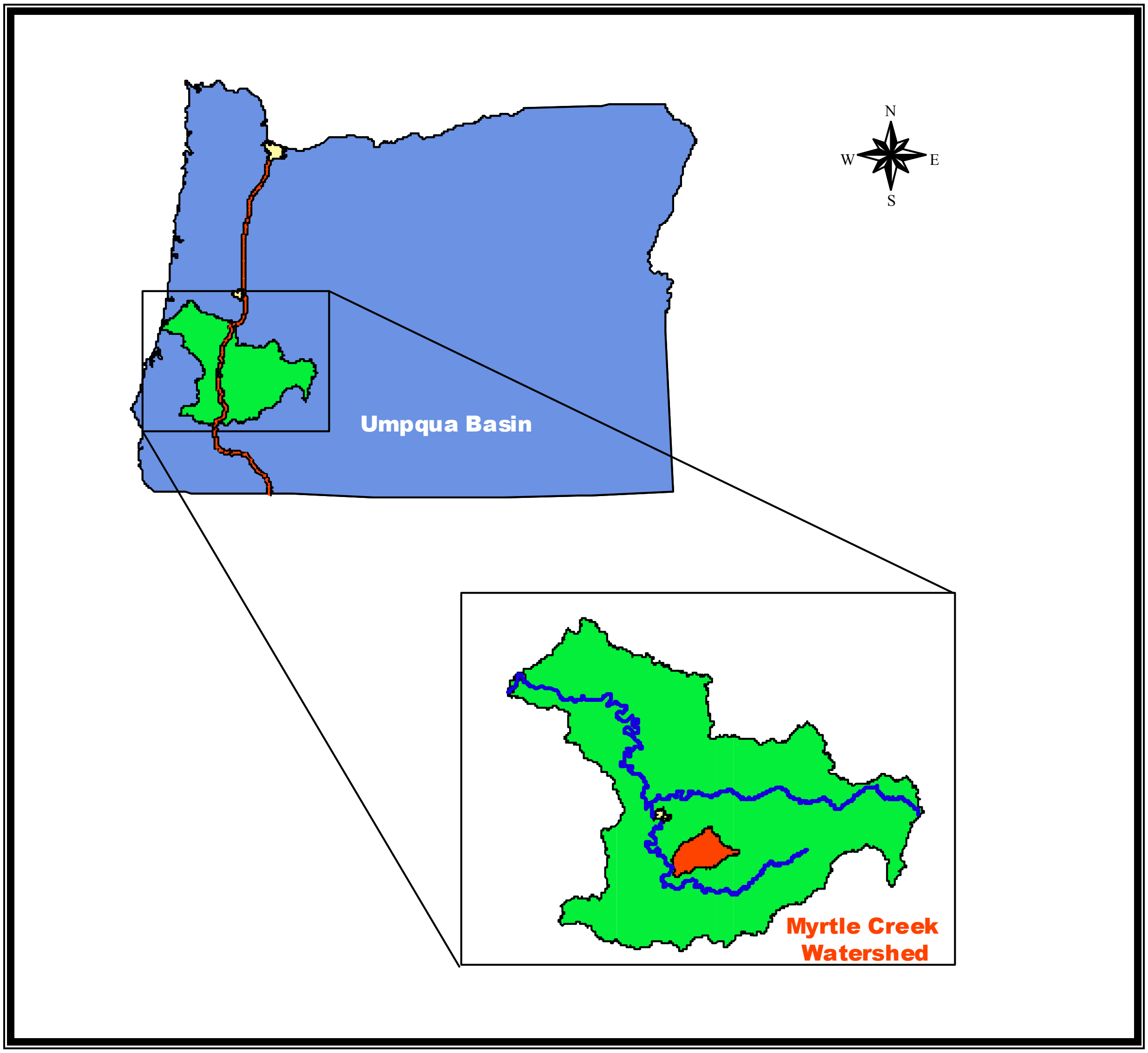
Myrtle Creek

Watershed Assessment and Action Plan



Prepared by Nancy A. Geyer for the

Umpqua Basin Watershed Council

June, 2003

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Acronym List

BLM	Bureau of Land Management
Cfs	Cubic feet per second
DFPA	Douglas Forest Protective Association
GIS	Geographic information systems
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 Myrtle Creek Watershed in terms of fish habitat and water quality.

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[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 were compiled from the following documents: the *Oregon Watershed Assessment Manual* (Watershed Professionals Network, 1999), the *Draft Myrtle Creek Watershed Analysis* (USDI Bureau of Land Management, 2002), 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 Myrtle Creek Watershed and what are its defining characteristics?
- What are the demographic, educational, and economic characteristics of Myrtle Creek 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 Myrtle Creek Watershed assessment has two goals:

1) To describe the past, present, and potential future conditions that affect water quality and fish habitat within the Myrtle Creek 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 that 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 Myrtle Creek 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 Myrtle Creek 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 Myrtle Creek Watershed and offer comments and suggestions for improvement.

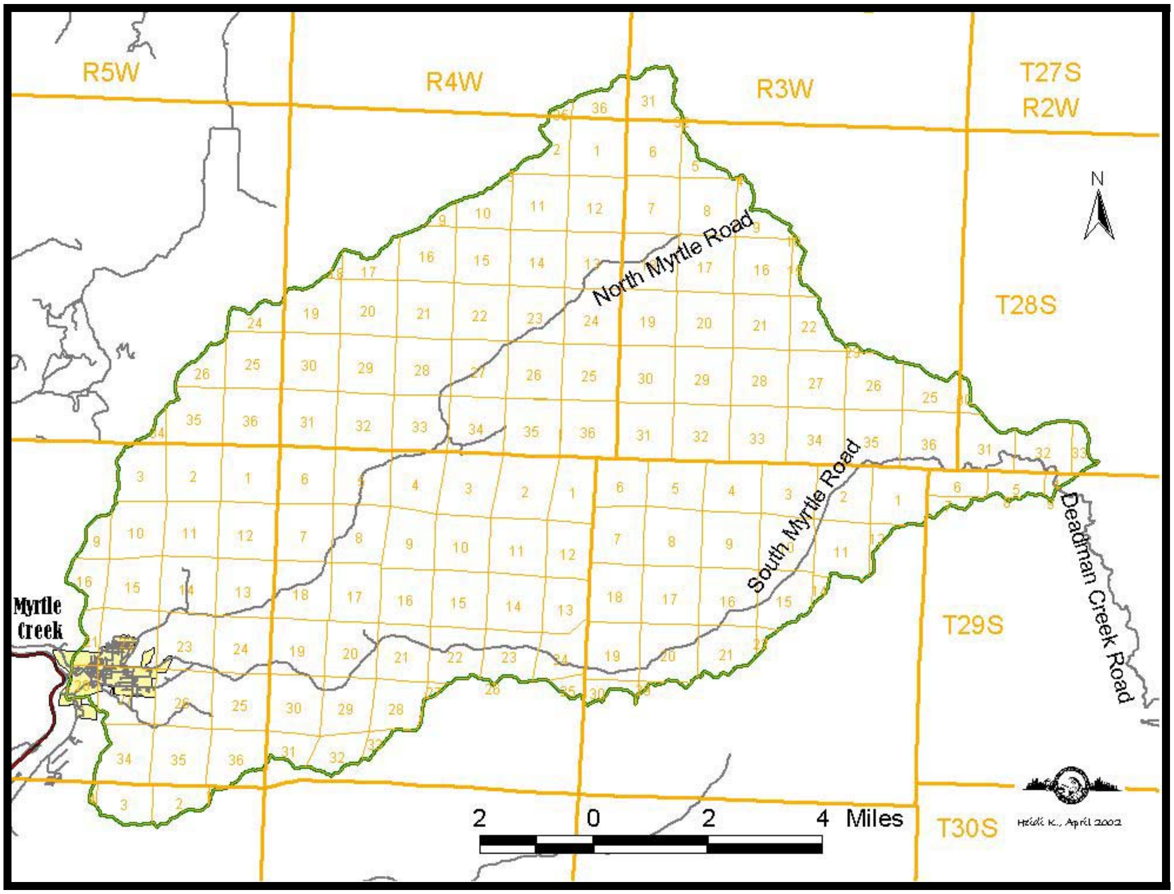
The Myrtle Creek Stakeholders' Group met once a month from April, 2002 to December, 2002 at the City of Myrtle Creek council chambers. A total of 42 people attended one or more meetings, with an average of nine participants at each meeting. Meeting participants included farmers and ranchers, family forestland owners, industrial timber company employees, city residents, city officials, and Bureau of Land Management personnel.

1.2 Watershed description

1.2.1 Location, size, and major features

The Myrtle Creek fifth-field watershed is located in Douglas County, Oregon, and is 76,322.3 acres (see Map 1-1). The watershed stretches a maximum of 10.8 miles north to south and 17.2 miles east to west. There are no highways within the watershed, and the only population center is the City of Myrtle Creek.

[3] Unless otherwise indicated, the Umpqua Basin Watershed Council developed all text, tables, maps, and figures.



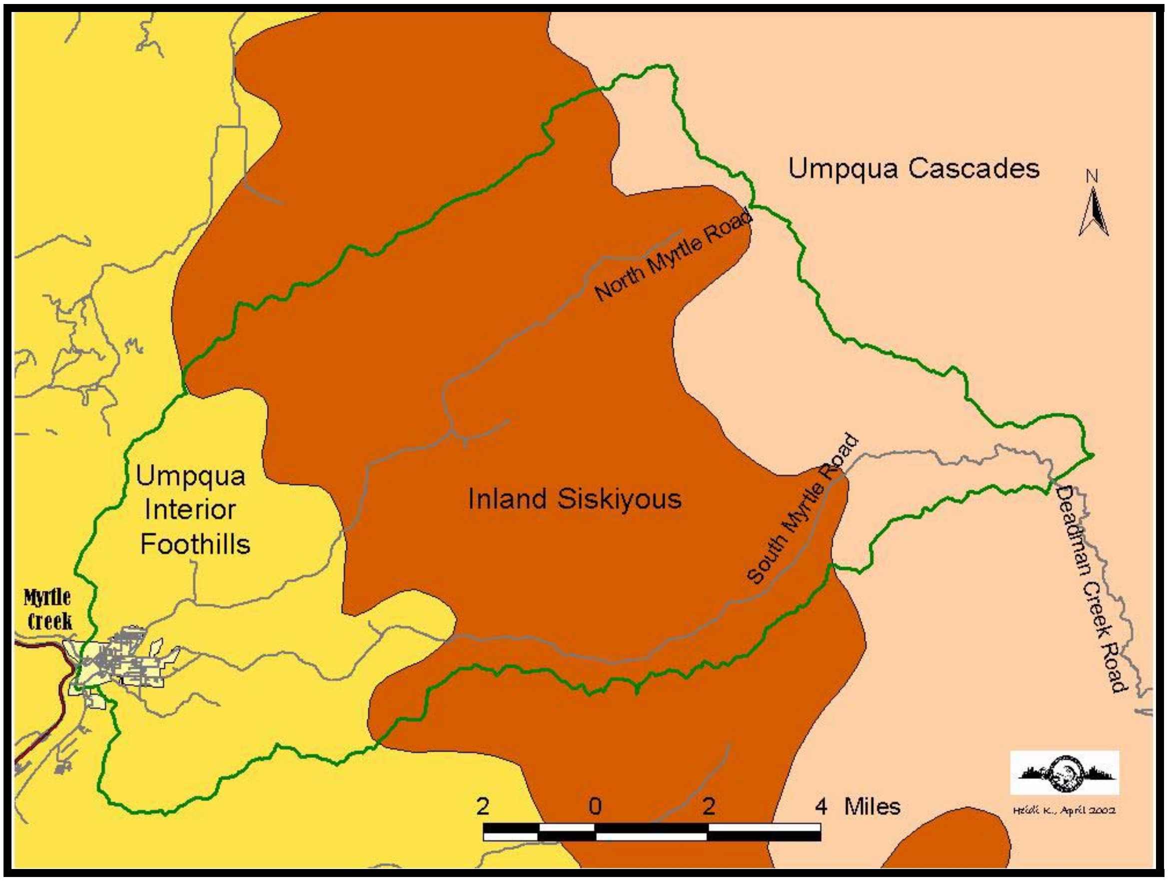
Map 1-1: Location of the Myrtle Creek Watershed.

1.2.2 Ecoregions

Ecoregions are areas with similar type, quality, and quantity of environmental resources, including landscape, climate, vegetation, and human use.[4] 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 three unique areas in the Myrtle Creek Watershed. In some cases, ecoregion information is used to supplement other data.

Map 1-2 and Table 1-1 show the Myrtle Creek Watershed's location, acres, and percent within each ecoregion. The southwestern-most portion of the watershed is within the Umpqua Interior Foothills Ecoregion. The majority of the watershed (57.3%) falls within the Inland Siskiyous Ecoregion. The eastern-most portion of the watershed is part of the Umpqua Cascades Ecoregion.

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



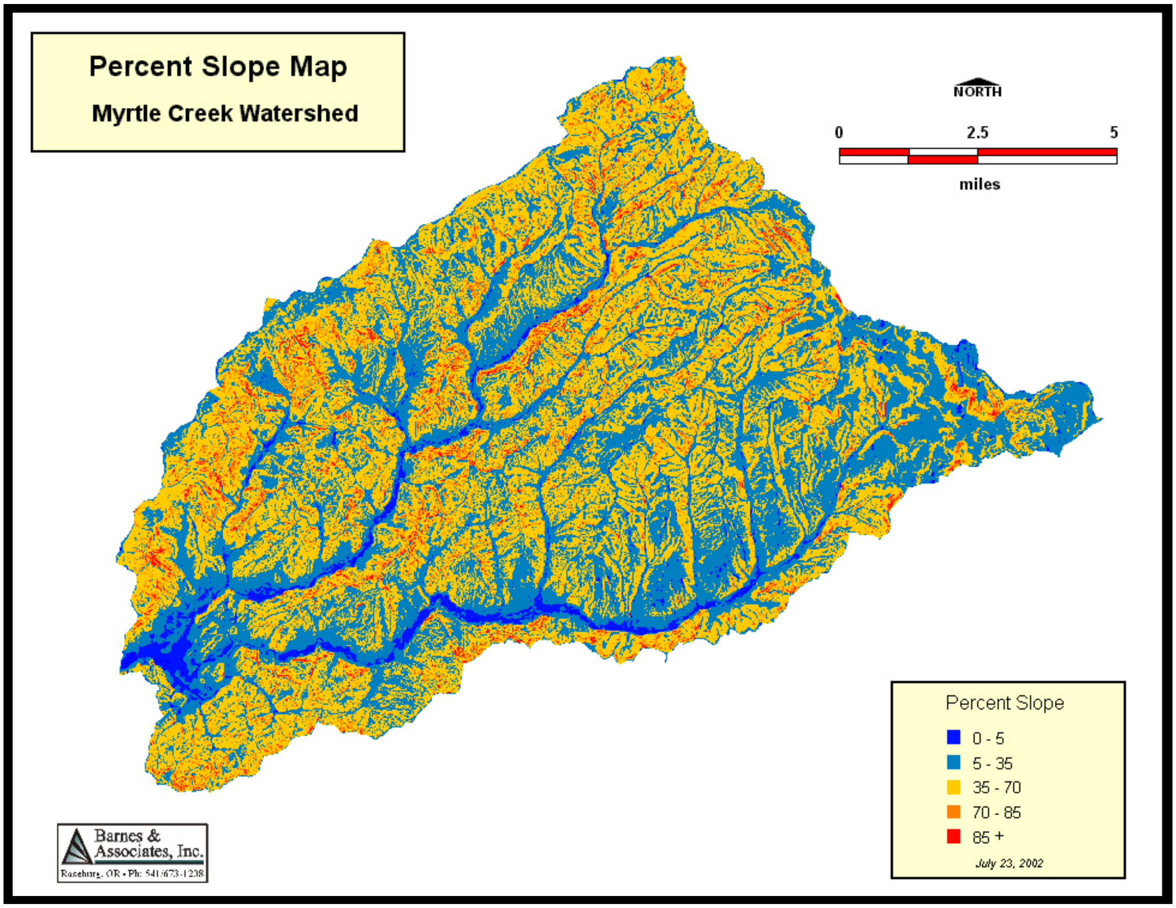
Map 1-2: Ecoregions of the Myrtle Creek Watershed.

Ecoregion	Acres	Percent of total
Umpqua Interior Foothills	18,755.4	24.6%
Inland Siskiyous	43,723.2	57.3%
Umpqua Cascades	13,843.8	18.1%
Total	76,322.4	100.0%

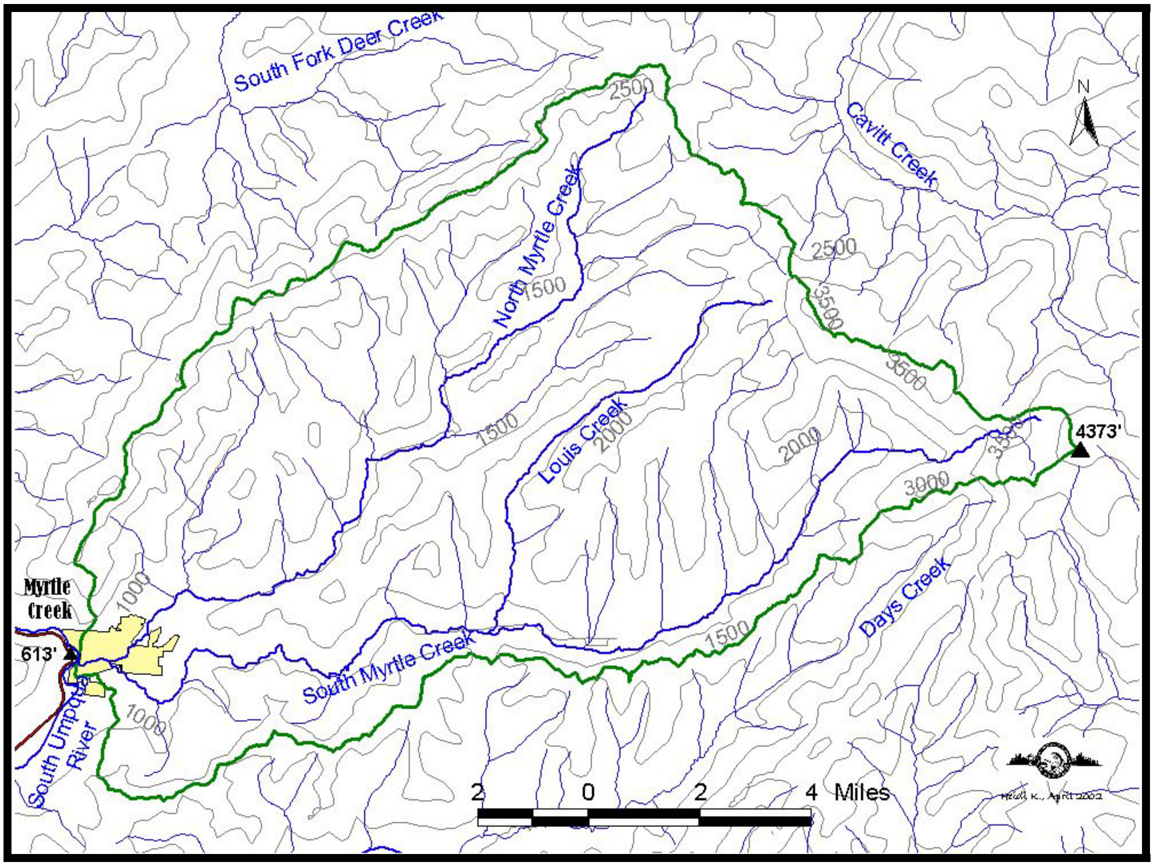
Table 1-1: Acres and percent of the Myrtle Creek Watershed within each ecoregion.

1.2.3 Slope, elevation, and topography

Gentle to moderate slopes characterize the Umpqua Interior Foothills Ecoregion (see Map 1-3). Elevation for most of the watershed ranges from 700 to 1,000 feet. The lowest point in the watershed is 572 feet where Myrtle Creek meets the South Umpqua River in the southwest, and the highest point is 4,486 feet at Deadman Mountain on the southeastern border of the Cascades (see Map 1-4).



Map 1-3: Percent slope for the Myrtle Creek Watershed.



Map 1-4: Elevation of the Myrtle Creek Watershed with highest and lowest points.

The overall orientation of geologic units within the watershed forms a distinctly northeast-southwest pattern, and each unit is offset from the one adjacent to it by a thrust fault. A thrust fault is a tensional fault with the plane of slippage dipping toward the down-thrown block. These major fault blocks have subsequently been broken up by a smaller set of faults running perpendicular and trending in a northwest-southeasterly direction. The streams within the Myrtle Creek Watershed do not appear to be greatly influenced by the fault system in terms of channel location, gradient, or direction of flow. Photo 1-1 illustrates the major fault system within the watershed. Appendix 1 provides a complete geologic overview of the Myrtle Creek Watershed.[5]

[5] Tim Grubert and John Runyon of BioSystems, Inc., contributed this paragraph.

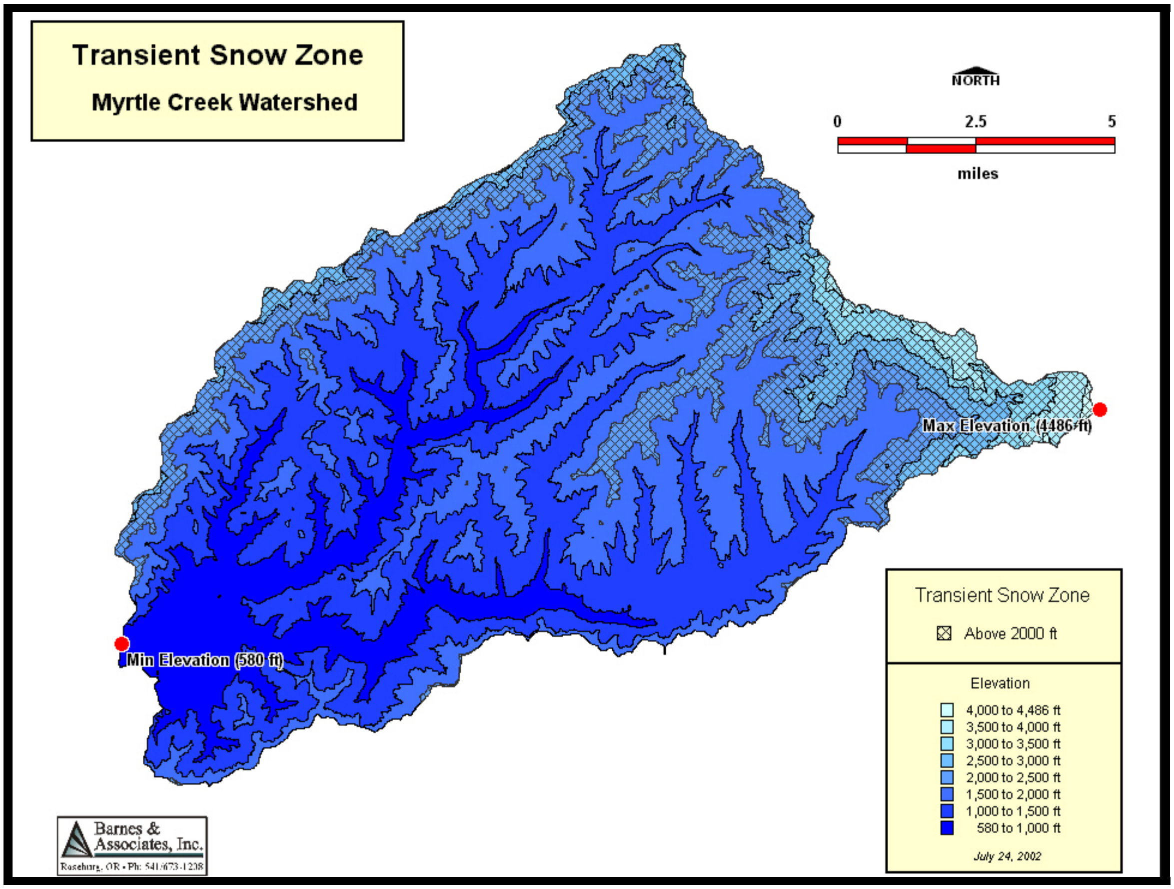
Photo 1-1: Photo illustrating wide flood plain of South Myrtle Creek, a low gradient deposition channel. UTM coordinates 489469/47644.[6]

1.2.4 Climate

The Umpqua Interior Foothills Ecoregion has a Mediterranean climate, with warm to hot, dry, summers. Precipitation averages 38.2 inches annually. Most precipitation occurs in the winter months, averaging 5.8 inches per month from November through January and averaging 0.8 inches per month from June through August.[7] The western mountains and foothills receive from 40 to 55 inches of annual precipitation. Precipitation is usually in the form of rain, with snow occurring in the eastern mountains. Approximately 22% of the Myrtle Creek Watershed is greater than 2,000 feet in elevation (see Map 1-5). 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.

[6] Tim Grubert and John Runyon of BioSystems, Inc., contributed this photograph.

[7] Precipitation data are from the Myrtle Creek and Tri City Wastewater Treatment Plant records from 1977 through 2000. The plant is located on the southwestern border of the watershed near Myrtle Creek's confluence with the South Umpqua River.



Map 1-5: Transient snow zone in the Myrtle Creek Watershed.[8]

Figure 1-1 shows the average low and high air temperature for the Myrtle Creek and Tri City wastewater treatment plant from 1997 through 2000. The average high and low temperatures in January are about 36°F and 49°F, respectively. In July, the average high and low temperatures are about 54°F and 81°F, respectively. According to ecoregion information, the lower elevations remain frost-free for approximately 120 to 180 days per year, while the higher eastern elevations are frost-free for around 80 to 180 days per year.

[8] The lowest point on this map is different than shown on Map 1-4, which is due to slight variations in the computer technology used to generate the maps.

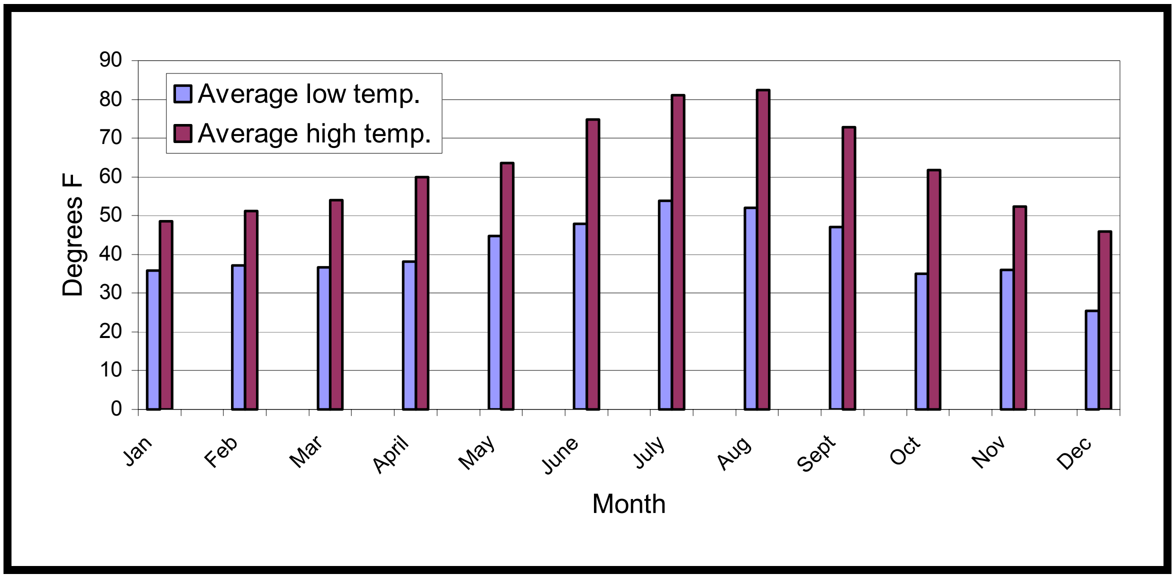


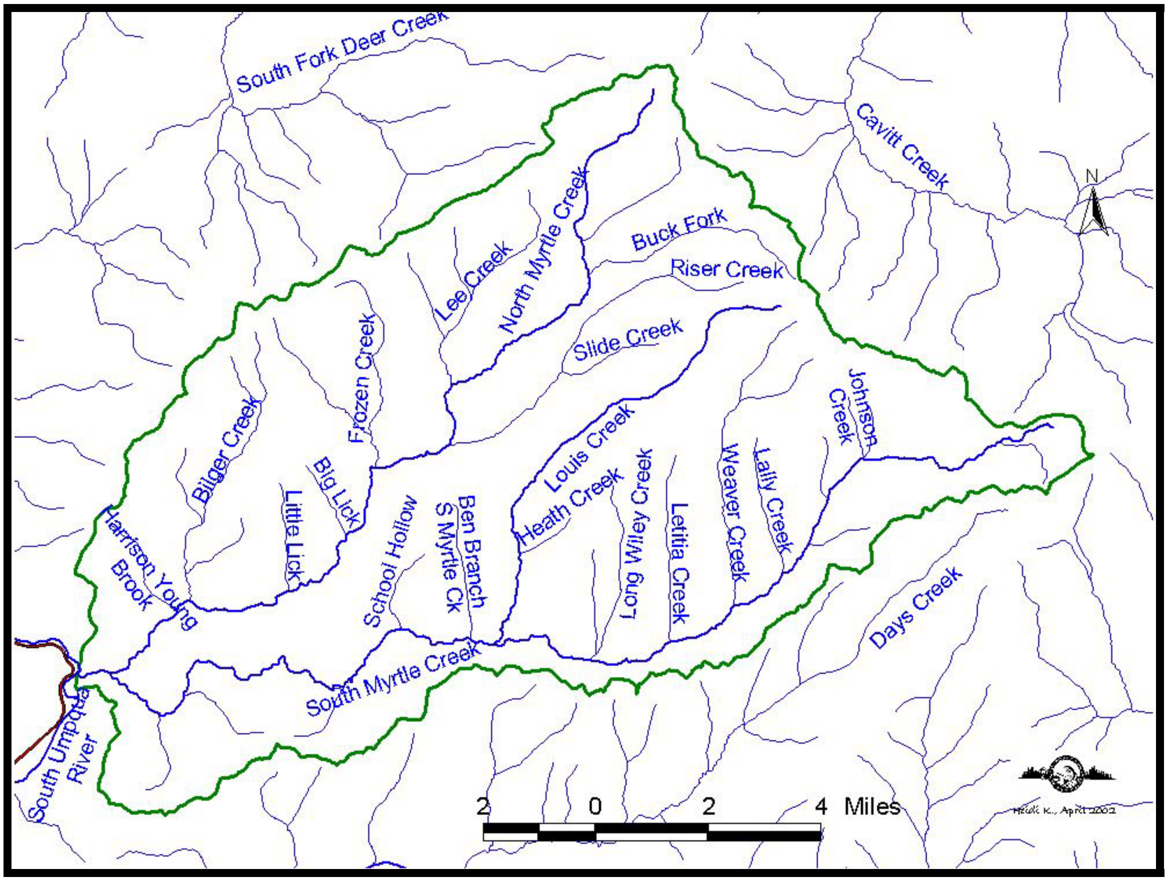
Figure 1-1: Average low and high air temperature for the Myrtle Creek and Tri City wastewater treatment plant (1997 through 2000).

1.2.5 The Myrtle Creek Watershed stream network

Map 1-6 shows all of Myrtle Creek's tributaries that are visible on a US Geological Survey 100,000 resolution map (131.5 total stream miles).[9,10] Myrtle Creek is a tributary of the South Umpqua River. Myrtle Creek flows 0.7 miles from the confluence of its two main tributaries to the South Umpqua River. North Myrtle Creek is 17.7 miles from the headwater to its confluence with South Myrtle Creek. South Myrtle Creek is 22.2 miles long.

[9] On a map of this resolution, one inch equals 8,333.3 feet

[10] Stream miles measure distance from the mouth by 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.



Map 1-6: Major streams of the Myrtle Creek Watershed.[11]

1.2.6 Vegetation

In the Umpqua Interior Foothills Ecoregion, valley bottoms have been converted from native prairie and savanna to urban and rural residential areas, agriculture lands, and grazing lands. Where the soil is favorable and there is sufficient moisture, the uplands support Douglas-fir, madrone, bigleaf maple, California black oak, incense cedar, and Oregon white oak. Where soils are drier, madrone and oaks are the dominant species, with some Douglas-fir, ponderosa pine, and incense cedar. Invasive species such as Himalayan blackberry and Scotch broom are common.

In the higher elevation Inland Siskiyous Ecoregion, Douglas-fir is dominant, with grand fir and white fir on northern aspects but minor or absent on southern aspects. Bigleaf maple, western redcedar, and incense cedar are also present. Hemlock and California black oak can be found where conditions are favorable. Northern aspects favor golden chinquapin, while madrone is prominent on south-facing slopes. For both aspects, the understory consists of salal, Oregon grape, western hazel, ocean spray, and red

[11] Myrtle Creek Watershed landowners state that the stream map layer has erroneously written "Lee Creek" instead of "Lees Creek." "Lees Creek" is used in this assessment. Letitia Creek is locally known as "Tish Creek."

huckleberry; however, due to insufficient moisture, salal, Oregon grape, and red huckleberry is less common on southern slopes.

The high elevations of the eastern Umpqua Cascades Ecoregion are dominated by Douglas-fir and western hemlock. Overstories also include western redcedar, sugar pine, Pacific yew, grand fir, and white fir. Some madrone is present on warmer south-facing slopes. Canyon oaks can be found on stony soils on all aspects. Understory vegetation includes rhododendron, Oregon grape, salal, golden chinquapin, red huckleberry, western sword fern, and bracken fern. The vegetation near Deadman Mountain is similar, except the growing season is much shorter.

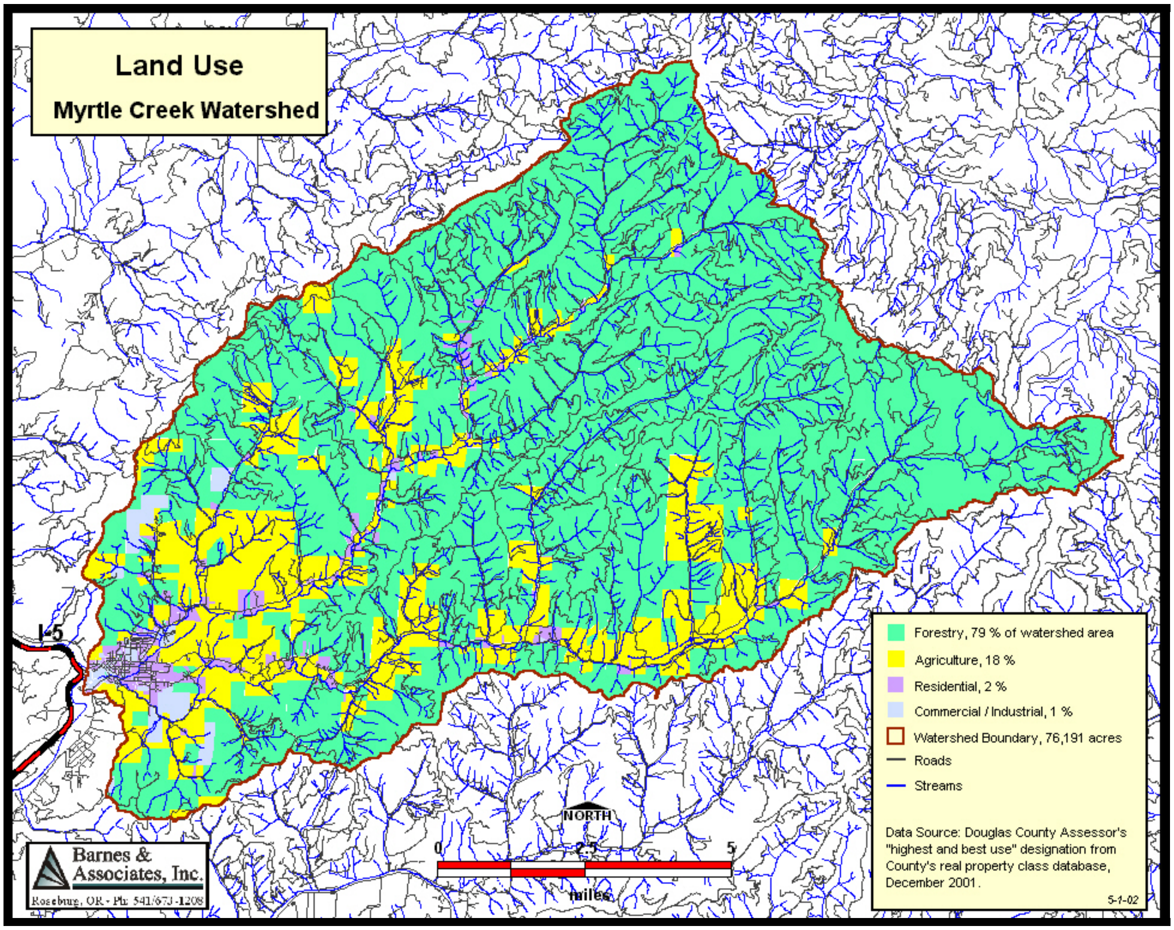
In areas with serpentine soils, the montmorillonite clays formed by the minerals absorb more water than many other types of clays, thus reducing the amount of water available to plants. These unique environmental factors reduce the ability of plants to adapt, which has in turn led to a highly specialized and diverse floral regime with a high percentage of endemic species.[12] Vegetation types occurring in serpentine soil habitats include grasslands, chaparral, woodlands, forest, and serpentine barrens, which are sparsely vegetated by annual and perennial herbaceous plants.[13]

1.3 Land use, ownership, and population

1.3.1 Land use and ownership

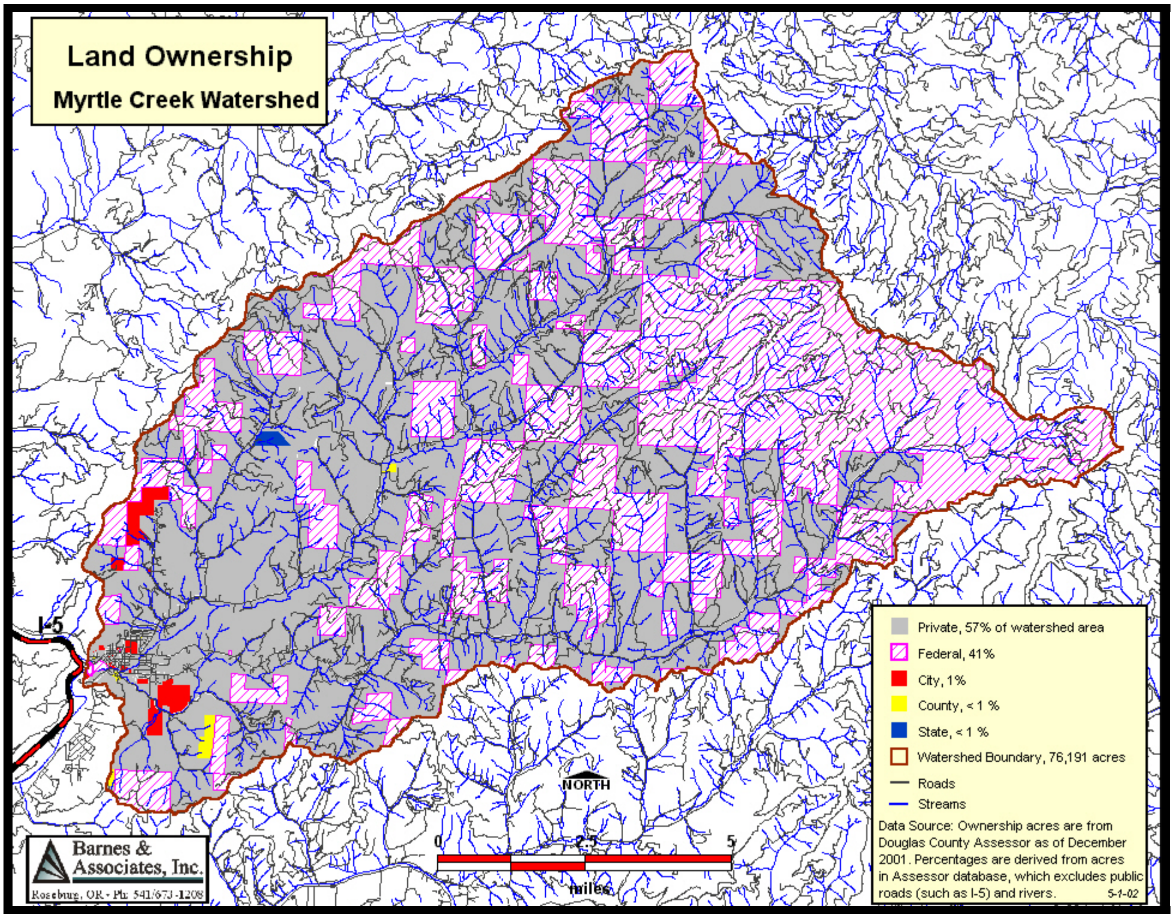
The most common land use in the Myrtle Creek drainage is forestry, with over 79% of the land base used for public or private forestry. Agriculture constitutes 18%, and mostly occurs in valleys (see Map 1-7). Land ownership is primarily private (57%), with public ownership (43%) mostly administered by the Bureau of Land Management (see Map 1-8).

[12] Endemic species are ones that are limited to a particular area.
[13] Tim Grubert and John Runyon of BioSystems, Inc., contributed this paragraph.



Map 1-7: Land use in the Myrtle Creek Watershed.

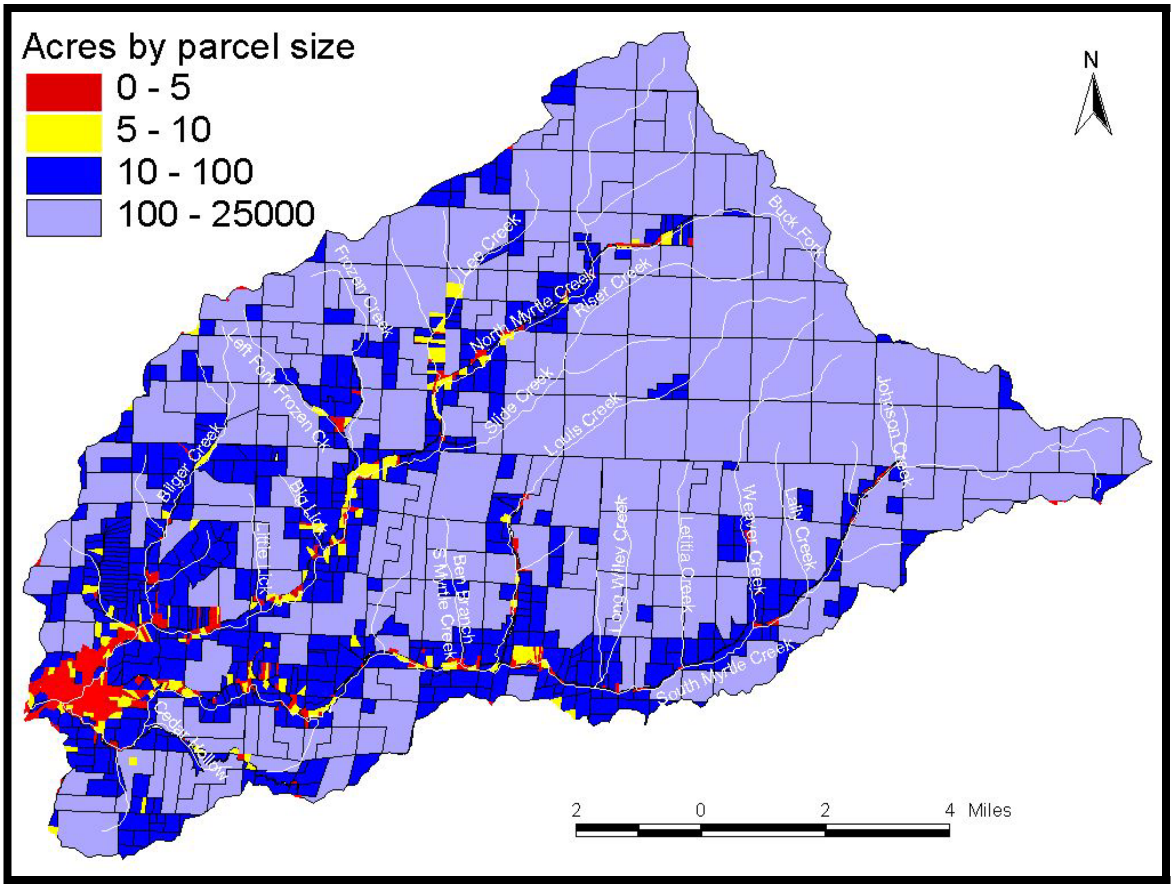
Map 1-9 and Table 1-2 show parcel size distribution and percent for the Myrtle Creek Watershed as of 2001. Over 64% of the watershed consists of tax lot parcels that are over 100 acres, of which most are located in upper elevations. Lower elevations are mostly 10 to 100 acres. Less than five percent of the Myrtle Creek Watershed is in parcels less than 11 acres. These parcels are mostly concentrated in and around the City of Myrtle Creek, North and South Myrtle Creeks, Lees Creek, and Louis Creek.



Map 1-8: Land ownership in the Myrtle Creek Watershed.

Parcel size	Percent of watershed
0-5	1.8%
5-10	2.5%
10-100	30.9%
100+	64.8%

Table 1-2: Percent of landholdings by parcel size for the Myrtle Creek Watershed.



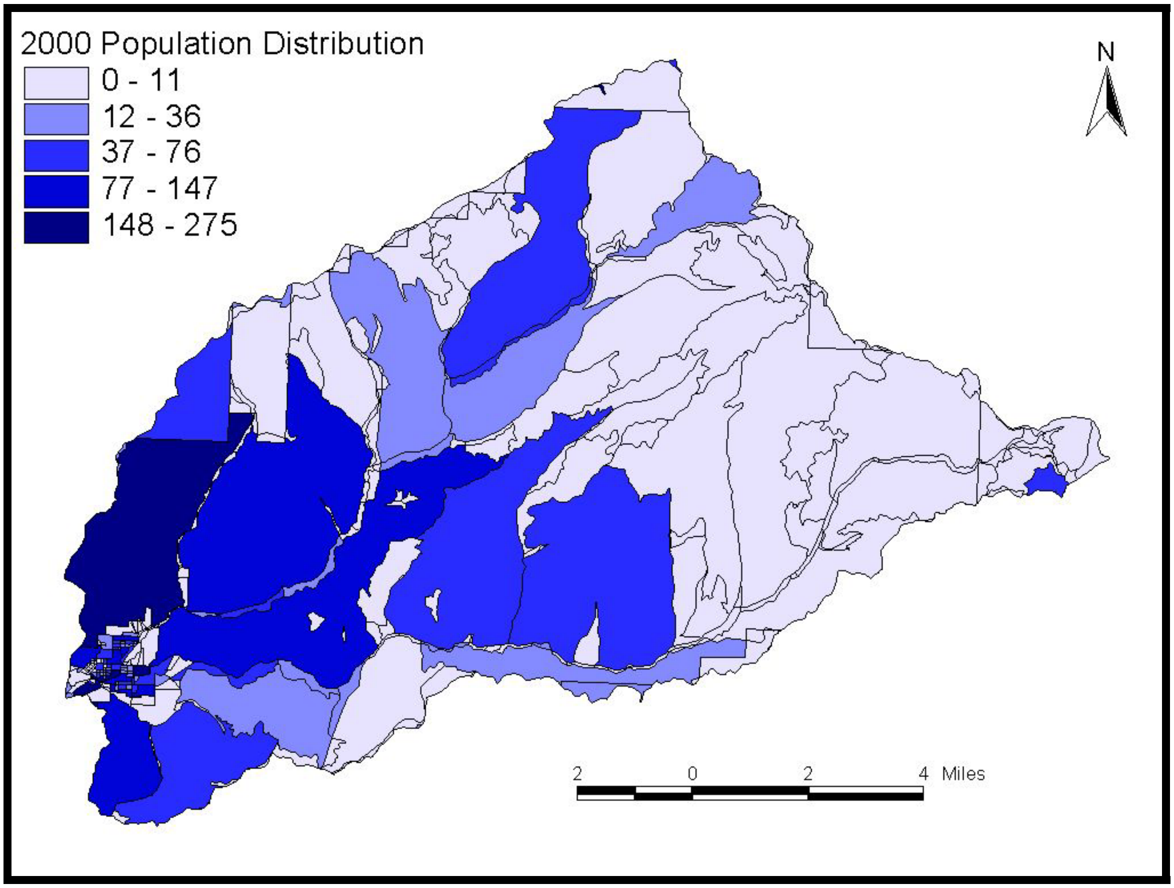
Map 1-9: Parcel size distribution for the Myrtle Creek Watershed.

1.3.2 Population and demographics

Population

According to the 2000 Census, the total population of the City of Myrtle Creek is 3,419 people. Approximately 83% of the City of Myrtle Creek (742 acres) is within the Myrtle Creek Watershed. The population of the Myrtle Creek Watershed is estimated to be no more than 5,542 people, or an average of 46.5 people per square mile.[14] The relative distribution of people in the watershed is shown in Map 1-10.

[14] 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.



Map 1-10: Population distribution within the Myrtle Creek Watershed.

General demographic characteristics and housing

Information about general demographic characteristics and housing is available from the 2000 US Census for the City of Myrtle Creek.[15] Table 1-3 provides 2000 demographic information for the city. Douglas County data are provided for comparison in Appendix 2. The median age is for Myrtle Creek is lower than for Douglas County. As with the county, the largest ethnic group is white, with the next largest groups being Hispanic or Latino, and persons of two or more races. Average household size and average family size are slightly greater than the county average. Myrtle Creek has fewer houses occupied by their owners and a lower vacancy rate than does the county.

[15] US Census data are available at http://factfinder.census.gov/servlet/BasicFactsServlet.

Parameter	City of Myrtle Creek
Median age (years)	36.0
Race	
White	94.4%
Hispanic or Latino	3.1%
Asian	0.9%
American Indian or Alaskan Native	2.1%
Black or African American	0.1%
Native Hawaiian or other Pacific islander	0.0%
Some other race	0.0%
Two or more races	2.6%
Households	
Avg. household size (#)	2.55
Avg. family size (#)	3.06
Owner-occupied housing	60.9%
Vacant housing units	6.8%

Table 1-3: General demographic characteristics and housing from the 2000 Census for the City of Myrtle Creek.

Social characteristics

Table 1-4 provides information from the 2000 Census for education, employment, and income. Appendix 2 provides the same information for Douglas County. The City of Myrtle Creek is below Douglas County for the percent of high school graduates and the percent of people with at least a four-year college degree. The percent of unemployed persons in the labor force is higher for Myrtle Creek than for Douglas County. The top three occupations account for over 67% of Myrtle Creek's labor force. The top three industries employ over half of workers, with "educational, health, and social services" accounting for 20% of all jobs. Myrtle Creek's per capita income is lower than per capita income for Douglas County, but median family income is similar. The City of Myrtle Creek has a higher poverty rate than does the county.

Parameter	**City of Myrtle Creek**
Education – age 25 or older	
High school graduate or higher	77.9%
Bachelor's degree or higher	12.3%
Employment- age 16 or older	
In labor force	62.5%
Unemployed in labor force	10.5%
Top three occupations	Production, transportation, and material moving; Service; Sales and office
Top three industries	Educational, health, and social services; Arts, entertainment, recreation, accommodation, food service; Manufacturing
Income	
Per capita income	$14,813
Median family income	$40,000
Families below poverty	14.4%

Table 1-4: 2000 Census information for education, employment, and income for the City of Myrtle Creek.

2. Past Conditions[16]

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 Myrtle Creek Watershed. Sections 2.1, 2.2, 2.3, and 2.4 describe the history of Douglas County. Section 2.5 provides information specific to the Myrtle Creek 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

[16] 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.

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).

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).

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	*Swan* 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 (Allan, 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

Sheepherders 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.

Year	1860	1880	1900
Population	4,412	9,634	14,500

Table 2-1: Population growth in Douglas County from 1860 through 1900.

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 (Oregon Department of Transportation website, 2002). 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

<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 6th 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

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, 2002). 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, 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.[17] 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

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).

[17] A flask is 76 pounds of mercury.

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 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 (Leedy, 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.[18]

Year	1900	1910	1920	1930	1940	1950	1960
Population	14,565	19,674	21,332	21,965	25,728	54,549	68,458

Table 2-2: Population growth in Douglas County from 1900 through 1960.

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

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).

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.[19]

<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

[19] 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.

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. 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 2-3 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 2-3: 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. 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.

Year	1960	1970	1980	1990	2000
Population	68,458	71,743	93,748	94,649	100,399

Table 2-4: Population growth in Douglas County from 1960 to 2000.

2.5 History of the Myrtle Creek Watershed

2.5.1 Myrtle Creek historical timeline

Date	**Event**	**Source**
1800	Before the arrival of the settlers, Indians used fire to clear lands and improve hunting. Lower elevations were covered with lush native grasses.	(USDI Bureau of Land Management, 1997)
1837	Cattle driven past the future site of Myrtle Creek. Ewing Young brought cattle north from California to the settlers of the Willamette Valley.	(“A brief history,” 1993)
1846	A survey party, led by Jesse Applegate, passed through the town site of Myrtle Creek. They were searching for a less difficult route for pioneers to reach Oregon. This route became the Applegate Trail.	(Cubic, 1984)
1851	James B. Weaver staked his claim at the town site.	(Cubic, 1984)
1852	Moses True Dyer erected a water-powered sawmill on South Myrtle Creek.	(Beckham, 1986)
1853 or 1854	Lazarus Wright bought the original James B. Weaver claim and erected a gristmill on Myrtle Creek.	(Beckham, 1986)

Date	Event	Source
1860	California Stage Company began service.	("A brief history," 1993)
1862	Telegraph service initiated.	("A brief history," 1993)
1865	John and Susannah Weaver Hall purchased 320 acres of Lazarus Wright's property. John Hall had the town site surveyed, platted, and subdivided.	("A brief history," 1993)
1882	Oregon and California Railway constructed along the west side of Myrtle Creek.	("A brief history," 1993)
1884	"The trees around the valley are mainly oak, but about five miles east of the village the heavy timber belt is reached which only ends at the top of the Cascades. These trees are mostly fir, cedar and pine. They exist in countless numbers, furnishing an almost inexhaustible source of the best of timber."	(Binder, A.W., 1990, p. 22A)
1886	Citizens State Bank established.	(Beckham, 1986)
1893	Myrtle Creek incorporated as a city; went bankrupt and reincorporated in 1903. (State of Oregon recognizes the original incorporation date of 1893.) Myrtle Creek named after groves of myrtle trees found along the banks of North Myrtle, South Myrtle, and Myrtle creeks.	("A brief history," 1993)
1897	Umpqua Beacon, Myrtle Creek's first newspaper, was started.	(Beckham, 1986)
1898	Chieftain and Continental gold mines discovered on Letitia Creek. Both mines worked in the early 1900s with limited production after the 1930s.	(USDI Bureau of Land Management, 1997)
1889 – 1894	Placer deposits were found on the northern ridges of North Myrtle Creek and on upper Lees Creek. A project was designed to bring water for placer mining from Little River in the North Umpqua drainage. Ditch digging began in 1890. By 1891 200 Chinese were hired to help dig this "China Ditch." About 18 miles of ditch were dug before work was suspended in 1894. The target of Little River was never reached.	("A brief history," 1993; Tishendorf, 1981)

Date	Event	Source
1900s	Fire suppression resulted in the replacement of open forest with more closed canopy forest and patches of dense underbrush.	(USDI Bureau of Land Management, 1997)
1912	Myrtle Lumber Company – a planing mill – was located on the north side of Myrtle Creek, west of Main Street. Rough lumber was flumed down the South Myrtle Creek valley directly to the mill. The flume was eighteen feet high and evident on many historical photographs.	("A brief history," 1993)
1920	Prune industry was at a peak. The most productive years for the prune industry were from the 1890's into the late 1920's.	("A brief history," 1993)
1948	Hanna Nickel constructed a smelter near Riddle and Myrtle Creek's population grew rapidly.	(Beckham, 1986)
1950s – 1980s	Timber on BLM lands harvested at a steady rate. BLM lands make up about 41 percent of the watershed.	(USDI Bureau of Land Management, 1997)
1987	North Myrtle Fire started from lightening. Burned in the Lower and Upper North Myrtle watersheds and into subwatersheds of Frozen Creek, Lee Creek, and North Myrtle Headwaters. Approximately 7,000 acres were burned.	(USDI Bureau of Land Management, 1997)

2.5.2 Myrtle Creek population

As shown in Figure 2-1, 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 is the jump from 441 in 1940 to 1,781 in 1950. The increase was due in part to the end of World War II and also to the opening of Hanna Mining on nearby Nickel Mountain. The decrease in population from 1980 to 1990 is most likely the result of the slowdown in the timber industry.

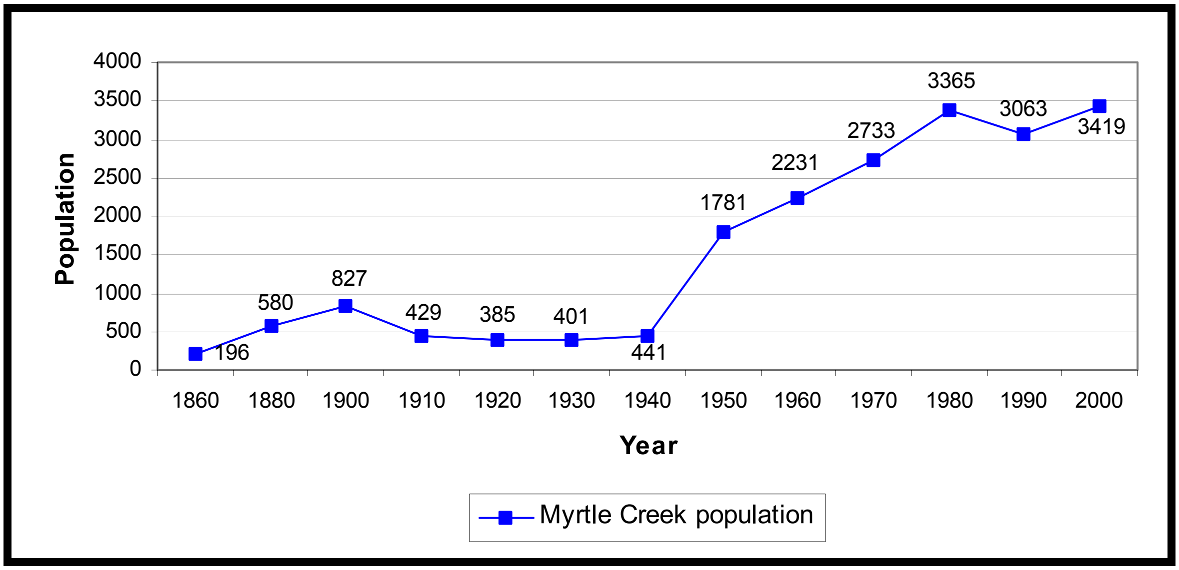
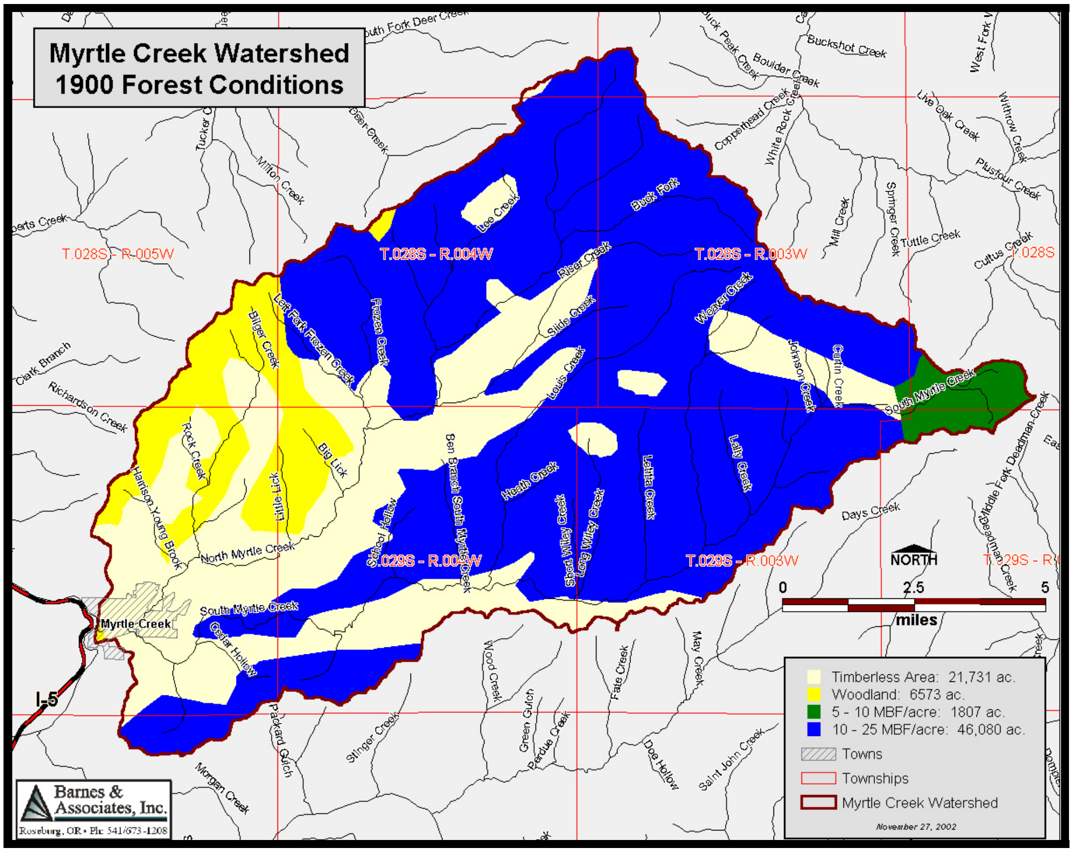


Figure 2-1: Myrtle Creek population from 1860 through 2000.

2.5.3 1900 forest conditions

Map 2-1 illustrates the vegetation patterns of 1900. The timberless acres probably represent cleared acres used by settlers for home sites, agricultural crops, and grazing livestock. Woodland areas are evident in the upper reaches of Bilger Creek, and along Big Lick and Little Lick. The forested areas are shown with 10 to 25 thousand board feet per acre. The far eastern tip of the watershed, at the upper reaches of South Myrtle Creek, averaged five to 10 thousand board feet per acre and was either a young or a poorly stocked forest. This area may have been burned or logged with the adjoining forests to the north, west, and south.



Map 2-1: 1900 vegetation patterns for the Myrtle Creek Watershed.

2.5.4 Historical fish use[20]

The Myrtle Creek 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 but was still able to support abundant populations of chinook and coho salmon, steelhead and cutthroat trout.[21] Appendix 3 provides 1968 temperature and streamflow data for North Myrtle Creek and South Myrtle Creek. 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

[20]This section on historical fish use is based on information from the *1997 Myrtle Creek Watershed Analysis* completed by the Roseburg District of the Bureau of Land Management.

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

Umpqua Basin. The Oregon State Game Commission found coho salmon plentiful in the South Umpqua River in 1972.

The Umpqua system was stocked with Alsea River cutthroat from 1961 through the late 1970s (see Table 2-5). 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.

	Chinook		**Coho**	**Steelhead**		**Sea-run**
Stream System	Spring	Fall		Winter	Summer	**Cutthroat**
South Umpqua River	600	1,500	4,000	10,000	0	10,000
Myrtle Creek	0	0	750	1,000	0	1,500

Table 2-5: Estimated number of adult anadromous salmonids (including hatchery fish) for 1972.[22]

2.6 Historical references

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

Anonymous. 1993. A Brief History of Myrtle Creek. City of Myrtle Creek: Myrtle Creek, Oregon. 18 p.

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. Douglas County Commissioners: Roseburg, Oregon. 285 p.

Binder, A.W. 1990. Really, Grandpa! Western Printers: Eugene, Oregon. 303 p.

[22] This information is from the *1972 Fish and Wildlife Resources of the Umpqua Basin, Oregon, and Their Water Requirements* by Jim E. Lauman of the Oregon State Game Commission.

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.

Cubic, K. 1986. Historic Resources of the City of Myrtle Creek, Oregon. Douglas County Planning Department. Roseburg, Oregon.

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.

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.

United States Department of the Interior (USDI) Bureau of Land Management. 1997. Myrtle Creek watershed analysis, Roseburg district, south river resource area. Roseburg, Oregon: USDI Bureau of Land Management.

3. Current Conditions

This chapter explores the current conditions of the Myrtle Creek 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 Myrtle Creek 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

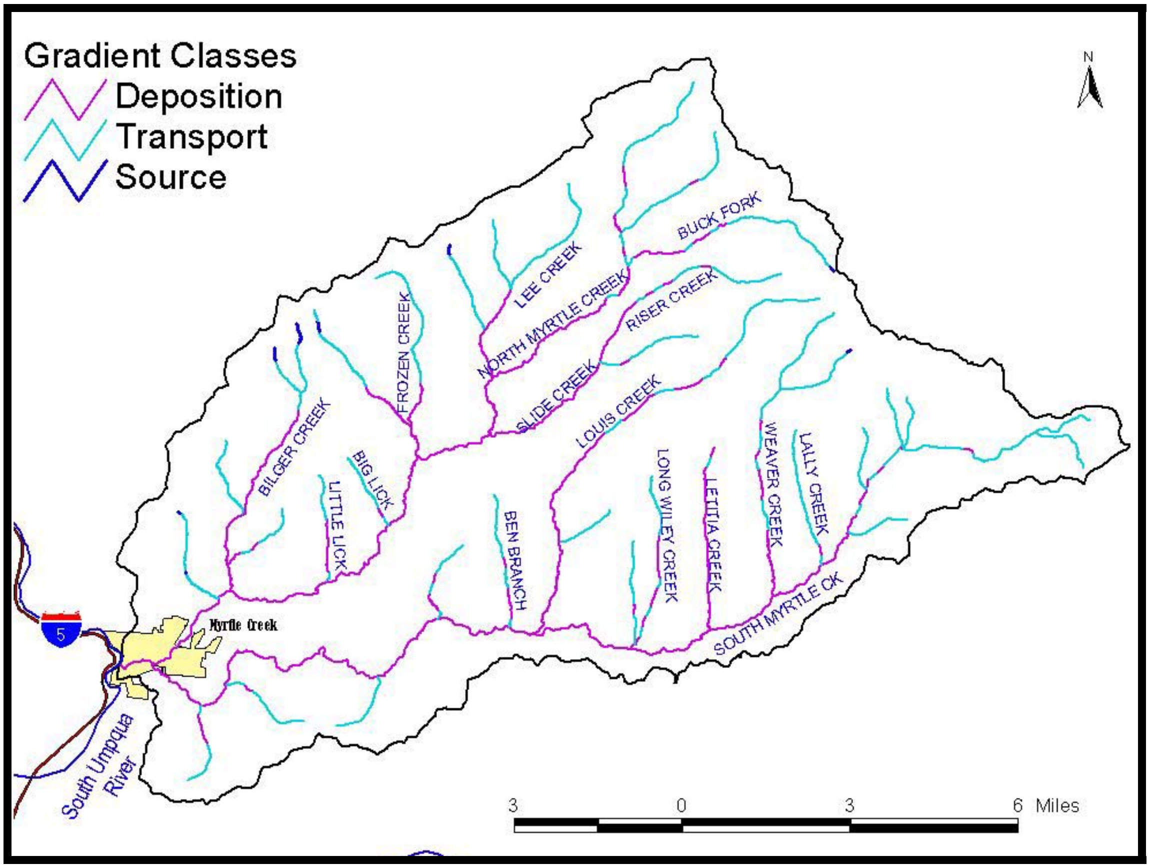
Stream gradients

The OWEB Watershed Assessment Manual provides a framework for classifying streams based on gradient, valley confinement, and stream size. Streams are classified into three basic categories based on these characteristics: source, transport, and depositional streams. Source streams are mountain headwater streams of high gradient and energy; transfer streams are low elevation streams of moderate to low gradient; and depositional streams are the meandering, low energy and low gradient rivers of the floodplains and valleys in the watershed. This 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.[23]

Source streams are steep with a 30% or greater gradient and are the location for most woody debris and gravel to enter the stream system. Gradients are often too steep for many fish species. Transport streams have gradients ranging from 3% to 30% and are a transitional area for large woody debris and gravel. These materials will settle for a short

[23] Tim Grubert and John Runyon of BioSystems, Inc., contributed this paragraph.

period and then move further down the stream with high water flows. Fish productivity is moderate. Deposition streams have gradients of less than 3%. Woody debris and gravel become lodged for longer periods of time in these streams. This is the most productive area for fish because of ample spawning grounds, smolt rearing grounds, and complex habitat with deep pools that provide food and shelter. 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 in the Myrtle Creek Watershed.

Gradient class	Stream miles in the watershed	% Total
Source	1.2	0.9
Transport	64.1	48.8
Deposition	66.2	50.3
Total	131.5	100.0

Table 3-1: Myrtle Creek Watershed stream miles within each gradient class.

Channel types[24]

Based on the processes that define the channel, it is possible to classify the complex array of channel types found within a watershed. While it may not be possible to quantify the precise nature of channel response, the similarity in geomorphic processes does allow for some degree of predictive capability with respect to channel change.

This discussion focuses on the stream areas in the Myrtle Creek Watershed that are the most sensitive to changes in flow, sediment, or wood in the channel: low gradient (less than 3%) channels set in wide valley areas with floodplains. These stream segments are often dynamic with channels that meander across the floodplain. In addition, these low gradient stream channels are often key fish spawning and rearing areas and can be very responsive to restoration actions. Most of the low gradient stream segments are in the lower portions of the watershed where the channel cuts across the Holocene alluvial deposits of sand, gravel, and silt.[25] These deposits form the floodplains and fill the channels of the main stems of North Myrtle Creek and South Myrtle Creek. The dominant substrate throughout this portion of the watershed consists of sand to cobble sized pieces of the conglomerate, sandstone, siltstone, and limestone from the Jurassic Myrtle Group formation. The channel in this portion of the drainage functions as a sediment deposition system with a capacity for short-term storage of fine sediment. The lack of confining terrain features and presence of fine substrate allows the stream to move both laterally and vertically. Despite being a low-energy system in this portion of the drainage, the large amount of sediment present during high flows often results in channel migration and new channel formation.

Most of the tributaries of South Myrtle Creek downstream of Long Wiley Creek to the confluence with North Myrtle Creek are also low gradient floodplain channels, with the larger ones such as Louis Creek being moderate to unconfined channels with small floodplains. These tributaries are generally depositional areas for sediment, and when the supply of sediment exceeds the transport capabilities of the stream, the channel becomes particularly vulnerable to widening, lateral movement, side-channel development, and braiding. Overall aquatic habitat complexity is reduced as pools are filled and obstructions such as boulders or bedrock outcrops are buried.

On the main stem of North Myrtle Creek, the tributaries downstream from Lees Creek fall into this low gradient, small to large floodplain, moderate to unconfined channel category. Several of the tributaries of this order form alluvial fan channels in the transitional zone between their confluence with the main stem in the valley floodplain and the steep mountain slopes from which they originated. Buck Fork Creek, Weaver Creek, and Lally Creek are examples of this type of moderate gradient, variably confined channel category (see Photo 3-1). Channels of this type can change course frequently, sometimes resulting in a multi-branched stream network. Within the Myrtle Creek

[24] John Runyon and Tim Gruber of BioSystems, Inc contributed this section. Terms such as “Jurassic” and “Cretaceous” refer to periods in the geological/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.

[25] See Appendix 1 for more information about geology. Geological terms are defined on page 154.

Watershed's highly erodible alluvial material of the Holocene Qal formation, the channels are often deeply incised, with the dominant substrate ranging in size from fine gravels to large cobbles.

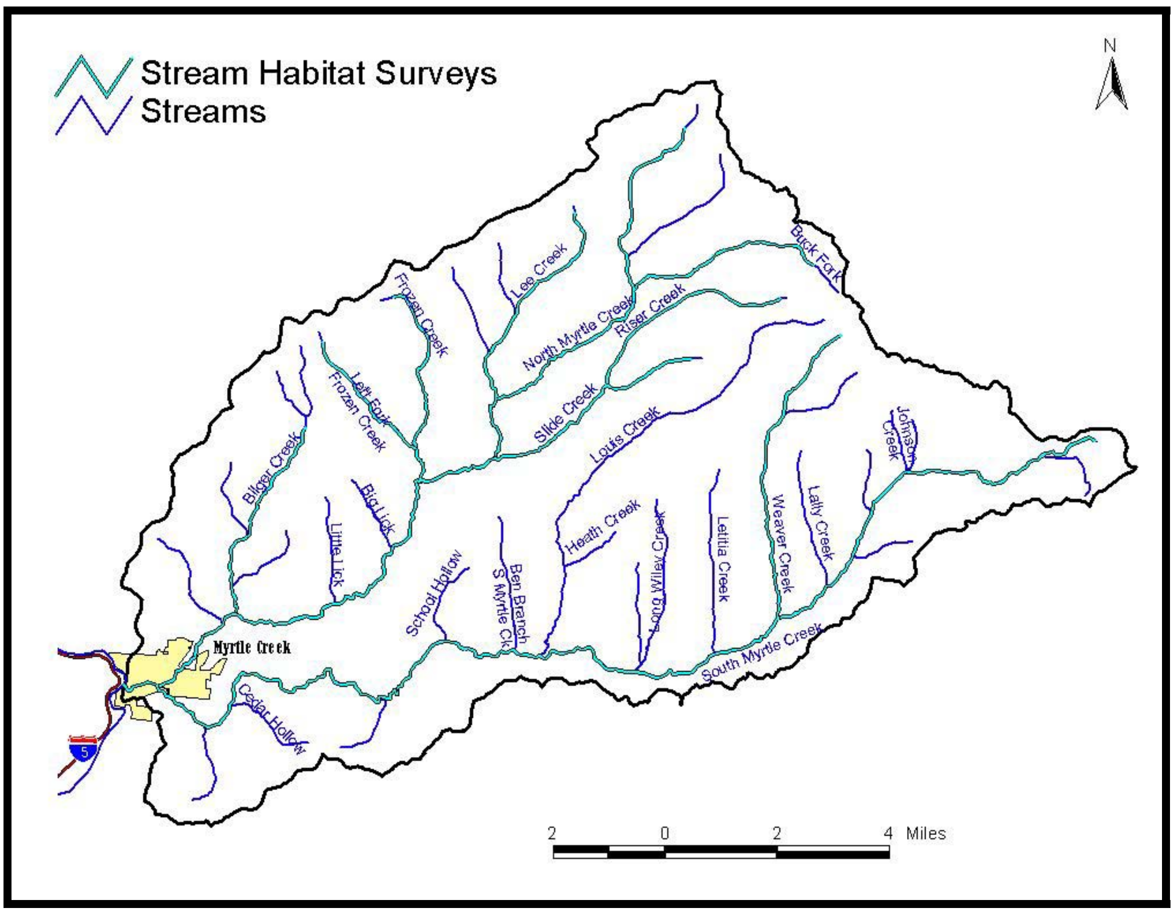
Photo 3-1: Weaver Creek, a moderate gradient, variably confined channel. Looking downstream from road crossing on BLM 29-3-16 (UTM coordinates 493881/4765163). Note limited presence of large wood in channel.

The upper reaches of the Myrtle Creek Watershed contain examples of moderate gradient confined channels, specifically Curtin Creek on the south main stem and several unnamed tributaries on both the north and south stems. These transport streams are high energy channels characterized by well-contained flows, large-particle substrate, and limited lateral movement. The confining nature of the landforms and the moderate gradient of the channel combine to produce enough stream energy to carry most introduced fine sediment downstream. However, these channels can be deposition areas for coarse and large sediment.

The eastern, uppermost reaches of the Myrtle Creek Watershed contain several unnamed tributaries which are classified as moderately steep, narrow valley channels confined by adjacent, moderate to steep hill slopes. Flood plains are narrow or nonexistent and even high flows are generally contained within the channel banks. The Cretaceous and

Jurassic granitic bedrock of the Kjg unit (comprised of highly resistant quartz diorite and tonalite) in this portion of the watershed creates stable streambanks with side slopes that may be unstable and prone to erosion. These headwater streams have gradients of up to 20% and are straight channeled for the most part. Lacking a floodplain, these streams are considered source areas for sediment and woody debris that are carried downstream to the rest of the watershed in landslides and debris torrents.

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 summer of 1994, ODFW staff conducted stream habitat surveys in the Myrtle Creek Watershed. Approximately 72.4 stream miles were surveyed in the Myrtle Creek Watershed (see Map 3-2),[26] or about 55% of the total stream miles visible on the map (131.5). Each stream was divided into reaches based on channel and riparian habitat characteristics for a total of 48 reaches averaging 1.4 miles in length. Appendix 4 provides a map detailing the stream reaches.



Map 3-2: Streams surveyed in the Myrtle Creek Watershed.

[26] See section 1.2.5 for more information about the stream map.

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 3-2 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 3-2 provides parameters used to develop the benchmark values.

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 small stream had 50% of its area in pools, then according to Table 3-2, 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, the 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.

Habitat characteristic	Measurements used for rating habitat quality	Benchmark values		
		Good	**Fair**	**Poor**
Pools	1. **Percent area in pools:** percentage of the creek area that has pools 2. **Residual pool depth:** depth of the pool (m), from the bottom of the pool to the bottom of the streambed below the pool a) small streams b) large streams	1. > 30 2a. > 0.5 2b. > 0.8	1. 16-30 2a. 0.5 - 0.3 2b. 0.8 - 0.5	1. <16 2a. < 0.3 2b. < 0.5
Riffles	1. **Width to depth ratio:** width of the active stream channel divided by the depth at that width 2. **Percent gravel in the riffles:** percentage of creek substrate in the riffle sections of the stream that are gravel 3. **Percent sediments** (silt, sand, and organics) **in the riffles:** percentage of creek substrate in the riffle sections of the stream that are sediments	1. ≤ 20.4 2. ≥ 30 3. ≤ 7	1. 20.5-29.4 2. 16-29 3. 8-14	1. ≥ 29.5 2. ≤ 15 3. ≥ 15
Riparian	1. **Dominant riparian species:** hardwoods or conifers 2. **Percent of the creek that is shaded** a) for a stream with width < 12m (39 feet) b) for a stream with width > 12m	1. large diameter conifers 2a. > 70 2b. > 60	1. medium diameter conifers & hardwoods 2a. 60 – 70 2b. 50 – 60	1. small diameter hardwoods 2a. < 60 2b. < 50
Large Woody Material in the Creek	1. **Number of wood pieces**[27] per 100m (328 feet) of stream length 2. **Volume of wood** (cubic meters) per 100m of stream length	1. > 19.5 2. > 29.5	1. 10.5-19.5 2. 20.5-29.5	1. < 10.5 2. < 20.5

Table 3-2: Stream habitat survey benchmarks.

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

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 Myrtle Creek Watershed is beyond the scope of this assessment. This assessment 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.

Within the Myrtle Creek Watershed, ODFW surveyed 48 stream reaches. Of these reaches, none rate as fair or good in all four categories. Forty-seven stream reaches have at least two categories rate as poor. Looking at the stream habitat data in Appendix 4, it is striking that more than 94% of reaches have poor riffles, and almost 88% of stream reaches have poor large woody material. For both riparian areas and pools, 42% of reaches are poor.

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.

<u>Bilger Creek</u>
All three reaches of Bilger Creek run through rural residential properties and large-growth timber. Pools and large wood are poor, riparian areas are fair, and riffles are poor or fair.

<u>Buck Fork Creek</u>
The first reach of this creek is in rural residential areas with heavy grazing, and is poor for pools, riffles, and riparian areas, and fair for large woody material. The next three reaches are in areas with young and second-growth timber. These reaches have poor riffles and poor or fair pools. All but reach four have poor large woody material.

<u>Frozen Creek</u>
The first three reaches are in areas with heavy grazing and agriculture, while the last reach is in second growth timber. All reaches have poor riffles and large woody material. Pools are poor or fair. Riparian habitat is poor or fair for the first three reaches.

<u>Lees Creek</u>
The first reach of Lees Creek is in rural residential property with second growth timber. The second reach is in mature timber with evidence of forest fire. Riffles and large woody material are poor for both reaches, and pools are fair. Reach one also had a fair riparian area.

<u>West Fork Frozen Creek</u>
This creek runs through areas with timber of different ages. Reach one has some light grazing and reach two is in an area with forest fire evidence. All reaches have poor large

woody material, and poor or fair pools. Reaches two and three also have poor and fair riparian areas, and reaches one and three have poor and fair riffles.

Myrtle Creek
Myrtle Creek is classified as the first reach of North Myrtle Creek. This stream flows through rural residential property, and is poor or fair for all parameters.

North Fork Myrtle Creek
Since Myrtle Creek was classified as reach one by the stream habitat surveyors, North Fork Myrtle Creek starts at reach two. Reach two is in an urban area with some rural residential property. Reaches three through seven are in rural residential areas with some light grazing and second growth timber. Reaches eight and nine are in second growth timber with some forest fire evidence and mature timber. All North Fork Myrtle Creek reaches have poor large woody material and riffles. All but reach seven have poor or fair riparian areas. Reaches two, five, seven, eight, and nine have poor or fair pools.

Riser Creek
All four reaches are in young timber with some second growth timber and recently harvested areas. Reach two is poor for all parameters. The other three reaches have poor large woody material and riffles, and poor to fair pools.

Slide Creek
Reach one is in an area with heavy grazing and rural residential property. The other three reaches are in timber of various ages. Large woody material is poor for all four reaches, as are riffles. Pools are poor or fair. Riparian habitat is poor for reach two only.

South Fork Myrtle Creek
Of this stream's 12 reaches, reaches three and five were not surveyed. Reach one flows through rural residential properties. Reaches two, four, and six have light grazing and timber. The remaining seven reaches are in second growth and large timber. All reaches have poor riffles and riparian areas. Reaches one through eight and reach 11 have poor large woody material; reach 10 is fair. All but reaches six, 10 and 13 have poor or fair pools.

Weaver Creek
All four reaches are in areas with large or mature timber; reach two has some timber harvest nearby. Riffles are poor for all reaches. Large woody material and pools are poor or fair. Reaches one and two also have fair riparian areas.

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.[28]

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.[29] 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 Myrtle Creek 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.[30] 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. 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 two active push-up dams along South Myrtle Creek that may be barriers to juvenile fish passage.

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 156 road and stream crossings in the Myrtle Creek 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.

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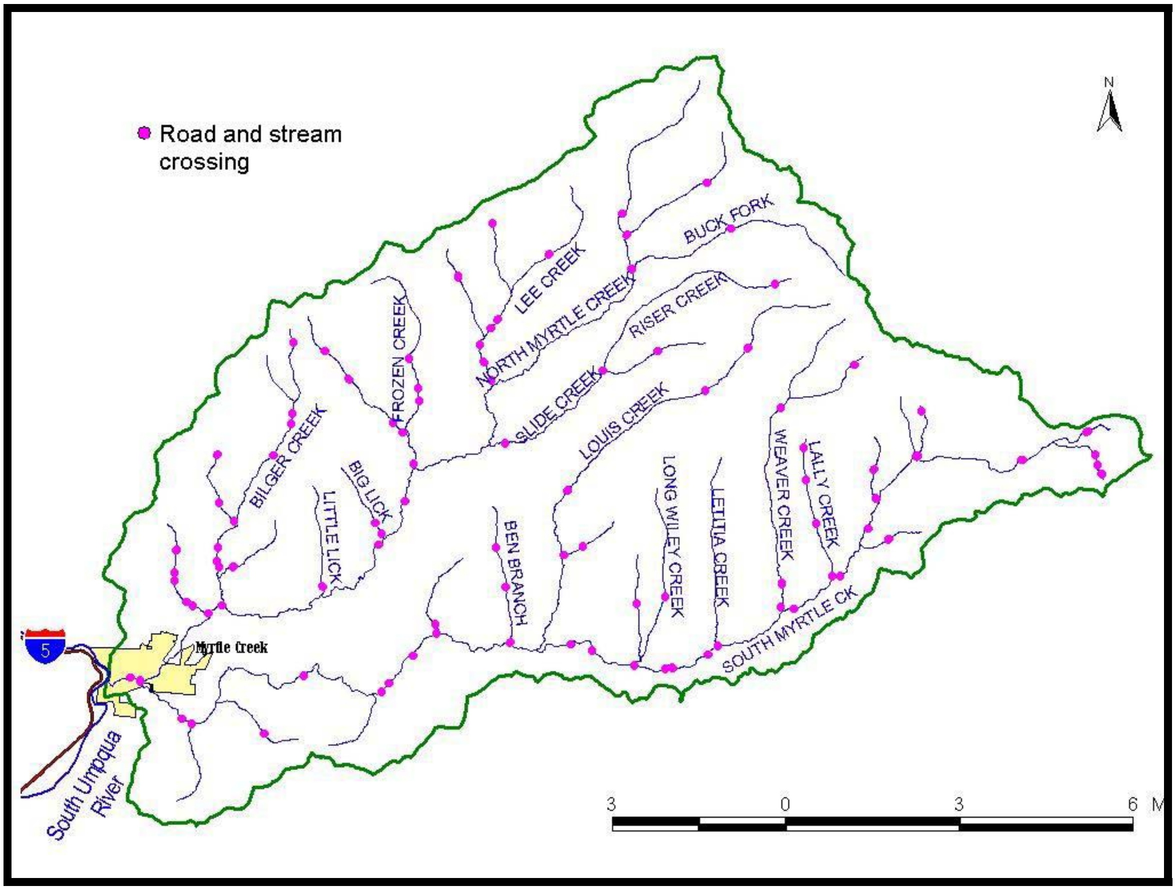
[28] See section 3.3.2 for more information about stream temperature.

[29] Fish wheel screens are a form of self-cleaning screen that prevents fish from entering an irrigation ditch and removes debris that may prevent water flow.

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



Map 3-3: Road and stream crossings in the Myrtle Creek Watershed.

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.

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.[31] A document summarizing the results of this project will be available in late 2003. Currently, landowner interviews and discussions with stream habitat restoration specialists indicate there are culverts blocking fish passage on Lees Creek, Frozen Creek, Bilger Creek, and Weaver Creek.

3.1.3 Channel modification[32]

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 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.[33] 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.

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[31] See section 3.5.2 for information about anadromous and resident salmonid distribution within the Myrtle Creek Watershed.
[32] Information in section 3.1.3 is primarily from interviews by the author with Douglas Soil and Water Conservation District staff.
[33] 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.

Historical channel modification projects

Quantifying historical channel modification activities is difficult because no permits were issued and the evidence is hidden or non-existent. According to the Douglas Soil and Water Conservation District staff, 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." There is evidence that landowners have used tractors to push gravel bars from the stream channel to the bank for erosion control. Gravel bars are not stationary, and during every flood event gravel is washed away and replaced by upstream materials.[34] Consequently, a gravel bar in the same location was often removed every year.

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.

Current channel modification projects done with permits

The majority of permitted channel modification projects in the Myrtle Creek Watershed have been done on Myrtle Creek and North Myrtle Creek. Most of the projects on Myrtle Creek have been done to prevent stream meandering from undermining structures. There are numerous gabion walls and rock riprap to protect against erosion. Recent bank stabilization projects, such as one completed near Mill Site Park, have included planting willows. As the willows have matured, the riprap and gabions are no longer visible.

Four projects have been done on the lower reaches of Frozen Creek and further upstream on North Myrtle Creek. These are bank erosion control projects using riprap, gabions, and Christmas trees. Christmas tree erosion control projects place trees against a bank, where the many tiny branches and needles slow water velocities and accumulate sediment. Over time, the trees become clogged with sediment and vegetation becomes established. The trees eventually decay and leave behind the intact bank. In addition, South Myrtle Creek has a gabion jetty downstream from School Hollow Creek.

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[34] In general, a gravel bar that has no grass or other vegetation is very unstable.

3.1.4 Stream function key findings and action recommendations

Stream morphology key findings

- The majority of streams within the Myrtle Creek Watershed have low gradients with few stream miles in the source areas, where most large woody material is recruited into the stream system. This may limit instream large woody material abundance.
- The low gradient channels with wide floodplains along North and South Myrtle Creeks and the lower reaches of their tributary streams are dynamic systems that provide key fish migration, spawning and rearing habitat.
- Depositional environments such as moderately confined channels with small floodplains are vulnerable to reductions in aquatic habitat complexity. In these areas, pools can be filled in and boulders or exposed bedrock buried when the sediment load exceeds the transport capabilities of the stream.
- Stream habitat surveys suggest that poor quality riffles and insufficient large woody material are limiting factors for fish habitat in most surveyed streams. Pools and riparian areas also limit fish habitat, but to a lesser degree.

Stream connectivity key findings

- Culverts and, to a lesser degree, dams, reduce stream connectivity, affecting anadromous and resident fish productivity in the Myrtle Creek Watershed. More information about fish passage barriers will be available in 2003.

Channel modification key findings

- Many landowners, especially newcomers to the area, may not understand the detrimental impacts of channel modification activities or are unaware of active stream channel regulations.

Stream function action recommendations

- o Where feasible, improve pools, collect gravel, and increase the amount of large woody material by placing large wood and/or boulders in streams with an active channel less than 30 feet wide.
- o 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.
- o Maintain areas with good native riparian vegetation.
- o 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. For example, culvert replacements should emphasize the low gradient channels (3% or less), especially the lower ends of tributary streams entering North Myrtle Creek and South Myrtle Creek.

- Increase landowner awareness and understanding of the effects and implications of channel modification activities.

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. Any conclusions about stream riparian zone conditions must 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 Myrtle Creek Watershed. Creek banks were 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. For the purpose of this assessment, main stem Myrtle Creek is considered part of South Myrtle Creek. A total of 37 miles of North Myrtle Creek and 47 miles of South Myrtle Creek were evaluated. Also evaluated were 91.4 miles of North Myrtle Creek tributaries and 87.5 miles of South Myrtle Creek 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 3-3 outlines the classifications for each parameter. Findings for each parameter for North and South Myrtle Creeks and tributaries are discussed below. Appendix 6, Appendix 7, and Appendix 8 have data by percent for North Myrtle Creek, South Myrtle Creek, the combined tributaries, and the following individual tributaries: Bilger Creek, Frozen Creek, Slide Creek, Riser Creek, Lees Creek, Buck Fork Creek, Big Ben Branch, Louis Creek, Long Wiley Creek, and Weaver Creek.[35]

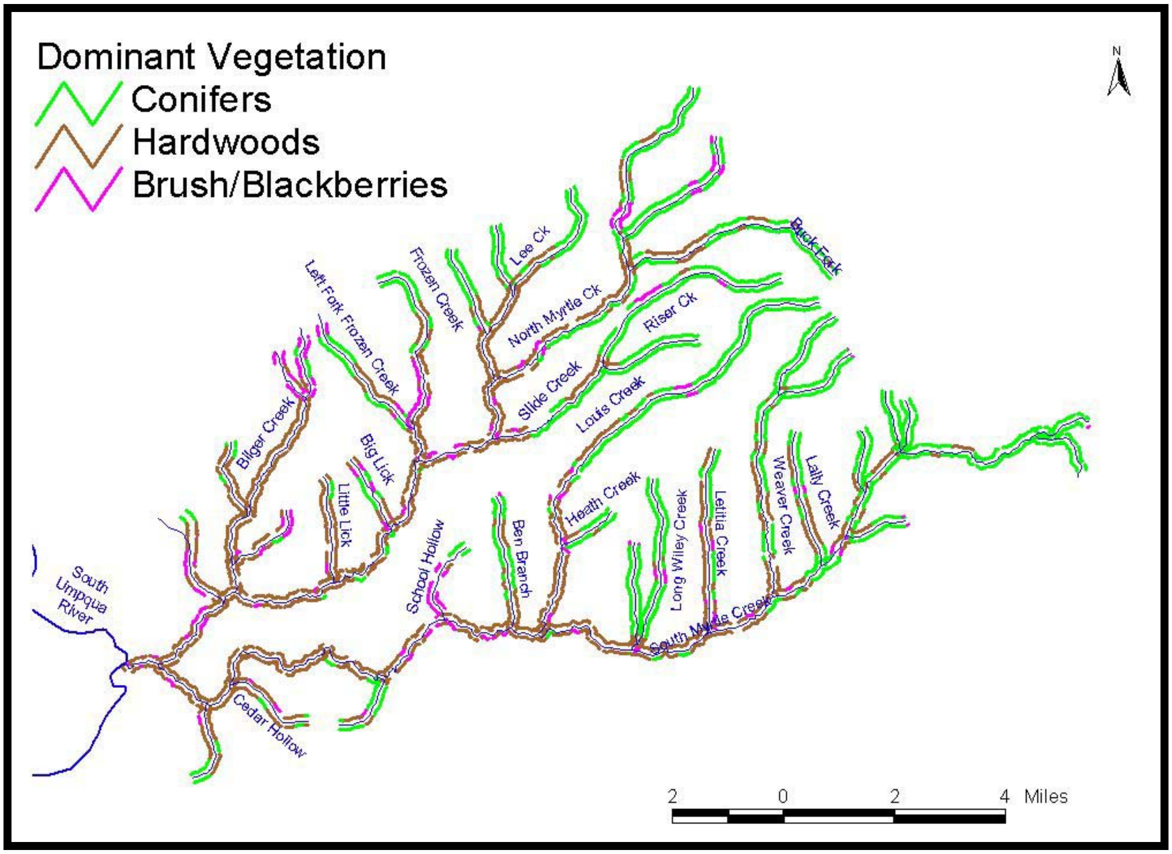
[35] Combined tributary data include these streams and others.

Riparian zone parameters	Parameter attributes Stream reaches are classified by the most dominant (>50% cover) characteristic
Dominant vegetation or feature	• Conifer trees • Hardwood trees • Brush/blackberries • Range/grass/blackberries • No vegetation (roads, bare ground, etc.) • Infrastructure (bridges and culverts)
Buffer width	• No trees • 1 tree width • 2+ tree width
Cover	• No cover • <50% cover • >50% cover

Table 3-3: Riparian zone classification for the Myrtle Creek 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 large bridge or culvert. Map 3-4 shows the three most common vegetation types for Myrtle Creek Watershed streams. Appendix 6 has the percent of all vegetation or features for North Myrtle Creek and South Myrtle Creek, the combined tributaries, and specific tributaries.

North and South Myrtle Creeks have similar vegetation or features. Hardwoods account for the majority of riparian vegetation for North Myrtle Creek (23.0 miles, 62.1%) and South Myrtle Creek (29.9 miles, 63.5%). Conifers are the second most predominant vegetation, accounting for 8.0 miles (25.1%) of North Myrtle Creek and 12.7 miles (27%) of South Myrtle Creek riparian areas. Brush/blackberry category is the third most common vegetation type, although each stream has less than five miles classified this way.

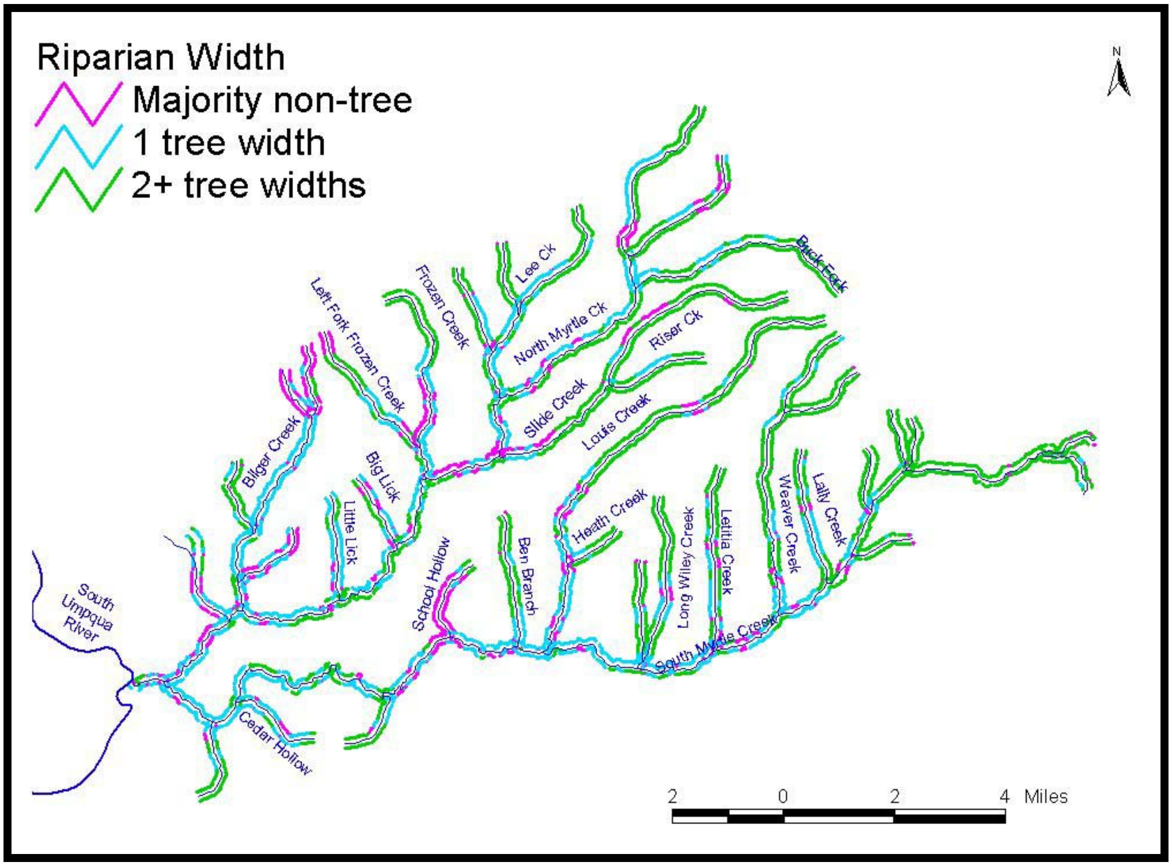


Map 3-4: Dominant riparian vegetation or feature for the Myrtle Creek Watershed.

Collectively, North Myrtle Creek's tributaries have similar areas dominated by hardwoods (37.4 miles, 40.9%) and by conifers (38.6 miles, 42.2%). South Myrtle Creek is dominated by conifers (51.2 miles, 58.6%) and has almost half as many miles of hardwoods (26.3 miles, 30.1%). The third most common vegetation feature or type for both sets of tributaries is brush/blackberries; North Myrtle Creek tributaries have 9.7 miles (10.6%) and South Myrtle Creek tributaries have 5.6 miles (6.5%). However, as can be seen from Appendix 6, the dominant vegetation and features for tributaries vary. Nearly 15% of Riser Creek is brush/blackberries and range/grass/blackberries, while Long Wiley Creek is almost 80% conifers.

Buffer width

Riparian areas with wide bands 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 water temperatures compared to other reaches within 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 North and South Myrtle Creeks. Appendix 7 provides data for North, South, and main stem Myrtle Creek, combined tributaries, and specific tributaries.



Map 3-5: Buffer widths for the Myrtle Creek Watershed.

Both North and South Myrtle Creek have single-tree riparian buffers; North Myrtle Creek has 16.9 miles (45.5%) and South Myrtle Creek 24.6 miles (52.3%) classified this way. Just over 38% of both North Myrtle Creek (14.1 miles) and South Myrtle Creek (18.0 miles) have buffer widths of two or more trees. South Myrtle Creek has a higher percentage of buffer zones with no trees, but North Myrtle Creek has more miles classified this way (6.1miles, 16.4% and 4.5 miles, 9.5%, respectively).

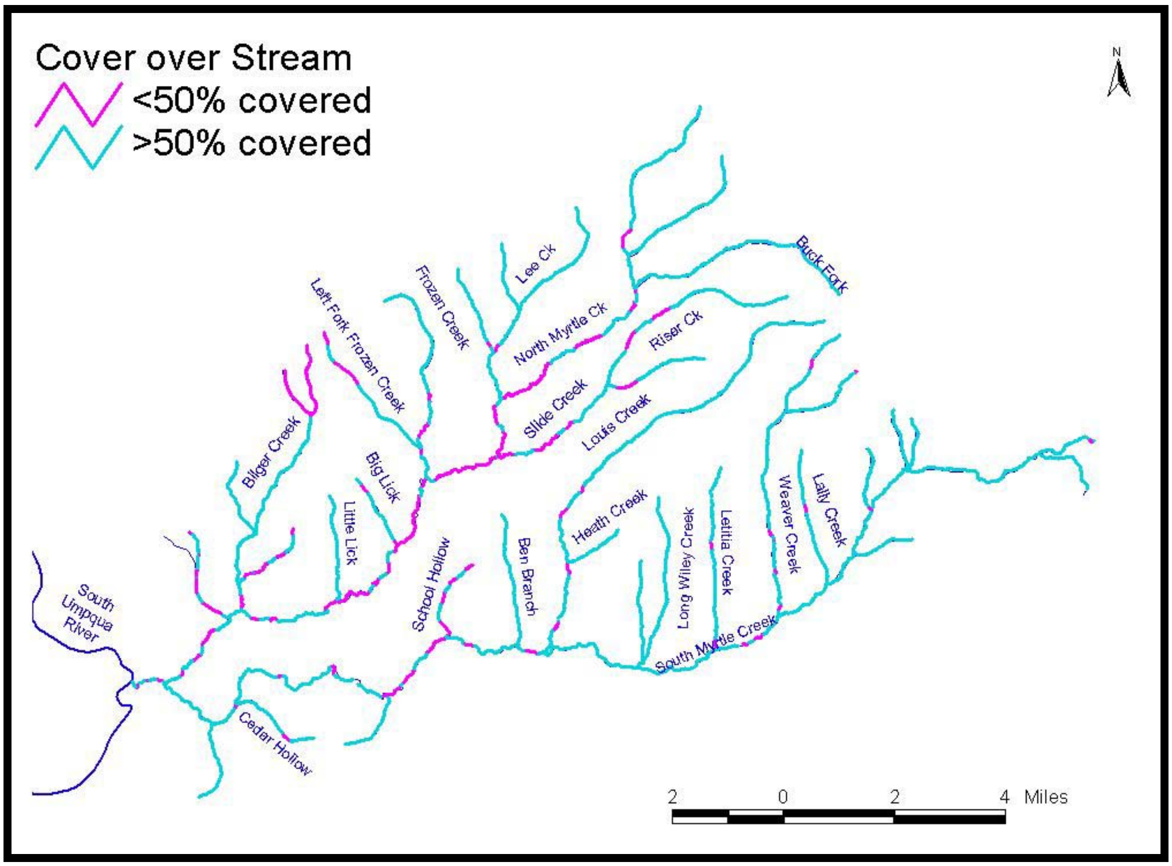
Collectively, over two-thirds of South Myrtle Creek's tributaries (56.4 miles) have buffers that are two or more trees wide, compared to just under half for North Myrtle Creek's tributaries (44.2 miles). North Myrtle Creek's tributaries have more miles and a slightly higher percent of areas with no trees (15.4 miles, 16.9%) than South Myrtle Creek's tributaries (9.9 miles, 11.3%). However, as shown in Appendix 7, there is tremendous variation among tributaries. Whereas over 70% of Buck Fork Creek's riparian zone is at least two trees wide, 23.3% of Frozen Creek has no trees.

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.[36] Blocking the amount of direct

[36] See section 3.3.2 for more information about stream temperature.

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.[37] 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 North Myrtle Creek, South Myrtle Creek, and for combined and select tributaries.



Map 3-6: Percent cover for the Myrtle Creek Watershed.

Over 80% of South Myrtle Creek, South Myrtle Creek tributaries, and North Myrtle Creek tributaries are mostly covered by vegetation or infrastructure (40.6 miles, 81.2 miles, and 75.1 miles, respectively). Only 58% of North Myrtle Creek is mostly covered by vegetation or infrastructure (21.6 miles). No stream category had more than one mile that was completely exposed (no cover).

[37] See section 3.3.1 for more information about 303(d) listed streams.

3.2.2 Wetlands[38]

Overview

The purpose of this analysis is to identify and evaluate historical and current stream-associated wetlands, wetlands surrounded by uplands, identify present and potential impacts or alterations to these wetlands, and examine potential strategic restoration areas located within the Myrtle Creek Watershed. The Myrtle Creek Watershed includes the North Fork, South Fork, and the Main Stem of Myrtle Creek. General wetland functions such as wildlife habitat, water quality improvement, and hydrologic control were evaluated, including more specific functions within each general function.

Many of the functions wetlands provide within a watershed can be grouped under the general functions of wildlife habitat, water quality improvement, and hydrologic control. Wetlands provide habitat for a variety of wildlife and wildlife uses. Small and large mammals, songbirds and waterfowl, amphibians, insects, reptiles and fish all benefit from wetlands wildlife habitat functions. Wetlands provide feeding opportunities, nesting, and refuge for wildlife. Water quality improving functions provided by wetlands include sediment stabilization, nitrogen removal, phosphorous retention, and thermoregulation. Wetland vegetation improves water quality by trapping and absorbing nutrients. Sediments are collected in variable microtopography typically found in wetland areas. Forested wetlands provide thermoregulation by shading water bodies. Hydrologic control functions reduce storm surges and peak flows from high water events due to the ability of many wetlands to retain significant volumes of surface water.

Review of the U.S. Fish and Wildlife Service National Wetland Inventory (NWI) maps for the Myrtle Creek Watershed indicate that nearly all wetlands are closely associated with streams. The stream-associated wetlands present are classified as palustrine, or riverine wetlands. No lacustrine (wetlands associated with lakes, reservoirs, or deep ponds) wetlands were identified on the NWI Maps. Fewer wetland prairies are found within the Myrtle Creek Watershed than are typically found in interior valleys due to highly variable topography. Few wetlands are present in the uplands of the Myrtle Creek Watershed. These wetlands are not associated with a stream, and are hydrologically driven by seeps or springs.

Riverine wetlands are defined as river, creek and stream habitats contained within a channel where water is usually flowing. Riverine systems confined to a channel are often unvegetated, but may include nonpersistent emergent vegetation; palustrine (persistent vegetation) wetlands are often adjacent to riverine systems or contained within them as islands (Cowardin et al. 1979). The definition of riverine wetlands may be expanded by including aspects of the Hydrogeomorphic (HGM) definition, which defines riverine wetlands as "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

[38] Brad Livingston and Loren Waldron from Land and Water Environmental Services, Inc., contributed this section.

biennial floodplains (Adamus, P.R., 2001). The above mentioned wetland types associated with a channel or floodplain are the most common wetlands found throughout the Myrtle Creek Watershed.

Historically, riparian zones and wetlands in the general area of the present day urban growth boundary (UGB) of the city of Myrtle Creek were more extensive due to a wide valley floor and broad floodplain. Further east in the watershed, valleys become narrower and restrict riparian zones and wetlands from expanding beyond the immediate channel.

Main stem Myrtle Creek

Historical Wetlands

The main stem of Myrtle Creek begins at the confluence of North and South Myrtle Creek, and flows into the South Umpqua River approximately one mile to the west. Stream associated wetlands and riparian areas were extensive throughout the main stem of the Myrtle Creek drainage. These areas contained diverse flora, and supported a wide range of fish and wildlife species.

Palustrine emergent wetlands were somewhat common within riparian areas, and may have contained sedges, rushes, and varying herbaceous hydrophytic vegetation. Permanent riverine wetlands contained deep pools within the channel of Myrtle Creek. Seasonal riverine and palustrine wetlands were inundated or saturated for much of the year, and were most often dry in summer months. Currently, wetland areas identified by the NWI are confined to the channel of Myrtle Creek. Historically, seasonal palustrine wetlands may have occupied a majority of the area beyond the immediate channel of the main stem of Myrtle Creek, within low lying valleys containing minimal slopes.

Some wetland prairies may have existed, or may still exist in the wider valley floors in the watershed. Much of the urban area of the City of Myrtle Creek may have contained wetland prairies.

Current Wetland Status

Permanent riverine wetlands containing open water less than 6.5 feet deep are identified where Myrtle Creek flows through an urban residential area. Seasonal riverine wetlands containing a rocky shore and exposed bedrock are identified near the confluence of Myrtle Creek with the South Umpqua River. These wetland types do not contain an abundance of vegetation or variable microtopography, and therefore do not improve water quality or hydrologic control significantly. Within the channel of Myrtle Creek are gravel deposits, which provide fish habitat. Scattered sections of Myrtle Creek contain a very narrow forested riparian buffer, with some areas containing more densely forested riparian zones.

Wetlands within the urban area of the main stem of Myrtle Creek are low functioning in regard to hydrologic control, and water quality improving functions. The lack of riverine and palustrine wetlands extending beyond the immediate channel, coupled with a lack of sufficient vegetation reduces the ability of the main stem of Myrtle Creek to provide water quality improvement, and hydrologic control. Wildlife habitat is primarily limited to aquatic species and birds.

Potential Sources of Impacts

Much of the historical wetlands associated with the main stem of Myrtle Creek have been eliminated or heavily impacted by urban and residential development. Wetlands associated with the main stem of Myrtle Creek were hydrologically altered by the placement of fill material, or the construction of dikes and berms for example.

Impacts to Myrtle Creek are similar to those that are typically associated with streams traversing urban areas. Urban development requires storm water management plans, sewage systems, residential development, and road construction which impact water resources and wetlands by altering natural hydrologic regimes, limiting wildlife access, degrading water quality, and removing native vegetation.

Additional impacts to Myrtle Creek are derived from disturbances upstream on North and South Myrtle Creeks. Principally, land management practices taking place upstream can cause sediments, fertilizers, pesticides, and other potential water quality limiting substances to be transported to Myrtle Creek. Residential development up stream has drained and filled wetlands to construct sound foundations, and has cleared forested areas for yards. These actions result in the loss of water storage capacity of wetlands upstream from the main stem of Myrtle Creek, which impairs hydrologic control. Storm surges and peak flows are intensified due to a lack of water storage capacity, which allows significant flow volumes from storm events to 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 downstream.

Potential Restoration Opportunities

Currently, potential restoration sites on the main stem of Myrtle Creek are adjacent to or within residential and park lands, where a change of land use to perform restoration may not be an option. Beginning at Evergreen park, and west to the confluence with the South Umpqua River, are extensive wetland restoration opportunities. Wetland restoration opportunities exist in this area because there appears to be space for such projects and few residences would be affected. Improving this area would have a positive effect on the South Umpqua River by improving over-wintering and spawning habitat for salmon. Potential restoration strategies might involve the placement of in-stream structures, planting native wetland vegetation, removing fill material, and stabilizing streambanks.

Creating or enlarging wetlands within riparian areas associated with Myrtle Creek would be beneficial, however, limited space is available within the (UGB). West of the UGB, and within the riparian zone of Myrtle Creek, are more substantial opportunities for creating or enlarging wetlands associated with riparian areas. Creation of wetland attributes requires the establishment of wetland hydrology, which may pose a considerable cost to construct. Once wetland hydrology is established on hydric soils, colonization of wetland vegetation will begin, followed immediately by the establishment of desirable wetland functions such as water quality improvement. Improving wetland functioning in this area would not only benefit Myrtle Creek, but would also benefit the water quality of the South Umpqua River through the ability of wetland vegetation to trap sediments, remove Nitrogen, and retain Phosphorous, which are detrimental to water quality.

When performing wetland restoration in urban areas, primary goals are typically to improve aesthetics, reduce erosion, capture sediments, and improve water quality. Urban wetlands are not usually built with the focus of creating wildlife habitat, and tend to be more focused on water quality and hydrologic control functions.

North Myrtle Creek

Historical wetlands

Historically, riverine and palustrine wetlands associated with stream channels, floodplains, and riparian zones were abundant in lowland valleys, where they had a hydrologic connection with a nearby stream. Wetlands located within the North Myrtle Creek drainage were very productive, and supported a variety of plant and animal life.

Palustrine emergent wetlands were somewhat common within riparian areas, and most likely contained sedges, rushes, and varying herbaceous hydrophytic vegetation. Forested palustrine wetlands were also common within riparian areas, and may have contained more area than palustrine emergent wetlands. Permanent riverine wetlands contained deep pools within the channel of North Myrtle Creek. Seasonal riverine and palustrine wetlands were inundated or saturated for much of the year, and were most often dry in summer months. Currently, wetland areas identified by the NWI are typically confined to the channel of North Myrtle Creek, and its tributaries. Historically, seasonal palustrine wetlands would have extended beyond the immediate channel of North Myrtle Creek, but would not have extended beyond the valley floor. Upper perennial and intermittent streams within the North Myrtle Creek drainage contained wetlands that were mostly confined to channels.

Current wetland status

Wetlands associated with the North Myrtle Creek drainage continue to provide wetland functions, although at a reduced capacity. Wildlife habitat remains, but many species of wildlife prefer a more natural unaltered riparian zone for nesting, feeding, and other activities. Currently, 45% of the riparian zone of North Myrtle Creek is two or more trees wide, and 35% of the riparian zones of tributaries to North Myrtle Creek are two or more trees wide. Most of the streams appear to provide suitable fish habitat, which includes shaded water, gravel beds, and off-channel refuge areas. The ability of the wetlands within the North Myrtle Creek drainage to provide water quality improving functions has been reduced by development activities, which have reduced native vegetation, altered hydrology, and increased impervious surfaces.

Narrow riparian zones have been maintained along much of the streams in the watershed, although some are more substantial than others. Further east from the City of Myrtle Creek are tight meanders, oxbows, meander scars, and gravel bars, which provide wildlife and fish habitat.

Wetland types identified by the NWI on North Myrtle Creek, and its tributaries, include palustrine and riverine wetlands. Permanent palustrine wetlands contain open water less than 6.5 feet deep. Seasonal palustrine wetlands contain forested areas dominated by broad leaved deciduous tree species. Permanent riverine wetlands contain open water less than 6.5 feet deep confined to the active channel of streams. Seasonal riverine wetlands are associated with intermittent streams descending upland areas. A significant portion of the wetlands identified by the NWI are confined to channels and lack persistent wetland vegetation. The lack of persistent vegetation limits uptake of nutrients, and terrestrial wildlife habitat.

Potential sources of impacts

Land use activities that have impacted or reduced the size of wetlands are well established. Development has taken place in riparian zones and floodplains for many years in the Myrtle Creek Watershed. Aggregate removal, clearing native vegetation, residential, industrial, and road development activities have all contributed to filling riverine and palustrine wetlands. Drainage ditches, the placement of fill material, or the construction of dikes and berms hydrologically alters wetlands. Clearing forested areas directly adjacent to streams, filling wetlands, altering hydrologic regimes, and building within the floodplain increases the potential impact of surface water runoff.

Industrial activities within the watershed are not as widespread as land clearing disturbances, and are mainly located near the South Umpqua River. Industrial facilities located near water resources increase impervious surfaces, which increases impacts from surface water runoff. A potentially water quality limiting impact derived from industrial facilities is point source pollution, which may deposit byproducts into water bodies from an easily identified outlet.

Although the impacts to wetlands are significant in the lower portion of the North Myrtle Creek drainage, restoration of key wetland areas may provide improved wildlife habitat, hydrologic control, and water quality.

Potential restoration opportunities

Potential wetland restoration opportunities exist in several locations within the tributaries, riparian zones, and floodplains of the North Myrtle Creek drainage. Wetland restoration or creation opportunities may include the physical construction of meanders, especially in areas that are currently ditched, or the removal of fill and other hydrologic modifications. In most circumstances, creation of wetland microtopography and hydrology, on hydric soils, creates conditions for the establishment of hydrophytic plants. Once hydrophytic vegetation and wetland hydrology becomes established, wildlife habitat, water quality improvement, and hydrologic control functions will return.

Wetland restoration projects should initially be focused in areas where the greatest loss of wetland functions has occurred, although successful wetland restoration can improve water quality and hydrologic control in areas downstream of the restored wetland. Water is stored and nutrients are filtered in wetland areas, which reduces flow volumes and harmful nutrients traveling downstream. Within the North Myrtle Creek drainage, the highest priority areas for wetland restoration are located within the UGB of the City of Myrtle Creek, and immediately outside city limits. Wetland restoration projects further east should be less of a priority, as these areas are less impacted.

South Myrtle Creek

Historical wetlands

Wetlands within the South Myrtle Creek drainage were mostly associated with perennial and intermittent streams. Of the few wetlands located in uplands, most are hydrologically driven by seeps or springs. Historically, with less developed flood plains and riparian areas, more palustrine emergent wetlands would have been present in river valleys with minimal slope. In upland areas, wetlands associated with steeply descending tributaries were confined to active channels.

Palustrine emergent wetlands were somewhat common within riparian areas, and may have contained sedges, rushes, and varying herbaceous hydrophytic vegetation. Permanent and seasonal wetlands were abundant throughout the South Myrtle Creek drainage. Permanent riverine wetlands contained deep pools within the channel. Seasonal riverine and palustrine wetlands were inundated or saturated for much of the year, and were most often dry in summer months. Currently, wetland areas identified by the NWI are mostly confined to the channel of South Myrtle Creek, and its tributaries.

Current wetland status

Development has taken place in riparian zones, wetlands, and floodplains for many years in the South Myrtle Creek drainage. Clearing of land, aggregate removal, road construction, residential and industrial development have all contributed to filling riverine and palustrine wetlands associated with streams. Narrow riparian zones have been maintained along much of the streams in the watershed, although some are more substantial than others.

Wetland types identified by the NWI within the South Myrtle Creek drainage include riverine and palustrine wetlands. Permanent riverine wetlands containing open water less than 6.5 feet deep are associated with perennial tributaries. Intermittently flooded palustrine wetlands containing broad leaved deciduous tree species are located in floodplains within low lying valleys. Seasonal palustrine emergent wetland areas are present within the South Myrtle Creek drainage, and are mostly dry in summer months.

Wetlands in the South Myrtle Creek drainage continue to perform wetland functions, albeit their values have diminished. Wildlife habitat remains, but is currently less extensive and variable than in the past. Most of the streams appear to provide suitable fish habitat. The ability of wetlands within the watershed to provide water quality improving functions has been reduced by development activities, which eliminate native vegetation and natural hydrologic regimes. Existing riverine and palustrine wetlands contribute to hydrologic control of high and low flow volumes at a diminished capacity, due to impacts associated with development. Habitat for terrestrial wildlife is limited due to development activities, however, some habitat remains for birds and aquatic wildlife.

Potential sources of impacts

Potential sources of impacts to wetlands within the South Myrtle Creek drainage appear to be derived from typical sources, these include: ditching, draining, and filling wetlands for development as well as clearing natural vegetation. Removal of native vegetation, construction, and maintenance activities involved with golf courses can also have an adverse effect on wildlife habitat, water quality, and hydrologic control. Roads built parallel to a waterway create a hydrologic obstacle, and restrict wildlife access.

Riparian buffers throughout much of the valleys within the South Myrtle Creek drainage have been cleared of natural vegetation and variable micro topography. Surface water runoff from the steep hilly terrain is not slowed or trapped by an abundance of vegetation, or captured in microtopographic depressions. As a result, runoff does not reduce velocity or settle its bed load before entering a stream.

Potential restoration opportunities

Potential wetland restoration opportunities exist in several locations within the tributaries, riparian zones, and floodplains of the South Myrtle Creek drainage. Wetland restoration or creation opportunities may include the physical construction of meanders, especially in areas that are currently ditched, or the removal of fill and other hydrologic modifications. In most circumstances, creation of wetland microtopography and hydrology, on hydric soils, creates conditions for the establishment of hydrophytic plants. Once hydrophytic vegetation and wetland hydrology become established, wildlife habitat, water quality improvement, and hydrologic control functions will return.

An effective strategy to increase the function of the stream associated wetlands within the South Myrtle Creek drainage would include: protecting existing wetlands located near the headwaters of tributaries to South Myrtle Creek, enhancing any stream associated wetlands by simply planting more native trees such as Oregon ash (*Fraxinus latifolia*), black cottonwood (*Populus balsamifera*), red alder (*Alnus rubra*), and various willow species (*Salix spp*.), planting conifers to reduce invasive species, stabilizing eroding streambanks using biotechnical erosion control methods or reducing slope severity by excavating, eliminating livestock access to streams by fencing riparian areas, and using farm ponds as drinking water for livestock. Downed woody debris and standing dead wood may be artificially placed to enhance habitat for a variety of wildlife uses. Wetland restoration is most beneficial when a large area can be restored and protected in perpetuity.

Cumulative restoration of all historical wetlands in a developed watershed is not a realistic goal, however, the identification and restoration of key sites in the watershed will improve water quality, reduce erosion, improve wildlife habitat, and increase hydrologic control among other wetland functions. Initial wetland restoration projects may be focused in the most disturbed locations, as there is the greatest potential for significant gains in wetland functions. Restoring wetlands does not only improve the integrity of water resources in the immediate area of the restoration, but also improves conditions elsewhere. Wetland restoration in a specific location will provide habitat only within the boundaries of the restored area, however, water quality improvement and hydrologic control functions will extend well beyond the specific restoration boundary. For example, restoring wetlands will improve water quality by trapping sediments and retaining nutrients, which will benefit downstream water quality, and may improve salmon habitat due to reduced sedimentation.

Wetland 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.

Bureau of Land Management. 2002. Draft Myrtle Creek Watershed Analysis. Roseburg District, South River Resource Area, 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

- Throughout the watershed, riparian vegetation is predominantly coniferous and/or hardwood trees. Collectively, South Myrtle Creek's tributaries have riparian zones with more than 50% conifers. Brush/blackberries predominate in approximately 10% of the North Myrtle Creek and its tributaries. There is much variation among specific tributaries.
- Riparian buffers that are one tree wide are most common in North Myrtle Creek and South Myrtle Creek. Tributary conditions vary from predominantly conifers to almost 25% treeless areas. Many individual tributaries have nearly a quarter of riparian zones without trees.
- North Myrtle Creek, South Myrtle Creek, their collective tributaries, and specific tributaries are mostly more than 50% covered.

Wetlands key findings[39]

- Wetlands improve water quality by trapping sediments, removing nitrogen, retaining phosphorous, and regulating stream temperatures.
- Stream associated wetlands are the dominant type of wetland found within the Myrtle Creek Watershed, and are typically confined to active channels.
- Narrow riparian zones have been maintained along much of the streams in the watershed, although some are more substantial than others.
- Historically, riverine and palustrine wetlands associated with stream channels, floodplains, and riparian zones were abundant in lowland valleys, where they had a hydrologic connection with a nearby stream. Wetlands located within the Myrtle Creek Watershed were very productive, supported a variety of plant and animal life, and were very dynamic ecosystems.

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 width 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 provide more than 50% cover.
- Provide information to landowners explaining the benefits of restricting livestock access to streams, establishing buffer zones, the importance of wetlands within watersheds, and the effects of downstream conditions.
- Promote public involvement in the maintenance of wetland resources by educating members of the local community as to the importance of maintaining natural heritage and diversity.
- 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, i.e. streams and rivers. Table 3-4 lists all beneficial uses for streams and rivers within the Umpqua Basin.

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

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 3-4: Beneficial uses for 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 is required to determine 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 3-5 shows the Myrtle Creek 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 Myrtle Creek 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. To evaluate water quality in the Myrtle Creek 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.

[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 Myrtle Creek Watershed, these streams are North Myrtle Creek (habitat and flow) and South Myrtle Creek (flow).

Stream or stream segment	Parameter(s)	Year listed	Stream miles listed[43]	Season
Myrtle Creek	Ammonia	2002	0 – 0.4	All year
North Myrtle Creek	Temperature	2002	0 – 15	Summer
			15 – 18.3	Sept. 15 – May 31
South Myrtle Creek	Temperature		0 – 22.2	Summer
				Sept. 15 – May 31
Buck Fork	Temperature	2002	0 – 4.4	
Letitia Creek	Temperature	2002	0 – 3.3	Summer
				Sept. 15 – May 31
Louis Creek	Temperature	2002	0 – 5	Summer
				Sept. 15 – May 31
Riser Creek	Temperature	1998	0 – 4.1	Summer
School Hollow	Temperature	2002	0 – 1.6	Summer
Slide Creek	Temperature	2002	0 – 2.6	Summer
				Sept. 15 – May 31
			2.6 – 4.4	Sept. 15 – May 31
Weaver Creek	Temperature	2002	0 – 1.5	Summer
				Sept. 15 – May 31
			1.5 – 5.7	Sept. 15 – May 31

Table 3-5: ODEQ water quality-limited stream segments in the Myrtle Creek Watershed (November, 2002).

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.[44] 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)

[43] Stream mile zero is the mouth of the stream.

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

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 by 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 months, water temperature can exceed the 64°F standard and cause streams to be water quality-limited. North Myrtle Creek, South Myrtle Creek, and seven tributaries are 303(d) listed for temperature (see
Table 3-5).

In 1999, the Umpqua Basin Watershed Council (UBWC) sponsored 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 Myrtle Creek (the Smith report).[45] Continuously sampling sensors were placed at 119 locations within the South Umpqua River sub-basin, of which 15 were within the Myrtle Creek 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 for North and South Myrtle Creek.[46] Appendix 9 has the same data for many tributaries.

Table 3-6 has the number of days and percent of days for which seven-day moving average maximum temperature exceeds 64°F. Two of three North Myrtle Creek monitoring sites had seven-day moving average maximum temperatures exceed the 64°F standard at each monitoring site every day the study was conducted. Monitoring sites at the headwaters of North Myrtle Creek and South Myrtle Creek and on some tributaries were below 64°F every monitoring day.

Table 3-7 shows the highest and lowest seven-day moving average maximum temperatures recorded and the dates they occurred for North Myrtle Creek, South Myrtle Creek, and their respective tributaries. Map 3-7 shows the monitoring sites where the highest and lowest maximum temperatures occurred. The highest temperature for South Myrtle Creek was near the mouth. North Myrtle Creek's highest recorded temperature is above Frozen Creek. As would be expected, the lowest recorded seven-day moving average maximum temperatures are near the headwaters for all monitoring categories.

Throughout the South Umpqua fourth-field watershed study area, tributaries including Myrtle Creek tended 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 similarly sized tributaries have the potential to be at cooler temperatures.

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[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 maximum temperature is an average of the maximum temperatures of a given day, the three preceding days, and the three days that follow.

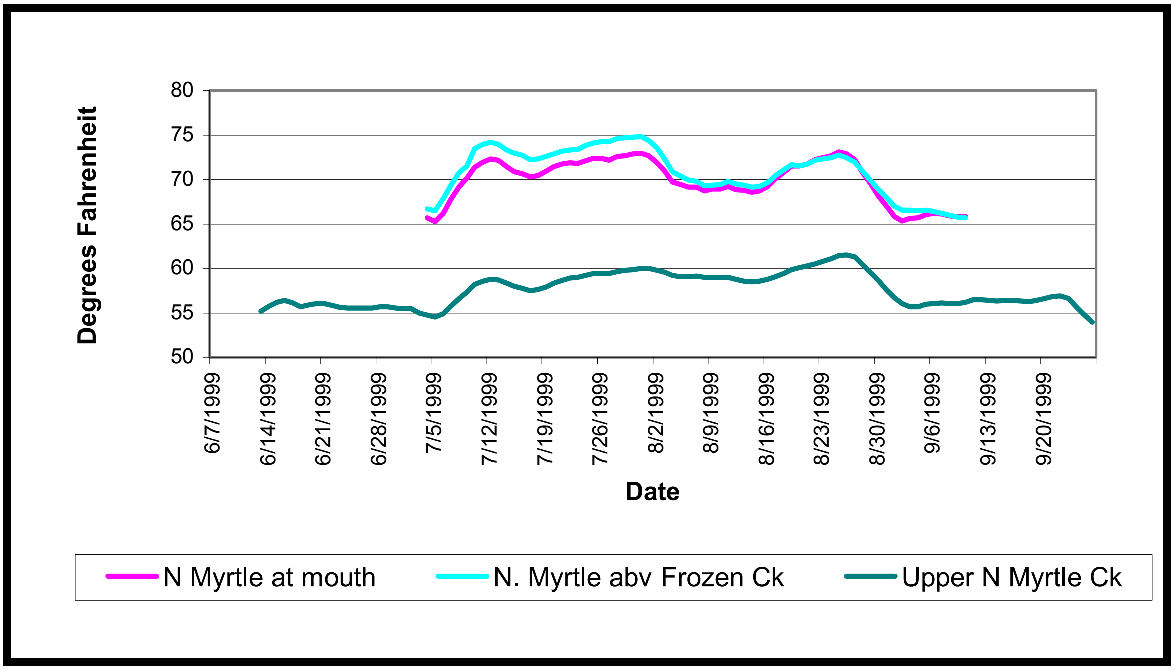


Figure 3-1: Summer temperature trends for North Myrtle Creek.

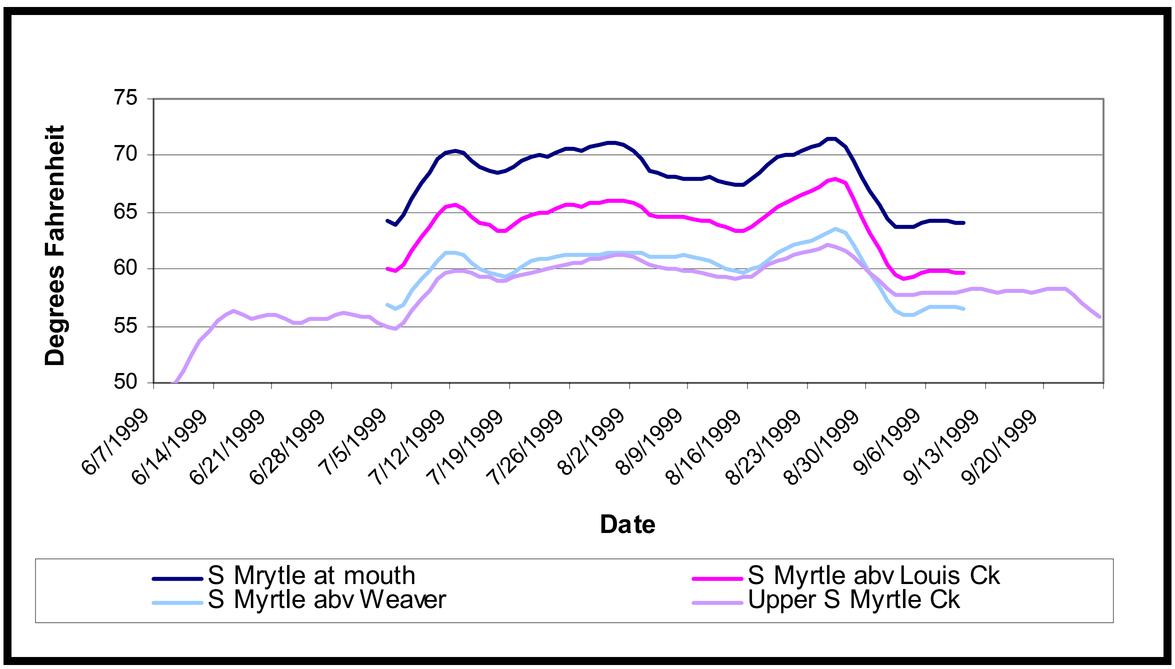


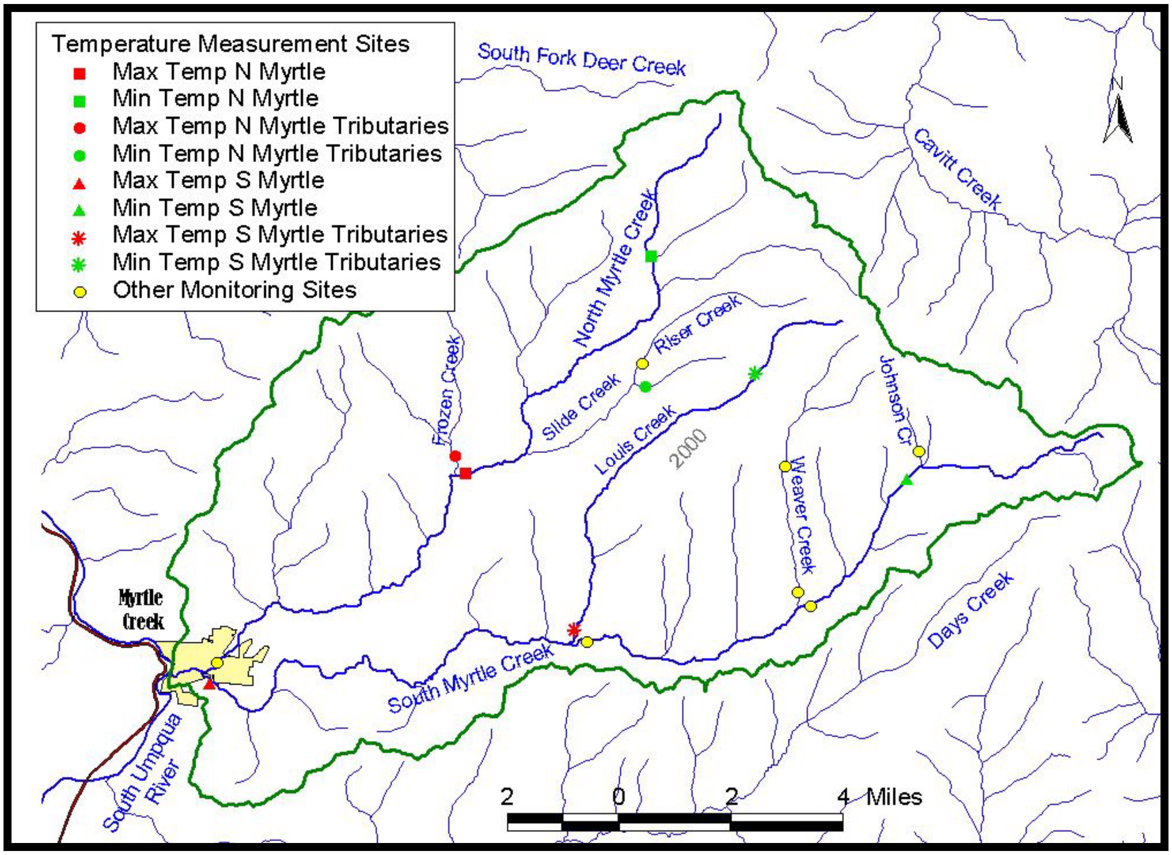
Figure 3-2: Summer temperature trends for South Myrtle Creek.

Sample Site	Days >64°F	Days monitored	% total days >64°F
North Myrtle at mouth	69	69	100.0
North Myrtle above Frozen Creek	69	69	100.0
South Myrtle at mouth	65	69	94.2
Louis Creek at mouth	56	69	81.2
Frozen Creek at mouth	52	69	75.4
Weaver Creek at mouth	23	35	65.7
South Myrtle above Louis Creek	42	69	60.9
Riser Creek near mouth	38	112	33.9
Slide Creek above Riser Creek	0	122	0.0
Upper North Myrtle Creek	0	112	0.0
Upper Louis Creek	0	112	0.0
Upper Weaver Creek	0	112	0.0
South Myrtle above Weaver Creek	0	69	0.0
Johnson Creek at mouth	0	112	0.0
Upper South Myrtle Creek	0	112	0.0

Table 3-6: Days for which seven-day moving average maximum temperatures exceeded 64°F in the Myrtle Creek Watershed.

Stream monitoring category	Highest	Date	Lowest	Date
N. Myrtle Creek	74.82°F	7/31/99	54.52°F	7/5/99
N. Myrtle Creek tributaries	67.97°F	8/25/99	55.16°F	9/18/99
S. Myrtle Creek	71.40°F	8/25/99	54.74°F	7/5/99
S. Myrtle Creek tributaries	69.71°F	8/25/99	52.85°F	7/5/99

Table 3-7: Highest and lowest seven-day moving average maximum temperatures for North Myrtle Creek, South Myrtle Creeks, and tributaries.



Map 3-7: Highest and lowest seven-day moving average maximum temperature monitoring sites.

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.

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, the Smith report

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

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 flows 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 influence 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 hydrogen 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 'eat away' at the protective mucous layer on aquatic organisms such as fish, amphibians, and mollusks. Without a healthy protective layer, fish and other animals are more susceptible to diseases. Also, pH affects nutrients, toxics, and metals within the stream. Changes in pH can alter the chemical form and 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, which can be toxic to humans, fish and wildlife, shift to more soluble forms in acidic water, and are more easily ingested.

Physical and biological factors cause surface and groundwater pH to normally be slightly alkaline or acidic. The chemical composition of rocks and rainfall can influence pH. Respiration and photosynthesis are normal metabolic processes of aquatic organisms that

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

also change pH. Carbon dioxide (CO_2) is produced during respiration and used for photosynthesis. The level of dissolved CO_2 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 CO_2. However, stream inputs that increase or decrease respiration and photosynthesis by aquatic organisms can indirectly shift pH by changing CO_2 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 CO_2. As CO_2 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.

Figure 3-3 shows the pH levels measured by ODEQ in the Myrtle Creek Watershed. Out of 12 samples, none was outside the acceptable range, indicating that pH is not limiting water quality.[50] However, pH could be a concern in other streams or reaches, which can only be determined by additional monitoring.

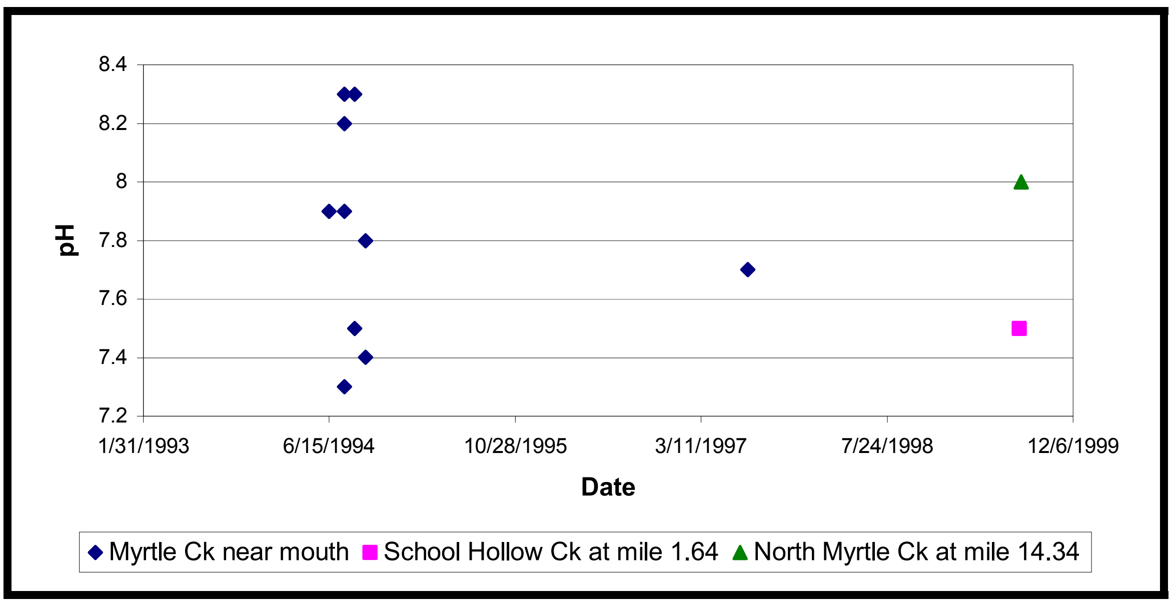


Figure 3-3: pH levels for Myrtle Creek Watershed monitoring sites.

[49] Increased nutrient levels in the winter have a smaller effect on pH because cold temperatures inhibit algae growth.
[50] Data are from ODEQ's Laboratory Analytical Storage and Retrievable (LASAR) database. All ODEQ data are available via the website www.deq.state.or.us. Select "water quality" and "Laboratory Analytical Storage and Retrievable Database – Monitoring Data."

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.[51] Aquatic organisms produce oxygen through photosynthesis and use oxygen during respiration. 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 other 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. The Oregon Watershed Enhancement Board states that for the purpose of a watershed assessment, it is appropriate to use eight mg/l as the minimum standard for dissolved oxygen in areas supporting cold-water fish. As of the writing of this assessment, there are no ODEQ data for dissolved oxygen levels in the Myrtle Creek Watershed. It is unknown at this time if dissolved oxygen levels are limiting fish spawning and rearing in the watershed's streams.

3.3.5 Nutrients

The beneficial uses affected by nutrients are aesthetics or "uses identified under related parameters."[52] This means that a stream may be considered water quality-limited for nutrients if nutrient levels adversely affect related parameters, such as dissolved oxygen, that then negatively impact one or more beneficial uses, such as resident fish and aquatic life. 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.[53]

Currently, there are no Umpqua Basin-based ODEQ values for acceptable stream nutrient levels and no streams that are 303(d) listed for nutrients in the Myrtle Creek Watershed. Therefore, this assessment used the OWEB standards for evaluating nutrient levels in the

[51] As water churns and moves, it makes contact with atmospheric oxygen, of which some dissolves in the water until the stream is saturated.
[52] From the *Oregon's Approved 1998 303(d) Decision Matrix*.
[53] Diamond Lake is within the Umpqua National Forest in the extreme eastern portion of the Umpqua Basin.

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).

Nutrients were measured at five sites in the Myrtle Creek Watershed between 1993 and 2000. The monitoring sites at the mouth, upstream of the Myrtle Creek wastewater treatment plant, and in downtown Myrtle Creek are close to one another and have been grouped together in Figure 3-4 as "Myrtle Creek near mouth." The other two sites are on School Hollow Creek at road mile 1.64 and on North Myrtle Creek at road mile 14.34.

Out of 13 main stem Myrtle Creek samples, one exceeded 0.05 mg/l for phosphorus and four exceeded 0.3 mg/l for nitrate. The four high nitrate samples were all taken in 1994 from the monitoring site located at the mouth of Myrtle Creek. Since this site was sampled seven times that year, 57% of samples from Myrtle Creek at the mouth exceeded water quality standards. A single sample was taken at North Myrtle Creek at road mile 14.34 and from one from School Hollow Creek at road mile 1.64; neither had phosphorus or nitrate/nitrite levels exceeding OWEB recommendations.[54]

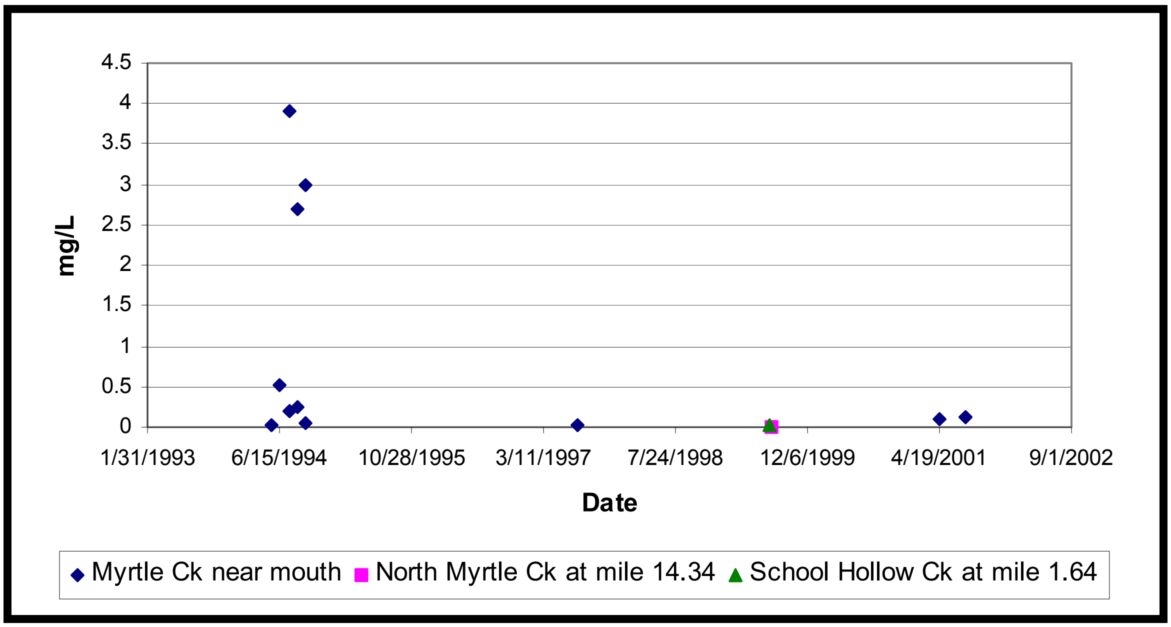


Figure 3-4: Nitrate/nitrite levels for monitoring sites in the Myrtle Creek Watershed.

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. Industrial and home fertilizers, wastewater treatment plant effluent, and fecal matter from wildlife, domestic animals, and septic systems, can increase stream nutrient levels. Not enough is known about normal nutrient levels for Umpqua Basin streams and rivers to determine whether or not nutrient levels in the Myrtle Creek Watershed are of concern. However, using OWEB's recommended nitrate levels, it appears that main stem

[54] Data are from ODEQ's Laboratory Analytical Storage and Retrievable (LASAR) database.

Myrtle Creek nitrate levels are high. More research is needed to determine if, in fact, there is a nutrient problem in the Myrtle Creek Watershed, the source of the problem, and possible solutions.

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. Stream contamination can also come 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. There are no ODEQ bacteria monitoring data for the Myrtle Creek Watershed, and it is unknown at this time if bacteria are a water quality-limiting factor in the watershed.

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 redds and will suffocate salmonid eggs. Although there are many aquatic organisms that require gravel beds, others, such as the larvae of the Pacific and western brook lamprey, thrive in sludgy streams.

Turbidity can be 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.[55] 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 become extremely high 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 Myrtle Creek 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 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 Myrtle Creek 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. No samples taken by ODEQ in 1994, 1997, and 1999 exceeded 50 NTUs; the highest recorded value was five NTUs.[56]

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[55] Suspended particles are not chemically mixed with water and will eventually settle to the stream bottom.
[56] Data are from ODEQ's Laboratory Analytical Storage and Retrievable (LASAR) database.

Sediment delivery processes[57]

Sediment introduction into streams and surface erosion from slopes and floodplains is a natural part of any watershed. The amount of erosion and the sediment load in the streams vary considerably throughout the year, with the bulk of sediment moving during the few days of highest flows. Human activities also affect the overall sediment delivery processes within the watershed. Separating human-induced erosion from natural erosion is difficult due to the highly variable nature of natural erosion patterns as well as the variability in timing and spatial pattern of erosion affected by human activity.

A comprehensive watershed assessment of erosion and sediment processes within a watershed requires three steps. First, an inventory of visible signs of erosion is performed, which begins by locating and mapping landslide scars, road washouts, or areas with extensive gullying. The next step is to identify and map areas or situations where erosion and sediment generation is likely to occur in the future, which is typically in the lower gradient stream channels of the system. This involves locating and mapping high-risk sections of road, undersized but still intact culverts at stream crossings, and places where inappropriate agricultural techniques and practices occur on sensitive areas. The third step is to summarize the information in a way that identifies the human-caused erosion problems, for which there is a high priority for mitigation and/or restoration.

Without further field verification and analysis, an in-depth and detailed report on sediment processes within the assessment area is beyond the scope of this screening-level assessment. Therefore, this assessment reviews five potential sources of stream sedimentation and turbidity in the watershed: roads and culverts, slope instability, hydrologic soil groups, soil k factor, urban drainage, and burns.

<u>Roads and culverts</u>

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.[58]

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 545 miles of roads in the Myrtle Creek Watershed, of which over two-thirds are surfaced. These are broken into nine classes (see Table 3-8).

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[57] Tim Grubert and John Runyon of BioSystems, Inc., contributed the introductory text for the sediment delivery processes section.

[58] Tim Grubert and John Runyon of BioSystems, Inc., contributed this paragraph.

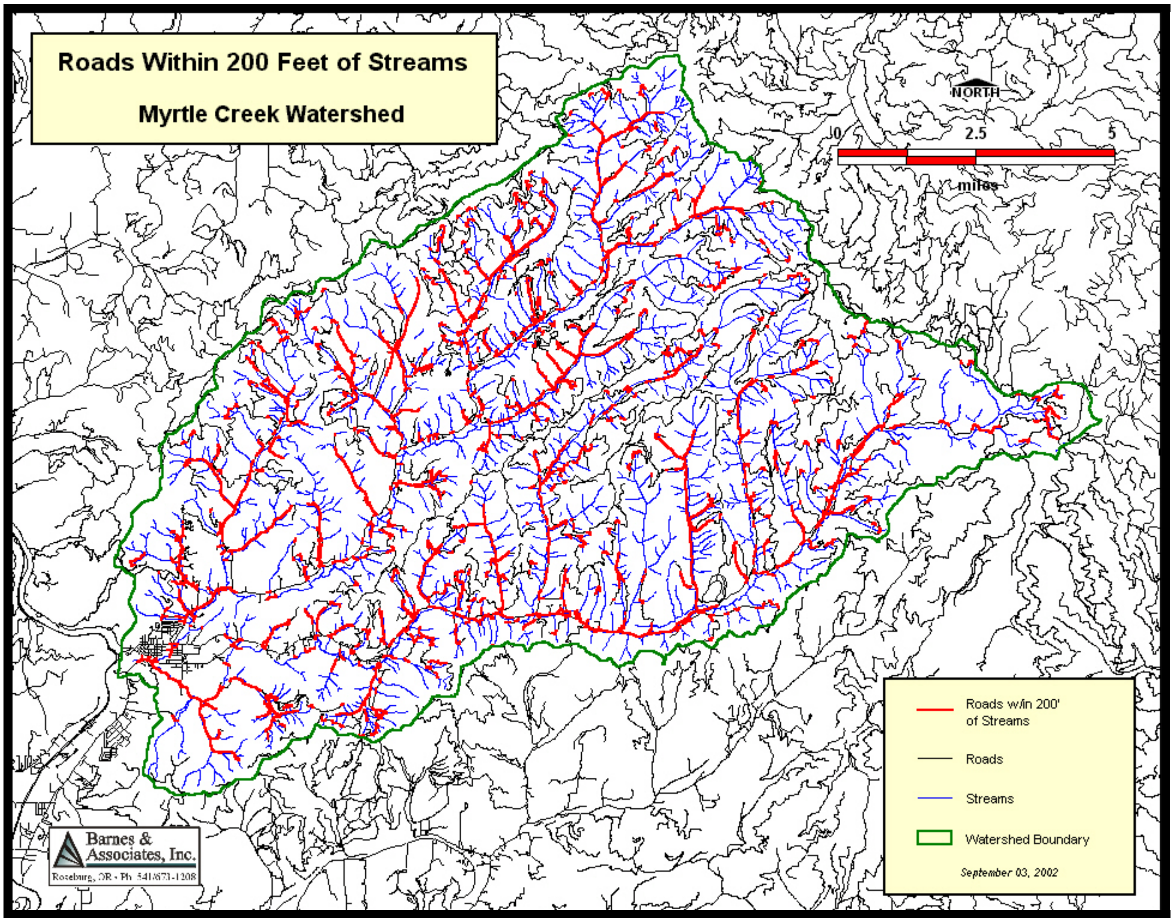
Surface type	**Total road miles**	**% total[59]**
Surfaced		
• Federal roads (paved)	0	-
• State roads (paved)	1	0.2%
• County/other (paved)	59	10.8%
• Major gravel	219	40.2%
• Minor gravel or spur	72	13.2%
Total surfaced	**351**	**64.4%**
Unsurfaced		
• Major dirt road	75.8	13.9%
• Minor dirt road	14.5	2.7%
Total unsurfaced	**90.3**	**16.6%**
Other		
• Unknown	57.1	10.5
• Closed	47.0	8.6
Total other	**104.1**	**19.1%**

Table 3-8: Total miles and percent of Myrtle Creek Watershed roads by class.

The closer a road is to a stream, the greater the likelihood that road-related runoff contributes to sedimentation. In the Myrtle Creek Watershed, there are approximately 167 miles of roads (30% of 545 total miles) within 200 feet of streams (see Map 3-8). Of these, approximately 108 miles (65%) are surfaced roads, 27 miles (16%) are unsurfaced roads, and 32 miles (19%) are unknown or closed.

Roads on steep slopes have a greater potential for erosion and/or failure than roads on level ground. There are approximately 11 miles of roads (2.0% of 545 total miles) located on a 50% or greater slope and within 200 feet of a stream. Most of these are found in the north-central part of the watershed (see Map 3-9). Of these roads on steep slopes, 4.8 miles (45%) are surfaced, 2.3 miles (22%) are unsurfaced, and 3.5 miles (33%) are closed or unknown. An analysis of road conditions near streams is necessary to determine how much stream sedimentation is attributable to road conditions.

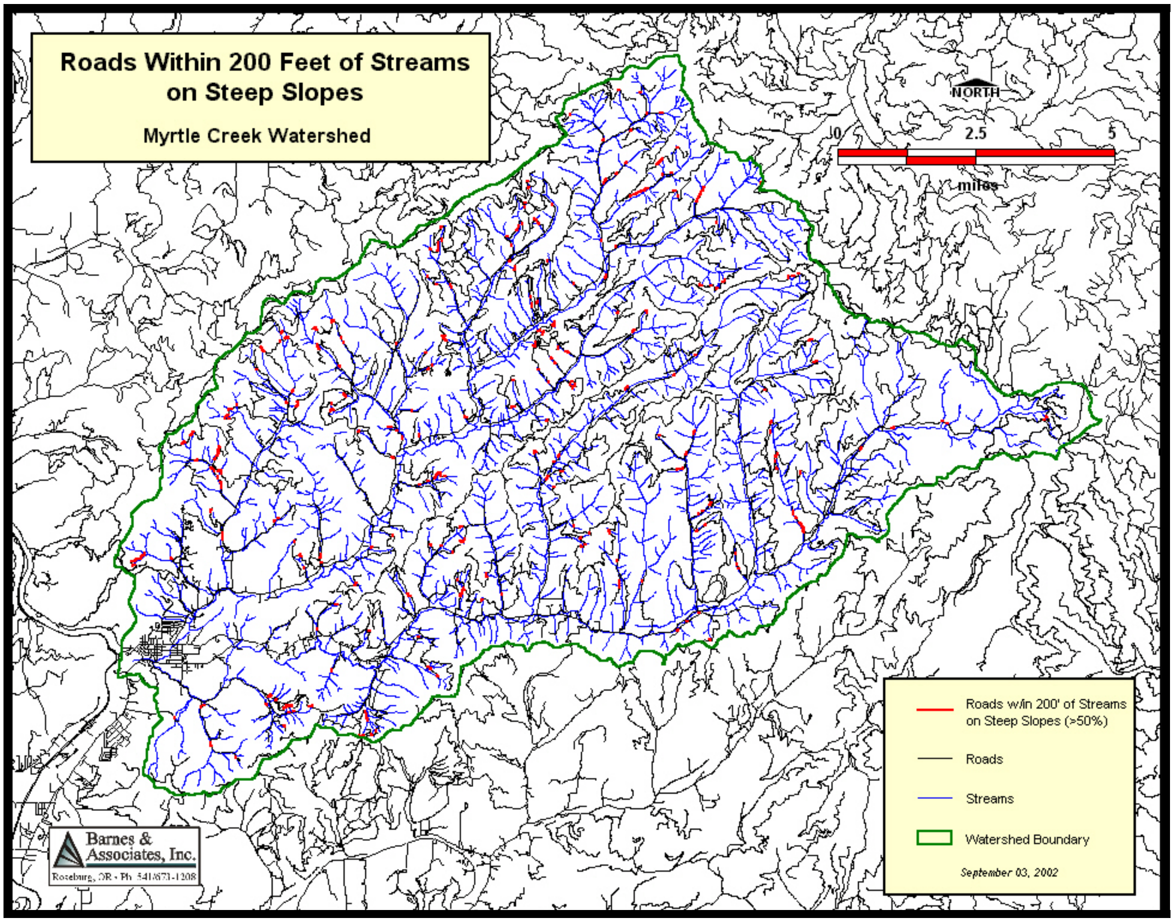
[59] Percents do not add to 100 due to rounding.



Map 3-8: Locations of Myrtle Creek Watershed roads within 200 feet of a stream.

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, and when the pipe is placed too high or too low in relation to the surface of a stream. In these 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 97 stream crossings in the Myrtle Creek Watershed. At this time, it is unknown how many of these crossing are culverts and how many culverts are failing.[60]

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

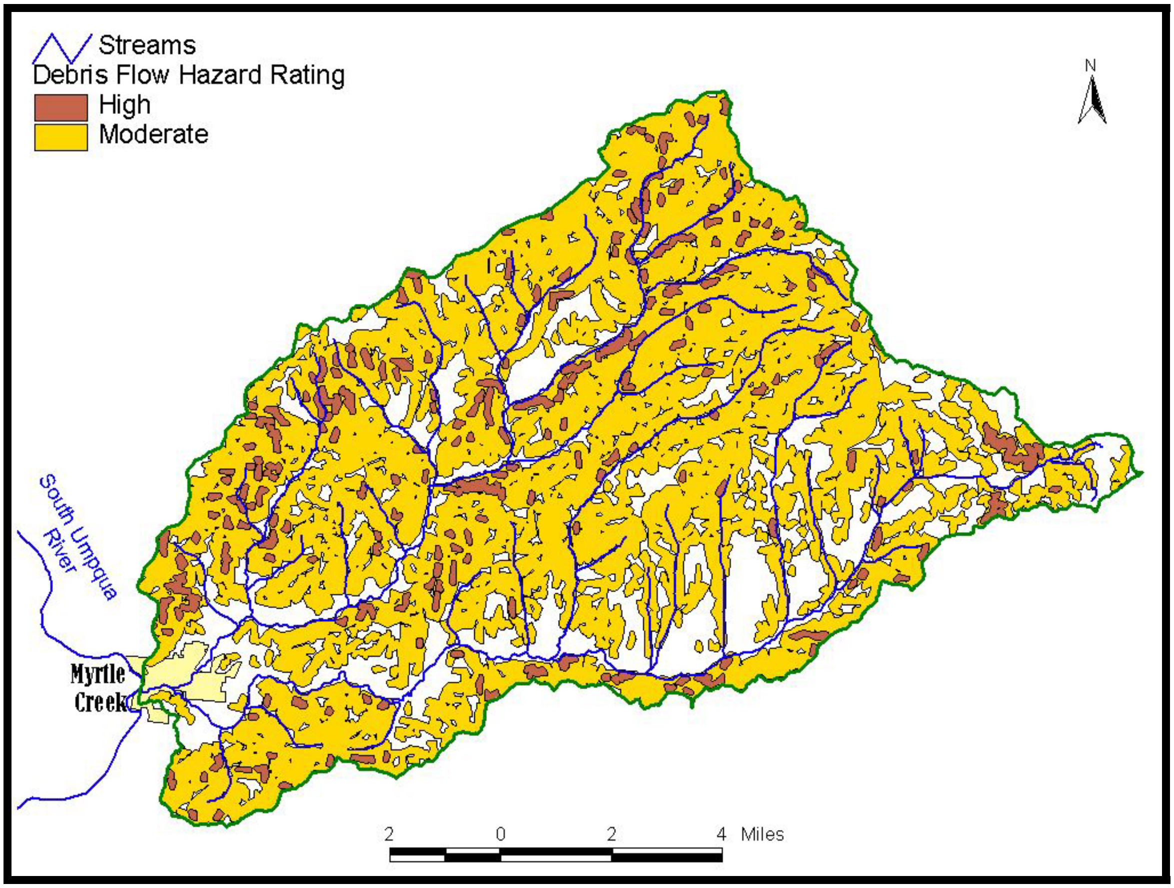


Map 3-9: Locations of Myrtle Creek Watershed roads within 200 feet of a stream and on slopes that are greater than 50%.

Slope instability

Debris flows (landslides) are the result of inherent slope instability and generally occur in areas with steep slopes and high rainfall. Slopes that are greater than 80% may be more vulnerable to landslides when vegetative cover is removed (see Map 1-3 in section 1.2.3). In 1999, the Oregon Department of Forestry completed a survey of debris flow potential in western Oregon (see Map 3-10).[61] Of the 76,322 acres within the Myrtle Creek Watershed, approximately 51,703 acres (68%) are considered moderate for debris flow potential and 5,517 acres (7.2%) are high. There are no areas within the watershed classified as having an extreme debris flow potential. Photo 3-2 shows a historical landslide in the Myrtle Creek Watershed.

[61] At the writing of this assessment, the Oregon Department of Forestry had not field verified all the debris flow potential areas.



Map 3-10: Debris flow potential within the Myrtle Creek Watershed.

After a landslide event, a large amount of sediment enters streams over a short period of time, which may change stream morphology and direction of flow. High amounts of debris flow can block stream paths entirely. Of the 131.5 miles of streams included in Map 3-10, 74 miles (56.2%) are within areas of moderate landslide potential, and six miles (4.5%) 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 Myrtle Creek Watershed.

Photo 3-2. Landslide on slope above South Myrtle Creek (UTM coordinates 482999/4763257).[62]

Hydrologic soil groups[63]

The Natural Resource Conservation Service classifies soil into four hydrologic soil groups that are based on the soil's runoff potential. Group A exhibits the smallest runoff potential and Group D has the greatest:

- Group A soils are dominated by deep, well to excessively drained sands and loams that yield low runoff potential and high infiltration rates with a high rate of water transmission. This group consists chiefly of coarse sands and gravels.

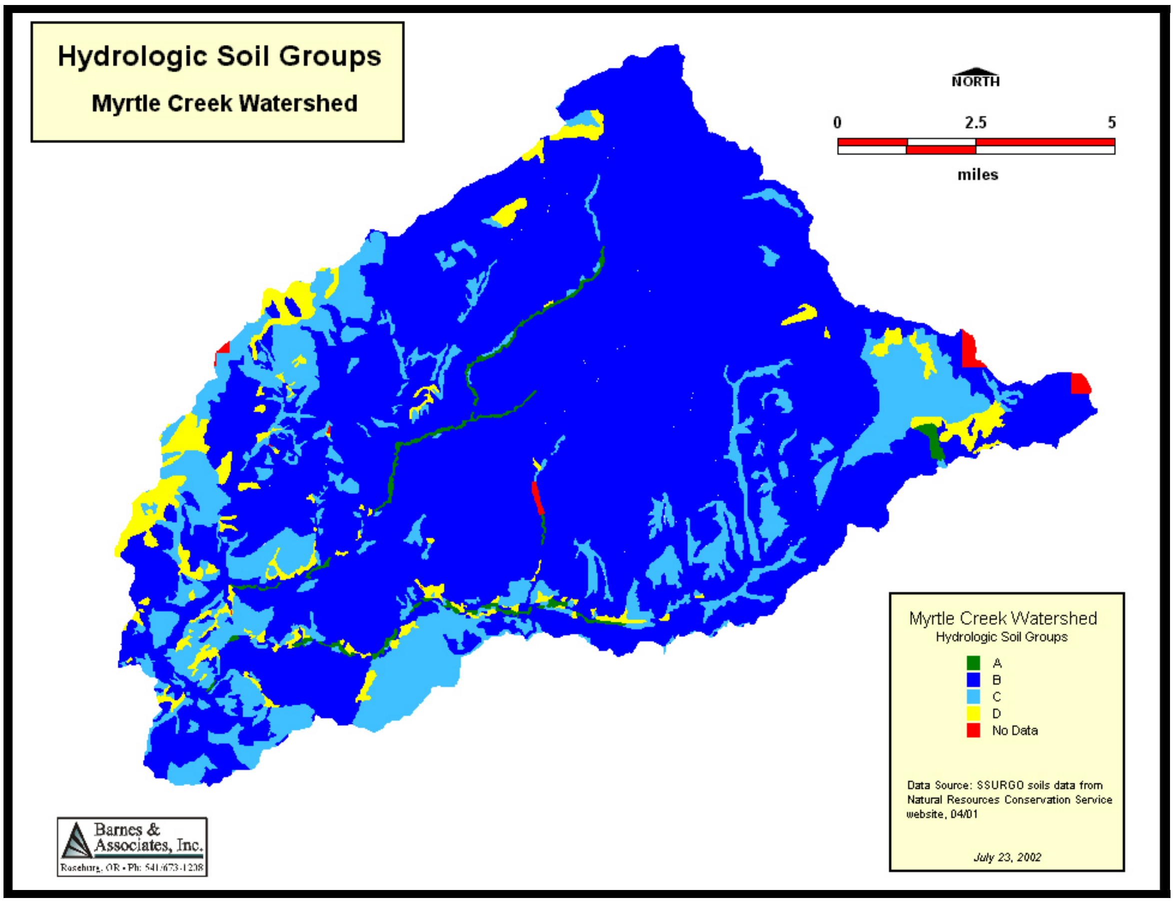
- Group B is typically a silt loam or loam with a moderate infiltration rate and consists chiefly of moderately deep to deep, well drained soils with moderately fine to coarse textures.

- Group C soils are sandy clay loams with typically low infiltration rates and are typified by a layer that impedes downward movement of water. Soil structure is moderately fine to fine.

[62] Tim Grubert and John Runyon of BioSystems, Inc., contributed this photograph.
[63] Tim Grubert and John Runyon of BioSystems, Inc., contributed this section.

- Group D soils are clays, clay loams, silty clay loams, sandy clays, and silty clays. These soils have the highest runoff potential with very low infiltration rates. They consist chiefly of clay soils with a high swelling potential, a high permanent water table, and a clay layer at or near the surface with shallow soils over nearly impervious material.

Group B is the dominant hydrologic soil group in the Myrtle Creek Watershed, comprising roughly 85 to 90 percent of the total surface area within the watershed. Map 3-11 illustrates the hydrologic soil groups of the watershed.



Map 3-11: Hydrologic soils map of the Myrtle Creek Watershed.

The soil type found within the Myrtle Creek Watershed is the silica-rich, ultramafic, serpentine soil commonly associated with areas that have been geologically active, particularly where plate tectonic activity has occurred and uplifted the altered peridoitite formations (see Appendix 1 and Appendix map I for more geologic information and definitions). Typical of the entire Klamath physiographic province, the chemical and physical characteristics of serpentine soils yield habitats that are very poor in nutrients and in some cases toxic due to the presence of heavy metals. Furthermore, the mineralogical components of serpentine rocks cause them to be highly erodible under normal atmospheric conditions.

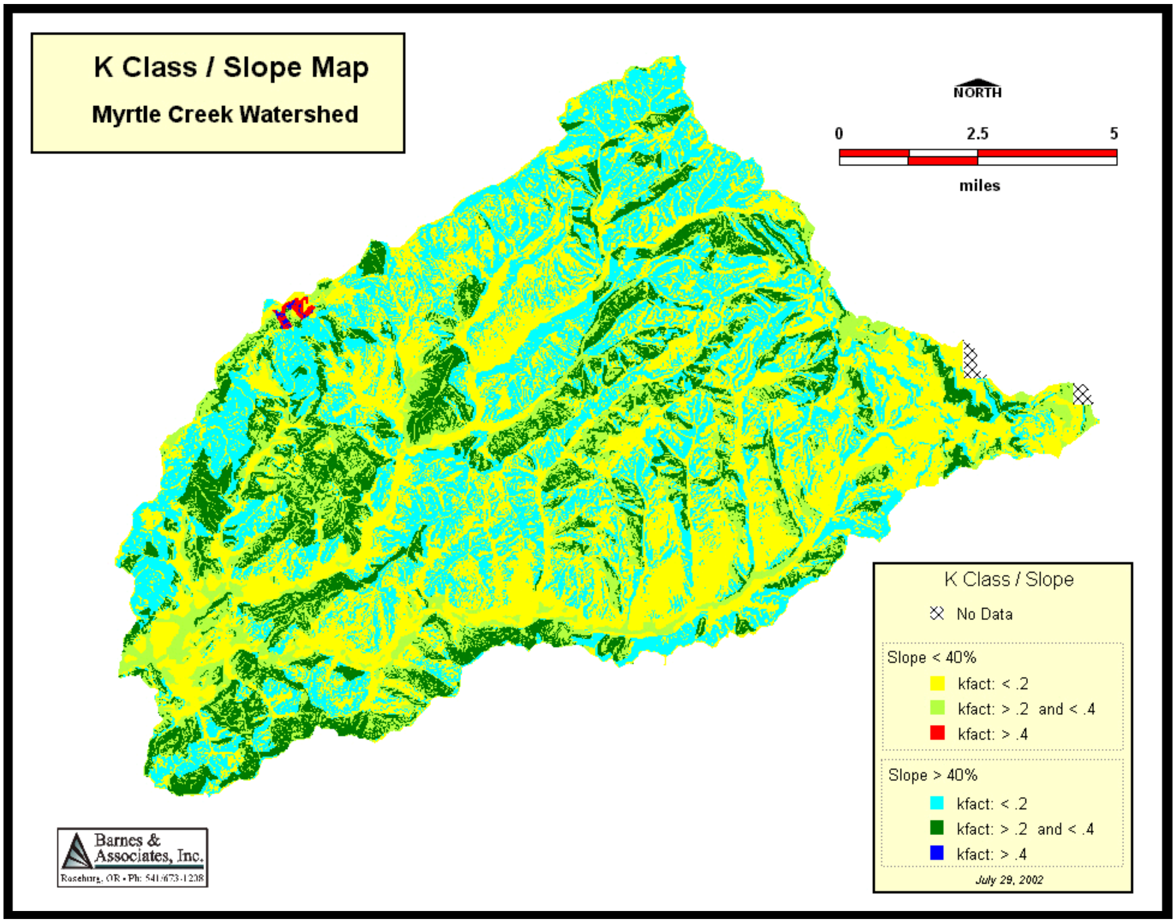
Soil K-factor[64]

Inherent erodibility of a soil is expressed in a figure known as the K factor. K factor gives an indication of the soil loss from a unit plot 72ft (22m) long with a 9.0% slope and continuous fallow culture. The two most important and closely related soil characteristics affecting erosion are infiltration capacity and structural stability.[65] Characteristics such as organic content, soil texture, the kind and amount of swelling clays, soil depth, tendency to crust, and the presence of impervious soil layers all influence the filtration capacity. K factor normally varies from near zero to about 0.6. A low K factor of less than 0.2 is usually assigned for well-drained, sandy soils with high infiltration rates. Soils with intermediate infiltration capacities generally have a K factor of 0.2 to 0.3, while the more easily eroded soils with low rates of infiltration will have a K factor of 0.3 or greater.

The soils found on the steep southeastern slopes of Dodson Butte along the northwestern boundary of the watershed have a K factor of greater than 0.4, and are therefore identified as being at high risk and susceptibility to erosion. Steep slopes and sparsely vegetated, impervious soils combine to make this an area sensitive to disturbance. However, less than 5% of the watershed contains soils from this class. Map 3-12 illustrates the K class and slope distribution within the watershed.

[64] Tim Grubert and John Runyon of BioSystems, Inc., contributed this section.

[65] Infiltration is the process by which water moves from the earth or surface water into the groundwater system, and the capacity is the maximum amount of such water that a system can absorb. Structural stability refers to a soil's ability to retain its shape and dimensions when exposed to high streamflows and varying temperature conditions.



Map 3-12: K-class and slope for the Myrtle Creek Watershed.

<u>Urban drainage</u>

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.[66] 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

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

once the construction is complete (Oregon Watershed Assessment Manual, p. VI-27).

Table 3-9 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 Myrtle Creek has the second lowest percent impervious area. More research is needed to determine the degree to which Myrtle Creek and other cities contribute to stream sediment.

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 3-9: Dominant land use and estimated percent impervious area for seven cities in the central Umpqua Basin.[67]

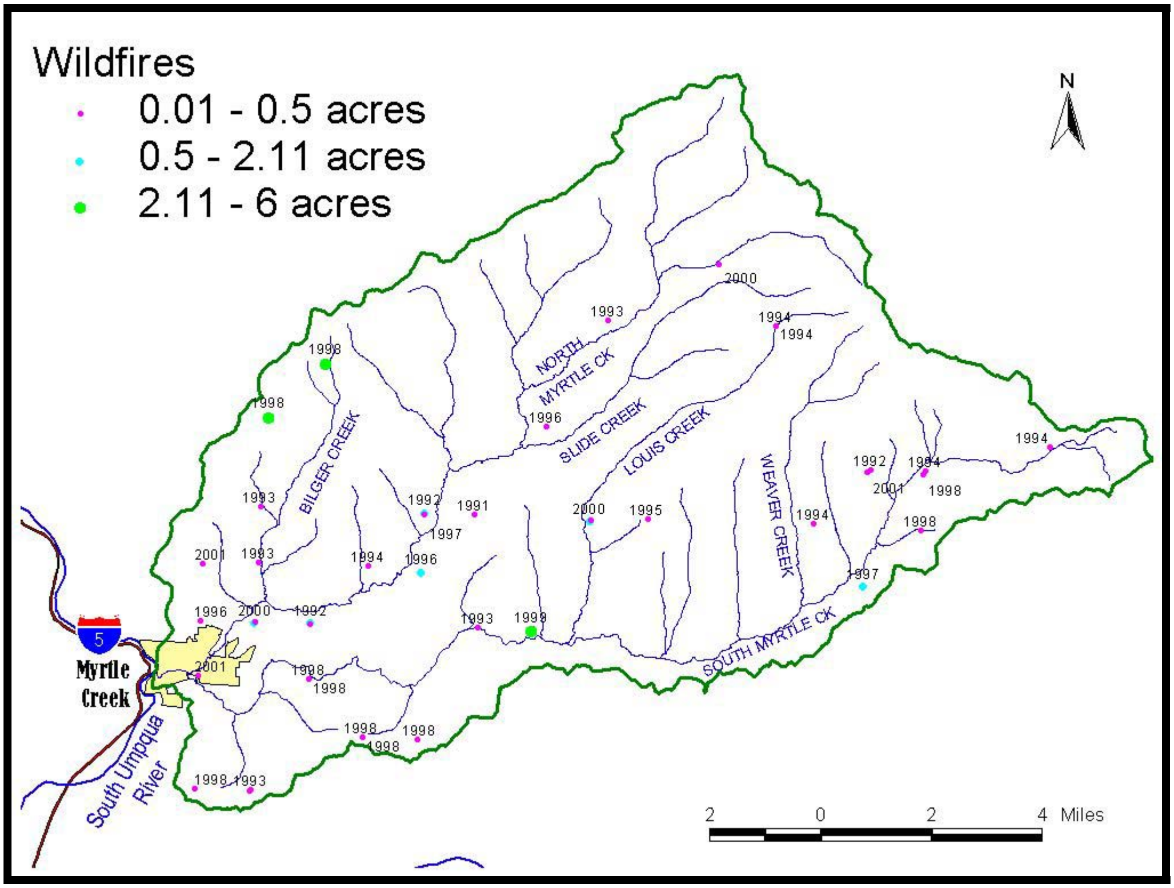
Burns

Burned areas erode more easily than unburned areas because of the lack of vegetative cover and an abundance of ash and charred material. In the Myrtle Creek Watershed, the Douglas Forest Protective Association (DFPA) is responsible for issuing burn permits. Table 3-10 shows the number of acres and piles for which burn permits were issued by DFPA from 1998 through 2001. Map 3-13 shows the location, years, and size of wildfires in the Myrtle Creek Watershed. 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	100	12
1999	0	11
2000	20	10
2001	77	19
Total	**197**	**52**

Table 3-10: Number of acres and burn piles for which permits were issued from 1998 through 2001 in the Myrtle Creek Watershed.

[67] Barnes and Associates, Inc., contributed the data in Table 3-9.



Map 3-13: Wildfire location, year, and size in the Myrtle Creek 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).[68]

[68] From ODEQ's *Oregon's Approved 1998 303(d) Decision Matrix*..

In 2002, the last 0.4 miles of Myrtle Creek was 303(d) listed for ammonia because 75% of samples exceeded ODEQ ammonia toxicity values.[69] The cause of the high ammonia values was effluent discharged from the Myrtle Creek and Tri City wastewater treatment plant during times of low stream flow. The wastewater treatment plant has begun extensive renovations that will treat the effluent to meet water quality standards. During low stream flows, the facility uses the effluent to irrigate the Myrtle Creek Golf Course, a process that, besides further treating the water, reduces the demand for additional water to maintain the golf course. Upon completion of the plant renovations in December, 2003, and continued irrigation of the golf course, ODEQ is confident the ammonia toxicity issue in this reach of Myrtle Creek attributed to this treatment facility will be resolved.[70]

3.3.9 Water quality key findings and action recommendations

Temperature key findings

- Monitoring locations within the watershed indicate that streams within the Myrtle Creek Watershed frequently have seven-day moving average maximum temperatures exceeding the 64°F 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 would 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. Although pH does not appear to be a concern, nitrate levels may be high in some stream reaches.
- There are no ODEQ monitoring data for bacteria contamination and dissolved oxygen levels within the Myrtle Creek Watershed.
- The ammonia 303(d) listing for Myrtle Creek is no longer valid.

Sedimentation and turbidity key findings

- Turbidity data evaluated using OWEB standards did not indicate that usual turbidity levels are high.
- Pockets of clay soils classified in the erosion prone, low infiltration, high runoff hydrologic soil group D are concentrated in small sections along lower South Myrtle Creek and to a smaller degree, along North Myrtle Creek. Serpentine soils, which are

[69] Toxics listing criteria are from the ODEQ 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.
[70] From Paul Heberling, an ODEQ water quality specialist for the Umpqua Basin.

found in the Myrtle Creek Watershed, are highly erodible under normal climatic conditions.
- There is no ODEQ monitoring data for sediment in the Myrtle Creek Watershed. Sediment delivery from improperly drained dirt and gravel roads are a primary source of sediment generation within most Oregon watersheds, which may be the case in the Myrtle Creek Watershed. Urban runoff, slope instability, streamside fires, and some land management activities are possible sources for sediment production and delivery within the Myrtle Creek Watershed.

Water quality action recommendations

- o Continue monitoring the Myrtle Creek Watershed for all water quality conditions. Expand monitoring efforts to include tributaries.
- o 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, if needed, improve in-stream conditions by placing logs and boulders within the active stream channel to create pools and collect gravel.
- o In very warm streams or where pH and/or dissolved oxygen are a problem, increase shade by encouraging wide riparian buffers and managing for full canopies.
- o Identify and monitor sources of bacteria and nutrients in the watershed. Where applicable, reduce nutrient 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 sources.
- o Where observation suggests that stream sediment or turbidity levels are of concern, survey the vicinity to identify possible on-going sediment sources, such as urban runoff, failing culverts or roads, landslide debris, construction, or burns. Take action to remedy the problem if possible.
- o Obtain comprehensive map coverage of the road system within the watershed and prioritize areas of concern based on road type, condition, and proximity to nearest stream. Use this information to target projects for improving road stability and drainage patterns, especially on dirt and gravel roads.
- o Identify areas with sensitive soils (high K factor, group D soils). In these areas, encourage landowners to identify the specific soil types on their property and include soils information in their land management plans.
- o Promote enhancement of native vegetation through restoration and streambank enhancement wherever such projects are feasible.
- o Limit stream channel and bank modifications.

- Provide landowner education about water quality concerns and potential improvement methods, such as how to improve dirt and gravel road drainage to minimize sediment delivery to streams.

3.4 Water quantity

3.4.1 Water availability[71]

Data from the Oregon Water Resources Department (OWRD) have been used to determine water availability in the Myrtle Creek Watershed.[72] 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 Myrtle Creek Watershed into three sub-basins (water availability basins, or WABs) for the purpose of analyzing water availability.

Figure 3-5 shows surface water availability for the Myrtle Creek WAB (#71186) in cubic feet per second (cfs). The solid yellow area is the average streamflow while the pink line represents the instream water right. The dark blue line is the estimated consumptive use. In this watershed, average streamflow exceeds consumptive use for the entire year. From August to October, the instream water right is close to or exceeds average streamflow. Surface water availability graphs for the South Myrtle Creek and North Myrtle Creek WABs are included in Appendix 10.

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

[72] Water availablity data are available from the Oregon Water Resources Department web site http://www.wrd.state.or.us/.

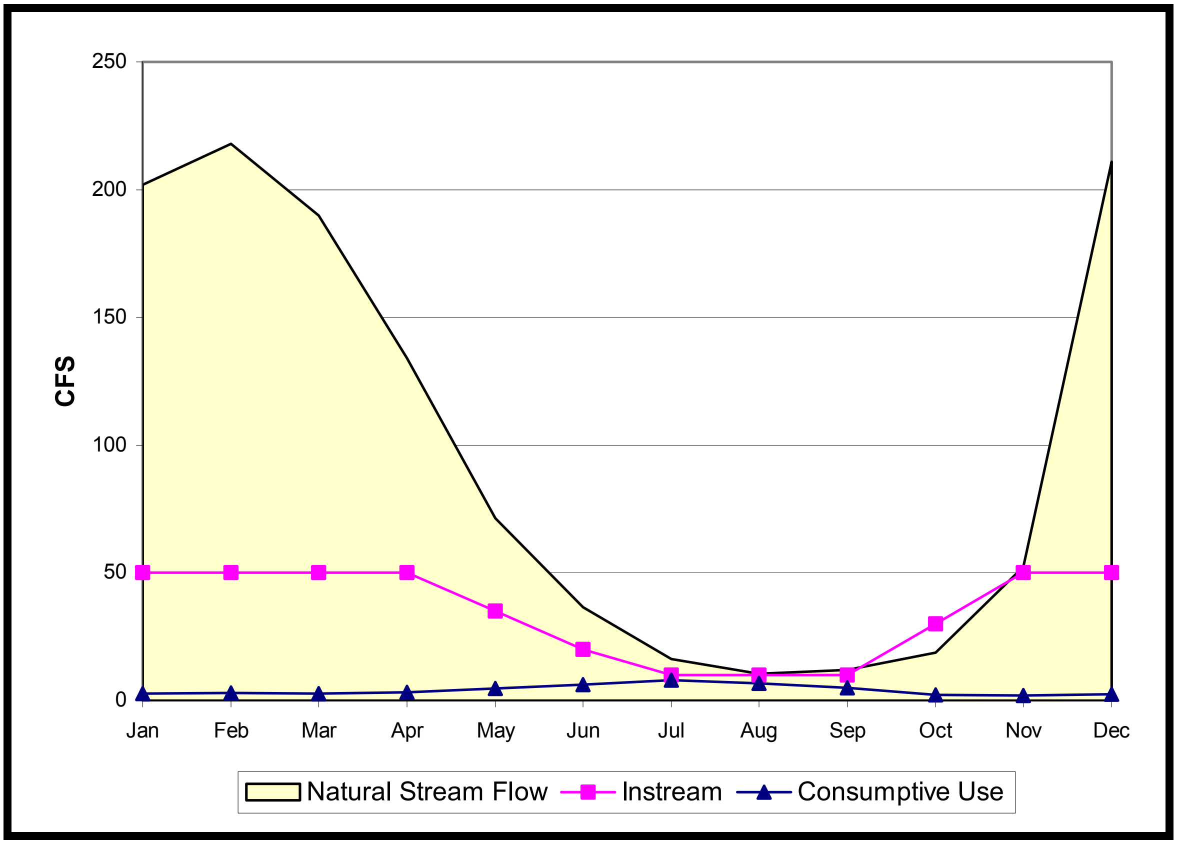


Figure 3-5: Water availability in the Myrtle Creek WAB (#71186).

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 3-11 and Table 3-12 show consumptive use by category for the Myrtle Creek Watershed.[73] Appendix 11 lists the possible uses included in each category. These records show uncanceled water rights and do not indicate actual water consumption.[74] Almost half of the water volume permitted for consumptive use comes from the watershed's various tributaries.[75] North Myrtle Creek and South Myrtle Creek have comparable water rights by volume, distantly followed by main stem Myrtle Creek.

[73] Water rights data are available from the Oregon Water Resources Department web site http://www.wrd.state.or.us/.

[74] 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.

[75] Tributaries include: Harrison Young Brook, Bilger Creek, Rock Creek, Little Lick Creek, Hughes Creek, Frozen Creek, Little Frozen Creek, Slide Creek, Lees Creek, East Fork High Prairie Creek, Weaver Creek,

Irrigation is the largest use in the watershed (68.4% of total use) and the largest individual use for Myrtle Creek, North Myrtle Creek, South Myrtle Creek, and for the tributaries. The greatest volume of irrigation water comes from South Myrtle Creek (12.28 cfs) and North Myrtle Creek (11.48 cfs). Almost 10 cfs of tributary water is held in irrigation water rights. Although Myrtle Creek has only 0.61 cfs, this constitutes 100% of all the water rights on this stream

Industry is the next largest use for the watershed (18.4% of total use). There are industrial water rights on North Myrtle Creek (1.0 cfs), Harrison Young Brook (1.8 cfs), Slide Creek (0.67 cfs), Lees Creek (3 cfs), East Fork High Prairie Creek (2 cfs), Louis Creek (0.01 cfs), and Letitia Creek (0.62). Municipal use is the third largest use (9.9% of total use), and all municipal water rights are on Harrison Young Brook.

	Total watershed		**Myrtle Creek**		**All tributaries**	
Source	Cubic feet/sec	% total	Cubic feet/sec	% of Myrtle Ck	Cubic feet/sec	% of tributaries
Irrigation	33.85	68.4%	0.61	100%	9.93	42.2%
Fish/WL	0.05	0.1%	0	-	0.05	0.2%
Agriculture	0.36	0.7%	0	-	0.10	0.4%
Industry	9.10	18.4%	0	-	8.10	34.4%
Municipal	4.92	9.9%	0	-	4.92	20.9%
Domestic	1.21	2.4%	0	-	0.45	1.9%
Total	49.49		0.61		23.55	

Table 3-11: Water rights by use for the total watershed, Myrtle Creek, and for tributaries.[76]

	Total		**North Myrtle Creek**		**South Myrtle Creek**	
Source	Cubic feet/sec	% Total	Cubic feet/sec	% of N. Myrtle Ck	Cubic feet/sec	% of S. Myrtle Ck
Irrigation	33.85	68.4%	11.48	89.5%	12.28	94.8%
Fish/WL	0.05	0.1%	0	-	0	-
Agriculture	0.36	0.7%	0.03	0.2%	0.23	17.7%
Industry	9.10	18.4%	1.0	7.8%	0	-
Municipal	4.92	9.9%	0	-	0	-
Domestic	1.21	2.4%	0.31	2.4%	0.45	3.5%
Total	49.49		12.82		12.96	

Table 3-12: Water rights by use for the total watershed, North Myrtle Creek, and South Myrtle Creek.[77]

Cox Creek, Wrights Creek, Buck Fork Creek, Carson Creek, Sanderson Creek, School Hollow Creek, Ben Branch South Myrtle Creek, Louis Creek, Heath Creek, Stone Creek, Lone Wiley Creek, Short Wiley Creek, Letitia Creek, Weaver Creek, and 13 unnamed creeks.

[76] Percents do not add to 100 due to rounding.

[77] Percents do not add to 100 due to rounding.

3.4.3 Stream flow and flood potential

There are two US Geological Survey (USGS) stream gauges in the Myrtle Creek Watershed that have been active for more than 10 years. The North Myrtle Creek gauge near Myrtle Creek (#14-311000) was active from 1955 until 1986. The South Myrtle Creek gauge near Myrtle Creek (#14-310700) was active from 1955 until 1972. A third gauge (#14-310800) on South Myrtle Creek below Carson Creek was run by the USGS in 1977 and 1978 and then by Douglas County until 1988. Currently, data from the South Myrtle Creek gauge below Carson Creek are not available in digital form and has been excluded from this assessment. Figure 3-6 and Figure 3-7 chart the monthly historical mean flow for both creeks.

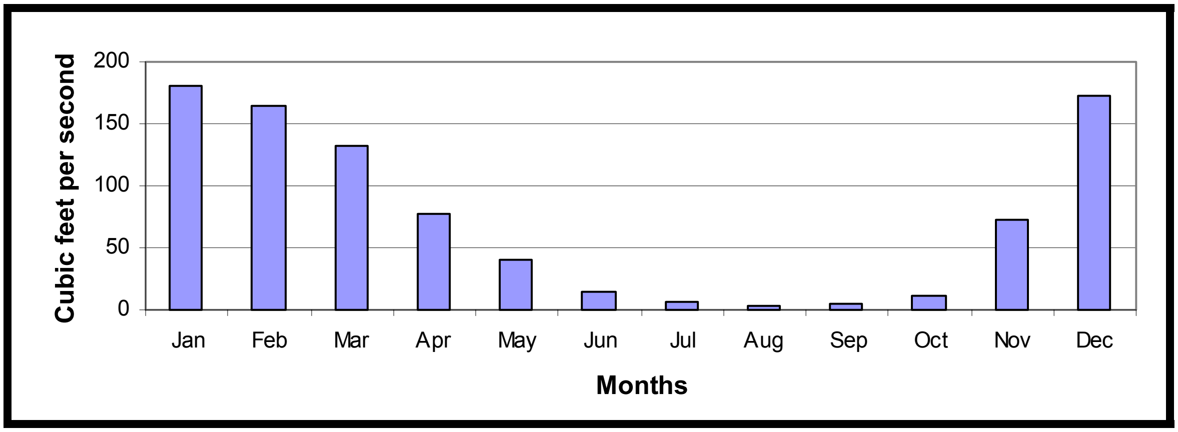


Figure 3-6: Mean monthly water flow for North Myrtle Creek near Myrtle Creek.

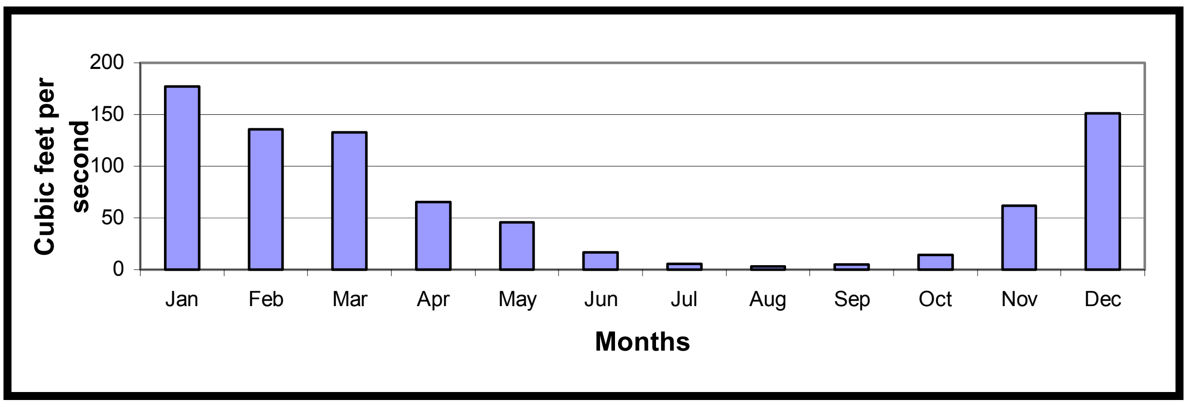


Figure 3-7: Mean monthly water flow for South Myrtle Creek near Myrtle Creek.

North and South Myrtle Creeks have comparable flows, with a slightly greater monthly average for North Myrtle Creek. Although South Myrtle Creek is longer than North Myrtle Creek (22.2 miles versus 17.7 miles), the North Myrtle Creek drainage is larger, and delivers a greater quantity of water to the stream. As would be expected from climate information in section 1.2.4, the winter months have the greatest average flow due to precipitation. During the summer months, both creeks' flow can drop down to one cfs. It is not unusual for stream reaches to have zero flow, meaning that there is no flowing water although there may be standing water. Landowners report that sections of both North and South Myrtle creek can be completely dry in the summer.

Figure 3-8 shows peak flow data that was collected on North Myrtle Creek from 1956 through 1986 and on South Myrtle Creek from 1956 through 1972.[78] From the streams' proximity to one another, it would be expected that their peak events would follow a similar trend. Although this is generally true, Figure 3-8 shows notable differences in the creeks' peak flows during the periods of record. The highest peak events for North Myrtle Creek's period of record occurred in 1982 and 1983, with 3,700 cfs and 3,630 cfs, respectively. South Myrtle Creek's peak events occurred in 1957 and 1965, with 3,050 cfs and 2,900 cfs, respectively. In 1957 and in 1964, the creeks appear to have opposite trends; whereas one creek's peak flow was greater than the previous year, the other creek's peak flow was less. These differences are most likely due to rainstorms that occurred over one stream system and not the other.

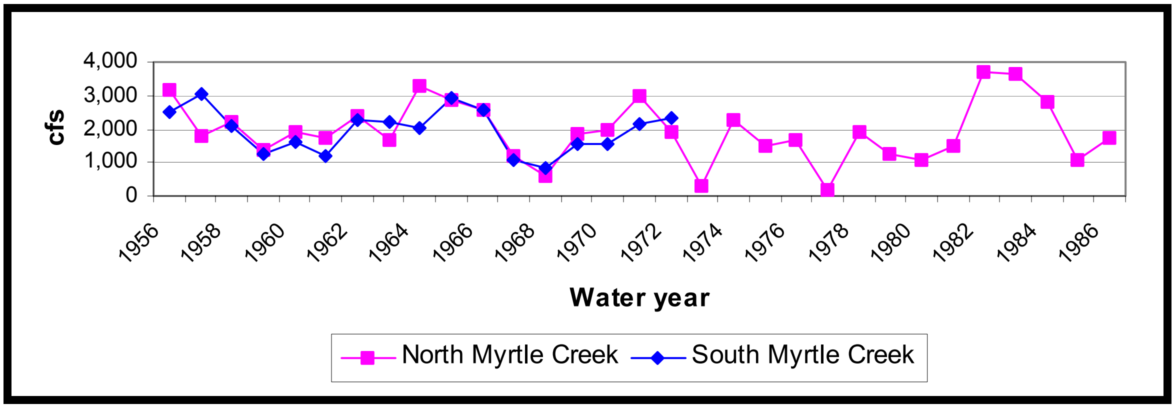


Figure 3-8: Peak flow for North Myrtle Creek and South Myrtle Creek.

Potential influences on flood potential

Approximately 22% of the Myrtle Creek Watershed is within the transient snow zone (TSZ) (see Map 1-5 in section 1.2.4). 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 Louis Creek, may be more susceptible to rain-on-snow events than lower elevation streams.

Road density may also influence peak flows. Table 3-13 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

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

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	0.5
Gravel	2.4
Dirt	1.6
Total	4.5

Table 3-13: Miles of road per square mile for surfaced and unsurfaced roads in the Myrtle Creek Watershed.

Disaster floods
The City of Myrtle Creek's 1977 Flood Insurance Study provides information about the estimated elevation of Myrtle Creek during 100- and 500-year floods. It is estimated that the stream's elevation would increase to 608 feet during a 100-year flood and to 611 feet during a 500-year flood. If Galesville Dam failed during a 500-year flood event, Myrtle Creek's surface elevation would increase to an estimated 653 feet. The City of Myrtle Creek will complete its disaster plan mitigation by November, 2003. In this document, Myrtle Creek City officials will outline their course of action for disasters such as a 100- or 500-year flood (see section 4.2.1).

3.4.4 Water quantity key findings and action recommendations

Water availability and water rights by use key findings

- During summer months, instream water rights and consumptive use is close to or exceeds average streamflow.
- The largest uses of water in the Myrtle Creek Watershed are irrigation, industry, and municipal uses.

Stream flow and flood potential key findings

- During the summer months, flow in both North Myrtle Creek and South Myrtle Creek can drop down to one cfs. It is not unusual for stream reaches to have no flowing water or be completely dry.
- No flooding trends can be determined from the records to date.
- The degree to which road density and the transient snow zone influence flood potential in the Myrtle Creek Watershed is unknown at this time.

Water quantity action recommendations

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

3.5 Fish populations

3.5.1 Fish presence

Table 3-14 lists the fish species in the Myrtle Creek Watershed that have viable, reproducing populations or annual runs. Although spring and fall chinook have been documented in Myrtle Creek, North Myrtle Creek, and South Myrtle Creek, their presence is intermittent and do not constitute runs.[79] Warm water fish, including largemouth bass (*Micropterus salmoides),* smallmouth bass (*Micropterus dolomieu*), yellow perch (*Perca flavescens*), bluegill (*Lepomis macrochirus*), brown bullhead (*Ameiurus nebulosus*), and pumpkinseed (*Ameiurus nebulosus*), have also been reported in the watershed. These fish are most likely introduced to watershed streams through private ponds, or have migrated into the watershed from the South Umpqua River. Myrtle Creek Watershed stream temperatures are generally too cold for these species to establish reproducing populations.

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 Myrtle Creek 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	*Oncorhynchus mykiss*
Coho salmon	*O. kisutch*
Cutthroat trout	*O. clarkii*
Western brook lamprey	*Lampetra richardsoni*
Pacific lamprey	*Lampetra tridentata*
Umpqua dace	*Rhinicthys cataractae*
Sculpin	*Cottus sp.*
Redside shiner	*Richardsonius balteatus*
Speckled dace	*Rhinicthys osculus*
Umpqua pike minnow	*Ptychocheilus oregonensise*
Largescale sucker	*Catostomus macrocheilus*

Table 3-14: Fish species with established populations or runs within the Myrtle Creek Watershed.

3.5.2 Fish distribution and abundance

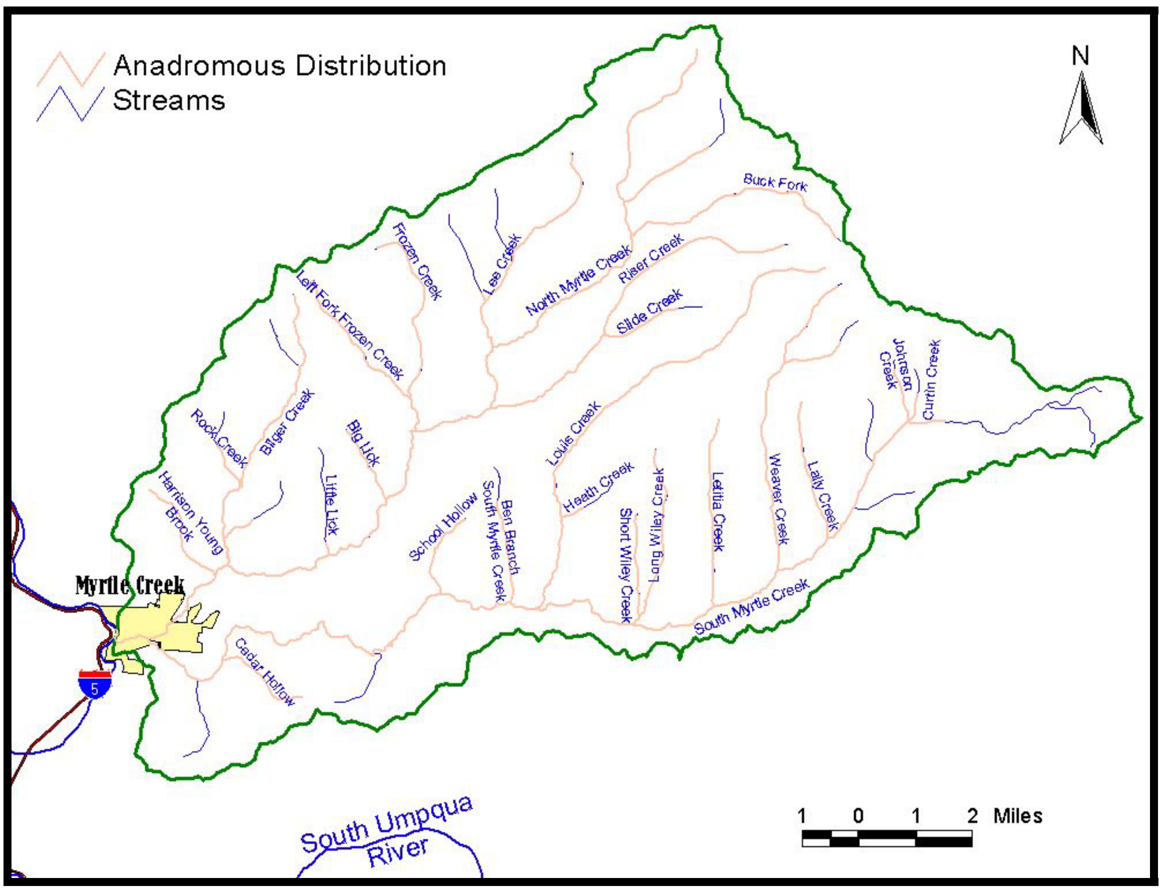
Information on fish distribution and abundance within the Lower South Umpqua Watershed is limited to salmonids. Although non-salmonid fish species are important as well, there are insufficient accessible data on the location of these types of fish, and they could not be included in the assessment. More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

[79] From Dave Harris, fisheries biologist for the Oregon Department of Fish and Wildlife, Roseburg District Office.

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, 2002, 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 108.1 stream miles within the Myrtle Creek Watershed. Map 3-14 shows the distribution of these anadromous salmonids within the watershed and Table 3-15 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 12). Coho and winter steelhead use many of the same stream reaches but at different times of the year.



Map 3-14: Anadromous salmonid distribution within the Myrtle Creek Watershed.

	Total	Coho	Winter steelhead
Miles	108.1	89.4	100.1

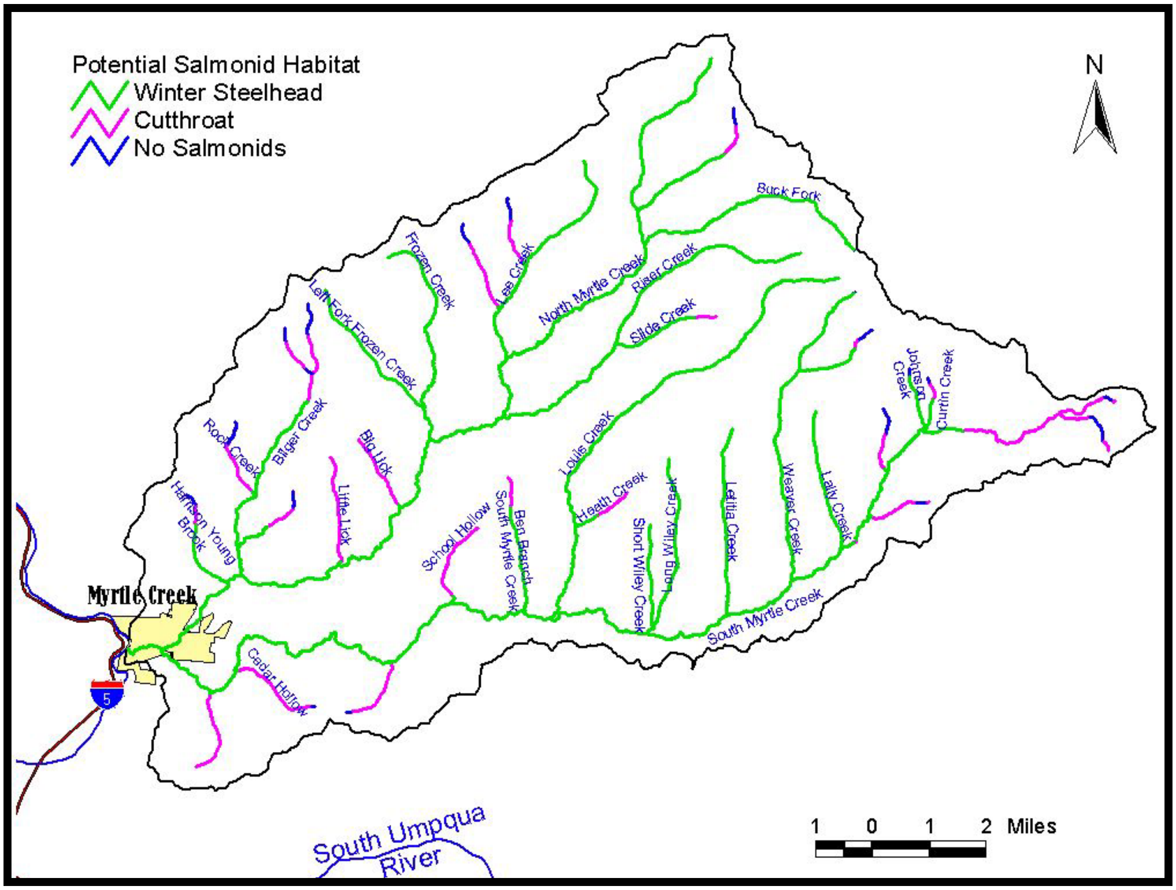
Table 3-15: Miles of stream supporting anadromous salmonids in the Myrtle Creek Watershed.

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 Myrtle Creek Watershed is the cutthroat trout. Although there is much overlap, anadromous salmonids generally prefer streams with a zero to 4.0% gradient, whereas resident cutthroat trout prefer gradients between 4.0% and 15%. Also, cutthroat are generally found beyond the range of winter steelhead.[80] Map 3-15 shows stream gradient and the associated salmonids within the Myrtle Creek Watershed. There are many factors other than stream gradient that determine fish habitat suitability, therefore Map 3-15 only identifies potential cutthroat trout habitat, such as the upper reaches of Heath Creek.

[80] From Dave Harris, fisheries biologist for the Oregon Department of Fish and Wildlife, Roseburg District Office.



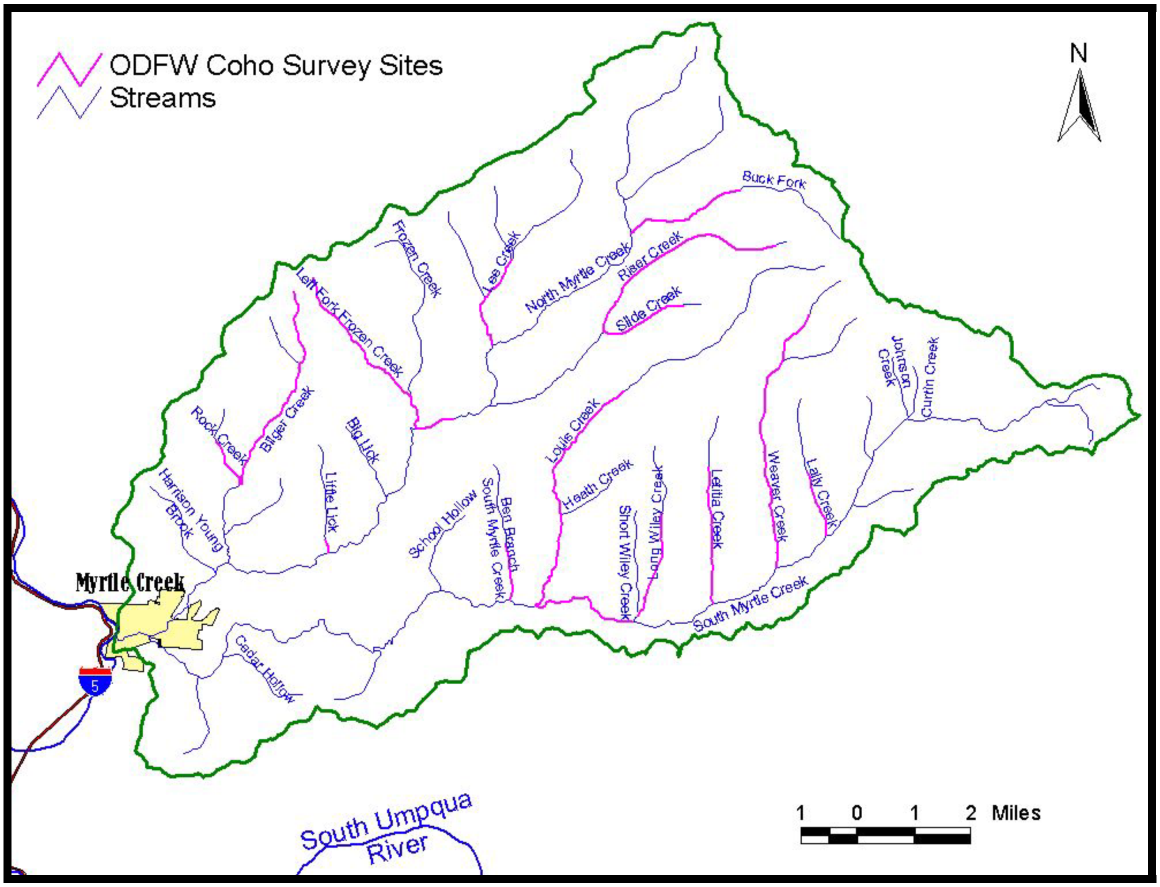
Map 3-15: Potential resident and anadromous salmonid habitat in the Myrtle Creek Watershed.

Salmonid abundance

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

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 or 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 Myrtle Creek Watershed from 1989 through 1999. Map 3-16 shows the surveyed stream reaches. Figure 3-9 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 3-16: Myrtle Creek Watershed coho spawning survey locations.

Within a given year, streams can have very different coho spawning populations. Whereas in 1996 Lees Creek had more than 20 observed coho per mile, Frozen Creek had less than five and Louis Creek had none. Since no Myrtle Creek Watershed stream has been surveyed more than once between 1995 and 2000, there is no way to evaluate coho spawning annual fluctuation within the watershed. More monitoring data are needed to draw conclusions about coho spawning in the watershed.

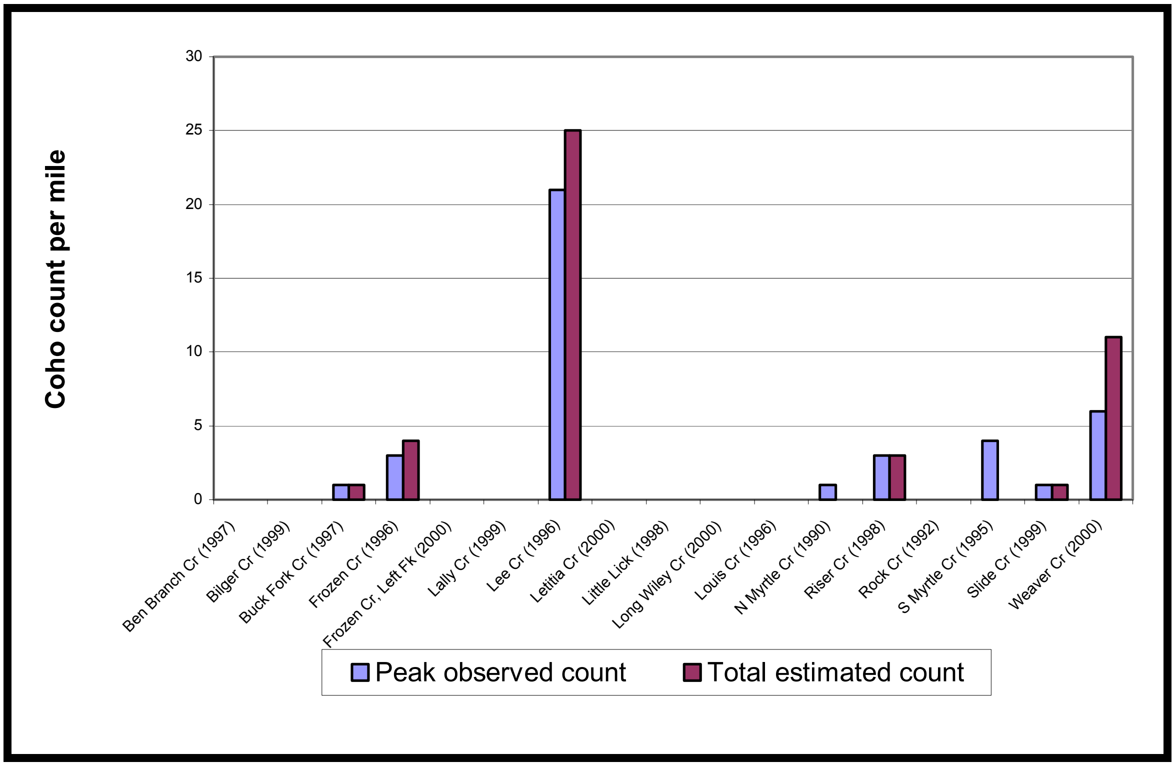


Figure 3-9: Coho spawning surveys from 1989 through 1999 for the Myrtle Creek Watershed.

<u>Migrating juvenile populations</u>
The US Forest Service (USFS), the Bureau of Land Management (BLM), and ODFW are working together to collect long-term information on the movements of juvenile salmonids out of their natal streams.[81] Juvenile salmonid data are primarily collected with five-foot rotary screw traps, which capture small fish. From data collected during trap operation, fisheries biologists can estimate the number of juvenile fish passing by the trap during the summer-long outward migration.

The BLM has operated a screw trap in the Myrtle Creek Watershed near the City of Myrtle Creek since 1997. The trap operates between 83 and 100 days each year, starting in early March and ending in late May or June. Figure 3-10 shows by age class the estimated number of coho, chinook, and steelhead passing the Myrtle Creek rotary trap during the outward migration. On the table "0+" indicates fish less than one year old, "1+" are fish between their first and second year, and so on.

[81] Natal streams refer to the streams where juvenile salmonids hatched.

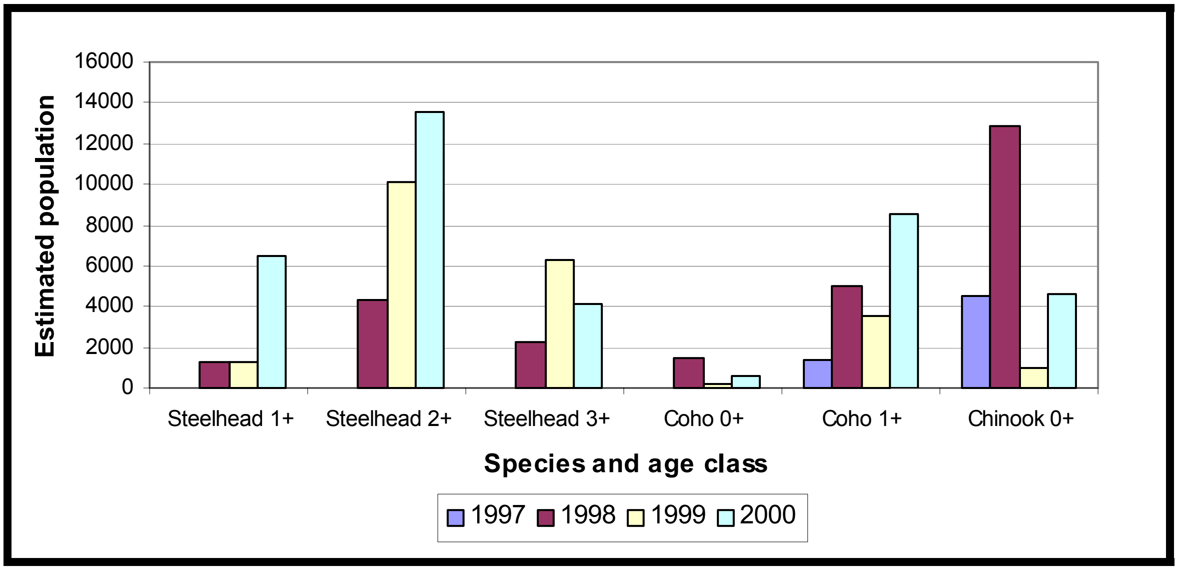


Figure 3-10: Estimated number of out-migrating juvenile salmonids by age class for each year of trap operation.

Population estimates can only be made when at least four fish have been trapped, marked, and recaptured. Although steelhead of all age classes and coho 0+ were captured in 1997, there were insufficient recaptures to estimate out-migrating populations. It appears from Figure 3-10 that there is tremendous fluctuation in juvenile salmonid out-migrating populations. More annual data are needed to determine any trends within the watershed.

3.5.3 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 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.

3.5.4 Fish populations key findings and action recommendations

Fish populations key findings

- The anadromous fish species in the Myrtle Creek Watershed are coho, winter steelhead, sea-run cutthroat trout, and lamprey. Although many Myrtle Creek Watershed medium and large tributaries are within the distribution of one or more salmonid species, salmonid ranges have not been verified for each tributary.

- Although spring and fall chinook have been documented in the watershed, their presence is intermittent and do not constitute a salmon run.
- More quantitative data are needed to evaluate salmonid abundance and the distribution and abundance of non-salmonid fish in the watershed.
- Temperature limits largemouth bass, smallmouth bass, and other non-native species to the South Umpqua River, but these species may occasionally enter the mouth of Myrtle Creek. Other non-natives have been accidentally or intentionally introduced to the watershed, but have not established reproducing populations.
- 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

- o Work with local specialists and landowners to verify the current and historical distribution of salmonids in tributaries.
- o Support salmonid and non-salmonid distribution and abundance research activities in the watershed, especially at the local level.
- o Encourage landowner and resident participation in fish monitoring activities.
- o Conduct landowner education programs about the potential problems associated with introducing non-native fish species into Umpqua Basin rivers and streams.
- o 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 perspectives[82]

4.2.1 The City of Myrtle Creek[83]

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

[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 a 2002 interview with Leslie Wilson, Myrtle Creek City Planner.

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, 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 is 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.

4.2.2 Agricultural landowners[84]

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.[85] Approximately one-fifth of the Myrtle Creek Watershed is zoned for agriculture. Almost all agricultural lands are privately held and most are located in valleys and lowlands.[86] 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, 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.

[84] The following information is primarily from 2002 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.

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

[86] Many farmers and ranchers are also forestland owners (see section 4.2.3).

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.[87] 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 documented killing and maiming livestock.[88] 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.[89] These species are territorial animals. As populations increase, the 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

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

[88] 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.

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

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.[90] 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.[91]

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

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

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.

4.2.3 Family forestland owners[92]

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. Of the approximately 60,295 forested acres in the watershed, approximately one-fifth 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 connected to the timber industry through their jobs or are recent arrivals to the area.

[92] The following information is from a 2002 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.

The impression is that many of the latter group left above-average 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 inherited their properties or have unusually large incomes, since the cost of forestland and its maintenance is beyond the means of people just starting 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 certifying wood products as derived from sustainably managed forests. Many family forestland owners follow the Oregon Forest Practices Act and 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.[93] 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

[93] "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.

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' profit. 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 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.

4.2.4 Industrial timber companies[94]

Most industrial timberlands are located in areas that favor Douglas-fir, which tend to be hillsides and higher elevations.[95] 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 Myrtle Creek Watershed industrial timber companies own 17,698 acres, which is almost 30% 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.[96] 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.

[94] The following information is primarily from a 2002 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.

[95] Hillsides and higher elevations are often a checkerboard ownership of Bureau of Land Management administered lands (see section 4.2.5) and industrial timberlands.

[96] 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.

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 not.

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.

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 the risk.

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, and 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.

4.2.5 The Bureau of Land Management[97]

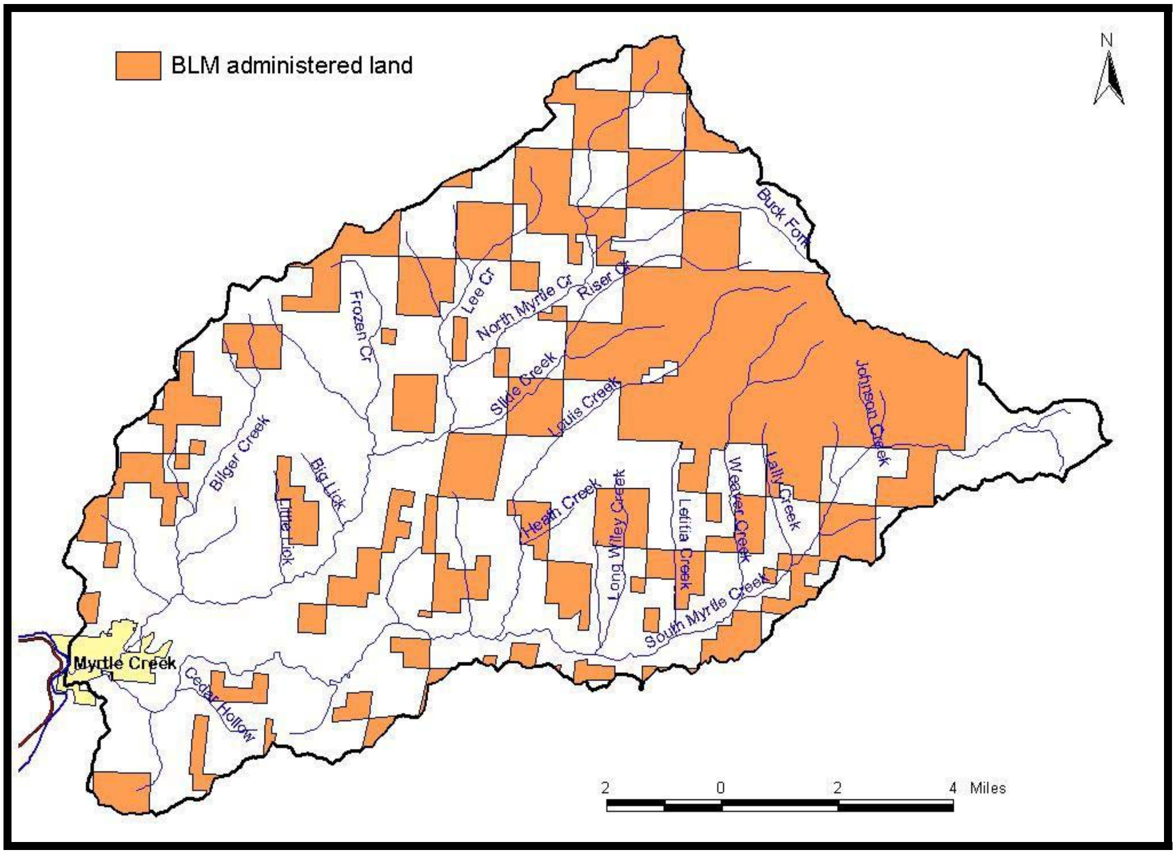
The Roseburg District Office of the Bureau of Land Management (BLM) administers a total of 425,588 acres of which most is within the Umpqua Basin and all is within Douglas County.[98] In the Myrtle Creek Watershed, the BLM administers approximately 41% of the watershed (see Map 4-1).

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.[99] The plan outlines the on-going resource management goals and objectives for lands administered by the BLM. All of the BLM's activities are guided by the resource management plan, and this assessment summarizes the main points of the document.

[97] The following information is from the Roseburg District of the 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.

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

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



Map 4-1: Location of BLM administered lands in the Myrtle Creek Watershed.

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 land use allocation 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. 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 BLM 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.[100]

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.[101] 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.[102] For the third year in a row, the

[100] For specific information about land use allocations and management, see the BLM Roseburg District's Resource Management Plan.
[101] Copies of the Roseburg District BLM's Annual Program Summary and Monitoring Report from fiscal year 2001 are available through the Roseburg District Office.
[102] 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.

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.

4.2.6 Oregon Department of Environmental Quality[103]

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 by:

- 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

[103] The following information is primarily from a 2002 interview with Paul Heberling, a water quality specialist for the Oregon Department of Environmental Quality in Roseburg.

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 education and outreach will 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 on to 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, 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 involved.

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.[104] Table 4-1 shows by parameter the number of Umpqua Basin streams failing to meet water quality standards.

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[104] See section 3.3.1 for 303(d) listed streams in the Myrtle Creek Watershed.

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
E. coli and fecal coliform	14	Total dissolved gas	4

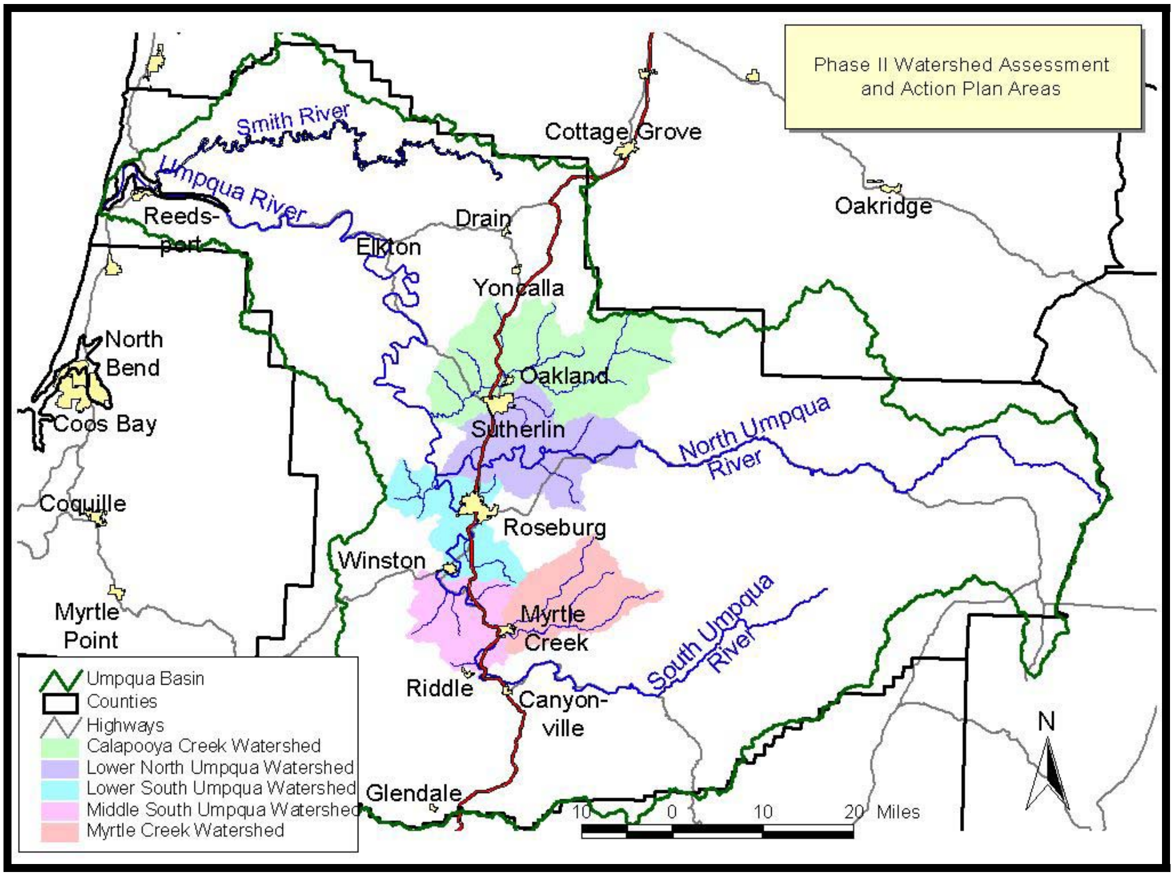
Table 4-1: Number of Umpqua Basin 303(d) listed streams by parameter.

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 ratio 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. Everyone understands the rationale for activities that reduce bacteria levels, such as 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 Cuttoff 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. 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

The Lower 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.

In 2002, 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.

5.1 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 rotate 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 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 cement 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 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.

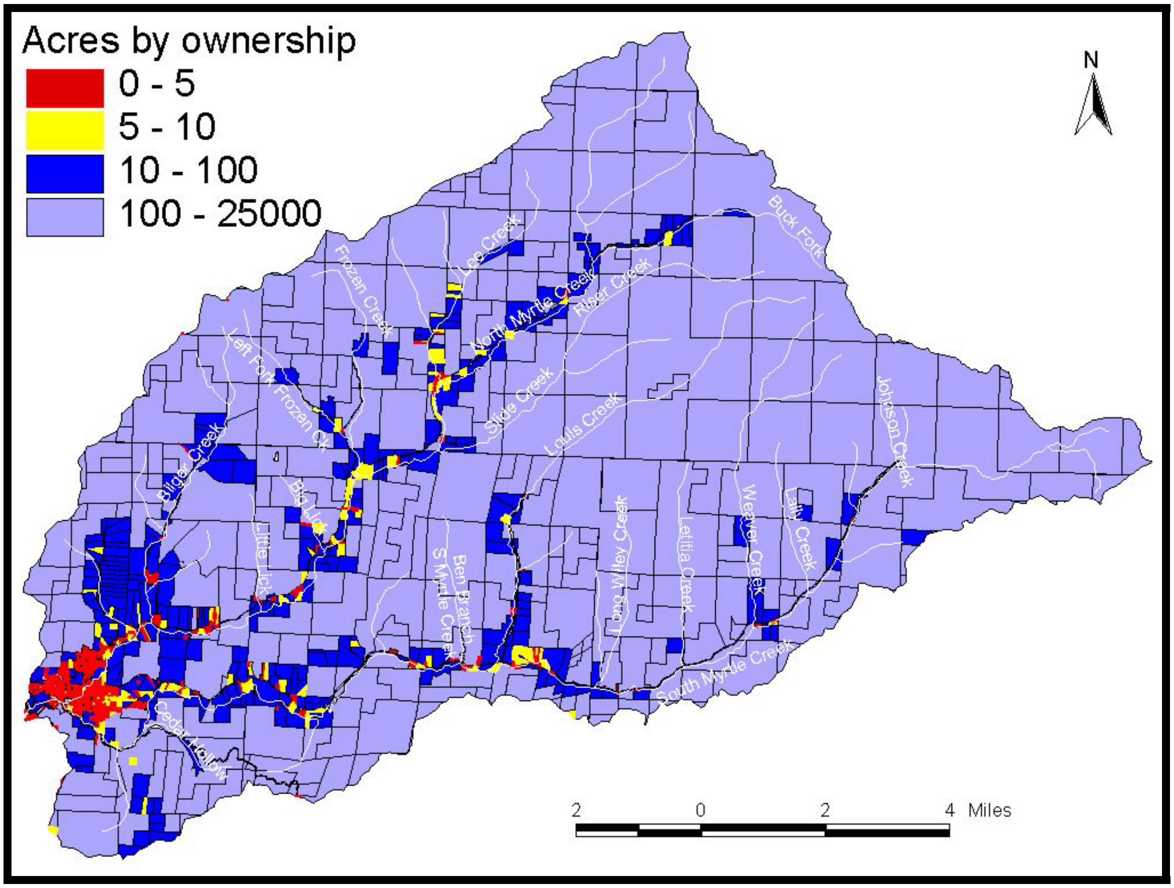
Key Questions

- 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 as the length of the stream included in the project increases. 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 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 Myrtle Creek Watershed. Unlike Map 1-9 in section 1.3, 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 many streams and stream segment in the Myrtle Creek Watershed, such as Slide Creek and upper South Myrtle Creek, which 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 Myrtle 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 Myrtle Creek Watershed.

6.2 Myrtle Creek Watershed key findings and action recommendations

6.2.1 Stream function

Stream morphology key findings

- The majority of streams within the Myrtle Creek Watershed have low gradients with few stream miles in the source areas, where most large woody material is recruited into the stream system. This may limit instream large woody material abundance.
- The low gradient channels with wide floodplains along North and South Myrtle Creeks and the lower reaches of their tributary streams are dynamic systems that provide key fish migration, spawning and rearing habitat.
- Depositional environments such as moderately confined channels with small floodplains are vulnerable to reductions in aquatic habitat complexity. In these areas, pools can be filled in and boulders or exposed bedrock buried when the sediment load exceeds the transport capabilities of the stream.
- Stream habitat surveys suggest that poor quality riffles and insufficient large woody material are limiting factors for fish habitat in most surveyed streams. Pools and riparian areas also limit fish habitat, but to a lesser degree.

Stream connectivity key findings

- Culverts and, to a lesser degree, dams, reduce stream connectivity, affecting anadromous and resident fish productivity in the Myrtle Creek Watershed. More information about fish passage barriers will be available in 2003.

Channel modification key findings

- Many landowners, especially newcomers to the area, may not understand the detrimental impacts of channel modification activities or are unaware of active stream channel regulations.

Stream function action recommendations

- o Where feasible, improve pools, collect gravel, and increase the amount of large woody material by placing large wood and/or boulders in streams with an active channel less than 30 feet wide.[105]
- o 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.
- o Maintain areas with good native riparian vegetation.
- o 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. For example, culvert replacements should emphasize the low gradient channels (3% or less), especially the lower ends of tributary streams entering North Myrtle Creek and South Myrtle Creek.
- o Increase landowner awareness and understanding of the effects and implications of channel modification activities.

6.2.2 Riparian zones and wetlands

Riparian zones key findings

- Throughout the watershed, riparian vegetation is predominantly coniferous and/or hardwood trees. Collectively, South Myrtle Creek's tributaries have riparian zones with more than 50% conifers. Brush/blackberries predominate in approximately 10% of the North Myrtle Creek and its tributaries. There is much variation among specific tributaries.
- Riparian buffers that are one tree wide are most common in North Myrtle Creek and South Myrtle Creek. Tributary conditions vary from predominantly conifers to almost 25% treeless areas. Many individual tributaries have nearly a quarter of riparian zones without trees.

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[105] Thirty feet is the maximum width for permitted in-stream log and boulder placement projects.

- North Myrtle Creek, South Myrtle Creek, their collective tributaries, and specific tributaries are mostly more than 50% covered.

Wetlands key findings[106]

- Wetlands improve water quality by trapping sediments, removing nitrogen, retaining phosphorous, and regulating stream temperatures.
- Stream associated wetlands are the dominant type of wetland found within the Myrtle Creek Watershed, and are typically confined to active channels.
- Narrow riparian zones have been maintained along much of the streams in the watershed, although some are more substantial than others.
- Historically, riverine and palustrine wetlands associated with stream channels, floodplains, and riparian zones were abundant in lowland valleys, where they had a hydrologic connection with a nearby stream. Wetlands located within the Myrtle Creek Watershed were very productive, supported a variety of plant and animal life, and were very dynamic ecosystems.

Riparian zones and wetlands action recommendations

- o 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.
- o Identify riparian zones dominated by blackberries and convert these areas to native trees (preferably conifers) and/or shrubs, depending on local conditions.
- o Investigate methods of controlling blackberries.
- o Where riparian buffers are one tree width or less, encourage buffer expansion by planting native trees (preferably conifers) and/or shrubs, depending on local conditions.
- o Maintain riparian zones that are two or more trees wide and provide more than 50% cover.
- o Provide information to landowners explaining the benefits of restricting livestock access to streams, establishing buffer zones, the importance of wetlands within watersheds, and the effects of downstream conditions.
- o Promote public involvement in the maintenance of wetland resources by educating members of the local community as to the importance of maintaining natural heritage and diversity.
- o 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 Myrtle Creek Watershed frequently have seven-day moving average maximum temperatures

[106] Brad Livingson and Loren Waldron of Land and Water Environmental Services, Inc., contributed the wetlands key findings and action recommendations.

exceeding the 64°F 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 would 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. Although pH does not appear to be a concern, nitrate levels may be high in some stream reaches.
- There are no ODEQ monitoring data for bacteria contamination and dissolved oxygen levels within the Myrtle Creek Watershed.
- The ammonia 303(d) listing for Myrtle Creek is no longer valid.

Sedimentation and turbidity key findings

- Turbidity data evaluated using OWEB standards did not indicate that usual turbidity levels are high.
- Pockets of clay soils classified in the erosion prone, low infiltration, high runoff hydrologic soil group D are concentrated in small sections along lower South Myrtle Creek and to a smaller degree, along North Myrtle Creek. Serpentine soils, which are found in the Myrtle Creek Watershed, are highly erodible under normal climatic conditions.
- There is no ODEQ monitoring data for sediment in the Myrtle Creek Watershed. Sediment delivery from improperly drained dirt and gravel roads are a primary source of sediment generation within most Oregon watersheds, which may be the case in the Myrtle Creek Watershed. Urban runoff, slope instability, streamside fires, and some land management activities are possible sources for sediment production and delivery within the Myrtle Creek Watershed.

Water quality action recommendations

- o Continue monitoring the Myrtle Creek Watershed for all water quality conditions. Expand monitoring efforts to include tributaries.
- o 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, if needed, improve in-stream conditions by placing logs and boulders within the active stream channel to create pools and collect gravel.
- o In very warm streams or where pH and/or dissolved oxygen are a problem, increase shade by encouraging wide riparian buffers and managing for full canopies.
- o Identify and monitor sources of bacteria and nutrients in the watershed. Where applicable, reduce nutrient 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 sources.
- Where observation suggests that stream sediment or turbidity levels are of concern, survey the vicinity to identify possible on-going sediment sources, such as urban runoff, failing culverts or roads, landslide debris, construction, or burns. Take action to remedy the problem if possible.
- Obtain comprehensive map coverage of the road system within the watershed and prioritize areas of concern based on road type, condition, and proximity to nearest stream. Use this information to target projects for improving road stability and drainage patterns, especially on dirt and gravel roads.
- Identify areas with sensitive soils (high K factor, group D soils). In these areas, encourage landowners to identify the specific soil types on their property and include soils information in their land management plans.
- Promote enhancement of native vegetation through restoration and streambank enhancement wherever such projects are feasible.
- Limit stream channel and bank modifications.
- Provide landowner education about water quality concerns and potential improvement methods, such as how to improve dirt and gravel road drainage to minimize sediment delivery to streams.

6.2.4 Water quantity

Water availability and water rights by use key findings

- During summer months, instream water rights and consumptive use is close to or exceeds average streamflow.
- The largest uses of water in the Myrtle Creek Watershed are irrigation, industry, and municipal uses.

Stream flow and flood potential key findings

- During the summer months, flow in both North Myrtle Creek and South Myrtle Creek can drop down to one cfs. It is not unusual for stream reaches to have no flowing water or be completely dry.
- No flooding trends can be determined from the records to date.
- The degree to which road density and the transient snow zone influence flood potential in the Myrtle Creek Watershed is unknown at this time.

Water quantity action recommendations

- Reduce summer water consumption through in-stream water leasing and by improving irrigation efficiency.

- o 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.
- o 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 Myrtle Creek Watershed are coho, winter steelhead, sea-run cutthroat trout, and lamprey. Although many Myrtle Creek Watershed medium and large tributaries are within the distribution of one or more salmonid species, salmonid ranges have not been verified for each tributary.
- Although spring and fall chinook have been documented in the watershed, their presence is intermittent and do not constitute a salmon run.
- More quantitative data are needed to evaluate salmonid abundance and the distribution and abundance of non-salmonid fish in the watershed.
- Temperature limits largemouth bass, smallmouth bass, and other non-native species to the South Umpqua River, but these species may occasionally enter the mouth of Myrtle Creek. Other non-natives have been accidentally or intentionally introduced to the watershed, but have not established reproducing populations.
- 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

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

6.3 Specific UBWC enhancement opportunities

1. Actively seek out opportunities with landowners, businesses, and resident groups in key areas to enlist participation in the following restoration projects and activities:
    - Improving irrigation efficiency and encouraging instream water leasing on main stem Myrtle Creek, North Myrtle Creek, South Myrtle Creek, and tributaries with irrigation rights, including Bilger Creek, Frozen Creek, and Louis Creek.
    - Developing projects on the following streams:
        - Big Lick Creek – monitor for fish presence.
        - Bilger Creek – instream enhancement (all) and riparian fencing/stock water, tree planting, and blackberry conversion (headwaters and mouth).
        - Buck Fork Creek – instream enhancement (all).

- Cedar Hollow – monitor for fish presence.
- Frozen Creek – riparian fencing/stock water, tree planting, and blackberry conversion (lower two-thirds).
- Harrison Young Brook – monitor for fish presence.
- Lally Creek – monitor for fish presence.
- Lees Creek – instream enhancement (all).
- Long Wiley Creek – monitor for fish presence (also on Short Wiley Creek).
- Louis Creek – instream enhancement (upper two-thirds), riparian fencing/stock water, tree planting, and blackberry conversion (lower half). Also monitor for fish presence on upper reaches.
- North Myrtle Creek – instream enhancement (upper reaches), riparian fencing/stock water, tree planting, and blackberry conversion (between Lees Creek and Buck Fork Creek and between Frozen Creek and Slide Creek).
- School Hollow Creek – riparian fencing/stock water, tree planting, and blackberry conversion (all). Also monitor for fish presence.
- Slide Creek – instream enhancement (all), riparian fencing/stock water, tree planting, and blackberry conversion (lower half).
- South Myrtle Creek – instream enhancement (upper reaches).
- Weaver Creek – instream enhancement (all).

2. Work with interested landowners on a case-by-case basis to on the following project types:
    - 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:
    - Creating 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.
    - Developing 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.
    - Designing engaging displays about fish passage barriers for community events, such as the Douglas County Fair.
    - Giving 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:
    - Training volunteers to conduct fish and water quality monitoring and research.
    - Providing equipment necessary for local water quality research.
    - Surveying long-term landowners and residents about historical and current fish distribution and abundance.

- Encouraging school and student participation in monitoring and research.

5. Enlist landowner participation to remove other fish passage barriers as identified. Work with landowners to eliminate barriers to fish passage at the following locations:
   - Bilger Creek: Two sites located approximately at Bilger Creek Road mile 2.0 and mile 2.5.
   - Frozen Creek: Two sites, the first at the Frozen Creek – North Myrtle Creek Road crossing and the second at Frozen Creek Road mile 0.75.
   - Lees Creek: Two sites located approximately at Lees Creek Road mile 0.25 and at the Lees Creek - BLM road 28.4-21crossing.
   - Weaver Creek: One site located approximately at Weaver Creek Road mile 0.5.

6. Educate policy makers about the obstacles preventing greater landowner participation in voluntary fish habitat and water quality improvement methods.

References

Allan, S.; Buckley, A. R., and Mecham, J. E. Atlas of Oregon. Eugene, Oregon: University of Oregon Press; 2001.

Alt, David and Hyndman, Donald W. Northwest Exposures: A Geologic Story of the Northwest. Mountain Press Publishing Company; 1995.

City of Myrtle Creek. Myrtle Creek and Tri City Wastewater Treatment Plant Temperature Data, 1977-2000: Myrtle Creek, Oregon; 2001 Oct

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.

Ollivant, Don and Rice, Bill, UBWC Board of Directors. Culvert/Fish Passage Problems of Public Road Crossings over Tributary Streams to North Myrtle Creek, a Tributary of Myrtle Creek in the South Umpqua Drainage, Douglas County, OR.; 2001 Aug.

Oregon Climate Service. Climate Data [Web Site]. Accessed 2002 Mar. Available at: http://ocs.oce.orst.edu/.

Oregon Department of Environmental Quality. Draft 2002 303(d) Database Search Choices Page [Web Site]. Accessed 2002 Nov. Available at: http://www.deq.state.or.us.

---. Laboratory Analytical Storage and Retrievable Database [Web Page]. 2002 Jul. Available at: http://www.deq.state.or.us.

---. Oregon’s Approved 1998 Section 303(d) Decision Matrix. Nov. 1998.

Oregon Department of Forestry. Debris Flow Hazard [Web Page]. 2000; Accessed 2003 Feb. Available at: http://www.odf.state.or.us/gis/debris.html.

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 May. Available at: http://www.wrd.state.or.us/.

Orr, Elizabeth L.; Baldwin, William N., and Ewart, M. Geology of Oregon. Kendall/Hunt Publishing Company; 1992.

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.

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 and Oregon Department of Agriculture; 2002 Dec.

US Geological Survey. NWISWeb Data for Oregon [Web Page]. Accessed 2002 Feb. Available at: http://or.waterdata.usgs.gov.

USDI Bureau of Land Management. Draft Myrtle Creek Watershed Analysis. Roseburg, Oregon: USDI Bureau of Land Management, Roseburg District Office; 2002 Feb.

---. 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. United States Geological Survey; 2001.

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

Appendices

Appendix 1: Geologic overview of the Myrtle Creek Watershed[107]

Physiography

The Myrtle Creek Watershed is located at the extreme northeastern tip of the Klamath Mountain physiographic province, situated adjacent to where the southeastern corner of the Oregon Coast Range province meets the western edge of the Cascade Mountain province. This unique position creates a varied and complex geologic makeup for the watershed due to the presence of overlapping terranes and the subsequent accretion of rocks from the adjacent provinces through faulting and mass wasting (refer to glossary on page 154 for definition of terms). A physiographic province is a geographic body in which all parts are similar in climate and geologic structure, and whose topographic features differ significantly from those of adjacent regions.

The bulk of the Oregon Klamath Mountains province is drained by the Rogue River and also by several coastal streams, the largest of which is the Chetco River. However, due to its extremely northeastern location within the Klamath province, the Myrtle Creek Watershed drains into the Umpqua River Basin, which is situated within the Coast Range physiographic province.

Geology

The Klamath Mountains physiographic province is an elongate north-south trending area straddling Oregon's southern border with more than half of its 12,000 square miles being in northern California. The region boasts a jumbled and severely displaced geologic history due to the fact that the province is made up of pieces of exotic terranes that were once parts of ocean crust or island archipelago environments spanning the early Paleozoic to Jurassic periods. A terrane is a suite of rocks bounded by fault surfaces that has been displaced from its point of origin. Each of the terranes has distinct rock layers by which it is identified. Formed in an ocean setting, these tectonic slices were carried eastward toward the North American landmass where they collided with and were accreted to the existing continent, with succeeding terranes thrust beneath each other like shingles on a roof. Each of these terranes is separated by a major thrust fault, all of which have been intruded by granitic plutons, which securely welded the accreting terranes to the mainland. The intense pressure and temperatures involved in this movement and collision resulted in much folding and faulting of the individual rock units that comprise each terrane. This, in turn, is responsible for the complex stratigraphy evident from viewing almost any outcrop within the Klamath Mountain province.

Because they were fabricated elsewhere, rocks of the Klamath Mountain province are much older than those in any other part of western Oregon, with some dating to the Ordovician geologic time period. As successive terranes were added, they arranged

[107] Tim Grubert and John Runyon of BioSystems, Inc., contributed the text for Appendix 1. Terms such as "Jurassic" and "Cretaceous" refer to periods in the geological/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.

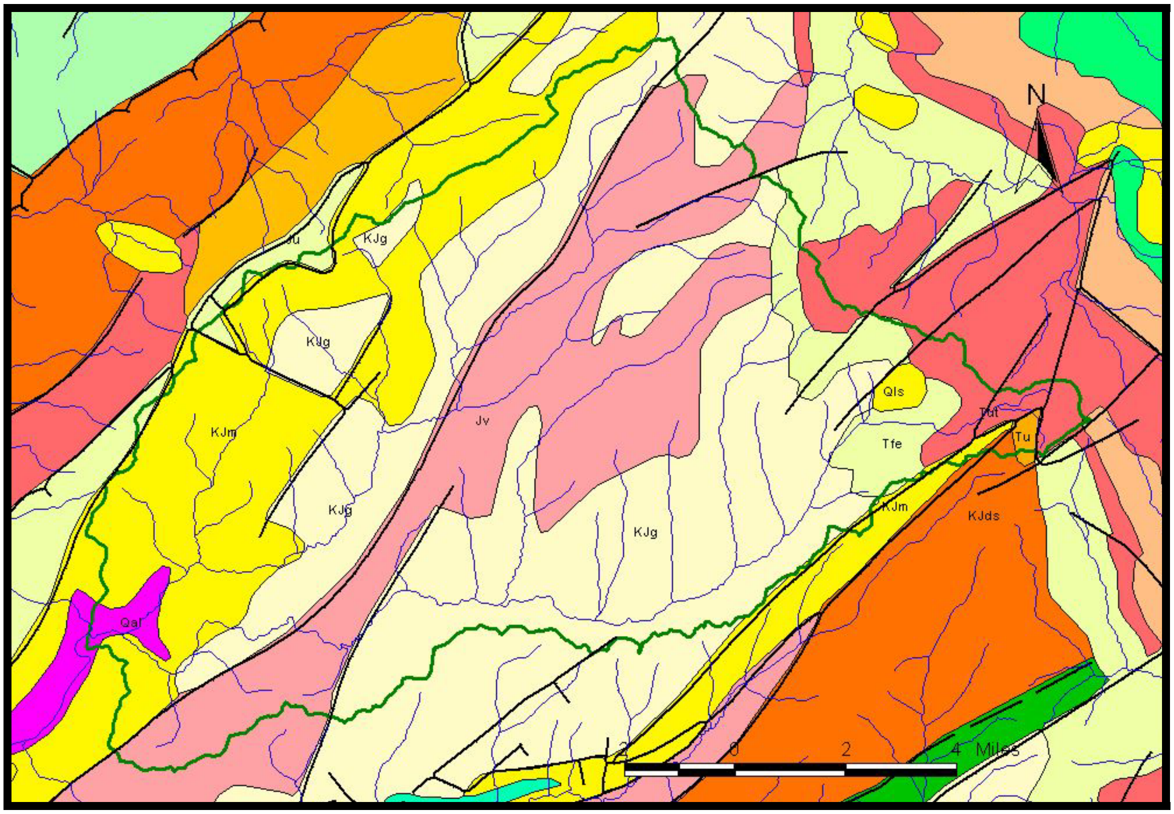
themselves like fallen dominoes aligned in a southeast to northwest orientation, with the oldest material of the Oregon Klamath province belonging to rocks of the Western Paleozoic and Triassic belt and the newest being from the Sixes River terrane. The Myrtle Creek Watershed contains material mostly from two terranes, with rocks from the Sixes River terrane comprising the western part of the watershed and rocks from the Snow Camp terrane covering the eastern portion.

After the rocks of oceanic origin were emplaced, the Cretaceous ocean that covered much of Oregon deposited sediments in a broad basin extending northward from the upper corner of the Klamath Mountains. This overlying sedimentary material was derived from volcanoes to the east and consists of sands, gravels, and silts carried eastward by a well-developed riverine system.

Geologic units of the Myrtle Creek Watershed
Rocks found at the surface within the Myrtle Creek Watershed include those of igneous origin such as basalt (Tu and Jv), andesite (Tu and Jv), and granite (KJg), in addition to an assemblage of ultramafic rocks (Ju) that represent fragments from an ancient ocean crust and are rich in magnesium, iron, and serpentine (Walker and MacCleod, 1991). Such rock assemblages are known as ophiolites. Other igneous rocks in the watershed include volcanics such as vitric ash and tuff (Tut) and are widespread throughout the watershed. Refer to Appendix map I for the surface geology map of the watershed.

Sedimentary rock components found within the watershed include alluvial deposits of Holocene age (Qal) such as sand, gravel, and silt which form flood plains and fill channels of present streams. Locally, these deposits include soils containing abundant amounts of organic material and thin peat beds. Other sedimentary rock units include the Eugene Formation (Tfe), the Myrtle Group (Kjm), and the landslide and debris flow deposits of Holocene and Pleistocene age represented by the unit Qls. The unit Tfe is a thin to moderately thick bedded coarse to fine grained arkosic and micaceous sandstone and siltstone. The unit KJm is comprised of conglomerate, sandstone, siltstone, and limestone. The Qls unit is an overlying deposit of unstratified fragments of adjacent bedrock that locally can include slopewash and colluvium.

Many rocks of the Klamath province have been subjected to tremendous heat and pressure and have therefore largely been compacted, folded and sheared to the point where they have metamorphosed to form new rock textures and minerals. Serpentenite, one of the most common rocks found in the province, is the product of the metamorphosis of greenish black iron rich ultramafic rock. The presence of iron results in the yellowish to reddish brown staining present in most Klamath rocks.



Appendix map I: Geologic map of Myrtle Creek Watershed with major fault system.

Geologic history and morphology of the Sixes River and Snow Camp Terranes

Comprising the lower western portion of the Myrtle Creek Watershed, the Sixes River terrane is exposed within the Oregon Klamath province just north of Cape Blanco and in a small sheet south of Roseburg. It consists of Jurassic and Cretaceous mudstones, sandstones, and conglomerates broken up by faults and studded with large separate blocks of blueschist and the distinctive high-grade metamorphic rock ecoglite.

The Snow Camp Terrane comprises the headwaters of the watershed and consists of a disjunct group of rocks including the Coast Range ophioloite that has been overlain by the lower Cretaceous and fossiliferous marine Days Creek formations of conglomerates, silts, and sands.

A rapid northwest withdrawal of oceanic waters at the end of the Cretaceous brought the southern edge of the shoreline up against the northern edge of the Klamath Mountains by Eocene time. Conglomerates represent late Eocene nearshore environments, which grade upward into the ashes, tuffs, and lava flows that record the earliest volcanic activity of the Western Cascades physiographic province situated immediately east of the Oregon Klamath. With continued uplift, the shoreline moved northward, and intensive erosion and leveling of the Klamath Mountains took place. Subsequently, during the Pleistocene, small glaciers formed in the Oregon Klamaths during the Ice Ages, although this range of mountains didn't have the extensive glacial system of the Blue Mountains, Cascade Range, or the substantially higher California portion of the Klamaths.

Glossary of geologic terms

Accretion- A tectonic process by which exotic rock masses (terranes) are physically annexed to another landmass after the two collide.

Alluvial- Refers to all detrital deposits resulting from operation of modern rivers, thus including the sediments laid down in river beds, flood plains, lakes, fans at the foot of mountain slopes, and estuaries.

Arkosic (sandstone) - Containing 25% or more feldspar usually derived from coarse-grained silicic igneous rock.

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.

Feldspar- A common rock-forming silicate mineral and one of the most abundant minerals in the earth's crust.

Igneous- A rock type formed by the crystallization of molten material called lava (volcanic) or magma (intrusive).

Limestone- A bedded sedimentary deposit consisting largely of calcium carbonate, sometimes containing fragments of sea shells or fossils.

Metamorphic- Type of rock which has been altered or deformed through heat and/or pressure.

Micaceous- Containing a high percentage of the mineral muscovite, a shiny, sheet-like, 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.

Ophiolite- A sequence of ocean crust beginning with ultramafic rocks at the base, grading upward to sheeted dikes, pillow lavas, and deep sea muds.

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 serpentenite.

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 the earth's crust consisting of ultramafic, dark colored igneous rocks high in magnesium and iron and low in silica, such as serpentenite and peridotite.

Sandstone- A consolidated sedimentary rock consisting of rock and mineral fragments ranging in size from 0.0625 mm 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.

Serpentine- See peridotite

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.

Terrane- A suite of rocks bounded by fault surfaces that has been displaced from a previous 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 four mm in diameter.

Ultramafic- An intrusive igneous rock very rich in iron and magnesium and with much less silicon and aluminum than most crustal rocks. Most come from the Earth's mantle.

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

Appendix 2: 2000 Douglas County census data

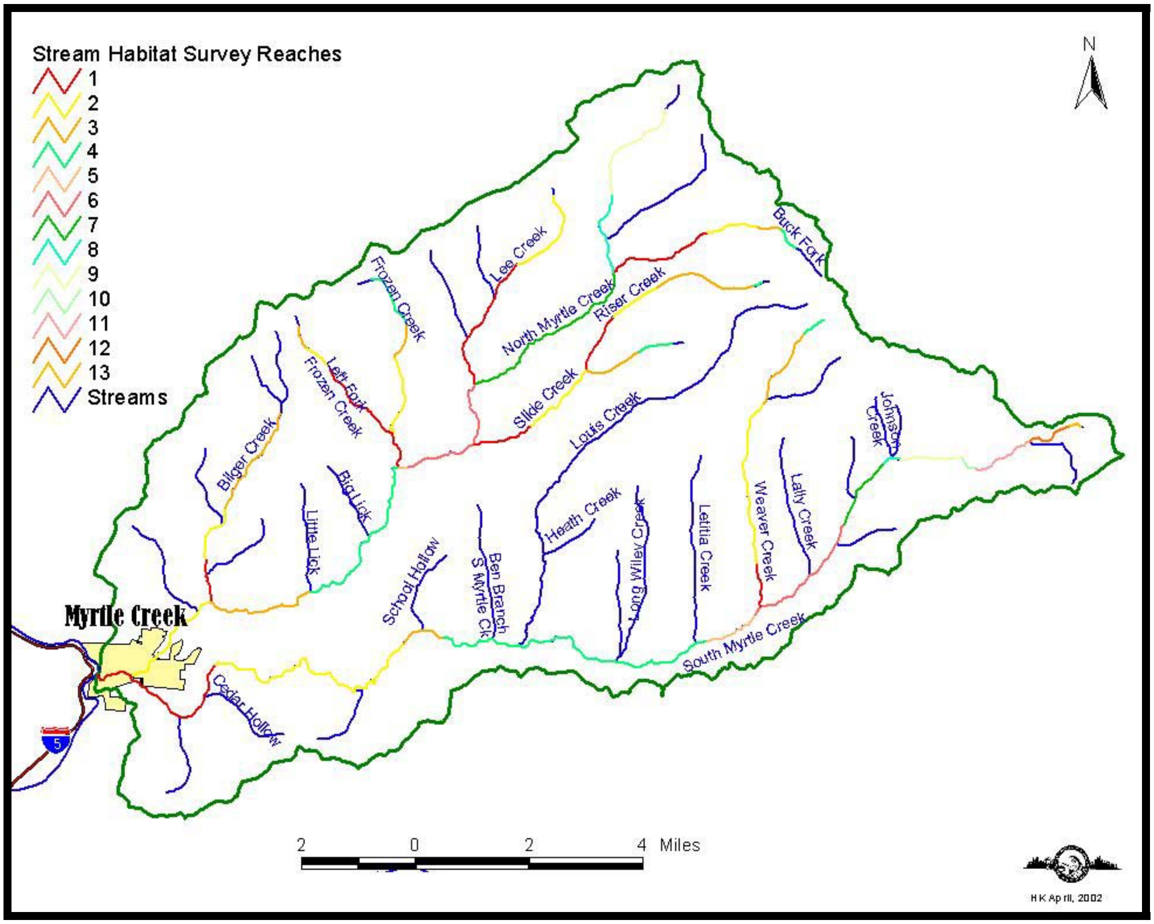
Age, race, and housing	
Population	100,399
Median age (years)	41.2
Race	
White	91.9%
Hispanic or Latino	3.3%
Asian	0.6%
American Indian or Alaskan Native	1.4%
African American	0.2%
Native Hawaiian and Pacific islander	0.1%
Some other race	0.1%
Two or more races	2.4%
Housing	
Avg. household size (#)	2.48
Avg. family size (#)	2.90
Owner-occupied housing	71.7%
Vacant housing units	8.0%
Education, employment, and income	
Education – age 25 or older	
High school graduate or higher	81.0%
Bachelor's degree or higher	13.3%
Employment – age 16 or older	
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
Income	
Per capita income	$16,581
Median family income	$39,364
Families below poverty	9.6%

Appendix 3: 1968 streamflow and temperature measurements

Stream	Location	Date	Degrees F.	Flow (cfs)
N. Myrtle Creek	0.1 mile above mouth	4/29/68	58	16
		5/23/68	56	18
		6/27/68	65	2.6
		7/26/68	63	1
		8/27/68	62	9.7
		10/4/68	56	5.9
		10/22/68	57	24
		11/19/68	50	63
S. Myrtle Creek	0.1 mile above mouth	4/29/68	59	11
		5/23/68	56	19
		6/27/68	65	1.2
		7/26/68	--	Intermittent
		8/27/68	63	7.4
		10/4/68	55	5.4
		10/22/68	54	22
		11/15/68	47	104

Appendix 4: Stream habitat surveys

Stream reaches surveyed by the Oregon Department of Fish and Wildlife



Myrtle Creek reach surveys ●●● = Good; ●● = Fair; ● = Poor

Stream	Reach	Pools	Riffles	Riparian Area	Large Woody Material
BILGER CREEK	1	●	●	●●	●
BILGER CREEK	2	●	●	●●	●
BILGER CREEK	3	●	●●	●●	●
BUCK FORK CREEK	1	●●	●	●	●
BUCK FORK CREEK	2	●●	●	●●●	●
BUCK FORK CREEK	3	●	●	●●	●
BUCK FORK CREEK	4	●	●	●●●	●●●
FROZEN CREEK	1	●●	●	●	●
FROZEN CREEK	2	●●	●	●	●
FROZEN CREEK	3	●	●	●●	●
FROZEN CREEK	4	●	●	●●●	●
LEES CREEK	1	●●	●	●●	●

Stream	Reach	Pools	Riffles	Riparian Area	Large Woody Material
LEES CREEK	2	••	•	•••	•
WEST FORK FROZEN CREEK	1	••	••	•••	•
WEST FORK FROZEN CREEK	2	•	•••	•	•
WEST FORK FROZEN CREEK	3	•	•	••	•
MYRTLE CREEK	1	••	•	••	•
NORTH FORK MYRTLE CREEK	2	••	•	••	•
NORTH FORK MYRTLE CREEK	3	•••	•	••	•
NORTH FORK MYRTLE CREEK	4	•••	•	••	•
NORTH FORK MYRTLE CREEK	5	•	•	•	•
NORTH FORK MYRTLE CREEK	6	•••	•	••	•
NORTH FORK MYRTLE CREEK	7	••	•	•••	•
NORTH FORK MYRTLE CREEK	8	••	•	•	•
NORTH FORK MYRTLE CREEK	9	•	•	•	•
RISER CREEK	1	••	•	•••	•
RISER CREEK	2	•	•	•	•
RISER CREEK	3	••	•	•••	•
RISER CREEK	4	•	•	•••	•
SLIDE CREEK	1	••	•	•	•
SLIDE CREEK	2	••	•	•••	•
SLIDE CREEK	3	••	•	•••	•
SLIDE CREEK	4	••	•	•••	•
SOUTH FORK MYRTLE CREEK	1	•	•	•	•
SOUTH FORK MYRTLE CREEK	2	••	•	•	•
SOUTH FORK MYRTLE CREEK UNSURVEYED	3				
SOUTH FORK MYRTLE CREEK	4	••	•	•	•
SOUTH FORK MYRTLE CREEK UNSURVEYED	5				
SOUTH FORK MYRTLE CREEK	6	•••	•	•	•
SOUTH FORK MYRTLE CREEK	7	•	•	•	•
SOUTH FORK MYRTLE CREEK	8	•	•	•	•
SOUTH FORK MYRTLE CREEK	9	••	•	•	•••
SOUTH FORK MYRTLE CREEK	10	•••	•	•	••
SOUTH FORK MYRTLE CREEK	11	•	•	•	•
SOUTH FORK MYRTLE CREEK	12	•	•	•	•••
SOUTH FORK MYRTLE CREEK	13	•••	•	•	•••
WEAVER CREEK	1	••	•	••	•
WEAVER CREEK	2	••	•	••	•
WEAVER CREEK	3	•	•	•••	••
WEAVER 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 Myrtle Creek Watershed. All categories have been included below, even those not applicable to the Myrtle Creek Watershed.

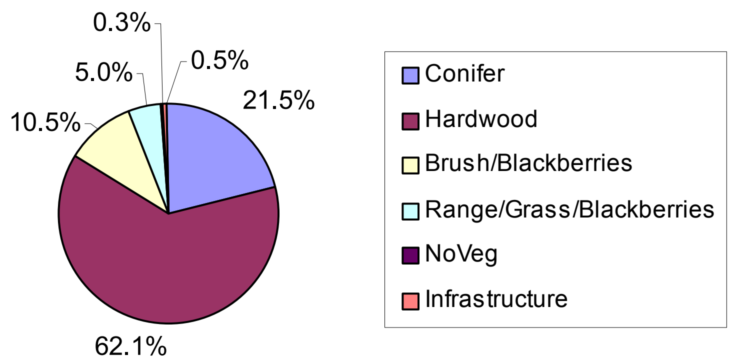
AG Agricultural crop or dairy land.
TH Timber harvest: active timber management including tree felling, logging, etc. Not yet replanted.
YT Young forest trees: can range from recently planted harvest units to stands with trees up to 15 cm dbh.
ST Second growth timber: trees 15-30 cm dbh in generally 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
BILGER CREEK	1	RR	LG
BILGER CREEK	2	RR	LG
BILGER CREEK	3	RR	LG
BUCK FORK CREEK	1	RR	HG
BUCK FORK CREEK	2	ST	YT
BUCK FORK CREEK	3	YT	NU
BUCK FORK CREEK	4	ST	YT
FROZEN CREEK	1	HG	AG
FROZEN CREEK	2	HG	AG

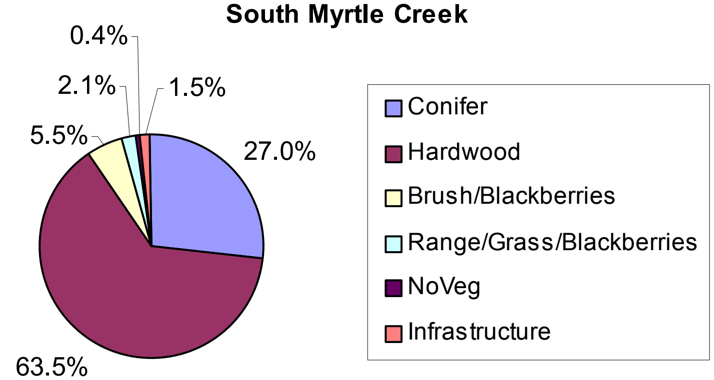
Creek	Reach	Primary land use	Secondary land use
FROZEN CREEK	3	HG	AG
FROZEN CREEK	4	ST	NU
LEES CREEK	1	RR	ST
LEES CREEK	2	MT	FF
W. FK. FROZEN CREEK	1	ST	LG
W. FK. FROZEN CREEK	2	YT	FF
W. FK. FROZEN CREEK	3	OG	YT
MYRTLE CR.	1	RR	
N. FK. MYRTLE CREEK	2	UR	RR
N. FK. MYRTLE CREEK	3	RR	ST
N. FK. MYRTLE CREEK	4	RR	LG
N. FK. MYRTLE CREEK	5		
N. FK. MYRTLE CREEK	6	RR	LG
N. FK. MYRTLE CREEK	7	RR	ST
N. FK. MYRTLE CREEK	8	ST	FF
N. FK. MYRTLE CREEK	9	ST	MT
RISER CREEK	1	YT	ST
RISER CREEK	2	YT	ST
RISER CREEK	3	YT	TH
RISER CREEK	4	YT	ST
SLIDE CREEK	1	HG	RR
SLIDE CREEK	2	ST	
SLIDE CREEK	3	ST	OG
SLIDE CREEK	4	MT	YT
SOUTH FORK MYRTLE CREEK	1	RR	
SOUTH FORK MYRTLE CREEK	2	LG	PT
SOUTH FORK MYRTLE UNSURVEYED	3		
SOUTH FORK MYRTLE CREEK	4	LG	ST
SOUTH FORK MYRTLE UNSURVEYED	5		
SOUTH FORK MYRTLE CREEK	6	LG	
SOUTH FORK MYRTLE CREEK	7	ST	
SOUTH FORK MYRTLE CREEK	8	ST	
SOUTH FORK MYRTLE CREEK	9	ST	
SOUTH FORK MYRTLE CREEK	10	LT	MT
SOUTH FORK MYRTLE CREEK	11	LT	
SOUTH FORK MYRTLE CREEK	12	LT	
SOUTH FORK MYRTLE CREEK	13	LT	
WEAVER CREEK	1	LG	
WEAVER CREEK	2	LG	TH
WEAVER CREEK	3	MT	
WEAVER CREEK	4	MT	

Appendix 6: Riparian vegetation and features

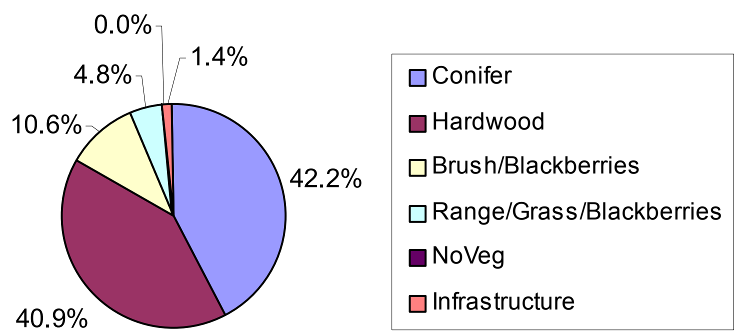
North Myrtle Creek



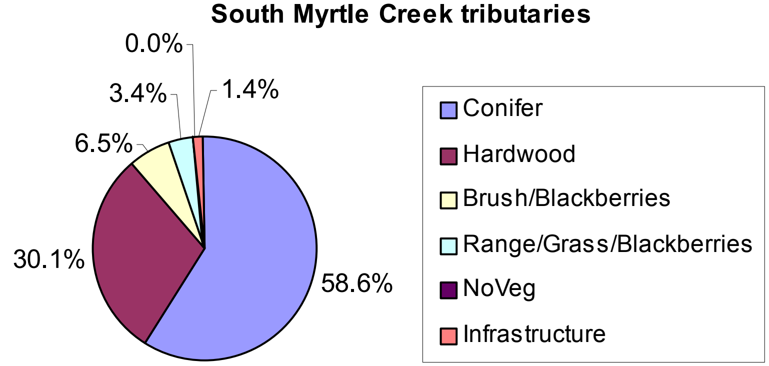
South Myrtle Creek



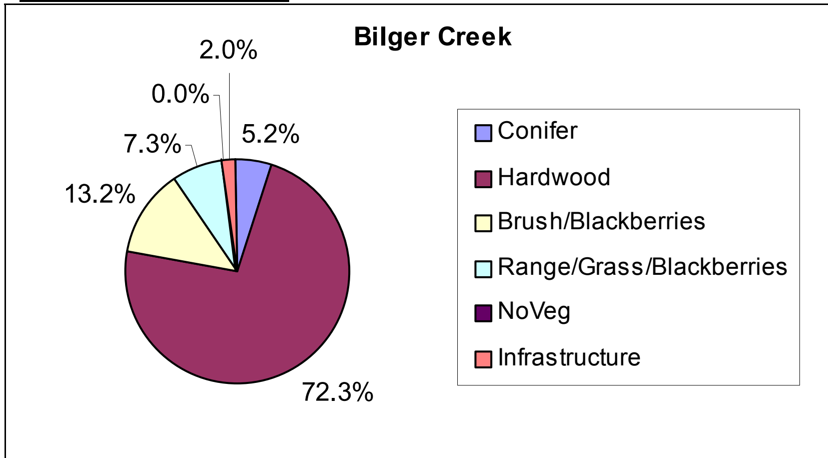
North Myrtle Creek tributaries

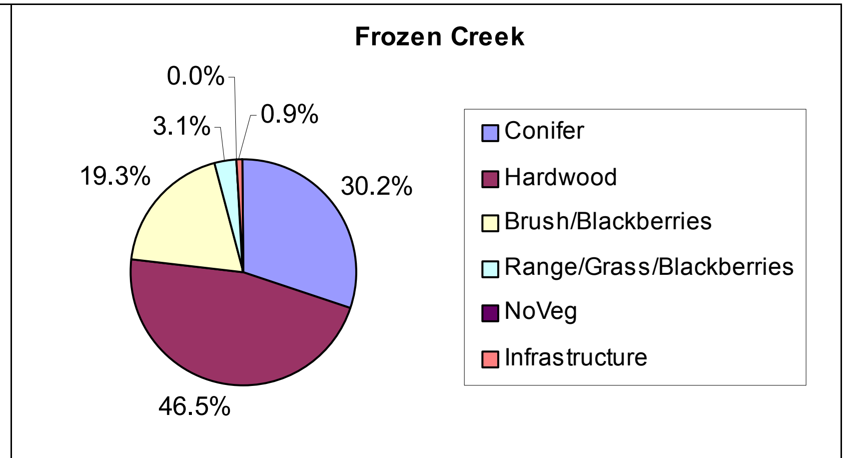


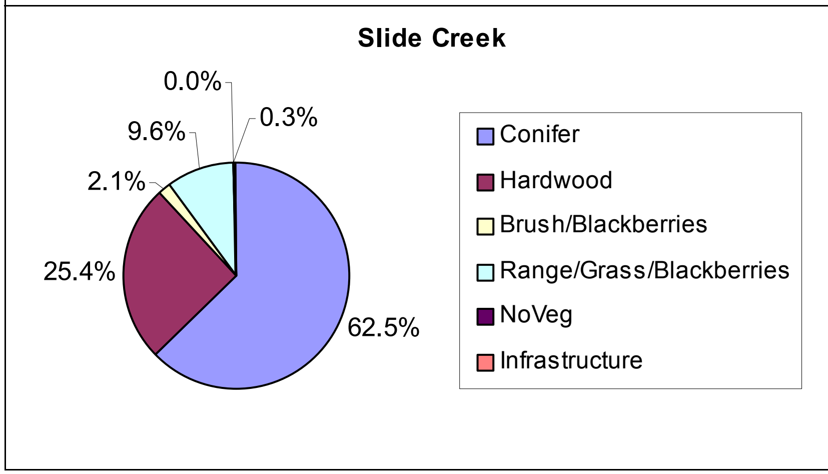
South Myrtle Creek tributaries

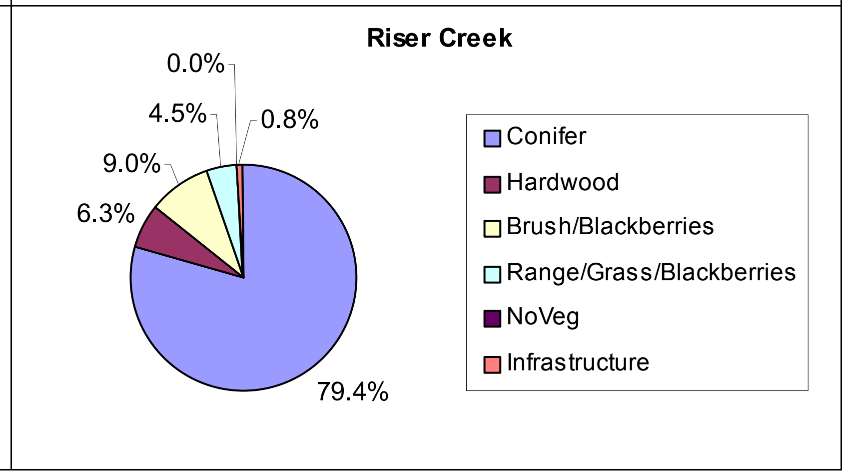


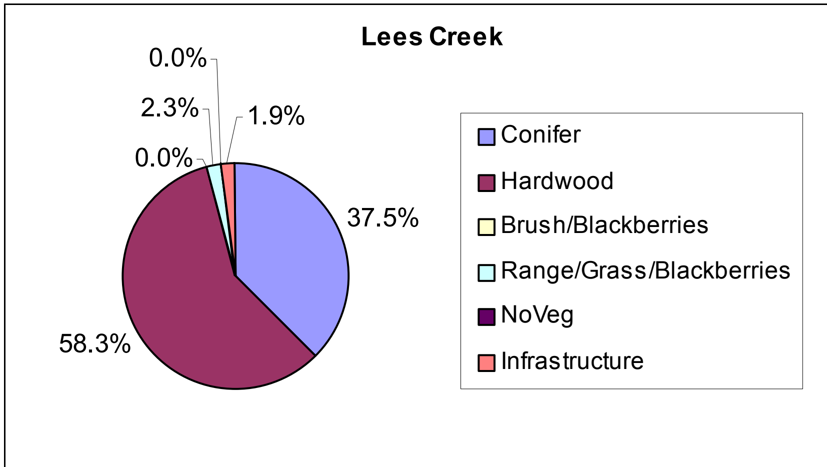
Individual tributaries

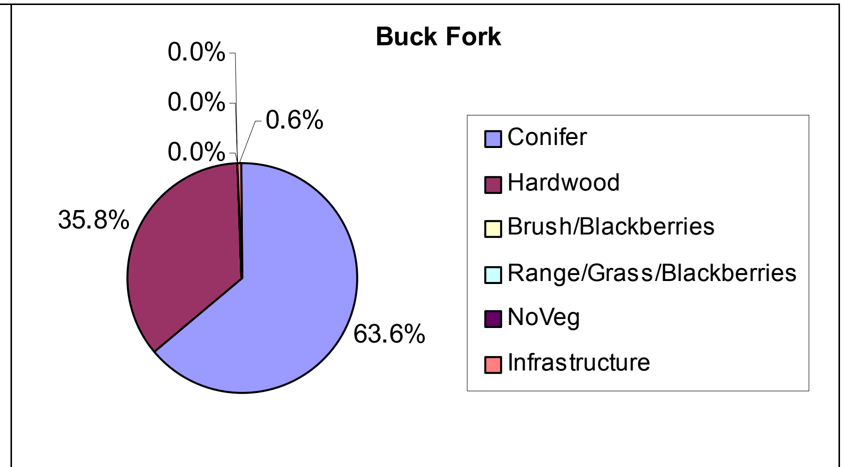


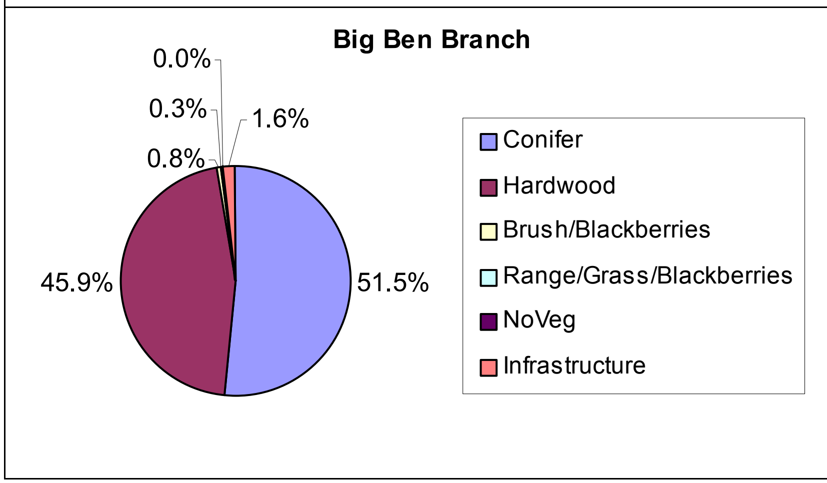


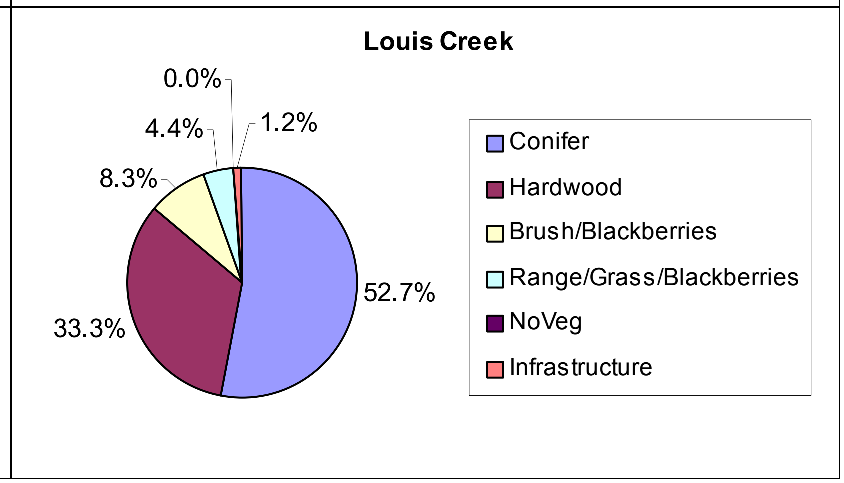


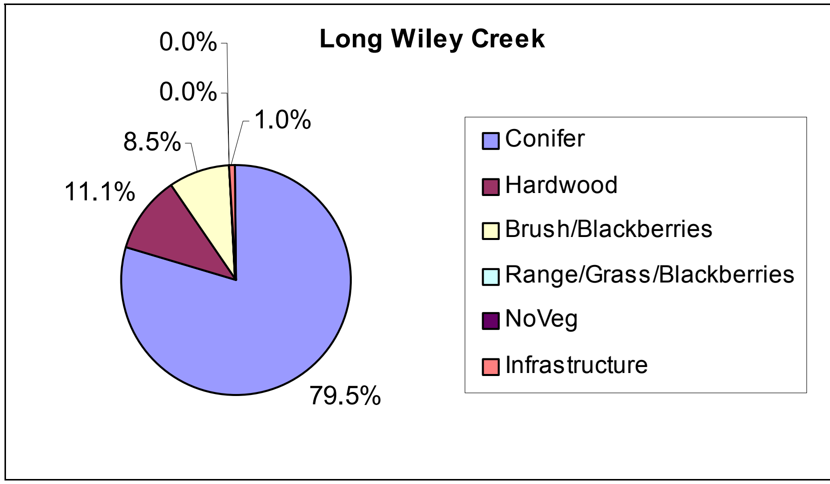


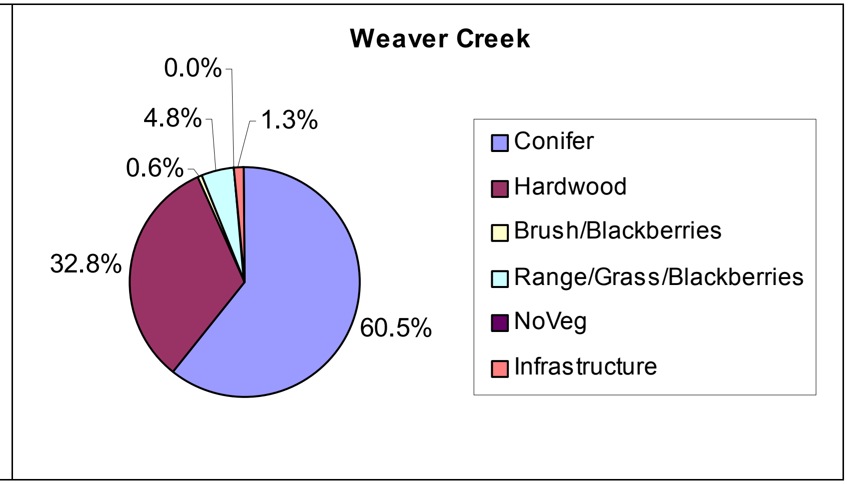

Lees Creek
0.0%
2.3%
1.9%
0.0%
37.5%
58.3%
Conifer
Hardwood
Brush/Blackberries
Range/Grass/Blackberries
NoVeg
Infrastructure


Buck Fork
0.0%
0.0%
0.6%
0.0%
35.8%
63.6%
Conifer
Hardwood
Brush/Blackberries
Range/Grass/Blackberries
NoVeg
Infrastructure

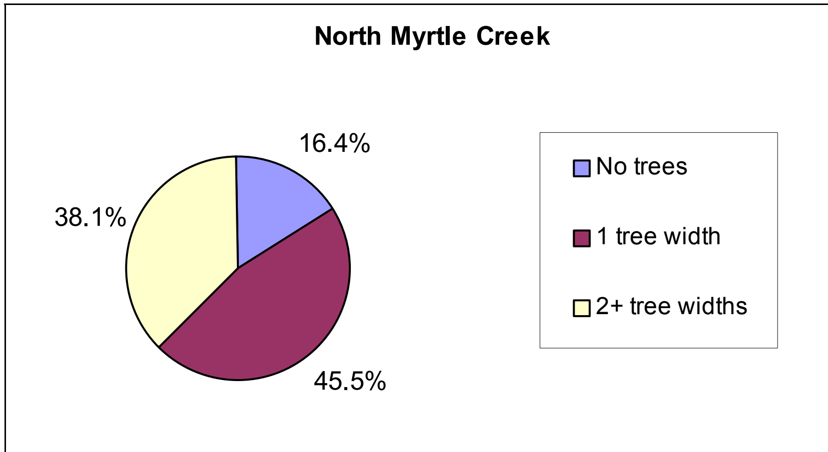

Big Ben Branch
0.0%
0.3%
1.6%
0.8%
45.9%
51.5%
Conifer
Hardwood
Brush/Blackberries
Range/Grass/Blackberries
NoVeg
Infrastructure

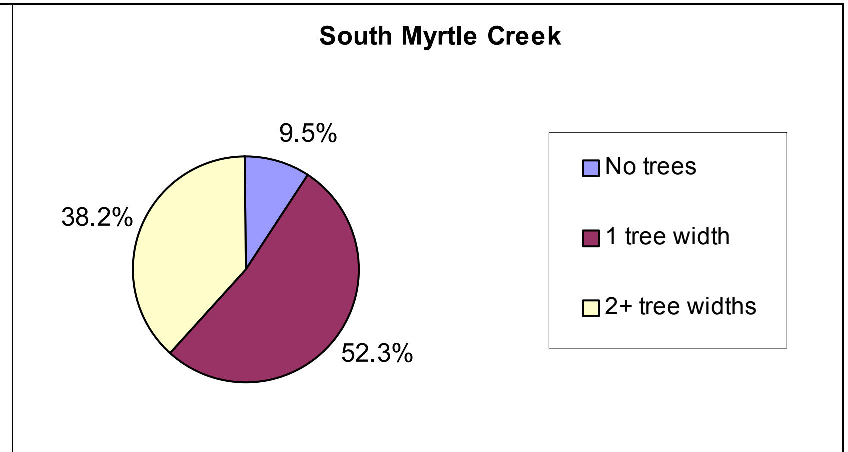

Louis Creek
0.0%
4.4%
1.2%
8.3%
52.7%
33.3%
Conifer
Hardwood
Brush/Blackberries
Range/Grass/Blackberries
NoVeg
Infrastructure

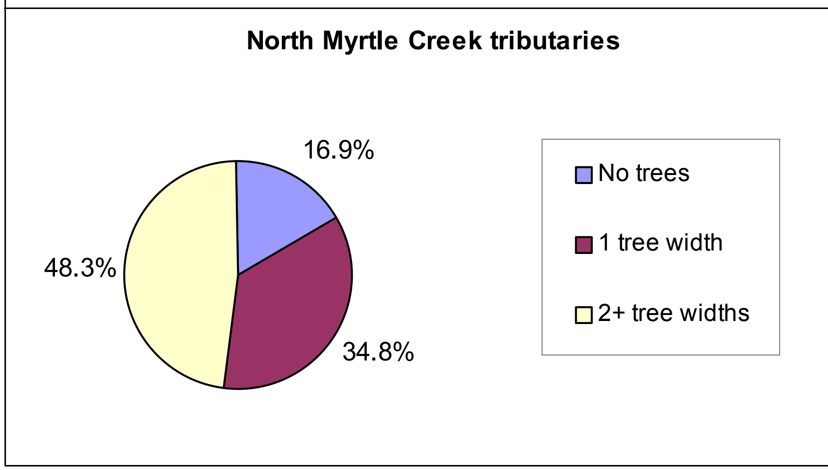

Long Wiley Creek
0.0%
0.0%
1.0%
8.5%
11.1%
79.5%
Conifer
Hardwood
Brush/Blackberries
Range/Grass/Blackberries
NoVeg
Infrastructure

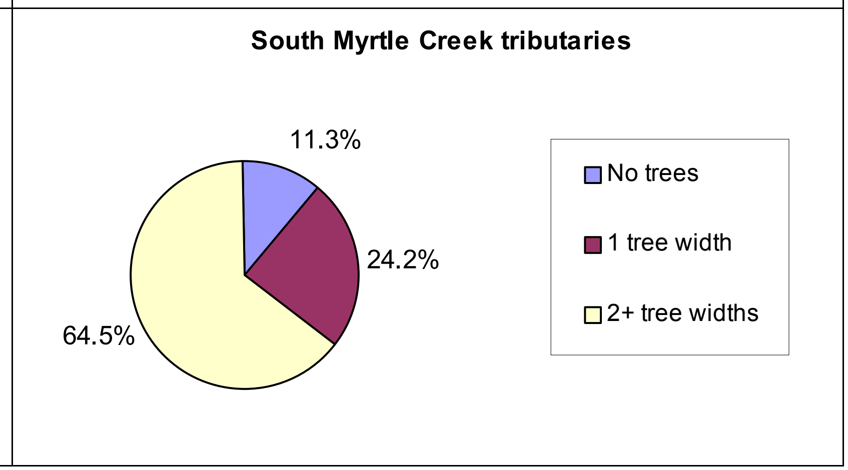

Weaver Creek
0.0%
4.8%
1.3%
0.6%
32.8%
60.5%
Conifer
Hardwood
Brush/Blackberries
Range/Grass/Blackberries
NoVeg
Infrastructure

Appendix 7: Buffer width

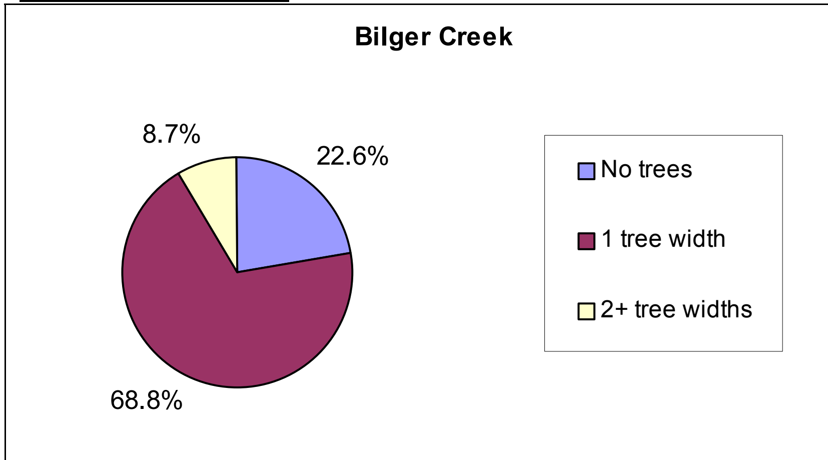


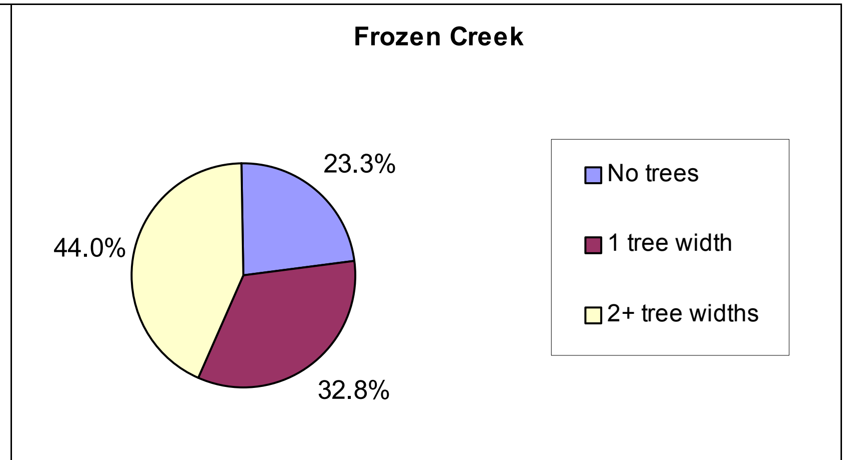


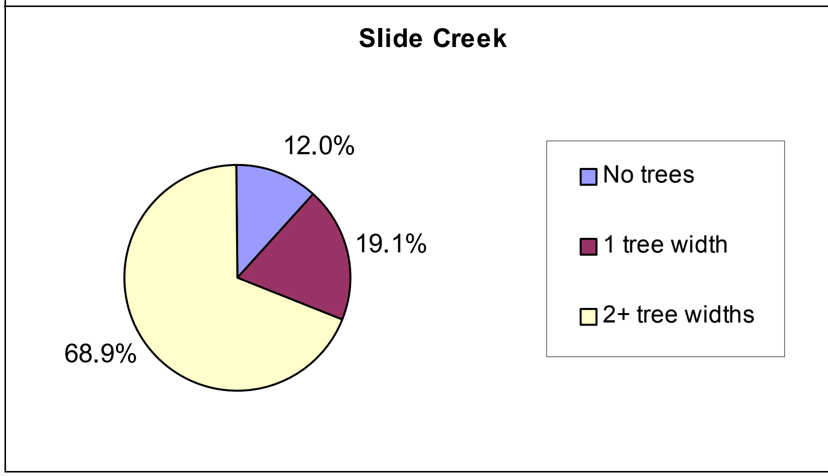


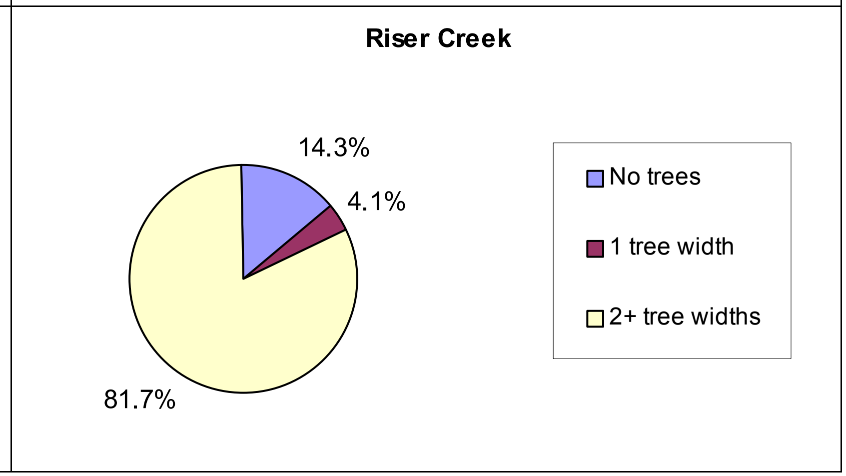


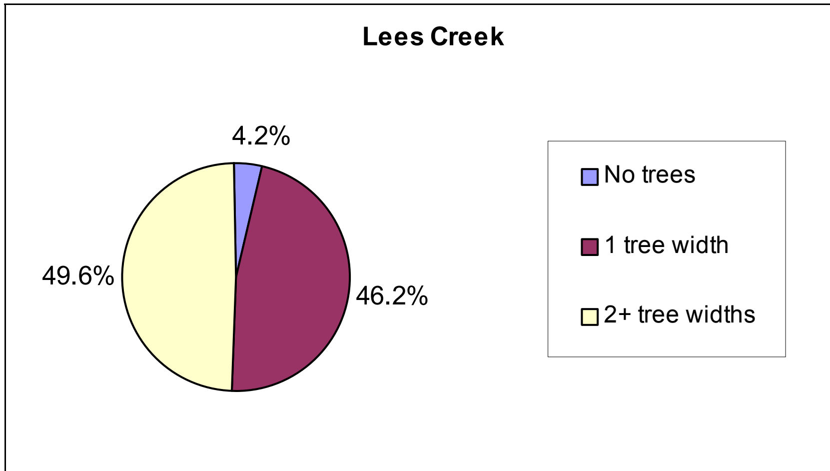
Individual tributaries

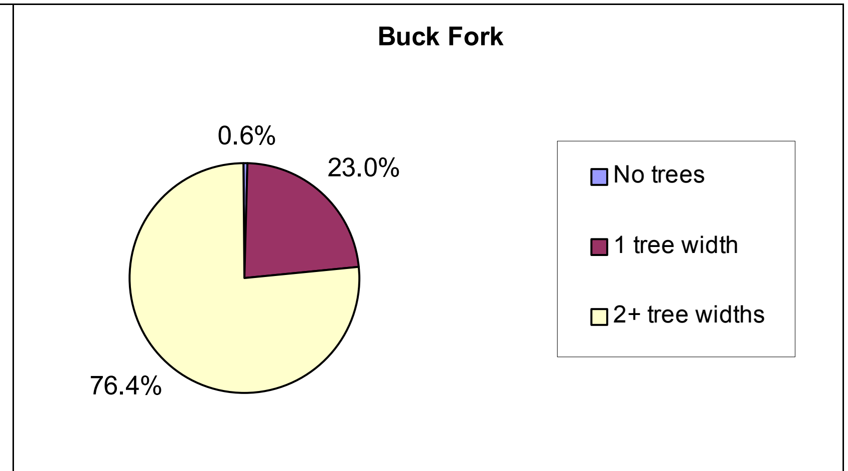


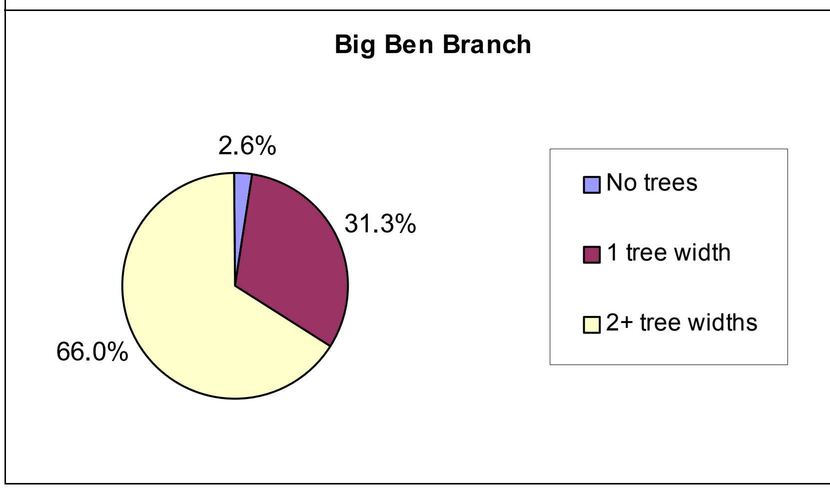


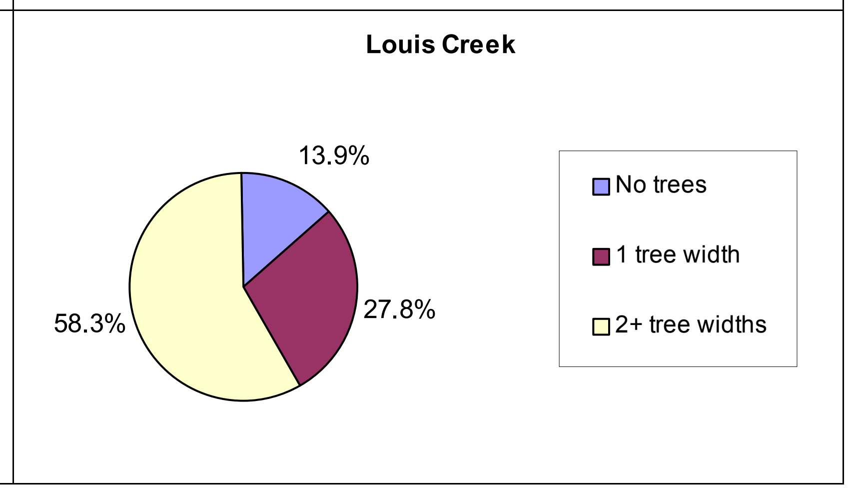


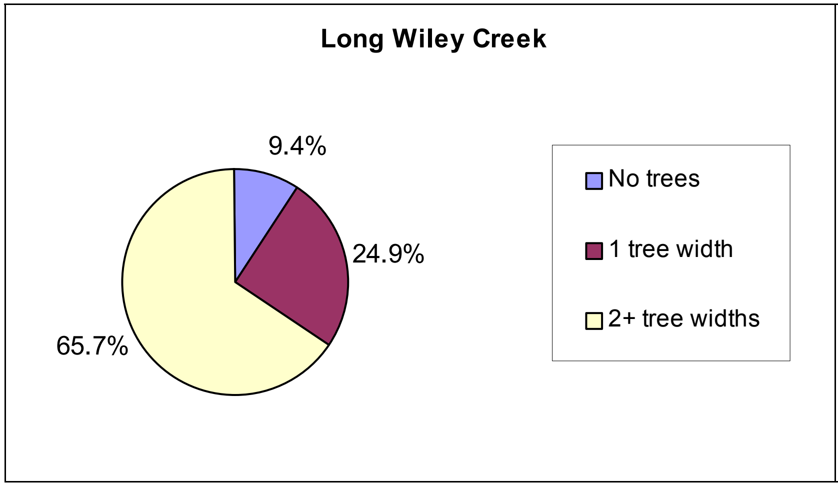


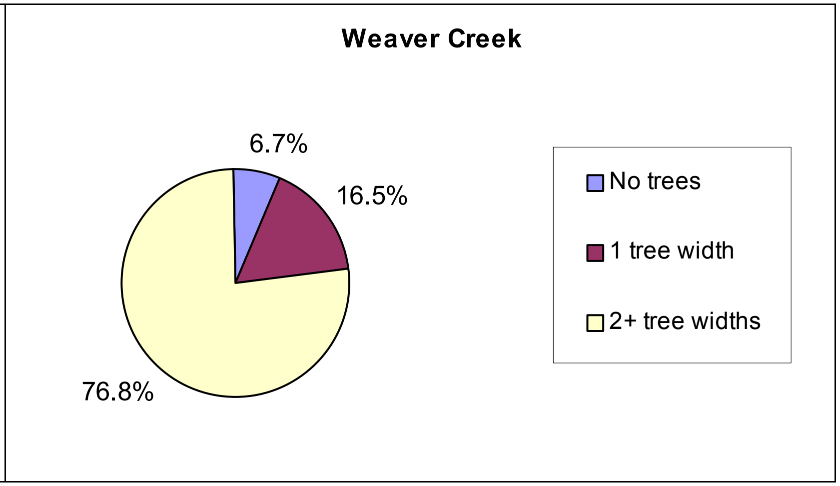

Lees Creek
4.2%
46.2%
49.6%
No trees
1 tree width
2+ tree widths


Buck Fork
0.6%
23.0%
76.4%
No trees
1 tree width
2+ tree widths

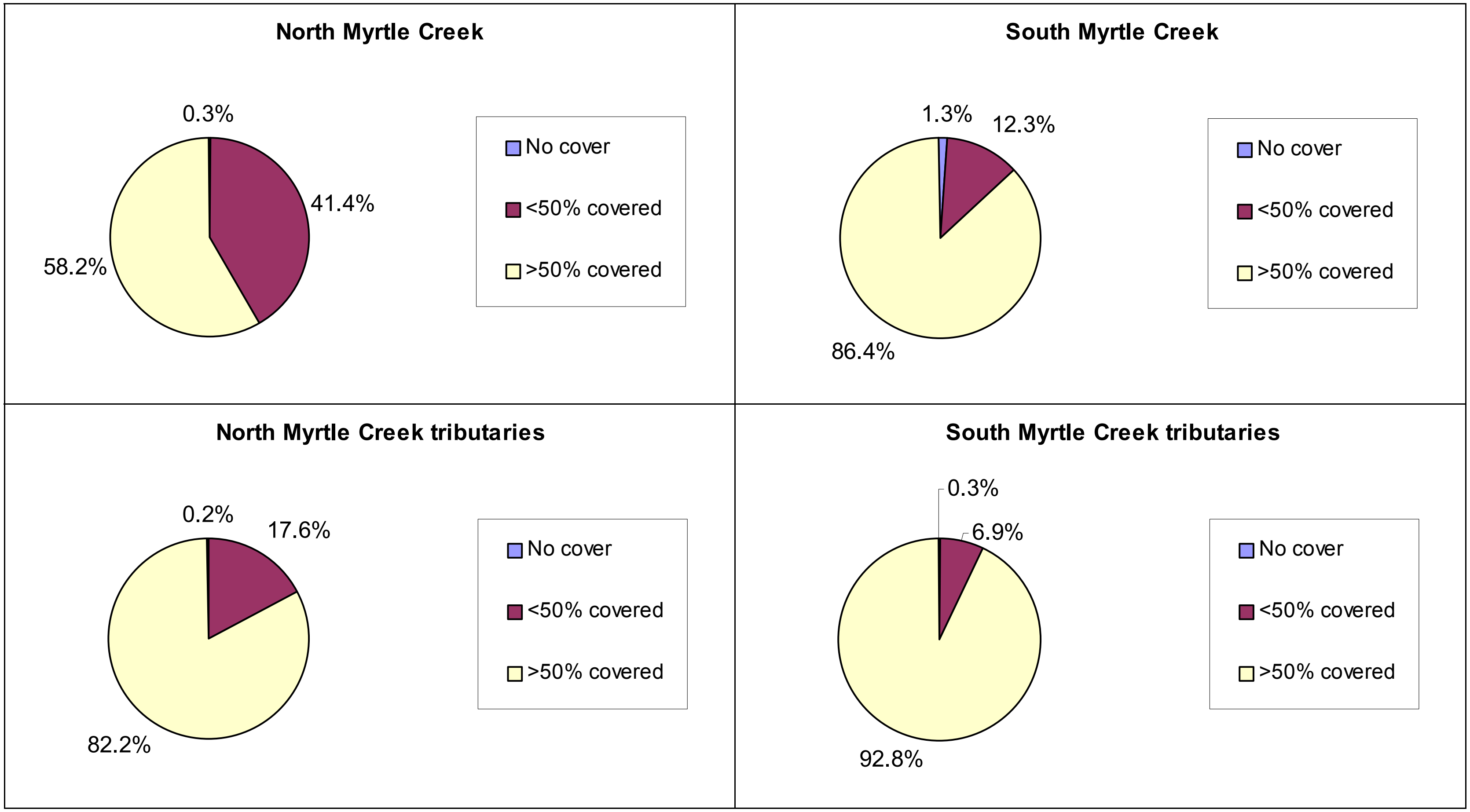

Big Ben Branch
2.6%
31.3%
66.0%
No trees
1 tree width
2+ tree widths


Louis Creek
13.9%
27.8%
58.3%
No trees
1 tree width
2+ tree widths

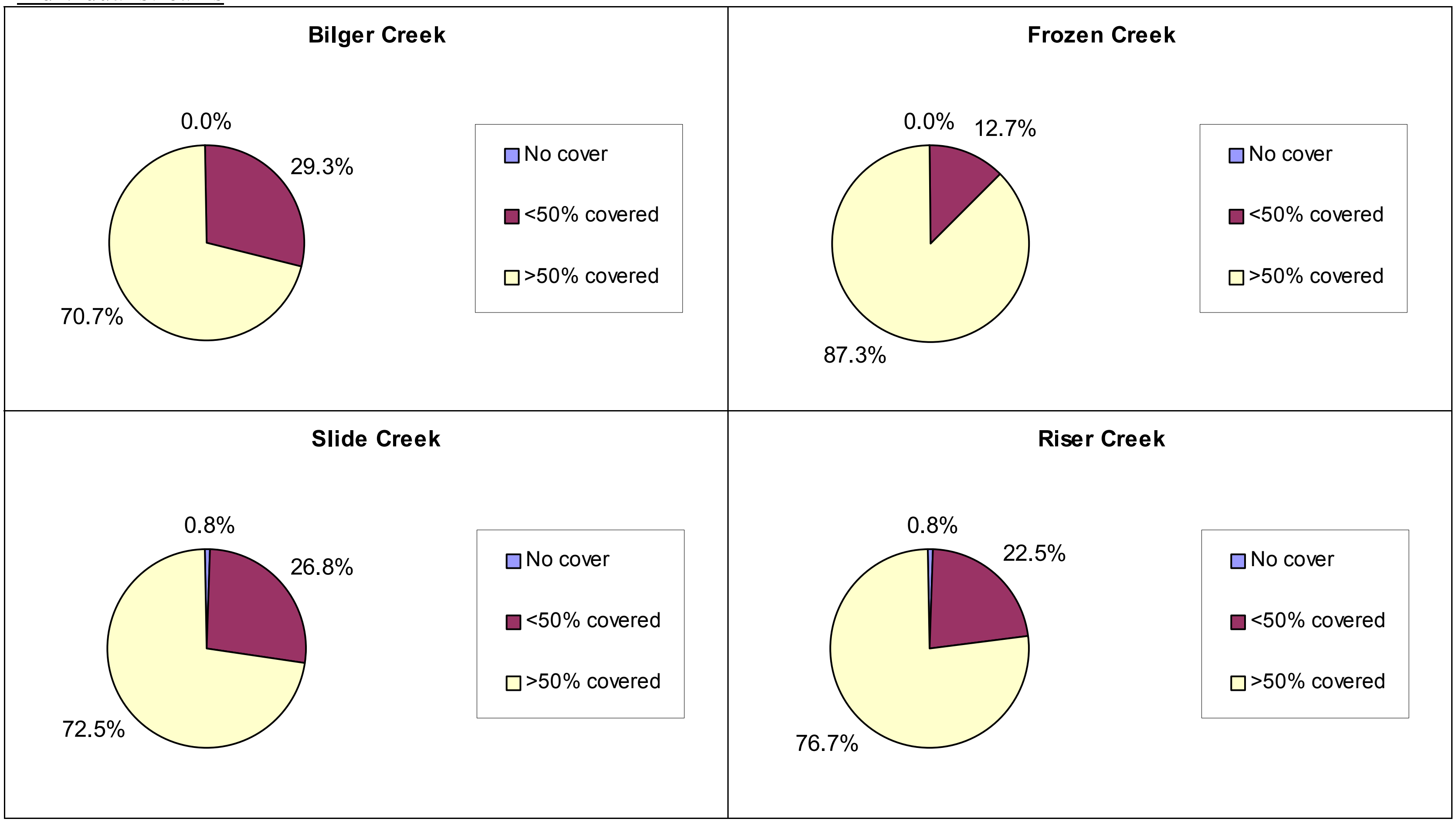

Long Wiley Creek
9.4%
24.9%
65.7%
No trees
1 tree width
2+ tree widths

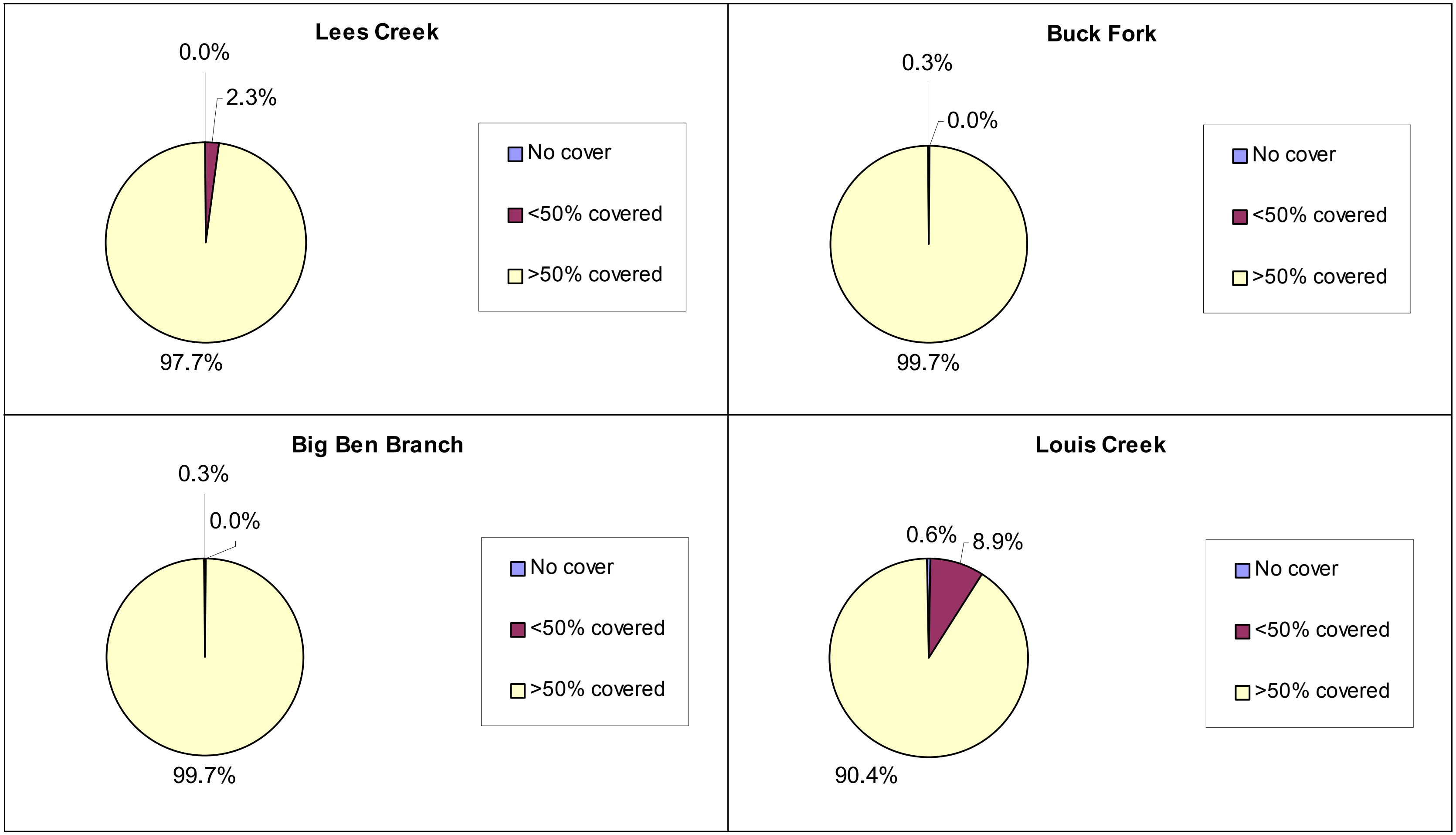

Weaver Creek
6.7%
16.5%
76.8%
No trees
1 tree width
2+ tree widths

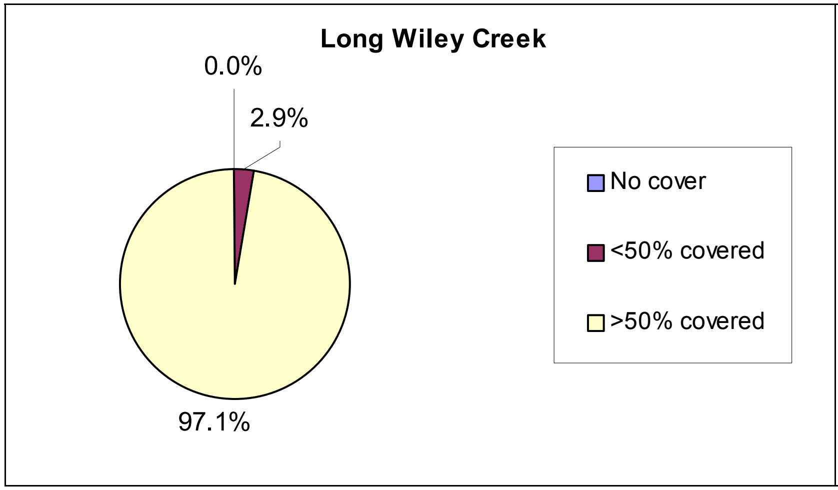
Appendix 8: Riparian cover

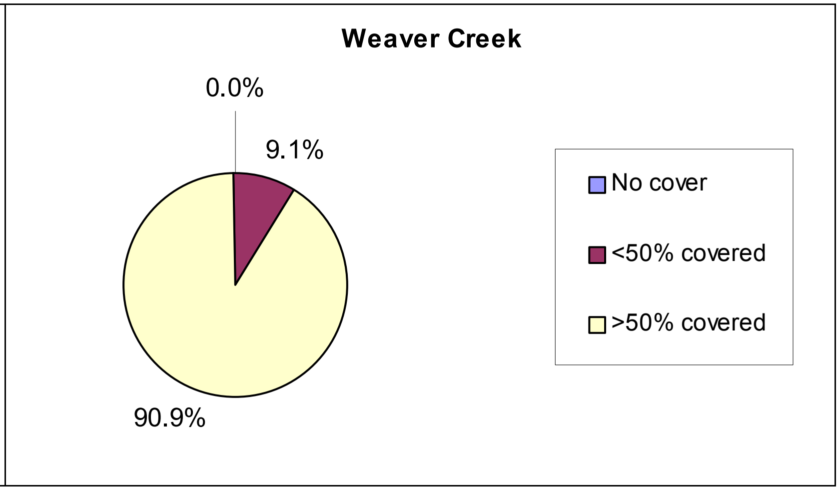


Individual streams




Lees Creek
0.0%
2.3%
97.7%
No cover
<50% covered
>50% covered
Buck Fork
0.3%
0.0%
99.7%
No cover
<50% covered
>50% covered
Big Ben Branch
0.3%
0.0%
99.7%
No cover
<50% covered
>50% covered
Louis Creek
0.6%
8.9%
90.4%
No cover
<50% covered
>50% covered

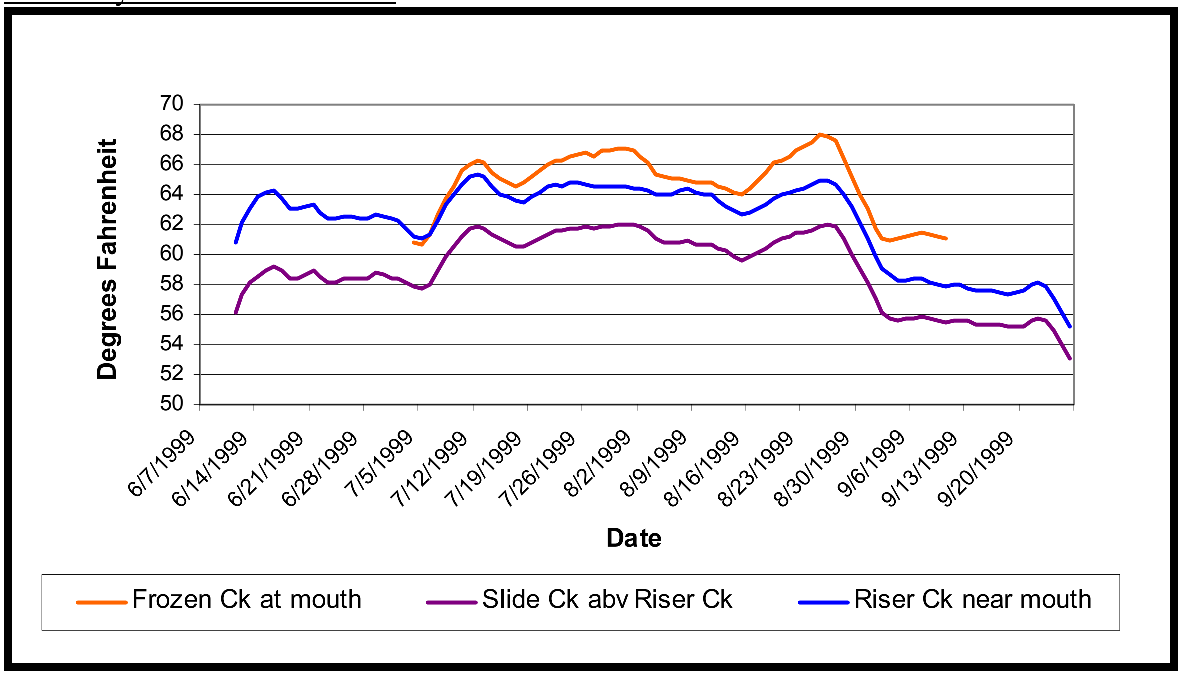

Long Wiley Creek
0.0%
2.9%
97.1%
No cover
<50% covered
>50% covered


Weaver Creek
0.0%
9.1%
90.9%
No cover
<50% covered
>50% covered

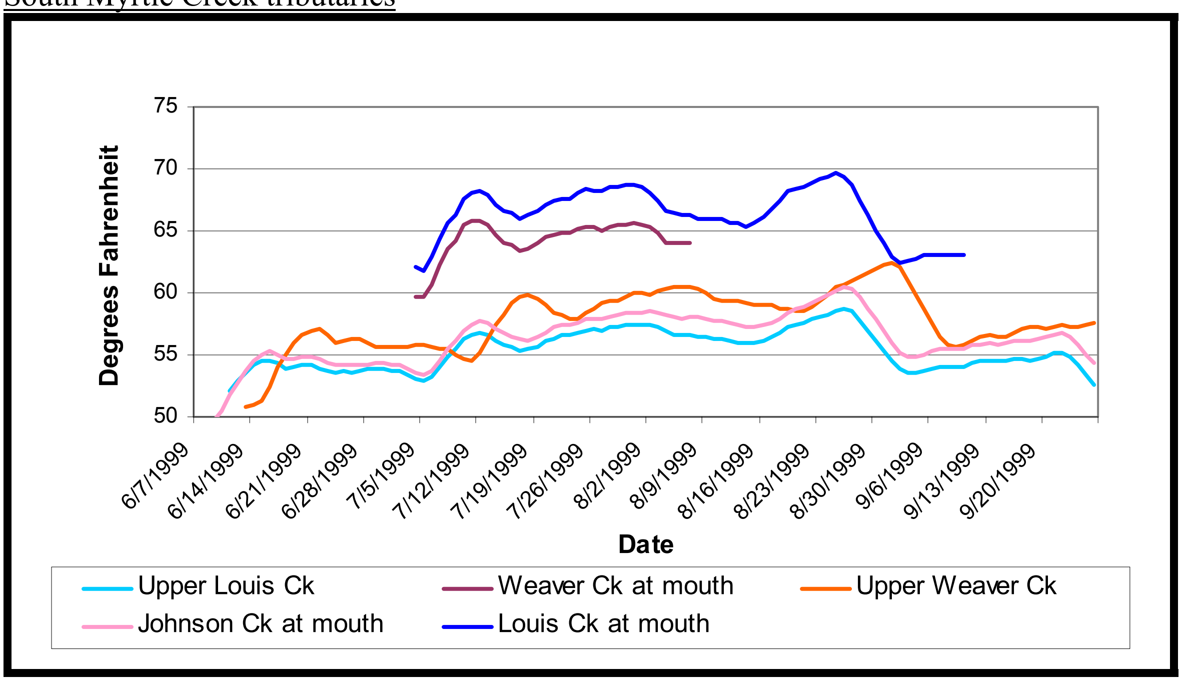
Appendix 9: Myrtle Creek Watershed tributary temperature trends

(From K. Smith, 1999).

North Myrtle Creek tributaries



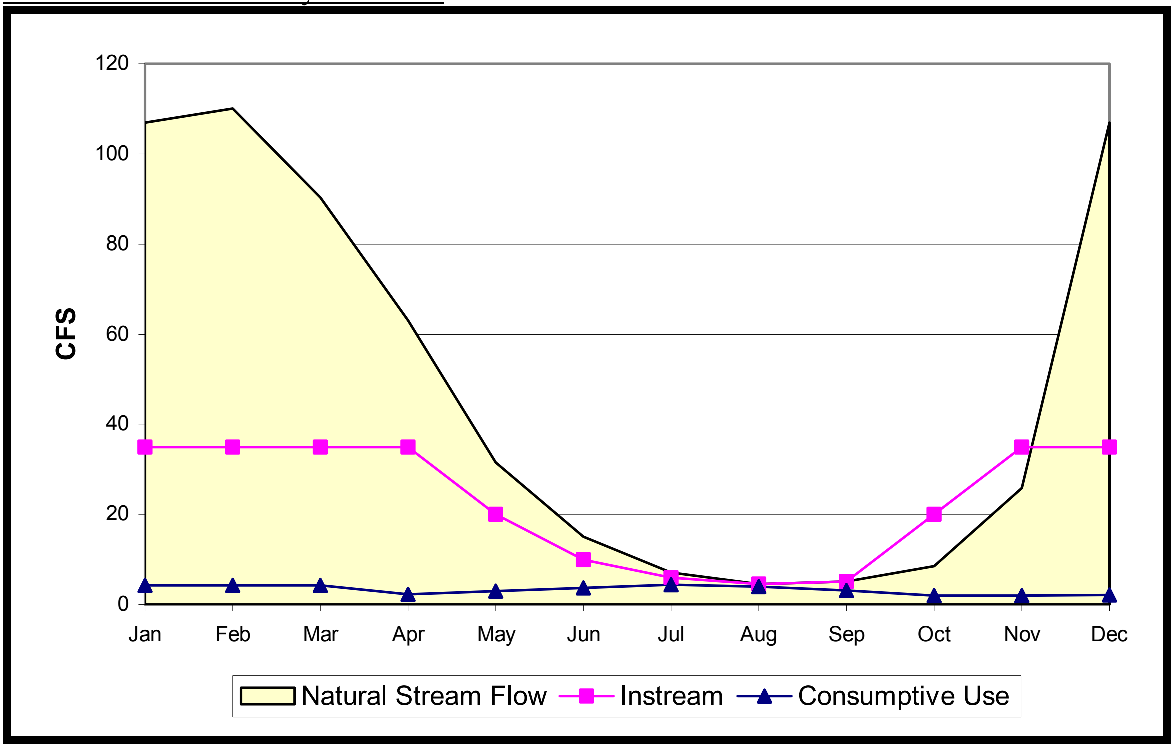
South Myrtle Creek tributaries



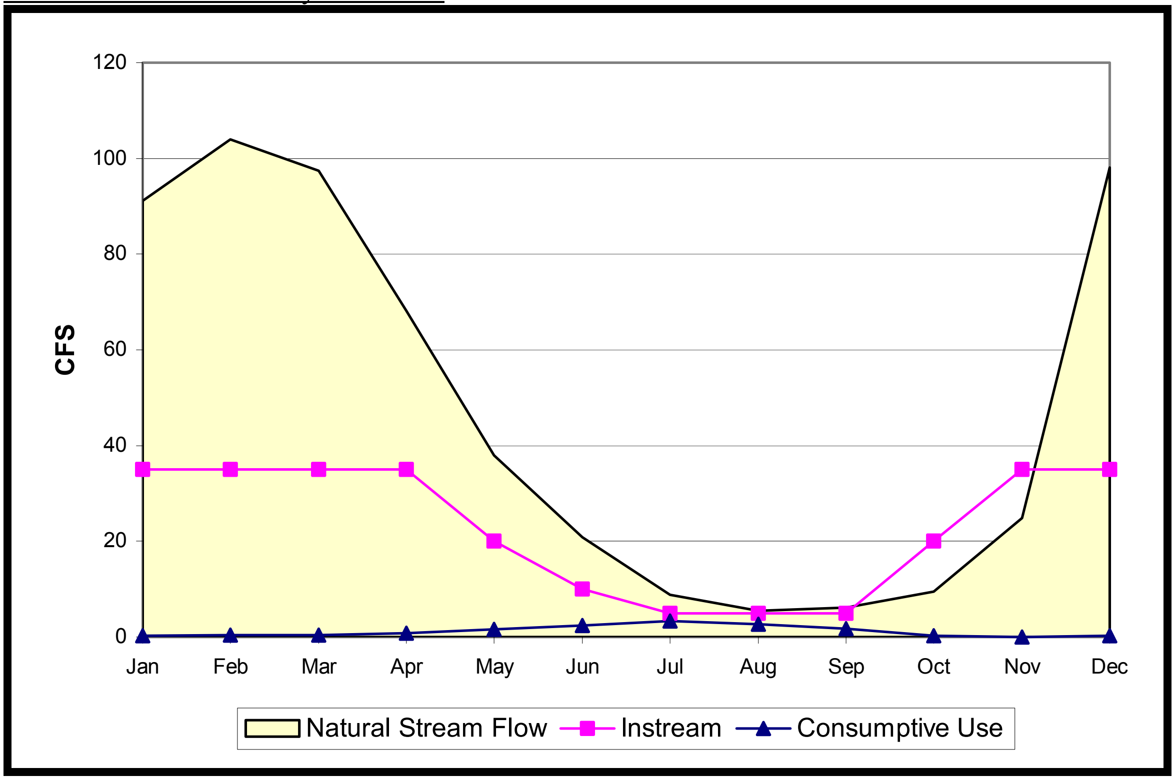
Appendix 10: Water availability graphs

Water availability graphs for the North Myrtle Creek and South Myrtle Creek water availability units (WABs).

WAB #71187 North Myrtle Creek



WAB #71191 South Myrtle Creek



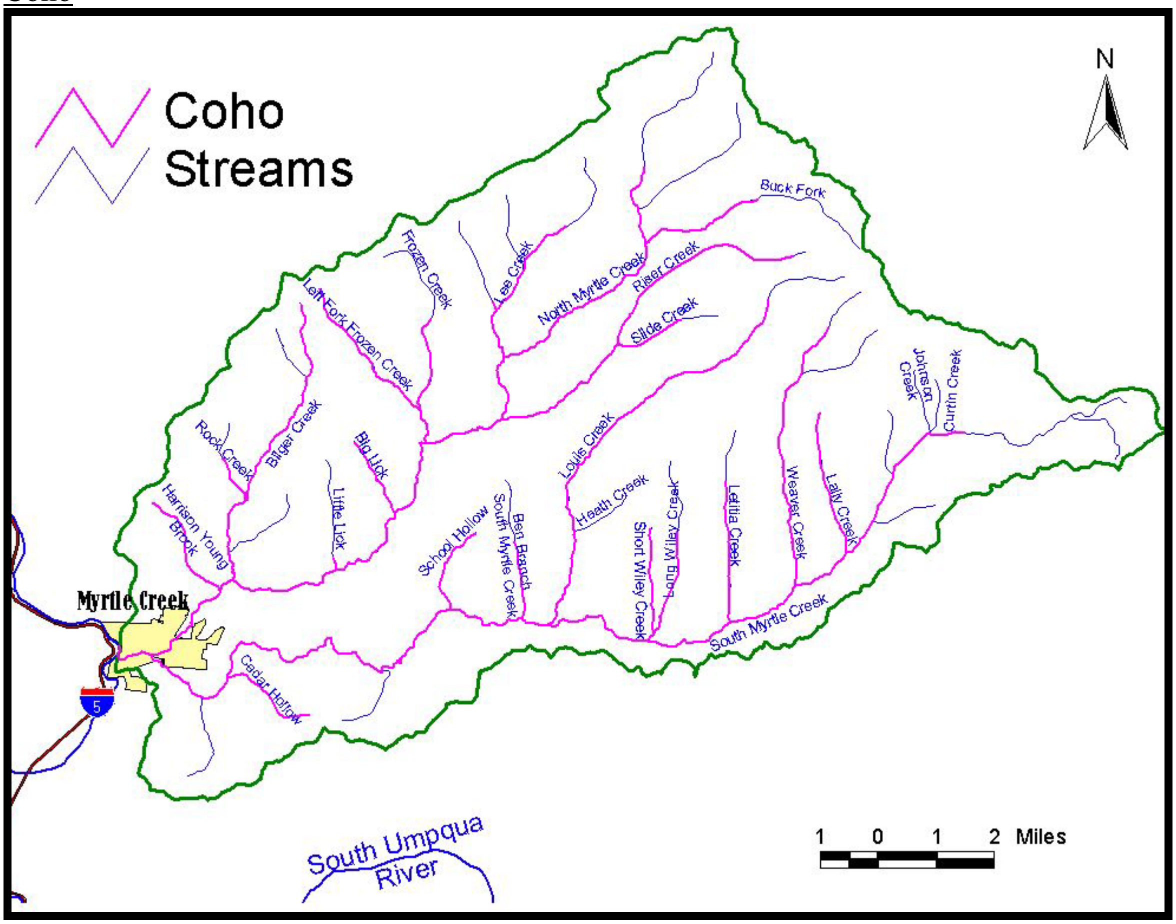
Appendix 11: Water use categories

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

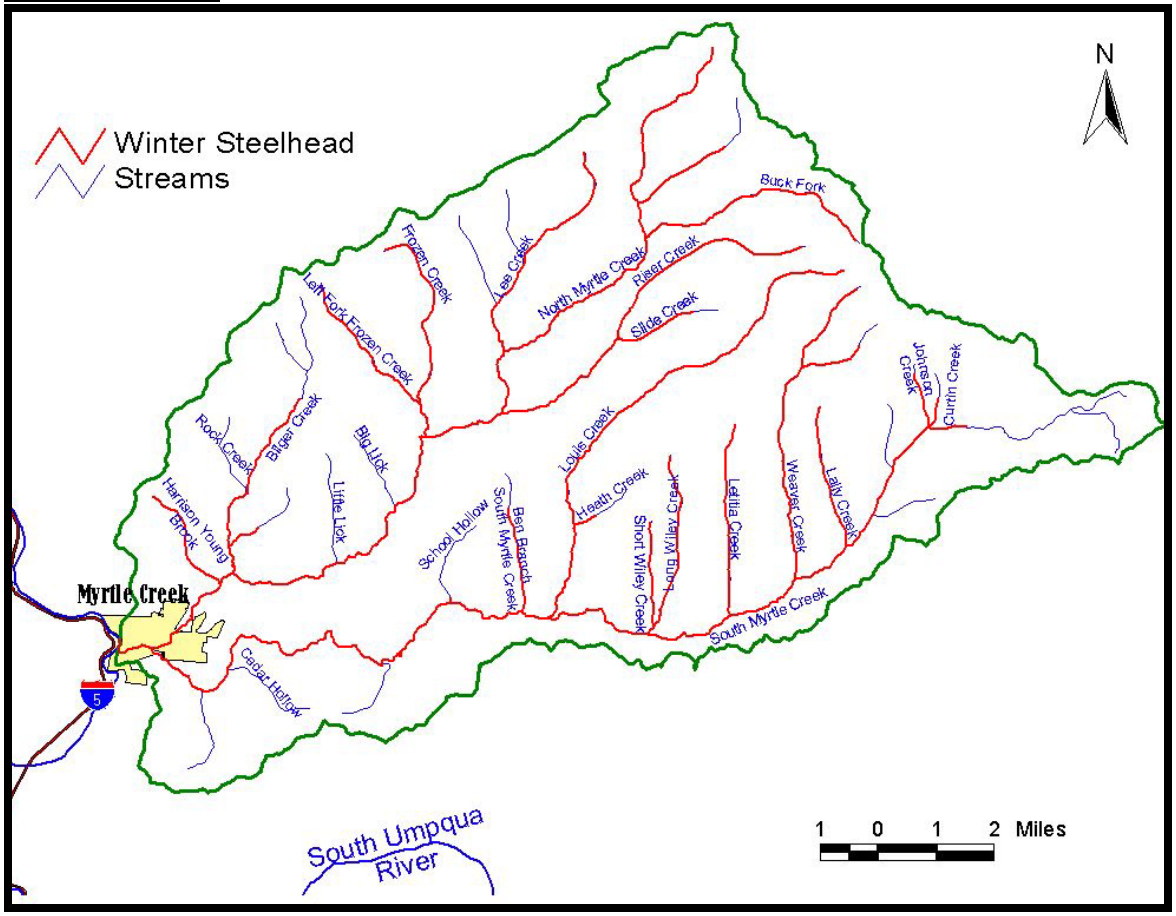
Irrigation	**Industrial**	**Domestic**
Primary and supplemental	Geothermal	Domestic
Irrigation	Manufacturing	Lawn and garden
Supplemental	Sawmill	Non-commercial
Cranberries	Shop	Stock
Irrigation, domestic & stock	Log deck	Group domestic
Irrigation & domestic	Commercial	Restroom
Irrigation & stock	Laboratory	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 12: Myrtle Creek Watershed anadromous salmonid distribution by species.

<u>Coho</u>

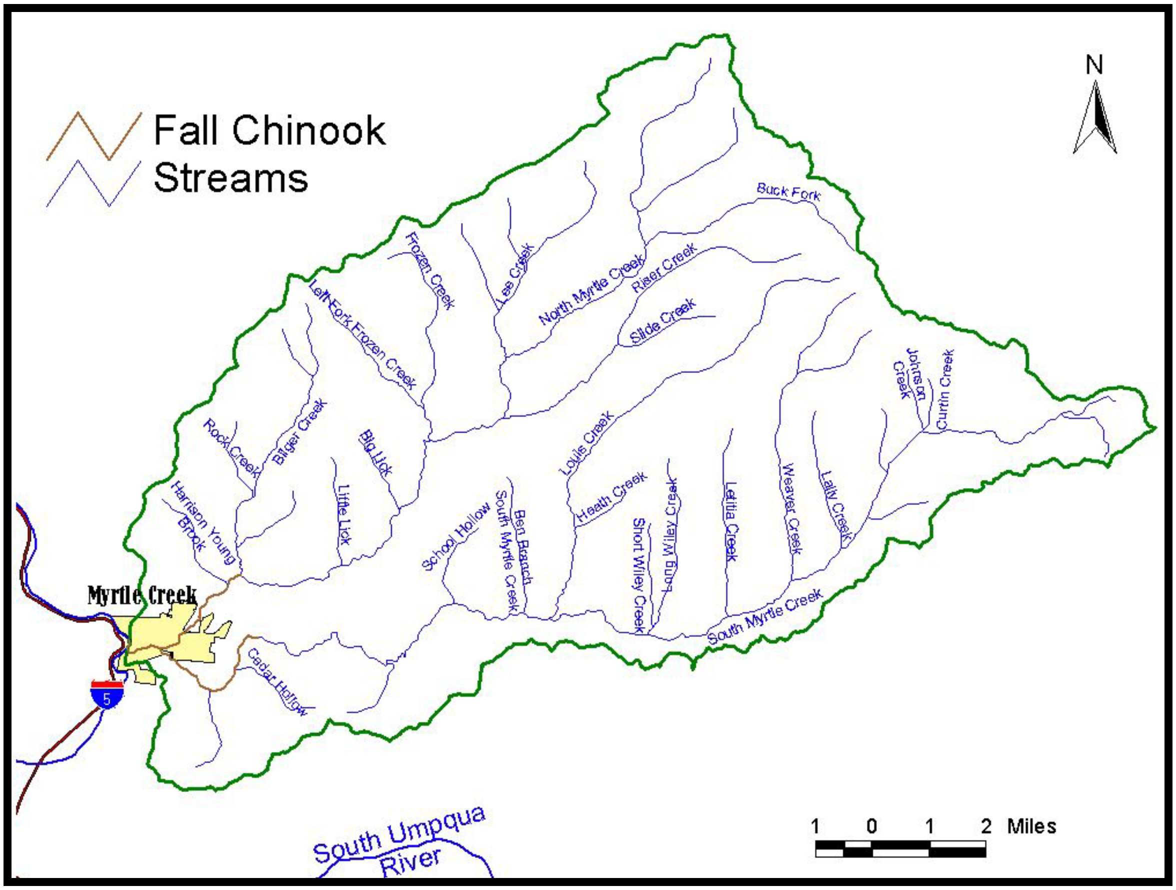


Winter steelhead



Fall chinook

Fall chinook spawning in the Myrtle Creek Watershed is intermitted and not considered a salmon run.



Acknowledgments

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 Myrtle Creek watershed assessment meetings and offered their critical review and insight. Their input and participation has been invaluable.

I am also grateful for the assistance of the following individuals and groups:

- Steve Johnson, who served as the UBWC's contact within the City of Myrtle Creek, provided data from the wastewater treatment plant, and coordinated part of our field trip.
- The City of Myrtle Creek for allowing the UBWC to use the city council chambers.
- Janice Green, Leonard Schussel, and Matthew DeVore for reviewing the document and offering suggestions for improvement.
- The landowners interviewed in Chapter Five, "Landowner Perspectives."
- The staff of the Douglas Soil and Water Conservation District, Oregon Department of Environmental Quality, Oregon Department of Fish and Wildlife, and Oregon Water Resources Department who answered many questions and provided much of the assessment's quantitative and qualitative data.
- The resource professionals who agreed to serve as guest speakers at our monthly Myrtle Creek watershed assessment meetings:
    - Bobbi Lindberg, ODEQ;
    - Dave Harris, ODFW;
    - Dave Williams, OWRD;
    - Kent Smith, InSight Consultants;
    - Les Wilson, City of Myrtle Creek;
    - Sam Dunnavant, ODFW; and
    - Walter Barton, Douglas Soil and Water Conservation District.

I would also like to thank Eric Geyer for his unwavering support throughout the process.