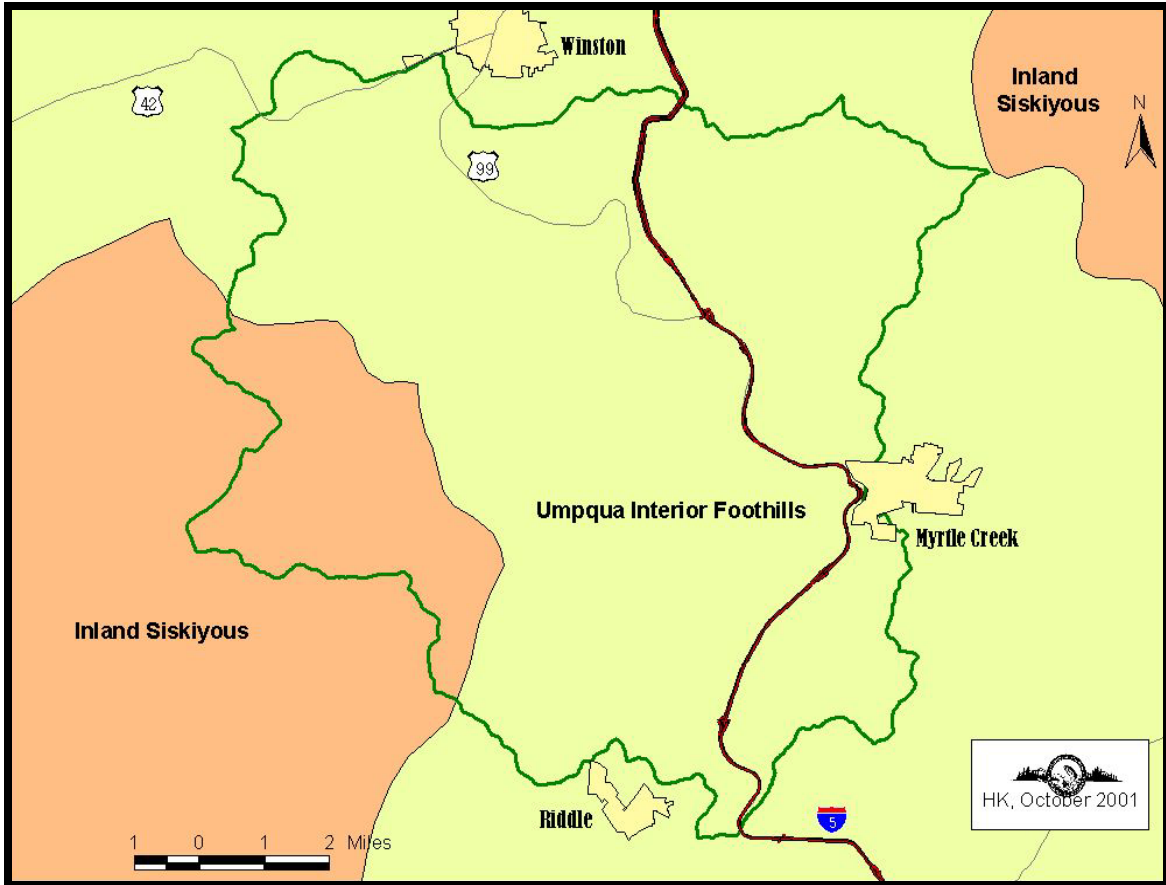
Map 1-1: Location of the Middle South Umpqua Watershed.

1.2.2. Ecoregions

Ecoregions are areas with similar type, quality, and quantity of environmental resources, including landscape, climate, vegetation, and human use.⁵ Ecoregion information is not specific to an individual watershed and is too general for the purposes of this assessment. However, ecoregions are useful because they divide the watershed into areas based on natural characteristics rather than on political boundaries or township, ranges, and sections. In this section, ecoregions are used to distinguish two unique areas in the Middle South Umpqua Watershed. In some cases, ecoregion information is used to supplement other data.

Map 1-2 and Table 1-1 show the Middle South Umpqua Watershed’s location, acres, and percent within each ecoregion. Over 86% of the watershed is within the Umpqua Interior Foothills Ecoregion. The west-central portion of the watershed is within the Inland Siskiyou Ecoregion.

⁵ The Environmental Protection Agency (EPA) and the Oregon Natural Heritage Program (ONHP) developed ecoregion boundaries for the State of Oregon.



Map 1-2: Ecoregions of the Middle South Umpqua Watershed.

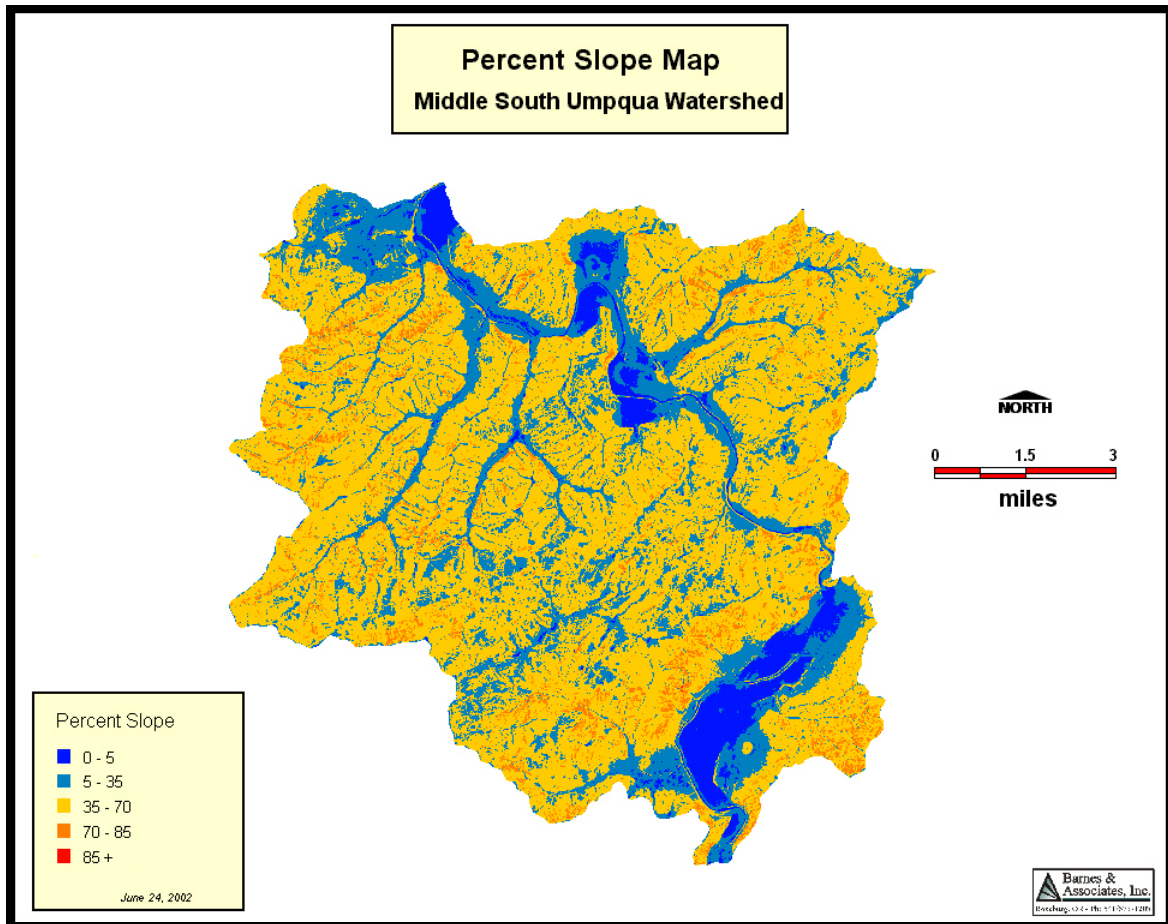
Ecoregion	Acres	Percent of total
Umpqua Interior Foothills	51,084.6	85.9%
Inland Siskiyou	8,356.8	14.1%
Total	59,441.4	100.0%

Table 1-1: Acres and percent of the Middle South Umpqua Watershed within each ecoregion.

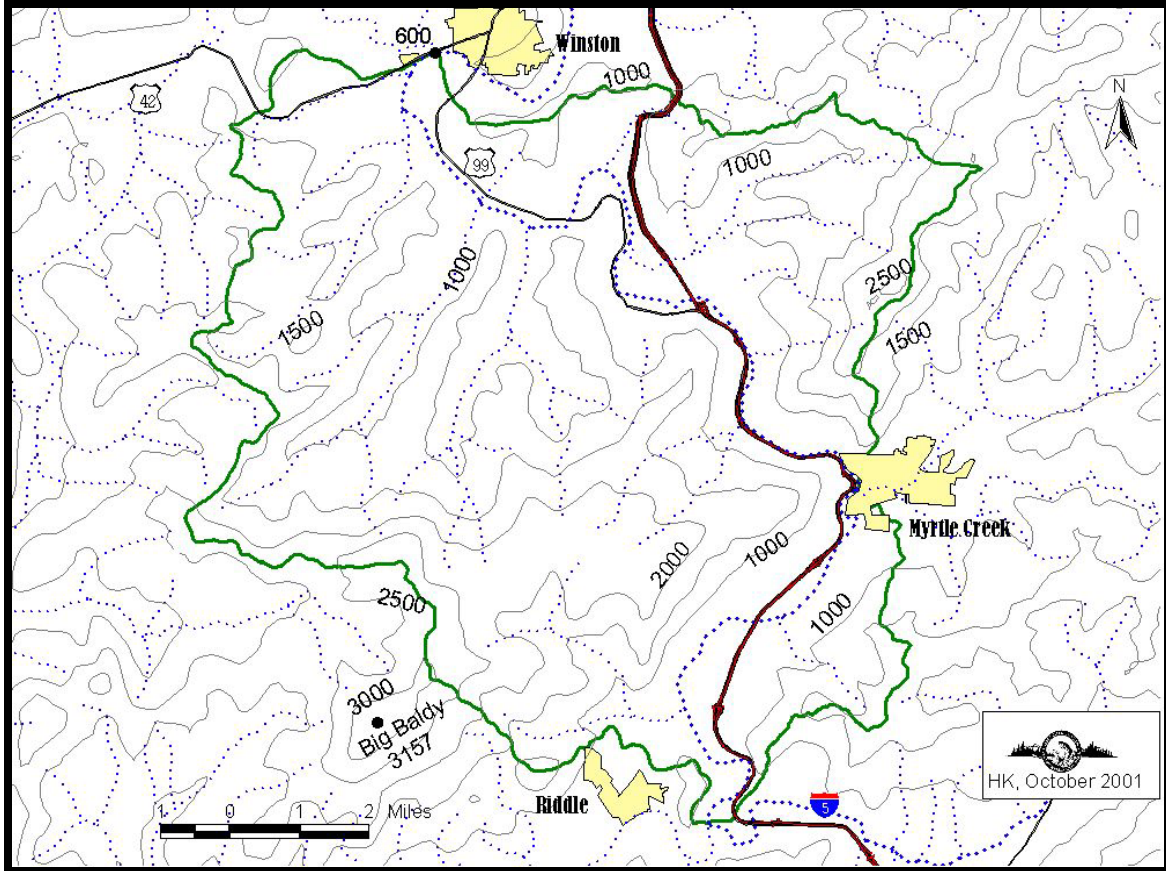
1.2.3. Topography

As shown in Map 1-3 low interior valleys, broad floodplains, and terraces with gentle to moderate slopes characterize the landscape of the Umpqua Interior Foothills. Steep mountains with deep, “v”-shaped valleys characterize the Inland Siskiyou Ecoregion. However, within the Middle South Umpqua Watershed, slopes are similar for both ecoregions.

Elevation for the Umpqua Interior Foothills area ranges from 1,000 to 2,000 feet (Map 1-4). The lowest point in the watershed is found in this ecoregion, which is 517 feet near Dillard. The Inland Siskiyou Ecoregion has the highest elevations, in general ranging from 1,500 to 2,500 feet, with a maximum height of 3,247 feet near Big Baldy Mountain.



Map 1-3: Percent slope for the Middle South Umpqua Watershed.



Map 1-4: Elevation of the Middle South Umpqua Watershed.

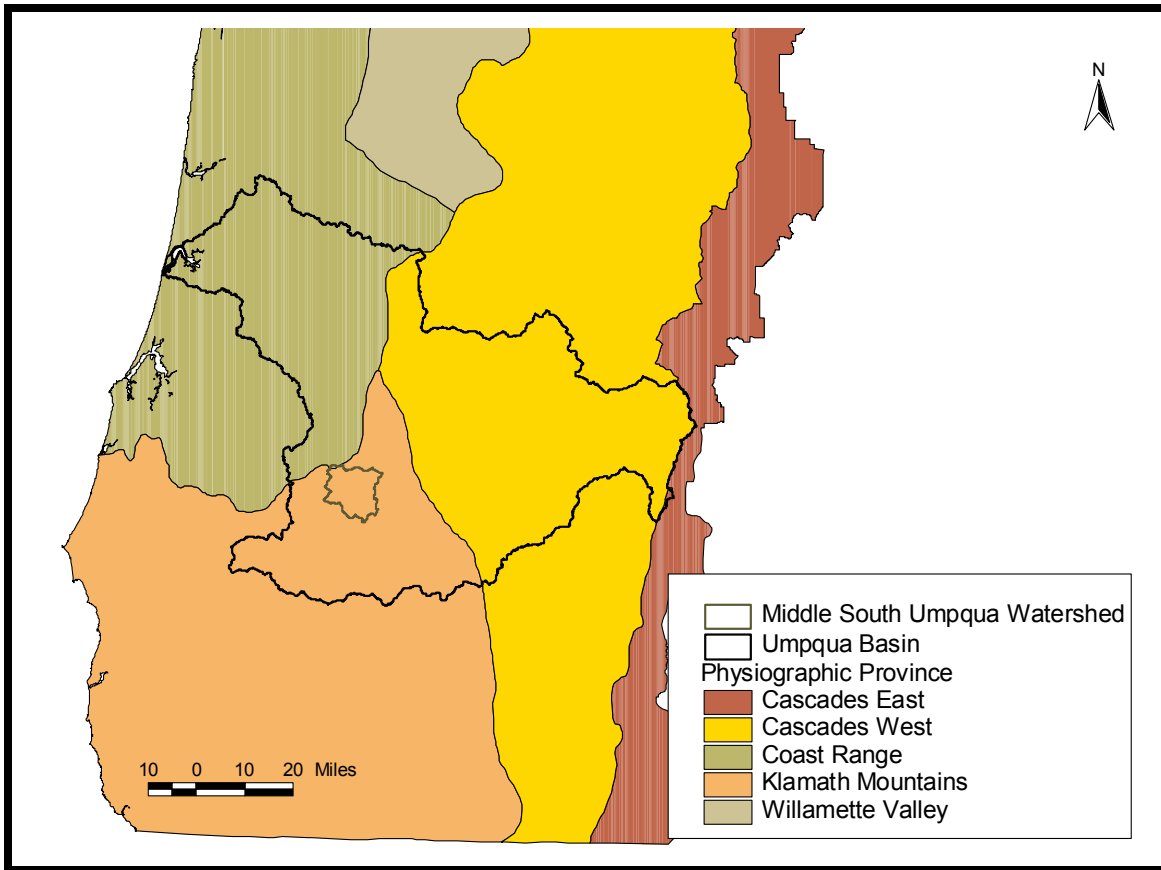
1.2.4. Geology⁶

Oregon has a complex geological history resulting in a variety of landscape types throughout the state. In southwestern Oregon, the most significant event in the history of the formation of the present day landscape is dominated by the collision of the western North American continental plate with the Pacific oceanic plate. This section summarizes the geology and geomorphology of the Middle South Umpqua Watershed. Appendix 1 includes more information about the geologic history of western Oregon and a glossary of terms. Information in this section and in Appendix 1 has been summarized from the following documents: *Northwest Exposures, A Geologic History of the Northwest* (Alt and Hyndman, 1995); *Atlas of Oregon* (Allan et al., 2001); *Geology of Oregon* (Orr et al., 1992); *Earth* (Press and Siever, 1986); and *Geologic Map of Oregon* (Walker and MacCleod, 1991).

⁶ Jenny Allen, Tim Grubert, and John Runyon of BioSystems, Inc., contributed the text, tables, and figures for section 1.2.4. Terms such as “Jurassic” and “Cretaceous” refer to periods in the geologic/evolutionary timetable. However, the UBWC takes no position regarding the time periods with which these terms are associated and is using the terms to refer to natural processes and the relative order in which they occurred.

Physiography

The Umpqua River Basin is located within three physiographic provinces: the Klamath Mountains, the Western Cascades, and the Coast Range. A physiographic province is defined as a geographic area that demonstrates similar climate and geologic structure but differs topographically from its surrounding areas. The three provinces of the Umpqua River Basin developed under varying geologic processes, resulting in the geologically complex features. The Middle South Umpqua Watershed lies within two of these physiographic provinces, the Klamath Mountains and the Coast Range. Approximately 95% of the watershed is within the Klamath Mountains Province and the remainder falls within the Coast Range. Map 1-5 illustrates the physiographic province distribution within the watershed.



Map 1-5: Physiographic provinces of the Middle South Umpqua Watershed.

Klamath Mountains Province

The Klamath Mountains Province encompasses almost 12,000 square miles; it is located just north of Roseburg, Oregon and continues south to Redding, California with portions bordering the coast. Narrow canyons and mountain peaks comprise part of the region; however, the majority of the Klamath Mountains Province exhibits uniform relief. The region is described as an eroded plain that has been fragmented by an extensive stream network (Orr and Orr, 1996). This stream network has developed due to the province’s high annual rainfall, which varies between 30 to 100 inches per year. This well-

developed system has also distributed Tertiary and Quaternary sediments (sands and silts) within the province (Table 1-2). It is important to note that a few of the geologic units of the Middle South Umpqua Watershed within the Klamath Mountains Province are more representative of these deposits rather than the older rocks typical of the Klamath Mountains.

Coast Range Province

The Coast Range Province is just over 200 miles long, extending south from Washington State to the Middle Fork of the Coquille River. The terrain consists of mountains and coastal headlands, which create the rolling hills characteristic of this province. The Coast Range is also influenced by a maritime climate of moderate temperatures and high annual rainfall exceeding 100 inches in some parts of the province. Due to this maritime climate, the Coast Range has developed lush, temperate forests and mature soils. However, due to its high average rainfall and steep gradients, erosion can be more problematic within this province.

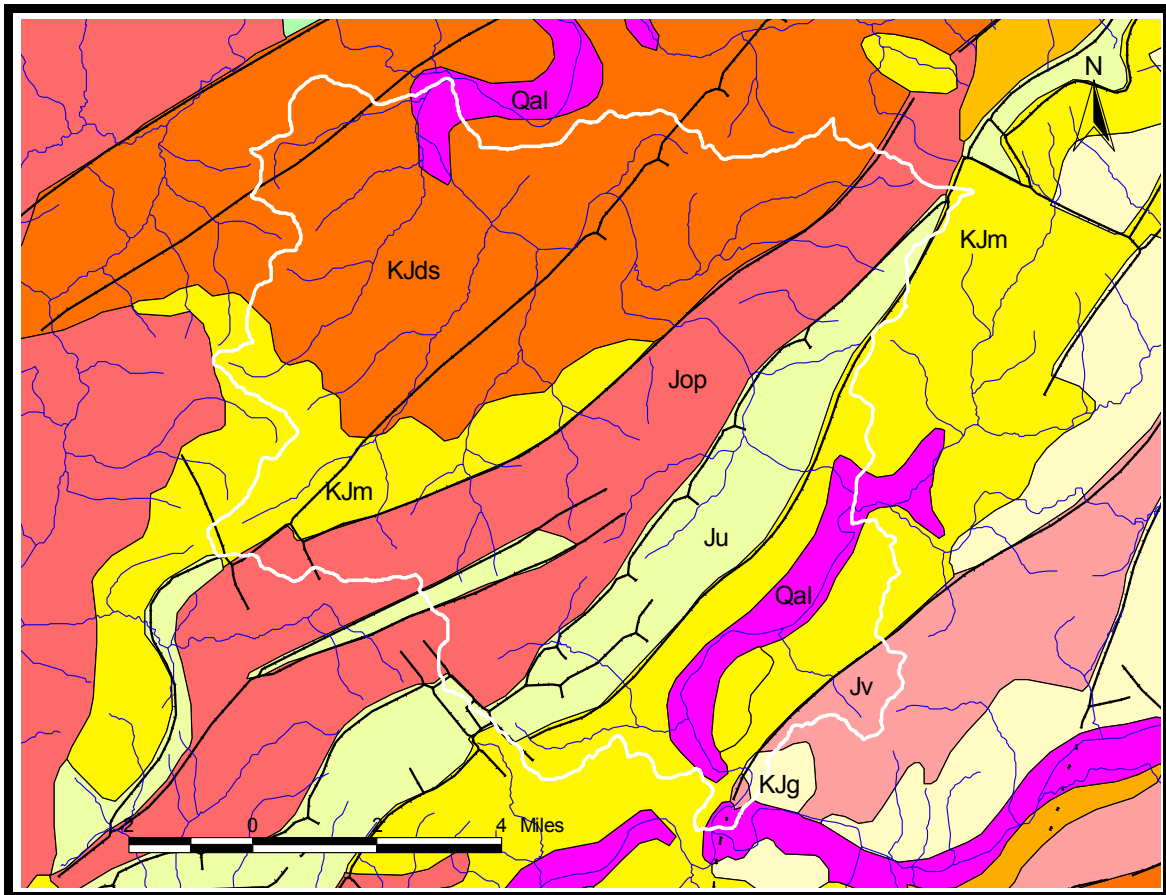
Era	Period	Epoch		
Cenozoic	Quaternary	Holocene		
		Pleistocene		
	Tertiary	Pliocene		
		Miocene		
		Oligocene		
		Eocene		
Mesozoic	Cretaceous	Paleocene		
		Jurassic		
		Triassic		
		Permian		
		Pennsylvanian		
Paleozoic	Mississippian	Devonian		
		Silurian		
		Ordovician		
		Cambrian		
		Precambrian	Proterozoic	Archean

Table 1-2: Relative geologic time scale (most recent to oldest – top to bottom).

Geologic units of the Middle South Umpqua Watershed

The majority of geologic units are associated with the older rocks of the Klamath Mountains and date to the Cretaceous and Jurassic periods. There are however, some small deposits within the watershed that date to the more recent Quaternary period. Refer to Map 1-6 for a mapped representation of the geologic units for the area. See the geologic glossary in Appendix 1 for a definition of terms. Sedimentary rocks, which consist of sandstone, conglomerate, greywacke, and rhythmically banded chert of the

Dothan Formation (KJds), are located in the north-northeastern portions of the watershed. The Myrtle Group (KJm) is comprised of the Riddle and Days Creek Formations, which are also sedimentary deposits of conglomerate, sandstone, siltstone, and limestone. These units are clustered around the tributaries to the South Umpqua River. Granitic rocks (KJg) are found in the southern portion of the watershed. Igneous rock of the ultramafic and related rocks of the ophiolite sequences (Ju) have been mapped in the eastern portion of the watershed, as are volcanic rocks (Jv) which are found in the southern tip of the area. The Otter Point Formation of Dott (1971) and related rocks (Jop) are comprised of highly sheared graywacke, mudstone, siltstone, and shale. Within the watershed, there are also a few alluvial deposits (Qal) of sand, gravel, and silt that have formed floodplains and filled stream channels. These deposits are found in the north-northwest and southeastern sections. Also in the southeast portion of the watershed is an old landslide and debris flow deposit (Qls). These units tend to be unstable given their previous history of mass failure. Appendix 1 provides more information about the geologic units within the Middle South Umpqua Watershed.



Map 1-6: Middle South Umpqua geologic units and faults.

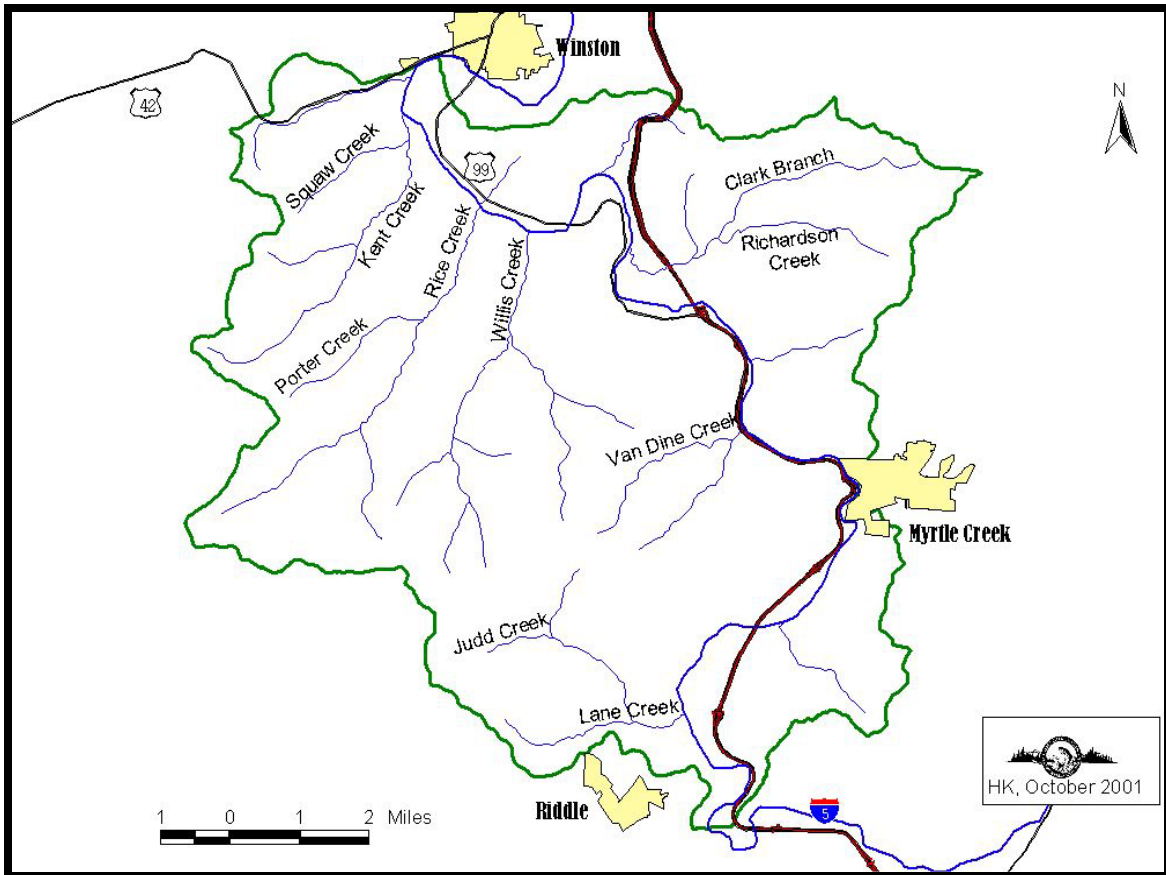
Structural Geology

The geologic units of the Middle South Umpqua Watershed are oriented in a predominately northeast-southwest direction. The faults within the watershed are also

situated in a northeast-southwest trend. The streams within the watershed do not appear to be strongly influenced by the fault system in terms of location, gradient, or direction of flow. The black lines in Map 1-6 represent the faults of the Middle South Umpqua Watershed.

1.2.5. The Middle South Umpqua Watershed stream network

The Middle South Umpqua Watershed begins approximately 47 stream miles from the mouth of the South Umpqua River, consisting of 22 stream miles of the South Umpqua River and its tributaries.⁷ Map 1-7 shows all the streams that are visible on a US Geological Survey 100,000 resolution map (97.0 total stream miles).⁸ Among the larger tributaries is Rice Creek, running 7.3 miles from the headwaters to the South Umpqua River, whereas Squaw Creek is only 2.3 miles long. Stream gradient (steepness) of the South Umpqua River within the watershed is 0.3%; tributaries have an average gradient of 6.1%.



Map 1-7: Major streams of the Middle South Umpqua Watershed.

⁷Stream miles measure distance from the mouth following the center of the stream channel to a given point. “Total stream miles” is the length of a stream in miles from the mouth to the headwaters. “Stream mile zero” always refers to the mouth.

⁸On a map of this resolution, one inch equals 8,333.3 feet.

1.2.6. Climate

As is typical of southwest interior Oregon, Inland Siskiyou Ecoregion and the Umpqua Interior Foothills Ecoregion are drier and colder than the northwest interior because much of the area is within the Coastal Mountain Range rain shadow. In the Inland Siskiyou Ecoregion, precipitation typically ranges from 35 to 70 inches, but can be up to 89 inches in higher elevations. The Umpqua Interior Foothills precipitation ranges from 30 to 50 inches.

There is no climate station that collects temperature and precipitation data within the Middle South Umpqua Watershed. The nearest station is outside of Riddle (station #7169).⁹ Temperature data have been collected from this station from 1961 through 2002. Figure 1-1 shows the monthly average daily minimum and maximum temperatures for Riddle. Maximum temperatures in the summer are generally in the 70s or low 80s. Minimum winter temperatures are usually above freezing.

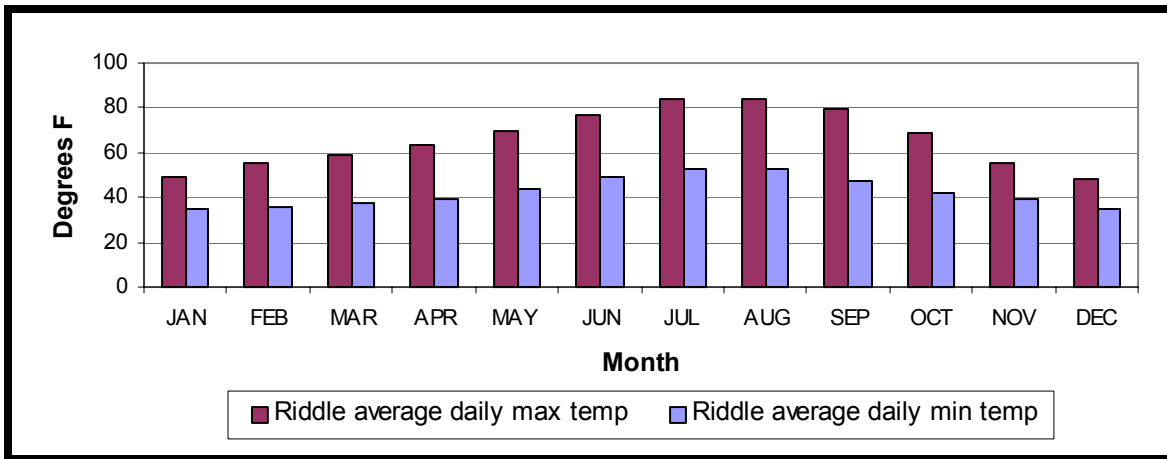


Figure 1-1: Average minimum and maximum temperature for Riddle (station #7169) averaged from 1961 through 2002.

Precipitation data have been collected from the Riddle climate station from 1900 through 2001. Rainfall averages 30.8 inches in Riddle, but can vary widely depending upon the year (see Figure 1-2). As is typical of southwest Oregon, most precipitation occurs in the winter months (see Figure 1-3). In Riddle, rainfall averages 4.8 inches for the months of November through February and 0.6 inches for June through September.

⁹ The National Oceanographic and Atmospheric Administration (NOAA) administers this station.

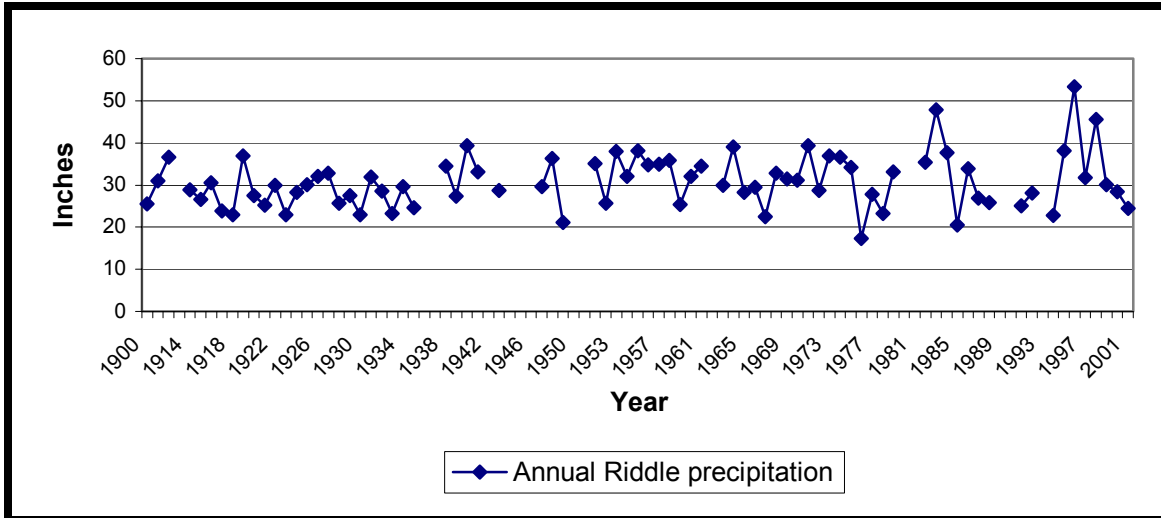


Figure 1-2: Annual precipitation for Riddle (station #7169).

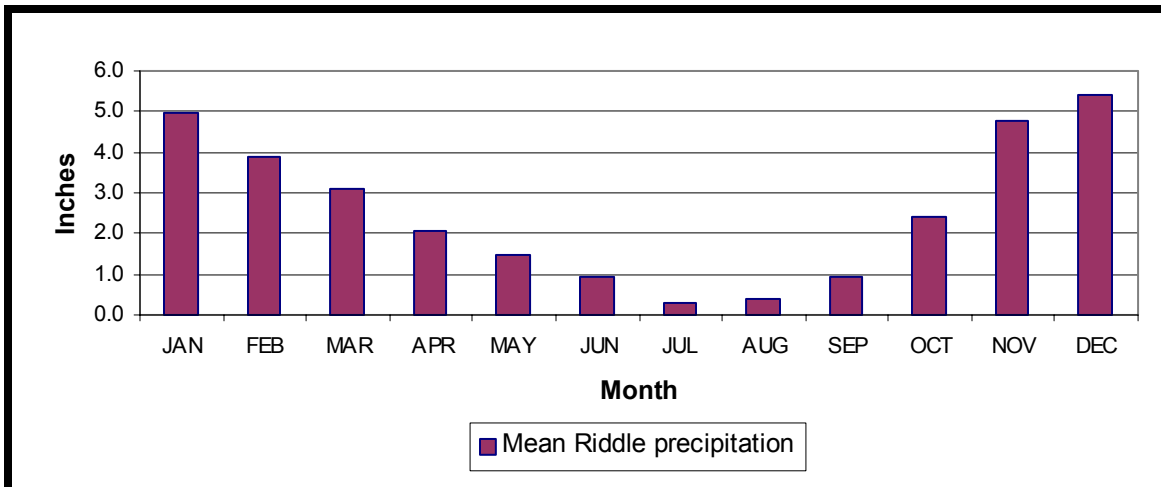
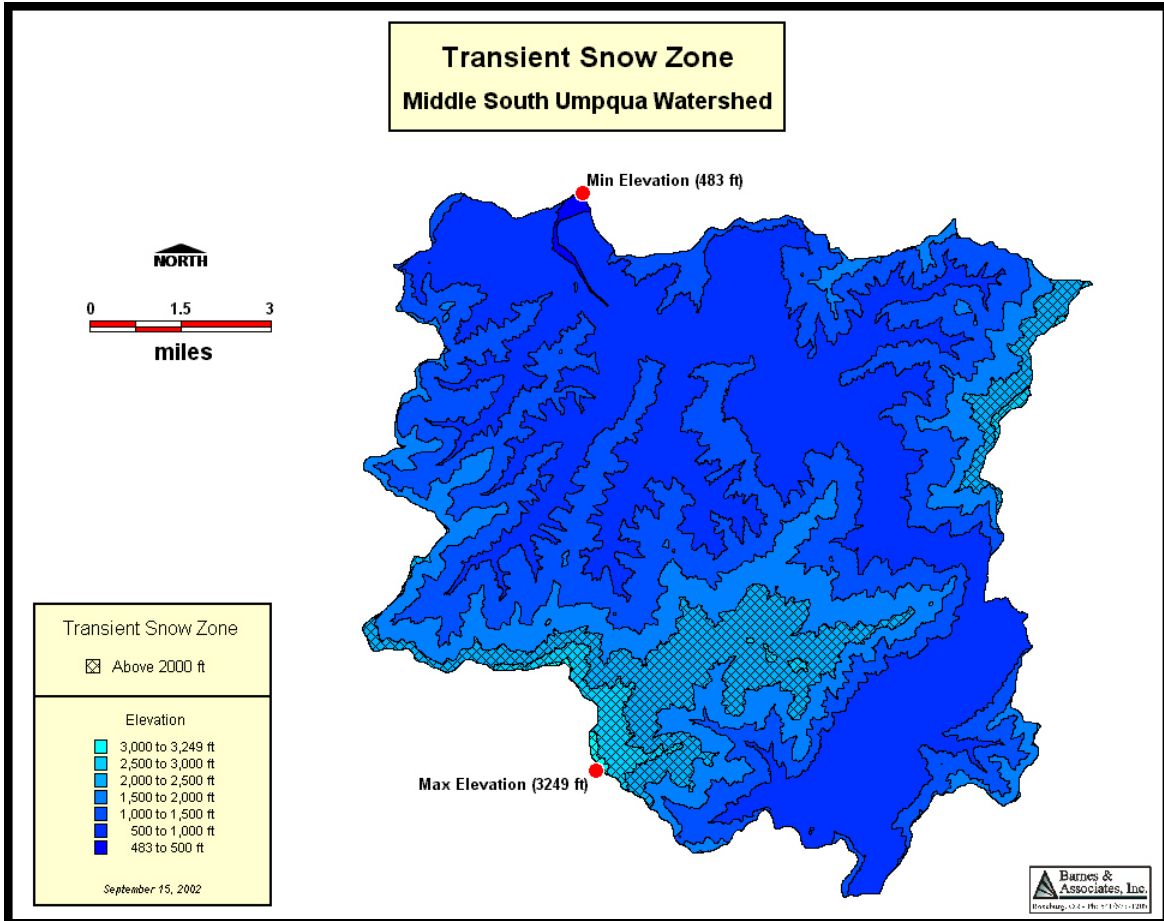


Figure 1-3: Mean monthly precipitation for Riddle (station #7169) averaged from 1900 through 2001.

Approximately 11% of the Middle South Umpqua Watershed is greater than 2,000 feet in elevation (see Map 1-8). Areas between 2,000 and 5,000 feet in elevation are known as the Transient Snow Zone (TSZ). Rain-on-snow events, in which rain falls on accumulated snow causing it to melt with consequent high runoff, may occur in these areas.



Map 1-8: Transient snow zone in the Middle South Umpqua Watershed.¹⁰

1.2.7. Vegetation

Umpqua Interior Foothills bottomland vegetation changes with the soil texture, drainage, and other factors. Overstory vegetation can range from cottonwoods on sandy or gravelly soils to oak species on poorly drained clay. Some deep, well-drained soils support Douglas-fir along with bigleaf maple and incense-cedar. Understory vegetation varies with soil type, but usually contains snowberry and Pacific poison oak, along with other species such as vine maple, Pacific ninebark, and western hazel. Invasive species such as Himalayan blackberry and Scotch broom are common. Intermixed with woodlands are cities, agricultural lands, and rural residential development.

Vegetation in the uplands of the Umpqua Interior Foothills varies. Where soil is favorable, Douglas-fir forests are common, intermixed with Pacific madrone, bigleaf maple, ponderosa pine, incense-cedar, California black oak, and some Oregon white oak. In dryer areas, hardwood stands of Oregon white oak, Pacific madrone, and some California black oak are intermixed with minor amounts of coniferous trees. Areas with shallow soil support grasslands with shrubs and scattered Oregon white oak.

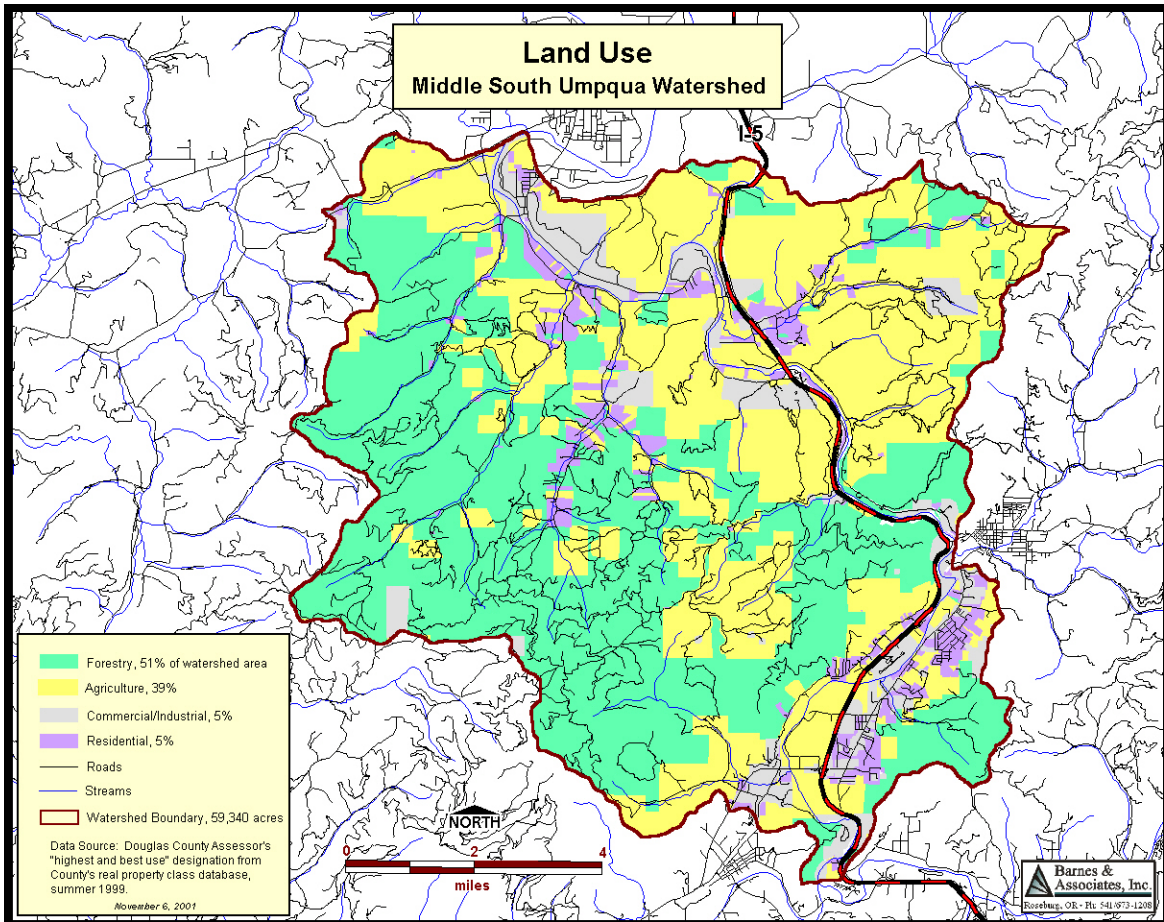
¹⁰ The highest and lowest points on this map are different than shown on Map 1-4. These differences are due to slight variations in the computer technology used to generate the maps.

In the western portion that lies within the Inland Siskiyou Ecoregion, Douglas-fir dominates older stands with grand fir common on the northern slopes but sparse or absent on the southern slopes. Golden chinquapin is also common on northern slopes, while Pacific madrone is common on south aspects. Incense-cedar and bigleaf maple are often present, and western redcedar and alder are found in very moist areas.

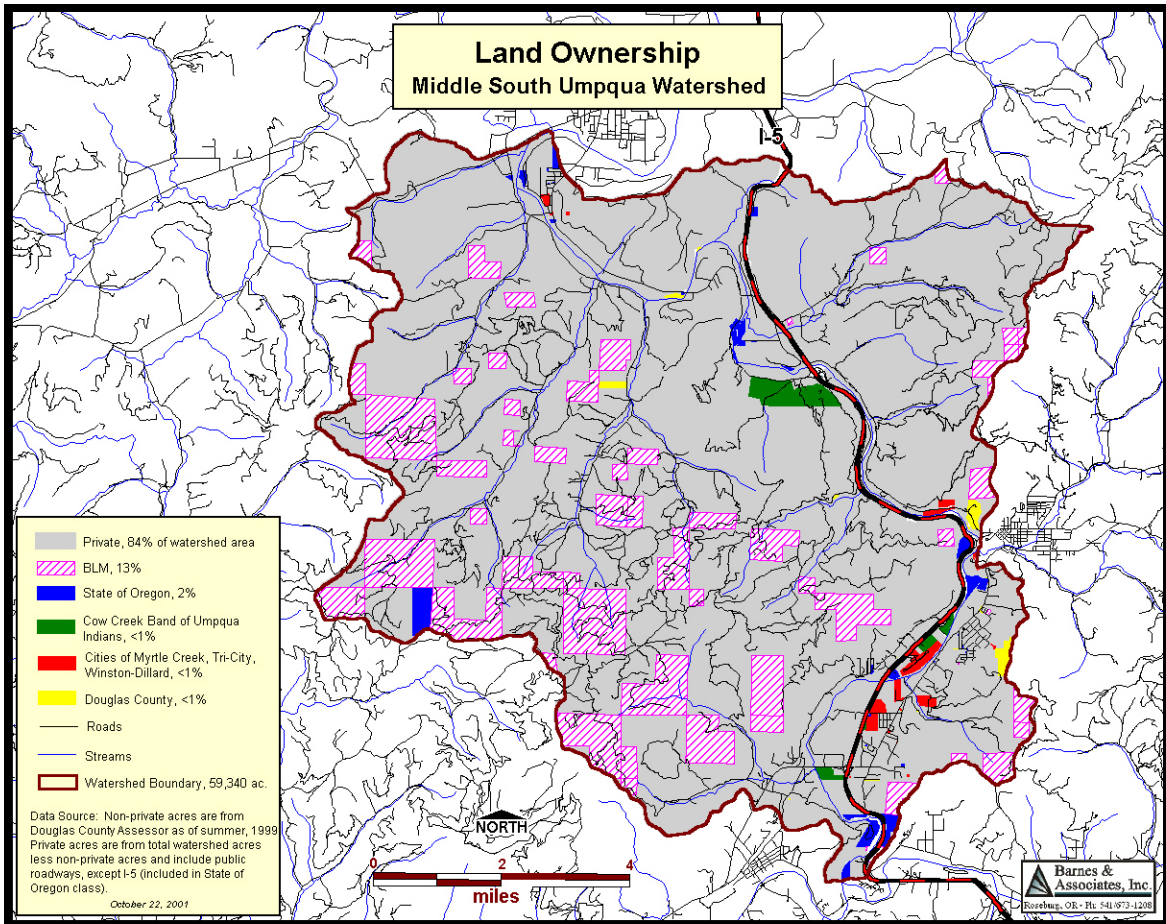
1.3. Land use, ownership, and population

1.3.1. Land use and ownership

Over half of the land base within the Middle South Umpqua Watershed is used for forestry (see Map 1-9). Lands used for agriculture account for almost 40% of the watershed, mostly located in the Umpqua Interior Foothills Ecoregion. Residential and commercial/industrial lands are found in and around Dillard, Myrtle Creek, and Tri-City, and along Willis Creek and Clarks Branch Creek. Land ownership is primarily private (84%). Federal lands account for 13% of the watershed. Lands owned by cities, the county, and by the Cow Creek Band of the Umpqua Tribe of Indians each account for less than 1% of the watershed (see Map 1-10).

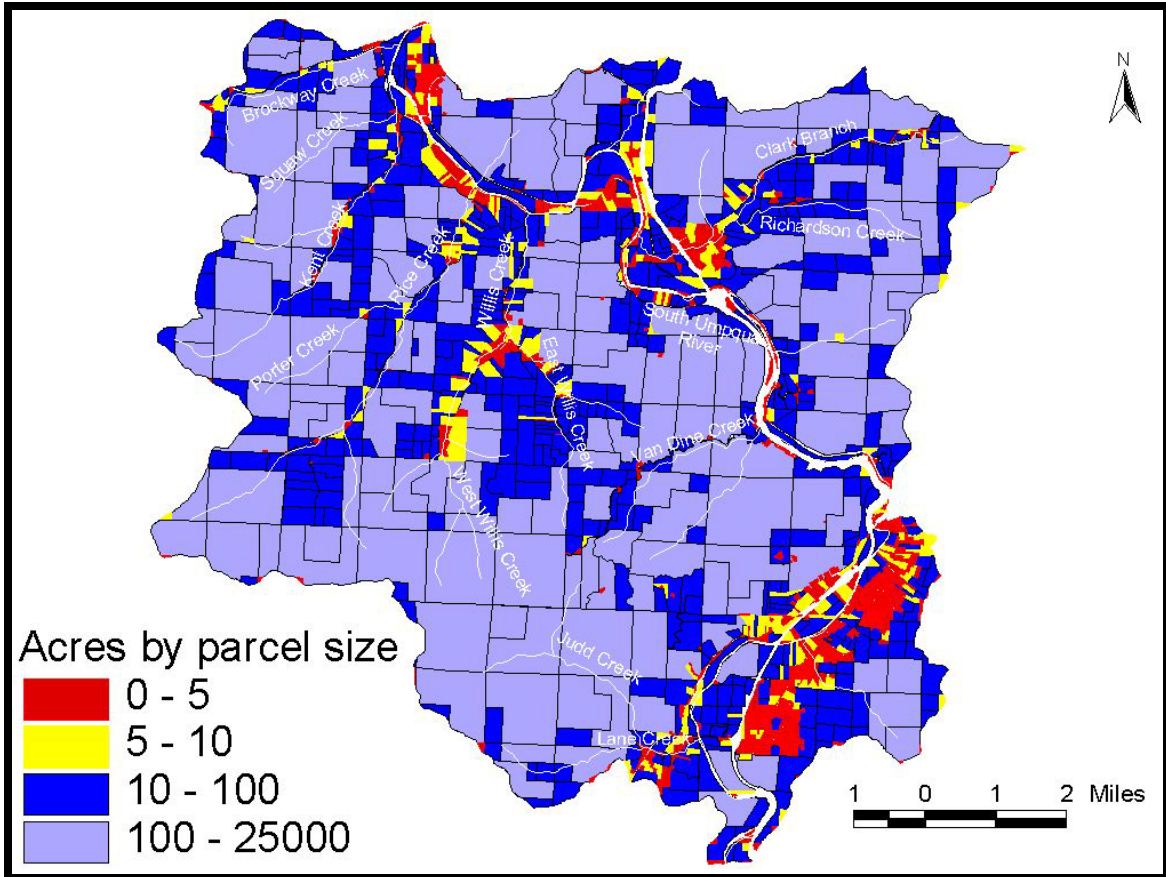


Map 1-9: Land use in the Middle South Umpqua Watershed.



Map 1-10: Land ownership in the Middle South Umpqua Watershed.

Map 1-11 and Table 1-3 show parcel size distribution and percent by class for the Middle South Umpqua Watershed as of 2001. Over two-thirds of the watershed consists of tax lot parcels that are over 100 acres. For the most part, tax lots smaller than 10 acres correspond with residential and commercial/industrial areas.



Map 1-11: Parcel size distribution for the Middle South Umpqua Watershed.

Parcel size	Percent of watershed
0-5	1.8%
5-10	2.5%
10-100	30.9%
100+	64.7%

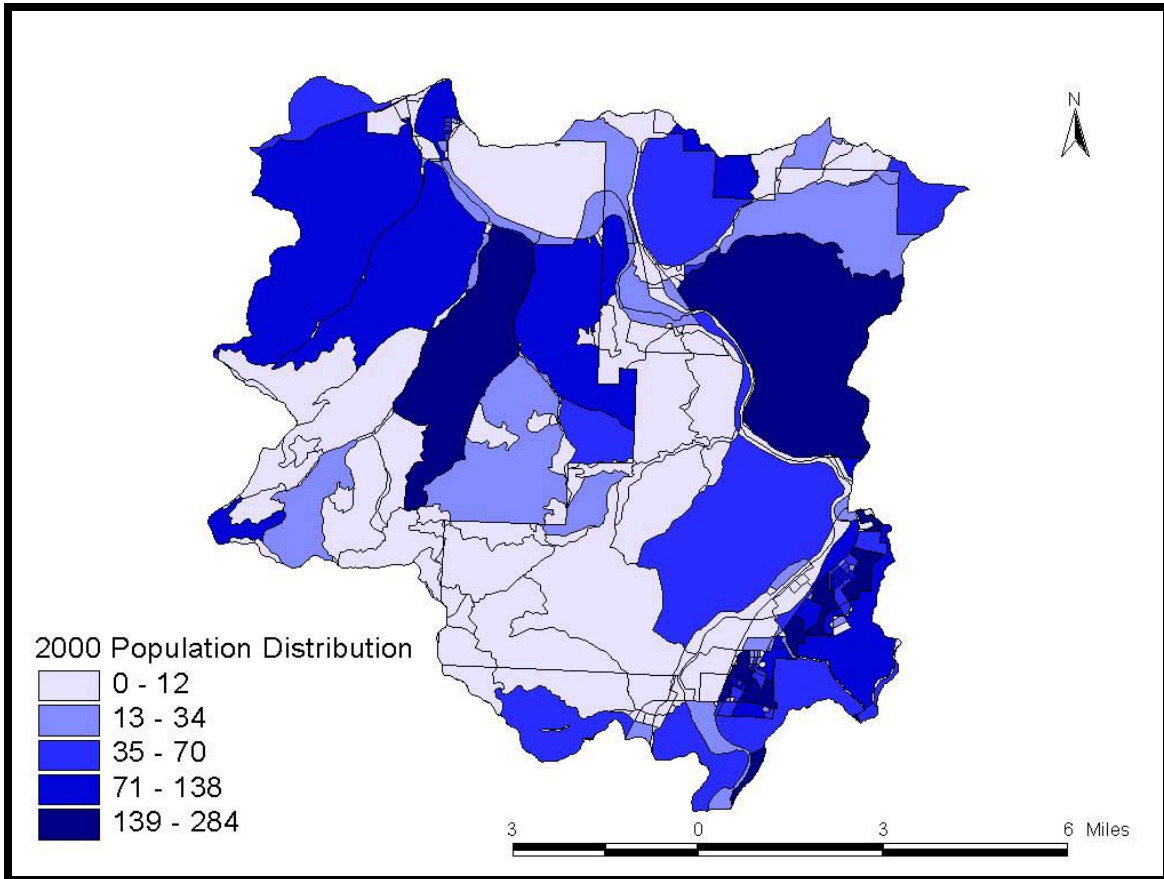
Table 1-3: Percent of landholdings by parcel size for the Middle South Umpqua Watershed.

1.3.2. Population and demographics

Population

According to the 2000 Census, Tri-City’s population is 3,519 people. Approximately 17% of the city of Myrtle Creek (152 acres) is within the Middle South Umpqua Watershed. Since the total population of Myrtle Creek is 3,419 people, approximately 581 Myrtle Creek residents live within Middle South Umpqua Watershed. The population of the Middle South Umpqua Watershed is estimated to be no more than 7,072 people, or

an average of 76.1 people per square mile.¹¹ The relative distribution of people in the watershed is shown in Map 1-12.



Map 1-12: Population distribution within the Middle South Umpqua Watershed.

General demographic characteristics and housing

Information about general demographic characteristics and housing is available from the 2000 Census for the Tri-City census division place (CDP), the Tenmile census county division (CCD), and the City of Myrtle Creek.¹² Table 1-4 provides 2000 demographic information for these areas. Appendix 2 provides location maps for the Tri-City CDP and Tenmile CCD, and provides census data for Douglas County.

¹¹ US Census tracts and blocks do not follow watershed boundaries, so it is not possible to make a precise estimate of the watershed’s population.

¹² According to the US Census Bureau website (<http://factfinder.census.gov/servlet/BasicFactsServlet>), a census county division (CCD) is “a subdivision of a county that is a relatively permanent statistical area established cooperatively by the Census Bureau and state and local government authorities. Used for presenting decennial census statistics in those states that do not have well-defined and stable minor civil divisions that serve as local governments.” A CDP is “a statistical entity, defined for each decennial census according to Census Bureau guidelines, comprising a densely settled concentration of population that is not within an incorporated place, but is locally identified by a name. CDPs are delineated cooperatively by state and local officials and the Census Bureau, following Census Bureau guidelines.”

As with the county, the largest racial group is white, constituting over 90% of the population, followed by Hispanic or Latino and persons of two or more races. All three areas have a slightly larger average household size than the county average. The City of Myrtle Creek’s average family size is larger than the county average, while Tenmile and Tri-City’s average is similar to the county average. Tri-City has a higher percent of owner-occupied housing than Tenmile, Myrtle Creek, or the county; Myrtle Creek has the lowest percent of owner-occupied housing. Tri-City also has lowest percent of vacant housing, while Myrtle Creek has the highest percent.

Parameter	Tri-City	Tenmile	City of Myrtle Creek
Median age (years)	38.4	38.8	36.0
<i>Race</i>			
White	91.6%	93.1%	94.4%
Hispanic or Latino	2.8%	2.5%	3.1%
Asian	0.5%	0.3%	0.9%
American Indian & Alaskan Native	1.7%	1.5%	2.1%
Black or African American	0.1%	0.1%	0.1%
Native Hawaiian or other Pacific islander	<0.1%	0.1%	0
Some other race	0	0.2%	0
Two or more races	3.3%	2.2%	2.6%
<i>Households</i>			
Avg. household size (#)	2.60	2.64	2.55
Avg. family size (#)	2.96	2.98	3.06
Owner-occupied housing	78.4%	70.7%	60.9%
Vacant housing units	4.3%	6.5%	6.8%

Table 1-4: General demographic characteristics and housing from the 2000 Census for the Middle South Umpqua Watershed.

Social characteristics

Table 1-5 provides information from the 2000 Census for education, employment, and income for Tri-City, Tenmile, and Myrtle Creek. Appendix 2 has the same information for Douglas County. Douglas County has the highest percent of people 25 years old or older that have graduated from high school and the highest percent of people that have at least a four-year college degree. Of the three areas, Tri-City has the lowest percent for both categories. All three areas have a higher percent of people in the labor force, and higher percent unemployment, than the county. In all three areas, the top three occupations account for approximately 70% of the labor force, and the top three industries employ over half of workers. Per capita income and median family income is slightly lower in Tri-City and Tenmile than for the county. Myrtle Creek’s median family income is higher than for the county, but per capita income is lower. The percent of families below poverty is higher in Tenmile than in Tri-City and the county. Of the three areas and Douglas County, Myrtle Creek has the highest percent unemployment.

Parameter	Tri-City	Tenmile	City of Myrtle Creek
<i>Education – age 25 or older</i>			
High school graduate or higher	71.2%	78.2%	77.9%
Bachelor’s degree or higher	6.2%	9.5%	12.3%
<i>Employment – age 16 or older</i>			
In labor force	57.4%	60.9%	62.5%
Unemployed in labor force	8.1%	8.6%	10.5%
Top three occupations	Production, transportation, and material moving; Service; Sales and office	Production, transportation, and material moving; Sales and office; Service	Production, transportation, and material moving; Service; Sales and office
Top three industries	Manufacturing; Educational, health, and social services; Retail trade	Manufacturing; Educational, health, and social services; Retail trade	Educational, health, and social services; Arts, entertainment, recreation, accommodation, food service; Manufacturing
<i>Income</i>			
Per capita income	\$15,017	\$14,415	\$14,813
Median family income	\$37,301	\$38,495	\$40,000
Families below poverty	9.3%	10.6%	14.4%

Table 1-5: 2000 Census information for education, employment, and income for the Middle South Umpqua Watershed.

2. Past Conditions¹³

The past conditions section provides an overview of events since the early 1800s that have impacted land use, land management, population growth, and fish habitat in Douglas County and in the Middle South Umpqua Watershed. Sections 2.1, through 2.4 describe the history of Douglas County. Section 2.5 provides information specific to the Middle South Umpqua Watershed. Most of this chapter is based on S.D. Beckman's 1986 book *Land of the Umpqua: A History of Douglas County, Oregon*. Material obtained from other sources will be cited in the text and included in the reference list at the end of the section.

Key Questions

- What were the conditions of the Umpqua Basin watersheds before the arrival of the settlers?
- What events brought settlers to Douglas County?
- How did land management change over time and how did these changes impact fish habitat and water quality?
- What were the major socioeconomic changes in each period?
- When were laws and regulations implemented that impacted natural resource management?

2.1. Pre-settlement: Early 1800s

The pre-settlement period was a time of exploration and inspiration. In 1804 President Thomas Jefferson directed William Clark and Meriwether Lewis to “secure data on geology, botany, zoology, ethnology, cartography, and the economic potentials of the region from the Mississippi Valley to the Pacific” (Beckham, 1986, p. 49). The two men successfully completed their journey in 1806 and returned with field collections, notes and diaries. The information they collected soon became an inspiration for others to follow their path. Fur trappers came first and reached Douglas County in the 1820s. The pre-settlement period was an eye-opener for both the European explorers and the native Indians.

2.1.1. Indian lands

The Indians of Douglas County used fire to manipulate the local vegetation to improve their hunting success. George Hall, Sr., a settler of Douglas County in the 1850s, found the hills in the Oakland area with only a few large fir trees. In the draws were poison oak, small shrubs and abundant deer. “The Indians kept these hills burned off for good hunting” (Chenoweth, 1972, p. 66). In southern Douglas County early white men told of the Indian custom of burning during the late summer months. Burning stimulated the grasses and helped eliminate the undergrowth. “Reports from some of the first white men to see the Cow Creek Valley compared it to a giant wheat field” (Chandler, 1981, p. 2). Grass covering the rolling prairies often was waist high. An expedition in the fall of 1841, funded by the federal government and led by Lt. George F. Emmons, met with

¹³ Robin Biesecker of Barnes and Associates, Inc., contributed Chapter Two.

dense, choking smoke as they traveled through the Umpqua Valley. Indians had created the smoky conditions by burning grasslands on the hillsides and along the river.

Accounts of the native Douglas County vegetation reveal extensive prairies and large trees. In June of 1826 David Douglas crossed the Calapooya Mountains and entered Yoncalla. His purpose was to collect specimens of native vegetation for the Royal Horticultural Society of London. Douglas was searching for stands of sugar pine. In the Umpqua Valley he was fortunate to meet and, with the help of beads and tobacco, make friends with an Indian. The Indian pointed to the south after Douglas drew pictures of the sugar pine and its huge cones. The pine stand was located and Douglas later described the largest pine windfall he had found: “57 feet nine inches in circumference; 134 feet from the ground, 17 feet five inches; extreme length, 215 feet” (Lavender, 1972, p. 148). Douglas was very fortunate to live through this experience. He was shooting up into the pine trees to clip cones when eight Indians, attracted by the noise, arrived armed with bows, arrows, and knives.

Douglas cocked his gun, backed up and “as much as possible endeavored to preserve my coolness” (Lavender, 1972, p. 148). After an eight to 10 minute staredown the Indian leader requested tobacco. Douglas complied, quickly retreated to his camp and, along with his three sugar pine cones, survived the encounter.

Explorers and early settlers described the trees and other vegetation found in Douglas County. Large cedar trees were found along the South Umpqua River. In 1855 Herman and Charles Reinhart found yellow and red cedars clear of limbs for 30 to 50 feet. The Pacific Railroad Surveys passed through the Umpqua Valley in 1855. The oak groves found in the valleys were reported to grow both in groups and as single trees in the open. The oaks were described as reaching two to three foot diameters and to have a low and spreading form. Many early visitors describe the fields of camas. Hall Kelley traveled the Umpqua River in 1832. “The Umpqua raced in almost constant whitewater through prairies covered with blue camas flowers and then into dense forest” (Cantwell, 1972, p. 72). In the present day Glide area, Lavola Bakken (1970) mentions the Umpqua Indian diet of sweet camas bulbs taken from the “great fields of camas” (p. 2). The Cow Creek Indians of southern Douglas County also ate the camas bulb (Chandler, 1981).

Origin of the name “Umpqua”

Many ideas exist about the origin of “Umpqua.” An Indian chief searching for hunting grounds came to the area and said “umpqua” or “this is the place.” Other natives refer to “unca” meaning “this stream.” One full-blooded Umpqua Indian interviewed in 1960 believed the term originated when white men arrived across the river from their village and began shouting and gesturing their desire to cross. “Umpqua,” she feels means “yelling,” “calling,” or a “loud noise” (Minter, 1967, p. 16). Another Indian when asked the meaning of “Umpqua” rubbed his stomach, smiled, and said, “Uuuuuump-kwa – full tummy!” (Bakken, 1970, p. 2).

The diet of the native Indians also included fish and wildlife. The Cow Creek Indians built dams of sticks across stream channels to trap the fish. Venison was their main game meat that, prior to the use of guns, was taken with snares and bows and arrows (Chandler, 1981). Salmon was the fundamental food of the Indians along the main Umpqua River. The Lower Umpqua Indians fished with spears and by constructing barriers along the narrow channels. The large number of fish amazed a trapper working for the Hudson’s Bay Company: “The immense quantities of these great fish caught might furnish all London with a breakfast” (Schlesser, 1973, p. 8). Wildlife was prevalent throughout Douglas County and included elk, deer, cougar, grizzly bear, beaver, muskrat, and coyotes.

2.1.2. European visitors

The Lewis and Clark Expedition gave glowing reports of the natural riches to be found and proved travel to Oregon was difficult but not impossible. Fur seekers, missionaries, and surveyors of the native geology, flora, and fauna were among the first European visitors to Douglas County. Methodist missionary Gustavus Hines preached to the Indians of the Umpqua in 1840. He concluded “the doom of extinction is suspended over this wretched race, and that the hand of Providence is removing them to give place to a people more worthy of this beautiful and fertile country” (Beckham, 1986, p.59).

Fur trading in Douglas County began in 1791 in the estuary of the Umpqua River. Captain James Baker traded with the Indians for about 10 days and obtained a few otter skins. The first land contact by fur traders in the Umpqua Valley was in 1818 by the Northwest Company of Canada. Trapping did not expand until Alexander Roderick McLeod – working for Hudson’s Bay Company - explored the Umpqua Valley in 1826. The number of trappers steadily increased along the Umpqua River from 1828 to 1836. Hudson’s Bay Company established Fort Umpqua first near the confluence of Calapooya Creek and the Umpqua in the 1820s and then, in 1836, near the present day city of Elkton. Fort Umpqua was reduced in size in 1846 and finally destroyed in a fire in 1851. By 1855, the beaver were trapped out and fur trading had ended along the Umpqua River (Schlesser, 1973).

<u>Presettlement timeline</u>	
1804 - 1806	Lewis & Clark Expedition
1810	John Jacob Astor establishes Pacific Fur Company in Astoria
1818	Umpqua Massacre – North West Company fur seekers kill at least 14 Indians in northern Douglas County
1826	David Douglas (botanist) travels Douglas County
1828	Smith Massacre – Jedediah Smith’s party attacked by Indians at the junction of the Smith and Umpqua Rivers; 14 killed

The travel routes of the trappers and early explorers closely parallel many of Douglas County’s current roads. For example, Interstate Five (I-5) is located in the vicinity of an

old trade route. The main difference is the original trail followed Calapooya Creek to its mouth and then up the Umpqua and South Umpqua rivers to Roseburg. Interstate Five uses a more direct route from Calapooya Creek to Roseburg via Winchester (Schlesser, 1973). The Umpqua Indian trails followed the major rivers and streams of the county including the main Umpqua and the North and South Umpqua Rivers, Little River, Rock Creek, and Steamboat Creek (Bakken, 1970).

The population of the Umpqua Valley is estimated to have been between 3,000 and 4,000 before the arrival of the white man (Schlesser, 1973). The Europeans brought diseases that reduced the population of Oregon Indians. Disease occurrences in Douglas County probably started between 1775 and the 1780s with the first smallpox outbreak. A smallpox or measles outbreak may have affected the far western part of the county in 1824 and 1825. The possibility of malaria in the central portion of the county occurred in 1830 through 1837. Smallpox was documented in the coastal portions of Douglas County in 1837 and 1838. Measles occurred in the western portions of the county in 1847 and 1848 (Allen, 2001). “The five bands of Athabascan speakers who lived along the Cow Creek were decreased to half their original number due to an epidemic during the severe winter of 1852-53” (Chandler, 1981, p. 9).

2.2. Settlement period: Late 1840s to the 1890s

2.2.1. Early settlement

California’s Gold Rush was one factor in the early settlement of the county. First of all, the new miners demanded goods and services. “The California Gold Rush of 1849 suddenly created a market for Oregon crops and employment for Oregonians” (Allan, 2001). Secondly, travelers on their way to the gold fields passed through Douglas County. Many of these visitors observed the great potential for farming and raising stock and, after the trip to California, returned to Douglas County to take up permanent residence

The Donation Land Act of 1850 was a further impetus for the settlement of Douglas County. This act specified married couples arriving in Oregon prior to December 1850 could claim 640 acres; a single man could obtain

<u>Settlement period timeline</u>	
1849	California Gold Rush
1850	Donation Land Act
1850s	Indian Wars; Douglas County Indians relocated to Grand Ronde Reservation
1860	Daily stages through Douglas County
1861	Flood
1870	<i>Swan</i> travels Umpqua River (Gardiner to Roseburg)
1872	Railroad to Roseburg
1873	Coos Bay Wagon Road completed
1887	Railroad connection to California
1893	Flood

320 acres. Men arriving after December 1850 were allowed to claim 320 acres if married and 160 acres if single. The patent to the land was secured with a four-year residency. The Donation Land Act was scheduled to end in December of 1853 but an extension increased this deadline to 1855. After 1855, settlers in Oregon were allowed to buy their land claims for \$1.25 per acre following a one-year residency (Allen, 2001; Patton, 1976).

Large numbers of settlers entered Douglas County between 1849 and 1855. Lands were settled along Calapooya Creek, in Garden Valley, at Lookingglass, at the mouth of Deer Creek (Roseburg), in Winchester, and along Myrtle and Cow Creeks. For example, in Cow Creek Valley almost all open lands were claimed by 1855 (Chandler, 1981). The rich bottomland of the Umpqua Valley was very attractive to the emigrants looking for farmland. As the number of settlers increased, the Indian population of the county decreased. Diseases, as mentioned previously, took a toll, as did the Indian Wars of the 1850s. Douglas County Indians were relocated to the Grand Ronde Reservation in the 1850s.

2.2.2. Gold mining

One of the earliest mines in Douglas County was the Victory Mine close to Glendale. The Roseburg Review on November 6, 1893, reported the mine consisted of 800 acres of gold bearing gravel. In order to work the Victory Mine a dam was built across a canyon with a reservoir capable of holding millions of gallons of water.

The early 1850s brought placer mining to the South Umpqua near Canyonville and Riddle. The miners worked many different branches of Cow Creek. Coffee Creek, a tributary of the South Umpqua, was one of the most important mining areas. A minor rush occurred in the Steamboat area – east of Glide - in the 1870s.

In May of 1890 construction was begun on the “China Ditch.” This ditch was to bring water from Little River to the Lower South Umpqua River area. The initial purpose was for use in hydraulic mining with future goals of floating logs and irrigating the local fruit orchards. In 1891, 200 Chinese laborers were hired, giving the ditch its name. About 18 miles of ditch were dug before the work was stopped in 1893 by a court order – employees had not been paid. The target destination of Little River was never reached (Tishendorf, 1981).

Mining techniques

Placer mining was commonly used to recover gold. Gravel deposits were washed away using water from ditches (often hand-dug) and side draws. The runoff was directed through flumes with riffles on the bottom. The gold settled out of the gravel and was collected by the riffles.

Hydraulic mining was placer mining on a large scale. A nozzle or “giant” was used to direct huge amounts of water - under pressure - at a stream bank. The soil, gravel, and, hopefully, gold was washed away and captured downstream.

Gold mining affected the fish habitat of the streams and rivers. The drainage patterns were changed when miners diverted and redirected water flow. The removal of vegetation along the stream banks increased erosion and added sediment to the waterways. Salmon spawning grounds were destroyed when the gravels were washed away and the stream bottom was coated with mud. Placer and hydraulic mining may have created spawning areas by washing new gravels into the streams.

2.2.3. Mercury mining

The Bonanza and Nonpareil mines were located about eight miles east of Sutherlin. The Nonpareil mine was discovered in 1860 but was not developed until 1878. By 1880 the smelter was capable of handling 40 tons of ore per day. The Bonanza Mine had some early production in 1887 but the large-scale development did not occur until 1935. The Elkhead Mine, southeast of Yoncalla, began mercury mining and production around 1870.

2.2.4. Nickel mining

Shepherders discovered nickel near Riddle on Old Piney (Nickel Mountain) in 1864 or 1865. Production was infrequent until 1882 when tunnels (some 320 feet long) and shafts were dug and a series of open cuts completed. Work slowed in the late 1890s and would not increase again until the late 1940s.

2.2.5. Agriculture

The early settlers brought livestock and plant seeds to use for food and for trade. Settler livestock included cattle, sheep, hogs, and horses. The early farmers sowed cereal crops of oats, wheat, corn, rye, and barley. Gristmills – used to grind the cereal crops into flour or feed – were first established in Douglas County in the 1850s and within 20 years almost every community in the county had one. Water was diverted from nearby streams and rivers to create power for the gristmills.

The early farmers reduced the indigenous food sources and changed the natural appearance of Douglas County. Hogs ate the acorns in the oak groves. The camas lilies were nipped by the livestock and diminished in number when the bottomlands were plowed to plant cereal crops. The deer and elk herds were decreased as the settler population increased. Indians were not allowed to burn the fields and hillsides in the fall because the settlers were concerned about their newly constructed log cabins and split rail fences.

2.2.6. Commercial fishing

The bountiful trout and salmon of the Umpqua were first sold commercially in the 1870s. William Rose caught trout and salmon at the confluence of the North and South Umpqua and sold them as far north as Portland. He caught the fish at night with nets and then shipped them out early the next morning. In 1877 the *Hera* – a boat with 100 Chinese workers and canning machinery – visited the lower Umpqua River. Local fishermen used gill nets stretched from the shore into the river to capture large numbers of fish as quickly as possible. Six-foot-long sturgeons were unwelcome captives. They were clubbed and thrown back in the river to rot on the shore. Yearly visits by the *Hera* and other cannery

boats continued for three decades. Commercial fishing at a much smaller level occurred along the North Umpqua River. The fishermen constructed small dams and breakwaters. These obstructions created eddies and slow-moving water – ideal for capturing fish with gill nets.

2.2.7. Logging

The first wood product export was shipped from the Umpqua estuary in 1850. Trees were felled into the estuary, limbed, and loaded out for piling and spars on sailing ships. An additional market was found in San Francisco for piles for wharfing. The earliest sawmills in Douglas County appeared in the 1850s. The sawmills were water powered, often connected with a gristmill, and scattered throughout the county. Early sawmills were built on South Myrtle Creek, Pass Creek (north of Drain), the main Umpqua River (at Kellogg), Calapooya Creek, and in Canyonville. Dams were created to secure water to drive the mills.

Splash dams

Loggers created splash dams to transport logs to the mills. A dam was built across the stream creating a large reservoir. Logs were placed in the reservoir. The dam timbers were knocked out and the surge of water started the logs on their journey downstream (Beckham, 1990).

Log drives were used on many of the streams and rivers of Douglas County to deliver logs to the mill.

The most common form of log drive included loading up the drainages with logs in the drier part of the year and then waiting for a winter freshet. When the rains came and the logs began to float, the “drive” would begin. Loggers would be positioned along the banks and at times would jump on and ride the logs. They used long poles to push and prod the logs downstream. Stubborn log jams would be blasted apart with dynamite. Log drives were often aided by the use of splash dams (see box). During these log drives, the stream channels were gouged, spawning gravels were removed or muddied, and fish passage was more difficult (Markers, 2000).

2.2.8. Transportation

Improvements in transportation were key to the economic development and population growth during this time period. The period began with limited transportation options into and through Douglas County. Ships came into the Umpqua estuary and delivered goods destined for the gold mines of California and the remainder of Douglas County. Goods moved from the estuary inland along the Scottsburg-Camp Stuart Wagon Road. Camp Stuart was a temporary military post occupied in 1851 in the Rogue River Valley. This route passed through Winchester and then into California following the Applegate Trail. Congress funded improvements to the Scottsburg-Camp Stuart Wagon Road and to the old Oregon-California Trail (Portland to Winchester) from 1853 through 1879. These road improvements led to the beginning of stage travel from Portland to Sacramento in 1860. The Oregon and California Stage Company began offering daily stages through Douglas County in July of 1860. A daily stage came through the Cow Creek area starting in 1862 (Chandler, 1981). The Coos Bay Wagon Road opened in 1873 allowing stage travel from Roseburg to Coos Bay.

Another form of transportation was attempted in 1870. A group of hopeful investors, *Merchants and Farmers Navigation Company*, financed a small sternwheel steamer, *Swan*, to navigate the Umpqua and South Umpqua Rivers from Gardiner to Roseburg. The voyage began February 10, 1870 and became a great social event as whole communities lined the riverbanks to watch the *Swan's* progress. Witness accounts recall the slowness of the trip upriver and the swiftness of the downriver journey. The *Swan* safely arrived in Roseburg with the captain, Nicholas Haun, very optimistic about vessel travel on the Umpqua. Captain Haun thought a minor clearing of the channel would allow a ship the size of the *Swan* to pass the rapids except in periods of very low water (Minter, 1967).

The U.S. Corps of Engineers surveyed the river and reported that it could be made navigable seven months of the year. Congress appropriated money for the removal of obstructions and W.B. Clarke was awarded the job. Reports are sketchy about how much channel modification was actually carried out. One witness remembered some blasting in the Umpqua River channel near Tyee. In February, 1871, the *Enterprise* began a maiden voyage upriver but, because of low water, only reached Sawyers Rapids – downstream of Elkton. The cargo was subsequently dumped at the rapids and no further attempt was made to navigate the upper Umpqua (Minter, 1967).

River travel on the Umpqua was soon forgotten when the Oregon California Railroad reached Roseburg in 1872. Financial problems stalled the southerly extension of the railroad for 10 years. Those 10 years proved to be an economic boon for Roseburg. Travelers heading south took the train to Roseburg and then rode the stage into California. Travelers poured in and out of Roseburg creating a need for new hotels and warehouses and leading to rapid population growth. Finally, in 1887, the tracks were completed and the railroad was extended into California.

2.3. Onset of the modern era: Early 1900s to the 1960s

2.3.1. Transportation

The first automobiles arrived in Oregon in 1899 and in Douglas County in the early 1900s. After 1910 automobile travel in western Oregon became a key motivation for road construction and improvements in Douglas County. One of the first major road construction projects in the state was the Pacific Highway (Highway 99) running from Portland to Sacramento and Los Angeles. Construction began in 1915 and by 1923 Oregon had a paved highway running the entire length of the state. In Douglas County the Pacific Highway passed through Drain, Yoncalla, Oakland, Sutherlin, Roseburg, Myrtle Creek, Canyonville, and Galesville for a total length of 97.7 miles.

Other major road construction projects completed before 1925 include routes between Roseburg and Coos Bay, Dixonville to Glide, Drain to Elkton, and Elkton to Reedsport. These roads were built to meet the expanding numbers of vehicles in the state. Registered vehicles in Oregon rose from 48,632 in 1917 to 193,000 in 1924. World War II slowed the road construction projects in the early 1940s but when the soldiers returned in 1945 road construction accelerated. The most important road-building project in the

1950s was Interstate Five (I-5), a four-lane, nonstop freeway, completed in 1966. I-5 was a windfall for cities along its path – Roseburg for example – but difficult for the bypassed cities of Yoncalla, Riddle, and Glendale.

2.3.2. Logging

Logging expanded in Douglas County in the early 1900s for two main reasons: the invention of the steam donkey engine and the use of logging railroads. The steam donkey engine was a power-driven spool with a rope or cable attached for yarding logs. It could be mounted on a log sled and yard itself, as well as logs, up and down extremely steep slopes. The logs were yarded with the steam donkey engine and then hauled to the sawmill on logging railroads. In Douglas County more than 150 miles of logging railroads were used between 1905 and 1947.

Gyppo loggers came into prevalence in the 1920s. These were loggers and mill owners with limited capital trying to break into the market. The term “gyppo” related to the real possibility that these loggers would “gyp” or not pay their workers. Many of the gyppos operated on the edge, cutting corners and costs whenever possible. Equipment breakdowns, fuel leaks, and accidents were common occurrences. The gyppo loggers searched for valuable logs, such as cedar, left after the initial logging.

Splash dams and log drives were still used in Douglas County into the 1940s (Markers, 2000). Log drives were phased out as more roads were built into the woods. In 1957 log drives in Oregon were made illegal; sports fishermen led the campaign against this form of log transport (Beckham, 1990). Waterways used to transport logs were scoured to bedrock,

<u>1890s to the 1960s timeline</u>	
1900	Fish hatchery established near Glide
1903	Prunes major agricultural crop
1909	Flood
1923	Pacific Highway (Highway 99) completed
1927	Flood
1929	Northwest Turkey Show in Oakland (Douglas County ranked 6 th in U.S. turkey production)
1936	Kenneth Ford establishes Roseburg Lumber Company
1945	Returning soldiers (WW II) create a housing – and timber – boom
1947 - 1956	Eight dams are built in the headwaters of the North Umpqua River as part of the North Umpqua Hydroelectric Project
1950	Flood
1953	Hanna Nickel production
1955	Flood
1962	Columbus Day Storm
1964	Flood
1966	Interstate Five completed

widened, and channelized. The large woody debris was removed and fish holding pools lost. As more logging roads were built in the 1950s, fish habitat was affected. Landslides associated with logging roads added sediment to the waterways. Logging next to streams removed riparian vegetation and the possibilities for elevated summer water temperatures and stream bank erosion were increased. Fewer old growth conifers were available as a new wood source in many Douglas County streams (Oregon Department of Fish and Wildlife, 1995).

Following World War II larger sawmills with increased capacity began to operate – just in time to take advantage of the housing boom. Kenneth Ford established Roseburg Lumber Company in 1936 by taking over the operation of an existing sawmill in Roseburg. He built his own mill at Dillard in 1944.

2.3.3. Mercury mining

H.C. Wilmot purchased the Bonanza Mine, approximately eight miles east of Sutherlin, in 1935 and began extensive development. The demand for mercury (quicksilver) for war purposes (World War II) led to a surge in prices to more than \$200 a flask.¹⁴ Flasks were made of cast iron and resembled the size and shape of a fruit jar (Oberst, 1985). A vast new deposit discovered in 1939 together with the high mercury demand, resulted in a production of 5,733 flasks by 1940, second highest in the nation. Some of the mineshafts extended more than 1,000 feet deep (Libbey, 1951; Oberst, 1985).

As with many other natural resources, mercury production followed the prices received. Prices fell to \$150 per flask in 1949 and then to \$70 in 1950, causing the first shutdown since 1936. A price surge in the mid-1950s to \$300 a flask reopened the mine. The Bonanza Mine had produced 39,488 flasks by 1960, its final year of operation (Libbey, 1951; Oberst, 1985; Wyant, 1955).

Other mercury mines were also active in the 1900s in Douglas County. The Elkhead Mine, southwest of Yoncalla, operated on and off into the 1960s. The Nonpareil

Mining at the Bonanza Mine in 1955

The mine is well-equipped with modern automatic machinery. The trains of cars which bring the ore to the reduction plant, perched on the side of the hill, are powered with electric batteries.

The reduction plant, in principle, is just one giant still. Ore from the mine is fed into a long, revolving kiln, where heat from an oil-fired furnace practically melts the small bits of ore. The mercury vaporizes and is carried into a battery of 24 3-story-high condensers.

The mercury is recovered in rubber buckets at the base of the condensers. The buckets are kept beneath water as a safeguard against escaping mercury vapor which is extremely poisonous.

Dust collects in the form of mud with the mercury. The final step in the recovery process is to allow the “mud” to dry on a sloping tray. Then, the mud is stirred and chopped with a garden hoe and the mercury trickles to a lower corner where it is collected and later stored in squat, 76-pound flasks (Wyant, 1955, p. 1).

¹⁴ A flask is 76 pounds of mercury.

Mine, next to the Bonanza Mine, was active from 1928 to 1932. The Tiller area had two mines, the Buena Vista and the Maud S, both active for short periods in the in the 1920s and 1930s. The Red Cloud Mine in upper Cow Creek was worked between 1908 and 1911 and then sporadically in the 1930s and 1940s.

The Oregon Department of Environmental Quality (DEQ) currently rates the Bonanza Mine as a high priority for further investigation and cleanup. High levels of mercury and arsenic have been found in the area of the old mine. Possibilities exist for movement of mercury into Foster Creek, which flows directly into Calapooya Creek. The site is a considerable risk to aquatic organisms in nearby drainages receiving runoff (Oregon Department of Environmental Quality, 2002).

2.3.4. Nickel mining / copper and zinc mining

M.A. Hanna Company obtained a lease in 1947 and contracted with U.S. government in 1953 to produce nickel. A tramway running almost to the top of Nickel Mountain was completed in 1954. By 1958, 21 million pounds of nickel had been produced. Production continued on Nickel Mountain into the 1990s.

The Formosa Mine is located about seven miles south of Riddle. This copper and zinc mine first opened in the early 1900s with the highest production occurring between 1927 and 1933. Formosa Explorations, Inc. reopened the mine in 1990 (Oregon Department of Environmental Quality, 2002).

2.3.5. Hatcheries

Douglas County's first fish hatchery was located northeast of Glide on the North Umpqua River near the mouth of Hatchery Creek. Built in 1900, the hatchery had an initial capacity for 1,000,000 eggs. In its first year of operations 200,000 salmon eggs were harvested. Another 600,000 chinook salmon eggs were brought in from a federal hatchery on Little White Salmon. These eggs produced approximately 700,000 fry that were released in the Umpqua river system. In 1901 a hatchery was constructed at the mouth of Steamboat Creek. A hatchery on Little Mill Creek at Scottsburg began operation in 1927 and operated for eight years (Bakken, 1970; Markers, 2000). The single remaining hatchery in Douglas County was established in 1937 northeast of Glide on Rock Creek.

In the 1910s large amounts of fish eggs were taken from the Umpqua river system. "In 1910 the State took four million chinook eggs from the Umpqua; the harvest mounted to seven million eggs in 1914. Over the next five years the State collected and shipped an estimated 24 million more eggs to hatcheries on other river systems" (Beckham, 1986, p. 208). The early hatcheries were focused on increasing salmon production for harvest. "Hatcheries have been essential in maintaining supplies of salmon, whose natural spawning grounds and migration routes have been severely disrupted in many areas by dams, agricultural reclamation and irrigation, and by timber operations" (Patton, 1976, p. 168). In recent years the effect of hatchery fish on the natural fish population has been examined. Flagg et al. (2000) concluded that salmonids raised in an artificial hatchery environment do not respond the same as fish reared in a natural setting. However, they

also felt current information was not sufficient to make concrete conclusions about how hatchery fish affect the survival of wild fish.

2.3.6. Agriculture

Crop irrigation was introduced to Douglas County farmers in 1928. J.C. Leady, Douglas County Agent (predecessor of County Extension Agent) gave a demonstration of ditch blasting in the 1928. In the demonstration one ditch in Melrose and one ditch in Smith River were created by blasting. The dimension of the resulting ditch was four feet deep by six feet wide. The report recommended this method of ditch creation in the low lands adjoining the Umpqua and Smith Rivers (Leady, 1929).

In 1935 Douglas County Agent J. Roland Parker introduced crop irrigation using gas and electric pumps. “The lift necessary to place irrigation water upon most land, laying along the numerous streams throughout the county, ranges from 15 to 30 feet. Only in exceptional cases will a higher lift be necessary” (Parker, 1936, p.15). Parker predicted the applications for water rights and the installation of irrigation systems would double in 1936. In his 1935 Annual Report, Parker listed 21 farms and their proposed irrigation projects. The water sources included the South Umpqua River, Calapooya Creek, Little River, North Umpqua River, Tenmile Creek, Myrtle Creek, Hubbard Creek, and Cow Creek (Parker, 1936).

The appropriation of water rights for agriculture left less water in the streams for fish, especially in the critical late months of summer. In Oregon water law follows the “prior appropriation” doctrine that is often described as “first come, first served.” The first person to obtain a water right on a stream will be the last user shut off when the streamflows are low. Junior users have water rights obtained at a later date than higher priority users. In periods of low water, the water right holder with the oldest priority date is entitled to the water specified in the senior water right regardless of the needs of junior users.¹⁵

2.4. Modern era: 1970s to the present

2.4.1. Logging

In 1972 the Oregon Forest Practices Act became effective. Standards were set for road construction and maintenance, reforestation, and streamside buffer strips. New rules were added in 1974 to prevent soil, silt, and petroleum products from entering streams. Starting in 1978, forest operators were required to give a 15-day notification prior to a forest operation. New rules were also added relating to stream channel changes. In 1987 riparian protection was increased – specific numbers and sizes of trees to be left in the riparian areas were specified. New rules in 1994 were added to create the desired future condition of mature streamside stands. Landowner incentives were provided for stream enhancement and for hardwood conversion to conifer along certain streams (Oregon Department of Forestry, 2002).

¹⁵ The water rights information was obtained on January 7, 2003, from the Oregon Water Resources Department website <http://www.wrd.state.or.us/>.

In the 1970s, Roseburg Lumber’s plant in Dillard became the world’s largest wood products manufacturing facility. Key to the development of this facility was the availability of federal timber from both the U.S. Forest Service and the Bureau of Land Management. A housing slump in the early 1980s and a decline in federal timber in the 1990s resulted in the closure or reduced the size of many other manufacturing companies in the 1980s and 1990s (Oregon Labor Market Information System, 2002). In 2002 and 2003, increased wood products imports from foreign producers such as Canada and New Zealand resulted in a surplus of timber-based products in the US. This caused a depression in the local forest products manufacturing industry. In April, 2003, Roseburg Forest Products, the largest private employer in Douglas County, laid off approximately 400 workers.¹⁶

<u>1970 to the present timeline</u>	
1971	Flood
1972	Clean Water Act
1972	Oregon Forest Practices Act
1973	Endangered Species Act
1974, 1981, 1983	Floods
1987	Hanna nickel mine in Riddle closed
1988	Glenbrook Nickel in Riddle begins production
1994	Northwest Forest Plan results in reduced federal log supplies
1996	Flood
1998	Glenbrook Nickel in Riddle closed
1999	International Paper Mill in Gardiner closed

2.4.2. Mining

The M.A. Hanna Company permanently closed the mine and smelter on Nickel Mountain (near Riddle) in January, 1987. Nickel prices had fallen to below \$2 per pound. By March of 1988 average prices rose to between \$5 and \$6 per pound allowing Glenbrook Nickel to start production. Glenbrook Nickel closed in April, 1998. The M. A. Hanna Company followed by Glenbrook Nickel diligently strived to reclaim Nickel Mountain and to maintain good water quality from the discharge points. Walter Matschkowsky of Glenbrook Nickel Company was named Reclamationist of the Year in 1998 for his career of responsible mining and reclamation. He supervised the Thompson Creek Reclamation project and was successful in converting an area affected by mining into a green, healthy forest (Oregon Department of Geology and Mineral Industries, 2002).

Formosa Explorations Inc. was not as successful in reclamation efforts in the mine south of Riddle. Formosa reopened the Silver Butte Mine in 1990 and produced copper and zinc ore until 1993. Formosa closed the mine in 1994, completed reclamation activities, and filed for bankruptcy. In the winter of 1995-96 acidic wastes were detected in Middle Creek and the South Fork of Middle Creek. Middle Creek is a tributary of Cow Creek.

¹⁶ This information is based on conversations between Nancy Geyer, Society of American Foresters president and president-elect Jake Gibbs and Eric Geyer, and Dick Beeby of Roseburg Forest Products.

Bureau of Land Management fish surveys in the Middle Creek watershed in 1984 indicated the presence of coho salmon and steelhead. These fish have not been observed in upper Middle Creek for several years. The Oregon Department of Environmental Quality and the Bureau of Land Management are working together to clean up the site (Oregon Department of Environmental Quality, 2002).

2.4.3. Dam construction

During the late 1960s through 1980s several dams were constructed in Douglas County. The largest ones are included in Table 2-1 obtained from the Oregon Water Resources Department.

Year completed	Dam name	Creek	Storage (acre feet)
1967	Plat I Dam	Sutherlin	870
1971	Cooper Creek Dam	Cooper	3,900
1980	Berry Creek Dam	Berry	11,250
1985	Galesville Dam	Cow	42,225

Table 2-1: Name, location, and storage capacity of Umpqua Basin dams built since 1960.

Dams have both beneficial and detrimental influences on fish. Water release during periods of low flow in the late summer can assist fish survival. However, Galesville Dam and Berry Creek Dam are complete barriers to fish movement. Cooper Creek Dam and Plat I Dam may be barriers to juvenile fish.

2.4.4. Tourism

The rapid expansion of tourism in Douglas County came after World War II. The improving economy left Americans with an increased standard of living and the mobility of automobile travel. The Umpqua Valley offers scenic attractions and good access roads. Interstate Five and the connecting State Highways 38, 42, and 138, provide access to Umpqua Valley’s excellent tourist areas. Tourist destination points include Crater Lake National Park, Wildlife Safari, Salmon Harbor, and the Oregon Dunes National Recreation Area. Tourism is a growing industry in Douglas County.

2.4.5. Settlement patterns and urbanization

Unlike many other Oregon counties, over 50 percent of Douglas County residents lived outside incorporated cities in 1980. The settlement pattern was mostly linear. Population density in 1980 was greatest in the central valley from Riddle to Roseburg to Sutherlin and lowest in the eastern and northwestern areas of the county (Cubic, 1987).

The population of Douglas County in 2000 was 100,399, which is an increase of almost 32,000 since 1960 (see Figure 2-1). Major urban areas have developed along the South Umpqua River to the confluence with the North Umpqua River and around the Umpqua estuary. Water quality along these streams gained protection with the passage of the Clean Water Act in 1972. The Clean Water Act established pollution discharge levels on point sources such as sewage treatment and wood processing plants.

2.4.6. Douglas County population growth

Figure 2-1 shows population growth data for Douglas County during the settlement period (1840s-1890s), the onset of the modern era (1900-1960s), and the modern era (1970s-present).

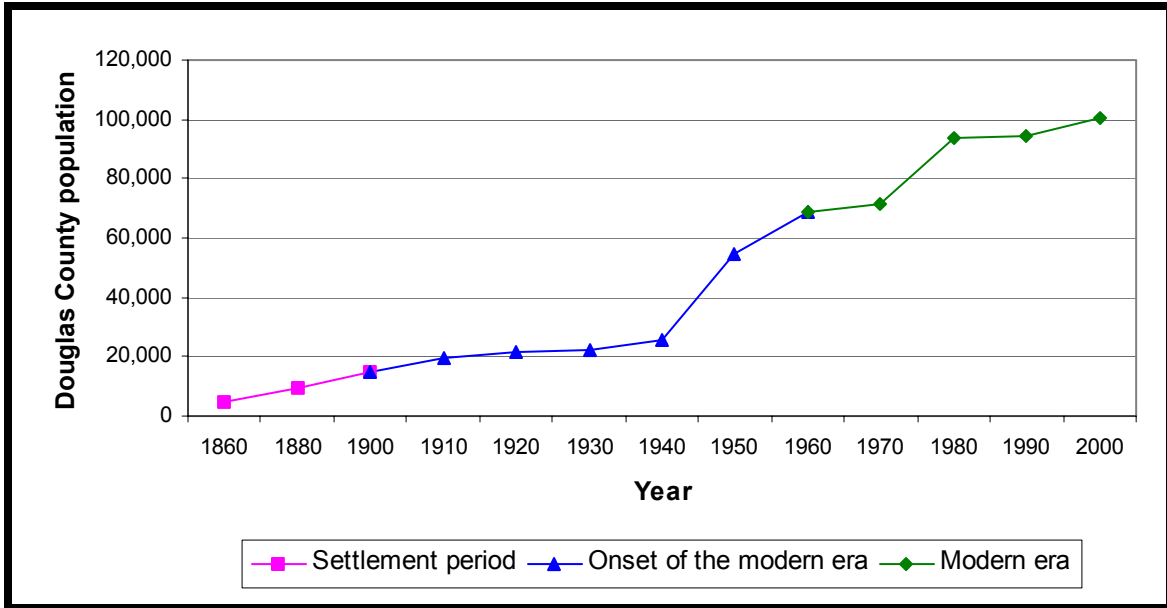


Figure 2-1: Population growth in Douglas County from 1860 through 2000.

2.5. History of the Middle South Umpqua Watershed

2.5.1. Middle South Umpqua historical timeline

Date	Event	Source
1853	In the vicinity of Rice Creek the “fruit and berries grew in abundance through the hills. Wild blackberries, huckleberries, raspberries were plentiful in their season.” Elderberry bushes were found along the banks of Rice Creek.	(Clayton, 1956, “Story of the Rices,” p. 15)
1853	Geese, ducks, swans, and cranes were found in the Kent Creek area.	(Clayton, 1957)
1855	The first public school in the watershed was established at the mouth of Rice Creek in a log hut.	(Clayton, 1956, “Story of Dillard”)
1855	Rice family attacked by Indians.	(Clayton, 1956, “Story of the Rices”)

UBWC Middle South Umpqua Watershed Assessment and Action Plan

1861	Rain and melting snow caused a December flood.	(Clayton, 1956, "Story of Dillard")
1862	In January the South Umpqua River froze and wagons were driven across the ice.	(Clayton, 1956, "Story of Dillard")
Late 1870s	"Fish in Rice Creek in those days were thick as the shakes on a large stock barn."	(Clayton, 1956, "Story of the Rices," p. 31)
1879 or 1880	The bottomlands near Dillard were all in grain.	(Clayton, 1956, "Story of Dillard")
1880	The first store opened in Dillard.	(Clayton, 1956, "Story of Dillard")
1880s	Lewis Dozier Kent planted hops in the watershed.	(Clayton, 1957)
1883	The Oregon and California Railroad reached Dillard.	(Clayton, 1956, "Story of Dillard")
1888	A sawmill was built on Kent Creek three miles southwest of Dillard. Mill workers fished in Rice and Kent creeks, preferring Rice Creek. "After the fall rains the streams were full of silver side salmon." The necessary fishing gear included a muzzle loading rifle, a pitchfork, and sacks to carry the fish.	(Clayton, 1956, "Story of Dillard," p. 14)
1890	The Winston and Agee families of Dillard grew prunes.	(Beckham, 1986)
1893	Myrtle Creek incorporated as a city. It later went bankrupt, and then re-incorporated in 1903. (State of Oregon recognizes the original incorporation date of 1893.)	("A brief history," 1993)
1893	Riddle incorporated as a city.	(Beckham, 1986)
Early 1900s	Melons, strawberries, and other produce were grown near Dillard.	(Clayton, 1956, "Story of Dillard")
1912	Road completed between Dillard and Roseburg – driving time between the cities was two and one half hours.	(Clayton, 1956, "Story of Dillard")
1917	Rice Creek Saw Mills operated in Dillard.	(Beckham, 1986)

1927	“Nearly all river bottomland was flooded.”	(Clayton, 1956, “Story of Dillard,” p. 31)
1927	California-Oregon Power Company completed a power line to Dillard.	(Clayton, 1956, “Story of Dillard”)
1944	Kenneth Ford built a sawmill in Dillard.	(Beckham, 1986)
Late 1940s	Timber harvesting occurred in the watershed.	(USDI Bureau of Land Management, 1999)
1948	Hanna Nickel constructed a smelter near Riddle.	(Beckham, 1986)
1950	The South Umpqua River flooded in October.	(Douglas County Oregon, 2002)
1955	The South Umpqua River flooded in December.	(Douglas County Oregon, 2002)
1955	City of Winston incorporated.	(Beckham, 1986)
1964	The South Umpqua River flooded in December.	(Douglas County Oregon, 2002)
1971, 1974	The South Umpqua River flooded in January.	(Douglas County Oregon, 2002)
1970s	Kenneth Ford’s Roseburg Lumber Company plant at Dillard became the world’s largest wood products manufacturing facility.	(Beckham, 1986)
1981	The South Umpqua River flooded in December.	(Douglas County Oregon, 2002)
1983	The South Umpqua River flooded in February.	(Douglas County Oregon, 2002)
1996	The South Umpqua River flooded in December.	(Douglas County Oregon, 2002)
2002	Water lines reached the Rice and Willis creek areas.	(Craig, 2002)

2.5.2. Middle South Umpqua population

A portion of the city of Myrtle Creek is located within the Middle South Umpqua Watershed. Riddle is located just to the south and Winston is very close to the northern boundary of the watershed. The population data for these three cities are shown in Figure 2-2.

Population data began in 1960 for Winston, 1910 for Riddle and, the earliest, 1860 for Myrtle Creek. The Myrtle Creek population appears to decrease sharply between 1900

and 1910. However, starting with the 1910 count, the population listed in the preceding table is for the city of Myrtle Creek. The three earliest population counts (1860, 1880, 1900) were reported by the precinct. Another noticeable change in both Riddle and Myrtle Creek is the large increase from 1940 to 1950. The increase was a product of the end of World War II and the opening of Hanna Mining on nearby Nickel Mountain. The decrease in population from 1980 to 1990 in Riddle and Myrtle Creek was probably the result of the slowdown in the timber industry and the closing of Glenbrook Nickel (previously Hanna Nickel) in 1987.

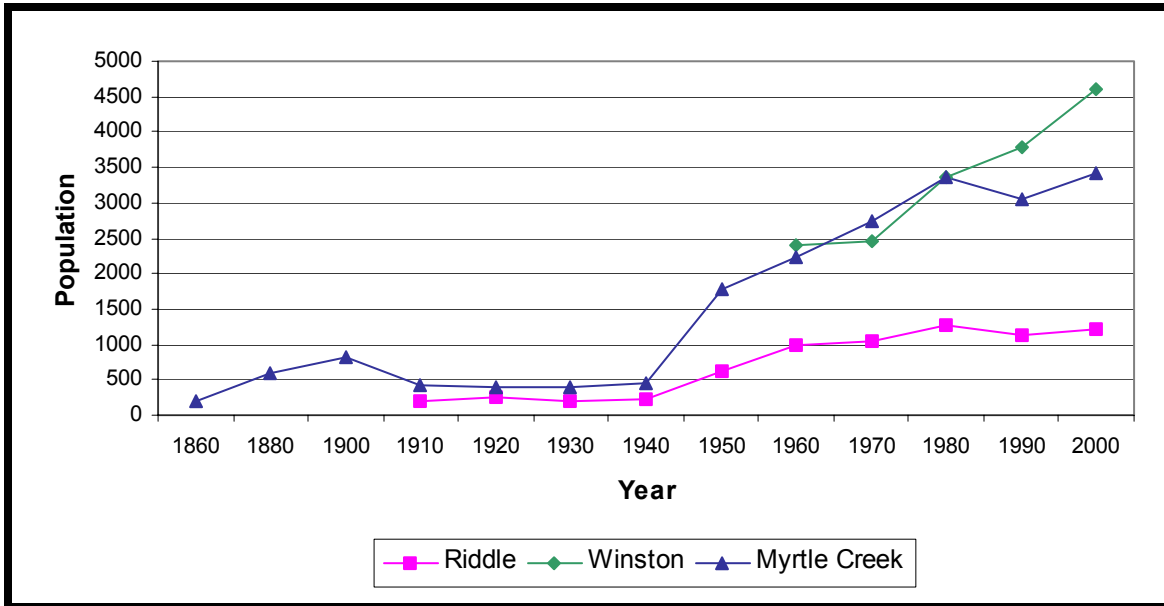
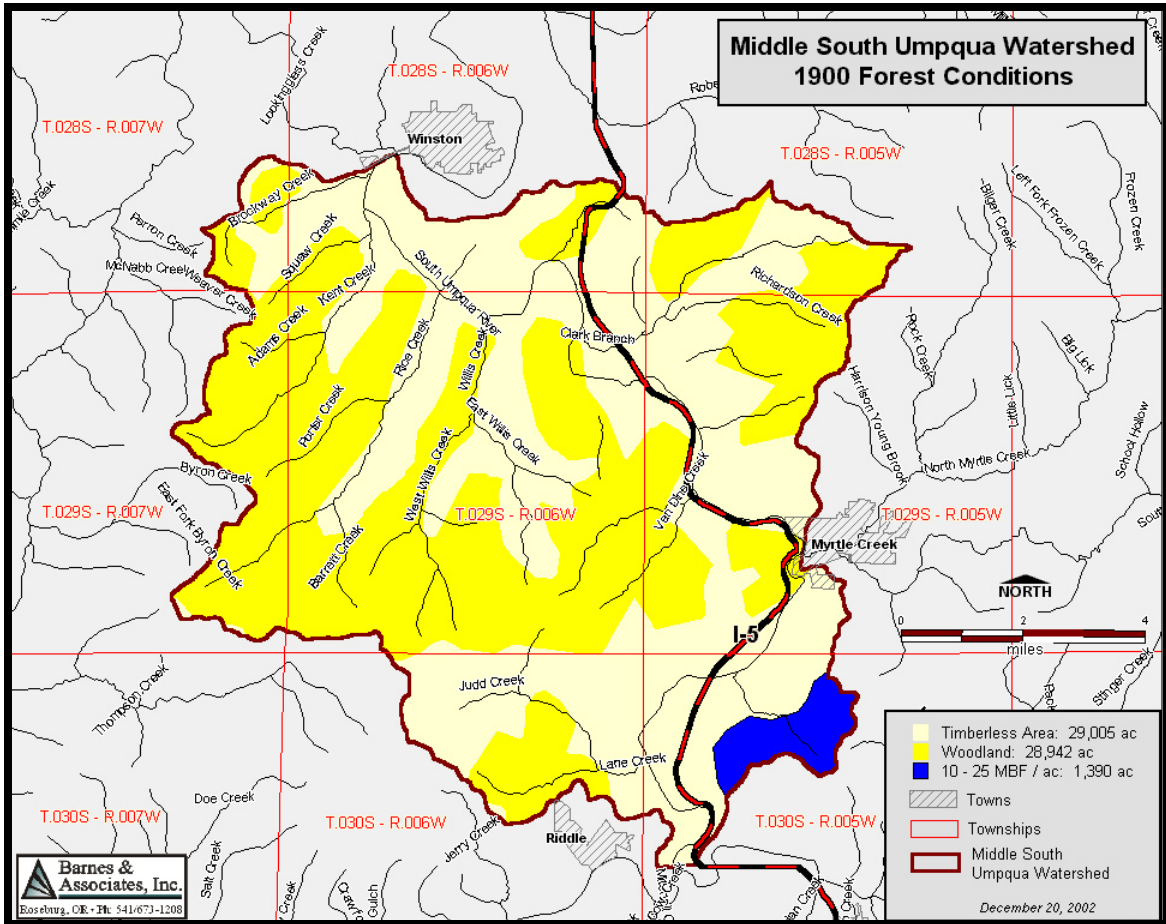


Figure 2-2: Middle South Umpqua population from 1860 through 2000.

2.5.3. 1900 forest conditions

Map 2-1 illustrates the vegetation patterns of 1900. The timberless acres were the bottomlands along the South Umpqua River and many of the streams of the watershed. The woodland areas were evident in the upper stream reaches. One small patch of timber was located in the southeast corner of the watershed east of the present-day location of Interstate Five.



Map 2-1: 1900 vegetative patterns for the Middle South Umpqua Watershed.¹⁷

2.5.4. Historical fish use¹⁸

The Middle South Umpqua Watershed is located within the South Umpqua Basin with all streams of the watershed eventually draining into the South Umpqua River. In 1937 the Umpqua National Forest surveyed portions of the South Umpqua Basin for fish use. Numerous salmon, steelhead, and cutthroat trout were found throughout the South Umpqua River and its tributaries. The riparian zones were typically the old growth forests found throughout the Pacific Northwest with much of the waterway shaded by tall trees.

Historically, this watershed has had naturally low streamflows and warm water temperatures during the summer months but was still able to support abundant populations of chinook and coho salmon, steelhead and cutthroat trout (see Appendix

¹⁷ “MBF” means thousand board feet.

¹⁸ This section on historical fish use is based on information from the *1999 Middle South Umpqua Watershed Analysis* completed by the Roseburg District of the Bureau of Land Management.

3).¹⁹ The 1937 Umpqua National Forest Survey found steelhead runs in the South Umpqua River were strongest in the winter while the chinook were most evident in late spring and summer. Cutthroat trout were observed throughout the surveyed stream segments of the Upper South Umpqua Basin. As shown in Table 2-2, the Oregon State Game Commission found coho salmon plentiful in the South Umpqua River in 1972.

Chinook		Coho	Steelhead		Sea-Run
Spring	Fall		Winter	Summer	Cutthroat
600	1,500	4,000	10,000	0	10,000

Table 2-2: Estimated number of adult anadromous salmonids (1972).²⁰

The Umpqua system was stocked with Alsea River cutthroat from 1961 through the late 1970s. The sea-run cutthroat trout returns have been low since the stocking was eliminated. The addition of the Alsea River cutthroat may have added to the survival problems of the sea-run cutthroat trout native to the Umpqua River Basin.

Between the years of 1989 and 1993, the Umpqua National Forest did a comparative study of the streams originally surveyed in 1937. Stream widening was found in 22 of the 31 segments of streams surveyed. The widening is related to increased peak flows. Peak flows increase when stream channels are simplified – sediment fills the pools leaving a smoother channel surface. Clearing of vegetation from the riparian areas along streams has typically increased erosion along the stream banks and added sediment to the waterways. Timber harvest, road construction, and mining have all played a role in changing the stream channels and riparian zones. Stream channel simplification decreases the number and depth of the pools used for fish rearing.

2.6. Historical references

A brief history of Myrtle Creek. 1993. Myrtle Creek, Oregon: City of Myrtle Creek.

Allan, S., Buckley, A.R., & Meacham, J.E. 2001. Atlas of Oregon. Eugene, Oregon: University of Oregon Press.

Bakken, L.J. 1970. Lone Rock free state. Myrtle Creek, Oregon: The Mail Printers.

Beckham, D. 1990. Swift flows the river: Log driving in Oregon. Coos Bay, Oregon: Arago Books.

Beckham, S.D. 1986. Land of the Umpqua: A history of Douglas County, Oregon. Roseburg, Oregon: Douglas County Commissioners.

¹⁹ Some believe that water impoundments caused by beaver dams may have regulated stream flows and stream temperature.

²⁰ The information in the table was taken from Lauman et al., 1972.

- Bureau of Land Management. 1999. Middle South Umpqua Watershed analysis. Roseburg, Oregon: USDI Bureau of Land Management, Roseburg district.
- Cantwell, R. 1972. The hidden northwest. New York, New York: J.B. Lippincott Company.
- Chandler, S.L. 1981. Cow Creek valley. Drain, Oregon: The Drain Enterprise.
- Chenoweth, J.V. 1972. Douglas county's golden age. Oakland, Oregon: Oakland Printing Company.
- Clayton, S. 1956. Story of Dillard: Pioneer stories. Dillard, Oregon: Sherley Clayton.
- Clayton, S. 1956. Story of the Rices: Pioneer stories. Dillard, Oregon: Sherley Clayton.
- Clayton, S. 1957. Story of the Kents: Pioneer stories. Dillard, Oregon: Sherley Clayton.
- Craig, P. 2002. Water lines come to Rice, Willis creek areas. The News-Review, August 15.
- Cubic, K. 1986. Historic resources of the city of Myrtle Creek, Oregon. Roseburg, Oregon: Douglas County Planning Department.
- Cubic, K.L. 1987. A Place Called Douglas County. Roseburg, Oregon: Douglas County Planning Department.
- Cubic, K.L. n.d.. Historic gold mining in Douglas County, Oregon. Roseburg, Oregon: Douglas County Planning Department.
- Douglas County Oregon. 2002. River flood crest history. Retrieved December 11, 2002, from: http://www.co.douglas.or.us/flood_crest.asp.
- Flagg T.A., Berejikian, B.A., Colt, J.E., Dickhoff, W.W., Harrell, L.W., D.J. Maynard, Nash, C.E., Strom, M.S., Iwamoto, R.N., & Mahnken, C.V.W. 2000. Ecological and behavioral impacts of artificial production strategies on the abundance of wild salmon populations. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC- 41.
- Lauman, Jim E., Thompson, Kenneth E., Fortune, John D. Jr. 1972. Fish and Wildlife Resources of the Umpqua Basin, Oregon, and Their Water Requirement. Oregon State Game Commission, Environmental Management Section.
- Lavender, D. (Ed). 1972. The Oregon journals of David Douglas – during the years 1825, 1826, & 1827. Ashland, Oregon: The Oregon Book Society.

- Leedy, J.C. 1929. 1928 annual report - Douglas County. Corvallis, Oregon: Oregon State Agricultural College.
- Libbey, F.W. 1951. Geology and mineral resources of Douglas County, Oregon. *The Ore.* –Bin, 13:2, 9-13.
- Markers, A.G. 2000. *Footsteps on the Umpqua*. Lebanon, Oregon: Dalton Press.
- Minter, H.A. 1967. *Umpqua valley Oregon and its pioneers: The history of a river and its people*. Portland, Oregon: Binfords & Mort, Publishers.
- Oberst, G. 1985. For sale: Quicksilver mine. *The News Review*, January 13, 1985, c1-c2.
- Oregon Department of Environmental Quality. 2002. Formosa mine: Project status report. Retrieved on November 14, 2002 from: <http://www.deq.state.or.us>.
- Oregon Department of Fish and Wildlife. 1995. 1995 Biennial Report in the Status of Wild Fish in Oregon. Retrieved on November 7, 2002, from: <http://www.dfw.state.or.us>.
- Oregon Department of Forestry. 2002. A brief history of the Oregon Forest Practices Act. Retrieved on November 13, 2002, from: <http://www.odf.state.or.us/>.
- Oregon Department of Geology and Mineral Industries. 2002. Recognizing environmentally conscious miners. Retrieved on November 14, 2002 from: <http://sarvis.dogami.state.or.us/>.
- Oregon Labor Market Information System. 2002. The lumber and wood products industry: Recent trends. Retrieved on November 13, 2002 from: <http://www.qualityinfo.org/olmisj/OlmisZine>.
- Parker, J.R. 1936. 1935 annual report - Douglas County. Corvallis, Oregon: Oregon State Agricultural College.
- Patton, C.P. 1976. *Atlas of Oregon*. University of Oregon: Eugene, Oregon.
- Schlesser, H.D. 1973. *Fort Umpqua: Bastion of empire*. Oakland, Oregon: Oakland Printing Company.
- Tishendorf, D. 1981. China ditch: The lost course of dreams. *The News-Review*, May 3, 1981, c1, c10.
- Wyant, D. 1955. Ore search goes on deep inside mountain. *Eugene Register-Guard*, September 5, 1955.

3. Current Conditions

This chapter explores the current conditions of the Middle South Umpqua Watershed in terms of instream, riparian, and wetland habitats, water quality, water quantity, and fish populations. Background information for this chapter was compiled from the following sources: the *Oregon Watershed Assessment Manual* (Watershed Professionals Network, 1999), the *Watershed Stewardship Handbook* (Oregon State University Extension Service, 2002), and the *Fish Passage Short Course Handbook* (Oregon State University Extension Service, 2000). Additional information and data are from the following groups' documents, websites, and specialists: the USDI Bureau of Land Management, the Oregon Department of Environmental Quality, the Oregon Department of Fish and Wildlife, the Douglas Soil and Water Conservation District, the US Geological Survey, and the Oregon Water Resources Department.

Key Questions

- In general how are the streams, riparian areas, and wetlands within the Middle South Umpqua Watershed functioning?
- How is water quality in terms of temperature, surface water pH, dissolved oxygen, and other parameters?
- What are the consumptive uses and instream water rights in the watershed, and what are their impacts on water availability?
- What are the flood trends within the watershed?
- What is the distribution and abundance of various fish species, what are the habitat conditions, and where are fish passage barriers?

3.1. Stream function

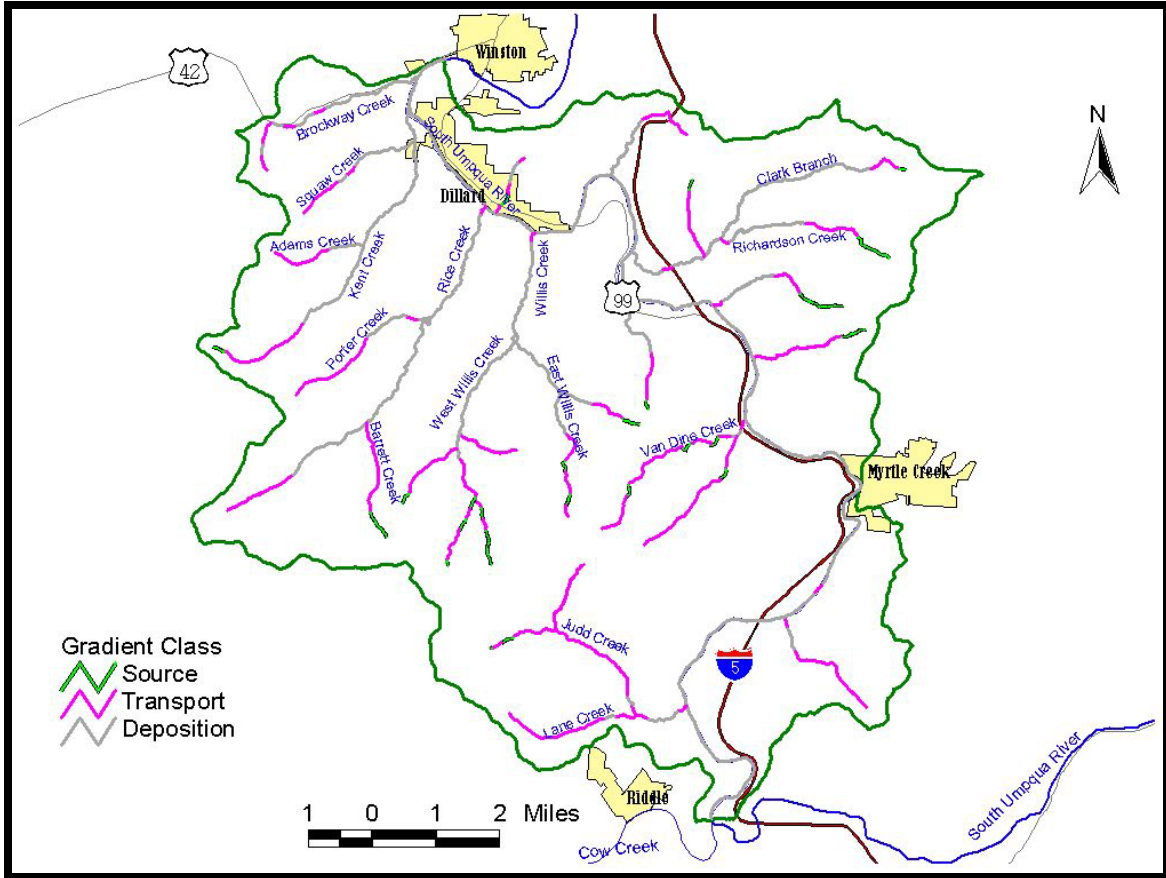
3.1.1. Stream morphology

Channel morphology²¹

The Oregon Watershed Assessment Manual (OWAM) was used for classifying streams within the Middle South Umpqua Watershed. In general, streams were classified according to channel habitat types based on stream gradient, valley confinement, and stream size. The OWAM further classifies and defines streams as source, transport, or depositional streams. Source streams are defined as steep (>16%), confined, mountain streams that are void of a floodplain. These channels are thought to be high-energy streams that carry wood and sediment to the lower reaches. Transport streams generally have a moderate gradient (3% to 16%) and are confined to narrow valleys. These streams may have small floodplains and temporarily store wood and sediment. However, these streams will transport wood and sediment to the downstream reaches during higher flow events. Depositional streams are defined as low gradient streams (<3%); they are low-energy streams that store wood and sediment for long periods of time. These streams are found in valley bottoms and have large floodplains (Ellis-Sugai and Godwin, 2002). This

²¹ Jenny Allen, Tim Grubert, and John Runyon of BioSystems, Inc., provided the text and Table 3-2 for this section.

classification scheme is based on the widely held assumption that stream channels possess specific physical characteristics resulting from the interaction of geologic, climatic, and vegetative inputs. Map 3-1 and Table 3-1 show the total stream miles and percent of streams within each gradient class.



Map 3-1: Stream gradients for the Middle South Umpqua Watershed.

Gradient class	Stream miles in the watershed	% Total
Source	5.9	6.1%
Transport	35.7	36.8%
Deposition	55.4	57.1%
Total	97.0	100.0%

Table 3-1: Middle South Umpqua Watershed stream miles within each gradient class.

The Middle South Umpqua Watershed has source streams located in the mountain headwaters of the upper reaches. Some of these channels include the upper reaches of Judd, Lane, and Van Dine Creeks. They have steep gradients (>16%) and narrow channels confined by adjacent steep hill slopes with little or no floodplain. Given the steep gradients of these channels, they have a tremendous amount of energy to deliver

wood and sediment to the downstream reaches, often in the form of landslides and debris torrents. Given the high-energy, steep gradients, and lack of floodplains, these streams are generally not responsive to habitat projects. Often these streams do not provide high quality aquatic habitat because the channels are dynamic, always in a state of transition. Many times these tributaries are located above the anadromous fish zone. The best approach to managing these types of systems may be through the careful monitoring and limiting of human activities such as cattle grazing and road building. Such activities can increase sediment loads into these systems that subsequently impact water quality of the lower reaches.

The middle portions of the Middle South Umpqua Watershed consist of transport streams such as East and West Willis, Richardson, and Porter Creeks that feed directly into the main stem of the South Umpqua. These channels have moderate gradients (3% to 12%) with unconfined to moderately confined valleys and small floodplains. Many are still considered high-energy streams capable of carrying wood and sediment downstream during high flows. However, wood and sediments may temporarily be stored in these systems, providing cover and shade, promoting pool formations, and helping to dissipate stream energy. Restoration projects within these channels should be carefully considered before implementation due to the wide range of responses. The success of the project will depend greatly on channel gradient, size of floodplain, sediment load from upper reaches, and amount of energy associated with high flows. Goals should be carefully matched to the individual channels for success of restoration projects.

The main stem of the South Umpqua and several of its tributaries, such as Willis Creek, the lower reach of Clark Creek and Rice Creek, are low gradient streams (1% to 3%) associated with medium to large floodplains. Sediment and large wood are deposited into these systems for long periods of time providing complex aquatic habitats within the stream network. The large wood and coarse sediments contribute to several processes that affect aquatic habitat, such as pool formation, bar formations, and development of side-channels. These tributary streams with large floodplains and low gradients are good candidates for restoration projects. Floodplains provide an important function for the stream. During high flows, the floodplain allows stream energy to be dissipated and slowly released as floodwaters recede. By slowing the stream energy during high flows, control structures like large wood often remain and continue to provide habitat. Furthermore, sediments have time to settle along the floodplains rather than filling pools and causing increased turbidity. The additions of control structures like boulders and large wood can improve fish habitat in several ways, such as increasing pool frequency and depth, promoting side-channel development, and dissipating stream energy during high flows. If stream shade and/or bank stability are issues, riparian plantings and excluding livestock through fencing are effective means to mitigate this problem. Table 3-2 lists the channel habitat types that are found in the area along with examples of streams that fall into each category within the watershed and restoration enhancement opportunities.

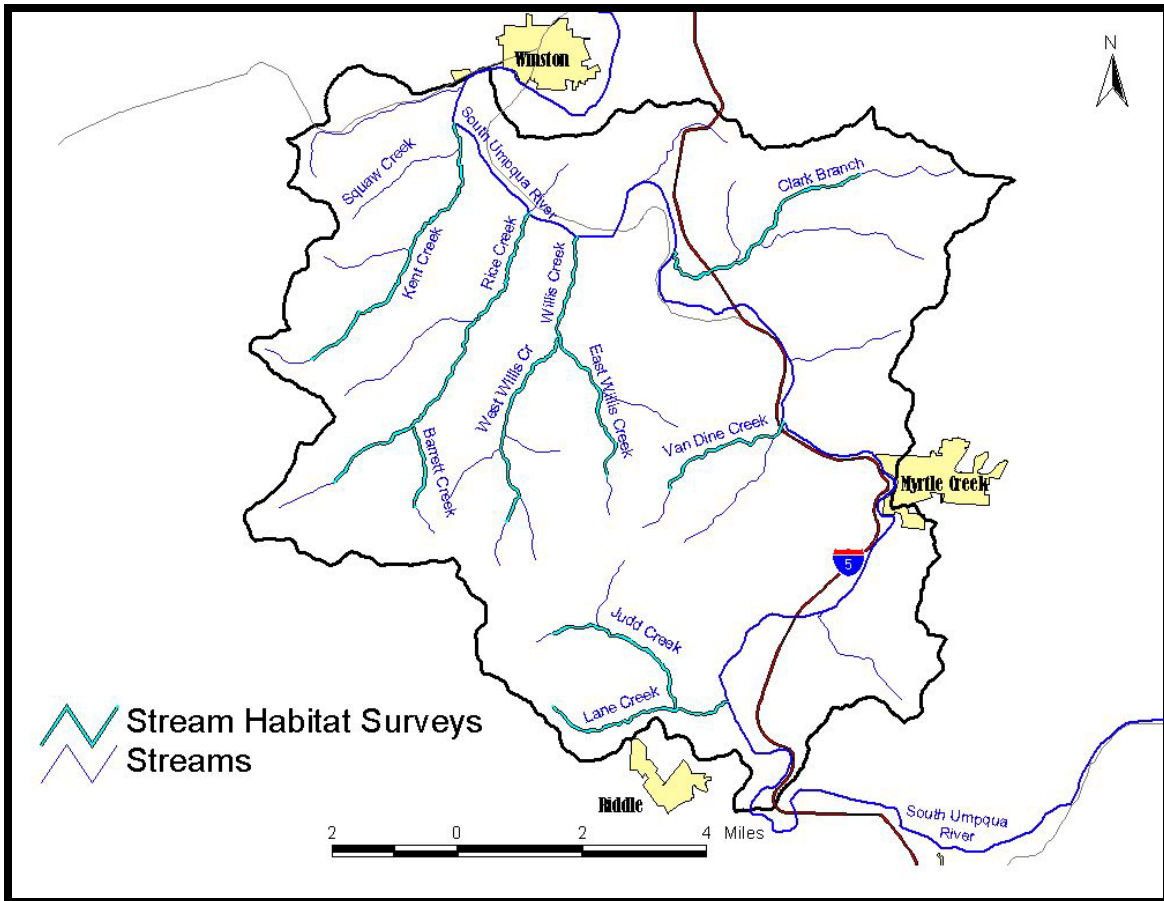
Channel habitat type	Example within watershed	Restoration opportunities
Low gradient large floodplain	South Umpqua River	Because of the migrating nature of these channels, restoration opportunities such as riparian planting projects on small side channels may be the best option for improvement.
Low gradient small floodplain	Lower reach of Clark Creek	Because of the migrating nature of these channels, restoration efforts may be challenging. However, because of their small size, projects such as riparian plantings might, at some locations, be successful.
Low gradient moderately confined	Willis Creek	These channels can be very responsive to restoration efforts. Adding roughness in forested areas may improve fish habitat while stabilizing stream banks in non-forested areas may decrease erosion.
Moderate gradient moderately confined	Richardson and Kent Creeks	These channels are among the most responsive to restoration projects. Adding large wood in forested areas may improve fish habitat and decrease erosion.
Moderate gradient confined	Porter and West Willis Creeks	Though these channels are not often responsive, riparian planting projects may improve water temperature and erosion issues.
Moderate gradient headwater	Upper reaches of Judd and Lane Creeks	These channels are often moderately responsive to restoration. Riparian planting projects may improve water temperature and erosion issues.

Table 3-2: Channel habitat types within the Middle South Umpqua Watershed.

Stream habitat surveys

Since 1992, the Oregon Department of Fish and Wildlife (ODFW) has conducted stream habitat surveys throughout the Umpqua Basin. The purpose of these surveys is to gather basic data about Umpqua Basin streams, and to compare current stream conditions to the habitat needs of salmonids and other fish. In the summers of 1994, 1995, and 1996, ODFW staff conducted stream habitat surveys in the Middle South Umpqua Watershed. Approximately 32.7 stream miles were surveyed in the Middle South Umpqua Watershed (see Map 3-2), or about a third of the total stream miles visible on the map (97.0miles).²² Each stream was divided into reaches based on channel and riparian habitat characteristics for a total of 34 reaches averaging one mile in length. Appendix 4 provides a map detailing the stream reaches.

²² See section 1.2.5 for more information about the stream map.



Map 3-2: Streams surveyed in the Middle South Umpqua Watershed.

For each stream, surveyors measured a variety of pre-determined habitat variables. Since a primary purpose of the stream habitat surveys was to evaluate the stream’s current condition compared to fish habitat needs, the ODFW developed habitat benchmarks to interpret stream measurements that pertain to fish habitat. This assessment includes nine measurements that have been grouped into four categories: pools, riffles, riparian areas and large instream woody material. Table 3-3 provides the habitat measurements included in each category.

Stream habitat benchmarks rate the values of the components of the survey in four categories: excellent, good, fair, and poor. For the purpose of this watershed assessment, “excellent” and “good” have been combined into one “good” category. Table 3-3 provides parameters used to develop the benchmark values.

Habitat characteristic	Measurements used for rating habitat quality	Benchmark values		
		Good	Fair	Poor
Pools	<p>1. Percent area in pools: percentage of the creek area that has pools</p> <p>2. Residual pool depth: depth of the pool (m), from the bottom of the pool to the bottom of the streambed below the pool</p> <p>a) small streams</p> <p>b) large streams</p>	<p>1. > 30</p> <p>2a. > 0.5</p> <p>2b. > 0.8</p>	<p>1. 16-30</p> <p>2a. 0.5 - 0.3</p> <p>2b. 0.8 - 0.5</p>	<p>1. <16</p> <p>2a. < 0.3</p> <p>2b. < 0.5</p>
Riffles	<p>1. Width to depth ratio: width of the active stream channel divided by the depth at that width</p> <p>2. Percent gravel in the riffles: percentage of creek substrate in the riffle sections of the stream that are gravel</p> <p>3. Percent sediments (silt, sand, and organics) in the riffles: percentage of creek substrate in the riffle sections of the stream that are sediments</p>	<p>1. ≤ 20.4</p> <p>2. ≥ 30</p> <p>3. ≤ 7</p>	<p>1. 20.5-29.4</p> <p>2. 16-29</p> <p>3. 8-14</p>	<p>1. ≥ 29.5</p> <p>2. ≤ 15</p> <p>3. ≥ 15</p>
Riparian	<p>1. Dominant riparian species: hardwoods or conifers</p> <p>2. Percent of the creek that is shaded</p> <p>a) for a stream with width < 12m (39 feet)</p> <p>b) for a stream with width > 12m</p>	<p>1. large diameter conifers</p> <p>2a. > 70</p> <p>2b. > 60</p>	<p>1. medium diameter conifers & hardwoods</p> <p>2a. 60 – 70</p> <p>2b. 50 – 60</p>	<p>1. small diameter hardwoods</p> <p>2a. < 60</p> <p>2b. < 50</p>
Large Woody Material in the Creek	<p>1. Number of wood pieces²³ per 100m (328 feet) of stream length</p> <p>2. Volume of wood (cubic meters) per 100m of stream length</p>	<p>1. > 19.5</p> <p>2. > 29.5</p>	<p>1. 10.5-19.5</p> <p>2. 20.5-29.5</p>	<p>1. < 10.5</p> <p>2. < 20.5</p>

Table 3-3: Stream habitat survey benchmarks

For this assessment, the UBWC and ODFW staff simplified the stream data by rating the habitat category by its most limiting factor. For example, there are two components that determine the pools rating: percent area in pools and residual pool depth. If a reach of a

²³ Minimum size is six-inch diameter by 10 ft length or a root wad that has a diameter of six inches or more.

small stream had 50% of its area in pools, then according to Table 3-3, it would be classified as good for percent area in pools. If average pool depth on the same reach were 0.4 meters in depth, this reach would have fair residual pool depth. This reach's classification for the pools habitat category would be fair. Most habitat categories need a combination of components to be effective, and therefore are rated by the most limiting factor, in this case pool depth.

The benchmark ratings should not be viewed as performance values, but as guides for interpretation and further investigation. Streams are dynamic systems that change over time, and the stream habitat surveys provide only a single picture of the stream. For each habitat variable, historical and current events must be considered to understand the significance of the benchmark rating. Take, for example, a stream reach with a poor rating for instream large wood. Closer investigation could uncover that this stream is located in an area that historically never had any large riparian trees. Failing to meet the benchmark for instream large wood may not be a concern because low instream wood levels may be the stream's normal condition. On the other hand, meeting a benchmark does not mean all is well. A stream reach in a historically wooded area could meet its benchmark for large instream wood because a logging truck lost control and dumped its load in the stream. In this example, meeting the large wood benchmark is not sufficient if that stream reach has no natural sources of woody material other than logging truck accidents.

Overview of conditions

Looking at the historical and the proximate conditions is necessary to fully understand the value of each reach's benchmark rating. Conducting this type of study for every reach within the Middle South Umpqua Watershed is beyond the scope of this assessment. Instead, it looks for patterns within the whole watershed and along the stream length to provide a broad view and help determine trends that might be of concern.

Of the 34 stream reaches surveyed by the ODFW, two (5.9%) rated as fair or good in all four categories. Thirty stream reaches (88%) had at least two categories rate as poor. Looking in Appendix 4, it is striking that almost all stream reaches are rated as poor for large woody material. Pools and riparian areas are similar, with around 60% of stream reaches rating as poor and 35% rating as fair. Just over half of stream reaches are fair or good for riffles.

Stream conditions

For each reach, the ODFW survey team classified the land use around the stream. A chart with these classifications and their definitions is provided in Appendix 5. Land uses and potential problem areas, which are parameters that were classified as "poor" or a combination of "fair" and "poor," are highlighted below.

Barrett Creek

Reach one is in agricultural land and reach two is in second growth timber. Both reaches have poor large woody material and poor pools, and poor or fair riparian areas.

Clark Branch Creek

There is no land use listed for the first reach of this stream. Reach two is in primarily rural residential development with some agricultural use. Both reaches rate as poor for all parameters.

Judd Creek

This stream has five reaches. The first reach is in an industrial area with some rural residential development. Reaches two and three are in young timber, reach four is in second growth timber, and reach five is in a mixture of large and young timber. All reaches are poor to fair for large woody material. Riparian areas are mostly poor with reaches four and five rating as fair and good.

Kent Creek

The first two reaches are mostly in rural residential development with light grazing and a timber harvest area. Reach three is in heavy grazing with second-growth timber, while the last two reaches are in second growth timber and young timber. All five reaches are poor for pools and large woody material. Riffles are mostly poor and riparian areas are fair except for reach one, which is poor for all parameters.

Lane Creek

The first three reaches are in areas with heavy grazing with some rural residential development and second growth timber. Reach four is in second-growth timber with some mature timber. All reaches rate as poor for pools and large woody material. Riffles are poor for the first two reaches. The first reach is poor for all parameters.

Rice Creek

The first reach is in a rural residential development, while the next three reaches are in agricultural areas. All four reaches are poor for large woody material, and all but reach one are poor for riparian areas. Pools range from poor to fair.

Van Dine Creek

The single reach, running through agricultural lands and is rated as poor for all parameters.

Willis Creek

The single reach, running through agricultural lands and heavy grazing, is poor for all parameters.

East Fork Willis Creek

Reaches one and three are in agricultural areas with light and heavy grazing, while reach four is in second growth timber. There is no land use indicated for reach two. All reaches rate poor for large woody material and riparian areas, and poor to fair for pools and riffles.

West Fork Willis Creek

The first four reaches pass through agricultural land with light grazing. The last two reaches are in second growth timber and large timber. All but the final reach are poor for large woody material and riparian areas, and poor to fair for riffles.

3.1.2. Stream connectivity

Stream connectivity refers to the ability of resident and anadromous fish, as well as other aquatic organisms, to navigate the stream network. The stream system becomes disconnected when natural and human-made structures such as waterfalls, log jams, and dams, inhibit fish passage. Although some stream disconnect is normal, a high degree of disconnect can reduce the amount of suitable spawning habitat available to salmonids. This, in turn, reduces the stream system's salmonid productivity potential. Lack of stream connectivity can also increase juvenile and resident fish mortality by blocking access to other critical habitat, such as rearing grounds and cool tributaries during the summer months.²⁴

For this assessment, fish passage barriers are structures that completely block all fish passage. A juvenile fish passage barrier permits adult passage but blocks all young fish. Structures that allow some adults or some juvenile fish to pass are referred to as obstacles. Although a single obstacle does not prevent passage, when there are multiple obstacles, fish can expend so much energy in their passage efforts that they may die or be unable to spawn or feed. This assessment reviews the known distribution and abundance of three common human-made fish passage barriers and obstacles: irrigation ditches, dams, and culverts.

Irrigation ditches

Irrigation ditches without fish wheel screens are primarily a problem for juvenile fish.²⁵ When the water diversion is in place, young fish swim into the ditches in search of food. When the diversion to the ditch is removed, the young fish left in the ditch cannot return to the stream network and will eventually die. At the writing of this assessment, no unscreened irrigation ditches in the Middle South Umpqua Watershed had been identified as significant juvenile fish passage barriers.

Dams

In the central Umpqua Basin, most dams on larger streams are push-up dams used to create pools to pump irrigation water.²⁶ These dams are only used during the summer months, and pose no passage barrier to fish during the winter. Dams can be barriers or obstacles to fish passage if the distance from the downstream water surface to the top of the dam is too far for fish to jump.

²⁴ See section 3.3.2 for more information about stream temperature.

²⁵ Fish wheel screens are self-cleaning screens that prevent fish from entering an irrigation ditch while passing floating debris that may prevent water flow.

²⁶ Some landowners may have dams on small tributaries to provide water for wildfire control, provide water for livestock, or for landscape aesthetics.

Whether or not a fish can overcome this distance depends on three factors: the size of the fish, the height of the drop, and the size of the pool at the base of the dam, which is where fish gain momentum to jump. If the pool is two feet deep, it is generally believed that adult fish can surmount a two-foot high dam or less, while juvenile fish can overcome a height of 0.5 feet or less. As pool depth decreases or height increases, fish have difficulty jumping high enough to pass over. According to the Oregon Water Resources Department, there are small dams on Willis Creek and on Rice Creek. It is unknown at this time the extent to which these dams may be barriers to fish passage (see The Umpqua Basin Fish Access Team subsection below).

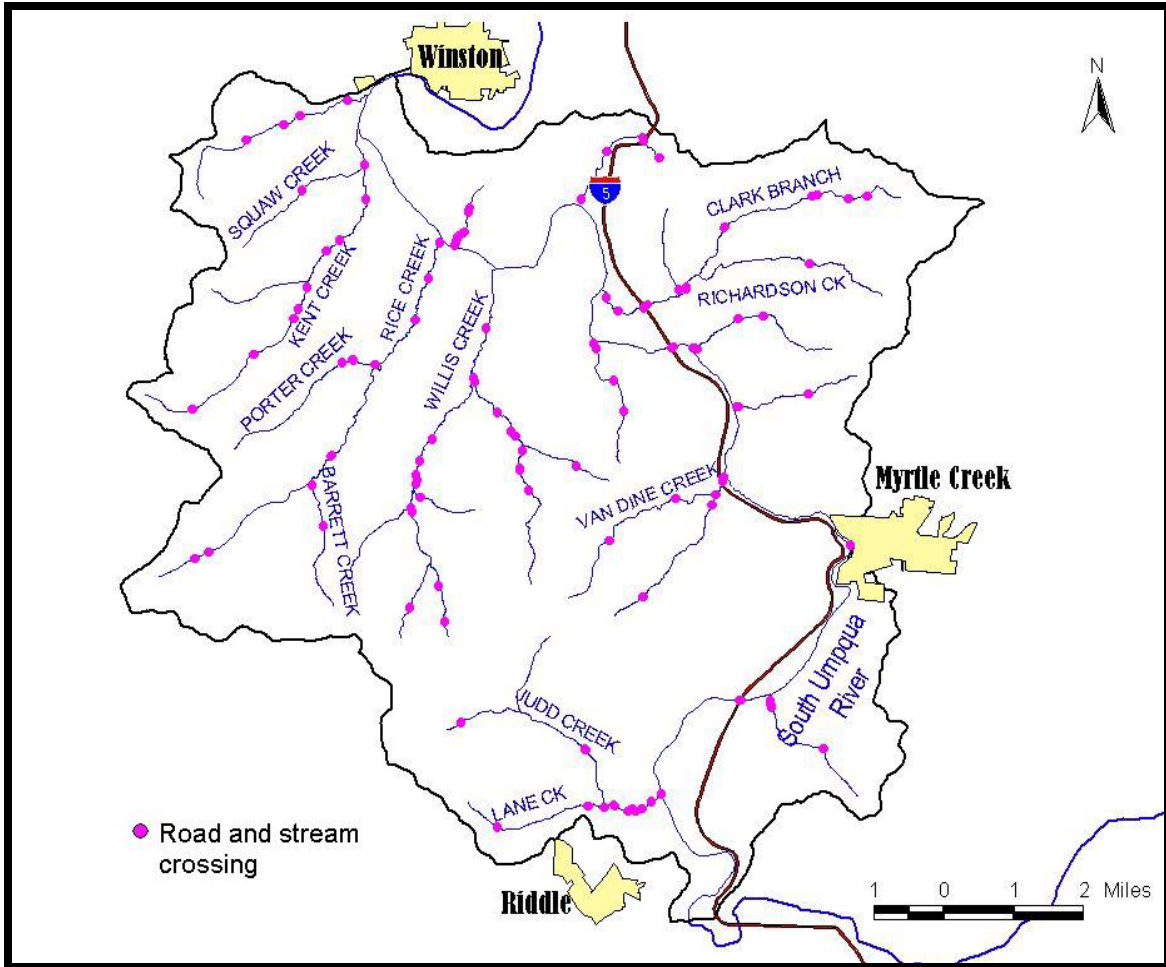
Culverts

Culverts pose the greatest problem for fish passage. Culverts are the most common method of crossing a road over a stream. There are at least 160 road and stream crossings in the Middle South Umpqua Watershed (see Map 3-3). Many of these are most likely culverts, but it's unknown at this time how many of the culverts are fish passage barriers or obstacles.

Culverts can be a barrier or obstacle to fish passage if the distance from the downstream water surface to the culvert outfall (or "drop") is too far for fish to jump. Just as with dams, it is generally believed that adult fish can reach a culvert outlet that is two feet or less from the downstream water, while juvenile fish overcome a height of 0.5 feet or less, if there is a two-foot deep pool at the outfall.

Unlike dams, water velocity within the culvert poses another potential fish passage barrier. In natural stream systems, fish are able to navigate high velocity waters by periodically resting behind rocks and logs or in pools. Smooth-bottomed culverts offer no such protection, and water velocities can prevent some or all fish from passing through the pipe. Fish may face additional velocity barriers at the upstream end of a culvert if it has been placed so that the stream flows sharply downward into the culvert entrance. In general, smooth-bottomed culverts at a 1% gradient or more are obstacles to fish passage. Culverts that are partially buried underground or built to mimic a natural streambed provide greater protection and allow fish passage at steeper gradients and higher water velocities.

It is important to note that culverts may be fish passage obstacles or barriers for only part of the year. As water levels change, so do pool depth, drop distance, and water velocity. A culvert with a five-foot drop in the summer may be easily navigated in the winter. High winter water flows can increase pool size and reduce jumping distance. However, high flows can also increase water velocities, making culverts impassible.



Map 3-3: Road and stream crossings in the Middle South Umpqua Watershed.

The Umpqua Basin Fish Access Team

Currently, the Umpqua Basin Fish Access Team (UBFAT) is working on identifying and prioritizing fish passage-limiting culverts, as well as other fish passage barriers and obstacles, on public and private land throughout the Umpqua Basin. This project is in the information gathering stage and does not yet have a list of fish passage-limiting culverts in the Umpqua Basin. Future prioritization will focus on identifying the fish passage barriers that will give the highest cost-to-benefit ratio, such as culverts blocking fish access near the mouths of streams that are within the distribution of salmonids.²⁷ A document summarizing the results of this project will be available in late 2003.

3.1.3. Channel modification²⁸

For the purpose of this assessment, “channel modification” is defined as any human activity designed to alter a stream’s flow or its movement within the floodplain, such as

²⁷ See section 3.5.2 for information about anadromous and resident salmonid distribution within the Middle South Umpqua Watershed.

²⁸ Information in section 3.1.3 is primarily from interviews by the author with Douglas Soil and Water Conservation District staff.

building riprap, dredging, or vegetative bank stabilization. Although placing structures like boulders or logs in a stream alters the channel, this type of work is done to improve aquatic habitat conditions and is not intended to alter the stream's path. As such, instream structure placement projects are not considered channel modification activities for this assessment.

In Oregon, the state has the authority to regulate all activities that modify a stream's active channel. The active channel is all the area along a stream that is submerged during high waters. Even if the entire stream is within a landowner's property, the active channel, like the water within it, is regulated by public agencies, and channel modification projects can only be done with a permit.²⁹ History has shown that channel modification activities are often detrimental to aquatic ecosystems and to other reaches of the same stream. Streams naturally meander, and attempts to halt meandering can alter aquatic habitats in localized areas and cause serious erosion or sedimentation problems further downstream. Although channel modification projects can still be done with a permit, obtaining a permit is a lengthy process.

Historical channel modification projects

Quantifying historical channel modification activities is difficult because no permits were issued and the evidence is hidden or non-existent. The majority of past channel modification activities were removing gravel bars from the stream and bank stabilization. Property owners removed gravel bars to sell the gravel as aggregate, to reduce water velocities, and "to put the creek where it belongs." Gravel bars are not stationary, and during every flood event gravel is washed away and replaced by upstream materials.³⁰ Consequently, a gravel bar in the same location was often removed every year. According to landowners, there used to be many small aggregate mining businesses along the South Umpqua River, which have been replaced by a few large companies.

Bank stabilization concerns any material added to the stream's bank to prevent erosion and stream meandering. The term "riprap" refers to bank stabilization done with any handy material including tires, car bodies, railroad ties, rocks, and cement. Other bank stabilization projects involve engineered structures, such as bank "barbs," which are large rocks strategically placed to divert the flow of water away from the bank. Frequently, riprap and engineered structures become buried by sediment only to be exposed years later when a stream alters its path. During the 1996 Douglas County area floods, many past bank stabilization projects were exposed as sediment was washed away. In some cases, entire car bodies used for riprap were found stranded in the middle of streams that had drastically changed course.

²⁹ Under the Oregon Removal/Fill Law (ORS 196.800-196.990), removing, filling, or altering 50 cubic yards or more of material within the bed or banks of the waters of the state or any amount of material within Essential Habitat streams or State Scenic Waterways requires a permit from the Division of State Lands. Waters of the state include the Pacific Ocean, rivers, lakes, most ponds and wetlands, and other natural bodies of water. Tree planting in the active stream channel, and timber harvesting in some circumstances, can be done without a permit.

³⁰ In general, a gravel bar that has no grass or other vegetation is unstable.

Current channel modification projects

There are only a handful of permitted channel modification activities recently done within the Middle South Umpqua Watershed. Two gravel mines are located near the South Umpqua River, one near Round Prairie and the other downstream of the mouth of Clark Branch Creek. Landowners report that these mines have altered the river's flow (see section 5.2). In 1999, a Christmas tree bank erosion project was completed on Rice Creek downstream of Porter Creek. Christmas tree erosion control projects place trees against a bank, where the many tiny branches and needles slow water velocities and accumulate sediment. As the trees become clogged with sediment, vegetation becomes established. The trees eventually decay and leave behind the intact bank. This project has successfully protected the stream bank by reducing water velocities and accumulating sediment.

Landowners and stream restoration professionals report that non-permitted channel modification activities still occur throughout the Umpqua Basin. In many cases, the people involved are unaware of the regulations and fines associated with non-permitted channel modification projects and the effects on aquatic systems.

3.1.4. Stream function key findings and action recommendations

Stream morphology key findings

- The majority of streams within the Middle South Umpqua Watershed have low gradients with few stream miles in source areas, where most large woody material is recruited into the stream system. This may limit instream large woody material abundance.
- Stream habitat surveys suggest that lack of adequate large woody material, poor quality pools, and poor riparian tree composition limit fish habitat in Middle South Umpqua tributaries.

Stream connectivity key findings

- Culverts and, to some degree, dams, reduce stream connectivity, reducing anadromous and resident fish productivity in the Middle South Umpqua Watershed. More information about fish passage barriers will be available from UBFAT in 2003.

Channel modification key findings

- Many landowners may not understand the detrimental impacts of channel modification activities or may be unaware of active stream channel regulations.

Stream function action recommendations

- Where appropriate, improve pools, collect gravel, and increase the amount of large woody material by placing large wood and/or boulders in streams with channel types that are responsive to restoration activities and have an active channel less than 30 feet wide.³¹

³¹ Thirty feet is the maximum stream width for which instream log and boulder placement projects are permitted.

- In areas with inadequate riparian conditions, encourage land use practices that enhance or protect riparian areas:
 - Protect riparian areas from livestock-caused browsing and bank erosion by providing stock water systems and shade trees outside of the stream channel and riparian zones. Fence riparian areas as appropriate.
 - Plant native riparian trees, shrubs, and understory vegetation in areas with poor or fair riparian areas.
 - Manage riparian zones for uneven-aged stands with large diameter trees and younger understory trees.
- Maintain areas with good native riparian vegetation.
- Encourage landowner participation in restoring stream connectivity by eliminating barriers and obstacles to fish passage. Restoration projects should focus on barriers that, when removed or repaired, create access to the greatest amount of fish habitat.
- Increase landowner awareness and understanding of the effects and implications of channel modification activities through public outreach and education.

3.2. Riparian zones and wetlands

3.2.1. Riparian zones

The vegetation immediately adjacent to a stream is the stream's riparian zone. Riparian zones influence stream conditions in many ways. Above-ground vegetation can provide shade, reduce flood velocities, and add nutrients to the stream. Roots help prevent bank erosion and stream meandering. Trees and limbs that fall into streams can increase fish habitat complexity and can create pools. Insects that thrive in streamside vegetation are an important food source for fish.

What constitutes a "healthy" riparian area, however, is dependent on many factors. Although many large diameter conifers and hardwoods provide the greatest amount of shade and woody debris, many streams flow through areas that don't support large trees or forests. In some areas, current land uses may not permit the growth of "ideal" vegetation types. Conclusions about stream riparian zone conditions should take into consideration location, known historical conditions, and current land uses. Therefore, this assessment's riparian zone findings should be viewed as a guide for interpretation and further investigation and not as an attempt to qualify riparian conditions.

Riparian zone classification methodology

Digitized aerial photographs were used to determine riparian composition of the Middle South Umpqua Watershed. Creek banks are classified separately since conditions on one side of a stream are not necessarily indicative of conditions on the opposite bank. Stream banks are labeled as "left" or "right" from the perspective of standing in the middle of the creek looking downstream. The miles of riparian zone are the combined total of both the left and right banks. This assessment evaluated a total of 44.0 riparian zone miles for the South Umpqua River and a total of 150.0 miles for Middle South Umpqua tributaries.

Each side of the stream was divided into reaches based on changes in vegetation type and vegetation width. The reaches were measured and classified using three vegetation

composition parameters: dominant vegetation or feature, buffer width, and cover. Table 3-4 outlines the classifications for each parameter. Findings for each parameter for the South Umpqua River and tributaries within the watershed are discussed below. Appendix 6, Appendix 7, and Appendix 8 have data by percent for Lane Creek, Van Dine Creek, Clarks Branch Creek, East Fork Willis Creek, Willis Creek, Rice Creek, and Kent Creek.³²

Riparian zone parameters	Parameter attributes Stream reaches are classified by the most dominant (>50% cover) characteristic
Dominant vegetation or feature	<ul style="list-style-type: none"> • Conifer trees • Hardwood trees • Brush/blackberries • Range/grass/blackberries • No vegetation (roads, bare ground, etc.) • Infrastructure (bridges and culverts)
Buffer width	<ul style="list-style-type: none"> • No trees • 1 tree width • 2+ tree width
Cover	<ul style="list-style-type: none"> • No cover • <50% cover • >50% cover

Table 3-4: Riparian zone classification for the Middle South Umpqua Watershed.

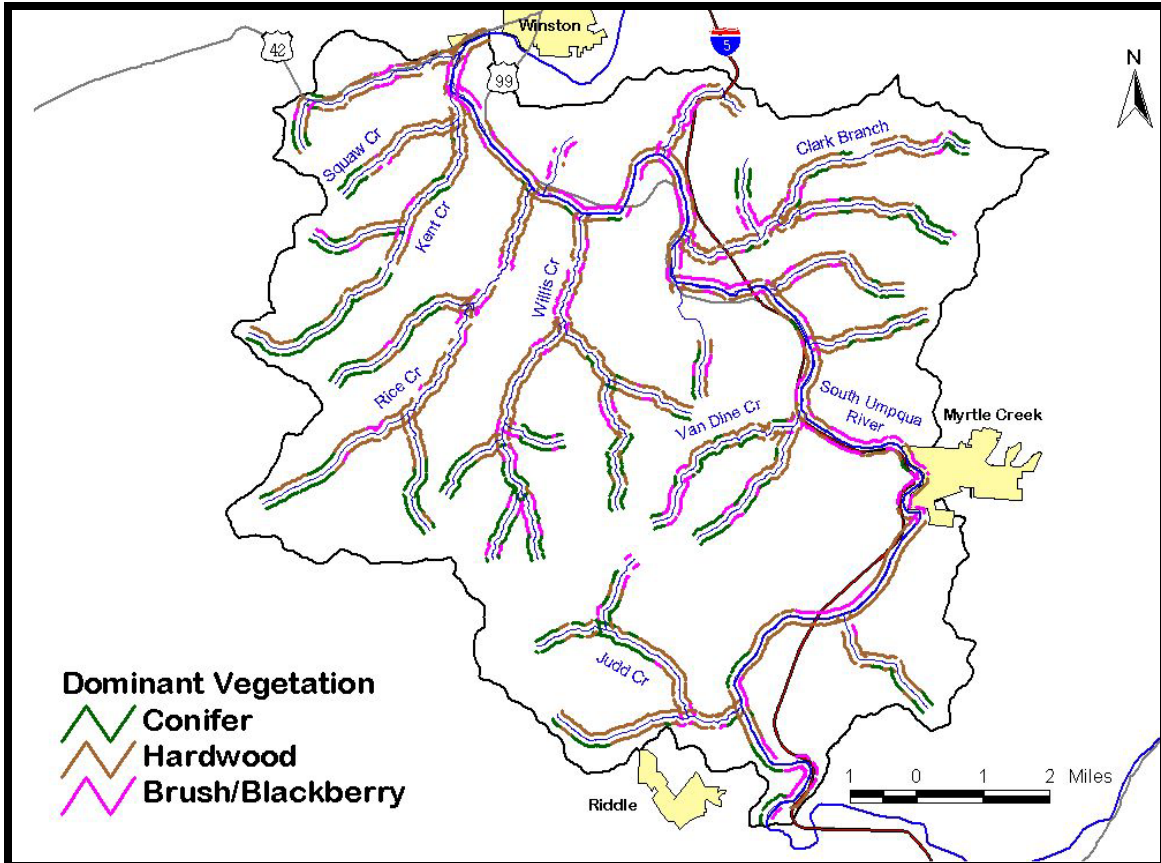
Dominant vegetation or feature

The dominant streamside vegetation or features affect ecological functions by providing different levels of shade and bank stability as well as different types of nutrients and wildlife habitat. For this assessment, the dominant vegetation or feature was evaluated using six attributes. Trees were split into two groups, conifers and hardwoods. Although all tree types provide shade and large woody debris, large conifers decompose very slowly and are less likely than hardwoods to wash downstream. Brush and blackberries constitute short broad plants. Blackberries were not given a separate category because they are frequently intertwined with other shrubs and difficult to differentiate. Range and grass includes blackberries because in most cases a predominantly range or grass riparian zone has a thin strip of blackberries close to the stream bank. Areas of no vegetation include streamside roads and railroads and non-road related bare ground and rock. Infrastructure indicates areas where the stream passes under a bridge or culvert. Map 3-4 shows the three most common vegetation types for Middle South Umpqua Watershed streams. Appendix 6 has the percent of all vegetation or features for the South Umpqua River, combined tributaries, and specific tributaries.

Hardwoods accounted for approximately half of the riparian vegetation for both the South Umpqua River (49.4%, 21.8 miles) and for all tributaries (51.8%, 77.7 miles). The

³² Combined tributary data include these streams and others.

second most common vegetation type is brush/blackberry for the South Umpqua River (40.6%, 17.9 miles), and conifers for tributaries (26.3%, 39.4 miles). Conifers are the third most prevalent vegetation type/feature for the South Umpqua River (5.9%, 2.6 miles). For tributaries, the third most common vegetation type is brush/blackberry (14.7%, 22.0 miles).



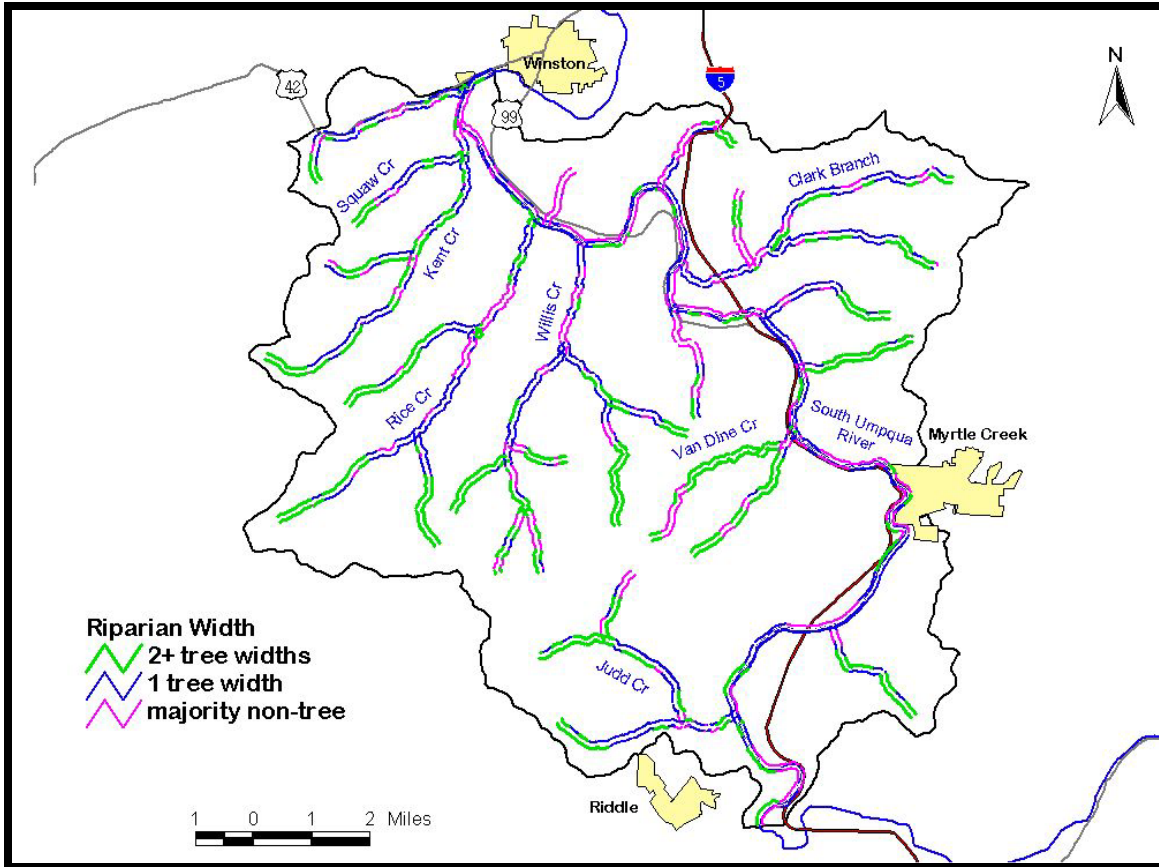
Map 3-4: Dominant riparian vegetation for the Middle South Umpqua Watershed.

Buffer width

Riparian areas with a wide band of trees provide habitat and migration corridors for wildlife. As the number of trees in proximity to the stream increases, so does the likelihood that some trees will fall into the stream, creating fish habitat and forming pools. Wide tree buffers also increase stream shading, creating a microclimate with cooler temperatures compared to other reaches of the same stream. Buffer width was classified as having no trees, one tree width, or a width of two or more trees. Map 3-5 shows buffer width findings for the South Umpqua River and combined tributaries. Appendix 7 provides data for the South Umpqua River, combined tributaries, and specific tributaries.

For the South Umpqua River, there are only slightly more riparian zone miles with no trees (19.6 miles, 44.6%) than areas with one tree width (18.7 miles, 42.5%). For tributaries, approximately the same amounts of riparian zones are one tree wide (58.0

miles, 38.7%) and two or more trees wide (59.1 miles, 39.4%). As shown in Appendix 7, there is tremendous variation among tributaries. Whereas less than 10% of East Fork Willis Creek’s riparian zone has no trees, almost a third of Van Dine Creek is treeless.



Map 3-5: Riparian buffer widths for the Middle South Umpqua Watershed.

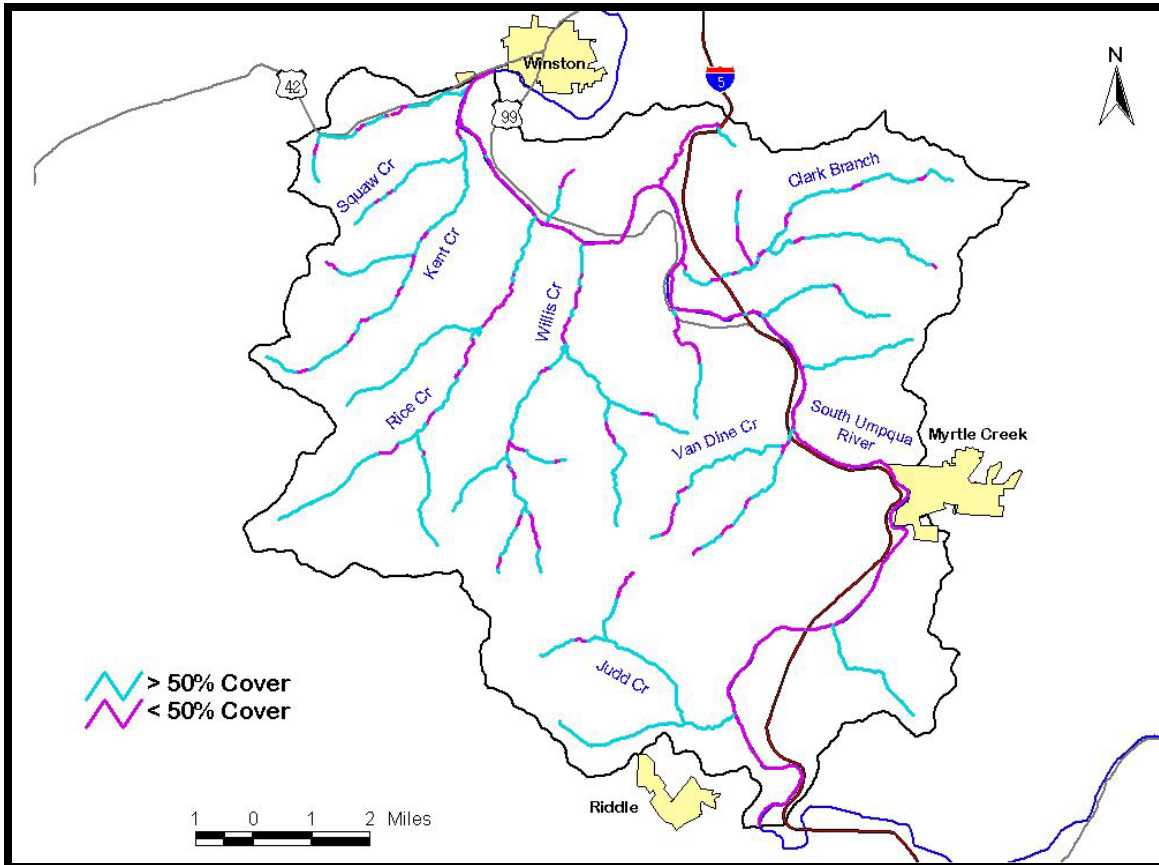
Cover

The ultimate source of stream heat is the sun, either by direct solar radiation or by ambient air and ground temperature around the stream.³³ Blocking the amount of direct solar energy reaching the stream surface reduces warming rates. Streams with complete cover receive the least direct solar radiation, and are therefore favored in the Umpqua Basin, where many streams are 303(d) listed for high temperature.³⁴ Cover is dependent on stream width and riparian vegetation. Shrubs and grasses can provide substantial cover for small, narrow streams. Larger streams can be partially shaded by vegetation and completely shaded by infrastructure. In very wide streams, only bridges provide complete coverage. This assessment looks at the percent of the total stream width that is covered by trees or infrastructure. Map 3-6 shows the stream reaches that have greater than 50% cover and less than 50% cover. Appendix 8 shows the percent cover for the South Umpqua River and for tributaries.

³³ See section 3.3.2 for more information about stream temperature.

³⁴ See section 3.3.1 and Table 3-6 for more information about 303(d) listed streams.

Due to the great width of the South Umpqua River, 99.0% of the river is less than half covered by vegetation or infrastructure (43.6 miles). The areas that are mostly covered are under bridges. Three-fourths of tributaries (117.1 miles) are more than half covered by vegetation or infrastructure, while 32.2 miles (21.4%) of tributaries are less than half covered. Only 2.7 tributary miles (0.5%) are completely exposed.



Map 3-6: Percent cover for the Middle South Umpqua Watershed.

3.2.2. Wetlands³⁵

Overview

The purpose of this analysis is to identify and evaluate historical and current wetlands associated with streams, wetlands surrounded by uplands, potential impacts or alterations to these wetlands, and to examine potential strategic restoration areas located within the Middle South Umpqua Watershed. General wetland functions such as wildlife habitat, water quality improvement, and hydrologic control were evaluated.

Wetlands provide several functions within their respective watersheds that are essential to healthy water resources. Many of these functions can be categorized under the general

³⁵ Brad Livingston and Loren Waldron from Land and Water Environmental Services, Inc., contributed all of section 3.2.2.

functions of wildlife habitat, water quality improvement, and hydrologic control. Wetlands provide feeding opportunities, refuge areas, and nesting sites for terrestrial wildlife, birds, and aquatic wildlife. Wetlands improve water quality by trapping sediments, removing nitrogen, retaining phosphorous, and regulating stream temperatures. Hydrophytic (water loving) vegetation improves water quality by removing nitrogen, retaining phosphorous, and shading streams. Hydrologic control functions reduce peak flows from high water events due to the ability of wetlands to retain high volumes of surface water. Wetlands are:

Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.³⁶

Review of the U.S. Fish and Wildlife Service National Wetland Inventory (NWI) maps for the Middle South Umpqua Watershed indicates that a significant amount of wetlands are closely associated with streams where they are predominantly confined to active channels or are located within poorly drained low lands. Two dominant wetland types are identified as palustrine and riverine. Palustrine wetlands include wetland prairies, slope wetlands, and marshy areas with persistent vegetation. Palustrine wetlands may contain trees, shrubs, and/or herbaceous vegetation.

[Riverine wetlands are] those that are closely associated with a channel or floodplain, including the active two year floodplain, sloughs, and riparian areas. Riverine wetlands should include any channel to a depth of 6.5 feet, scoured floodplains, wetlands that comprise entire islands within channels, some ditches, sloughs connected to main channels, river alcoves with seasonally stagnant conditions, and depressions or temporarily ponded areas within active biennial floodplains.³⁷

Wetland prairies are flat areas dominated by wetland grasses and other herbaceous hydrophytic (water loving) vegetation. Wetland prairies are mostly precipitation driven, poorly drained, seasonal, and typically contain a hummocky microtopography. Some slope wetlands receive water from surface water flowing downhill, from lateral subsurface flow, or from a seep or spring.

Historical wetlands

Early surveyors noted that within bottomlands and ravines were ash, maple, vine maple, alder, and oak with thick undergrowth consisting of willow, ninebark, ferns, briars, and vines (1853 County Surveyors Record, Douglas County, Oregon). Low lying areas contained wetland prairies that were often maintained by frequent fires.

³⁶ Environmental Laboratory, 1987, p. 13.

³⁷ Adamus, P.R., 2001, p. 2.

Interior valleys contained wide floodplains formed by the South Umpqua River. These floodplains contained areas of coniferous and hardwood forests located near a stream or semi-permanent water source. Lowland valleys within the Middle South Umpqua Watershed were primarily dominated by open oak savannahs; however, areas with a persistent hydrologic source provided conditions that allowed forested wetlands, scrub/shrub wetlands, and emergent wetlands to develop. Riverine and palustrine wetlands associated with streams provided nutrients and woody debris, shaded streams, stabilized streambanks, and provided habitat for wildlife.

Fire played a significant role in historical wetland areas. Fire would burn forested wetlands, which would soon become wetland prairies or emergent wetlands as herbaceous vegetation colonized. Wetland prairies provided grasses, sedges, rushes and other herbaceous vegetation for use by songbirds and other wildlife. Native Americans would regularly burn areas within the interior valleys to maintain wetland prairies and propagate the growth of their primary food sources, which included wetland plants such as camas.

Current wetland status

Wetlands currently present within the Middle South Umpqua Watershed are mostly confined to the active channel of streams and tributaries. Wetland prairies are present in low-lying areas that contain poorly drained soils within the interior valleys. Areas with steep terrain to the east and west of the South Umpqua River contain wetlands that are almost exclusively confined to the active channel of streams.

Within the watershed, wetlands associated with streams, and brush and blackberries often dominate riparian zones. Forested wetlands and riparian areas are mostly dominated by hardwood tree species. Some forested wetlands contain mixed coniferous and hardwood tree species. The result of the loss of forested wetlands and riparian zones is an increase in stream temperature, reduced capacity for hydrologic control, and impacted wildlife habitat.

Several wetland types identified by the NWI are located within the Middle South Umpqua Watershed. Wetland types may be divided by their orientation and function within the landscape. For the purpose of this assessment, wetlands are organized as wetlands associated with the active channel of the South Umpqua River, wetlands associated with tributaries to the South Umpqua River, and wetlands within predominantly upland areas.

Wetlands are commonly located within the active channel of the South Umpqua River. Existing wetlands include seasonally exposed streambeds, permanent open water riverine wetlands, gravel beds and beaches, intermittently flooded scrub/shrub wetlands, and wetlands along meander scars and seasonal over-flow channels. No forested wetlands are identified in association with the South Umpqua River within the Middle South Umpqua Watershed.

Wetland areas associated with tributaries to the South Umpqua River include seasonally saturated hardwood forested areas, permanent diked/impounded wetlands containing open water, seasonal scrub-shrub/emergent wetlands, and seasonally saturated hardwood forested/emergent wetlands. Overall, wetlands associated with tributaries to the South Umpqua River are either palustrine forested wetlands, or riverine streambed wetlands. Many of the wetlands are seasonal, mostly dry by late summer.

Current wetlands are less extensive than they were prior to European settlement. Wildlife habitat remains, but access is limited to terrestrial wildlife in some areas due to various forms of development. Hydrologic control has been reduced by the lack of water storage capacity primarily due to floodplain development. Wetlands are impacted in a variety of ways that are directly related to unregulated development activities of the past.

Potential sources of impacts

Most of the historical wetlands within the Middle South Umpqua Watershed have been eliminated or heavily impacted. Alterations include the placement of fill material, the construction of dikes and berms, clearing of vegetation near waterways, erosion, the physical alteration of stream morphology, and the removal of aggregate resources from active channels.

Roads built parallel to a waterway create a hydrologic obstacle, and impede wildlife access. Roads are often located adjacent to streams within the interior valleys. Roads built in upland portions of the watershed create hydrologic obstacles; however, they do not impede wildlife access as severely. Roads require the placement of culverts, ditches, and fill material, altering natural drainage patterns. Additionally, the construction of roads into areas with steep terrain can cause erosion, increasing the turbidity of nearby streams.

Various land uses and development activities extend throughout the interior valleys and into the upland portions of the watershed, near the headwaters of several tributaries. Development typically includes an increase of impervious surface area, and the replacement or alteration of native vegetation. Land clearing activities have impacted wetlands by removing native vegetation, minimizing riparian buffers, and altering natural water regimes by the placement of fill material or the excavation of drainage ditches.

Rapid draining of the watershed occurs due to cleared native vegetation, increased impervious surface area, and artificial draining. Additionally, domestic water uses associated with irrigation, drinking water, and sewage systems may lead to significantly low flow volumes during summer months.

Many riverine wetlands contain gravelly beds and beaches, important features for wildlife habitat. Aggregate removal from within the active channel of streams in the watershed may increase turbidity, decrease instream woody structure, alter flows, and impact fish and wildlife habitat. The loss of substrate can cause channels to deepen, reducing flow velocity and white water. Churning white water increases dissolved oxygen that is necessary for aquatic life.

Additional impacts are derived from disturbances near the headwaters of tributaries to the South Umpqua River. These impacts are primarily related to clearing of land and the construction of roads. Storm surges and peak flows are intensified due to reduced water storage capacity. Significant flow volumes from storm events travel downstream without being contained in wetland areas. The reduced ability of wetlands upstream to perform hydrologic control during high flow events can lead to increased erosion and turbidity downstream.

Potential restoration opportunities³⁸

Restoration should begin with the most significantly altered wetland areas. Within the Middle South Umpqua Watershed, these areas are located throughout the riparian zone and floodplain of the South Umpqua River and Rice Creek. Restoration activities may include planting and seeding native wetland vegetation, restoring wetland hydrology by plugging drainage ditches or removing drain tiles, removing culverts and unused roads, placing instream structure such as woody debris and boulders in tributary streams, and stabilizing streambanks or reducing streambank slope severity.

Effective strategies to increase the functions of stream-associated wetlands within the Middle South Umpqua Watershed might also include protecting existing wetlands located near the headwaters of tributaries, enhancing any stream associated wetlands by planting more native trees such as Oregon ash (*Fraxinus latifolia*), black cottonwood (*Populus balsamifera*), red alder (*Alnus rubra*), and various willow species (*Salix spp.*), stabilizing eroding streambanks, eliminating livestock access to streams by fencing riparian areas, and using off-channel stock water systems. Downed woody debris and standing dead wood may be artificially placed to enhance habitat for a variety of wildlife uses.

Potential wetland restoration opportunities exist in several locations within the tributaries, riparian zones, lowlands, and floodplains of the Middle South Umpqua Watershed. In most circumstances, creation of wetland microtopography and hydrology, on hydric soils, creates typical wetland conditions. Once wetland hydrology is established on poorly drained soils, natural colonization of wetland vegetation will begin, followed by the establishment of desirable wetland functions.

Cleared lands with poorly drained soils located in lowland areas may be converted to palustrine wetlands by removing hydrologic modifications that may be present. Clearing the area of undesirable vegetation, containing surface water on the site, and establishing wetland vegetation can improve water quality by trapping sediments and nutrients from surface water runoff, improve hydrologic control by contributing to ground water recharge and containing excessive amounts of surface water, and can provide wildlife habitat.

³⁸The Clean Water Act regulates in part the Removal/Fill Law and water resources of the State of Oregon. Many restoration activities require a permit and/or approval by the Division of State Lands and the Army Corps of Engineers. Penalties are assigned to violators of laws regulating water resources including wetlands.

Establishing a forested riparian buffer within the floodplains of Rice Creek, Brockway Creek, Squaw Creek, and Willis Creek will improve water quality, hydrologic control, and wildlife functions within the watershed. Planting native vegetation in areas that receive adequate surface water may enhance any stream within the watershed that is visibly degraded.

Benefits of wetland restoration projects typically extend beyond immediate project boundaries. Improved water quality is beneficial to downstream areas, and hydrologic control can help reduce impacts of flooding downstream. Regular monitoring and maintenance is essential to a successful wetland restoration project.

Wetlands references

Adamus, P.R. 2001. Guidebook for Hydrogeomorphic (HGM)-based Assessment of Oregon Wetland and Riparian Sites: Statewide Classification and Profiles. Oregon Division of State Lands, Salem, OR.

County Surveyors Record. 1853. Douglas County, OR.

Cowardin et al. 1979. Classification of Wetlands and Deepwater Habitats of the United States. U.S. Fish and Wildlife Service, Washington, D.C.

Environmental Laboratory. 1987. "Corps of Engineers Wetlands Delineation Manual," Technical Report Y-87-1, US Army Engineer Waterways Experiment Station, Vicksburg, Miss.

Guard, J.G. 1995. Wetland Plants of Oregon and Washington. Lone Pine Publishing, Vancouver, British Columbia.

3.2.3. Riparian zones and wetlands key findings and action recommendations

Riparian zones key findings

- For both the South Umpqua River and tributaries within the watershed, hardwoods are the dominant vegetation type. Brush/blackberry is the second most common vegetation type for the South Umpqua River. Brush/blackberry is less common than conifers along tributaries, but still constitutes over 15% of riparian zones.
- Over 85% of the South Umpqua River's riparian buffers are dominated by treeless riparian zones and by zones that are one tree wide. Tributary buffers are mostly one or two trees wide, but over 20% of tributaries have no trees.
- Over 20% of tributaries are less than half covered by vegetation or infrastructure.

Wetlands key findings³⁹

- Within the Middle South Umpqua Watershed, the predominant wetland types are riverine wetlands confined to active channels and wetland prairies located within lowland areas.
- Wetlands have been impacted and eliminated by various activities such as road construction, storm water management, agricultural drainage, increases of impervious surfaces, and a reduction of native vegetation.
- Reduction in the water storage capacity and ground water recharge function of wetlands has resulted in intensified storm surges and peak flows.
- Wetlands provide an essential link between terrestrial and aquatic habitats. Various fish and wildlife species require attributes only found in wetlands for specific life stages and development.

Riparian zones and wetlands action recommendations

- Where canopy cover is less than 50%, establish wide buffers of native trees (preferably conifers) and/or shrubs, depending upon local conditions. Priority areas are fish-bearing streams for which more than 50% canopy cover is possible.
- Identify riparian zones dominated by blackberries and convert these areas to native trees (preferably conifers) and/or shrubs, depending on local conditions.
- Investigate methods of controlling blackberries.
- Where riparian buffers are one tree wide or less, encourage buffer expansion by planting native trees (preferably conifers) and/or shrubs, depending on local conditions.
- Maintain riparian zones that are two or more trees wide and, along tributaries, provide more than 50% cover.
- Expand forested riparian zones and riverine wetlands by planting hydrophytic tree species in locations having appropriate conditions at a density sufficient to improve functions over time.
- Provide information to landowners explaining the benefits of eliminating livestock access to streams, establishing effective buffer zones, the importance of wetland functions within watersheds, promoting the understanding of the interconnectedness of water resources, and the effects of impacts on downstream conditions.
- Educate policy makers, landowners, and community members on the importance of maintaining wetlands for healthy watersheds, and their educational, recreational, and aesthetic values for the local community.

3.3. Water quality

3.3.1. Stream beneficial uses and water quality impairments

The Oregon Water Resources Department (OWRD) has established a list of designated beneficial uses for surface waters, including streams, rivers, ponds, and lakes. Beneficial uses are based on human, fish, and wildlife activities associated with water. This assessment focuses on the designated beneficial uses for flowing water, which are

³⁹ Brad Livingston and Loren Waldron of Land and Water Environmental Services, Inc., contributed the wetlands key findings and action recommendations.

streams and rivers. Table 3-5 lists all beneficial uses for streams and rivers within the Umpqua Basin.

Beneficial uses	
Public domestic water supply	Private domestic water supply
Industrial water supply	Irrigation
Livestock watering	Boating
Aesthetic quality	Anadromous fish passage
Commercial navigation and transportation	Resident fish and aquatic life
Salmonid fish spawning	Salmonid fish rearing
Wildlife and hunting	Fishing
Water contact recreation	Hydroelectric power

Table 3-5: Beneficial uses for streams surface waters in the Umpqua Basin.

The beneficial uses of a stream determine its water quality standards. In a stream where “salmonid fish rearing” is a beneficial use, stream temperature is a concern because salmonids need cool water to survive. In a stream where people swim (a water contact recreation), the level of human disease-causing toxins or bacteria would be a concern.

The Oregon Department of Environmental Quality (ODEQ) has established water quality standards for the designated beneficial uses. These standards determine the acceptable levels or ranges for water quality standards, including temperature, dissolved oxygen, and pH. Water quality standards set by ODEQ are reviewed and updated every three years. ODEQ monitors streams and stream reaches throughout Oregon, and streams or reaches that are not within the standards are listed as “water quality impaired.”⁴⁰ The list of impaired streams is called the “303(d) list,” after section 303(d) of the Clean Water Act. For each stream on the 303(d) list, ODEQ determines the total maximum daily load (TMDL) allowable for each parameter.⁴¹ Streams can be de-listed once TMDL plans are complete, when monitoring shows that the stream is meeting water quality standards, or if evidence suggests that a 303(d) listing was in error.

Table 3-6 shows the Middle South Umpqua Watershed streams and stream segments included in the 2002 draft 303(d) list that require TMDL plans.⁴² This table is not a comprehensive evaluation of all water quality concerns in the Middle South Umpqua Watershed. There are many streams and stream segments that have not been monitored by ODEQ, or for which additional information is needed to make a listing determination.

⁴⁰ ODEQ can also use data collected by other agencies and organizations to evaluate water quality.

⁴¹ Total maximum daily loads are limits on pollution developed when streams and other water bodies do not meet water quality standards. TMDL plans consider both human-related and natural pollution sources.

⁴² Streams that are water quality limited for habitat modification and flow modification do not require TMDL plans. In the Middle South Umpqua Watershed, these streams are: Clarks Branch Creek (habitat), Kent Creek (habitat and flow), Lane Creek (habitat and flow), Rice Creek (habitat and flow), the South Umpqua River (habitat and flow), and Willis Creek (flow).

To evaluate water quality in the Middle South Umpqua Watershed, this assessment explores seven water quality parameters that may be of concern within the watershed. These parameters are temperature, pH, dissolved oxygen, nutrients, bacteria, sedimentation and turbidity, and toxics. ODEQ monitoring data was used and evaluated using ODEQ or OWEB water quality standards.

Stream	Parameter(s)	Year listed	Stream miles listed	Season
Rice Creek	Temperature	2002	0 – 6.8	Summer
				Sept 15 – May 31
South Umpqua River	Fecal coliform	1998	15.9 – 57.7	Summer
				Winter/spring/fall
	Biological criteria	1998	15.9 – 57.7	Not listed
	pH	1998	15.9 – 57.7	Summer
	Chlorine	1998	0 - 51	All year
	Temperature	2002	15.9 – 57.7	Sept 15 – May 31
	Aquatic weeds or algae	1998	15.9 – 57.7	Summer

Table 3-6: ODEQ water quality-limited stream segments in the Middle South Umpqua Watershed.

3.3.2. Temperature

Importance of stream temperature

Aquatic life is temperature-sensitive and requires water that is within certain temperature ranges. The Umpqua Basin provides important habitat for many cold-water species, including salmonids. When temperature exceeds tolerance levels, cold-water organisms such as salmonids become physically stressed and have difficulty obtaining enough oxygen.⁴³ Stressed fish are more susceptible to predation, disease, and competition by temperature tolerant species, which in the case of salmonids might be bass. For all aquatic life, prolonged exposure to temperatures outside tolerance ranges will cause death. Therefore, the beneficial uses affected by temperature are resident fish and aquatic life, and salmonid spawning and rearing.

Temperature limits vary depending upon species and life cycle stage. Salmonids are among the most sensitive fish, and so ODEQ standards have been set based on salmonid temperature tolerance levels. From the time of spawning until fry emerge, 55°F (12.8°C) is the maximum temperature criterion. For all other life stages, the criterion is set at 64°F (17.8°C). Temperatures 77°F (25°C) or higher are considered lethal.

Stream temperature fluctuates by time of year and time of day. In general, water temperature during the winter and most of spring (between November and May) is well below both the 55°F and 64°F standards, and is not an issue. In the summer and fall

⁴³ Cold water holds more oxygen than warm water; as water becomes warmer, the concentration of oxygen decreases.

months, water temperature can exceed the 64°F standard causing streams to be water quality limited. Over six miles of Rice Creek and all of the South Umpqua River in the Middle South Umpqua Watershed are 303(d) listed for temperature at various times of the year (see Table 3-6).⁴⁴

In 1999, the Umpqua Basin Watershed Council (UBWC) undertook a study on water temperature for the entire South Umpqua fourth-field watershed to determine temperature trends for the South Umpqua River and its tributaries, including streams in the Middle South Umpqua Watershed (the Smith report).⁴⁵ Continuously sampling sensors were placed at 119 locations within the watershed, of which 12 were within the Middle South Umpqua Watershed. Sensors were placed at sites between June 24 and June 30, 1999, and removed between September 9 and September 15, 1999.

Figure 3-1 and Figure 3-2 show the seven-day moving average maximum temperature for the South Umpqua River and tributaries within the watershed.⁴⁶ Table 3-7 has the number of days and percent of days for which seven-day moving average maximums temperature exceeded 64°F. Results of the study show that throughout the Middle South Umpqua Watershed, seasonal seven-day moving average maximum temperatures in the South Umpqua River exceeded water quality standards. Every monitoring day, the South Umpqua River had maximum temperatures exceed the 64°F. During the study period, no sites were below 64°F every day.

Throughout the South Umpqua fourth-field watershed study area, tributaries tend to be 10°F cooler than the South Umpqua River. Charting data with respect to distance shows that maximum temperatures of the coldest streams tend to increase 0.58°F per downstream mile. It also appears that many tributaries that are less than seven stream miles long have the potential to be at cooler temperatures.

Influences on stream temperature

The ultimate source of stream heat is the sun, either by direct solar radiation or by ambient air and ground temperature around the stream, which are also a result of solar energy.⁴⁷ Groundwater has the least exposure to solar energy, and therefore is at the coolest temperature (52°F in the Umpqua Basin). Since groundwater accounts for a large proportion of a stream's flow at the headwaters, streamflow is generally coolest at the headwaters. When groundwater enters a stream and become surface water, it is exposed to solar energy and will become warmer until it reaches equilibrium with ambient temperatures and direct solar radiation levels. As solar energy inputs change, such as at night, so do the ambient and stream temperatures.

⁴⁴ There are 102.2 total South Umpqua River miles that are 303(d) listed for temperature.

⁴⁵ Copies of this study "South Umpqua Watershed Temperature Study, 1999" by Kent Smith are available at the UBWC office.

⁴⁶ The seven-day moving average is an average of the maximum temperatures of a given day, the three preceding days, and the three days that follow.

⁴⁷ Friction adds a very small amount of heat to streams. Geothermal heat is a minor factor in the Umpqua Basin.

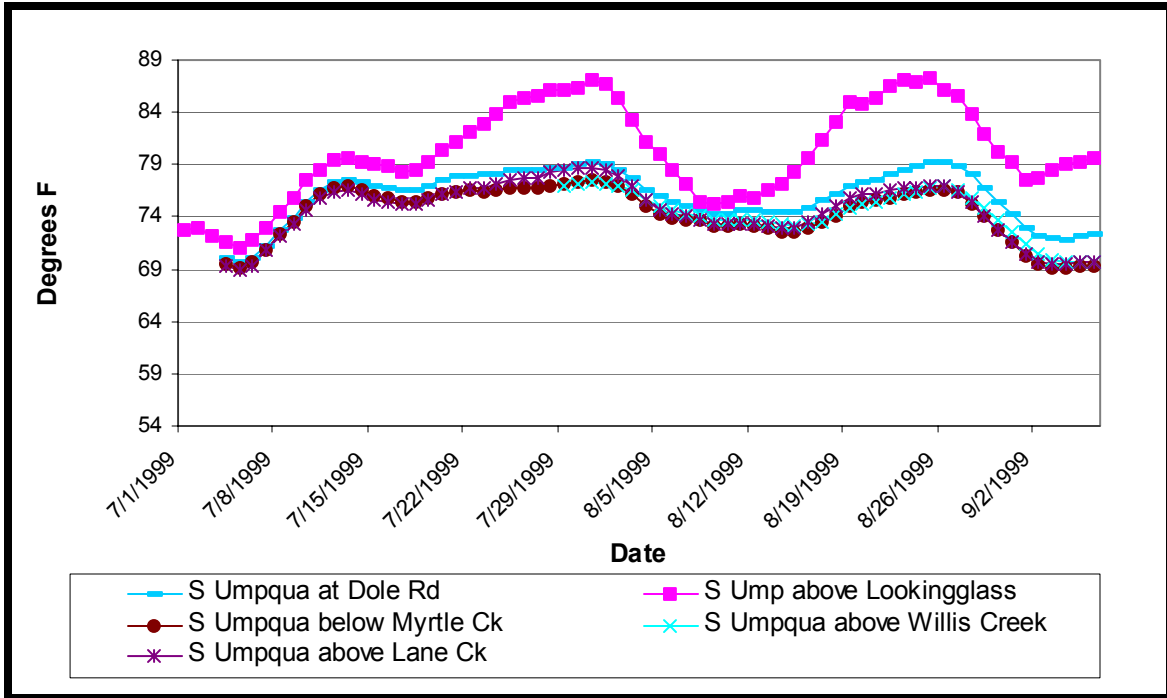


Figure 3-1: Seven-day moving average maximum temperature trends for the South Umpqua River within the Middle South Umpqua Watershed.

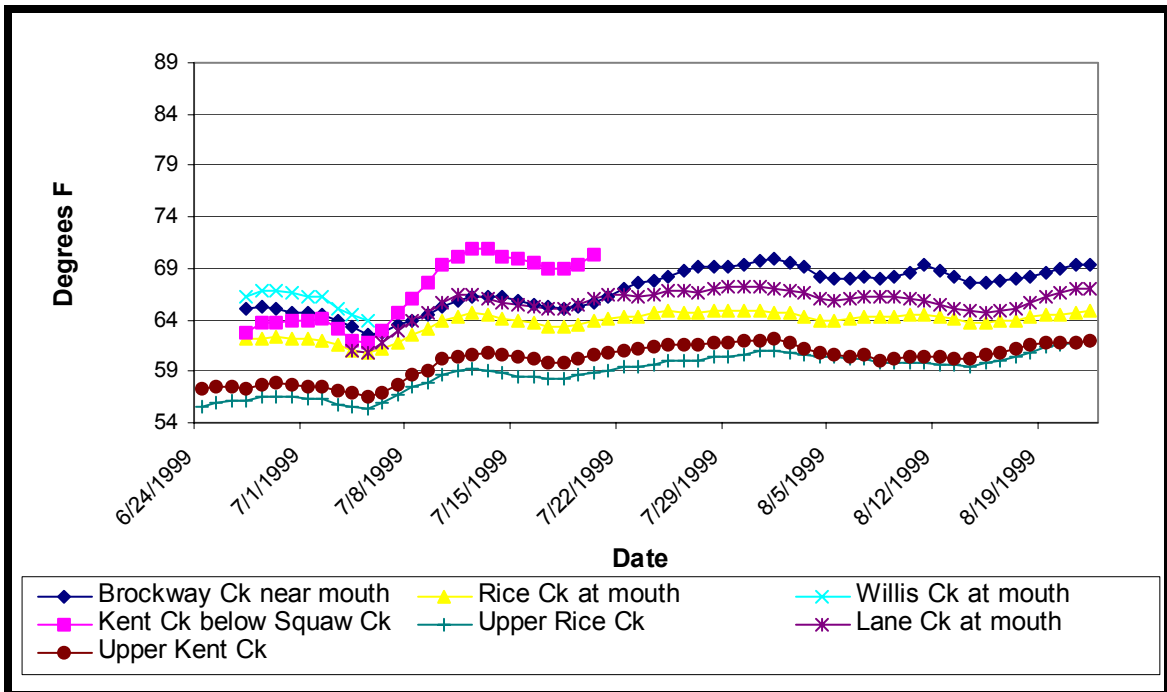


Figure 3-2: Seven-day moving average maximum temperature trends for Middle South Umpqua Watershed tributaries.

Sample Site	#days >64°F	# days monitored	% >64°F
South Umpqua above Willis Creek	47	47	100.0%
South Umpqua above Lookingglass	79	79	100.0%
South Umpqua at Dole Road	72	72	100.0%
South Umpqua below Myrtle Creek	72	72	100.0%
South Umpqua above Lane Creek	72	72	100.0%
Brockway Creek near mouth	61	79	77.2%
Kent Creek below Squaw Creek	20	30	66.7%
Lane Creek at mouth	48	72	66.7%
Willis Creek at mouth	9	15	60.0%
Rice Creek at mouth	37	64	57.8%
Upper Kent Creek	0	79	0.0%
Upper Rice Creek	0	79	0.0%

Table 3-7: Number of days and percent of days for which seven-day moving average maximum temperatures exceeded 64°F in the Middle South Umpqua Watershed.

If solar energy were the only influence on stream warming, it would be expected that stream temperature would increase at a smooth and steady rate until the stream was in equilibrium with solar energy inputs. However, stream temperature at a given location is influenced by two factors: the temperature of the upstream flow and local conditions. As upstream flow reaches a given stream location, factors such as stream morphology and riparian buffer conditions can affect warming rates. For example, data from the Smith report indicates that when upstream flow enters a reach that is highly exposed to direct solar radiation, the flow in that reach is usually warmer than would be expected from the upstream flow’s temperature.

Localized groundwater influx and tributary flow can reduce stream temperatures. As stated earlier, groundwater in the Umpqua Basin is typically 52°F. When groundwater enters a stream, it mixes with the warmer upstream surface flow until temperature equilibrium is reached. As the proportion of groundwater increases, so will the cooling effect. Groundwater has the greatest influence on small and medium-sized streams. This is partially because groundwater constitutes a greater proportion of small streams’ flow. As a result, cooler flow from small tributaries entering larger streams can, like groundwater influx, reduce stream temperature at that location. In some cases, this may also occur when a tributary is practically dry. Evidence from the Smith report suggests that in some cases tributaries with gravel-dominated streambeds permit cooler subsurface water to pass into the main stem, even when the stream has no surface flow. Smith suggests that the lower reaches and mouths of small and medium-sized tributaries, and reaches within warm streams that have high groundwater influx and shade, may provide important shelter for fish during the summer months.

Management implications

An important implication of Smith's studies is that prevailing stream temperatures on small streams can be strongly influenced by local conditions. Local stream temperature management restoration projects may be very effective in improving stream temperature conditions in many small streams in the Umpqua Basin.⁴⁸

3.3.3. Surface water pH

The ion concentration of a liquid, which determines acidity or alkalinity, is expressed using pH. A logarithmic scale that ranges from one to 14 measures pH. On this scale, a pH of seven is neutral, more than seven is alkaline, and less than seven is acidic.

The beneficial uses affected by high or low pH levels are resident fish and aquatic life, and water contact recreation. When pH levels exceed the stream's normal range, water can dissolve the protective mucous layer on aquatic organisms such as fish, amphibians, and mollusks. Without a healthy protective layer, fish and other animals become more susceptible to diseases. Also, pH affects nutrients, toxics, and metals within the stream. Changes in pH can alter the chemical form and affect availability of nutrients and toxic chemicals, which can harm resident aquatic life and be a human health risk. In mining areas, there is the potential for both low pH levels and the presence of heavy metals. This is an issue because metal ions shift to more toxic forms in acidic water, which is a concern for both wildlife and humans.

Physical and biological factors cause surface and groundwater pH to normally be slightly alkaline or acidic. The chemical composition of rocks and rainfall will influence pH. Respiration and photosynthesis are normal metabolic processes of aquatic organisms that change pH. Carbon dioxide (CO₂) is produced during respiration and used for photosynthesis. The level of dissolved CO₂ in a stream raises and lowers pH. Normally, there is a balance between instream metabolic processes and a natural chemical buffering system that prevents streams from becoming too acidic or alkaline from CO₂. However, stream inputs that increase or decrease respiration and photosynthesis by aquatic organisms can indirectly shift pH by changing CO₂ levels. For example, nitrogen and phosphorus from organic matter such as feces and urine, or from inorganic chemicals such as fertilizers, encourage algae growth in the summer and can result in algae "blooms." When a stream's algae population grows, so does the overall consumption of dissolved CO₂. As CO₂ levels drop, pH elevates and can reach detrimental levels.⁴⁹

In an attempt to differentiate between the natural variability of surface water pH and the changes caused by other nitrogen and phosphorus sources, the Oregon Water Quality Standards established a range of acceptable pH levels for river basins or for specific bodies of water. In the Umpqua Basin, the acceptable pH range is 6.5 to 8.5. When 10% or more of pH measurements from the same stream are outside of the 6.5 to 8.5 range, the stream is designated water quality limited.

⁴⁸ From Kent Smith's "Thermal Transition in Small Streams under Low Flow Conditions," 2002.

⁴⁹ Increased nutrient levels in the winter have a smaller effect on pH because cold temperatures inhibit algae growth.

Figure 3-3 shows the South Umpqua River’s pH range from three sampling sites taken at different times of year from 1959 to 1997.⁵⁰ Out of 56 summer pH samples, 14 were outside the 6.5 to 8.5 pH range (25.0%). Thirteen out of 19 samples from the South Umpqua River at Highway 99 were above 8.5 (68.4%).⁵¹ Within the Middle South Umpqua Watershed, all of the South Umpqua River is 303(d) listed for pH.⁵²

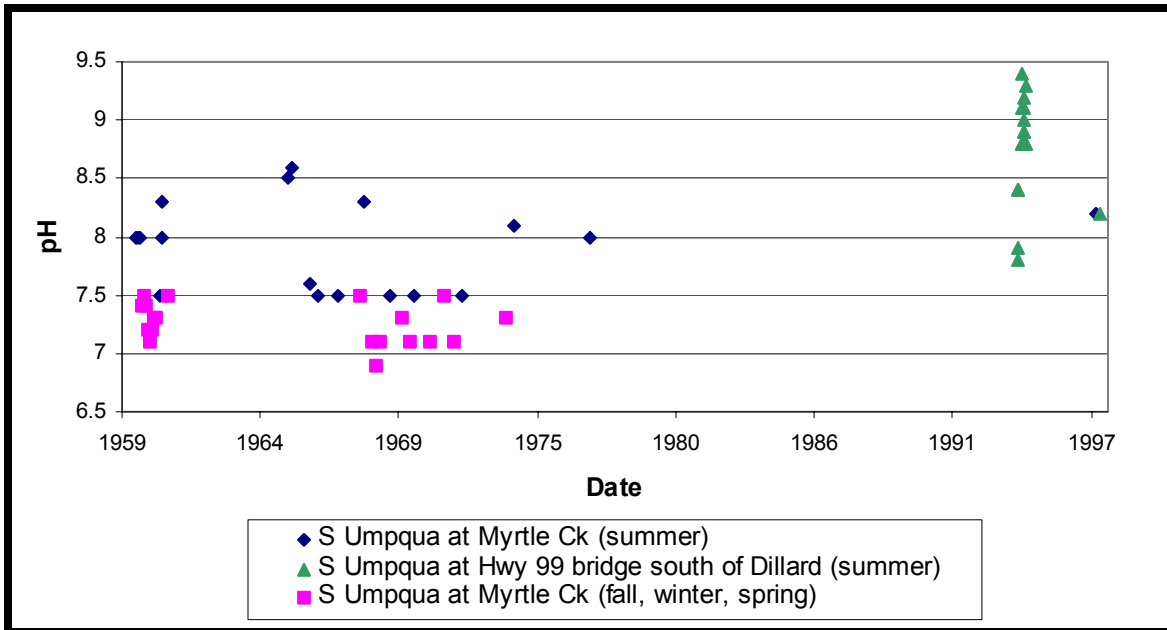


Figure 3-3: pH levels for Middle South Umpqua Watershed monitoring sites.

3.3.4. Dissolved oxygen

In the Umpqua Basin, cold-water aquatic organisms are adapted to waters with high amounts of dissolved oxygen. Salmonid eggs and smolts are especially sensitive to dissolved oxygen levels. If levels drop too low for even a short period of time, eggs, smolts, and other aquatic organisms will die. Therefore, the beneficial uses most affected by dissolved oxygen are resident fish and aquatic life, salmonid fish spawning, and salmonid fish rearing.

The amount of oxygen that is dissolved in water will vary depending upon temperature, barometric pressure, flow, and time of day. Cold water dissolves more oxygen than warm water. As barometric pressure increases, so does the amount of oxygen that can dissolve in water. Flowing water has more dissolved oxygen than still water.⁵³ Aquatic organisms produce oxygen through photosynthesis and use oxygen during respiration.

⁵⁰ Samples taken on the same day that were close in value will overlap in Figure 3-3.

⁵¹ Data are from ODEQ’s Laboratory Analytical Storage and Retrieval (LASAR) database. All ODEQ data are available via the website www.deq.state.or.us. Select “water quality” and “Laboratory Analytical Storage and Retrieval Database – Monitoring Data.”

⁵² There are a total of 102.2 South Umpqua River miles 303(d) listed for pH.

⁵³ As water churns and moves, it makes contact with atmospheric oxygen, some of which dissolves in the water until the stream is saturated.

As a result, dissolved oxygen levels tend to be highest in the afternoon when algal photosynthesis is at a peak, and lowest before dawn after organisms have used oxygen for respiration.

Since oxygen content varies depending on many factors, Oregon Water Quality Standards have many dissolved oxygen criteria. The standards specify oxygen content during different stages of salmonid life cycles and for gravel beds. Standards change based on differences in elevation and stream temperature. During months when salmon are spawning, ODEQ uses 11 mg/l as the dissolved oxygen standard for the South Umpqua River. For the rest of the year, the standard is eight mg/l.

Between 1959 and 1997, up to 28% of South Umpqua River dissolved oxygen samples within the Middle South Umpqua Watershed have been below both the eight mg/l and 11 mg/l standards.⁵⁴ In 1998, the South Umpqua River from stream mile 15.9 to 57.7 was 303(d) listed for dissolved oxygen. However, in 2002, ODEQ determined that dissolved oxygen levels were meeting water quality criteria; hence the listing has changed to “attaining criteria/uses.” There are no dissolved oxygen data for Middle South Umpqua tributaries. More monitoring is needed to determine if dissolved oxygen is a concern for tributaries.

3.3.5. Nutrients

There are many sources of phosphorus and nitrate in streams. Aquatic organisms produce nutrient-rich wastes. Decomposition of organic material also adds nutrients to the stream. Wastewater treatment plant effluent, industrial and home fertilizers, as well as fecal matter from wildlife, domestic animals, and septic systems, can increase stream nutrient levels.

The beneficial uses affected by nutrients are aesthetics and “uses identified under other parameters” (pH, dissolved oxygen, etc.). This means that a stream may be considered water quality limited for nutrients if levels adversely affect parameters such as pH that then negatively impact other beneficial uses. As stated earlier, high nutrient levels encourage the growth of algae and aquatic plants. Excessive algal and vegetative growth can result in little or no dissolved oxygen, and interfere with water contact recreation such as swimming. Also, certain algae types produce by-products that are toxic to humans, wildlife, and livestock, as occurred in Diamond Lake in the summer of 2002.⁵⁵

Currently, there are no Umpqua Basin-based ODEQ values for acceptable stream nutrient levels. Therefore, this assessment used the OWEB standards for evaluating nutrient levels in the watersheds. The Oregon Watershed Enhancement Board recommends using 0.05 mg/l for total phosphorus, and 0.3 mg/l for total nitrate (including nitrites and nitrates).

⁵⁴ Data are from ODEQ’s Laboratory Analytical Storage and Retrieval (LASAR) database.

⁵⁵ Diamond Lake is within the Umpqua National Forest in the extreme eastern portion of the Umpqua Basin.

Phosphorus was periodically measured from 1991 to 1997 at three sites within the Middle South Umpqua Watershed. Out of eight samples, one was greater than 0.05 mg/l (12.5%). In 1994, phosphorus was measured along an eight-mile stretch of the South Umpqua River within the Middle South Umpqua Watershed. Out of 17 samples, one was exactly 0.05 mg/l (5.9%); none exceeded OWEB's recommendations. Nitrates were measured from 1991 to 1997. Out of 25 samples taken from 12 sites, none exceeded the 0.3 mg/l recommended standard for total nitrates.⁵⁶ More monitoring is needed to determine if nutrient levels limit water quality in any Middle South Umpqua tributaries.

3.3.6. Bacteria

Bacteria are present in all surface water. In general, resident bacteria are not harmful to the overall aquatic environment or to most human uses. However, ingestion of fecal bacteria such as *Escherichia coli* (*E. coli*) can cause serious illness or death in humans. The presence of fecal bacteria indicates a potential vector for other serious human diseases, such as cholera and typhoid. Water contact recreation is the beneficial use most affected by bacteria. Private and public drinking water supplies are not affected because water filtration systems are able to remove harmful microorganisms.

There are many possible sources of *E. coli* and other fecal bacteria in water. These can be divided into "point sources" and "non-point sources." The legal definition of a point source is one for which there is an operational permit, such as the outlet for a wastewater treatment plant. Most stream contamination comes from non-point sources, or ones for which there is no operational permit, such as animal waste. Although septic systems require an installation permit, there is no annual operational permit. These sources are considered non-point even if it is clear that, for example, a single failing septic field adjacent to a stream is causing high fecal bacteria levels. Upland areas with concentrated fecal waste can be non-point sources that contribute significantly to bacteria levels because bacteria are washed down into streams during rain events.

According to the Oregon Water Quality Standards, a stream is considered water quality limited for bacteria when one of two events occurs: 1) 10% of two or more samples taken from the same stream have *E. coli* concentrations exceeding 406 bacteria per 100 ml of water; and 2) the average *E. coli* concentration of five samples taken within a 30-day period exceeds 126 bacteria per 100 ml of water.

The South Umpqua River from stream mile 15.9 to 57.7 (the confluences with Roberts Creek and Days Creek) are 303(d) listed in the summer and for the winter, spring, and fall for bacteria. Between 1986 and 1995, four out of 27 samples (14.8%) at one monitoring site and one out of 25 samples (4.0%) at a second site had fecal coliform levels exceeding 406 bacteria per 100 ml during the summer. Maximum values were 920 and 460, respectively. In the winter, the same sites had six out of 52 samples (11.5%) and one out of 51 samples (2.0%) exceeding 406 bacteria. Maximum values were 1600 and 540, respectively.⁵⁷ Additional monitoring is necessary to determine if Middle South Umpqua Watershed tributaries have water quality-limiting levels of bacteria.

⁵⁶ Data are from ODEQ's Laboratory Analytical Storage and Retrieval (LASAR) database.

⁵⁷ Data are from ODEQ's Laboratory Analytical Storage and Retrieval (LASAR) database.

3.3.7. Sedimentation and turbidity

Sediment is any organic or inorganic material that enters the stream and settles to the bottom. When considering water quality, this assessment is specifically referring to very fine particles of organic or inorganic material that have the potential of forming streambed “sludge.” The beneficial uses affected by sedimentation are resident fish and aquatic life, and salmonid fish spawning and rearing. Salmonids need gravel beds for spawning. Eggs are laid in a gravel-covered nest called a “redd.” Water is able to circulate through the gravel, bringing oxygen to the eggs. The sludge layer resulting from stream sedimentation does not allow water circulation through the redd and will suffocate salmonid eggs. Although there are many aquatic organisms that require gravel beds, others, such as the larvae of the Pacific lamprey, thrive in sludgy streams.

Turbidity is closely related to sediment because it is a measurement of water clarity. In many cases, high turbidity indicates a large amount of suspended sediment in a stream.⁵⁸ Small particles such as silt and clay will stay suspended in solution for the longest amount of time. Therefore, areas with soils comprised of silt and clay are more likely to be turbid than streams in areas with coarser soil types. Also, turbidity levels can rise during a storm. This is because rapidly moving water has greater energy than slower water. During storms, upland material is washed into the stream from surface flow, which adds sediment to the system.

The beneficial uses affected by turbidity are resident fish and aquatic life, public and private domestic water supply, and aesthetic quality. As turbidity increases, it becomes more difficult for sight-feeding aquatic organisms to see, impacting their ability to search for food. High levels of suspended sediment can clog water filters and the respiratory structures in fish and other aquatic life. According to the Oregon Watershed Assessment Manual, suspended sediment is a carrier of other pollutants, such as bacteria and toxins, which is a concern for water quality in general. Finally, clear water is simply more pleasant than cloudy water for outdoor recreation and enjoyment.

Sediment is considered to be water quality limiting if beneficial uses are impaired. ODEQ determines impairment by monitoring changes in aquatic communities (especially macroinvertebrates, such as insects), changes in fish populations, or by using information from non-ODEQ documents that use standardized protocols for evaluating aquatic habitat and fish population data. Currently, ODEQ monitors streams for suspended solids, which indicates sedimentation. At the writing of this assessment, neither ODEQ nor OWEB has established criteria for these data. There are currently no streams in the Middle South Umpqua Watershed 303(d) listed for sedimentation. More data are needed to determine if sedimentation is a problem in the watershed.

Turbidity is measured by passing a light beam through a water sample. As suspended sediment increases, less light penetrates the water. Turbidity is recorded in NTUs (nephelometric turbidity units), and high NTU values reflect high turbidity. According to the Oregon Water Quality Standards, turbidity is water quality limiting when NTU levels

⁵⁸ Suspended particles are not chemically mixed with water and will eventually settle to the stream bottom.

have increased by more than 10% due to an on-going operation or activity, such as dam releases or irrigation. To date, there are no streams in the Middle South Umpqua Watershed that are 303(d) listed for turbidity.

The Oregon Watershed Assessment Manual recommends using 50 NTUs as the turbidity evaluation criteria for watershed assessments. At this level, turbidity interferes with sight-feeding aquatic organisms and provides an indication of the biological effect of suspended sediment. Between 1991 and 1997, there were 31 turbidity samples taken at 12 sites within the watershed. All samples were less than two NTUs. Additional monitoring is necessary to determine if turbidity levels are of concern for tributaries within the watershed.

Sediment delivery processes⁵⁹

Sediment delivery to streams from adjacent floodplains and slopes is a natural process for watersheds. The amount of sediment delivered to the streams will vary over time, with the bulk of sediment delivered during high flows. Streams have an inherent ability to dissipate energy and carry sediments. Aquatic organisms within these systems have also adapted to deal with these natural sediment loads. Problems arise when sediment delivered to the streams exceed natural levels. For instance, human activity, such as runoff from towns, can significantly inflate natural sediment loads within stream networks. If erosion and runoff increase within the watershed, sediments also increase and then overwhelm a stream's ability to transport the additional build up. In turn, the sediments may decrease the quality of fish habitat by raising the elevation of the streambed, filling in pools, burying cobbles, boulders, and logs, and contributing to accelerated erosion of stream banks through the formation or addition of gravel bars. This changes the dynamics of the stream and its ability to dissipate energy and has a domino effect by causing more erosion downstream.

Distinguishing between human-induced erosion and a stream's natural rate of erosion can prove challenging due to the variable nature of natural erosion patterns in addition to the timing and spatial pattern of human-induced erosion. In general, aquatic organisms will be affected by an increase in sediment for reasons previously mentioned. Increased human use of the watershed may be apparent during times of high sediment loads, causing increased turbidity and accelerated rates of bank erosion within normally stable streams. These factors are indicators of increased sediment moving through the system. Furthermore, human caused changes within the watershed can often be narrowed to a few locations that experience high-use or that pass through developed areas. The Oregon Watershed Assessment Manual is a valuable resource for determining such problem areas within the watershed. It provides the steps necessary to inventory and address increased sediment loads and erosion.

Without further field verification and analysis using GIS, a more in-depth and detailed report on sediment processes within the assessment area is beyond the scope of this screening-level assessment. This assessment reviews five potential sources of stream

⁵⁹ Jenny Allen, Tim Grubert, and John Runyon of BioSystems, Inc., contributed the introductory text for the sediment delivery processes subsection.

sedimentation and turbidity in the watershed: roads and culverts, debris flow potential, soil type, urban drainage, and burns.

Roads and culverts

As is the case in many watersheds, sediment delivery from dirt and gravel roads is a leading cause of increased sediment in stream systems. Road sediment production and delivery involves many factors and processes such as road surface type, ditch infeed lengths, proximity to nearest stream channel, condition of road, and level and type of use the road system receives. Since complete road data for the watershed are not available, specific values for sediment delivery from the road system are not included in this assessment. Rather, this assessment looks at the current state of road types, road to stream proximity and slope, and culverts.⁶⁰

Roads can be divided into two types: surfaced and unsurfaced. Surfaced roads are ones that have been paved or rocked. Unsurfaced roads are dirt roads. Unsurfaced roads are much more likely to erode and fail than surfaced roads. There are 500.6 miles of roads in the Middle South Umpqua Watershed. These are broken into nine classes (see Table 3-8).

The closer a road is to a stream, the greater the likelihood that road-related runoff contributes to sedimentation. In the Middle South Umpqua Watershed, there are 201.3 miles of roads (60% of 500.6 total miles) within 200 feet of streams (Map 3-7). Of these, approximately 160.2 miles (79.6%) are surfaced roads, 35.5 miles (17.6%) are unsurfaced roads, and 5.6 miles (2.8%) are unknown or closed.

Roads on steep slopes have a greater potential for erosion and/or failure than roads on level ground. There are 15.5 road miles (3.1% of 500.6 total miles) located on a 50% or greater slope within 200 feet of a stream (see Map 3-8). Of these roads on steep slopes, 11.5 miles (74.2%) are surfaced, 3.5 miles (22.6%) are unsurfaced, and 0.4 miles (2.6%) are closed or unknown. An analysis of road conditions near streams is necessary to determine how much stream sedimentation is attributable to road conditions.

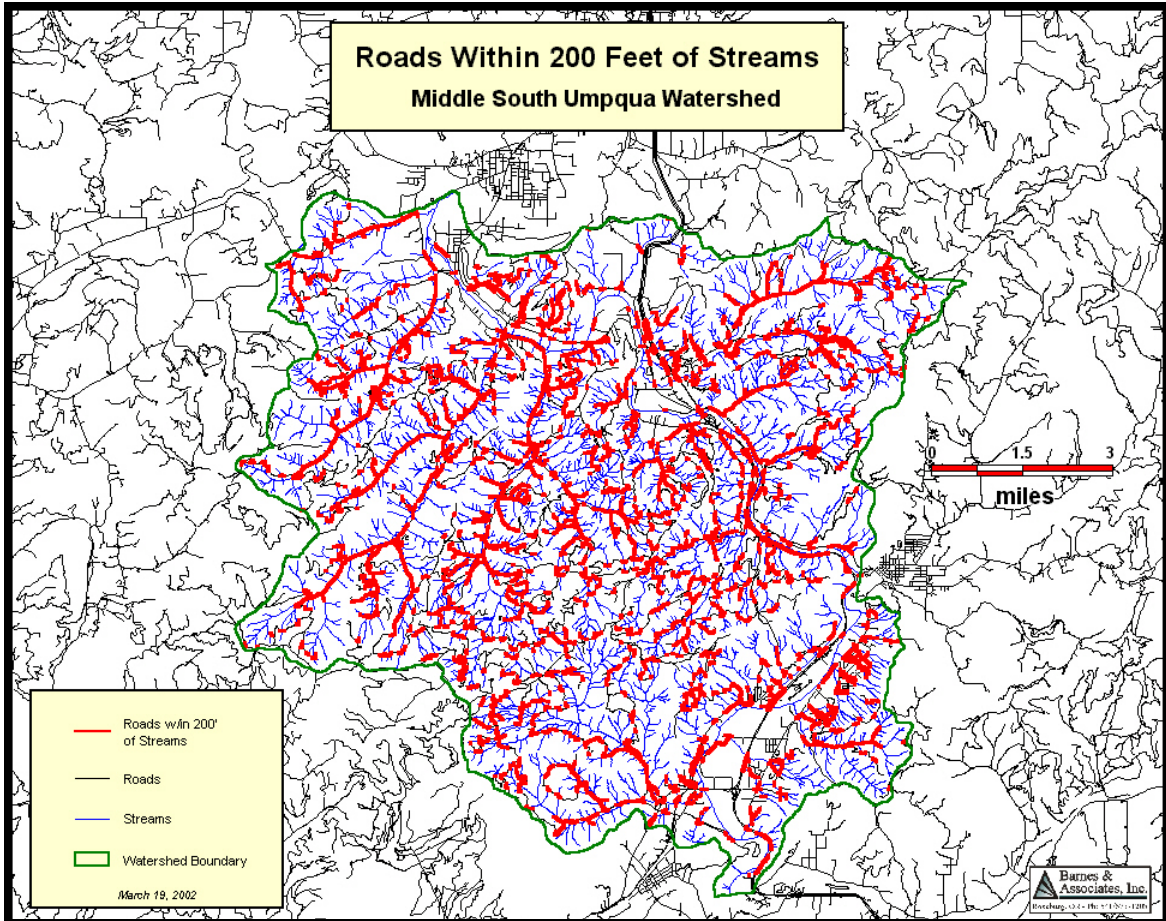
⁶⁰ Tim Grubert and John Runyon of BioSystems, Inc., contributed this paragraph.

Surface type	Road miles	% total
Surfaced		
• Federal roads (paved)	39.0	7.8%
• State roads (paved)	13.5	2.7%
• County/other (paved)	63.4	12.7%
• Major gravel	229.3	45.8%
• Minor gravel or spur	53.1	10.6%
Total surfaced	398.3	79.6%
Unsurfaced		
• Major dirt road	87.8	17.5%
• Minor dirt road	3.8	0.8%
Total unsurfaced	91.6	18.3%
Other		
• Unknown	2.2	0.4%
• Closed	8.7	1.7%
Total other	10.9	2.1%

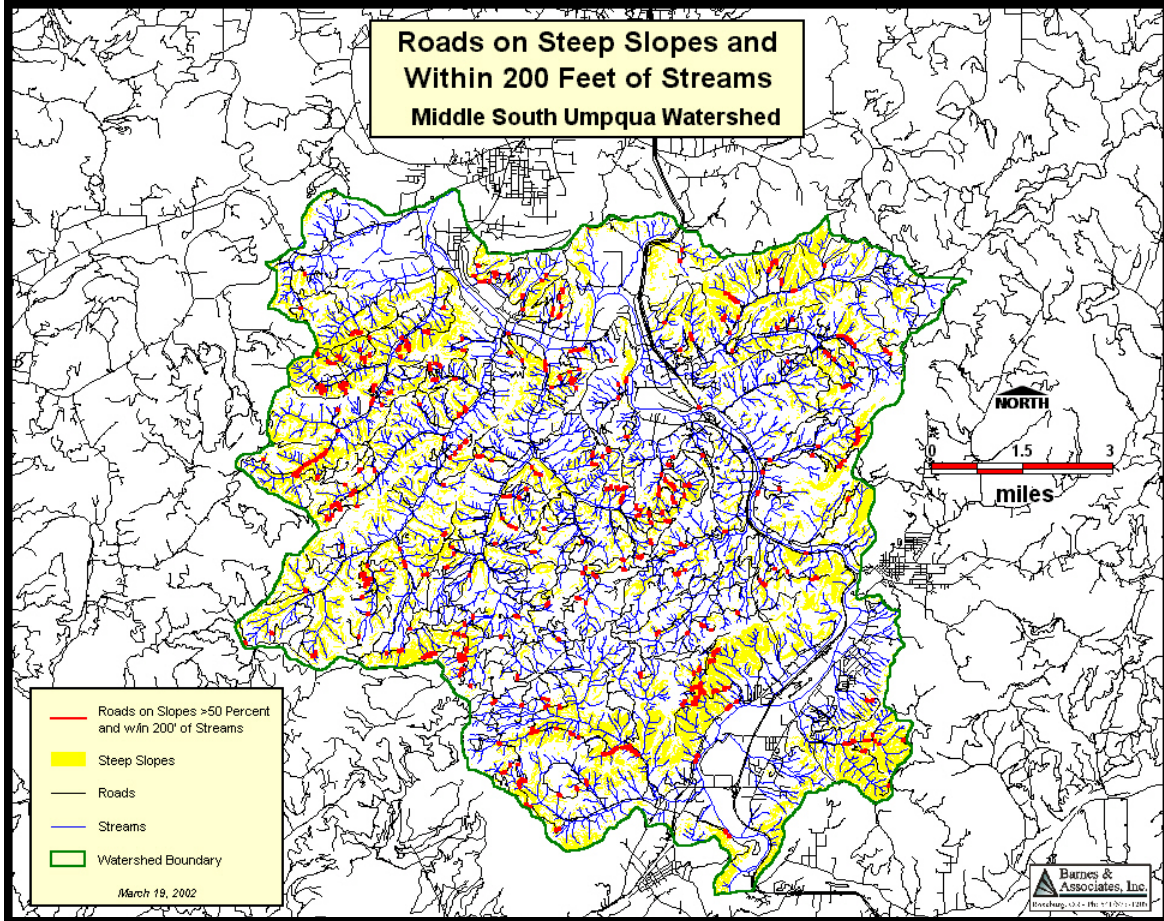
Table 3-8: Miles and percent of Middle South Umpqua Watershed roads by class.

Like roads, culverts can contribute to stream sedimentation when they are failing. Culverts often fail when the pipe is too narrow to accommodate high stream flows, or when the pipe is placed too high or too low in relation to the surface of a stream. In the latter cases, the amount of flow overwhelms the culvert’s drainage capacity, and water floods around and over the culvert, eroding the culvert fill, road, and streambank. There are at least 160 stream crossings in the Middle South Umpqua Watershed. At this time, it is unknown how many of these crossing are culverts and how many culverts are failing.⁶¹

⁶¹ See section 3.1.2 for a discussion of current culvert identification and restoration efforts in the Umpqua Basin.



Map 3-7: Locations of Middle South Umpqua Watershed roads within 200 feet of a stream.



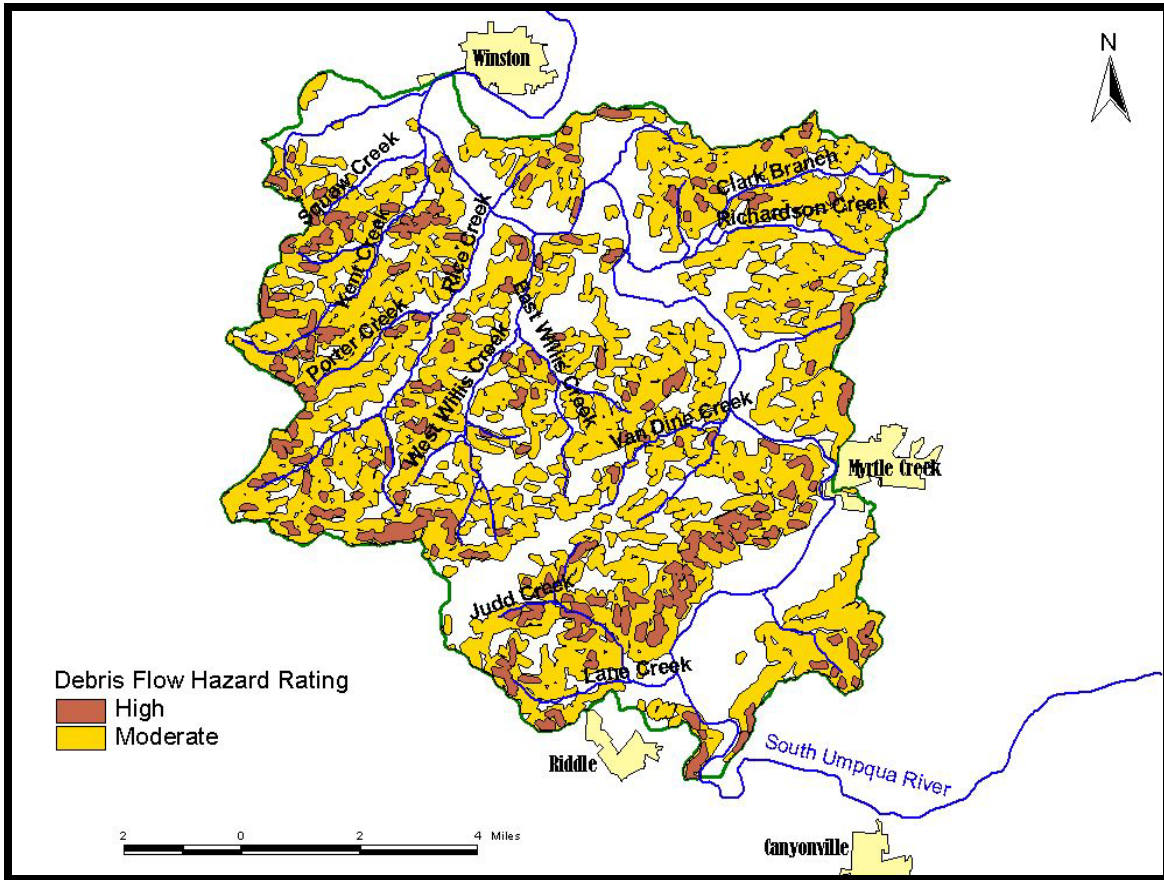
Map 3-8: Locations of Middle South Umpqua Watershed roads within 200 feet of a stream and on slopes that are greater than 50%.

Slope instability

In 2000, the Oregon Department of Forestry (ODF) published a debris flow hazard study that is geographically categorized by counties. These data sets were developed by evaluating slope steepness, geologic units, stream channel confinement, fan shaped geomorphology, historical information on debris flow occurrence, and the “ODF Storm Impacts and Landslides of 1996” study. This can be a useful tool for the watershed council to use when evaluating sediment delivery to streams and determining areas at risk for landslides and mass failures. However, this is a coarse scale study that was primarily designed to assist land managers in locating areas that are naturally prone to debris flows. This model should not be used to make decisions without further investigation of the areas mapped as high risk. The debris flow hazard model for the Middle South Umpqua Watershed is shown in Map 3-9. An organization known as Nature of the Northwest is in the process of publishing a similar landslide study that is more refined. The new study has incorporated more variables into the model and refined the scale to make it a more realistic management tool with which land managers can make decisions.⁶²

⁶² Jenny Allen, Tim Grubert, and John Runyon of BioSystems, Inc., contributed this paragraph.

Of the 59,441.4 acres within the Middle South Umpqua Watershed, 29,858.9 acres (50.2%) are considered moderate for debris flow potential, and 5,242.1 acres (8.8%) are classified as high. There are no areas within the watershed classified as having an extreme debris flow potential. Of the 97.0 miles of streams included in Map 3-9, 24.6 miles (25.3%) are within areas of moderate landslide potential, and 2.6 miles (2.7%) are within areas of high landslide potential. Although landslides can contribute significant amounts of stream sediment, they are periodic events and are difficult to predict. At this time, it is unknown how much stream sediment is a result of landslides in the Middle South Umpqua Watershed.



Map 3-9: Debris flow potential within the Middle South Umpqua Watershed.

Hydrologic soil groups⁶³

The Natural Resources Conservation Service (NRCS) classifies soil into four hydrologic soil groups that are based on the soil’s runoff potential given similar storm and groundcover conditions. Soil texture, depth to water table, structure, and permeability influence the soil’s runoff potential. The hydrologic soil groups are categorized as A through D, with A having the lowest runoff potential and D having the highest runoff potential. Please refer to Table 3-9 for more details about the soil groups.

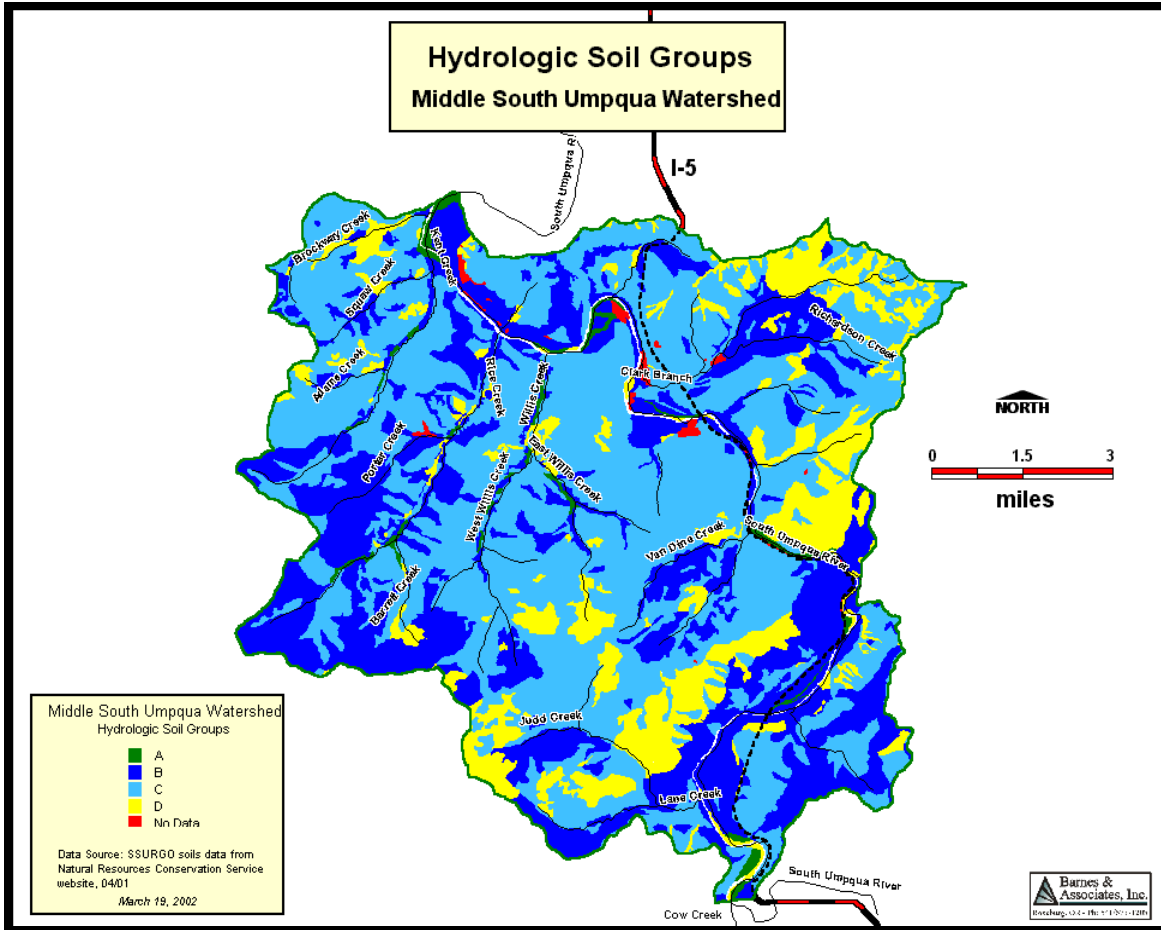
⁶³ Jenny Allen, Tim Grubert, and John Runyon of BioSystems, Inc., contributed this section. Information in this section is from *The Nature and Properties of Soils* (Brady and Weil, 1996).

HSG	Soil Description
A	These soils can be sand, loamy sand, or sandy loam. These soils have low runoff potential and high infiltration rates even when thoroughly wetted. They consist chiefly of deep, well to excessively drained sands or gravels and have a high rate of water transmission.
B	This soil type is silt loam or loam. These soils have moderate infiltration rates when thoroughly wetted and consist chiefly of moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse textures.
C	This soil type is sandy clay loam. These soils have a low infiltration rate when thoroughly wetted and consist chiefly of soils with a layer that impedes downward movement of water and soils with moderately-fine to fine structure.
D	This soil type is clay loam, silty clay loam, sandy clay, silty clay, or clay. This hydrologic soil group has the highest runoff potential. These soils have very low infiltration rates when thoroughly wetted and consist chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface and shallow soils over nearly impervious material.

Table 3-9: Hydrologic soil groups.⁶⁴

The Middle South Umpqua Watershed includes soil from all of the hydrologic soil groups; 1% to 2% of the soils in the watershed are currently unclassified (see Map 3-10). Group A soils represent a small area, roughly 1% to 3% of the watershed. These soils are found in the lower portions adjacent to or near the main stem of the South Umpqua River, as well as, along some of the tributaries like Kent, Willis, and Rice Creeks. Group B soils make up about 10% to 15% of the watershed and are mapped throughout the area. Group C soils dominate the watershed, comprising approximately 65% of the area and are soils with low infiltration rates. These soils are found throughout the watershed, subsequently, many are located adjacent to source streams. These streams have the potential to deliver increased sediment to the lower reaches when disturbed, given their low infiltration rates. Group D soils comprise 10% to 15% of the area and are concentrated in the upper and midsections of the watershed. These soils have the highest runoff potential and lowest infiltration rates. Some of these soils are also located adjacent to headwater streams and have the potential to deliver sediment to the lower reaches when disturbed.

⁶⁴Source: SSURGO soils data from the NRCS website.



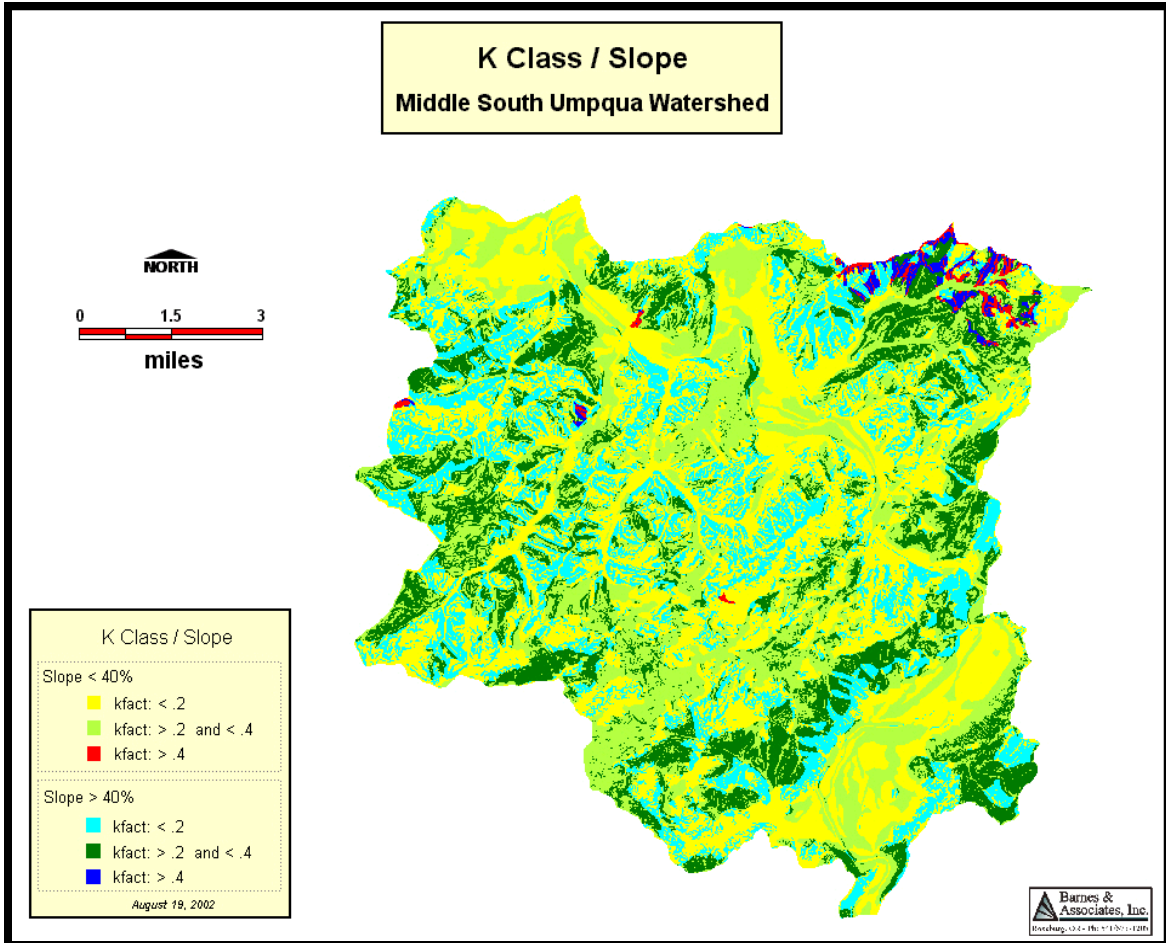
Map 3-10: Hydrologic soils map of the Middle South Umpqua Watershed.

Soil K-factor⁶⁵

Erodibility generally refers to a soil’s susceptibility to the erosive force of water running over land and is expressed as a value known as the K-factor. The two major factors that define K-factor are the soil’s infiltration capacity and its structural stability. Major influences of a soil’s infiltration capacity and structural stability include characteristics such as: the amount of organic matter, soil texture, the kind and amount of swelling clays, soil depth, the presence of impervious soil layers, and the tendency of the soil to crust. K-factor is generally expressed as a value between zero and 0.6. Soils with a K-factor of less than 0.2 are classified as well-drained, sandy soils with high infiltration rates. Soils with a K-factor in the range of 0.2 to 0.4 are considered to have moderate infiltration capacities. Soils with K-factors greater than 0.4 are assigned to soils with low infiltration rates and a high susceptibility to erosion. Slope also influences erosion rates. Since steep slopes are more prone to the erosive force of water, slopes can adversely affect soils that have moderate infiltration rates and levels of erosion potential. On steep slopes, areas with moderate K-factors may still be prone to a high risk of erosion. In general, the

⁶⁵ Jenny Allen, Tim Grubert, and John Runyon of BioSystems, Inc., contributed this section. Information in this section is from *The Nature and Properties of Soils* (Brady and Weil, 1996).

steeper the slope, the more likely it is to fail; however, some geologic material is more stable than others on varying gradients. For instance, tuffs, breccias, and sediments such as marine deposits, are more prone to erosive forces than harder material such as granite, which is better able to support steep slopes.⁶⁶ Map 3-11 illustrates the K-factor and slope distribution of the area.



Map 3-11: K class distribution within the Middle South Umpqua Watershed.

Much of the watershed has been categorized as having a low to moderate K-factor with slopes less than 40% and a low K-factor with slopes greater than 40%. However, a proportion of the watershed is mapped on slopes greater than 40% that have moderate to high K-factors. As mentioned above, it is important to pay attention to the areas that have been classified as having a K-factor greater than 0.2 and less than 0.4 on slopes greater than 40%. Subsequently, these are found to some degree throughout the watershed. These areas have formed predominately from sedimentary deposits that are generally less stable than harder materials. Concentrated in the northeastern boundary of the watershed are areas with a high K-factor with slopes greater than 40%. Since these

⁶⁶ Section 1.2.4 and Appendix 1 provide more information on the geologic units within the Middle South Umpqua Watershed.

areas are naturally more prone to erosion, development activities should be limited in these areas as they may be slower to recover from disturbance.

Urban drainage

In cities and towns, most sediment enters streams from storm water systems. Urban development results in high amounts of impervious surfaces concentrated in a small area.⁶⁷ As a result, rainfall is no longer absorbed by the soil or stored in wetlands, leading to heightened peak streamflows and shortened lag times (time from rainfall to peak streamflow) following rain events. To prevent flooding, cities have extensive storm water systems that convey runoff from streets and other paved areas to nearby rivers, streams, and/or lakes.

Different types of land within an urban setting produce different amounts of sediment. Residential neighborhoods produce the least amount of sediment per square mile. Commercial areas produce moderate loads of sediment, and heavy industrial areas produce even higher amounts. The highest amounts occur in areas that are actively being developed. Earth disturbances and bared surfaces usually makes sediment production the highest within a town, albeit the sediment production usually decreases once the construction is complete (Oregon Watershed Assessment Manual, p. VI-27).

Table 3-10 shows the dominant land use and estimated percent of total impervious surfaces for seven cities in the central Umpqua Basin. “Residential” is the dominant land use for all seven cities. The City of Roseburg has the highest estimated amount of impervious area while the City of Winston has the lowest estimated amount. More research is needed to determine the degree to which these cities contribute to stream sediment.

⁶⁷ Impervious surfaces are ones that do not permit water infiltration, such as roads, roofs, and compacted soil.

Urban Growth Boundary	% of area commercial, industrial or residential	Dominant type of land use	Estimate of % total impervious area
Drain	76	Residential	36
Myrtle Creek	74	Residential	34
Oakland	88	Residential	38
Roseburg	75	Residential	42
Sutherlin	76	Residential	38
Winston	39	Residential	18
Yoncalla	93	Residential	48

Table 3-10: Dominant land use and estimated percent impervious area for seven cities in the central Umpqua Basin.⁶⁸

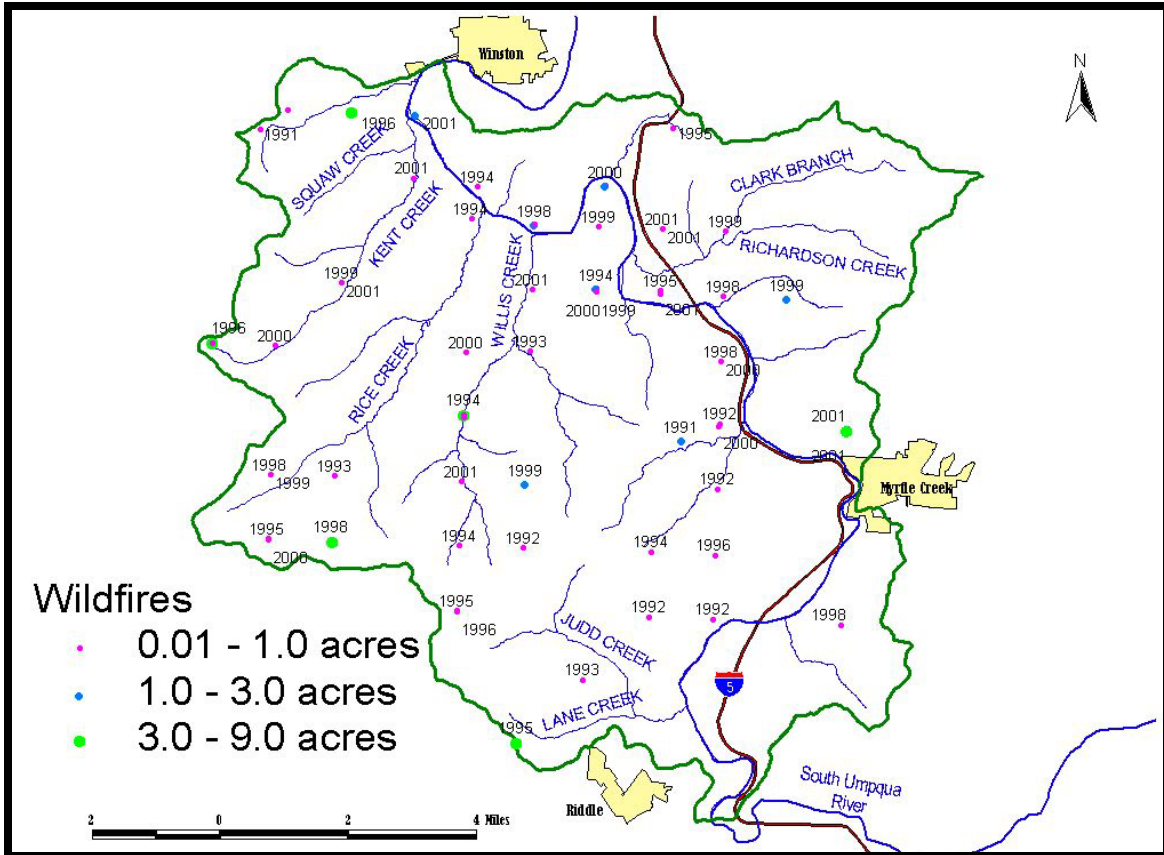
Burns

Burned areas erode more easily than unburned areas because of the lack of vegetative cover and abundance of ash and charred material. In the Middle South Umpqua Watershed, the Douglas Forest Protective Association (DFPA) is responsible for issuing burn permits. Table 3-11 shows the number of acres and piles for which burn permits were issued by DFPA from 1998 through 2001. Map 3-12 shows the location, years, and size of non-permitted (accidental) fires in the Middle South Umpqua Watershed from 1991 through 2001. The UBWC was unable to locate quantitative data on burns/stream proximity and it therefore cannot evaluate the potential for stream sedimentation from burns.

Year	Field acres	Debris piles
1998	1,018	26
1999	2,255	24
2000	280	33
2001	15	51
Total	3,568	134

Table 3-11: Number of acres and burn piles for which permits were issued from 1998 through 2001 in the Middle South Umpqua Watershed.

⁶⁸ Barnes and Associates, Inc., provided the data in Table 3-10.



Map 3-12: Wildfire location, year, and size in the Middle South Umpqua Watershed.

3.3.8. Toxics

Toxics are a concern for residential fish and aquatic life and for drinking water. A variety of substances can be toxic, including metals, organic chemicals, and inorganic chemicals. Toxics are not defined by substance type, but rather by their effects on humans, fish, wildlife, and the environment. According to the ODEQ:

Toxic substances shall not be introduced above natural background levels in the waters of the state in amounts, concentrations, or combinations [that] may be harmful, may chemically change to harmful forms in the environment, or may accumulate in sediments or bioaccumulate in aquatic life or wildlife to levels that adversely affect public health, safety, or welfare, [or are detrimental to] aquatic life, wildlife, or other designated beneficial uses (p. 22).⁶⁹

As shown in Table 3-6 on page 75, The Middle South Umpqua is 303(d) listed for chlorine from the mouth to river mile 51 (the confluence with Canyon Creek). Ammonia

⁶⁹ From ODEQ’s *Oregon’s Approved 1998 303(d) Decision Matrix*.

is listed as a “potential concern” for the same stretch of the South Umpqua River.⁷⁰ A general description of these toxics and ODEQ’s water quality monitoring findings are provided below.

Chlorine

The South Umpqua River was listed for chlorine in 1998. According ODEQ, TMDL development for the river showed chlorine toxicity associated with major discharges from Canyonville to the mouth of the river. The beneficial uses affected by this toxicity are resident fish and aquatic life, anadromous fish passage, and drinking water. The Hach Corporation, which develops products for testing water quality, also provides educational information about various chemicals. Below is a description of chlorine from the Hach Corporation website (<http://www.hach.com>).⁷¹

Chlorine is a greenish-yellow gas that dissolves easily in water. It has a pungent, noxious odor that some people can smell at concentrations above 0.3 parts per million. Because chlorine is an excellent disinfectant, it is commonly added to most drinking water supplies in the US...Chlorine is also used as a disinfectant in wastewater treatment plants and swimming pools. It is widely used as a bleaching agent in textile factories and paper mills, and it’s an important ingredient in many laundry bleaches.

As shown in Table 3-12, chlorine is toxic to fish and aquatic life in very small concentrations. Chlorine becomes more toxic in low pH levels and in combination with other toxics, such as cyanide and ammonia.

⁷⁰ Toxics listing criteria are from the ODEQ draft 2002 303(d) database website: <http://www.deq.state.or.us>. Select “water quality,” “303(d)” list,” “review the final 2002 303(d) list,” and “search 303(d) list by waterbody name, parameter, and/or list date.” Query the database by waterbody, parameter, listing status, and listing date.

⁷¹ Select “visit H2OU,” and then “educator resources,” and “important water quality factors.”

Amount of total chlorine (mg/l)	Effects on fish and aquatic life
0.006	Kills trout fry in two days.
0.01	Recommended maximum for all fish and aquatic life.
0.01	Kills chinook salmon and coho salmon.
0.01-0.05	Oysters have difficulty pumping water through their bodies.
0.02	Maximum brook and brown trout can withstand.
0.05	Maximum amount that can be tolerated by young Pacific salmon in the ocean.
0.1	Kills most marine plankton.
0.25	Only the hardiest fish can survive.
0.37	Maximum fish can tolerate.
1.0	Kills oysters.

Table 3-12: Effects of chlorine on fish and aquatic life.⁷²

Ammonia

As with chlorine, ODEQ TMDL development showed possible ammonia toxicity in the South Umpqua River associated with major discharges from Canyonville to the mouth. Ammonia can come from numerous sources. In nature, ammonia is formed by the action of bacteria on proteins and urea. The Kentucky Department of Natural Resources’ River Assessment Monitoring Project summarizes ammonia sources and environmental impacts.

About three-fourths of the ammonia produced in the United States is used in fertilizers either as the compound itself or as ammonium salts such as sulfate and nitrate. Large quantities of ammonia are used in the production of nitric acid, urea, and nitrogen compounds. It is used in the production of ice and in refrigerating plants. "Household ammonia" is an aqueous solution of ammonia. It is used to remove carbonate from hard water. Since ammonia is a decomposition product from urea and protein, it is found in domestic wastewater. Aquatic life and fish also contribute to ammonia levels in a stream.

NH₃ is the principal form of toxic ammonia. It has been reported toxic to fresh water organisms at concentrations ranging from 0.53 to 22.8 mg/l. Plants are more tolerant of ammonia than animals, and invertebrates are more tolerant than fish. Hatching and growth rates of fishes may be affected. In the structural development, changes in tissues of gills, liver, and kidneys may also occur.⁷³

⁷² From the Hach Corporation web site <http://www.hach.com>.

⁷³ From the website <http://water.nr.state.ky.us/ww/ramp/default.htm>. Select “what we are testing for” and “ammonia.”

Like nitrates, ammonia may result in excessive plant growth, which in turn depletes oxygen levels. The danger ammonia poses for fish depends on the water temperature and pH along with the dissolved oxygen and carbon dioxide levels. In general, ammonia becomes more toxic as pH increases or water becomes warmer.

3.3.9. Water quality key findings and action recommendations

Temperature key findings

- Monitoring locations within the watershed indicate that streams within the Middle South Umpqua Watershed frequently have seven-day moving average maximum temperatures exceeding the 64°F water quality standard during the summer. High stream temperatures may limit salmonid rearing in these reaches.
- Warmer sites often lack shade. Increasing shade on small and medium-sized streams may improve overall stream temperature.
- Groundwater and tributary flows can contribute to stream cooling. Gravel-dominated tributaries may permit cooler subsurface flows when surface flows are low.
- Fish may find shelter from high summer temperatures in the lower reaches and mouths of small and medium-sized tributaries and in reaches within warm streams that have proportionately high groundwater influx and shade.

Surface water pH, dissolved oxygen, nutrients, bacteria, and toxics key findings

- Temperature and the levels of pH, nutrients, and dissolved oxygen are interrelated. In the South Umpqua River during the summer, pH does not meet water quality standards. This condition is detrimental to resident fish, aquatic life, and human contact recreation. Nutrient monitoring indicates that phosphorus levels are high. Dissolved oxygen levels no longer limit water quality. It is unknown if these parameters are concerns for other locations within the watershed.
- Within the Middle South Umpqua Watershed, South Umpqua River bacteria levels exceed water quality standards all year, decidedly a human health concern. Additional monitoring is necessary to determine if other locations in the watershed have high bacteria levels.
- Within the Middle South Umpqua Watershed chlorine levels exceed water quality limits, and ammonia is a potential concern. It is unknown if these toxics are a concern for other streams in the watershed.

Sedimentation and turbidity key findings

- Turbidity data indicate that usual turbidity levels in the South Umpqua River do not impair sight-feeding fish like salmonids.
- Soils prone to high rates of erosion due to low infiltration and high rates of runoff are located in the upper to midsections of the watershed.
- Developed areas within the watershed may impact water quality (i.e. runoff from roads and roofs). Improperly drained roads and poor land management practices can increase sediment loads to streams. In the Umpqua Basin, more studies are needed to determine the impacts of roads, culverts, landslides, burns, soil type, and urban conditions on sedimentation and turbidity.

Water quality action recommendations

- Continue monitoring the Middle South Umpqua Watershed for all water quality conditions. Expand monitoring efforts to include tributaries.
- Identify stream reaches that may serve as “oases” for fish during the summer months, such as at the mouth of small or medium-sized tributaries. Protect or enhance these streams’ riparian buffers and, when appropriate, improve instream conditions by placing logs and boulders within the active stream channel to enhance large woody debris abundance and create pools.
- In very warm streams and where dissolved oxygen and pH are a problem, increase shade by encouraging wide riparian buffers and managing for native trees and full canopies.
- Identify and monitor sources of bacteria, nutrients, and ammonia. Where applicable, reduce bacteria, nutrient, and ammonia levels through activities such as:
 - Limiting livestock stream access by providing stock water systems and shade trees outside of the stream channel and riparian zones. Fence riparian areas as appropriate.
 - Relocating structures and situations that concentrate domestic animals near streams, such as barns, feedlots, and kennels. Where these structures cannot be relocated, establish dense and wide riparian vegetation zones to filter fecal material.
 - Repairing failing septic tanks and drain fields.
 - Using wastewater treatment plant effluent for irrigation.
 - Reducing chemical nutrient and ammonia sources.
- Where data show that stream sediment or turbidity levels exceed established water quality standards, identify sediment sources such as urban runoff, failing culverts or roads, landside debris, construction or burns. Take action to remedy the problem or seek assistance through organizations such as the UBWC and Soil and Water Conservation Districts.
- Obtain comprehensive map coverage of the forest road system within the watershed and prioritize areas of concern based on road type, condition, and proximity to nearest stream. If necessary, use this information to target projects for improving road stability and drainage patterns.
- Identify areas with high concentrations of the group D soils that have been disturbed; prioritize areas for vegetation plantings and limit activities in these sensitive areas. This will help maintain soil structure, improve infiltration rates, and decrease erosion.
- Provide landowner education about water quality concerns and potential improvement methods:
 - Improving dirt and gravel road drainage to minimize sediment delivery to streams.
 - Enhancing soil infiltration by leaving vegetation litter on the ground after timber and crop harvests.
 - Planting bio-swales near streams in urban and suburban areas to catch urban runoff.
- Work with ODEQ to educate landowners about activities that will reduce any non-point sources of ammonia and chlorine in the watershed.

3.4. Water quantity

3.4.1. Water availability⁷⁴

Data from the Oregon Water Resources Department (OWRD) have been used to determine water availability in the Middle South Umpqua Watershed.⁷⁵ Availability is based on streamflow, consumptive use and instream water rights. The amount of water available for issuance of new water rights is determined by subtracting consumptive use and the instream water right from streamflow. The OWRD has divided the Umpqua Basin into sub-basins, or water availability basins (WABs), for the purpose of analyzing water availability. In the Middle South Umpqua Watershed, four WABs encompass most of the watershed.

Figure 3-4 shows surface water availability for the Kent Creek WAB (#319) in cubic feet per second (cfs). Appendix 9 has the same data for the Rice Creek, Willis Creek, and South Umpqua River WABs. The solid yellow area is the average streamflow while the blue line represents the instream water right. The red line is the estimated consumptive use. In the Kent Creek, Rice Creek, and Willis Creek WABs, the instream water right exceeds average streamflow for the entire year. From August through October, consumptive use equals average streamflow in these three WABs.

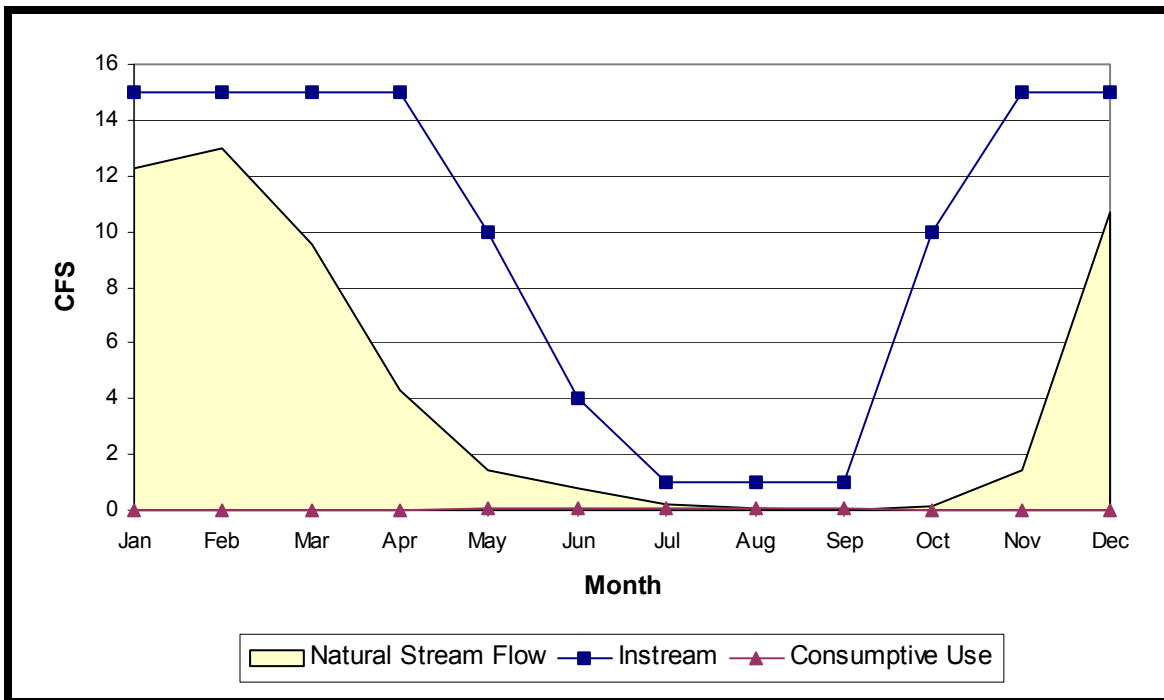


Figure 3-4: Water availability in the Kent Creek WAB (#319).

⁷⁴ David Williams, the Oregon Water Resources Department Watermaster for the Umpqua Basin, contributed the text for section 3.4.1.

⁷⁵ Water availability data are available from the Oregon Water Resources Department web site <http://www.wrd.state.or.us/>.

Oregon law provides a mechanism for temporarily changing the type and place of use for a certificated water right by leasing the right to an instream use. Leased water remains in-channel and benefits streamflows and aquatic species. The water right holder does not have to pay pumping costs and while leased the instream use counts as use under the right for purposes of determining forfeiture.

3.4.2. Water rights by use

Table 3-13 shows consumptive use by category for the Middle South Umpqua Watershed.⁷⁶ Appendix 10 lists the possible uses included in each category. These records show uncanceled water rights and do not indicate actual water consumption.⁷⁷

Within the Middle South Umpqua Watershed, irrigation is the largest consumptive use (53.8%), followed by industry (24.9%) and municipal use (16.5%). Use for the South Umpqua follows the same trend as for the total watershed. The largest use of water for the South Umpqua’s tributaries in the watershed is also irrigation (50.5%), followed by miscellaneous uses (20.1%) and municipal use (13.1%).

Source	Total use		South Umpqua		Tributaries	
	cfs	% of total	cfs	% of S. Umpqua	cfs	% of tributaries
Irrigation	29.37	53.8%	25.71	54.3%	3.66	50.5%
Fish/WL	0.0	-	0.0	-	0.0	-
Agriculture	0.15	0.3%	0.03	0.1%	0.12	1.7%
Industry	13.60	24.9%	13.08	27.6%	0.52	7.2%
Municipal	9.02	16.5%	8.07	17.0%	0.95	13.1%
Domestic	0.80	1.5%	0.31	0.7%	0.49	6.8%
Recreation	0.0	-	0.0	-	0.0	-
Misc.	1.66	3.0%	0.15	0.3%	1.51	20.1%
Total	54.60	100.0%	47.35	100.0%	7.25	100.0%

Table 3-13: Water rights by use for the South Umpqua River and tributaries within the Middle South Umpqua Watershed.

3.4.3. Streamflow and flood potential

The US Geological Survey (USGS) administers a stream gauge on the South Umpqua River near Brockway (gauge #14312000). This station is used to assess streamflow and flood potential in the Middle South Umpqua Watershed. Data were intermittently collected at Brockway from 1905 to 1926 and steadily collected since 1942.

⁷⁶ Water rights data are available from the Oregon Water Resources Department web site <http://www.wrd.state.or.us/>.

⁷⁷ Uncanceled water rights include: 1) valid rights, which are ones that have not been intentionally canceled and the beneficial use of the water has been continued without a lapse of five or more consecutive years in the past 15 years; and 2) rights that are subject to cancellation due to non-use. For more information about water rights, contact the Oregon Water Resources Department.

Figure 3-5 charts the average monthly streamflow for the South Umpqua River at Brockway. In 1986, the Galesville Dam became fully operational. The dam is located at the headwaters of Cow Creek, which is the largest tributary to the South Umpqua River. Figure 3-5 has separated the historical streamflow into two units: before Galesville Dam (1926 through 1985) and after Galesville Dam (1986 through 2001).

As would be expected from climate information in this assessment’s introduction, the winter months have the greatest streamflow due to precipitation. It appears that Galesville Dam has reduced winter flows and slightly increased summer flows within the South Umpqua River. Nevertheless, the river can have less than 100 cfs during the summer months.

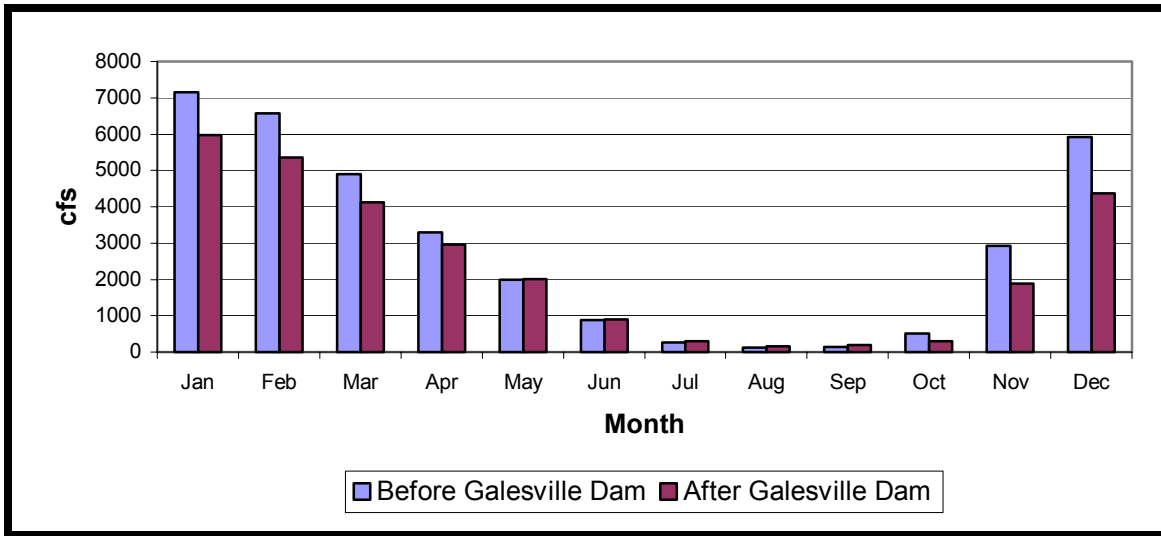


Figure 3-5: Mean monthly water flow for the South Umpqua River at Brockway (gauge #14312000).

Figure 3-6 shows average flow and peak flow for each year from 1942 until the year 2000 for the South Umpqua River at Brockway. The solid blue area represents average annual flow; the scale is on the right side of the chart. It appears from this chart that peak flows generally follow average annual flow trends. 1996 is a notable exception. While 1996 average annual flow is the highest recorded (5,123 cfs), the peak flow was below average (46,700 cfs).⁷⁸

The highest peak events are in December, 1964 (125,000 cfs) and January, 1974 (105,000 cfs). It appears from the graph that high annual peak flows were more common prior to the early 1980s, especially in the 1940s and 1950s. Galesville Dam was built, in part, for flood control, and has had a stabilizing effect on peak flow.

⁷⁸ Data are shown by water year. Water years begin October 1 and end September 30. Therefore, a flood event in December, 2001 will be recorded in the 2002 water year.

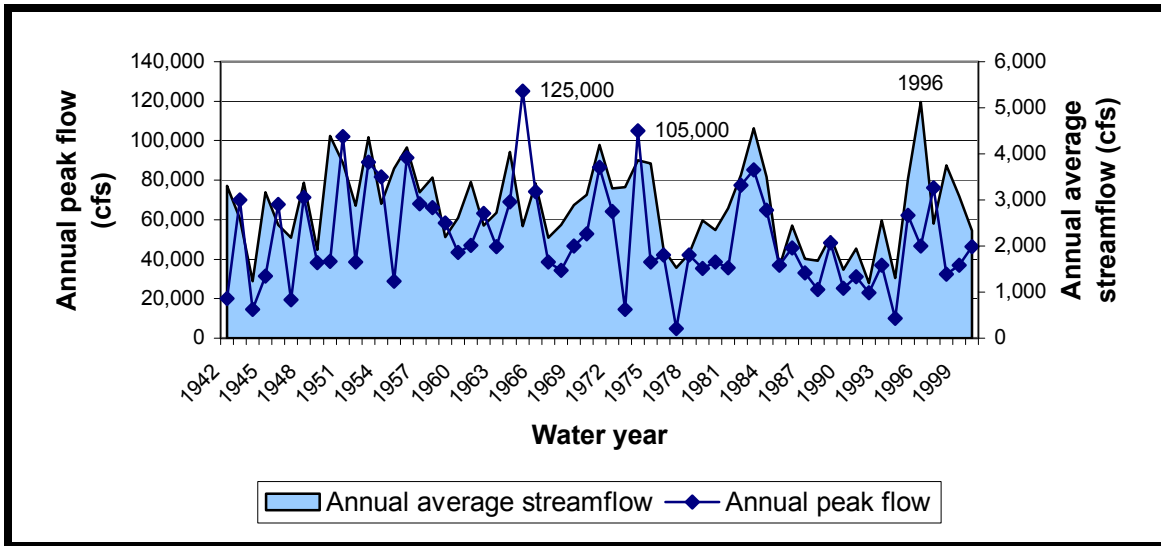


Figure 3-6: Annual average flow and peak flow for the South Umpqua River at Brockway (gauge #14312000).

Potential influences on flood potential

Approximately 11% of the Middle South Umpqua Watershed is within the transient snow zone (TSZ) (see Map 1-8 in section 1.2.6). In the TSZ, snow can accumulate in areas with open canopies such as meadows, burned areas, or timber harvest units. When warmer rain falls on the accumulated snow, the snow quickly melts and can result in high runoff levels and peak streamflows. Streams with headwaters in the TSZ zone, such as Willis Creek, are more susceptible to rain-on-snow events than lower elevation streams.

Road density can also influence peak flows. Table 3-14 shows the miles of road per square mile for surfaced and unsurfaced roads. Paved roads are impermeable to water, and rock or dirt roads are somewhat permeable. When it rains or accumulated snow on road surfaces melts, water that is not absorbed will flow off the road. The soil and vegetation surrounding the road may absorb the runoff. If the surrounding area is unable to absorb the excess water, and if the road is close to a stream, then the excess water flows into the stream, resulting in high peak flows. It is important to note that the relationship between roads, streams, and peak flows is dependent on many factors, and the influence of roads on stream flow and peak events is debatable.

Road type	Road miles/ square mile
Paved	1.3
Gravel	3.1
Dirt	1.1
Total	5.5

Table 3-14: Miles of road per square mile for surfaced and unsurfaced roads in the Middle South Umpqua Watershed.

Landowner comments

During a watershed assessment meeting held November 27, 2001, local landowners suggested that forest management practices in the 1940s and 1950s might have influenced flashiness. According to residents, timber harvests at that time removed all vegetation, sometimes clearing multiple hillsides, leaving no riparian buffer strip along streams. Some participants suggested that the lack of trees permitted more surface runoff and resulted in greater stream flashiness, accounting for the pre-1960 peak flows in Figure 3-6.

3.4.4. Water quantity key findings and action recommendations

Water availability and water rights by use key findings

- In Middle South Umpqua tributary WABs, instream water rights exceed average flow all year, and consumptive use equals average flow from August through October.
- The largest water users in the Middle South Umpqua Watershed are irrigators, industries, and municipalities.

Streamflow and flood potential key findings

- It is not unusual for the flow of the South Umpqua River at Brockway to be less than 100 cfs during the summer months.
- The construction of Galesville Dam appears to have had a stabilizing effect on winter peak flows for the South Umpqua River at Brockway.
- The degree to which road density and the TSZ influence flood potential in the Middle South Umpqua Watershed is unknown at this time.
- Some landowners believe that historical surface vegetation removal permitted greater surface water runoff and may have contributed to stream flashiness.

Water quantity action recommendations

- Reduce summer water consumption through instream water leasing and by improving irrigation efficiency.
- Continue monitoring peak flow trends in the watershed. Try to determine the role of vegetative cover, flooding, road density, and the TSZ on water volume.
- Educate landowners about proper irrigation methods and the benefits of improved irrigation efficiency.

3.5. Fish populations

3.5.1. Fish presence

Table 3-5 lists the fish species in the Middle South Umpqua Watershed that have viable, reproducing populations or annual runs. Warm water fish, including largemouth bass (*Micropterus salmoides*), yellow perch (*Perca flavescens*), and bluegill (*Lepomis macrochirus*) may also be present in the watershed. These fish are accidentally or intentionally introduced to streams from private ponds.

The Oregon Coast coho salmon was listed as a threatened species in 1998 under the Endangered Species Act of 1973. Currently, there are no other threatened or endangered

aquatic species in the Middle South Umpqua Watershed. In January, 2003, various groups petitioned to protect the Pacific lamprey and western brook lamprey, as well as two other lamprey species not present in the Umpqua Basin, under the Endangered Species Act.

Common Name	Scientific Name
Steelhead	<i>Oncorhynchus mykiss</i>
Coho salmon	<i>O. kisutch</i>
Chinook (spring and fall)	<i>O. tshawytscha</i>
Cutthroat trout	<i>O. clarkii</i>
Umpqua chub	<i>Oregonichthys kalawatseti</i>
Western brook lamprey	<i>Lampetra richardsoni</i>
Pacific lamprey	<i>Lampetra tridentata</i>
Umpqua dace	<i>Rhinichthys cataractae</i>
Sculpin	<i>Cottus sp.</i>
Redside shiner	<i>Richardsonius balteatus</i>
Speckled dace	<i>Rhinichthys osculus</i>
Umpqua pikeminnow	<i>Ptychocheilus oregonensise</i>
Largescale sucker	<i>Catostomus macrocheilus</i>
Smallmouth bass	<i>Micropterus dolomieu</i>
Brown bullhead	<i>Ameiurus nebulosus</i>

Table 3-15: Fish species with established populations or runs within the Middle South Umpqua Watershed.

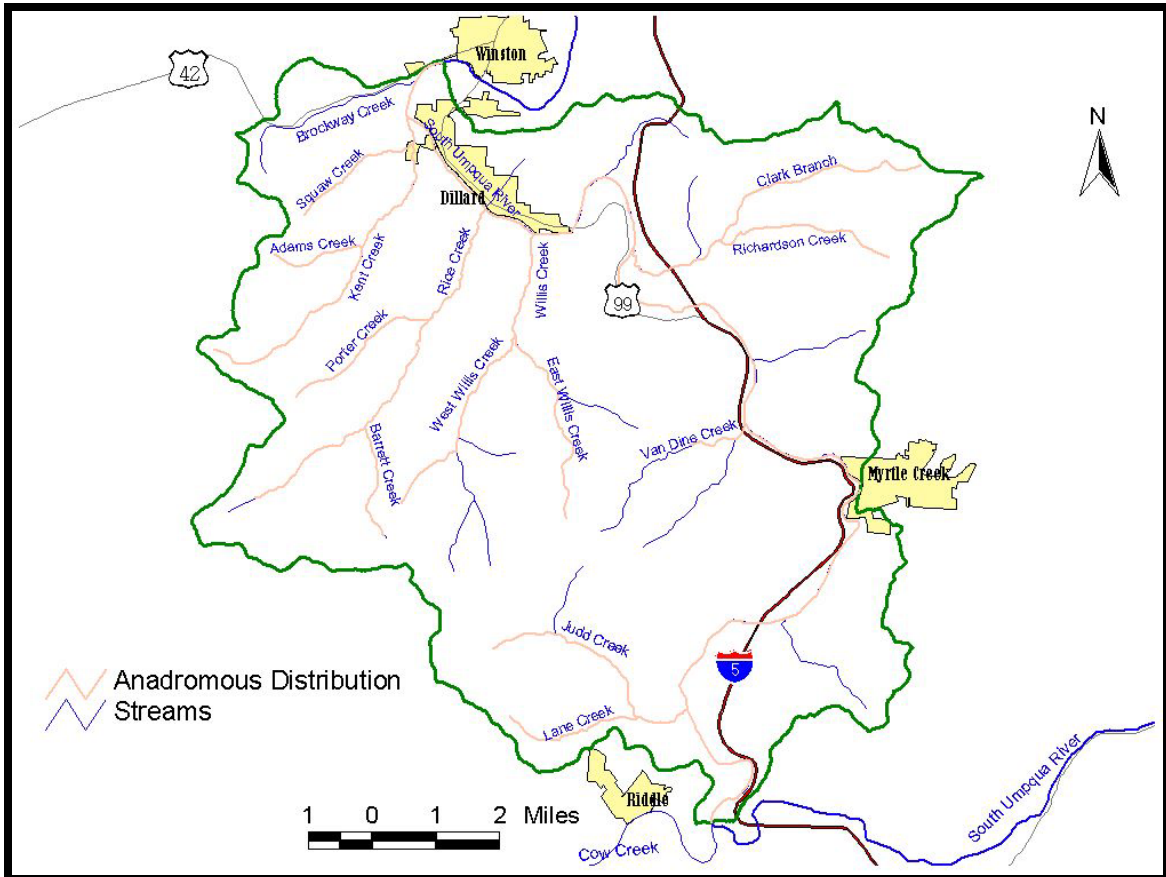
3.5.2. Fish distribution and abundance

Information on fish distribution and abundance within the Middle South Umpqua Watershed is limited to salmonids. Although non-salmonid fish species are important as well, there are insufficient accessible data on the location of these types of fish, and they could not be included in the assessment. More information about these species may be available in the future.

Anadromous salmonid distribution

The Oregon Department of Fish and Wildlife (ODFW) has developed anadromous salmonid distribution maps based on fish observations, assumed fish presence, and habitat conditions. Fish observations are the most accurate because ODFW personnel have seen live or dead fish in the stream. With assumed fish presence, streams or reaches are included in the distribution map because of their proximity to fish-bearing streams and adequate habitat. Also included on the map are streams that appear to have adequate habitat for a given salmonid, even if there have been no fish sightings and the stream is not near a fish-bearing stream. As of January, 2003, ODFW was in the process of revising the salmonid distribution maps to distinguish observed fish-bearing streams from the others. It is possible that some streams have been included in the distribution maps that do not have salmonid presence.

According to ODFW, coho and winter steelhead use over 66 stream miles within the Middle South Umpqua Watershed. Map 3-13 shows the distribution of these anadromous salmonids within the watershed and Table 3-16 lists the miles of stream used by each species. Total stream miles with anadromous salmonids does not equal the sum of miles used by each species because many species overlap (see Appendix 11). Coho and winter steelhead use many of the same stream reaches but at different times of the year.



Map 3-13: Anadromous salmonid distribution within the Middle South Umpqua Watershed.

	Total	Spring chinook	Fall chinook	Coho	Winter steelhead
Miles	66.7	22.0	23.8	64.1	63.0

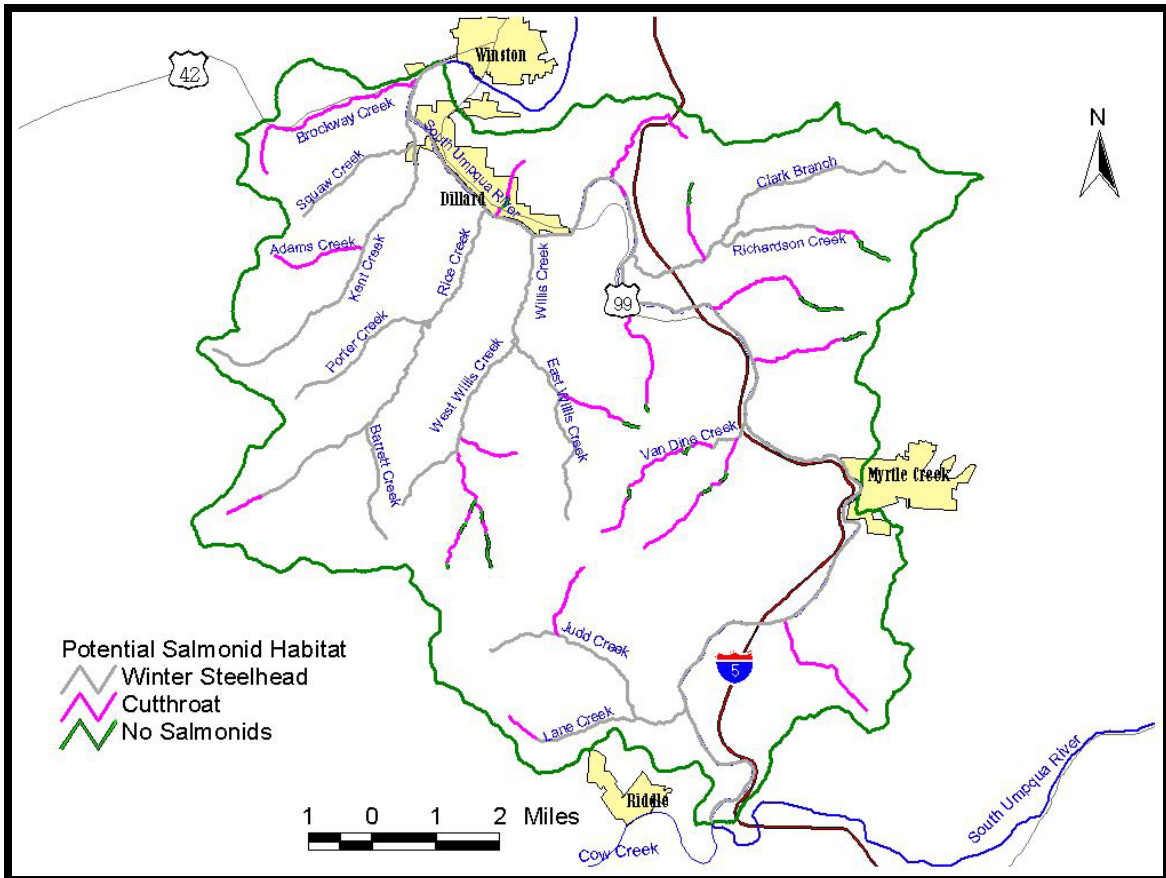
Table 3-16: Miles of stream supporting anadromous salmonids in the Middle South Umpqua Watershed.

Resident salmon distribution

There are no comprehensive data about resident salmonid distribution in the Umpqua Basin. ODFW is compiling regional data and will develop maps indicating fish presence

by stream. However, the project will not be completed until after this assessment is complete.

The only resident salmonid in the Middle South Umpqua Watershed is the cutthroat trout. Although there is much overlap, anadromous salmonids generally prefer streams with a 0-4% gradient, whereas resident cutthroat trout prefer streams with a 4-15% gradient. Also, cutthroat are generally found beyond the range of winter steelhead.⁷⁹ Map 3-14 shows streams with gradients that are less than 15% and are beyond winter steelhead distribution. Streams such as Adams Creek may provide suitable habitat for cutthroat trout. However, there are many factors other than stream gradient that determine fish habitat suitability.



Map 3-14: Potential resident and anadromous salmonid habitat in the Middle South Umpqua Watershed.

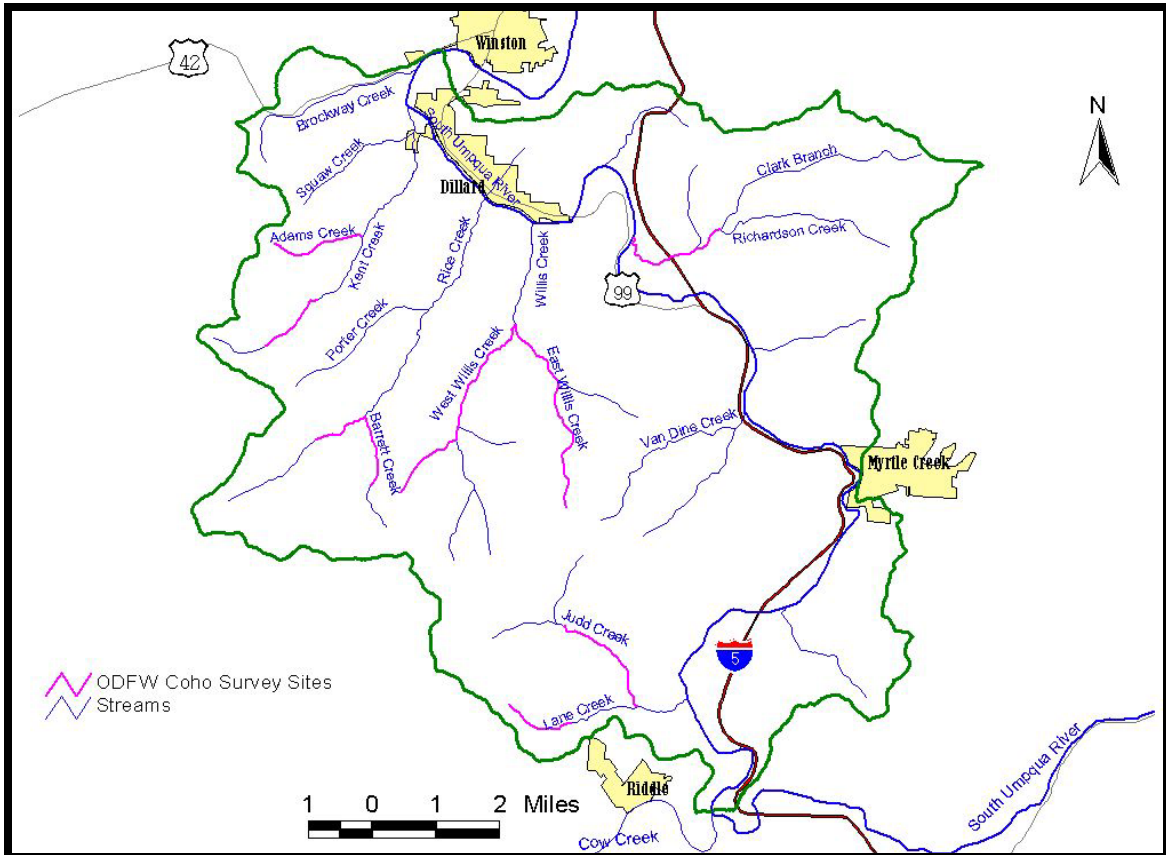
Salmonid abundance

Fish abundance is difficult to assess in the Middle South Umpqua Watershed. Available data focuses on coho spawning and juvenile salmonid migration abundance. It was not possible to locate abundance data for resident salmonids.

⁷⁹ From Dave Harris, fish biologist, Oregon Department of Fish and Wildlife, Roseburg District Office.

Coho spawning surveys

ODFW conducts coho spawning surveys throughout the Umpqua Basin. Volunteers and ODFW personnel survey pre-determined stream reaches and count the number of live and dead coho. The same person or team usually does surveys every 10 days for two or three months. There are coho spawning data for the Middle South Umpqua Watershed from 1990 through 2000. Map 3-15 shows the surveyed stream reaches. Figure 3-7 shows the maximum number of live and dead coho seen per mile on a given day. The estimated total number of coho per mile is included as a red bar next to peak per mile count.



Map 3-15: Middle South Umpqua Watershed coho spawning survey locations.

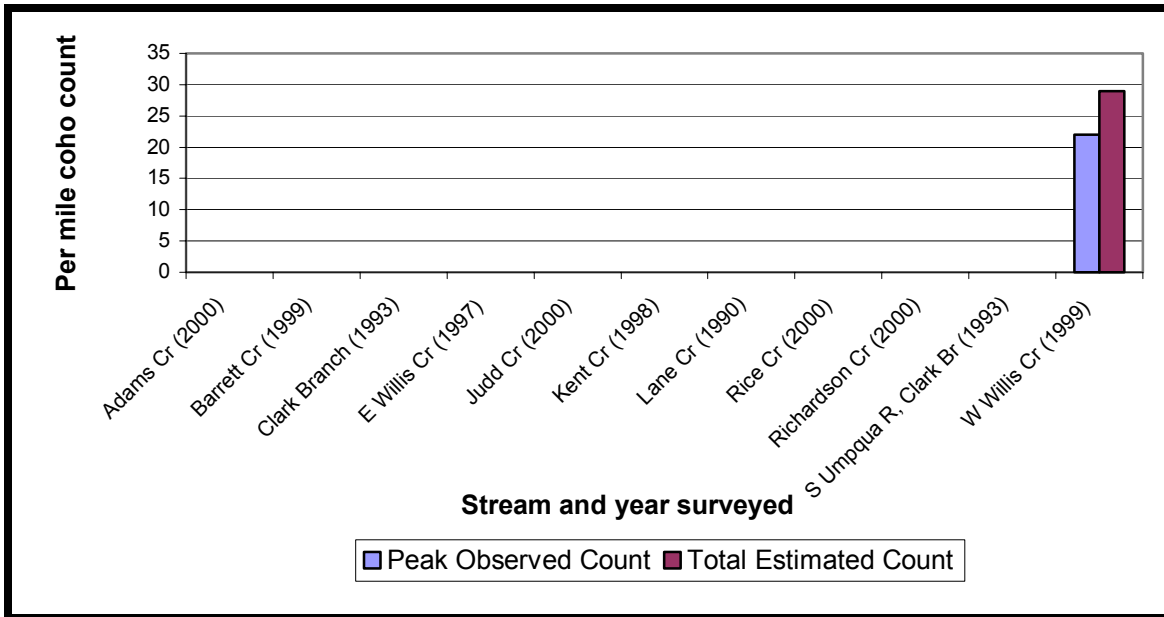


Figure 3-7: Middle South Umpqua Watershed coho spawning surveys from 1998 through 2000.

West Willis Creek is the only stream in which surveyors observed coho, even though all eleven streams are within the coho’s distribution. Spawning returns fluctuate annually, so it is very likely that some coho were present in these streams in years other than the survey year. More data are needed to draw conclusions about coho spawning in the watershed.

Aerial fall chinook counts

Oregon Department of Fish and Wildlife (ODFW) conducts annual aerial counts of fall chinook fish redds in the South Umpqua River and in Cow Creek. The South Umpqua River is surveyed from the mouth to Milo. Flights are normally made twice a year, both before and after the height of the run. Counts are based on the average count for both flights.

Fall chinook adult fish have been surveyed since 1983. From 1983 through 1997, ODFW fish surveyors divided the South Umpqua River into reaches based on permanent features that are visible from a helicopter, such as an I-5 bridge. These divisions do not exactly follow watershed boundaries, but are close enough that these counts can be used to estimate chinook spawning in the Middle South Umpqua Watershed.

Figure 3-8 shows annual fall chinook fish counts for the Middle South Umpqua Watershed and for the total South Umpqua River from 1983 through 1997. There were no fish surveys conducted in 1985. Within the watershed, the highest fish count was 1,359 in 1995, and the lowest count was 177 fish in 1986. On average, two-thirds of the fall chinook counted in the South Umpqua River from the mouth to Milo are in the Middle South Umpqua Watershed.

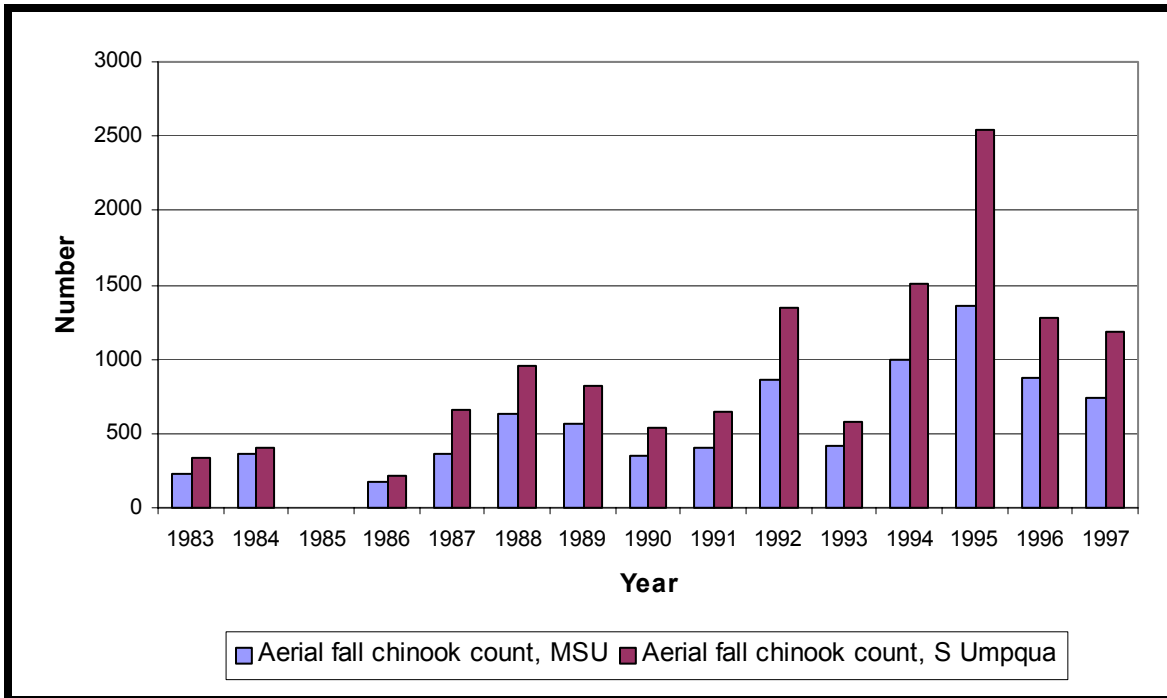


Figure 3-8: Aerial fall chinook counts for the Middle South Umpqua Watershed and for the entire South Umpqua River.

Fall chinook redds have been surveyed since 1978. Red counts are recorded for the entire river, and data are not specific to the Middle South Umpqua Watershed. In 1998 and 1999, the ODFW Pacific Salmon Commission (PSC) undertook a study on the South Umpqua River to calibrate fall chinook aerial redd counts to actual population levels.⁸⁰ The study concluded that there are 3.86 adult fish for each counted redd. Figure 3-9 shows actual fall chinook fish and redd counts in the South Umpqua River, and the PSC fall chinook run size estimate. In 1995, there may have been nearly 10,000 fall chinook present in the South Umpqua River.

⁸⁰ Oregon Department of Fish and Wildlife, 2000.

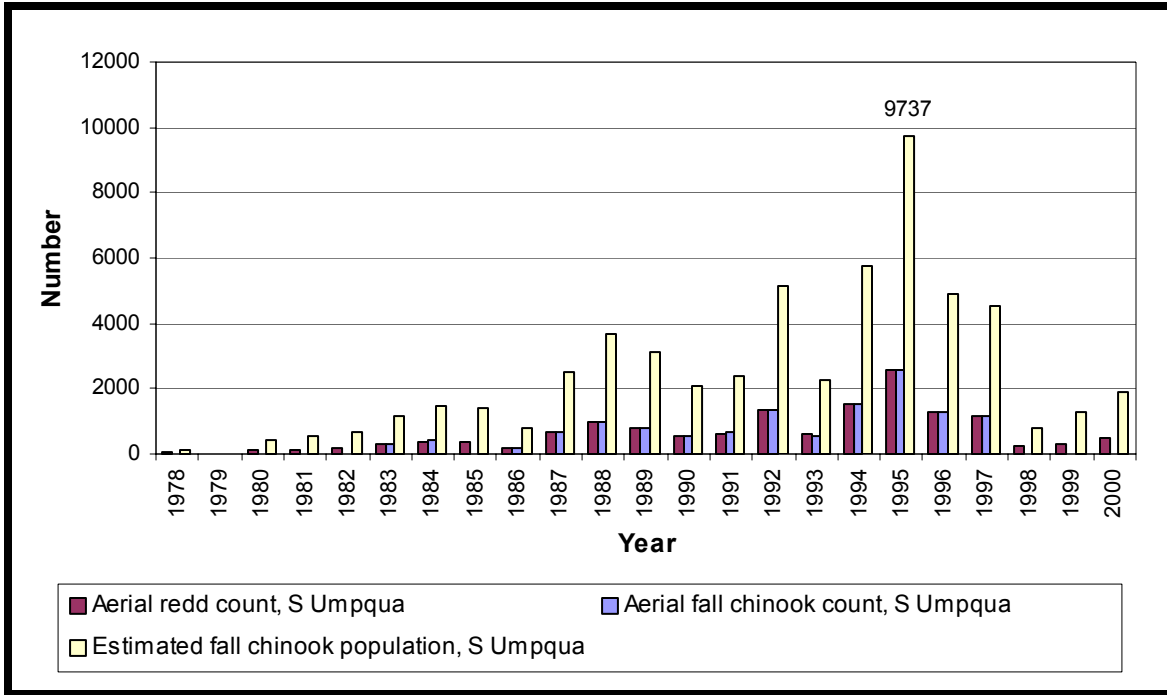


Figure 3-9: Aerial fall chinook count, redd count, and estimated total adult fish population for the South Umpqua River.

3.5.3. Fishing

The South Umpqua River is closed to all fishing during the fall chinook spawning season, which is from September 15 through November 15.⁸¹ Table 3-17 shows creel data from 1998 through 2000 for the Middle South Umpqua Watershed during the open season. Fishing success appears to be low compared to number of anglers and angling hours. Steelhead are the most commonly caught fish.

Middle S. Umpqua	Number of anglers	Number of angler hours	Spring chinook	Coho	Winter steelhead
1998	35	116	0	0	3
1999	275	955	0	1	89
2000	335	1,674	0	0	125
TOTAL	645	2,745	0	1	217

Table 3-17: Angler numbers, hours, and catches for the Middle South Umpqua Watershed.

3.5.4. Salmonid population trends

According to Dave Harris of the Oregon Department of Fish and Wildlife, adult salmonid returns to the South Umpqua River system have increased from 1998 to 2002. This trend may be attributed to greater numbers of wild and hatchery fish surviving to adulthood

⁸¹ The South Umpqua River is open to winter steelhead fishing from November 16 through March 31. Cutthroat trout season is from the fourth Saturday of May through September 15th.

because of normal winter storm events (i.e. no major floods or landslides) and ocean conditions that favor survival and growth. When both of these limiting factors are favorable over several years or fish generations, the result is an increase in adult run sizes. This trend is expected to continue until there is a change in ocean conditions or winter freshwater events.

Activities that improve freshwater conditions for salmonids will also help increase fish runs. These activities include removing barriers to fish passage, increasing instream flows, and improving critical habitat in streams and estuaries. It is also important to continue gathering data about salmonids and educating the public.

3.5.5. Fish populations key findings and action recommendations

Fish populations key findings

- The anadromous fish species in the Middle South Umpqua Watershed are coho, spring chinook, fall chinook, winter steelhead, sea-run cutthroat trout, and Pacific lamprey. Although many Middle South Umpqua Watershed medium and large tributaries are within the distribution of one or more salmonid species, salmonid ranges have not been verified for each tributary.
- Non-native fish, including smallmouth bass, have established populations in the watershed. Other non-natives, such as bluegill, have been accidentally or intentionally introduced to the watershed, but have not established reproducing populations.
- More quantitative data are needed to evaluate salmonid abundance and the distribution and abundance of non-salmonid fish in the watershed.
- Umpqua Basin-wide data indicate that salmonid returns have improved. Although ocean conditions are a strong determinant of salmonid run size, improving freshwater conditions will also increase salmonid fish populations.

Fish populations action recommendations

- Work with local specialists and landowners to verify the current and historical distribution of salmonids in tributaries.
- Support salmonid and non-salmonid distribution and abundance research activities in the watershed, especially at the local level.
- Encourage landowner and resident participation in fish monitoring activities.
- Conduct landowner education programs about the potential problems associated with introducing non-native fish species into Umpqua Basin rivers and streams.
- Encourage landowner participation in activities that improve freshwater salmonid habitat conditions.

4. Current Trends and Potential Future Conditions

This chapter evaluates the current trends and the potential future conditions that could affect important stakeholder groups in the watershed.

Key Questions

- What are the important issues currently facing the various stakeholder groups?
- How can these issues affect the future of each group?

4.1. Overview

There are many commonalities among the identified stakeholder groups. All landowners are concerned that increasing regulations will affect profits, and all have to invest more time and energy in the battle against noxious weeds. The non-industrial private landowners are concerned about the global market's effect on the sale of local commodities. These groups are also struggling with issues surrounding property inheritance. Some groups are changing strategies in similar ways; community outreach is becoming increasingly important for both the Oregon Department of Environmental Quality (ODEQ) and industrial timber companies. Overall, the future of fish habitat and water quality conditions in the Umpqua Basin is bright. According to ODEQ, basin-wide conditions are improving and have the potential to get better.

4.2. Stakeholder perspectives⁸²

4.2.1. The City of Winston⁸³

The City of Winston's estimated population growth rate is 2.5% per year. According to the 2000 US Census, Winston's population was 4,613 people. Assuming a 2.5% growth rate, Winston's 2003 population is 4,968 people.

Population growth

Over the past 10 years, the City of Winston's population has increased by 25%. Job opportunities within the city have not increased at the same rate. City officials believe that Winston's growth is due to inexpensive housing costs and an abundance of flat, developable land compared to Roseburg and other nearby cities. This has made Winston an affordable place for people to purchase, rent, or build homes. Enrollment in Winston public schools has not followed the same growth trend as the city. This supports local observation that many of the newcomers to Winston are retirees.

Even with the influx of retirees, it is believed that approximately 50% of Winston's residents are low or moderate income, which means that half of the city's population

⁸² It was not possible to develop a comprehensive viewpoint of the current trends and potential future conditions for the conservationist and environmentalist community in the Umpqua Basin. Therefore, this perspective is not included in section 4.2.

⁸³ This information is primarily from an interview with Bruce Kelly, City Administrator for the City of Winston.

earns less than 80% of the area's median income. As such, there is a strong need for affordable housing, such as manufactured homes, apartments, duplexes, and townhouses. Some groups are building affordable housing complexes in Winston, but many developers are focusing on upscale homes to attract higher-income retirees. Although bringing higher-income people to the city is desirable, the reality is that Winston needs more affordable housing. The city is working to increase the number of developments that cater to its low and moderate-income population.

Local observation suggests that many of Winston's young adults do not stay in the city. Officials believe that Winston's manufacturing, retail, and service-oriented job market is not attractive to young adults, so they leave to find better opportunities elsewhere. Many people believe that Winston's older population is growing, while the number of young adults is decreasing.

Economic development

Although Winston is economically depressed, officials do not believe it is in the city's best interest to increase industrial development within its urban growth boundary. Winston officials support the efforts of groups like the Umpqua Economic Development Partnership, and believe the city's residents will benefit from industrial development in Roseburg and along I-5. Winston also highly prizes its small-town atmosphere, close-knit neighborhoods, and slower pace. Officials believe that increasing heavy or light industry within the urban growth or corporate city boundaries would reduce the quality of life the city's residents enjoy.

Winston officials would like to increase retail and tourism-related businesses within the city. Winston has an abundance of second-hand shops, but has few stores that deal in new clothing, kitchenware, and other household goods. Despite less costly rents compared to Roseburg, it is difficult for Winston-area stores to compete with stores in its larger neighbor, since most residents are accustomed to shopping in Roseburg. City officials believe that specialty retail stores could be very successful in Winston. For example, the city currently has a shop that specializes in decorative rubber stamps and stamping-related products. Stamping is a popular hobby, and this business attracts many customers beyond the city limits. Winston officials believe that other specialty stores could find equal success in their city.

Winston is probably best known as the location of Wildlife Safari, which attract upwards of 150,000 visitors per year. The access road to Wildlife Safari is on the eastern edge of town; few tourists to the game park travel the extra distance to visit Winston, possibly because there are no attractions within the city. Winston is also on a main route to the coast, but the lack of tourist-oriented businesses results in few of these travelers spending money in the city. Winston officials believe the city could capitalize on the large number of people that visit the area every year by providing more tourist-oriented attractions. The city is opportunistically pursuing a variety of options, including supporting the establishment of an old-fashioned metal and glass foundry.

City services

Compared to other Douglas County cities and towns, Winston is very young. The city was incorporated in 1953, but the Winston-Dillard Water District predates the city. The community's water source is from water rights from the South Umpqua River. In the summer, water availability is a problem for the community, but the district purchases additional water from Ben Irving Reservoir and has the ability to purchase water from Galesville Reservoir. The Water District plans to acquire additional water from the reservoirs over the next several years. Within the next five years, the Water District plans to upgrade the water treatment facility.

In 2000, the Winston-Green wastewater treatment plant completed over six million dollars worth of upgrades in anticipation of stricter water quality standards. However, the upgrades did not increase the plant's wastewater treatment capacity. Should the City of Winston continue to grow at its current rate, in 10 years the wastewater treatment plant will need to be expanded.

Winston officials are hoping to increase the number of parks within the city limits to create more green space. Along the South Umpqua River south of Highway 42, the city would like to establish a park that could also serve as a floodway. If possible, the city will build a bike path along parts of the river as well as benches and picnic tables. Officials believe that creating more green space through this and other parks will provide more recreational opportunities and therefore improve the overall quality of life in the city.

The future of Winston

Twenty years from now, the City of Winston expects its population to reach 10,000 residents. At that time, the city hopes that it will have successfully increased its green space and have a community center. Officials also hope to improve transportation choices by expanding the sidewalk system and building a network of bike paths. Officials would like to eventually establish and maintain a citywide public transportation system, which would reduce older and low-income residents' need to drive.

When asked what factors would most likely have the greatest impact on the city, officials identified economics and population changes. Like many other economically depressed cities, Winston relies heavily on state-shared revenues, such as those that come from liquor and cigarette taxes. These funds are distributed based on population. Should these funds decrease or become unavailable to Winston, the city would face financial hardships and would be unable to continue to provide some services to its residents.

The city would also struggle if it had a sudden change in population. For example, if Roseburg Forest Product's mill in Dillard closed, many city residents would move elsewhere, since the mill is a primary employer in the area. This type of sudden population drop could turn Winston into a ghost town. A sudden boom in population would also be hard to manage. The city's urban growth boundary and development activities are sufficient to manage its current growth rate for the next 20 years. However,

in the event of a sudden, high demand for housing in the area, the city would have difficulties providing the necessary services.

4.2.2. The City of Myrtle Creek⁸⁴

The City of Myrtle Creek is the only incorporated city within the Myrtle Creek Watershed. According to the US Census Bureau, the city's total population in 2000 was 3,419. The city's growth rate is estimated at 1.2%; therefore, the City of Myrtle Creek's population in 2003 is estimated to be 3,544 people.

Disaster mitigation plans

As of May 2002, City of Myrtle Creek officials were busily working on their disaster mitigation plan as required by the Federal Emergency Management Agency (FEMA). Due to its proximity to I-5, the primary transportation route in western Oregon, the City of Myrtle Creek is required to develop a plan that will ensure I-5 is accessible in the event of a major disaster. For the purpose of the document, Leslie Wilson, Myrtle Creek's City Planner, must develop a "worst case scenario" action plan, which would be a Richter nine earthquake during a flood event. An earthquake of this magnitude would most likely cause the bridge at exit 108 of I-5 to collapse into the South Umpqua River, Galesville Dam to break, and result in massive flooding the City of Myrtle Creek. FEMA requires the City of Myrtle Creek to develop a strategy that will create access to I-5 in the event of this and other disasters. Without a disaster mitigation plan, Myrtle Creek would not qualify for federal relief funds.

As part of their disaster mitigation plan, the City of Myrtle Creek is exploring building a bridge at road mile 106 that would cross over the South Umpqua River into the Tri-City area. This may be a cooperative project between the City of Myrtle Creek and the Cow Creek Band of the Umpqua Tribe of Indians. This new bridge would be an additional detour around "the curve" at exit 106 and would provide greater access to the east bank of the South Umpqua River.

City development

The City of Myrtle Creek has additional plans for the area over the next five years. The topography of Myrtle Creek and proximity to the South Umpqua River limits its building space. It is unlikely Myrtle Creek could accommodate an industry requiring large buildings such as a factory, warehouse, or office complex. Therefore, city officials are working to make Myrtle Creek attractive as a "bedroom community" for workers in other areas, like Canyonville, Roseburg, Riddle, and Winston.

As part of this plan, Myrtle Creek officials are working with the Douglas Industrial Board to attract diverse, non-water consumptive, high-wage industries to the area around mile marker 103, such as high-tech and biomedical companies. Since easy and accessible transportation is key to attracting businesses, the City of Myrtle Creek will improve its airport in three or four years to accommodate private jets and perhaps eventually small commercial planes. As the mile marker 103 area develops and people move into the area,

⁸⁴ This information is primarily from an interview with Leslie Wilson, Myrtle Creek City Planner.

Myrtle Creek will have the customer base to attract more specialty stores and mom-and-pop establishments in the downtown area.

The city also plans to encourage higher-end housing developments and the gentrification of its older neighborhoods. Currently, the average home in Myrtle Creek is assessed at less than \$100,000, and very few homes cost more than \$150,000. Myrtle Creek officials hope to see more homes around \$200,000 built and sold in the next five or 10 years. Officials believe these homes will attract retirees from other areas, more affluent workers from the surrounding cities, and eventually from the mile marker 103 developments.

To accommodate Myrtle Creek's current population, the expected future growth, and to comply with Oregon Department of Environmental Quality standards, the city will begin a \$12 million upgrade of its wastewater treatment facility. The project completion date is in December of 2003, at which point the city plans to also improve and expand its freshwater treatment facility. Until the wastewater treatment facility is upgraded, Myrtle Creek is not allowed to add any new connections to its sewer system.

Myrtle Creek's future

When asked what Myrtle Creek will be in 20 years, Leslie Wilson predicted one of four outcomes. The best scenario is that higher-wage industries become established along the I-5 corridor, and the city serves as a bedroom community for these companies' employees. The next scenario is that a currently unknown industry establishes itself within Myrtle Creek and revitalizes the city's economy. If non-water consumptive, high-wage industries do not move to the I-5 corridor, than Myrtle Creek could maintain its current status quo, with high poverty and unemployment rates. Finally, Myrtle Creek could become a ghost town. Some city officials fear that government policies will become increasingly strict and require changes that are too expensive for small cities to implement. As a result, small cities such as Myrtle Creek will be unable to meet government requirements without heavy local taxes. As taxes increase, larger towns with lower taxes will become more desirable, and Myrtle Creek's population will dwindle.

4.2.3. Agricultural landowners⁸⁵

Farmers in the Umpqua Basin/Douglas County area produce a variety of agricultural goods, including corn, beans, alfalfa, peaches, strawberries, filberts, and grapes for wine. Livestock operations mostly raise beef cattle and sheep, with a small number of poultry operations.⁸⁶ Approximately 39% of the Middle South Umpqua Watershed is zoned for agriculture, and 84% of the watershed is privately owned (see section 1.3.1).⁸⁷ The agricultural community could potentially have the greatest influence on fish habitat and water quality restoration efforts in the Umpqua Basin. Barriers to farmer and rancher participation in fish habitat and water quality activities are limited time, limited money,

⁸⁵ The following information is primarily from interviews with Tom Hatfield, the Douglas County Farm Bureau representative for the Umpqua Basin Watershed Council, and Kathy Panner, a member of the Douglas County Livestock Association. Shelby Filley from the Douglas County Extension Service and Stan Thomas from the USDA Wildlife Services provided additional information.

⁸⁶ There are people who raise pigs, dairy cows, horses, llamas, and other animals, but few are commercial operators.

⁸⁷ Many farmers and ranchers are also forestland owners (see section 4.2.4).

and in many cases low awareness or understanding of restoration project requirements, benefits, and funding opportunities.

Agricultural producers

Local observation suggests that there are four types of agricultural producers in the Umpqua Basin/Douglas County area. The first group is people who have been very successful in purchasing or leasing large parcels of lands, sometimes thousands of acres, to run their operations. This group generates all their income from agricultural commodities by selling very large quantities of goods on the open market. The second group is medium to large-sized operators who are able to support themselves by selling their products on the direct market (or “niche” market). This group is able to make a profit on a smaller quantity of goods by “cutting out the middlemen.” The third group is smaller operators who generate some income from their agricultural products, but are unable to support themselves and so must have another income as well. The last group is “hobby” farmers and ranchers who produce agricultural goods primarily for their own enjoyment and have no plans in place to make agricultural production their primary income source. Agricultural hobbyists often produce their goods to sell or share with family and friends. In many cases, members of this group do not identify themselves as part of the agricultural community. Observation suggests that in Douglas County the few very large operators are continuing to expand their land base. At the same time, smaller operators who hold outside jobs and agricultural hobbyists are becoming more common.

Factors influencing farmers and ranchers

Weeds

One concern for farmers and ranchers is weeds. There are a greater variety and distribution of weeds now than there were 20 years ago, including gorse, Himalayan blackberry, a variety of thistles, and Scotch broom.⁸⁸ Many of these species will never be eradicated; some, like Himalayan blackberries, are too widespread, and others, like Scotch broom, have seeds that can remain viable for at least 30 years.

Weeds are a constant battle for farmers and ranchers. These plants often favor disturbed areas and will compete with crops and pastures for water and nutrients. Many weeds grow faster and taller than crops and compete for sunlight. On pasturelands, weeds are a problem because they compete with grass and reduce the number of livestock that the land can support. Some species are poisonous; tansy ragwort is toxic to cattle, horses, and most other livestock except sheep. Whereas foresters must battle weeds only until the trees are “free to grow,” farmers and ranchers must constantly battle weeds every year. As a result, an enormous amount of time, effort, and money is invested for weed management, which reduces profits and can drive smaller operators out of business.

Predators

Predators have always been a problem for ranchers. Cougar, coyote, and bear cause the most damage, but fox, bobcat, domestic dogs, and wolf/dog hybrids have also been

⁸⁸ Tansy ragwort is less common today than ten years ago due to the introduction of successful biological control methods.

documented killing and maiming livestock.⁸⁹ Prior to the 1960s, the US Department of Agriculture (USDA) handled all predator management in Douglas County. The county took over all predator control programs in the 1960s until 1999. Now, the USDA once again handles all predator management.

The populations of cougar and bear appear to be on the rise, which is due, in part, to changes in predator control regulations.⁹⁰ These species are territorial animals. As populations increase, animals that are unable to establish territories in preferred habitat will establish themselves in less suitable areas, which are often around agricultural lands and rural residential developments. Some wildlife professionals believe that cougars are less shy than they have been in the past, and are becoming increasingly active in rural and residential areas. As cougar and bear populations continue to rise, so will predation by these species on livestock. It is also possible that incidents involving humans and predators will increase as well.

Contrary to popular belief, predators do not only kill for food. Local ranchers have lost dozens of sheep and cattle overnight to a single cougar. In these cases, only a few of the carcasses had evidence of feeding, which indicates that the cougar was not killing livestock for food. Small animals like sheep are easy prey, so some ranchers are switching to cattle. However, local observation indicates that cougar, bears, and packs of coyote are quite capable of killing calves and adult cattle as well.

Loss of quality farmland

Due in part to the difficulties facing today's ranchers and farmers, many young people are favoring other careers over agriculture. As a result, many agricultural lands are sold out of the original families. In some cases, the land is purchased by other nearby farmers and ranchers, and remains in production.⁹¹ Local observation suggests that new residents from outside of southwest Oregon purchase some of these agricultural lands. In the case of smaller operations, new owners are often unable to turn a profit. Some residents suggest this may be because the newcomers do not understand local conditions or the specific needs of the property and are therefore unable to manage it profitably. In other cases, family farms and ranches are purchased by developers and divided into smaller lots for hobby farms, or converted into residential developments and taken out of production entirely. Statewide, there were 18.1 million acres of farmland in 1980; this number dropped to 17.2 million acres in 2000. This averages to be a loss of 45,000 acres of Oregon farmland per year.⁹²

⁸⁹ The last confirmed wild wolf sighting in Douglas County occurred in the late 1940s. Wolf/dog hybrids are brought to the Douglas County/Umpqua Basin area as pets or for breeding and escape or are intentionally released.

⁹⁰ Cougar populations have been increasing since protection laws were passed in the 1960s. Coyote, fox, bobcat, and other predator populations appear to be stable.

⁹¹ The topography of the Umpqua Basin makes this area undesirable to large agricultural conglomerates.

⁹² Data are from the 2000-2001 Oregon Agriculture and Fisheries Statistics publication compiled by the US Department of Agriculture. A farm is defined as a place that sells or would normally sell \$1,000 worth of agricultural products.

Regulations

Another concern for ranchers and farmers is the threat of increasing regulations. Since the 1970s, farmers and ranchers have had to change their land management practices to comply with stricter regulations and policies such as the Endangered Species Act, the Clean Water Act, and the Clean Air Act. The costs associated with farming and animal husbandry have increased substantially, which may be attributed to increased standards and restricted the use of pesticides, fertilizers, and other products. More regulations could further increase production costs and reduce profits.

Market trends

Perhaps the most important influence on agricultural industries is market trends. In the United States, there are around 10 food-marketing conglomerates that control most of the agricultural market through their immense influence on commodity prices. These conglomerates include the “mega” food chains like Wal-Mart and Costco. Also, trade has become globalized and US farmers and ranchers are competing with farmers in countries that have lower production costs because they pay lower wages, have fewer environmental regulations, and/or have more subsidies. The conglomerates are in fierce competition with one another and rely on being able to sell food at the lowest possible price. These food giants have no allegiance to US agriculture, and the strength of the dollar makes purchasing overseas products very economical. On the open market, US farmers and ranchers must sell their goods at the same price as their foreign competitors or risk being unable to sell their products at all. In many cases, this means US producers must sell their goods at prices below production costs. As a result, it is very difficult for all but the very largest producers to compete with foreign agricultural goods, unless they are able to circumvent the open market by selling their goods directly to local or regional buyers (“niche” marketing).

The future of local agriculture

The future of farmers and ranchers depends a lot on the different facets of these groups’ ability to work together. The agricultural community tends to be very independent, and farmers and ranchers have historically had limited success in combining forces to work towards a common goal. By working together, Oregon’s agricultural community may be able to overcome the issues described above. If not, it is likely that in the Umpqua Basin hobby farms and residential developments will replace profitable family farms and ranches.

4.2.4. Family forestland owners⁹³

The term “family forestland” is used to define forested properties owned by private individuals and/or families. Unlike the term “non-industrial private forestland,” the definition of “family forestlands” excludes non-family corporations, clubs, and other associations. It is difficult to determine how many acres of land in the Middle South

⁹³ The following information is from an interview with Bill Arsenault, President of the Douglas Small Woodland Owners Association and member of the Family Forestlands Advisory Committee, and from “Sustaining Oregon’s Family Forestlands” (Committee for Family Forestlands, 2002). For more information about this document, contact Wally Rutledge, Secretary of the Committee for Family Forestlands, Oregon Department of Forestry, 2600 State Street SE, Salem, OR 97310.

Umpqua Watershed are family forestlands. Of the 30,315 forested acres in the watershed, approximately 51% are non-industrial private forestlands. Family forestlands most likely constitute a slightly smaller percent of the private non-industrial forests.

Family forestlands differ from private industrial forests. Industrial timber companies favor expansive stands of even-aged Douglas-fir. Family forestlands are more often located in lower elevations, and collectively provide a mixture of young and medium-aged conifers, hardwood stands, and non-forested areas such as rangeland. Family forestland owners are more likely to manage their property for both commercial and non-commercial interests such as merchantable timber, special forest products, biological diversity, and aesthetics.

Family forestland owners play a significant role in fish habitat and water quality restoration. Whereas most public and industrial timber forests are in upper elevations, family forestlands are concentrated in the lowlands and near cities and towns. Streams in these areas generally have low gradients and provide critical spawning habitat for salmonids. As such, issues affecting family forestland property management may impact fish habitat and water quality restoration efforts.

Family forestland owners

Who are Douglas County's family forestland owners? In Oregon, most family forestland owners are older; nearly one in three are retired and another 25% will reach retirement age during this decade. Douglas County woodland owners seem to follow this general trend. Local observation suggests that many family forestland owners in Douglas County are either connected to the timber industry through their jobs or are recent arrivals to the area. The impression is that many of the latter group left high paying jobs in urban areas in favor of Douglas County's rural lifestyle. In general, few family forestland owners are under the age of 35. It is believed that most young forestland owners inherit their properties or have unusually large incomes, since the cost of forestland and its maintenance is beyond the means of people just beginning their careers.

Factors influencing family forestlands

Changing markets

There are very few small private mills still operating in Douglas County, so timber from family forests is sold to industrial timber mills. Timber companies are driven by the global market, which influences product demand, competition, and production locations. As markets change, so do the size and species of logs that mills will purchase. Family forestland owners must continually reevaluate their timber management plans to meet the mills' requirements if they want to sell their timber. For example, mills are now favoring smaller diameter logs, and so family forestland owners have little financial incentive to grow large diameter trees.

Another aspect of globalization is a growing interest in certified wood products as derived from sustainably managed forests. Family forestland owners follow the Oregon Forest Practices Act and many consider their management systems sustainable. The Committee for Family Forestlands is concerned that wood certification parameters do not

take into account small forest circumstances and management techniques. They fear that wood certification could exclude family forest-grown timber from the expanding certified wood products market. However, the long-term effect of wood certification is still unclear.

Ultimately the key to continued family forestland productivity is a healthy timber market. Although globalization and certification may change the way family forestland owners manage their timber, foreign log imports have kept local mills in operation, providing a place for family forestland owners to sell their timber. The long-term impact of globalization on forestland will depend on how it affects local markets.

Indirectly, changes in the livestock industry also influence family forestland owners. The livestock market is down and many landowners are converting their ranchlands to forests. Douglas County supports these efforts through programs that offer landowners low-interest loans for afforestation projects.⁹⁴ Should the market for livestock remain low, it is likely that more pastureland will be converted to timber.

Land management issues

Exotic weeds are a problem for family forestland owners. Species like Scotch broom, gorse, and blackberries can out-compete seedlings and must be controlled. Unlike grass and most native hardwoods, these exotic species require multiple herbicide applications before seedlings are free to grow, which raises the cost of site maintenance by about \$200 per acre. The cost is not enough to “break the bank” but can narrow family forestland owners’ profit margins. The cost of weed control may increase if these exotic species and others such as Portuguese broom become more established in the Umpqua Basin.

Regulations

Many family forestland owners fear that increasing regulations will diminish forest management profitability. For example, some Douglas County forestland owners are unable to profitably manage their properties due to riparian buffer protection laws. Although most family forestland owners support sound management practices, laws that take more land out of timber production would further reduce the landowners’ profits. This would likely discourage continued family forestland management.

Succession/inheritance

Succession is a concern of many family forestland owners. It appears that most forestland owners would like to keep their property in the family; however, an Oregon-wide survey indicates that only 12% of private forestland owners have owned their properties since the 1970s. Part of this failure to retain family forestlands within the family unit may result from complex inheritance laws. Inheritors may find themselves overwhelmed by confusing laws and burdensome taxes and choose to sell the property. Statewide, over 20,000 acres of timberland leave family forestland ownership every year. Private industrial timber companies are the primary buyers. Although the land remains

⁹⁴ Afforestation is planting trees in areas that have few or no trees. Reforestation is planting trees in areas that recently had trees, such as timber harvest sites or burned forests. Contact the Douglas County Extension Forester for more information on this program.

forested, private industrial timber companies use different management prescriptions than do most family forestland owners. Other family forestlands have been converted to urban and residential development to accommodate population growth.

4.2.5. Industrial timber companies⁹⁵

Most industrial timberlands are located in areas that favor Douglas-fir, which tend to be hillsides and higher elevations.⁹⁶ Higher gradient streams provide important habitat for cutthroat trout. Riparian buffer zones in stream headwater areas may influence stream temperatures in lower gradients.

In the Middle South Umpqua Watershed industrial timber companies own 6,623 acres, which is 22% of the total forested area in the watershed. These lands are intensively managed for timber production. For all holdings, timber companies develop general 10-year harvest and thinning schedules based on 45 to 60 year timber rotations, depending upon site indices.⁹⁷ The purpose of these tentative harvest plans is to look into the future to develop sustained yield harvest schedules. These harvest and thinning plans are very general and are modified depending on market conditions, fires, regulatory changes, and other factors, but are always developed to maintain sustained timber yield within the parameters outlined by the Oregon Forest Practices Act.

Current land management trends

Land acquisition

Most industrial timber companies in the Umpqua Basin have an active land acquisition program. When assessing land for purchase, industrial timber companies consider site index along with the land's proximity to a manufacturing plant, accessibility, and other factors. The sale of large private forestlands is not predictable, and it would be difficult for timber companies to try to consolidate their holdings to a specific geographic area. However, most land holdings and acquisitions by timber companies tend to be where conditions favor Douglas-fir production. While purchasing and selling land is commonplace, land exchanges are rare.

Weeds

Noxious weeds are a concern for industrial timber managers. As with family forestlands, species such as Scotch broom, hawthorn, and gorse increase site maintenance costs. Weeds can block roads, which add additional costs to road maintenance. Some weeds are fire hazards; dense growth creates dangerous flash and ladder fuels capable of spreading fire quickly. To help combat noxious weeds, some industrial timber companies are working with research cooperatives to find ways of controlling these species.

⁹⁵ The following information is primarily from an interview with Dick Beeby, Chief Forester for Roseburg Forest Product's Umpqua District, and Jake Gibbs, Forester for Lone Rock Timber and President of the Umpqua Chapter of the Society of American Foresters.

⁹⁶ Hillsides and higher elevations are often a checkerboard ownership of Bureau of Land Management administered lands (see section 4.2.6) and industrial timberlands.

⁹⁷ Site index is a term used to describe a specific location's productivity for growing trees. Specifically, it relates a tree's height relative to its age, which indicates the potential productivity for that site.

Fire management

Fires are always a concern for industrial timber companies. The areas at greatest risk are recently harvested and thinned units, because of the flammable undecayed slash (debris) left behind. Timber companies believe that the fire risk is minimized once slash begins to decay. Although many timber companies still use prescribed burning as a site management technique, it is becoming less common due to regulations and the associated cost versus risk factors.

Road maintenance

Although a good road system is critical to forest management, poorly maintained roads can be a source of stream sediment and undersized or damaged culverts can be fish passage barriers. Roads on industrial timberlands are inventoried and monitored routinely. Problems are prioritized and improvements scheduled either in conjunction with planned management activities or independently based on priority. Currently, most industrial timber companies repair roads so they do not negatively affect fish habitat and water quality, such as replacing failing culverts with ones that are fish-passage friendly. Road decommissioning is not common, but is occasionally done on old roads. When a road is decommissioned, it is first stabilized to prevent erosion problems, and then nature is allowed to take its course. Although these roads are not tilled or plowed to blend in with the surrounding landscape, over time vegetation is re-established. New roads are built utilizing the latest technology and science to meet forest management objectives while protecting streams and other resources.

Community outreach

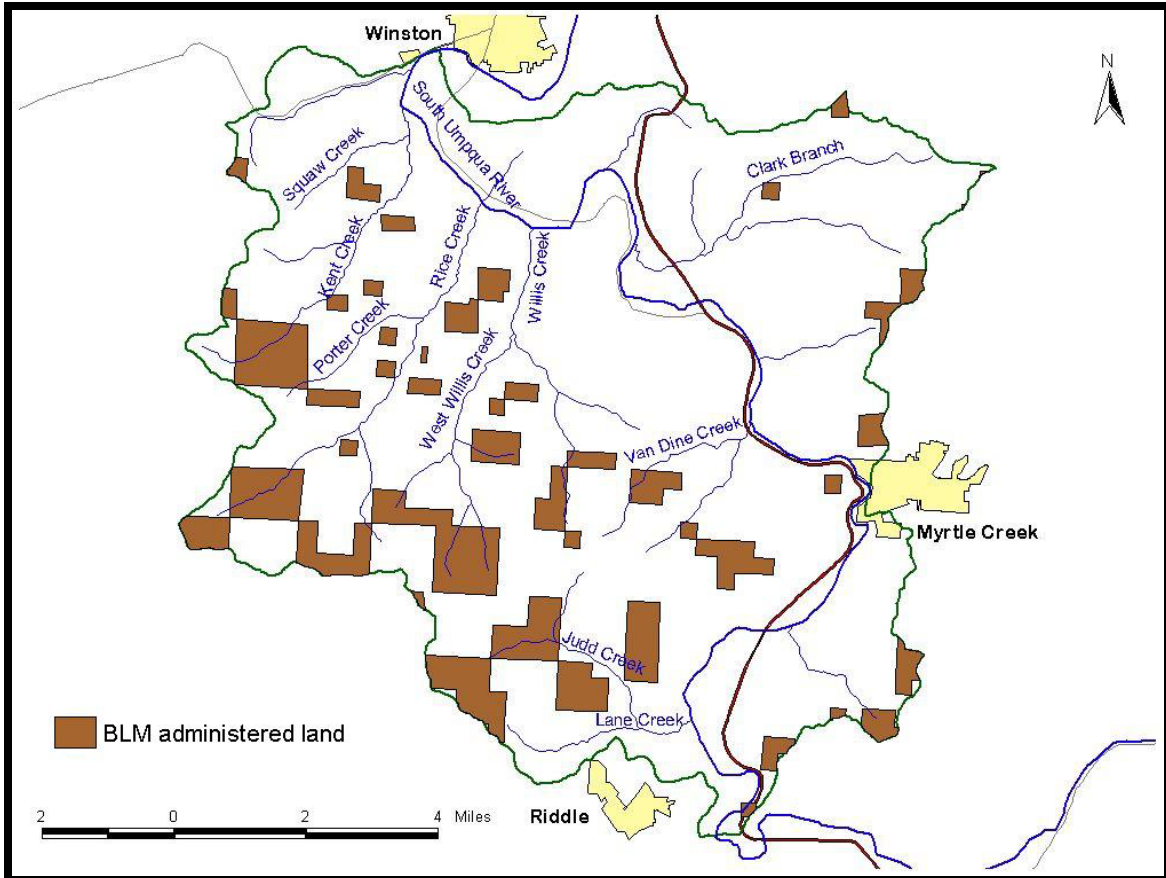
The population of Douglas County is growing. Local observation suggests that many new residents are retirees or transfer incomes from urban areas. Many of these new residents moved to the area for its “livability” and are not familiar with the land management methods employed by industrial timber companies. As a result, establishing and maintaining neighbor relations is becoming increasingly important. Many timber companies will go door-to-door to discuss upcoming land management operations with neighboring owners and address any questions or concerns that the owners may have. These efforts will continue as the rural population within the Umpqua Basin grows.

Regulations

Increased regulations will most likely have the greatest impact on the future of industrial timber companies. Like family forestland owners, most industrial timber companies believe in following sound forest management principles and consider their current management systems sustainable. There is concern that the efforts and litigation that changed forest management methods on public lands will now be focused on private lands. Should forestry become unprofitable due to stricter regulations, industrial timber companies would most likely move their business elsewhere and convert their forestlands to other uses.

4.2.6. The USDI Bureau of Land Management⁹⁸

The Roseburg District Office of the United States Department of the Interior Bureau of Land Management (BLM) administers a total of 425,588 acres of which most is within the Umpqua Basin and all is within Douglas County.⁹⁹ In the Middle South Umpqua Watershed, the BLM administers approximately 13% of the watershed (see Map 4-1).



Map 4-1: Location of BLM administered lands in the Middle South Umpqua Watershed.

The Bureau of Land Management and US Forest Service activities within the range of the Northern Spotted Owl follow the guidelines of the 1994 Northwest Forest Plan. In compliance with this policy, the Roseburg BLM's District Office developed a Record of Decision and Resource Management Plan in 1995.¹⁰⁰ The plan outlines the on-going resource management goals and objectives for lands administered by the BLM. All of

⁹⁸ The following information is from the Roseburg District of the USDI Bureau of Land Management's 1995 Record of Decision and Resource Management Plan and the District's Annual Program Summary and Monitoring Report for fiscal year 2000 to 2001.

⁹⁹ Including 1,717 acres of non-federal land with federal subsurface mineral estate administered by the BLM.

¹⁰⁰ For copies of this document, contact the Bureau of Land Management Roseburg District Office at 777 Northwest Garden Valley Road, Roseburg, Oregon 97470.

the BLM's activities are guided by the resource management plan, and this assessment summarizes the main points of the document.

General overview

The BLM Roseburg District Office's vision is that the "Bureau of Land Management will manage the natural resources under its jurisdiction in western Oregon to help enhance and maintain the ecological health of the environment and the social well-being of the human population." Ecosystem management is the strategy used by the Roseburg BLM to guide its vision:

Ecosystem management involves the use of ecological, economic, social, and managerial principals to ensure the sustained condition of the whole. Ecosystem management emphasizes the complete ecosystem instead of individual components and looks at sustainable systems and products that people want and need. It seeks a balance between maintenance and restoration of natural systems and sustainable yield of resources (p. 18).

The BLM manages all its land using two primary management concepts outlined in the Northwest Forest Plan. The first is "Ecological Principles for Management of Late Successional Forests." One goal for this management concept is "to maintain late-successional and old-growth species habitat and ecosystems on federal lands." The second goal is "to maintain biological diversity associated with native species and ecosystems in accordance with laws and regulations."

The second management concept is the "Aquatic Conservation Strategy." This strategy was developed "to restore and maintain the ecological health of watersheds and aquatic ecosystems contained within them on public lands." A primary intent is to protect salmonid habitat on federal lands administered by the Bureau of Land Management and US Forest Service through activities such as watershed restoration and protecting riparian areas.

Land use allocations and resource programs

As part of its strategy, the BLM has four land use allocations that are managed according to specific objectives and management actions/directions that contribute to the two primary management concepts. The first land use allocation is Riparian Reserves. These areas are managed to provide habitat for various wildlife species. The second is Late-Successional Reserves (LSR). These are managed to protect and enhance conditions of late-successional and old-growth forest ecosystems that provide habitat for many species such as the northern spotted owl. Third, Matrix Areas have multiple objectives, which include providing a sustainable supply of timber and other forest commodities, connecting late successional reserves, and providing habitat for organisms associated with young, mature, and older forests. The last land use allocation is Adaptive Management Areas, where the agency develops and tests new management approaches to integrate ecological health with other social parameters, such as economic stability. In the Roseburg BLM District, the Adaptive Management Area is located in the Little River Watershed. The BLM also manages for 20 specific resource programs such as

wilderness, timber resources, rural interface areas, and noxious weeds. As with the land use allocations, there are specific objectives and management actions/directions for each of the resource programs that are congruent with the Northwest Forest Plan management concepts.¹⁰¹

Current trends

A requirement of the Roseburg District BLM's Resource Management plan is to publish a report on its annual activities. This document is called the Annual Program Summary and Monitoring Report.¹⁰² It describes the BLM's accomplishments during the fiscal year, provides information about its budget, timber receipt collections, and payments to Douglas County.

Overall, the Roseburg BLM District is implementing the Northwest Forest Plan. The BLM met its goals for its land use allocations and for many of its resource programs, such as "water and soils" and "fish habitat." However, uncertainty surrounding the Survey and Manage standard, as well as on-going litigation, has affected the BLM's ability to implement some of its program elements.¹⁰³ For the third year in a row, the BLM's forest management and timber resource program did not come close to achieving its goal of sustainably harvesting 45 million board feet (MMBF) of timber. During fiscal years 1996 through 1998, the BLM came close to or exceeded its 45 MMBF goal. In 1999, harvests fell to 10 MMBF (22% of goal), and then dropped to 1.4 MMBF in 2000 (3% of goal). In 2001, harvest levels climbed slightly to 2.7 MMBF (6% of goal). Under the Resource Management Plan, more acres of BLM-administered forested lands are approaching late-successional stage than are being managed for timber.

Future of BLM management

The BLM's Resource Management Plan is the guide to all of the BLM's activities and is not subject to casual changes. There are three situations that may result in significant alterations to the current plan. First, major policy changes, such as modifying the Northwest Forest Plan, would require the BLM's Resource Management Plan to be updated so it corresponds with new policies. Second, landscape-wide ecological changes, such as a 60,000-acre fire or a landscape-wide tree disease outbreak, could require changes to the BLM's current plan. Finally, the Resource Management Plan is slated for evaluation in 2005. At that time, the current plan would be evaluated to ascertain if newer information or changed circumstances warranted an amendment or revision of the Resource Management Plan. In all cases, the public has the opportunity to review and comment on an amendment or revision of the plan.

¹⁰¹ For specific information about land use allocations and management, see the BLM Roseburg District's Resource Management Plan.

¹⁰² Copies of the Roseburg District BLM's Annual Program Summary and Monitoring Report from fiscal year 2001 are available through the Roseburg District Office.

¹⁰³ The Northwest Forest Plan's Survey and Manage standard requires that all agencies conduct surveys prior to any activities on public lands to identify resident species of which little is known (such as mosses, mollusks, and fungi) and develop appropriate management strategies. Depending on the specific species requirements, surveys for a project can take two years or more to complete.

4.2.7. Oregon Department of Environmental Quality¹⁰⁴

The Oregon Department of Environmental Quality (ODEQ) plays an important and unique role in fish habitat and water quality restoration. ODEQ's primary responsibility is to support stream beneficial uses identified by the Oregon Water Resources Department through the following activities:

- Establishing research-based water quality standards;
- Monitoring to determine if beneficial uses are being impaired within a specific stream or stream segment; and
- Identifying factors that may be contributing to conditions that have led to water quality impairment.

Approximately every three years, ODEQ reassesses its water quality standards and streams that are 303(d) listed as impaired. Throughout the development and reassessment of water quality standards, ODEQ attempts to keep the public involved and informed about water quality standards and listings. All sectors of the public, including land managers, academics, and citizens-at-large, are encouraged to offer input into the process. Water quality standards and 303(d) listings may be revised if comments and research support the change.

Current and future efforts

To fulfill its responsibilities into the future, ODEQ will continue to prioritize areas that are important for the various beneficial uses through their own research and the research of other groups. When these areas have been identified and prioritized, ODEQ will examine current land use practices to determine what changes, if any, will benefit preserving and/or restoring resources. Also, ODEQ will continue its efforts to work with individuals, agencies, citizen groups, and businesses to encourage them to voluntarily improve fish habitat and water quality conditions.

ODEQ hopes that through education and outreach, they can help residents understand that improving conditions for fish and wildlife also improves conditions for people. For example, well-established riparian buffers increase stream complexity by adding more wood to the stream channel. Increased stream complexity provides better habitat for fish. It also helps downstream water quality by trapping nutrients and preventing stream warming, which can lead to excessive algae growth and interfere with water contact recreation.

Potential hindrances to water quality restoration

One hindrance to ODEQ's work is the financial reality of many water quality improvement activities. In some cases, the costs associated with meeting current standards are more than communities, businesses, or individual can easily absorb. For example, excessive nutrients from wastewater treatment plants can increase nitrate and phosphate levels and result in water quality impairments. The cost for upgrading a wastewater treatment plant can run into tens of millions of dollars, and is usually passed

¹⁰⁴ The following information is primarily from an interview with Paul Heberling, a water quality specialist for the Oregon Department of Environmental Quality in Roseburg.

onto the community through city taxes and higher utility rates. Upgrading septic systems to meet current standards can cost a single family in excess of \$10,000, which is more than many low and middle-income rural residents can afford. People’s interest in improving water quality often depends on the degree of financial hardship incurred for the gains.

Another potential hindrance to ODEQ’s work is budget cuts and staff reductions. There are two Healthy Stream Partnership positions assigned to the Umpqua Basin, which is approximately three million acres. Without sufficient funding or personnel, it is difficult for ODEQ to conduct its basin-wide monitoring activities and reassess current water quality standards and impaired streams.

Current and potential future water quality trends

Although many Umpqua Basin streams and reaches are water quality impaired, current trends indicate that conditions are improving. In 1998, there were 1,067 streams or stream segments identified as failing to meet one or more of Oregon’s water quality standards. Of these, approximately 10% were in the Umpqua Basin.¹⁰⁵ The breakdown of Umpqua Basin streams not meeting water quality standards is as follows:

Parameter	# of listed streams or reaches	Parameter	# of listed streams or reaches
Ammonia	1	Iron	4
Aquatic weeds/algae	3	Lead	3
Arsenic	4	Manganese	2
Biological criteria	7	Mercury	4
Cadmium	1	pH	14
Chlorine	2	Phosphorus	1
Copper	2	Sediment	7
Dissolved oxygen	7	Temperature	180
<i>E. coli</i> and fecal coliform	14	Total dissolved gas	4

Table 4-1: Number of Umpqua Basin 303(d) listed streams by parameter.

Accordingly, the focus for preservation and restoration efforts is directed toward improving stream temperature and bacterial levels to support the various beneficial uses. Improving stream temperature may provide the greatest cost-benefit ration because temperature is a major factor in impacting or exacerbating other water quality parameters, including dissolved oxygen, pH, bacteria, and ammonia. Land management activities that reduce the rate of stream warming, such as establishing functional riparian buffers, can also improve other water quality parameters, such as sedimentation. Reducing bacteria levels is also a focus because of the serious human health risks associated with fecal bacteria. There is a clear rationale for activities that reduce bacteria levels, such as

¹⁰⁵ See section 3.3.1 for 303(d) listed streams in the Middle South Umpqua Watershed.

fixing failing septic systems and reducing the amounts of fecal wastes reaching streams from livestock, pets, and other sources.

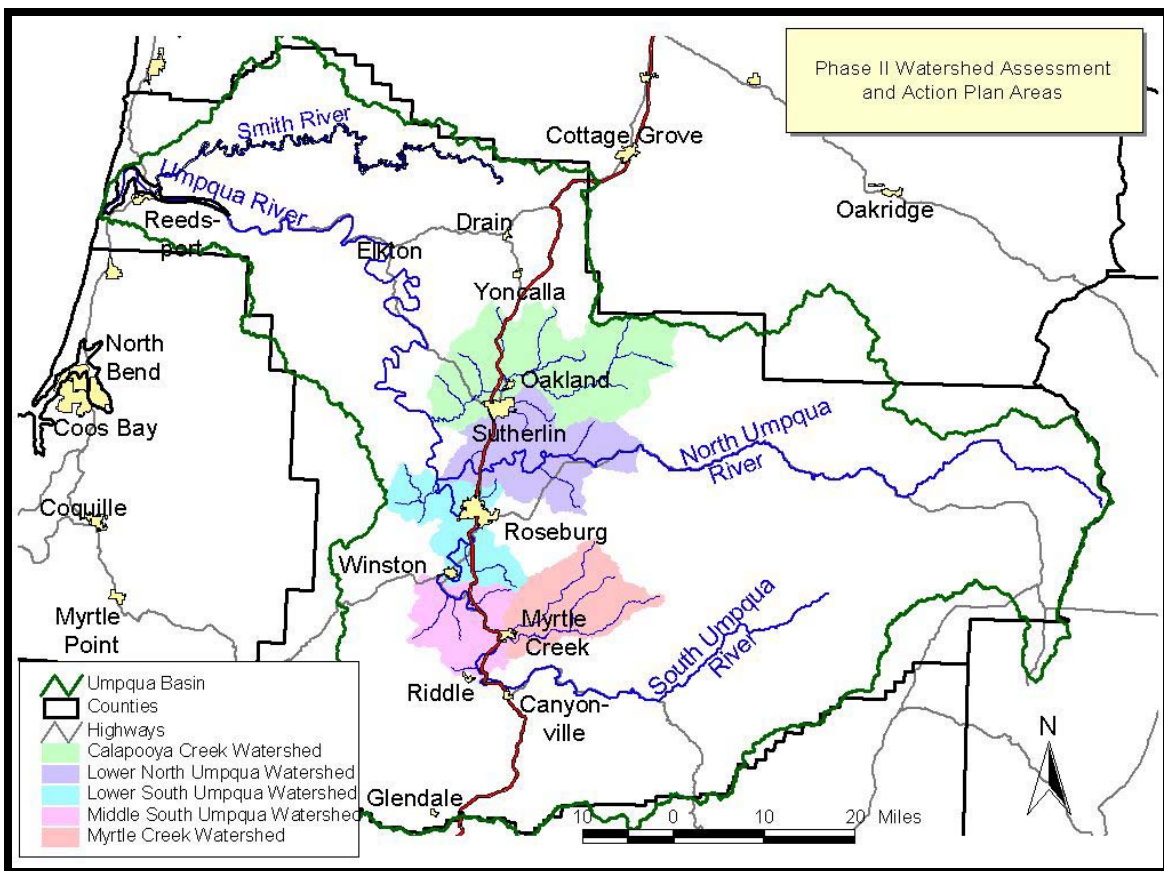
Data from ODEQ long term monitoring sites in the Umpqua Basin indicate that between 1989 and 1998, water quality conditions of many Umpqua Basin rivers and streams improved. The South Umpqua River at Melrose Road, Stewart Park Road, Winston, and Days Creek Cutoff Road, as well as Cow Creek at the mouth, Calapooya Creek at Umpqua, and the North Umpqua at Garden Valley Road, are listed as sites that have shown significant improvement. Water quality conditions for Elk Creek at Elkton and the Umpqua River at Elkton have also improved. From these data, ODEQ believes that continuing to support beneficial uses through water quality improvement activities will insure a bright future for fish habitat and water quality in the Umpqua Basin.

5. Landowner perspectives

This chapter provides insight into the thoughts, opinions, and perspectives of landowners in the Umpqua Basin.

5.1. Overview

The Middle South Umpqua Watershed assessment was part of phase II of the UBWC’s watershed assessment and action plan program. The document was written during the same general time period as assessments for four other watersheds along I-5: Calapooya Creek, Lower North Umpqua, Lower South Umpqua, and Middle South Umpqua (see Map 5-1).



Map 5-1: Phase II watershed assessment and action plan areas.

The coordinator for the phase II watershed assessments started conducting landowner interviews for the past conditions section as suggested in the Oregon Watershed Assessment Manual. Some interviewees have lived in the Umpqua Basin area for most of their lives and had a wealth of historical knowledge. Other landowners were recent arrivals who knew little about the area’s history, but had unique perspectives about land management, fish habitat, life as a “newcomer,” and other topics. In the end, the interviews were most valuable because of the insight they provide into the different

perspectives, opinions, and thoughts of Umpqua Basin landowners. Therefore, interviews from all five watersheds are included in this chapter.

5.2. Landowner interviews

Mr. and Mrs. A; Lower South Umpqua Watershed

Mr. and Mrs. A are recent residents of the Winston area and own a sheep ranch in Lookingglass, which is managed by one of their children. An unfenced stream flows through their property, but heavy brush and blackberries prevent sheep access. The couple says they have never seen fish in the stream, but they also rarely go down to look.

Although these landowners have not been in Oregon long, they have been farming and ranching their entire lives. The A's feel that farmers and ranchers are often wrongly accused of being the primary contributors to environmental problems. The A's believe that farmers and ranchers are among the best stewards of the earth; they manage their property to produce quality crops while protecting the land. As Mrs. A stated, "a farmer who manages his land poorly is only hurting himself." Mrs. A points out that their heavily grazed 100 acres all have healthy, green grass and there is no evidence of soil erosion, even on steep slopes. This couple rotates their sheep pasture to allow the land to recuperate, as all good ranchers do.

These landowners are very concerned that the "global market" is hurting local agriculture. Mr. and Mrs. A believe that Oregon is, for the most part, capable of feeding itself. Douglas county farmers grow fruits and vegetables and ranchers raise cattle, sheep, and hogs. These landowners feel that Americans need to buy US-grown products. Why purchase New Zealand lamb when Oregon lamb is not only better quality, its purchase supports the community? Mrs. A states that developing countries like Mexico do not have the same environmental standards as the US, and imported agricultural products may be contaminated by US-banned chemicals. This couple feels very strongly that if the global food market continues as it is, US farmers will lose their way of life.

Mr. B; Lower South Umpqua Watershed

A lifetime Winston-area resident, Mr. B has lived more than 60 years on a farm by the South Umpqua River. His father farmed the same property before him. Mr. B had a day job for most of his working life but was able to earn additional income through farming and ranching his 80 acres. We discussed what has changed since his childhood, current issues, and the future of the Winston-Roseburg areas.

Aspects of the river channel have changed since Mr. B was young. A gravel bar located upstream of the Happy Valley bridge has grown at least 100 feet, and many of the stream bank features he vividly remembers as a child are gone. Mr. B believes that the river's features have changed because the direction of flow has shifted and eroded banks. He pointed out full-sized trees in his riparian area that are tipping towards the river, which he said is a sign of bank erosion. When asked why he thinks this happens, he stated that the complexities of stream flow dynamics make it impossible to pinpoint a single culprit.

Erosion has always occurred on the banks of the South Umpqua River to varying degrees. On his own property, Mr. B pointed out slumping on the riverbank. These are recent slumps that did not occur during flood events. Although they are now overgrown with herbaceous plants, Mr. B stated that without trees, these slumps are more susceptible to erosion. He made it clear that bank erosion, like slumping, can occur at any time of the year. Mr. B believes that flood events cause the most damage to stream banks.

Mr. B doesn't think that normal flooding rates or levels have changed. Using Oregon Department of Water Resources data, Mr. B showed that since 1950, the river has been above 26 feet nine times. The floods are random and don't appear to have become more or less severe. However, Mr. B believes that extreme floods are not as severe as in the past. Although he doesn't have exact figures, Mr. B believes the 1964 flood levels were higher than the 1996 flood

When asked why slumping and bank erosion occur (other than because of streamflow changes and flooding), Mr. B suggested that a growing nutria population may be a culprit (he says the beaver population has remained stable). Nutria are an introduced species that burrow into streambanks. Their burrows create weak points on the bank and encourage erosion during high water. Also, livestock are a problem. Where ranchers allow their livestock to drink from the river, the banks are often denuded, and erosion is a problem. Mr. B fenced his riparian area over 35 years ago, and uses a stock water system for his cattle. He has a very lush riparian area.

Mr. B commented on changes in water quality. During his childhood, he regularly drank from the river. Now he would never consider doing so. Not only does he know what's occurring upstream, but algae sometimes grows over a third of the river's surface, and he frequently observes foam floating on the water. When asked what the foam was from, he said he didn't know for sure, but suspected it might originate at one of the upstream mills or wastewater treatment plants. Although the South Umpqua was always turbid right after a storm event, it seems to take longer now for the river to run clean again than when he was younger. Not being much of a fisherman, Mr. B couldn't comment on changes in fish populations. He did say as a child there were catfish in the river and an abundance of bullfrogs. He has not seen a catfish nor heard a bullfrog in over 25 years. When asked why he thought that might be, Mr. B said he suspects that the introduced bass might be the cause.

Except for changes in size and ownership, the primary industries in the Winston-Roseburg area have remained the same. The South Umpqua River supported many mom-and-pop mills and small-scale gravel mines. Since his youth, the many, small mills have been replaced with fewer, large mills. Similarly, aggregate gravel has been mined from the South Umpqua for as long as he can remember. There were always many small commercial mines, and most riverside landowners would freely take the aggregate they needed. Now, the small aggregate mines are gone and have been replaced by large-scale mines. Mr. B has noted that where large-scale gravel mining occurs next to the river, the channel fills with sediment and becomes wider, shallower, and the river's direction of flow shifts. To make his point, Mr. B provided Photo 5-1 and Photo 5-2 that show how

during high flows, the South Umpqua River can inundate gravel mines. This landowner didn't comment on the effects that many small mines had on the river.



Photo 5-1: Gravel mine along the South Umpqua River during high water.

According to Mr. B, the number and size of farms, as well as the types of crops, have changed since his youth. His father, like most farmers, was able to support his family through agriculture alone. Fifty years ago, most farmers had substantial acreage and grew a variety of fruits and vegetables and had pasture for livestock. Much of the Winston area had orchards. Over time, the orchards, especially pears and plums, were replaced with other crops. When asked why this happened, Mr. B said that pears and plums are more labor-intensive than other crops, and as the cost of workers increased, orchards became less profitable. Mr. B stated that the cost of labor has continued to rise so that most farmers are unable to support their families from agriculture alone. Now, farms are smaller and most farmers hold day jobs in addition to growing crops, hay, or grazing livestock. Only very large properties with intensive agricultural practices are able to support a family.

Mr. B commented that overall, people's activities on the land and in the river have improved since his youth. Before, landowners didn't know better and would do things that damaged the environment, like driving tractors into streams. Now we know better and have established laws to protect the river and other natural resources. Mr. B pointed out that unfortunately, there always seems to be ways around the laws. He is very concerned that an adjacent, upstream property purchased by Beaver State will be mined

for river aggregate. The site of the proposed mine is prime farmland with excellent soil, and Mr. B believes that prime farmland is supposed to be protected under the law. In addition, Mr. B is downstream of the proposed gravel mine; he is concerned that an aggregate mine will cause the river to change its course and erode his banks and topsoil.



Photo 5-2: Gravel mine by the South Umpqua River during normal flows.

Mr. B believes that to ensure economic stability, the Roseburg-Winston area needs to attract diverse industries. In the past, a variety of businesses have come and gone but no big businesses have stayed for any length of time. Mr. B believes that increasing tourism is not the answer. He says that Roseburg, Winston, and other towns along I-5 are places where tourists stop on their way elsewhere, not a place where people stop to visit for a long time. The increase in retirees from California and other states settling in this area has helped some, since retirees spend money and purchase locally grown produce. This landowner states that he is willing to accept the fact that population growth is unavoidable and has an overall affect on the area. However, he would rather not have such growth. Mr. B states that he does not think all growth is from California, and they should not take all the blame or the credit for changes in the area.

When asked what will have the single greatest impact on the future of the Winston-Roseburg area, Mr. B identified the area's population growth. He recognizes that we can't turn the clocks back to 1945. The area's population is growing and Mr. B feels we need to plan appropriately to make the best use of our resources. Across from his house on a hill is a new housing development. Although he is not delighted with the change in

view, Mr. B agrees that putting in new housing on poorer, upland soil is much better than filling in the formerly abundant wetlands or subdividing farms to build housing for more people. Mr. B also stated that quality gravel used for concrete and roads can be obtained from upland quarries instead of using river aggregate. This landowner is concerned that unless we plan well, the Roseburg-Winston area will have the same fate as the East and the Seattle-Portland areas; money will be in abundance but quality food, water, and air will be limited. Only by managing our area's resources for the best uses will we be able to accommodate a growing population and protect our natural resources.

Like Mr. and Mrs. A, Mr. B believes that the North American Free Trade Agreement (NAFTA) and the global market hurts local farmers. He states that US labor is too expensive compared to other nations and farmers can't turn enough of a profit. Therefore, in the future most farmers will be like him; those who continue to farm because they enjoy the lifestyle and the additional source of income. Mr. B is concerned that today's youth are not interested in farming; they perceive it as requiring too much work for the financial benefit.

Mr. C; Lower South Umpqua Watershed

Mr. C offers an interesting perspective as a newcomer to the Roberts Creek area. He and his wife moved up permanently from southern California a year before the interview. When asked what brought him to the area, he said that they have family on Roberts Creek, and life in southern California was becoming too expensive and hectic. He and his wife wanted to live somewhere peaceful where they could have some property. Their 12-acre parcel has brought them just that. When asked if he faced any hostility from locals because he's from California, he said no. Mr. C believes that most of the anti-California attitude is directed at businesspeople who come to this area and bring with them the fast-paced, high stakes approach to life. Overall, local residents have been very nice to Mr. C, but then he has adapted himself to the slower pace of life along Roberts Creek.

Roberts Creek runs through Mr. C's land, and he pointed out the bare, eroded banks. Mr. C hasn't lived on his property long enough to know the flood trends. However, he reported that the neighbors, who are long-time residents, are very concerned with the stream changing its course and would like Roberts Creek to stay where it belongs. Mr. C didn't mention any activities the neighbors had done, if any, to prevent stream meandering. Mr. C is looking at options to prevent further erosion of Roberts Creek stream banks within his property.

Mr. C reported a stream-related incident that he found curious. Last spring, Pacific Power needed to replace power line poles on either side of the Roberts Creek reach on Mr. C's property. There is no bridge across the stream, but Mr. C has an established crossing that he uses to reach his pasture on the other side of the creek. That pasture can also be accessed via a vacant lot off of Carnes Road. According to Mr. C, the contractors working for Pacific Power created a new stream crossing to reach the other side of Robert's Creek rather than using the Carnes Road access. He also stated that they tore up the active channel doing so. Mr. C told the contractors they needed to return and clean

up the mess. The contractors didn't return until December, at which point Mr. C was told the ground was too wet for anything to be done, although they promised to come back when the ground was dry. The UBWC recommended Mr. C contact Pacific Power and report the incident.

Mr. D; Myrtle Creek Watershed

Mr. D is an Oregon native who moved to the San Francisco Bay area and then returned to Oregon. He and his wife have lived on over 100 acres of timberland on a North Myrtle Creek tributary since the late 1970s. Mr. D teaches at a nearby school.

Earlier last century, Mr. D's property was the site of a small mill. In the 1950s, the property was heavily logged and not replanted but did regenerate naturally. Mr. D did a logging operation on his property in 1979. Now, this landowner mostly manages his timber using selective cutting. Using this method, Mr. D can obtain all the firewood he needs and periodically harvest some logs. Mr. D does not have enough property to harvest timber every year, but once every five years or so, he is able to cut enough logs to provide some additional income. Mr. D avoids tree planting by encouraging natural regeneration. He uses hand methods rather than chemical sprays to control competing vegetation. Fifteen years ago, this landowner planted knobcone pine on southern slopes. Unfortunately, they are not doing well. Mr. D speculates that drought may have made these trees susceptible to bark beetle attack.

When asked if his land management method was pretty common in his area, he said that it varies. Mr. D pointed out that most of the timberland in Myrtle Creek is either federally managed or owned by private industrial timber companies. As for small woodland owners, some do little or no active management. These folks are often retirees from other areas. On the other hand, another couple nearby was short of cash and clearcut their entire property. These folks have yet to replant. As such, Mr. D could not generalize on how most small woodland owners manage their property.

Two creeks run through Mr. D's property. Neither stream is fish-bearing. Downstream from Mr. D's property, there are three culverts that may block fish passage. When asked about replacing the culverts, Mr. D said that he, and probably the neighbors as well, would not be interested. Without fish, Mr. D can block off the culvert during the summer months and store 80,000 gallons of water for fighting forest fires. The neighbors can create a small pond in their yard as well. These activities would not be possible if the stream had anadromous fish. Mr. D obtains all of his domestic water from springs further upstream.

As a side note, Mr. D stated that many people claim riparian trees do not reduce stream flow. From his observations, this timberland owner has concluded in large numbers, young alders can take up so much water that the stream flow is reduced to a trickle. As the alders mature, they naturally thin out and take up less stream water while providing shade.

When asked about changes in the streams, Mr. D stated that both of the creeks on his property have remained about the same over the last 25 years. Both creeks have ample riparian habitat, instream wood, and are well shaded. Mr. D has never noticed an erosion problem, although the streams become caramel-colored during “gully-washer” floods. There hasn’t been a really big flood in many years. The only long-term change in the stream that he’s noted is more brush, which is probably due to opening the forest canopy from his selective logging activities. There are probably few snags since Mr. D also occasionally removes dead trees for firewood.

Outside of the stream, Mr. D noted that he is seeing more invasive plant species. Four or five years ago, he started finding tansy ragwort and Scotch broom. To date, Mr. D has not found any gorse on his property, but it is not far away, and he suspects that eventually it will make its way to his area.

When asked about changes in the population, Mr. D noted that there are fewer active farms than before. Business in recent years has remained stable; small companies come and go, but the number of businesses and stores remains about the same. The population of Myrtle Creek is growing some due to an influx of retirees from other areas. This has resulted in more housing construction in the city. When asked what long-time residents feel about the newcomers, Mr. D concurred with Mr. C; attitude is everything.

Mr. D identified three major events in the past 25 years that he believes have changed Myrtle Creek. First, the nickel mine on Nickel Mountain closed, costing many jobs. Second, the reduction in logging from federally managed forests also resulted in a loss of jobs for Myrtle Creek residents. Finally, in the 1970s the state welfare system relocated several people on public assistance to Myrtle Creek because the cost of living was cheaper than in the larger, northern cities. Mr. D believes these events have resulted in Myrtle Creek’s higher than the county average poverty and unemployment rate, and have shaped the culture of Myrtle Creek. According to this landowner, there are a large number of families that have had multiple generations on public assistance, and many people don’t see the value of school. There are few profitable jobs in the area and a large population of high school dropouts. Many people have difficulties earning a living wage and are apathetic. Apathy puts the skids on community growth.

This landowner feels very strongly that a strong vocational education program is critical for Myrtle Creek’s children. Since education is not a high priority, finishing high school is, for some people, their most significant educational accomplishment; they will most likely not continue their education to learn a trade or marketable skill. Mr. D believes that providing high school graduates with marketable skills, such as carpentry, welding, and “mechanicking,” will give them the background needed to seek jobs for skilled laborers.

When asked about the future of Myrtle Creek, this landowner stated that unless timber can be harvested from federal forests, or unless another industry moves into the area, Myrtle Creek is destined to be a bedroom community for Roseburg, Canyonville, and Winston.

Mr. E; Calapooya Creek Watershed

Mr. E moved to the Calapooya Creek Watershed in 1981. Since that time, Mr. E has worked very hard to improve his 100-acre ranch and the 0.25 miles of cutthroat trout-bearing stream that runs through his property. Mr. E has extensively cross-fenced his property. The uplands are planted with various conifers including KMX, which is a cross between knobcone pine and Monterey pine. The trees range from 20 years old to less than two. For each grazing section he has planted triangular clusters of trees to provide weather protection for his livestock. Mr. E also cuts all the Scotch broom and any other invasive plant he finds on his property.

Mr. E has done substantial work on his stream's riparian area. When this landowner purchased the property, cattle had full access to the stream and there were no trees. In the summer, the creek sometimes went dry. Mr. E fenced the riparian area and planted various conifers and hardwoods. Shortly after the cattle were excluded, beaver returned to that section of the creek. When asked why this occurred, Mr. E speculated that cattle discourage beaver because they crush beaver burrows and compete for food. Once the cattle were gone and the stream was once again "safe," the beavers returned. When the beaver returned they built dams that have resulted in deep pools and year-round water. Unfortunately, Mr. E also lost many of his trees. Consequently, Mr. E builds four-foot high wire fabric tubes to protect trees of all ages, because he has noted that beavers can cut trees more than 12 inches in diameter. This landowner still plants trees in the riparian area, which he also protects from competing vegetation using mats made from the Wall Street Journal and through hand control methods.

Today, Mr. E's stream section has many tall trees and willows providing shade; the stream flows slowly through many deep pools that boast both ample cutthroat trout and crayfish. Although there is some bank erosion, Mr. E is not concerned because the downcutting is minimal and most likely a result of the increased flow. Overall, Mr. E's efforts have dramatically improved his stream section, especially compared to the neighboring reaches.

Mr. E's efforts have been very beneficial to the fish in his creek. However, this landowner is very clear that it would be very difficult for people working a full-time job to accomplish what he did. Mr. E is retired and can dedicate much of his time to successfully restoring his stream.

6. Action Plan

The action plan summarizes key findings and action recommendations from all previous chapters, and identifies specific and general restoration opportunities and locations within the watershed. The Umpqua Basin Watershed Council, the Oregon Department of Fish and Wildlife, and the Douglas Soil and Water Conservation District developed the action plan for the Middle South Umpqua Watershed.

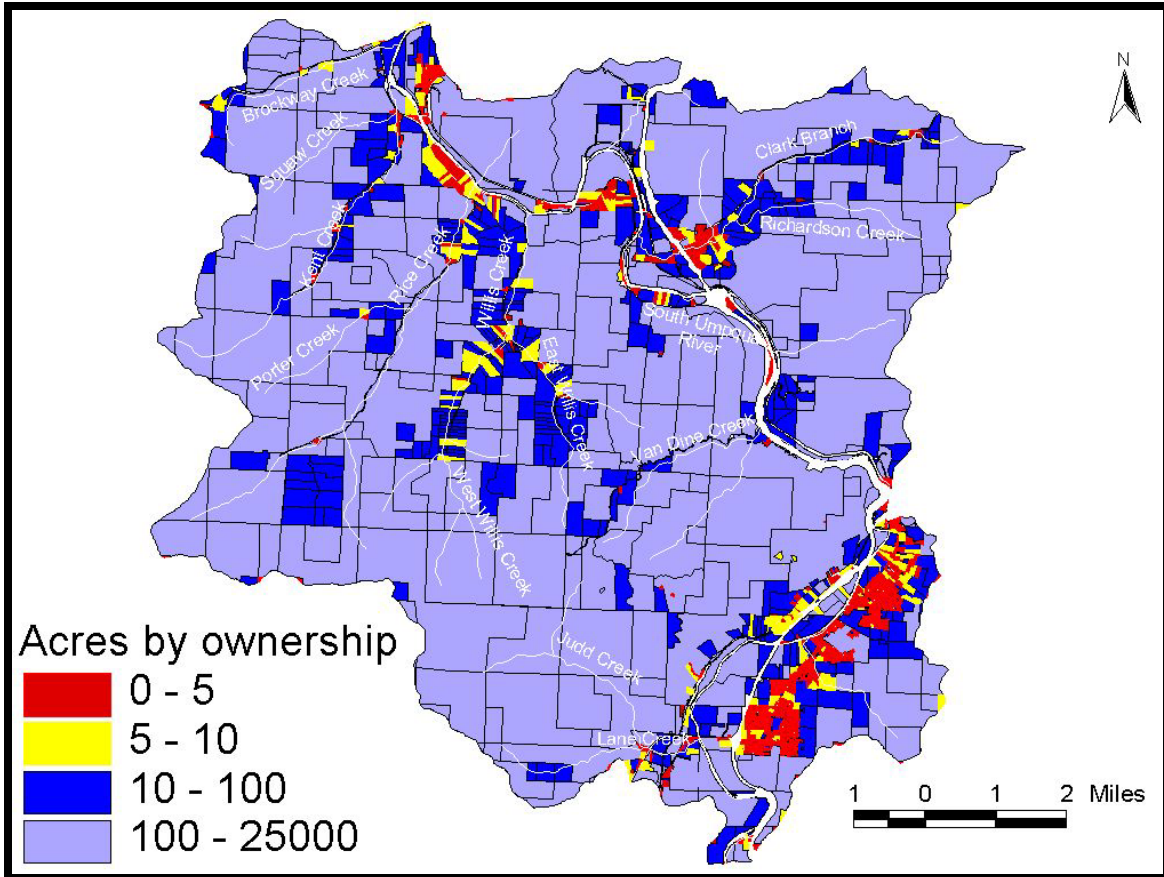
Key Questions

- Where are potential project location sites and activities in the watershed?
- How does property ownership affect restoration potential?

6.1. Property ownership and restoration potential

For some projects, such as eliminating fish passage barriers, the actual length of stream involved in implementing the project is very small. If only one culvert needs to be replaced, it doesn't make any difference if the participating landowner has 50 feet or a half-mile of stream on the property. The benefits of other activities, such as riparian fencing and tree planting, increase with the length of the stream included in the project. Experience has shown that for the UBWC, conducting projects with one landowner, or a very small group of landowners, is the most efficient approach to watershed restoration and enhancement. Although working with a large group is sometimes feasible, as the number of landowners cooperating on a single project increases, so do the complexities and difficulties associated with coordinating among all the participants and facets of the project. For large-scale enhancement activities, working with one or a few landowners on a very long length of stream is generally preferred to working with many landowners who each own only a short segment of streambank.

Map 6-1 shows parcel size in acres by ownership in the Middle South Umpqua Watershed. Unlike Map 1-11 in section 1.3.1, all parcels owned by the same person, family, agency, group, etc., are colored to reflect total ownership size. For example, if a single family owns three five-acre parcels, all parcels will be colored dark blue to reflect the total ownership of 15 acres. This map indicates that there are streams and stream segment in the Middle South Umpqua Watershed, such as Judd Creek, mostly run through larger ownerships, and are good candidates for large-scale stream habitat restoration projects. Other streams that mostly consist of smaller ownerships, such as Willis Creek, should be considered for smaller-scale restoration and enhancement activities, and for landowner education programs.



Map 6-1: Ownership size by acre for the Middle South Umpqua Watershed.

6.2. *Middle South Umpqua Watershed key findings and action recommendations*

6.2.1. Stream function

Stream morphology key findings

- The majority of streams within the Middle South Umpqua Watershed have low gradients with few stream miles in source areas, where most large woody material is recruited into the stream system. This may limit instream large woody material abundance.
- Stream habitat surveys suggest that lack of adequate large woody material, poor quality pools, and poor riparian tree composition limit fish habitat in Middle South Umpqua tributaries.

Stream connectivity key findings

- Culverts and, to some degree, dams, reduce stream connectivity, reducing anadromous and resident fish productivity in the Middle South Umpqua Watershed. More information about fish passage barriers will be available from UBFAT in 2003.

Channel modification key findings

- Many landowners may not understand the detrimental impacts of channel modification activities or may be unaware of active stream channel regulations.

Stream function action recommendations

- Where appropriate, improve pools, collect gravel, and increase the amount of large woody material by placing large wood and/or boulders in streams with channel types that are responsive to restoration activities and have an active channel less than 30 feet wide.¹⁰⁶
- In areas with inadequate riparian conditions, encourage land use practices that enhance or protect riparian areas:
 - Protect riparian areas from livestock-caused browsing and bank erosion by providing stock water systems and shade trees outside of the stream channel and riparian zones. Fence riparian areas as appropriate.
 - Plant native riparian trees, shrubs, and understory vegetation in areas with poor or fair riparian areas.
 - Manage riparian zones for uneven-aged stands with large diameter trees and younger understory trees.
- Maintain areas with good native riparian vegetation.
- Encourage landowner participation in restoring stream connectivity by eliminating barriers and obstacles to fish passage. Restoration projects should focus on barriers that, when removed or repaired, create access to the greatest amount of fish habitat.
- Increase landowner awareness and understanding of the effects and implications of channel modification activities through public outreach and education.

6.2.2. Riparian zones and wetlands

Riparian zones key findings

- For both the South Umpqua River and tributaries within the watershed, hardwoods are the dominant vegetation type. Brush/blackberry is the second most common vegetation type for the South Umpqua River. Brush/blackberry is less common than conifers along tributaries, but still constitutes over 15% of riparian zones.
- Over 85% of the South Umpqua River's riparian buffers are dominated by treeless riparian zones and by zones that are one tree wide. Tributary buffers are mostly one or two trees wide, but over 20% of tributaries have no trees.
- Over 20% of tributaries are less than half covered by vegetation or infrastructure.

Wetlands key findings¹⁰⁷

- Within the Middle South Umpqua Watershed, the predominant wetland types are riverine wetlands confined to active channels and wetland prairies located within lowland areas.

¹⁰⁶ Thirty feet is the maximum stream width for which instream log and boulder placement projects are permitted.

¹⁰⁷ Brad Livingston and Loren Waldron of Land and Water Environmental Services, Inc., contributed the wetlands key findings and action recommendations.

- Wetlands have been impacted and eliminated by various activities such as road construction, storm water management, agricultural drainage, increases of impervious surfaces, and a reduction of native vegetation.
- Reduction in the water storage capacity and ground water recharge function of wetlands has resulted in intensified storm surges and peak flows.
- Wetlands provide an essential link between terrestrial and aquatic habitats. Various fish and wildlife species require attributes only found in wetlands for specific life stages and development.

Riparian zones and wetlands action recommendations

- Where canopy cover is less than 50%, establish wide buffers of native trees (preferably conifers) and/or shrubs, depending upon local conditions. Priority areas are fish-bearing streams for which more than 50% canopy cover is possible.
- Identify riparian zones dominated by blackberries and convert these areas to native trees (preferably conifers) and/or shrubs, depending on local conditions.
- Investigate methods of controlling blackberries.
- Where riparian buffers are one tree wide or less, encourage buffer expansion by planting native trees (preferably conifers) and/or shrubs, depending on local conditions.
- Maintain riparian zones that are two or more trees wide and, along tributaries, provide more than 50% cover.
- Expand forested riparian zones and riverine wetlands by planting hydrophytic tree species in locations having appropriate conditions at a density sufficient to improve functions over time.
- Provide information to landowners explaining the benefits of eliminating livestock access to streams, establishing effective buffer zones, the importance of wetland functions within watersheds, promoting the understanding of the interconnectedness of water resources, and the effects of impacts on downstream conditions.
- Educate policy makers, landowners, and community members on the importance of maintaining wetlands for healthy watersheds, and their educational, recreational, and aesthetic values for the local community.

6.2.3. Water quality

Temperature key findings

- Monitoring locations within the watershed indicate that streams within the Middle South Umpqua Watershed frequently have seven-day moving average maximum temperatures exceeding the 64°F water quality standard during the summer. High stream temperatures may limit salmonid rearing in these reaches.
- Warmer sites often lack shade. Increasing shade on small and medium-sized streams may improve overall stream temperature.
- Groundwater and tributary flows can contribute to stream cooling. Gravel-dominated tributaries may permit cooler subsurface flows when surface flows are low.
- Fish may find shelter from high summer temperatures in the lower reaches and mouths of small and medium-sized tributaries and in reaches within warm streams that have proportionately high groundwater influx and shade.

Surface water pH, dissolved oxygen, nutrients, bacteria, and toxics key findings

- Temperature and the levels of pH, nutrients, and dissolved oxygen are interrelated. In the South Umpqua River during the summer, pH does not meet water quality standards. This condition is detrimental to resident fish, aquatic life, and human contact recreation. Nutrient monitoring indicates that phosphorus levels are high. Dissolved oxygen levels no longer limit water quality. It is unknown if these parameters are concerns for other locations within the watershed.
- Within the Middle South Umpqua Watershed, South Umpqua River bacteria levels exceed water quality standards all year, decidedly a human health concern. Additional monitoring is necessary to determine if other locations in the watershed have high bacteria levels.
- Within the Middle South Umpqua Watershed chlorine levels exceed water quality limits, and ammonia is a potential concern. It is unknown if these toxics are a concern for other streams in the watershed.

Sedimentation and turbidity key findings

- Turbidity data indicate that usual turbidity levels in the South Umpqua River do not impair sight-feeding fish like salmonids.
- Soils prone to high rates of erosion due to low infiltration and high rates of runoff are located in the upper to midsections of the watershed.
- Developed areas within the watershed may impact water quality (i.e. runoff from roads and roofs). Improperly drained roads and poor land management practices can increase sediment loads to streams. In the Umpqua Basin, more studies are needed to determine the impacts of roads, culverts, landslides, burns, soil type, and urban conditions on sedimentation and turbidity.

Water quality action recommendations

- Continue monitoring the Middle South Umpqua Watershed for all water quality conditions. Expand monitoring efforts to include tributaries.
- Identify stream reaches that may serve as “oases” for fish during the summer months, such as at the mouth of small or medium-sized tributaries. Protect or enhance these streams’ riparian buffers and, when appropriate, improve instream conditions by placing logs and boulders within the active stream channel to enhance large woody debris abundance and create pools.
- In very warm streams and where dissolved oxygen and pH are a problem, increase shade by encouraging wide riparian buffers and managing for native trees and full canopies.
- Identify and monitor sources of bacteria, nutrients, and ammonia. Where applicable, reduce bacteria, nutrient, and ammonia levels through activities such as:
 - Limiting livestock stream access by providing stock water systems and shade trees outside of the stream channel and riparian zones. Fence riparian areas as appropriate.
 - Relocating structures and situations that concentrate domestic animals near streams, such as barns, feedlots, and kennels. Where these structures cannot be

- relocated, establish dense and wide riparian vegetation zones to filter fecal material.
- Repairing failing septic tanks and drain fields.
- Using wastewater treatment plant effluent for irrigation.
- Reducing chemical nutrient and ammonia sources.
- Where data show that stream sediment or turbidity levels exceed established water quality standards, identify sediment sources such as urban runoff, failing culverts or roads, landside debris, construction or burns. Take action to remedy the problem or seek assistance through organizations such as the UBWC and Soil and Water Conservation Districts.
- Obtain comprehensive map coverage of the forest road system within the watershed and prioritize areas of concern based on road type, condition, and proximity to nearest stream. If necessary, use this information to target projects for improving road stability and drainage patterns.
- Identify areas with high concentrations of the group D soils that have been disturbed; prioritize areas for vegetation plantings and limit activities in these sensitive areas. This will help maintain soil structure, improve infiltration rates, and decrease erosion.
- Provide landowner education about water quality concerns and potential improvement methods:
 - Improving dirt and gravel road drainage to minimize sediment delivery to streams.
 - Enhancing soil infiltration by leaving vegetation litter on the ground after timber and crop harvests.
 - Planting bio-swales near streams in urban and suburban areas to catch urban runoff.
- Work with ODEQ to educate landowners about activities that will reduce any non-point sources of ammonia and chlorine in the watershed.

6.2.4. Water quantity

Water availability and water rights by use key findings

- In Middle South Umpqua tributary WABs, instream water rights exceed average flow all year, and consumptive use equals average flow from August through October.
- The largest water users in the Middle South Umpqua Watershed are irrigators, industries, and municipalities.

Streamflow and flood potential key findings

- It is not unusual for the flow of the South Umpqua River at Brockway to be less than 100 cfs during the summer months.
- The construction of Galesville Dam appears to have had a stabilizing effect on winter peak flows for the South Umpqua River at Brockway.
- The degree to which road density and the TSZ influence flood potential in the Middle South Umpqua Watershed is unknown at this time.
- Some landowners believe that historical surface vegetation removal permitted greater surface water runoff and may have contributed to stream flashiness.

Water quantity action recommendations

- Reduce summer water consumption through instream water leasing and by improving irrigation efficiency.
- Continue monitoring peak flow trends in the watershed. Try to determine the role of vegetative cover, flooding, road density, and the TSZ on water volume.
- Educate landowners about proper irrigation methods and the benefits of improved irrigation efficiency.

6.2.5. Fish populations

Fish populations key findings

- The anadromous fish species in the Middle South Umpqua Watershed are coho, spring chinook, fall chinook, winter steelhead, sea-run cutthroat trout, and Pacific lamprey. Although many Middle South Umpqua Watershed medium and large tributaries are within the distribution of one or more salmonid species, salmonid ranges have not been verified for each tributary.
- Non-native fish, including smallmouth bass, have established populations in the watershed. Other non-natives, such as bluegill, have been accidentally or intentionally introduced to the watershed, but have not established reproducing populations.
- More quantitative data are needed to evaluate salmonid abundance and the distribution and abundance of non-salmonid fish in the watershed.
- Umpqua Basin-wide data indicate that salmonid returns have improved. Although ocean conditions are a strong determinant of salmonid run size, improving freshwater conditions will also increase salmonid fish populations.

Fish populations action recommendations

- Work with local specialists and landowners to verify the current and historical distribution of salmonids in tributaries.
- Support salmonid and non-salmonid distribution and abundance research activities in the watershed, especially at the local level.
- Encourage landowner and resident participation in fish monitoring activities.
- Conduct landowner education programs about the potential problems associated with introducing non-native fish species into Umpqua Basin rivers and streams.
- Encourage landowner participation in activities that improve freshwater salmonid habitat conditions.

6.3. *Specific UBWC enhancement opportunities*

1. Actively seek out opportunities with landowner and resident groups to enlist participation in restoration projects and activities:
 - Improve irrigation efficiency and instream water leasing (all streams with water rights); and
 - Riparian planting, blackberry conversion, fencing, and alternative livestock watering systems (especially the South Umpqua River from Rice Creek to Barrett Creek, Clarks Branch Creek, and Willis Creek).

2. Work with interested landowners on a case-by-case basis on the following projects:
 - Improve instream fish habitat in areas with good riparian zones and an active channel that is less than 30 feet; and
 - Enhance and/or protect riparian zones and wetlands to improve wildlife habitat, fish habitat, and water quality conditions.
3. Develop educational materials and/or outreach programs to educate target audiences about fish habitat and water quality-related issues:
 - Create educational brochures about bank erosion, the problems associated with channel modification, and the importance of riparian areas. These could be given to new landowners through real estate agents.
 - Develop public service announcements about ways of improving or maintaining riparian and instream conditions, such as the benefits of riparian fencing and how to use fertilizers and pesticides in a stream-friendly fashion.
 - Design engaging displays about fish passage barriers for community events, such as the Douglas County Fair.
 - Give presentations at citizen groups about the benefits to landowners and to fish that result from upland stock water systems, off-channel shade trees, and instream water leasing.
4. Support local fish habitat and water quality research:
 - Train volunteers to conduct fish and water quality monitoring and research.
 - Provide equipment necessary for local water quality research and monitoring.
 - Survey long-term landowners and residents about historical and current fish distribution and abundance.
 - Encourage school and student participation in monitoring and research.
5. Enlist landowner participation to remove fish passage barriers as identified.
6. Educate policy makers about the obstacles preventing greater landowner participation in voluntary fish habitat and water quality improvement methods.

References¹⁰⁸

- Allan, S.; Buckley, A. R., and Mecham, J. E. Atlas of Oregon. 2 ed. Eugene, Oregon: University of Oregon Press; 2001.
- Alt, David and Hyndman, Donald W. Northwest Exposures, A Geologic History of the Northwest. Mountain Press Publishing Company; 1995.
- Brady, Nyle C. and Weil, Ray R. The Nature and Properties of Soil. 11 ed. Prentice Hall; 1996.
- Committee for Family Forestlands. Sustaining Oregon's Family Forestlands. Oregon Department of Forestry; 2002.
- Douglas County Assessor. Microfiche CD of Assessment Data, 2000-2001: Douglas County, Oregon; 2001 Apr.
- Ellis-Sugai, Barbara and Godwin, Derek C. Going With the Flow: Understanding Effects of Land Management on Rivers, Floods, and Floodplains. Corvallis, Oregon: Oregon Sea Grant/Oregon State University; 2002.
- Kentucky Department of Natural Resources - River Assessment Monitoring Project. Ammonia and Water Quality [Web Page]. Accessed 2003 Feb. Available at: <http://water.nr.state.ky.us/ww/ramp/default.htm>.
- Oregon Climate Service. Climate Data [Web Page]. Accessed 2002 Sep. Available at: <http://ocs.oce.orst.edu/>.
- Oregon Department of Environmental Quality. Draft 2002 303(d) Database Search Choices Page [Web Page]. Accessed 2003 Feb. Available at: <http://www.deq.state.or.us>.
- . Laboratory Analytical Storage and Retrieval Database [Web Page]. Accessed 2002 Mar. Available at: <http://www.deq.state.or.us>.
- . Oregon's Approved 1998 Section 303(d) Decision Matrix. 1998 Nov.
- Oregon Department of Fish and Wildlife. Development of Methods to Estimate Escapement of Chinook Salmon in the South Umpqua River: Pacific Salmon Commission Semi Annual Progress Report - Oregon. 2000 Jun.
- Oregon Department of Forestry. Debris Flow Hazard [Web Page]. 2000; Accessed 2003 Feb. Available at: <http://www.odf.state.or.us/gis/debris.html>.

¹⁰⁸ References for Chapter Two, "Past Conditions," and the "Wetlands" subsection are not included in this list.

- Oregon State University Extension Service. Fish Passage Short Course. Oregon State University; 2000 Jun.
- . Watershed Stewardship: A Learning Guide. Oregon State University; 1998 Jul.
- Oregon Water Resources Department. State of Oregon Water Resources Department [Web Page]. Accessed 2002 Oct. Available at: <http://www.wrd.state.or.us/>.
- Orr, Elizabeth L.; Baldwin, William N., and Ewart, M. Geology of Oregon . 4 ed. Dubuque, Iowa : Kendall/Hunt Publishing Company; 1992.
- Press, F. and Siever, R. Earth. Fourth ed. San Francisco: W.H. Freeman and Company; 1986.
- Smith, Kent. South Umpqua Watershed Temperature Study 1999: Procedure, Results, and Preliminary Analysis. Yoncalla, Oregon: Umpqua Basin Watershed Council; 2000 Feb.
- . Thermal Transition in Small Streams Under Low Flow Conditions. Yoncalla, Oregon: Umpqua Basin Watershed Council; n.d.
- The Hach Corporation. Chlorine [Web Page]. Accessed 2003 Feb. Available at: <http://www.hach.com>.
- US Census Bureau. American Factfinder [Web Page]. Accessed 2002 Aug. Available at: <http://factfinder.census.gov/servlet/BasicFactsServlet>.
- US Department of Agriculture; Oregon Agriculture Statistics Service; Goodwin, Janice A., and Eklund, Bruce. 2001-2002 Oregon Agriculture and Fisheries Statistics. United States Department of Agriculture //Oregon Department of Agriculture; 2002 Dec.
- US Geological Survey. NWISWeb Data for Oregon [Web Page]. Accessed 2003 Feb. Available at: <http://or.waterdata.usgs.gov>.
- USDI Bureau of Land Management. Lower South Umpqua Watershed Analysis. Roseburg, Oregon: USDI Bureau of Land Management, Roseburg District Office; 2000 May.
- . Middle South Umpqua Watershed Analysis. Roseburg, Oregon: USDI Bureau of Land Management, Roseburg District Office; 1999 Nov.
- . Record of Decision and Resource Management Plan. Roseburg, Oregon: USDI Bureau of Land Management, Roseburg District Office; 1995 Jun.
- . Roseburg District Annual Program Summary and Monitoring Report: Fiscal Year 2001. Roseburg, Oregon: USDI Bureau of Land Management, Roseburg District Office; 2002 Jul.

Walker, G. W. and MacCleod, N. S. Geologic Map of Oregon. US Geologic Survey; 1991.

Watershed Professionals Network. Oregon Watershed Assessment Manual. Salem, Oregon: Prepared for the Governor's Watershed Enhancement Board; 1999 Jun.

Appendices

Appendix 1: Additional geological information for western Oregon and for the Middle South Umpqua Watershed.....	152
Appendix 2: Census area locations and Douglas County data.	161
Appendix 3: 1968 streamflow and temperature measurements.....	164
Appendix 4: Stream habitat surveys.	165
Appendix 5: Land use classifications for the ODFW stream habitat surveys.	167
Appendix 6: Riparian vegetation and features.....	169
Appendix 7: Riparian buffer width.....	172
Appendix 8: Riparian cover.....	175
Appendix 9: Water availability graphs.....	178
Appendix 10: Water use categories.....	180
Appendix 11: Middle South Umpqua Watershed anadromous salmonid distribution by species.....	181
Appendix table I: Geologic time scale (most recent to oldest – top to bottom).	153

Appendix 1: Additional geological information for western Oregon and for the Middle South Umpqua Watershed.¹⁰⁹

Geologic History

The process of plate tectonics, or movement of large plates of solid rock crust on the earth's surface, can result in many different landscape-altering events, such as volcanic activity and mountain building. The collision of the North American continental plate with the Pacific oceanic plate resulted in a collision boundary that has shaped the geologic history of southwestern Oregon. In this case, the Pacific plate has been thrust beneath the continental plate, creating a collision boundary known as a subduction zone. The geologic history of this area has been driven by its location on the western edge of the North American plate adjacent to the Pacific Ocean. The collision of the Pacific plate with the North American plate also resulted in the accretions (see glossary for definitions) of islands and small landmasses to the continental plate. The Klamath Mountains and the Coast Range are examples of this process, known as accretionary tectonics.

During the Devonian period, a mountain building event known as the Antler orogeny occurred, resulting in the formation of the Klamath Mountains (refer to Appendix table I for geologic time scale). This process began with the collision and the subsequent subduction of the oceanic crust beneath the western margin of the continental crust. With the collision, sedimentary deposits and exotic terranes began collecting atop the ocean floor. Terranes are defined as a suite of rocks usually bound by faults that have been displaced from their place of origin. During the Mesozoic era, the plates began to collide again, mashing the sediments and terranes into the North American plate. The resulting pressure caused these sediments and terranes to be crumpled into folds along thrust faults, laced with granite intrusions (Alt and Hyndman, p. 68), forming the Klamath Mountains. The Klamaths are also thought to have once been contiguous with the Sierra Nevadas. However, the Klamaths separated and moved along a plate boundary forming a microcontinent that shifted west of the Sierra Nevadas. As the Klamath block shifted west, a 60-mile wide basin developed to the east, forming an ocean and subsequently filling with marine sediments.

A small portion of the Middle South Umpqua Watershed lies within the Coast Range, which was one of the last provinces to form in the Pacific Northwest. Its formation began early in the Cenozoic era with the separation of two oceanic plates. The two divergent plates formed a rift from which magma was released that subsequently formed a chain of undersea volcanic islands arranged in a north-south direction between the two plates. These volcanic islands were subject to eruptions of basalt throughout the Paleocene and Eocene epochs. Furthermore, the chain remained submersed beneath the

¹⁰⁹ Jenny Allen, Tim Grubert, and John Runyon of BioSystems, Inc., contributed the text and tables for Appendix 1. Terms such as "Jurassic" and "Cretaceous" refer to periods in the geologic/evolutionary timetable. However, the UBWC takes no position regarding the time periods with which these terms are associated and is using the terms to refer to natural processes and the relative order in which they occurred.

ocean, collecting marine deposits. Later in the Eocene, this volcanic chain collided with the North American plate, beginning the formation of the Coast Range. During the Oligocene, an orogeny (mountain building process) occurred that caused the Coast Range to rise out of the ocean. Also during this time, volcanoes of the Western Cascades were erupting frequently and depositing large amounts of ash into the ocean atop the emerging Coast Range.

Era	Period	Epoch
Cenozoic	Quaternary	Holocene
		Pleistocene
	Tertiary	Pliocene
		Miocene
		Oligocene
		Eocene
		Paleocene
Mesozoic	Cretaceous	
	Jurassic	
	Triassic	
Paleozoic	Permian	
	Pennsylvanian	
	Mississippian	
	Devonian	
	Silurian	
	Ordovician	
	Cambrian	
Precambrian	Proterozoic	
	Archean	

Appendix table I: Geologic time scale (most recent to oldest – top to bottom).

Geologic units for the Middle South Umpqua Watershed.¹¹⁰

Period	Epoch	Geologic unit	Description of geologic unit
Quaternary	Holocene	Qal	Alluvial deposits: Sand, gravel, and silt forming floodplains and filling channels of present streams. In places includes talus and slope wash. Locally includes soils containing abundant organic material, and thin peat beds.
Lower Cretaceous and Upper Jurassic		KJds	Dothan Formation and related rocks: Sedimentary rock: Sandstone, conglomerate, greywacke, rhythmically banded chert lenses. Includes western Dothan and Otter Point Formations of M.C. Blake, Jr. and A.S. Jayko (unpub. data, 1985) in Curry and southern Coos Counties.
Lower Cretaceous and Upper Jurassic		KJm	Myrtle Group: Conglomerate, sandstone, siltstone, and limestone. Locally fossiliferous. As shown, includes Riddle and Days Creek Formations (Imlay and others, 1959; Jones, 1969).
Cretaceous and Jurassic		KJg	Granitic rocks: Mostly tonalite and quartz diorite but including lesser amounts of other granitoid rocks.

¹¹⁰ From Walker and MacCleod, 1991. References cited with Walker and MacCleod are provided at the end of Appendix 1.

Upper Jurassic		Jop	Otter Point Formation of Dott (1971) and related rocks: Highly sheared greywacke, mudstone, siltstone, and shale with lenses and pods of sheared greenstone, limestone, chert, blueschist, and serpentine. Identified as mélangé by some investigators.
Jurassic		Jv	Volcanic rocks: Lava flows, flow breccia, and agglomerate dominantly of plagioclase, pyroxene, and hornblende porphyritic and aphyric andesite. Includes flow rocks that range in composition from basalt to rhyolite as well as some interlayered tuff and tuffaceous sedimentary rocks. Commonly metamorphosed to greenschist facies; locally foliated, schistose or gneissic. Includes the Rogue Formation and volcanic rocks commonly assigned to the Galice Formation (Wells and Walker, 1953; Wells and Peck, 1961). Considered to be accreted island-arc terrane.
Jurassic		Ju	Ultramafic and related rocks of ophiolite sequences: Predominantly harzburgite and dunite with both cumulate and tectonic fabrics. Locally altered to serpentinite. Includes gabbroic rocks and sheeted diabasic dike complexes. Comprises Josephine ophiolite of Harper (1980), ophiolites of Onion Mountain, Sextan Mountain, Pearsoll Peak, Rogue River, and Riddle areas (Smith and others, 1982) and Coast Range ophiolite and serpentinite mélangé of M.C. Blake, Jr. and A.S. Jayko (unpub. data, 1985). In southwest Oregon, locally includes small bodies of early Mesozoic or Late Paleozoic serpentinitized and sheared ultramafic rocks, mostly in shear zones. Locally, volcanic and sedimentary rocks shown separately.

Glossary of terms¹¹¹

- Accretion-** A tectonic process by which exotic rock masses (terranes) are physically annexed to another landmass after the two collided.
- Alluvial-** Refers to all detrital deposits resulting from operation of modern rivers, thus including the sediments laid down in riverbeds, flood plains, lakes, fans at the foot of mountain slopes, and estuaries.
- Andesite-** A volcanic rock type intermediate in composition between rhyolite and basalt.
- Arkosic (sandstone) -** Containing 25% or more feldspar usually derived from coarse-grained silicic igneous rock.
- Basalt-** Fine-grained, dark, mafic igneous rock composed largely of plagioclase feldspar and pyroxene.
- Breccia-** A clastic rock composed of mainly large angular fragments.
- Clastic Rock-** Sedimentary rock formed from particles that were mechanically transported.
- Colluvium-** Deposits of unstratified debris deposited by means of physical or chemical weathering.
- Conglomerate-** A sedimentary rock made up of rounded pebbles and cobbles coarser than sand.
- Diorite-** A coarse-grained, volcanically intruded rock similar in composition to granite but containing a higher percentage of potassium feldspar.
- Ecoglite-** A metamorphic, semi-precious, pink-hued stone consisting of ruby, zoisite, muscovite, and quartz.
- Fault-** A crack or fracture in the earth's surface across which there has been relative displacement. Movement along the fault can cause earthquakes or--in the process of mountain-building--can release underlying magma and permit it to rise to the surface.

¹¹¹ These definitions were compiled from dictionaries of geologic terms at <http://www.geotech.org/survey/geotech/dictiona.html>, <http://www.tc.umn.edu/~smith213/newpage1.htm>, <http://volcano.und.nodak.edu/vwdocs/glossary.html>, and in Press and Siever (1986), Jackson (1997), Orr, Orr, and Ewart (1992) and Orr and Orr (1996). Additional definitions not included in this glossary can be found at the websites and sources given above.

- Feldspar- A common rock-forming silicate mineral and one of the most abundant minerals in the earth's crust.
- Formation- A body of rock identified by lithic characteristics and stratigraphic position and is mappable at the earth's surface or traceable in the subsurface.
- Geomorphology: The science of surface landforms and their interpretation on the basis of geology and climate.
- Granite- Coarse-grained, intrusive igneous rock, composed of quartz, orthoclase feldspar, sodium-rich plagioclase feldspar, and micas.
- Graywacke- A poorly sorted sandstone containing abundant feldspar and rock fragments, often in a clay-rich matrix.
- Group- Two or more formations in a stratigraphic column which formed by similar events or processes.
- Igneous- A rock type formed by the crystallization of molten material called lava (volcanic) or magma (intrusive).
- Island Arcs- A linear or arcuate chain of volcanic islands formed at a convergent plate boundary. It is formed in the overriding plate from rising melt derived from the subducted plate and from the asthenosphere above that plate.
- Landslide: The rapid downslope movement of soil and rock material, often lubricated by groundwater, over a basal shear zone; also the tongue of stationary material deposited by such an event.
- Limestone- A bedded sedimentary deposit consisting largely of calcium carbonate, sometimes containing fragments of seashells or fossils.
- Mass Wasting- The rapid movement of colluvial materials downslope.
- Metamorphic- Type of rock, which has been altered or deformed through heat and/or pressure.
- Micaceous- Containing a high percentage of the mineral muscovite (muscovite), a shiny, sheetlike, opaque mineral that separates from a parent body in thin sheets.
- Montmorillonite- A term referring to a type of clay mineral characterized by its chemical composition and molecular structure which gives it greater plasticity and swelling capacity.
- Morphology- The form, structure, or arrangement of features within a landscape.

- Mudstone- The lithified equivalent of mud, a fine-grained sedimentary rock similar to shale but more massive.
- Ophiolite- A sequence of ocean crust beginning with ultramafic rocks at the base, grading upward to sheeted dikes, pillow lavas, and deep-sea muds.
- Orogeny- The tectonic process, in which large areas are folded, thrust-faulted, metamorphosed, and subjected to plutonism. The cycle ends with uplift and the formation of mountains.
- Peridotite- A coarse-grained ultramafic rock consisting of olivine and pyroxene with other accessory minerals. Peridotite is thought to make up much of the earth's mantle, and when altered is called serpentinite.
- Pillow lava- A general term for those lavas displaying pillow structures (globes of lava with curved tops and "pinched" bottoms) and considered to have formed under water.
- Plate tectonics- The movement of large segments (plates) of the earth's crust and the study of their interrelationship.
- Pluton- A large igneous body (such as a batholith) formed within in the earth's crust consisting of Ultramafic- Dark colored igneous rocks high in magnesium and iron and low in silica, such as serpentinite and peridotite.
- Rhyolite- Fine-grained volcanic or extrusive equivalent of granite, light brown to gray and compact.
- Rift- A narrow crevice or fissure in rock produced by splitting due to tension.
- Sandstone- A consolidated sedimentary rock consisting of rock and mineral fragments ranging in size between 0.0625 to 2.0 mm in diameter and cemented together with silica, calcium carbonate, or iron oxide.
- Sedimentary- Rock type comprised of weathered particles of other rocks and minerals and cemented together by calcium carbonate, silica, or iron oxide. Limestone is a sedimentary rock comprised of calcium carbonate compound becoming insoluble in water and hardening into various types of rock forms.
- Shale- A very fine grained detrital sedimentary rock composed of silt and clay.
- Shearing- The motion of surfaces sliding past one another.
- Silica- A crystalline compound consisting of silicon and oxygen.

Siltstone- A consolidated sedimentary rock made up of fragments ranging between sizes smaller than sand grains and larger than clay grains.

Slopewash- Debris carried down a slope surface by one or more physical weathering processes.

Stratigraphy- The study of stratified layered rocks.

Subduction- The sinking of an oceanic plate beneath an overriding plate.

Subduction zone- A dipping planar zone descending away from a trench and defined by high seismicity, interpreted as the shear zone between a sinking oceanic plate and an overriding plate.

Talus- A deposit of large angular fragments of physically weathered bedrock, usually at the base of a cliff or steep slope.

Tectonics – The study of the movements and deformation of the crust on a large scale.

Terrane- A suite of rocks bounded by fault surfaces that has been displaced from its point of origin.

Tonalite- A dark, igneous mafic rock containing the minerals hornblende, plagioclase, clinopyroxene, biotite, and quartz.

Tuff- A rock composed of volcanic ash with particles smaller than 4.0 millimeters in diameter.

Ultramafic- A magnesium-rich igneous rock with less than 45% silica (silicon dioxide); typical composition of the earth's mantle.

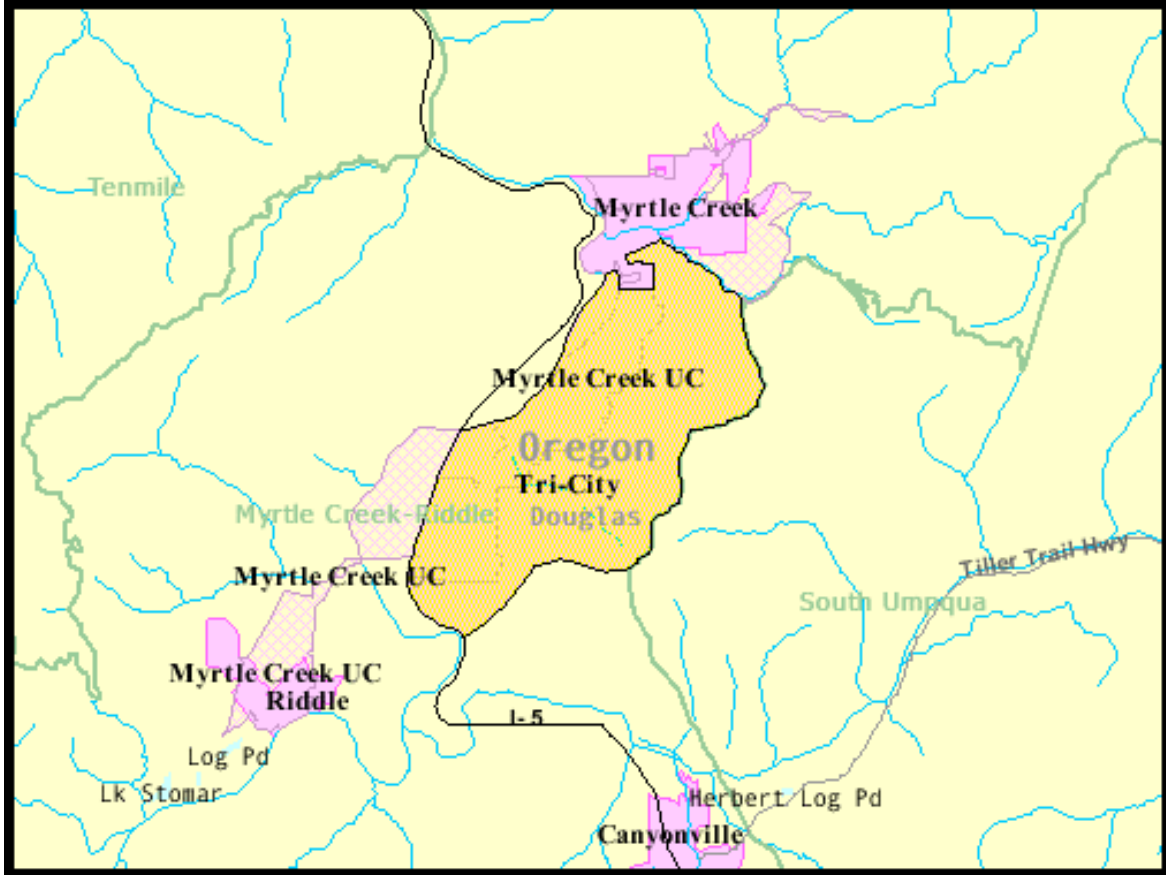
Vitric Ash- Volcanic ash that has cooled slowly enough to form a glassy texture in its matrix.

References cited within Walker and MacCleod (1991)

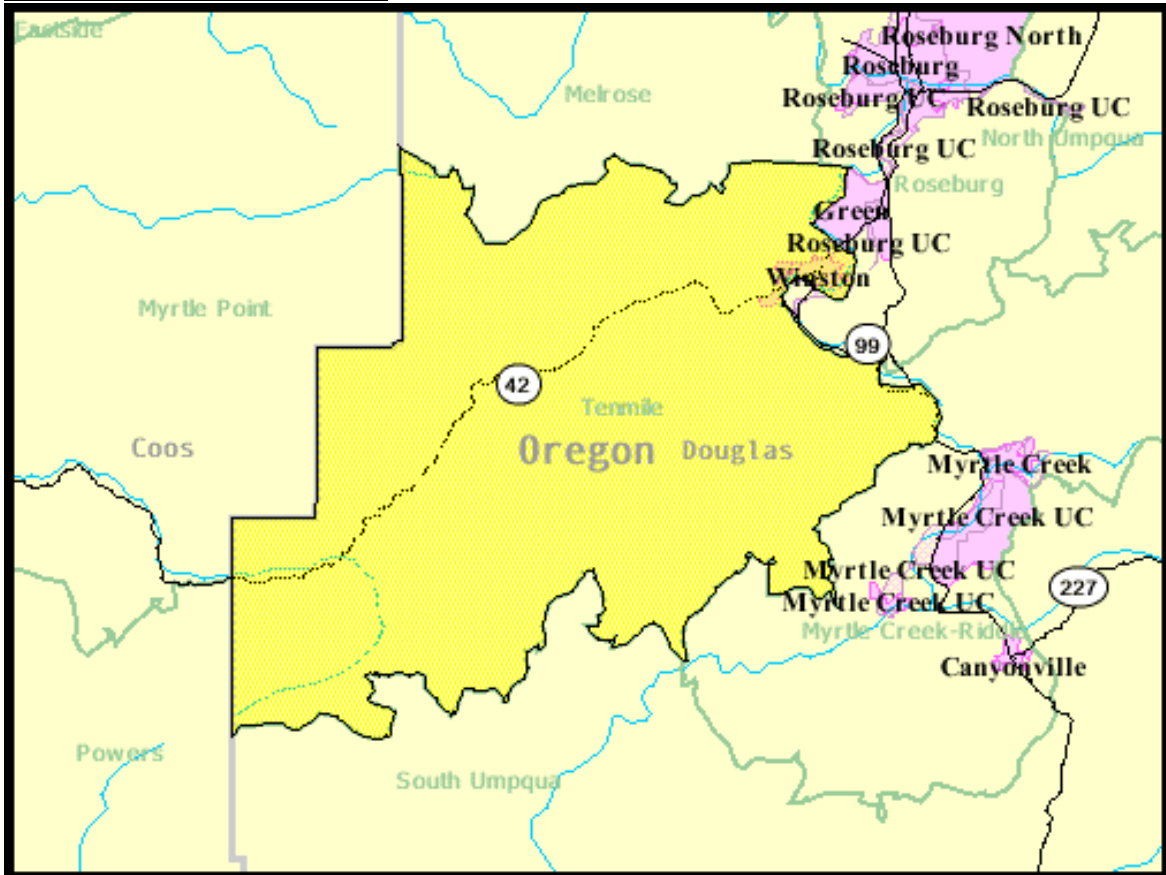
- Dott, R.H., Jr.. 1971. Geology of the southwestern Oregon coast west of the 124th meridian: Oregon Department of Geology and Mineral Industries Bulletin 69, 63p.
- Harper, G.D.. 1980. Structure and petrology of the Josephine Ophiolite and overlying meta-sedimentary rocks, northwestern California: Berkeley, California, University of California, Ph.D. dissertation, 281p.
- Imlay, R.W., Dole, H.M., Wells, F.G., and Peck, Dallas. 1959. Relations of certain Jurassic and Lower Cretaceous formations in southwestern Oregon” American Association of Petroleum Geologists Bulletin, v. 43, no. 12, p. 2770-2785.
- Jones, D.L.. 1969. Buchia zonation in the Myrtle Group, southwest Oregon [abs.]: Geological Society of America Abstracts with Programs, Cordilleran Section Meeting, 65th, Eugene, Oregon, pt. 3, p. 31-33.
- Smith, J.G., Page, N.J., Johnson, M.G., Moring, B.C., and Gray, Floyd. 1982. Preliminary geologic map of the Medford 1° by 2° quadrangle, Oregon and California: U.S. Geological Survey Open-File Report 82-955, scale 1:250,000.
- Wells, F.G., and Peck, D.L.. 1961. Geologic map of Oregon west of the 121st meridian: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-325, scale 1:500,000.
- Wells, F.G., and Walker, G.W.. 1953. Geology of the Galice quadrangle, Oregon: U.S. Geological Survey Geologic Quadrangle Series GQ-25, scale 1:62,500.

Appendix 2: Census area locations and Douglas County data.

Location of the Tri-City CDP



Location of the Tenmile CCD



2000 Douglas County census information

Age, race, and housing	
Population	100,399
Median age (years)	41.2
<i>Race</i>	
White	91.9%
Hispanic or Latino	3.3%
Asian	0.6%
American Indian or Alaskan Native	1.4%
African American	0.2%
Native Hawaiian and Pacific islander	0.1%
Some other race	0.1%
Two or more races	2.4%
<i>Housing</i>	
Avg. household size (#)	2.48
Avg. family size (#)	2.90
Owner-occupied housing	71.7%
Vacant housing units	8.0%
Education, employment, and income	
<i>Education – age 25 or older</i>	
High school graduate or higher	81.0%
Bachelor’s degree or higher	13.3%
<i>Employment – age 16 or older</i>	
In labor force	56.9%
Unemployed in labor force	7.5%
Top three occupations	Management, professional and related occupations; Sales and office; Production, transportation, and material moving.
Top three industries	Educational, health, and social services; Manufacturing; Retail
<i>Income</i>	
Per capita income	\$16,581
Median family income	\$39,364
Families below poverty	9.6%

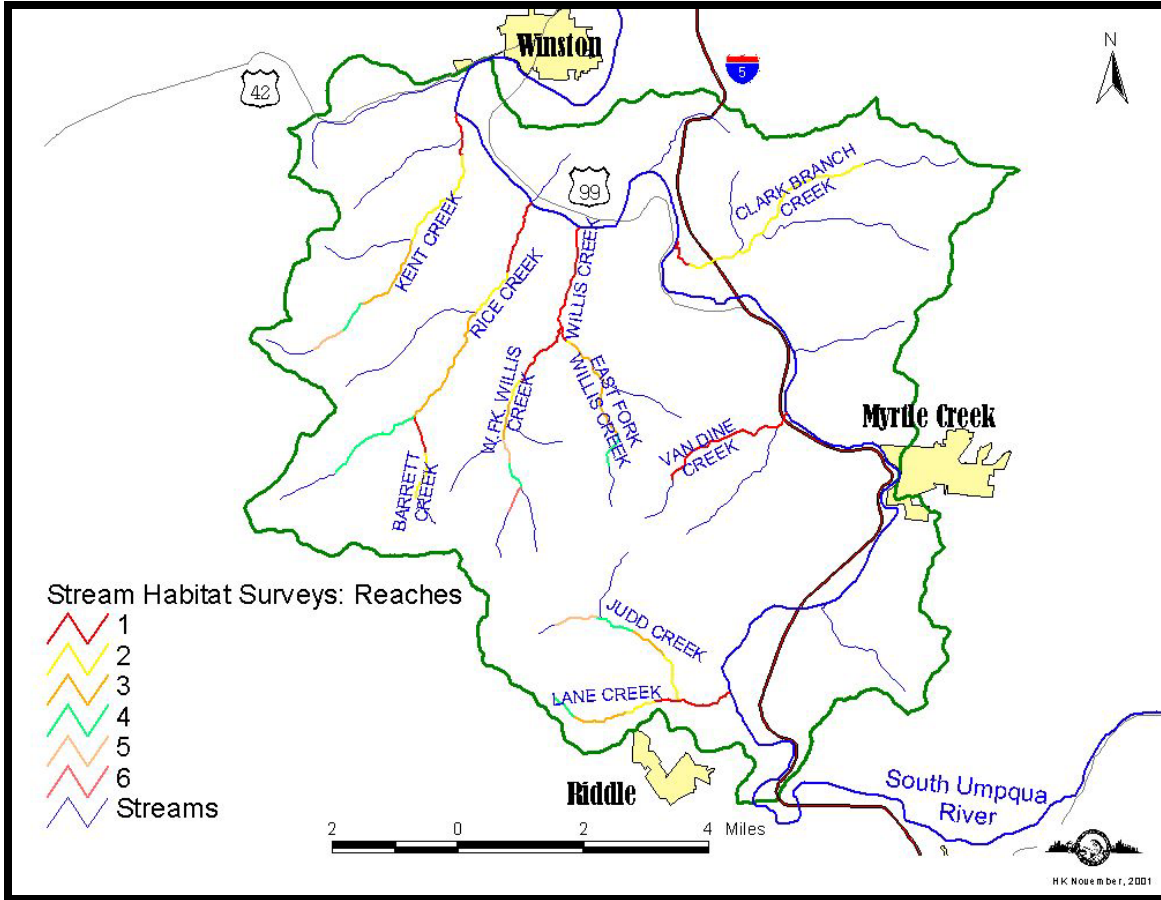
Appendix 3: 1968 streamflow and temperature measurements. ¹¹²

Stream	Location	Date	Degrees F.	Flow (cfs)
Kent Creek	0.1 mi. above mouth	5/1/68	51	1.2
		5/27/68	56	0.4
		6/27/68	--	Dry
		7/26/68	--	Dry
		9/3/68	--	Dry
		10/2/68	--	Dry
		11/3/68	48	1.0
		11/10/68	52	2.0
		11/12/68	50	20
Rice Creek	Mouth	5/1/68	52	2.0
		5/27/68	58	1.5
		6/27/68	65	0.3
		7/26/68	--	< 0.1
		9/3/68	67	0.1
		10/2/68	57	.03
		11/3/68	49	2.0
		11/10/68	53	7.6
		11/12/68	50	44
Willis Creek	0.4 mi. above mouth	5/1/68	52	2.0
		5/27/68	59	1.7
		6/27/68	65	0.1
		7/26/68	--	< 0.1
		9/3/68	--	0.1
		10/2/68	57	0.2
		11/10/68	54	13

¹¹² The information in the following table was taken from Lauman et al., 1972. This document is cited in section 2.6.

Appendix 4: Stream habitat surveys.

Stream reaches surveyed by the Oregon Department of Fish and Wildlife



Middle South Umpqua surveys

●●● = Good; ●● = Fair; ● = Poor

Stream highlighted in yellow are good or fair for all categories.

Stream	Reach	Pools	Riffles	Riparian Area	Large Woody Material
BARRETT CREEK	1	●	●●●	●●	●
BARRETT CREEK	2	●	●●●	●●	●
CLARK BRANCH CREEK	1	●	●	●	●
CLARK BRANCH CREEK	2	●	●	●	●
KENT CREEK	1	●	●	●	●
KENT CREEK	2	●	●	●●	●
KENT CREEK	3	●	●	●●	●
KENT CREEK	4	●	●●	●●	●
KENT CREEK	5	●	●	●●	●
RICE CREEK	1	●●	●●●	●●	●
RICE CREEK	2	●	●●●	●	●

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Stream	Reach	Pools	Riffles	Riparian Area	Large Woody Material
RICE CREEK	3	••	•••	•	•
RICE CREEK	4	•	•••	•	•
VAN DINE CREEK	1	•	•	•	•
W.FK. WILLIS CREEK	1	••	••	•	•
W.FK. WILLIS CREEK	2	•••	•	•	•
W.FK. WILLIS CREEK	3	••	••	•	•
W.FK. WILLIS CREEK	4	••	•	•	•
W.FK. WILLIS CREEK	5	••	•	•	•
W.FK. WILLIS CREEK	6	••	•••	••	•••
WILLIS CREEK	1	•	•	•	•
EAST FORK WILLIS CREEK	1	••	•	•	•
EAST FORK WILLIS CREEK	2	•	•	•	•
EAST FORK WILLIS CREEK	3	••	••	•	•
EAST FORK WILLIS CREEK	4	•	••	•	•
JUDD CREEK	1	•••	••	•	•
JUDD CREEK	2	••	••	•	•
JUDD CREEK	3	••	••	•	•
JUDD CREEK	4	••	••	••	••
JUDD CREEK	5	•	••	•••	••
LANE CREEK	1	•	•	•	•
LANE CREEK	2	•	•	••	•
LANE CREEK	3	•	••	••	•
LANE CREEK	4	•	•••	••	•

Appendix 5: Land use classifications for the ODFW stream habitat surveys.

The Oregon Department of Fish and Wildlife classified the land use for each reach surveyed within the Middle South Umpqua Watershed. All categories have been included below, even those not applicable to the Middle South Umpqua Watershed.

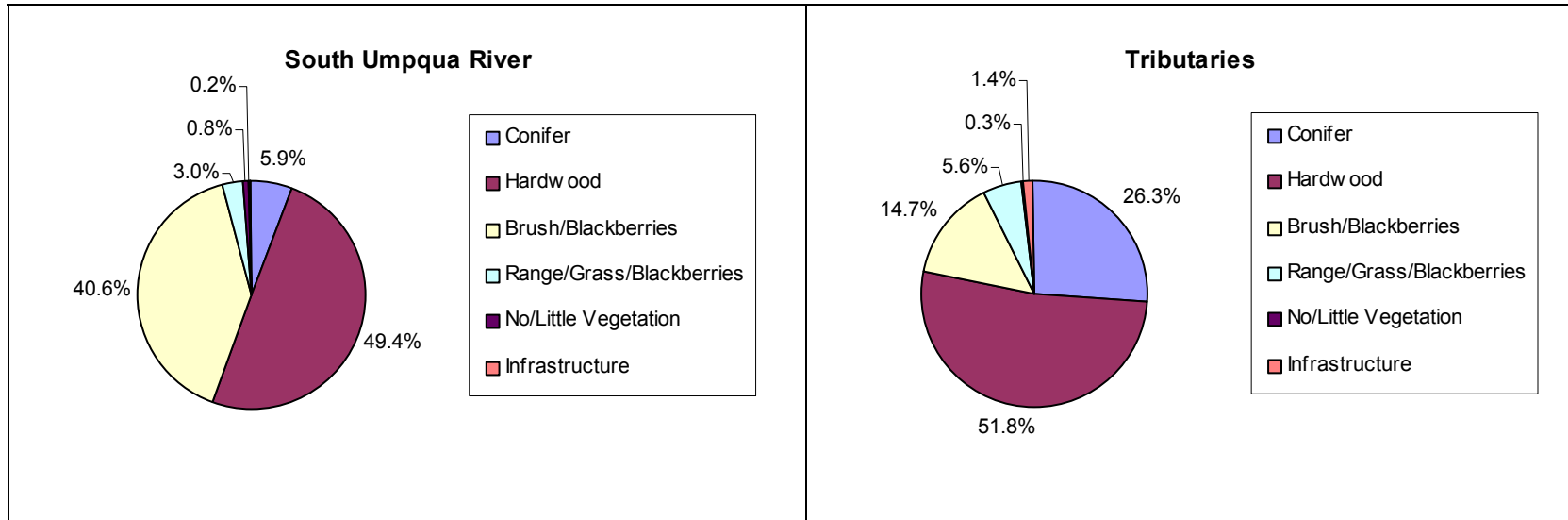
- AG Agricultural crop or dairy land.
- TH Timber harvest: active timber management including tree felling, logging, etc. Not yet replanted.
- YT Young forest trees: can range from recently planted harvest units to stands with trees up to 15 cm dbh.
- ST Second growth timber: trees 15-30 cm dbh within generally dense, rapidly growing, uniform stands.
- LT Large timber: 30 to 50 cm dbh.
- MT Mature timber: 50 to 90 cm dbh.
- OG Old growth forest: many trees with 90+ cm dbh and plant community with old growth characteristics.
- PT Partial cut timber: selection cut or shelterwood cut with partial removal of large trees. Combination of stumps and standing timber.
- FF Forest fire: evidence of recent charring and tree mortality.
- BK Bug kill: eastside forests with >60% mortality from pests and diseases.
- LG Light grazing pressure: grasses, forbs, and shrubs present. Banks not broken down, animal presence obvious only at limited points such as water crossing. Cow pies evident.
- HG Heavy grazing pressure: broken banks, well established cow paths. Primarily bare earth or early successional stages of grasses and forbs present.
- EX Exclosure: fenced area that excludes cattle from a portion of rangeland.
- UR Urban
- RR Rural residential
- IN Industrial
- MI Mining
- WL Wetland
- NU No use identified

Creek	Reach	Primary land use	Secondary land use
BARRETT CREEK	1	AG	-
BARRETT CREEK	2	ST	-
CLARK BRANCH CREEK	1	-	-
CLARK BRANCH CREEK	2	RR	AG
KENT CREEK	1	RR	LG
KENT CREEK	2	RR	TH
KENT CREEK	3	HG	ST
KENT CREEK	4	ST	YT
KENT CREEK	5	ST	YT

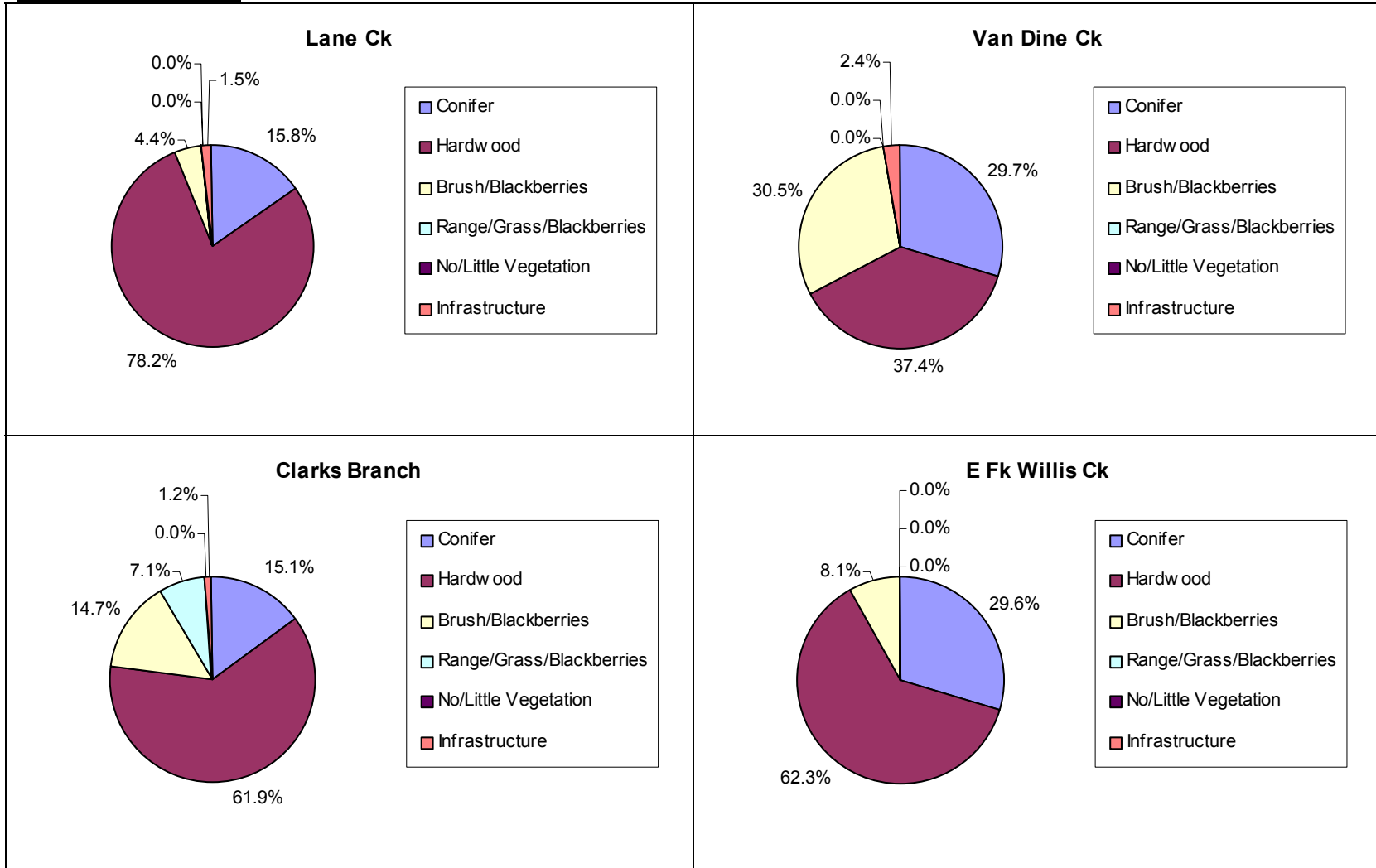
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Creek	Reach	Primary land use	Secondary land use
RICE CREEK	1	RR	-
RICE CREEK	2	AG	-
RICE CREEK	3	AG	-
RICE CREEK	4	AG	-
VAN DINE CREEK	1	AG	-
W.FK. WILLIS CREEK	1	AG	LG
W.FK. WILLIS CREEK	2	AG	LG
W.FK. WILLIS CREEK	3	AG	LG
W.FK. WILLIS CREEK	4	AG	LG
W.FK. WILLIS CREEK	5	ST	-
W.FK. WILLIS CREEK	6	ST	LT
WILLIS CREEK	1	AG	HG
EAST FORK WILLIS CREEK	1	AG	HG
EAST FORK WILLIS CREEK	2	-	-
EAST FORK WILLIS CREEK	3	AG	LG
EAST FORK WILLIS CREEK	4	ST	-
JUDD CREEK	1	IN	RR
JUDD CREEK	2	YT	-
JUDD CREEK	3	YT	-
JUDD CREEK	4	ST	-
JUDD CREEK	5	LT	YT
LANE CREEK	1	HG	RR
LANE CREEK	2	HG	ST
LANE CREEK	3	HG	ST
LANE CREEK	4	ST	MT

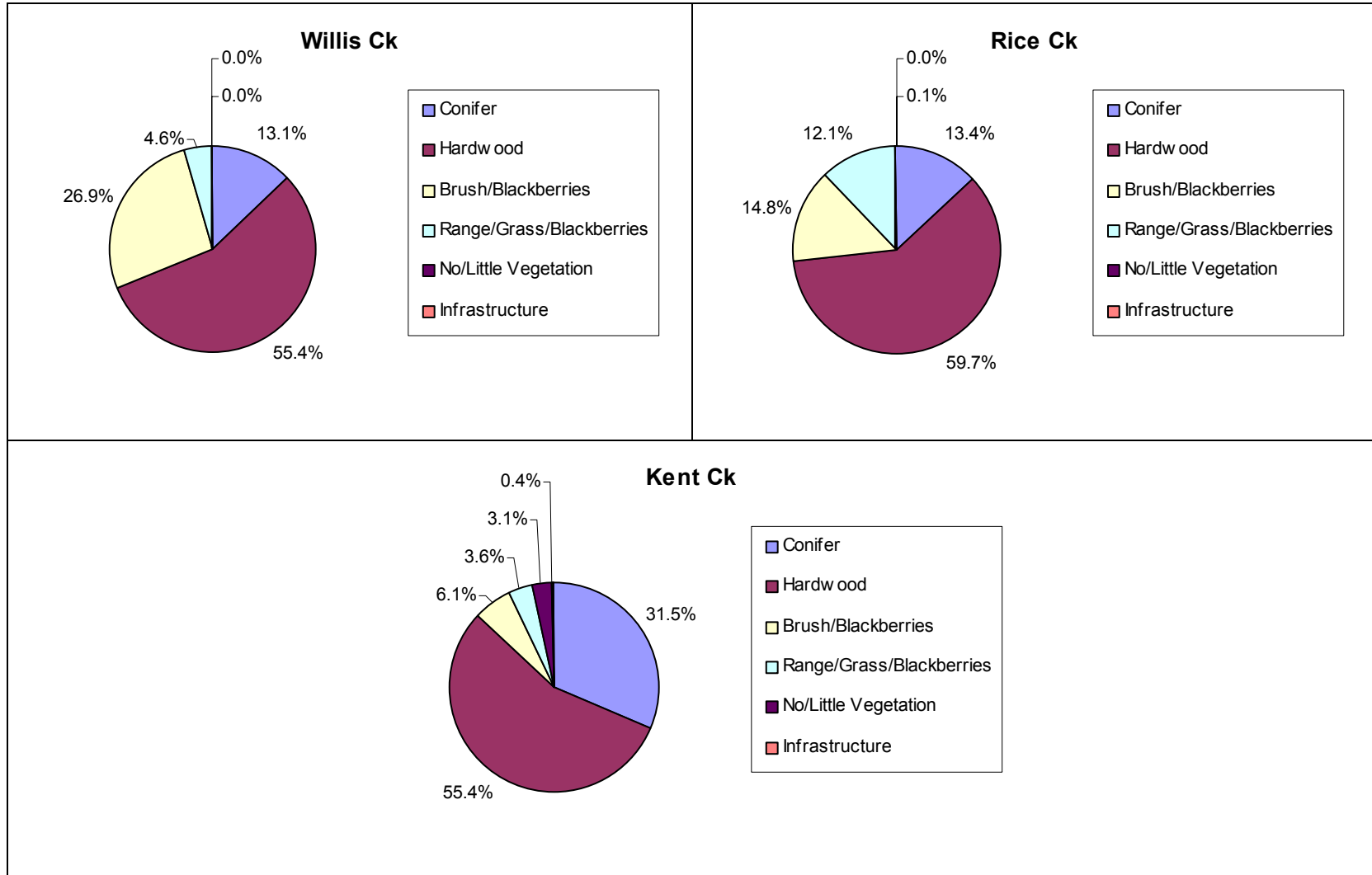
Appendix 6: Riparian vegetation and features.



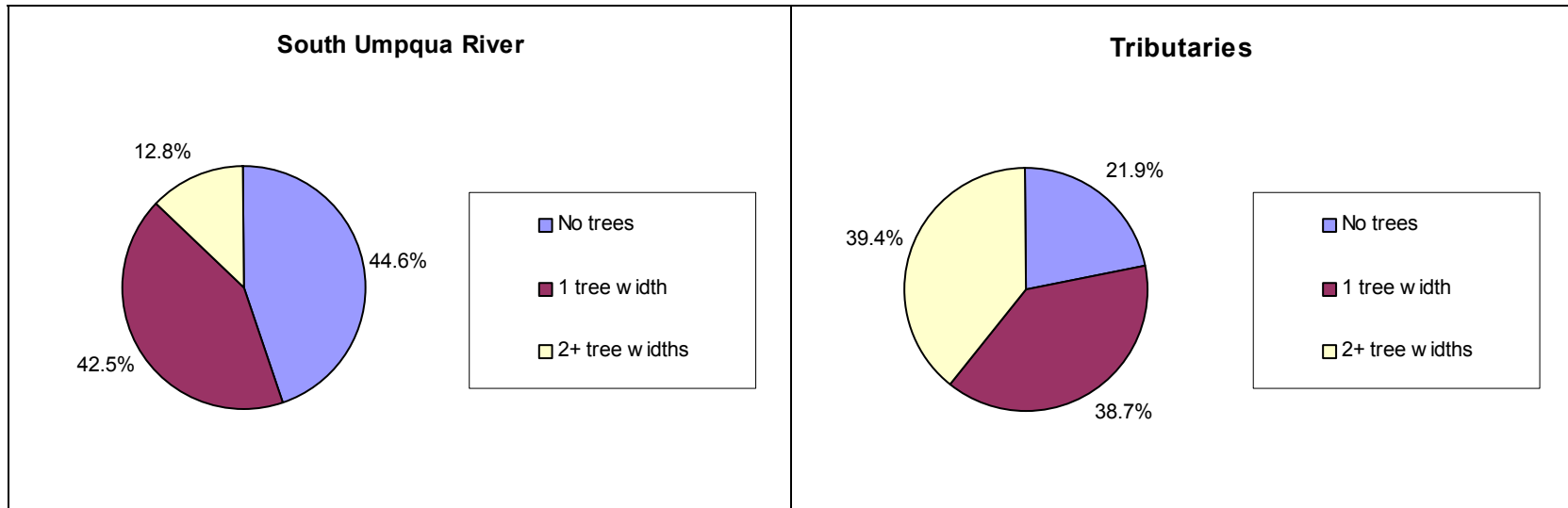
Individual tributaries



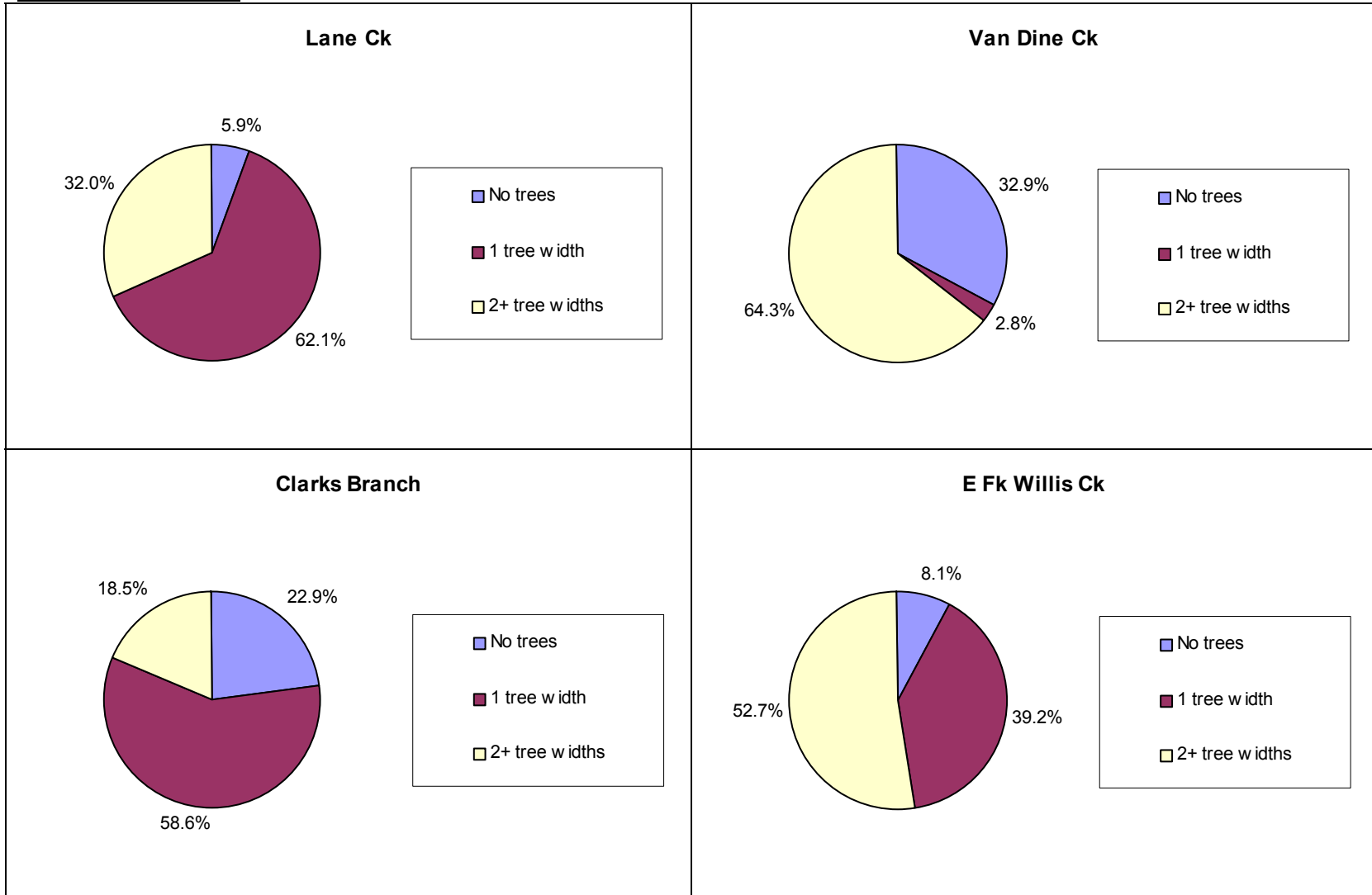
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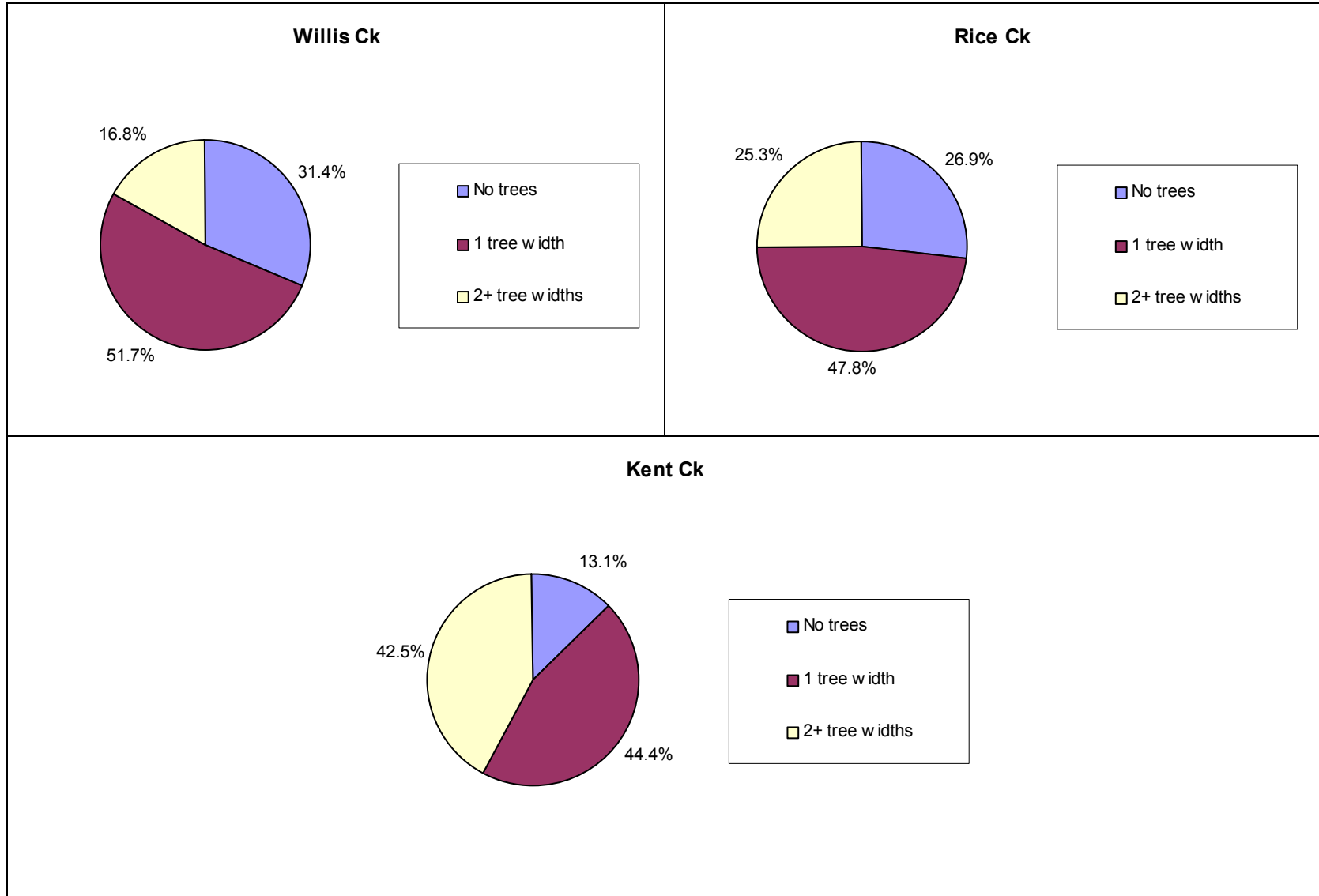
Appendix 7: Riparian buffer width.



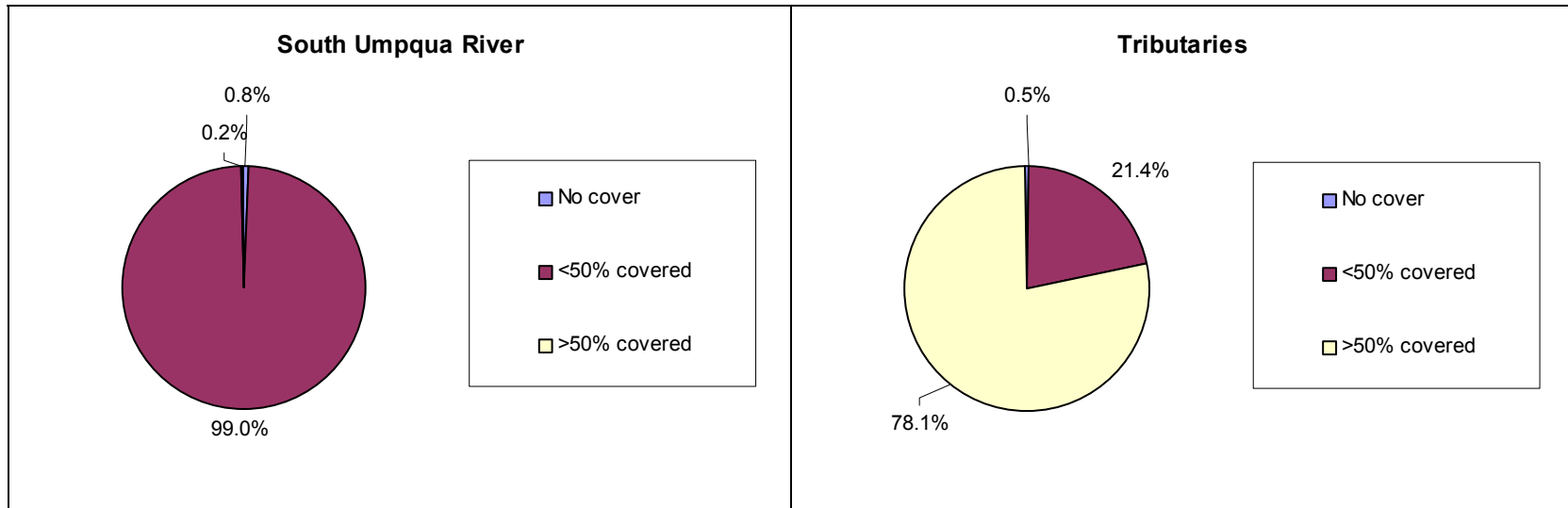
Individual tributaries



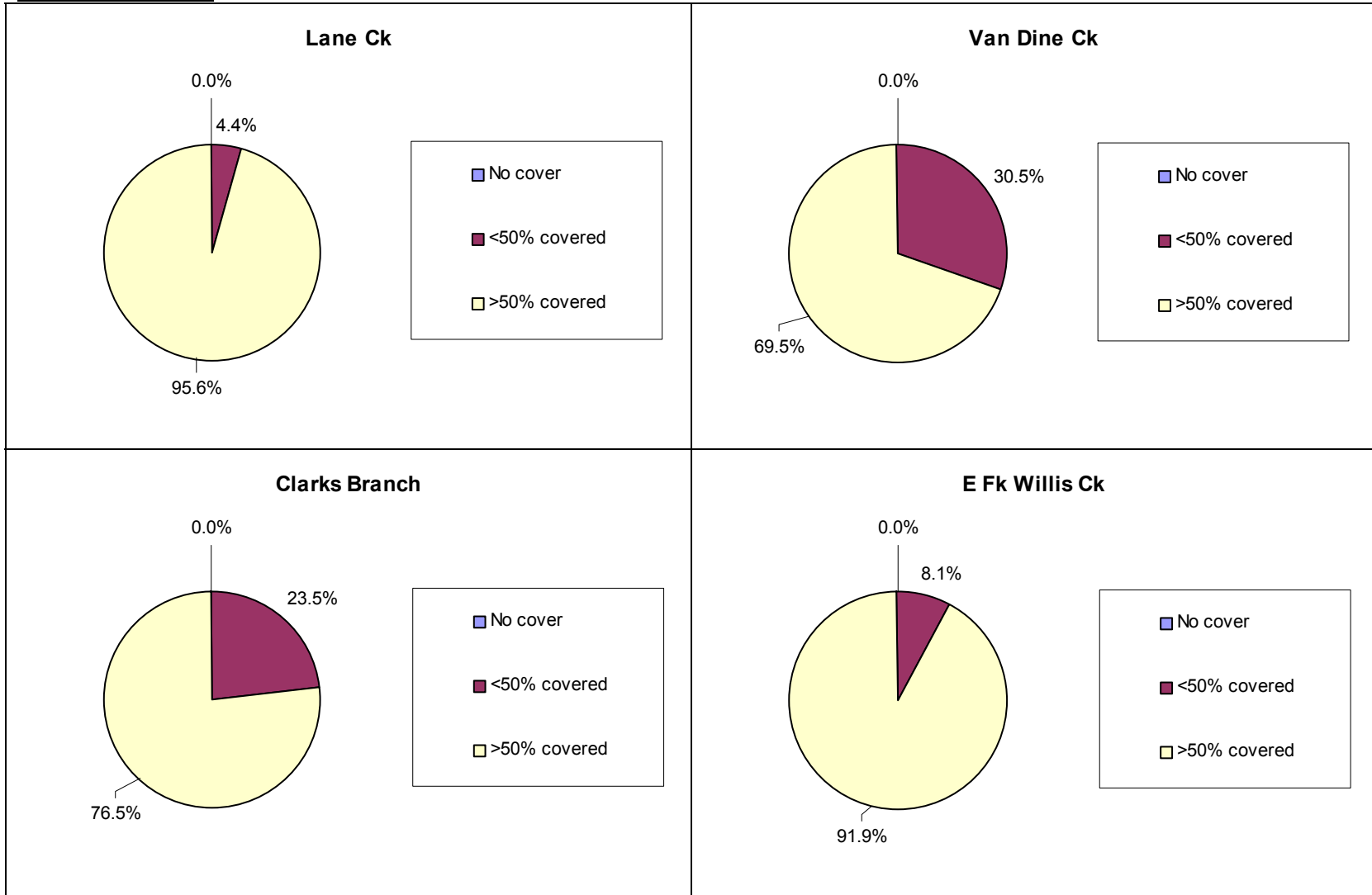
UBWC Middle South Umpqua Watershed Assessment and Action Plan



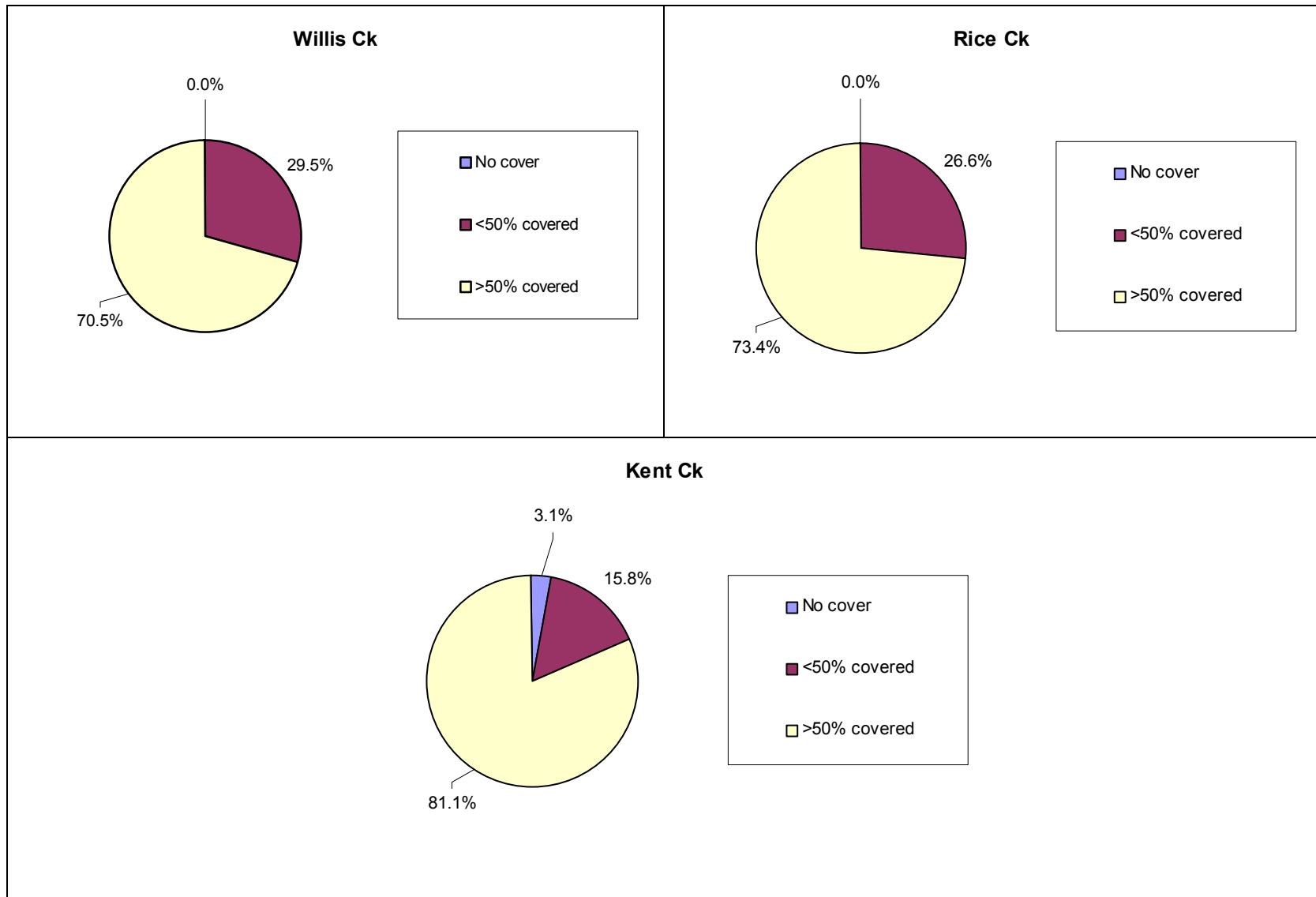
Appendix 8: Riparian cover.



Individual streams

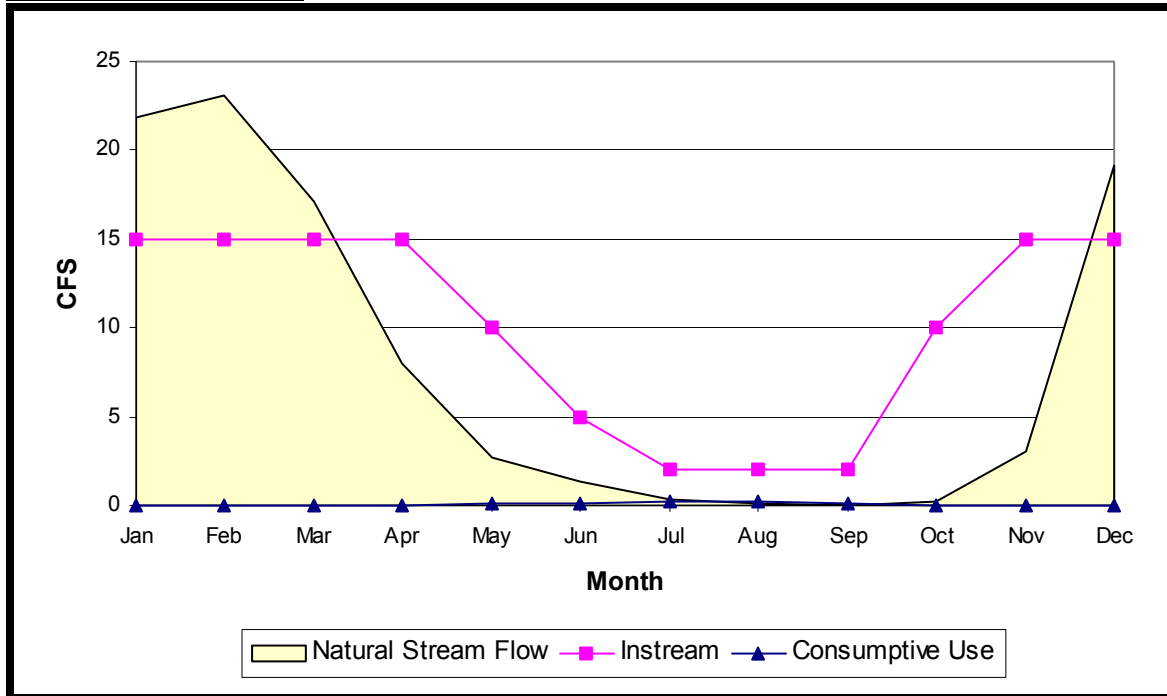


UBWC Middle South Umpqua Watershed Assessment and Action Plan

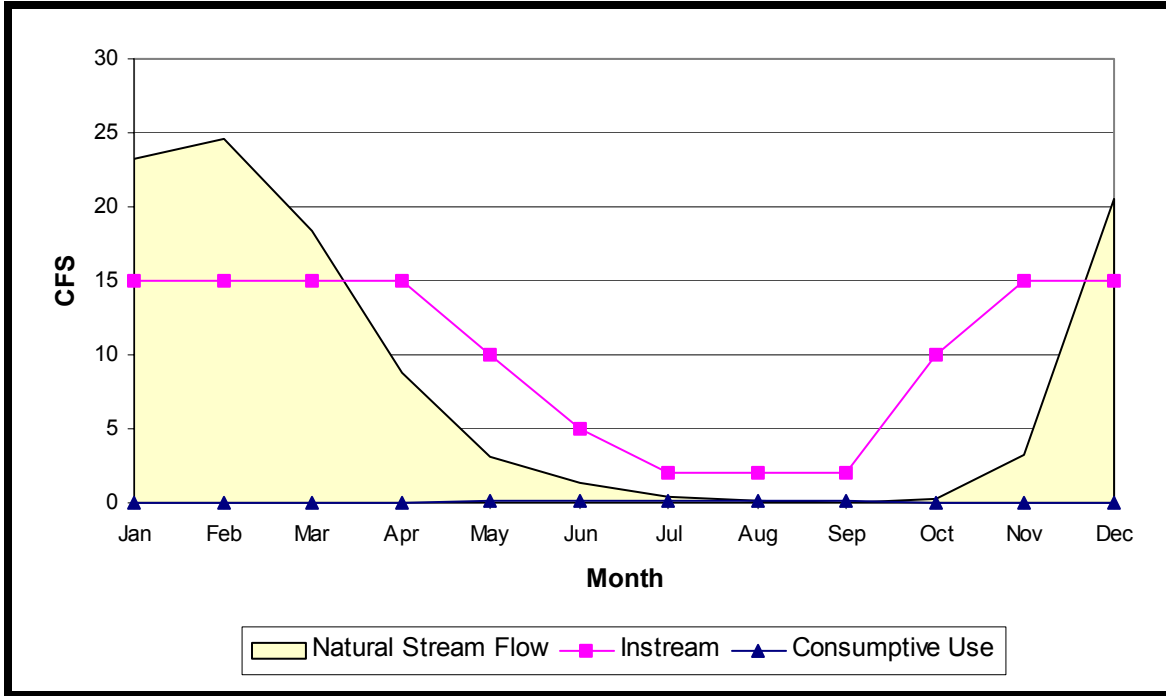


Appendix 9: Water availability graphs

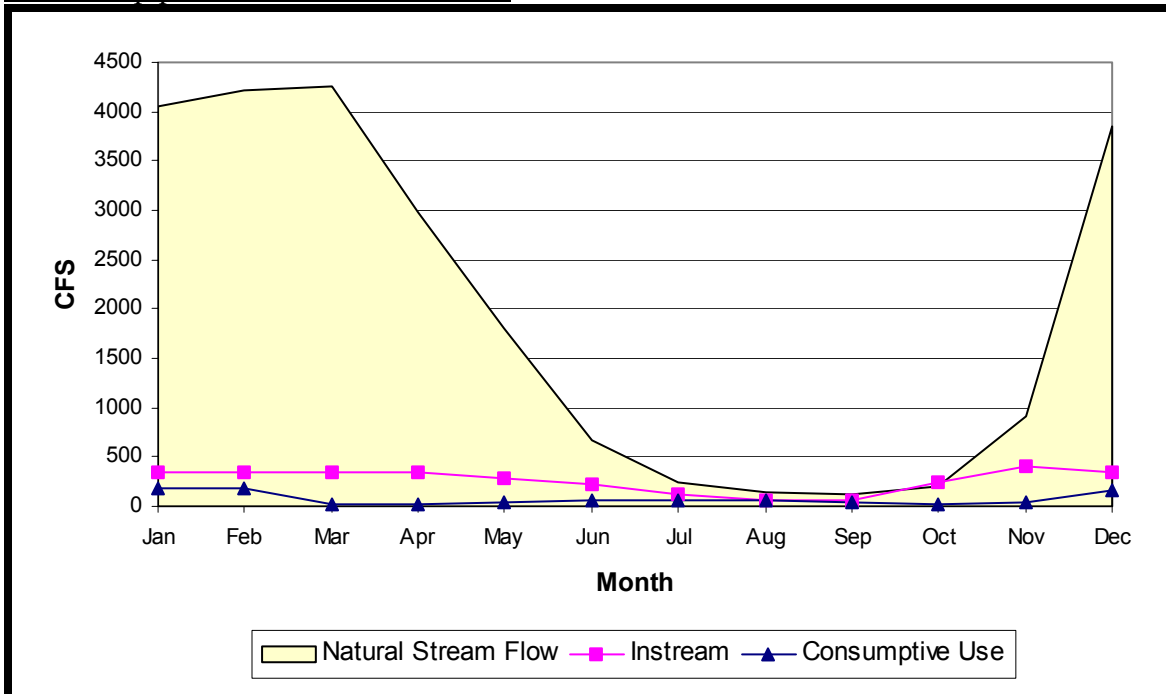
Rice Creek WAB #345



Willis Creek WAB #375



South Umpqua River WAB #31630218



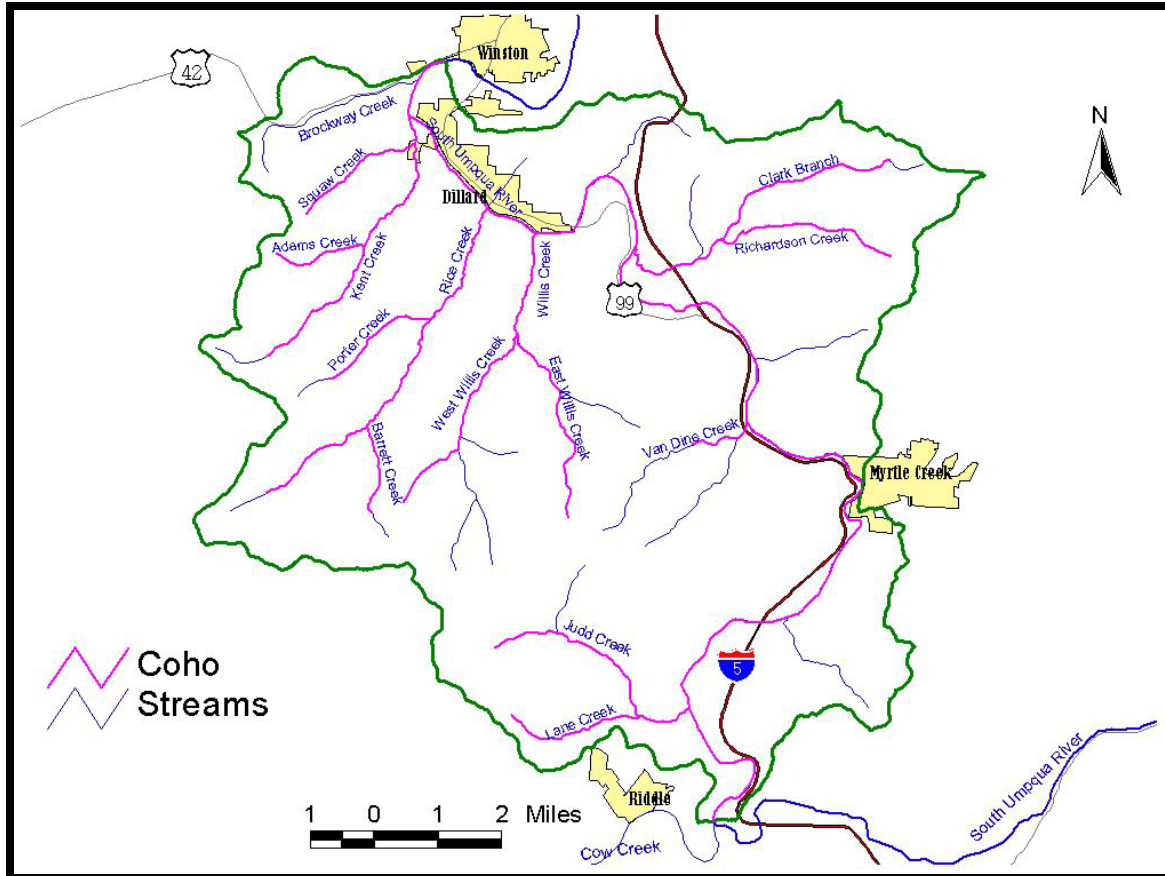
Appendix 10: Water use categories.

There are eight general water use categories in the Middle South Umpqua Watershed. The table below lists the Oregon Water Resources Department uses that are included in each category. Not all uses occur in the Middle South Umpqua Watershed.

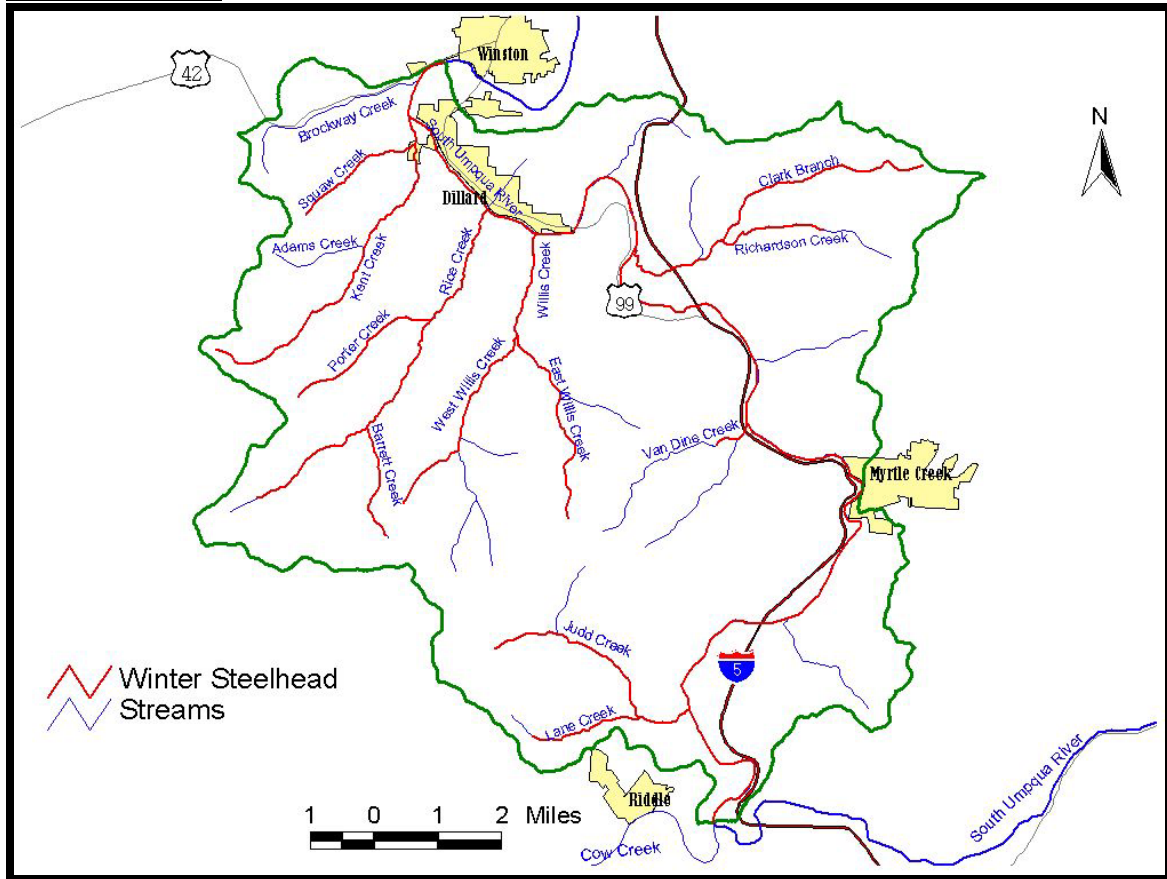
Irrigation	Industrial	Domestic
Primary and supplemental Irrigation	Geothermal	Domestic
Supplemental Cranberries	Manufacturing	Lawn and garden
Irrigation, domestic & stock	Sawmill	Non-commercial
Irrigation & domestic	Shop	Stock
Irrigation & stock	Log deck	Group domestic
	Commercial	Restroom
	Laboratory	School
Fish and Wildlife	Municipal	Recreation
Aquaculture	Municipal	Campground
Fish	Quasi-municipal	Recreation
Wildlife		School
Agriculture	Miscellaneous	
Agriculture	Air conditioning	
Cranberry harvest	Aesthetic	
Flood harvesting	Forest management	
All cranberry uses	Fire protection	
Temperature control	Groundwater recharge	
Dairy barn	Pollution abatement	
Frost protection	Road construction	
Greenhouse	Storage	
Mint still		
Nursery use		

Appendix 11: Middle South Umpqua Watershed anadromous salmonid distribution by species.

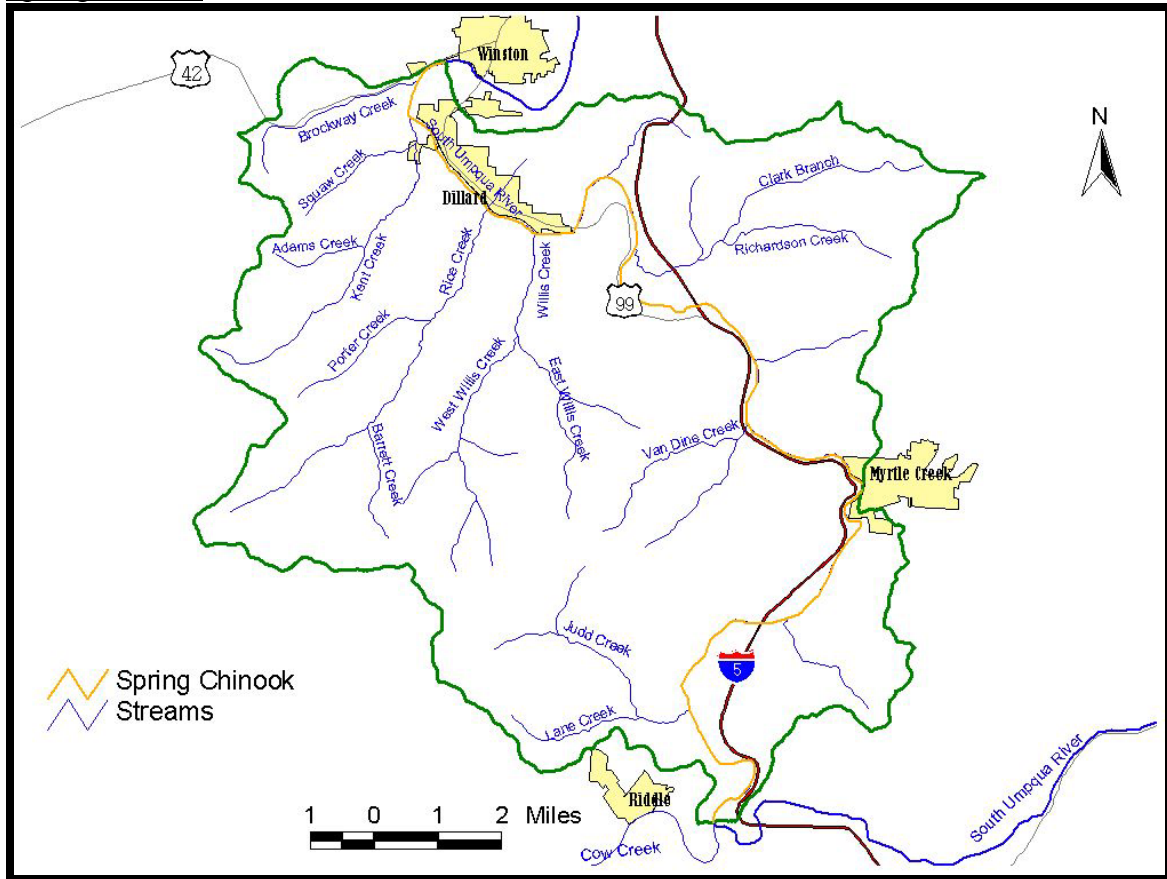
Coho



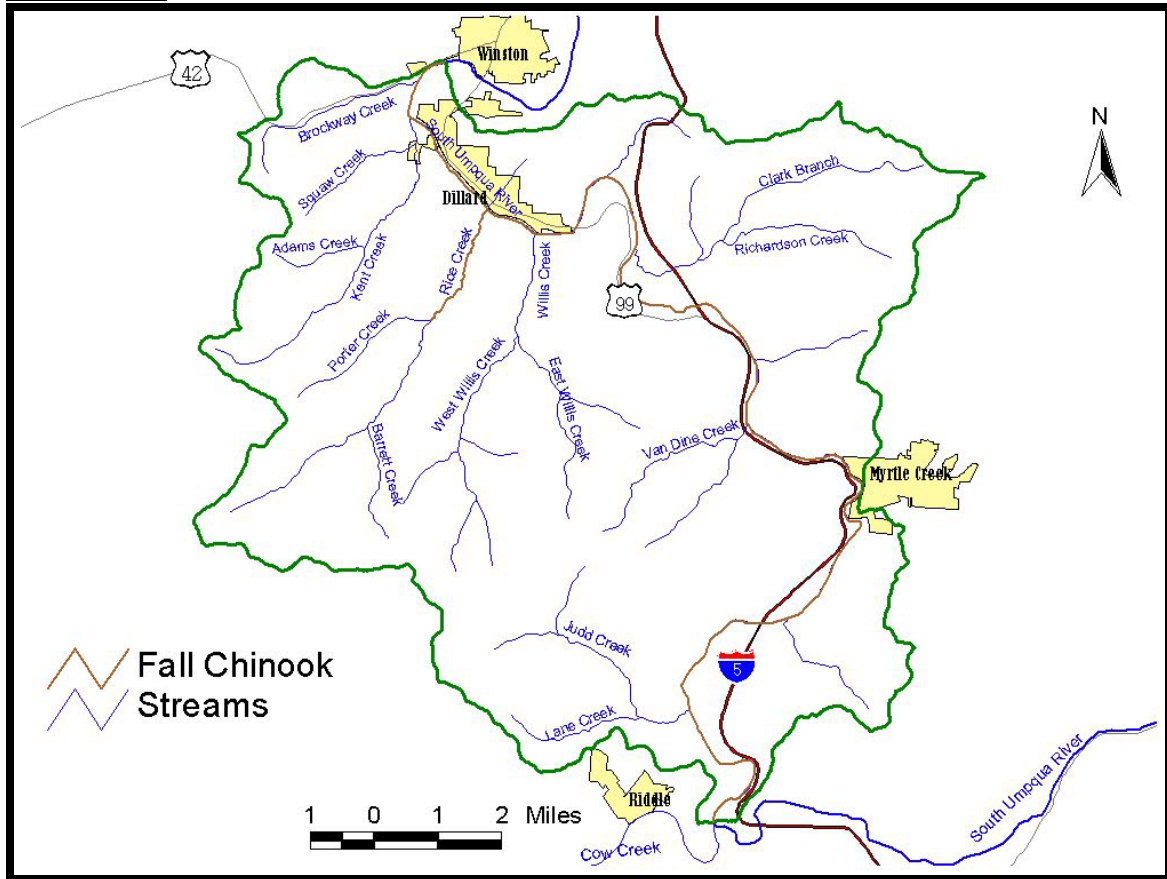
Winter steelhead



Spring chinook



Fall chinook



Acknowledgements

This assessment would not have been possible without the help of community volunteers. I am very grateful to the landowners, residents, and UBWC directors and members who attended the monthly watershed assessment meetings and offered their critical review and insight. Their input and participation was invaluable.

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 - Dave Williams, OWRD;
 - Kent Smith, InSight Consultants;
 - Sam Dunnavant, ODFW; and
 - Walter Gayner, Douglas Soil and Water Conservation District.

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