Water Quality Restoration Plan

Southern Oregon Coastal Basin
Lower Rogue Subbasin

Horseshoe Bend-Rogue River Watershed

Bureau of Land Management (BLM), Medford District Office
Glendale and Grants Pass Resource Areas

May 2010

Horseshoe Bend-Rogue River Watershed at a Glance

Hydrologic Unit Code Number	1710031004
Watershed Area/Ownership	Total: 104,061 acres BLM: 99,374 acres (95.5%) Forest Service: 695 acres (0.7%) State of Oregon: 482 acres (0.4%) State Forestry: 794 acres (0.8%) Private: 2,715 acres (2.6%)
303(d) Stream Miles Assessed	Total: 30.4 miles BLM Ownership: 30.2 miles
303(d) Listed Parameter	Temperature
Key Resources and uses	Salmonid, aesthetic, recreation
Known Human Activities	Timber harvest, roads, mining, recreation, communication site, utility corridor, inactive airstrip
Natural Factors	Geology: metasedimentary with portions of metavolcanics Soils: various series and complexes; many areas of shallow soils with low water holding capacity, and relatively infertile - depth and fertility typically increases moving from east to west

Statement of Purpose

This water quality restoration plan (WQRP) has been prepared to meet the requirements of Section 303(d) of the 1972 Federal Clean Water Act.

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Element 1. Condition Assessment and Problem Description

A. Introduction

This document describes how the Bureau of Land Management (BLM) will implement and achieve the Oregon Department of Environmental Quality's (DEQ's) *Rogue River Basin Total Maximum Daily Load (TMDL)* (ODEQ 2008) for 303(d) listed streams on BLM-administered lands. Its organization is designed to be consistent with the DEQ's Rogue River Basin Water Quality Management Plan (WQMP) (ODEQ 2008). This plan covers land managed by the BLM within the Horseshoe Bend-Rogue River Watershed on both sides of the Rogue River from below the confluence of Grave Creek to the Mule Creek confluence.

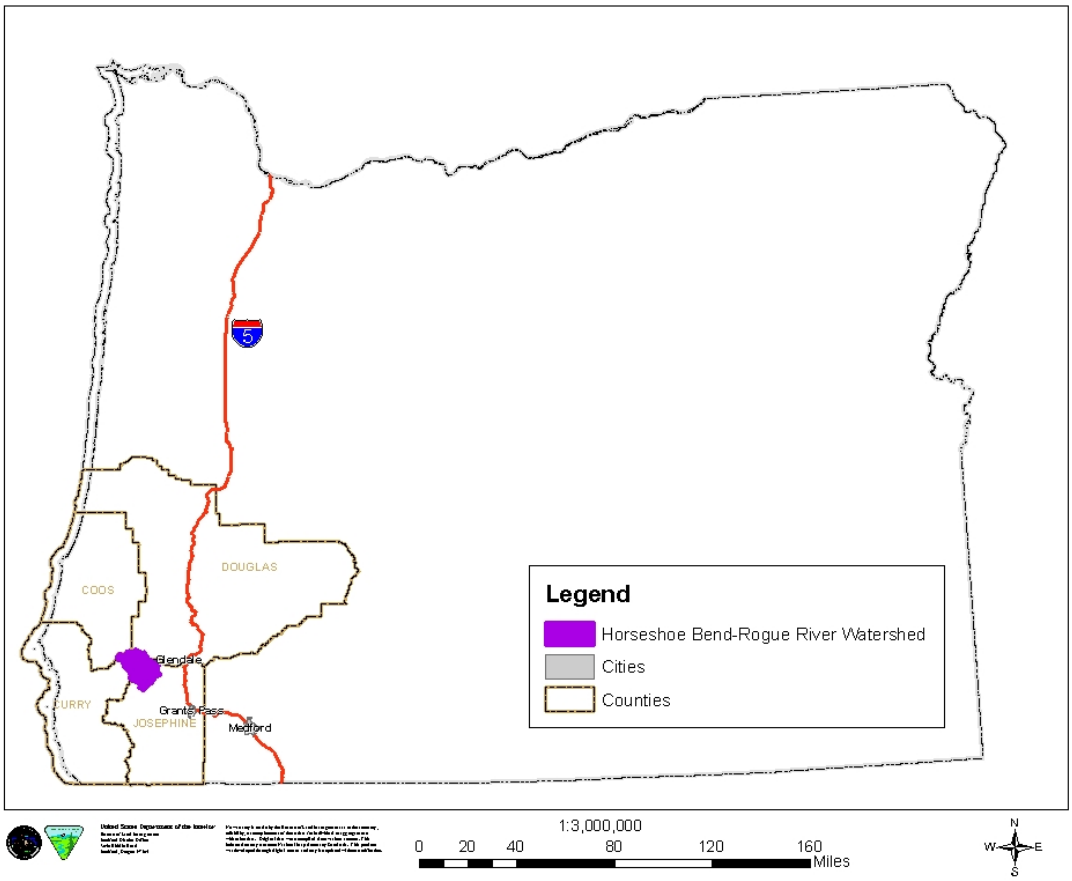
This document will detail the extent that federal actions may contribute to changes in water temperature as well as outline efforts to protect and enhance water quality on federal lands in this watershed. This Water Quality Restoration Plan (WQRP) constitutes the BLM's commitment as a Designated Management Agency (DMA) responsible for compliance with the Clean Water Act on BLM-administered lands, to the implementation of the Rogue River Basin TMDL.

B. Watershed Characterization

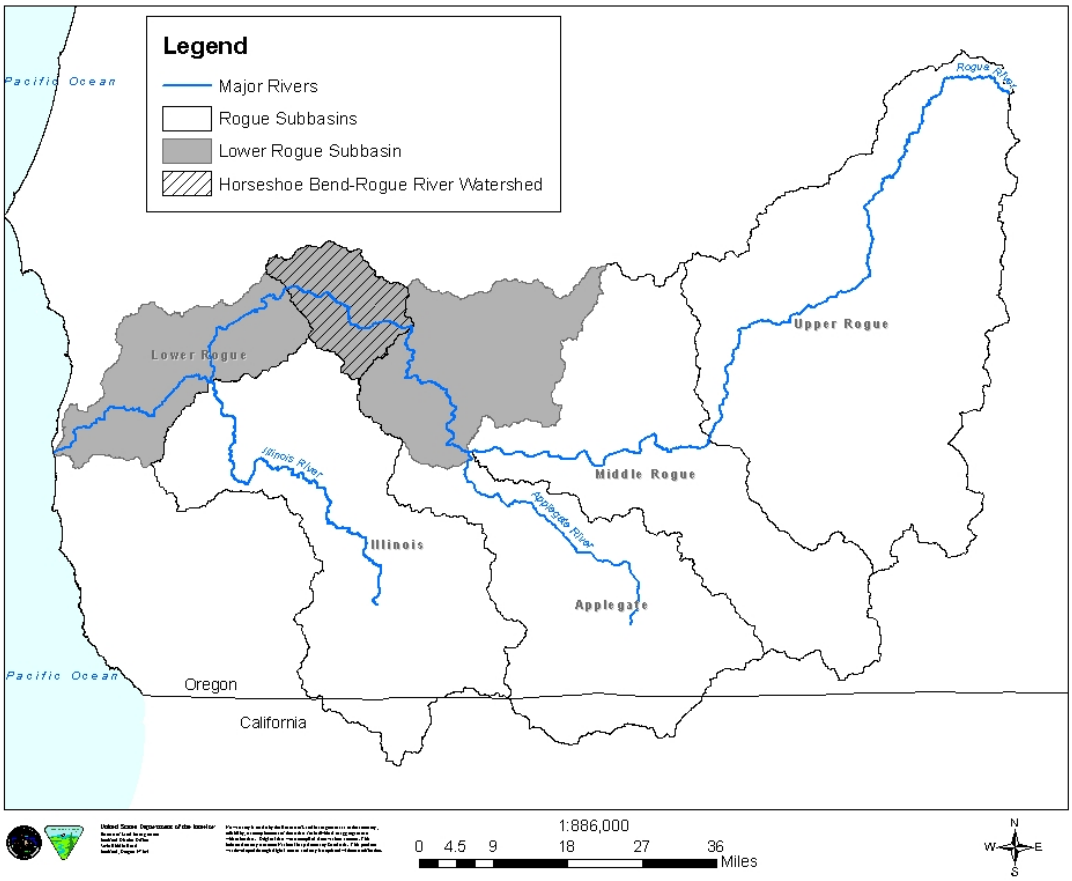
Horseshoe Bend-Rogue River is an approximately 104,061 acre watershed that contains the mainstem Rogue River corridor in the Klamath Mountains province of southwest Oregon. The National Wild and Scenic Rogue River and the Wild Rogue Wilderness in this watershed provide numerous recreational opportunities to the public. The majority of this watershed is managed by the BLM's Medford District.

The Horseshoe Bend-Rogue River Watershed is located approximately 26 miles north of Grants Pass at the junction of four counties: Coos, Curry, Douglas, and Josephine (Map 1). It is a fifth-field watershed within the Lower Rogue Subbasin (Map 2).

Map 1. Horseshoe Bend-Rogue River Watershed Location



Map 2. Rogue Basin and Lower Rogue Subbasin



Land Ownership

The BLM manages about 91,284 acres (87.7 percent) of the watershed (Table 1 and Map 3). The Wild Rogue Wilderness is on BLM; however, it is managed by the U.S. Forest Service. The Horseshoe Bend-Rogue River Watershed is somewhat unique in that it has minimal non-federal ownership, unlike most BLM-administered lands in western Oregon which are intermingled with non-federal lands in an alternating "checkerboard" pattern that is characteristic of much of the Oregon and California (O & C) railroad lands.

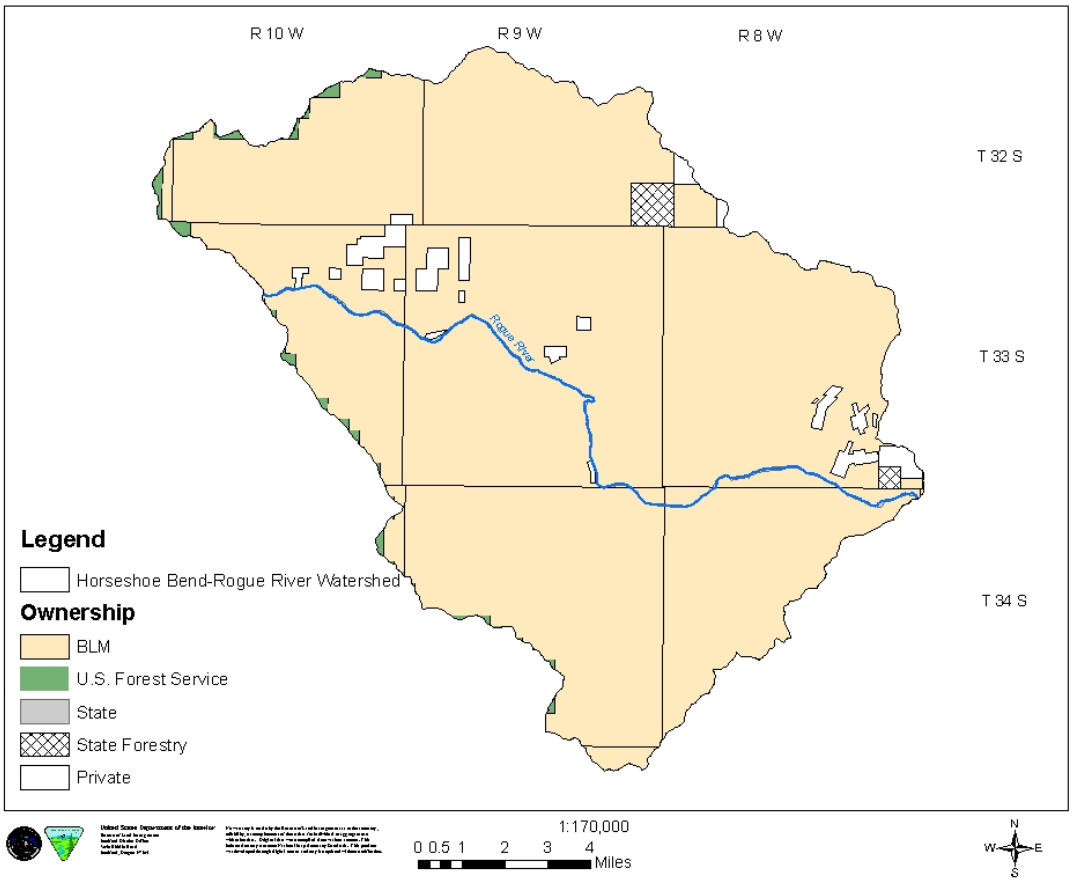
Table 1. Land Ownership in the Horseshoe Bend-Rogue River Watershed.

Ownership/Land Use	Acres	Percent of Horseshoe Bend-Rogue River Watershed
BLM, Medford District	91,284	87.7
BLM, Wild Rogue Wilderness[1]	8,090	7.8
U.S. Forest Service	695	0.7
State of Oregon[2]	482	0.4
State Forestry	794	0.8

Ownership/Land Use	Acres	Percent of Horseshoe Bend-Rogue River Watershed
Private	2,715	2.6
Total	104,061	100

1/ The Wild Rogue Wilderness is managed by the U.S. Forest Service.
2/ State of Oregon lands are under the Rogue River.

Map 3. Land Ownership in the Horseshoe Bend-Rogue River Watershed



There are no major communities within the Horseshoe Bend-Rogue River Watershed. There are scattered rural residences throughout this watershed. In addition there are also two cultural sites, the Rogue River Ranch and Whisky Creek Cabin. The Zane Grey Cabin located at Winkle Bar is pending nomination to the National Register of Historic Places.

Land Use Allocations

The *Medford District Resource Management Plan* (RMP) (USDI 1995) designated several land use allocations for BLM-administered lands within the watershed (Table 2 and Map 4). These allocations provide overall management direction and varying levels of resource protection.

Table 2. Federal Land Use Allocations within the Horseshoe Bend-Rogue River Watershed.

Land Use Allocation	Acres	Percent of Horseshoe Bend-Rogue River Watershed
Late-successional Reserves[1]	61,780	59.3
Connectivity/Diversity Blocks	1,263	1.2
General Forest Mgmt.[2]	21,900	21.1
Congressional Reserves	14,431	13.9
Total	99,374	95.5

1/ Late-successional reserves include portions of large LSR and 100 acre spotted owl core areas.
2/ General forest management area includes Riparian Reserves.

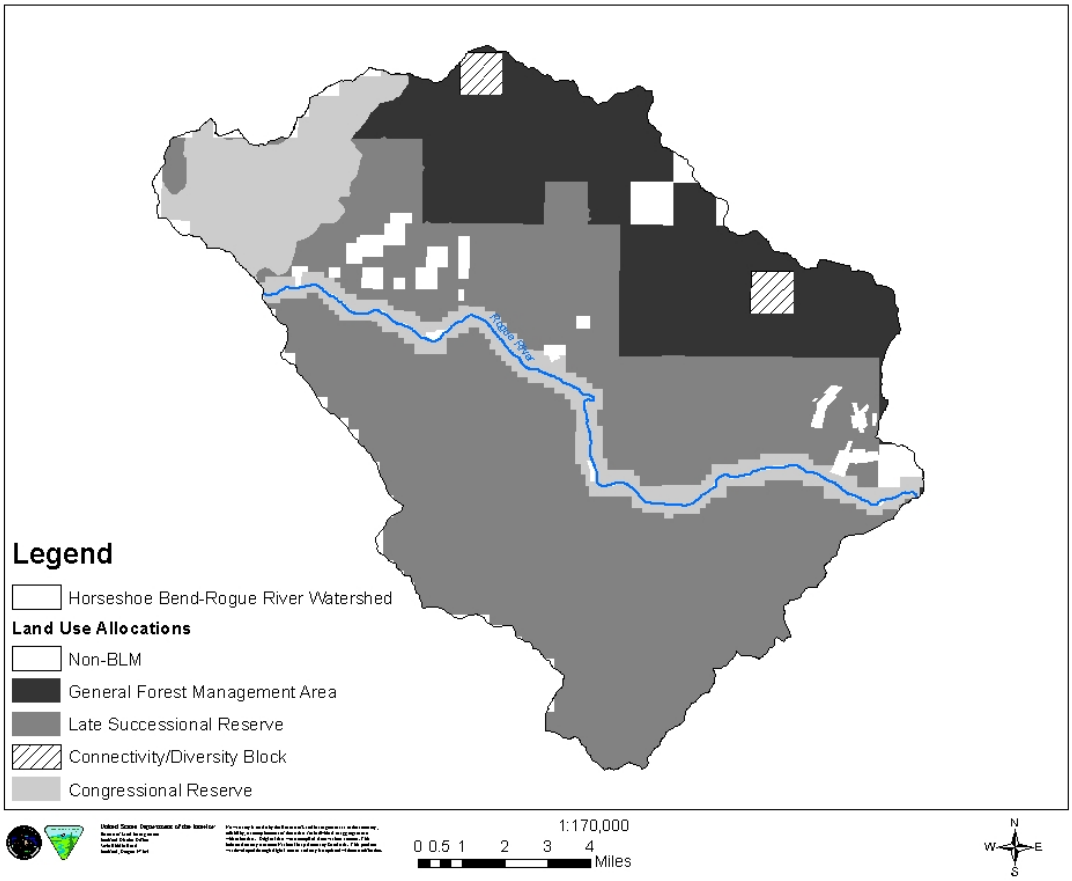
Late-successional reserves (LSRs) are areas designated in the RMP where the major management objective is to protect and enhance the conditions of late-successional and old growth forest ecosystems which serve as habitat for late-successional and old growth forest related species, including the spotted owl and marbled murrelet. This watershed has a large percentage of land allocated as LSR and contains 13 approximately 100-acre spotted owl core areas which surround 28 active spotted owl sites.

Connectivity/Diversity blocks are generally square mile sections in which at least 25 to 30 percent of each block will be maintained in late-successional conditions. They are designed to promote movement of species associated with late-successional habitat across the landscape and add richness and diversity to the land outside LSRs. There are portions of two of these Connectivity/Diversity blocks in the watershed.

General Forest Management Area (GFMA) is the allocation where timber harvest is a primary objective. GFMA areas only occur in the northeast portion of the Horseshoe Bend-Rogue River Watershed, where the RMP calls for retaining at least 6-8 large trees per acre in regeneration harvests. Within GFMA lands there are acres which have been withdrawn from intensive timber harvest. The majority of these acres were withdrawn due to rocky soils which preclude successful replanting.

Congressionally Reserved Areas are areas that require enactment for their establishment, such as wild and scenic rivers and wilderness areas. There is one of each of these congressionally established areas within this watershed.

Map 4. Horseshoe Bend-Rogue River Watershed Land Use Allocations on BLM-Administered Lands



Geology/Soils

Soils in this watershed are derived from metasedimentary, ultramafic, and metavolcanic rock types. Soils resulting from sedimentary rock types tend to be deeper and have more nutrients available. Soils developed from volcanic rock types tend to be shallow and have less soil nutrients and soil development than the sedimentary. Organic matter plays an increasing role in the productivity of the metavolcanic sites. Portions of this watershed are dominated by serpentine-derived soils which are low in calcium and high in magnesium and other minerals, which produce unique vegetative communities, and preclude many plant species which are adapted to calcium-based soils.

Climate/Hydrology

Annual precipitation in the watershed averages about 40-150 inches, moving from east to west. Extended summer drought is common.

A large portion of the Horseshoe Bend-Rogue River Watershed is located in the transient snow zone, making it prone to flood events that often occur as a result of rain on snow events. Loss of forest vegetation resulting from events such as large fires and logging operations increases the

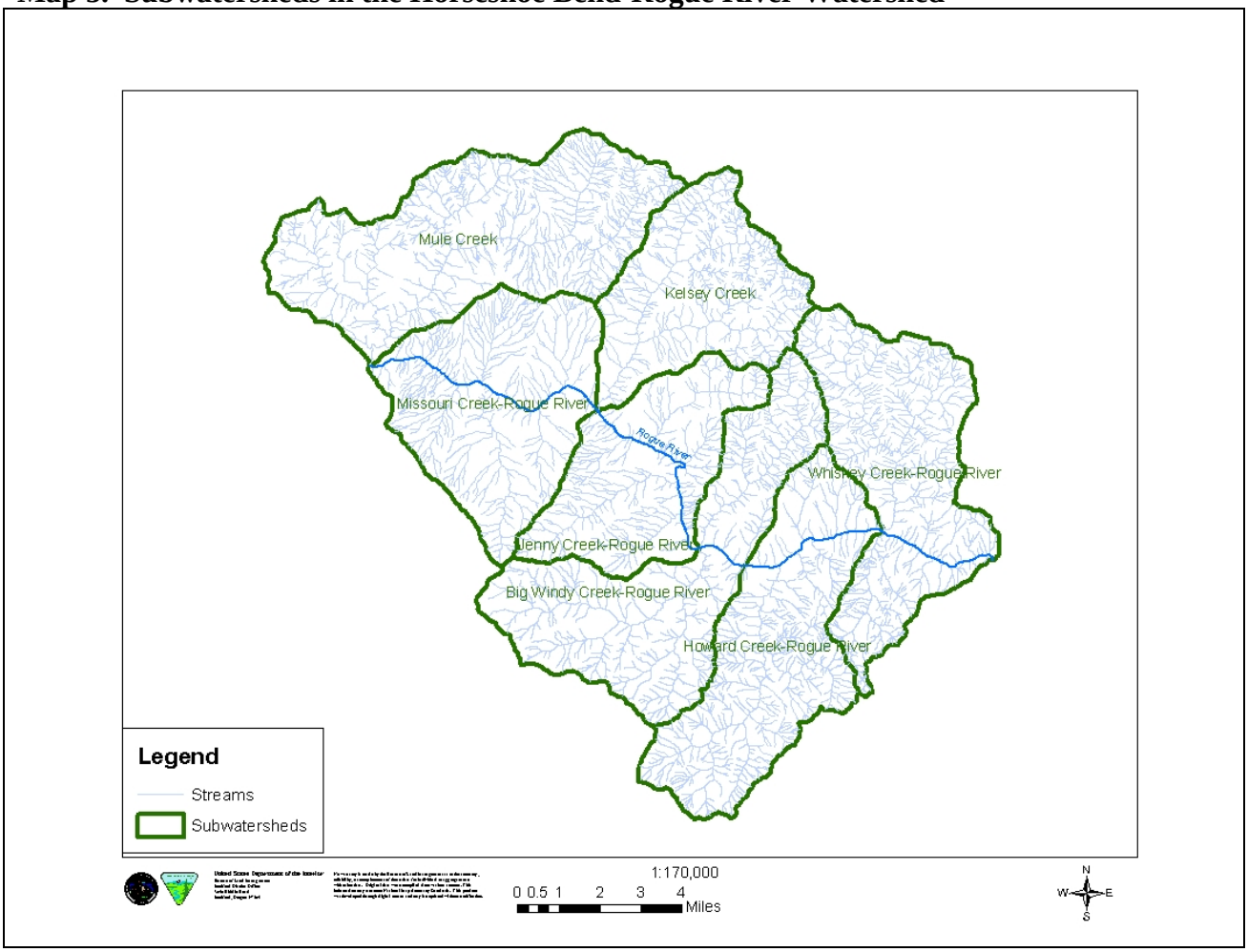
magnitude of these events. Much of the upper portion of this watershed consists of steep, confined channels. High scour marks within these channels indicate that large volumes of fast moving water have occurred during flood events. Consequently streambanks that have been stripped of vegetation and soils below the high water mark are common in the upper portions of this watershed. In lower portions of the watershed large flood events such as those that occurred in 1861, 1890, 1927, 1955, 1964, 1974, and 1997, have had devastating consequences on the anthropologic environment, and have altered stream courses. The Lost Creek (1976) and Applegate (1980) dams were built to assist in reducing flood water levels in the Rogue River.

Major tributaries of the Rogue River in the Horseshoe Bend-Rogue River Watershed include Whisky, Rum, Howard, Big Windy, Jenny, Kelsey, Missouri and Mule creeks. There are seven sixth-field subwatersheds within the watershed (Table 3 and Map 5) and 60 seventh-field drainages ranging from about 3.4 acres to about 4,485 acres.

Table 3. Subwatersheds in the Horseshoe Bend-Rogue River Watershed

Sixth-field Subwatershed	Acres	Percent of Horseshoe Bend-Rogue River Watershed
Whisky Creek-Rogue River	15,089	15%
Howard Creek-Rogue River	15,314	15%
Big Windy Creek-Rogue River	16,375	16%
Jenny Creek-Rogue River	11,352	11%
Kelsey Creek	11,545	11%
Missouri Creek-Rogue River	14,847	14%
Mule Creek	19,539	19%
Total	104,061	100%

Map 5. Subwatersheds in the Horseshoe Bend-Rogue River Watershed



The lowest 7-day low flow for the Rogue River, measured at the U.S. Geological Survey gage near Grants Pass, was 195 cfs. This flow was recorded before the installation of Lost Creek and Applegate dams. Low flows generally reflect annual precipitation levels with higher low flows in wetter years and lower summer flows in drier years. Variation in low flow from year to year is typical for this stream system. Since the dams began regulating flow, the lowest recorded discharge recorded at the Grants Pass station was 744 cfs. Operation of Lost Creek Reservoir typically benefits summer Rogue River temperatures by providing increased summer flow and decreased water temperature (ODEQ 2008). Historic data for the gaging station is available at web site address: http://www.wrd.state.or.us/apps/sw/hydro_report/Default.aspx.

Higher ordered streams within the Rogue formation have a history of hydraulic and placer mining activity. Placer mining is still ongoing in several locations, particularly along Whisky Creek. Stream channels have been altered and riparian vegetation has been removed as a result of mining, primarily along Whisky Creek and Mule Creek. Associated clearing has also altered riparian vegetation on private parcels of land. Streams in the Dothan formation have had little, if any, mining activity since there is little or no gold associated with these rock types.

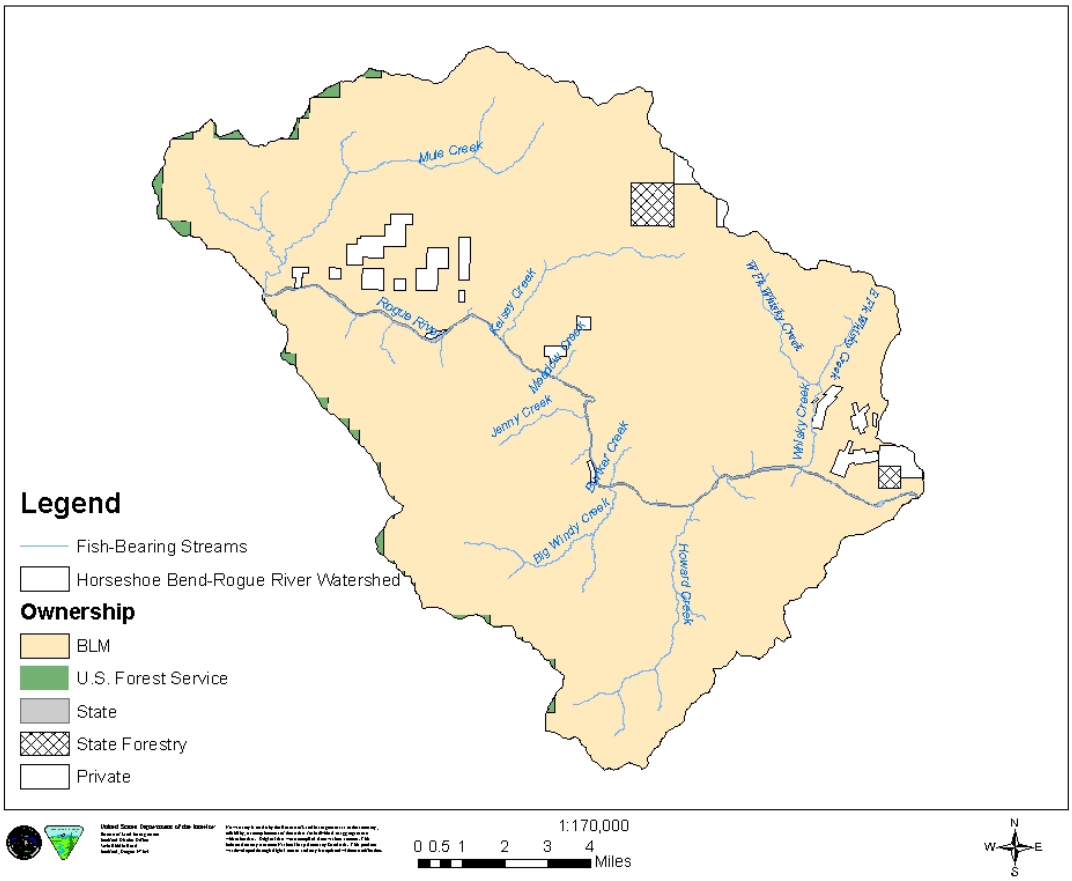
Timber management activities have resulted in an extensive road network in some parts of the

watershed. There are other areas, such as the Wild Rogue Wilderness, where there are relatively few roads. Road density is important since roads result in more rapid runoff, decreased groundwater interception, can cause channel confinement at crossings, and can increase sediment to streams. Overall, the road density within the Horseshoe Bend-Rogue River Watershed is 2.5 miles per square mile; however, there are two subwatersheds with road densities higher than 3.0 miles per square mile: Kelsey Creek and Missouri Creek-Rogue River with road densities of 3.4 and 3.3 miles per square mile respectively. Areas of road densities greater than 3 miles per square mile are considered not functioning properly by National Marine Fisheries Service. These high road densities have likely altered the duration and timing of localized runoff rates during storm events. According to BLM road and stream data, about 33 percent of roads within the Horseshoe Bend-Rogue River Watershed are within 200 feet of streams.

Fisheries

The Rogue River is a major migration corridor for anadromous fish. Chinook and coho salmon as well as summer and winter steelhead are known to spawn in the larger creeks within this watershed during moderate to high flow periods, but are not found in the low order tributaries. Resident cutthroat trout are believed to inhabit a large portion of the Rogue River and the higher ordered streams in this watershed. Some streams within the southern portion of this watershed may have less than optimal conditions for fish habitat as a result of mining, timber harvest, road building, and fire suppression. In most areas in the northern portion of the Horseshoe Bend-Rogue River Watershed, it is believed that habitat and spawning conditions are likely near their historic potential. High channel gradients, lack of spawning gravel, and relatively frequent landslides on low order side channels are natural barriers that are potentially limiting fish distribution in this watershed. There are currently no known artificial barriers within this watershed that are inhibiting fish distribution. Fish-bearing streams are shown on Map 6.

Map 6. Fish Distribution in the Horseshoe Bend-Rogue River Watershed



Watershed Analysis

The Northwest Forest Plan (NWFP) Standards and Guidelines (USDA and USDI 1994) incorporate the Aquatic Conservation Strategy (ACS) to restore and maintain the ecological health of watersheds and aquatic ecosystems contained within them on public lands. Watershed analyses are a required component of the ACS under the NWFP. Two watershed analyses were completed for the Horseshoe Bend-Rogue River Watershed: the *Wild Rogue North Watershed Analysis* (USDI 1999) and the *Wild Rogue South Watershed Analysis* (USDI 2000). This WQRP tiers to and appends the two watershed analyses. A summary of historical and present watershed conditions that may affect stream temperatures in the Horseshoe Bend-Rogue River Watershed has been compiled from the two watershed analyses (Table 4). The analysis and recommendations found in this WQRP use data from the watershed analyses. Additional analysis and recommendations have been included in this WQRP where the watershed analysis data were incomplete or new information was available.

Table 4. Summary of Historic and Current Watershed Conditions in the Horseshoe Bend-Rogue River Watershed

Riparian Vegetation	
Historical Condition	• Hardwood dominated early to late seral conditions resulting from regular large scale fire events in this watershed. Though streams flowed through a mosaic of stand ages due to fire activity, riparian areas of lower ordered streams were generally well shaded by the large brush and shrub component along these narrow channels.
Present Condition	• Most riparian areas in this watershed, with the exception of the northern portions of Kelsey and Mule Creek subwatersheds, exhibit conditions that are within the range of natural variability due to limited human influence. Some areas along Whisky, Mule, and Missouri Creeks may be outside this range due to current mining activities and changes in peak flows resulting from the 2005 Blossom Fire (Mule Creek) and past upland timber harvest.
Forest Health & Productivity	
Historical Condition	• Frequent, large scale fires of varying intensity maintained a mosaic of stand ages and densities.
Present Condition	• Many areas of this watershed still exhibit historical conditions. Portions of harvested areas have densely planted and overstocked (increased competition) stands. Soil compaction has altered small scale hydrologic patterns in areas where tractor harvest was used and compaction was not ameliorated.
Roads	
Historic Condition	• Few roads before industrial timber harvesting began in the early 1950s. Several ridgetop trails and the streamside trail along the Rogue River were used by local Indians prior to early settlers. Trails began to be converted into roads in the 1930s.
Present Condition	• Most roads in this watershed are presently in fair to good condition. There is currently a total of about 405 miles of road with varying distribution within the watershed. Maintenance on some non-arterial roads has been reduced as a result of decreased funding. These roads are in various stages of deterioration from being overgrown to, in some cases, having sections that have slid. Many of these deteriorating roads have been inventoried for management needs and corrective actions identified, including road maintenance and where no longer needed for management purposes, road decommissioning. • Road density averages 2.5 mi/mi^2
Flow Regime	
Historic Condition	• Prior to the building of Applegate and Lost Creek Dams low flows of 195 cfs have been recorded on the Rogue River by a USGS gaging station near Grants Pass.
Present Condition	• Mainstem flows are now augmented by releases from Lost Creek and Applegate dams upstream. The lowest recorded flow since the dams began operation was 744 cfs at the USGS gaging station near Grants Pass.

A summary of watershed characteristics was compiled from the two watershed analyses that cover the Horseshoe Bend-Rogue River Watershed (Table 5).

Table 5. Horseshoe Bend-Rogue River Watershed Analysis Summary

MORPHOLOGY	
Geographic Province	Klamath Mountains
Watershed size	104,061 acres
Elevation range	~400 - ~4,300 feet – mouth of Grave Creek to confluence of Mule Creek
Drainage pattern	Dendritic
Total streams	956 miles
Drainage density	5.9 miles/mile^2
Sixth-field watersheds	Whisky Creek-Rogue River 15,089 acres Howard Creek-Rogue River 15,314 acres Big Windy Creek-Rogue River 16,375 acres Jenny Creek-Rogue River 11,352 acres Kelsey Creek 11,545 acres Missouri Creek-Rogue River 14,847 acres Mule Creek 19,539 acres Total 104,061 acres
METEOROLOGY	
Annual precipitation	Average annual precipitation ranges from 40 inches in the eastern portion of the watershed to 150 inches in the central western portion.
Precipitation Timing	Western portion of watershed is marine climate with cool, very wet winters and temperate, mild summers. The central and eastern portion is Mediterranean climate with wet winters and dry hot summers.
Temperature range	0-110 degrees F seasonally
SURFACE WATER	
Minimum flow	Mainstem Rogue River is currently regulated through outputs from Lost Creek and Applegate Dams. Lowest flow recorded since filing of the dams was 744 cfs near Grants Pass. Historically the Rogue near Grants Pass had a minimum flow of 195 cfs. Many tributaries in this region dry up during hot summer months.
Maximum peak flow	Maximum flow on the Rogue River near Grants Pass was 290,000 cfs in Dec 1964; before the Lost Creek and Applegate Dams were built.
Reservoirs	No large reservoirs within the watershed. Approximately 36 small water developments on BLM-administered lands. Applegate and Lost Creek Dams regulate Rogue River flows approximately 50 miles upstream of watershed boundary.

Water quality limited streams	Exceedance of salmon and trout rearing and migration criteria (64.4^{o}F) - 26.2 miles Whisky Creek – 2.4 miles East Fork Whisky Creek – 3.7 miles Rogue River – 20.1 miles Exceedance of salmon rearing criteria (64.0^{o}F) – 4.2 miles West Fork Whisky Creek – 4.2 miles
GEOLOGY	
Geologic Type	Marine volcanic, metamorphic sedimentary and ultra-mafic rock. Primarily Rogue and Dothan Formations.
Soils	Shallow depth, many different series and complexes. Generally very low water holding capacity, relatively infertile.
BIOLOGICAL	
Vegetation	Primarily mixed evergreen; conifers and hardwoods. Vegetative communities differ by slope, aspect, elevation and soils.
Total fish-bearing streams (anadromous and resident)	81.5 miles
Candidate, threatened, or endangered species	Spotted owl: 28 active sites; 13 100-acre core areas in north section; south section protected by other land use allocations Marbled murrelet: potential nesting range, west half of watershed within 50 miles of coast (none found) Fish: Southern Oregon/Northern California coho salmon
Survey and Manage species	Fungi, del Norte Salamander, mollusks, bryophytes, lichens, red tree vole, great grey owl
Special Status Plants	Numerous species and locations
HUMAN INFLUENCE	
Counties	Josephine Curry Douglas (small portions along northeast boundary) Coos (very small portions along northwest boundary)
Roads	405 miles
Road density	2.5 mi/ mi^{2}
Streams within one tree length of roads	137 miles
Fish Streams within one tree length of roads	3 miles
Timber production	GFMA 21,900 acres gross (9,255 acres outside all reserves)
Utility corridors	Fiber optics line
Communities	No communities, scattered rural residential
PUBLIC LANDS	
BLM Medford lands	99,374 acres (95.5 %)

BLM Medford Land Use	**Acres**	**(Percent)**
Late-successional Reserves	61,780	(59.3)
Connectivity/Diversity Blocks	1,263	(1.2)

	General Forest Mgmt. Area -total acres -usable acres after riparian reserves, owl cores, etc	21,900 (9,255)	(21.1)
	River Corridor & Wilderness[1]	14,431	(13.9)
	Total	99,374	
State of Oregon lands State Forestry lands	482 acres 794 acres		
Forest Service lands	695 acres		

1/ The Wild Rogue Wilderness is managed by the U.S. Forest Service.

C. Temperature

Beneficial Uses

The Oregon Environmental Quality Commission has adopted numeric and narrative water quality standards to protect designated beneficial uses. Oregon Administration Rules (OAR 340–41–271) list the designated beneficial uses for Rogue River waters (Table 6). In practice, water quality standards have been set at a level to protect the most sensitive uses. Seasonal standards may be applied for uses that do not occur year round. Cold-water aquatic life, such as salmon and trout are the most sensitive beneficial uses in the Horseshoe Bend-Rogue River Watershed (ODEQ 2008).

Table 6. Beneficial Uses in the Horseshoe Bend-Rogue River Watershed (ODEQ 2008)

Beneficial Use		*Beneficial Use*	
Public Domestic Water Supply[1]	✓	Fishing	✓
Private Domestic Water Supply[1]	✓	Boating	✓
Industrial Water Supply	✓	Water Contact Recreation	✓
Irrigation	✓	Aesthetic Quality	✓
Livestock Watering	✓	Hydro Power[3]	✓
Fish & Aquatic Life[2]	✓	Commercial Navigation & Trans.[4]	✓
Wildlife and Hunting	✓		

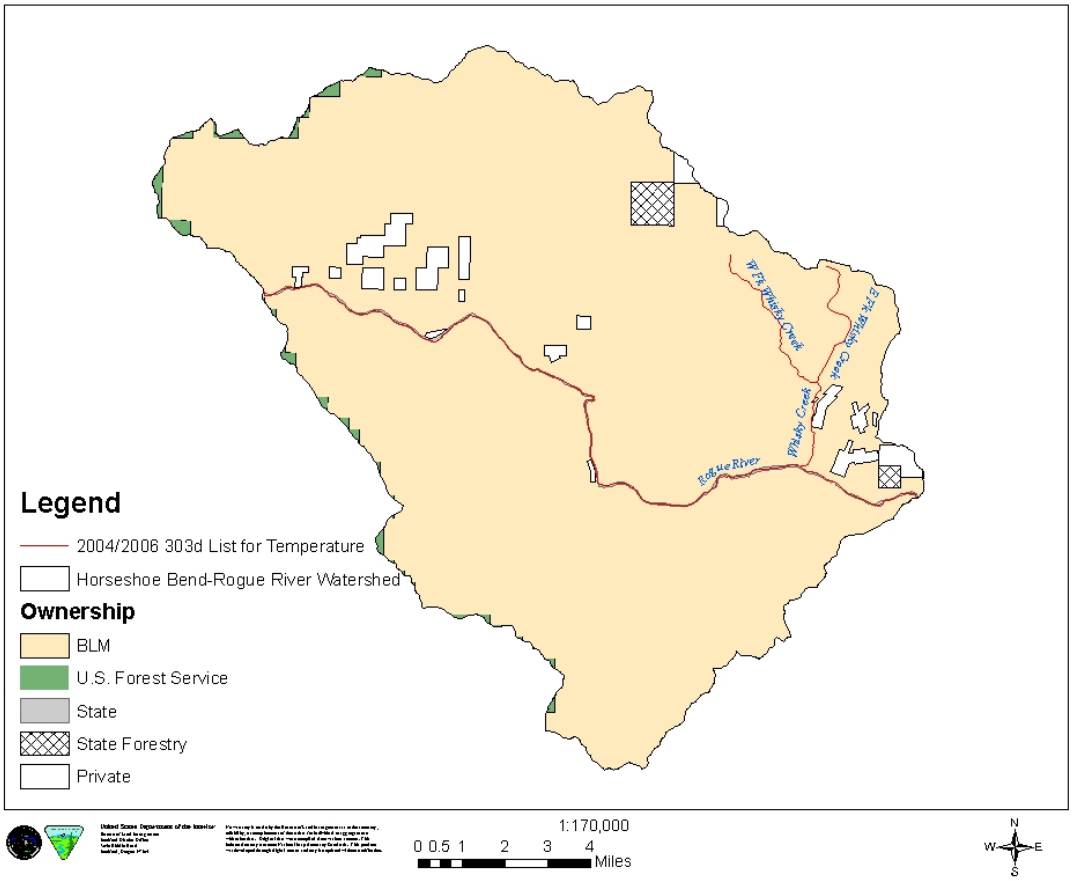
1/ With adequate pre-treatment (filtration and disinfection) and natural quality to meet drinking water standards.
2/ See Figures 271A and 271B for fish use designations for this watershed on the DEQ website (http://www.deq.state.or.us/wq/rules/div041tblsfigs.htm#f1).
3/ Rogue River tributaries.
4/ Rogue River mainstem.

The Clean Water Act (CWA) of 1972, as amended by the Water Quality Act of 1987, provides direction for designated beneficial uses. The DEQ is responsible for developing a list of streams that fail to meet established water quality criteria for one or more beneficial uses. These designated streams are often referred to on the state's 303(d) list. Water quality monitoring throughout the Horseshoe Bend-Rogue River Watershed has resulted in 303(d) listings for 30.4 miles of streams that have failed to meet established criteria for one or more beneficial uses (Table 7 and Map 7). All the listed streams in the Horseshoe Bend-Rogue River Watershed flow through BLM-administered lands except for 0.2 miles along Whisky Creek.

Table 7. 2004/2006 303(d) Listings in the Horseshoe Bend-Rogue River Watershed (ODEQ 2008)

303(d) List Date	Stream Segment	Listed Parameter	Season	Miles Affected
2004	Whisky Creek	Temperature	Year Around (Non-spawning)	2.4
2002	West Fork Whisky Creek	Temperature	Summer (Rearing)	4.2
2004	East Fork Whisky Creek	Temperature	Year Around (Non-spawning)	3.7
2004	Rogue River (Grave Creek to Mule Creek)	Temperature	Year Around (Non-spawning)	20.1
	Total stream miles listed for rearing temperature			**4.2**
	Total stream miles listed for rearing and migration temperature			**26.2**

Map 7. 2004/2006 303(d) Temperature-Listed Streams in the Horseshoe Bend-Rogue River Watershed



Applicable Water Quality Criteria

Numeric stream temperature criteria are expressed as a seven-day average of daily maximum temperature (7DADM). Oregon's water temperature criteria are biologically based using salmonid's life cycles as the indicator. A stream is listed as water quality limited for temperature if there is documentation that the 7DADM exceeds the appropriate criteria listed below. This represents the warmest seven-day period and is calculated by a moving average of the daily maximums.

The Oregon water quality temperature criteria that applies to the Horseshoe Bend-Rogue River Watershed was approved by EPA on March 2, 2004 and is found in OAR 340-041-0028 (4) (a-c) (http://www.deq.state.or.us/wq/standards/temperature.htm). Excerpts of the 2004 temperature criteria read as follows:

> *(4) Biologically Based Numeric Criteria. Unless superseded by the natural conditions criteria described in section (8) of this rule, or by subsequently adopted site-specific criteria approved by EPA, the temperature criteria for State waters supporting salmonid fishes are as follows:*
>
> *(a) The seven-day-average maximum temperature of a stream identified as having salmon and steelhead spawning use on subbasin maps and tables set out in OAR 340-041-0101 to OAR 340-041-0340: Tables 101B, and 121B, and Figures 130B, 151B, 160B, 170B, 220B, 230B, 271B, 286B, 300B, 310B, 320B, and 340B, may not exceed 13.0 degrees Celsius (55.4 degrees Fahrenheit) at the times indicated on these maps and tables;*
>
> *(b) The seven-day-average maximum temperature of a stream identified as having core cold water habitat use on subbasin maps set out in OAR 340-041-101 to OAR 340-041-340: Figures 130A, 151A, 160A, 170A, 220A, 230A, 271A, 286A, 300A, 310A, 320A, and 340A, may not exceed 16.0 degrees Celsius (60.8 degrees Fahrenheit);*
>
> *(c) The seven-day-average maximum temperature of a stream identified as having salmon and trout rearing and migration use on subbasin maps set out at OAR 340-041-0101 to OAR 340-041-0340: Figures 130A, 151A, 160A, 170A, 220A, 230A, 271A, 286A, 300A, 310A, 320A, and 340A, may not exceed 18.0 degrees Celsius (64.4 degrees Fahrenheit);*

Fish use maps 271A and 271B for the Horseshoe Bend-Rogue River Watershed temperature criteria can be found at: http://www.deq.state.or.us/wq/rules/div041tblsfigs.htm#f1. Perennial streams in the Horseshoe Bend-Rogue River Watershed are designated as salmon and trout rearing and migration use on fish use map 271A, therefore the seven-day-average maximum for these streams may not exceed 18.0°C (64.4°F) from May 16 through October 14. No streams within the Horseshoe Bend-Rogue River Watershed are designated as core cold-water habitat. Map 271B shows salmon and steelhead spawning use designations for the Rogue River and its tributaries within the Horseshoe Bend-Rogue River Watershed. The seven-day average maximum temperature for these streams may not exceed 13.0°C (55.4°F) from October 15 through May 15.

Three of the four temperature-listed stream segments within the Horseshoe Bend-Rogue River Watershed were listed in 2004 under the 2004 temperature criteria (Table 7). West Fork Whisky Creek has a list date of 2002 (Table 7). This listing uses the State of Oregon water quality

standards adopted in 1996. Excerpts of the 1996 temperature criteria (OAR 340-041-0365(2)(b)) read as follows:

A) To accomplish the goals identified in OAR 340-041-0120(11), unless specifically allowed under a Department-approved surface water temperature management plan as required under OAR 340-041-0026(3)(a)(D), no measurable surface water temperature increase resulting from anthropogenic activities is allowed:

(i) In a basin for which salmonid fish rearing is a designated beneficial use, and in which surface water temperatures exceed 64.0°F (17.8°C);

(ii) In waters and periods of the year determined by DEQ to support native salmonid spawning, egg incubation, and fry emergence from the egg and from the gravels in a basin which exceeds 55.0°F (12.8°C);

(iii) In waters determined by DEQ to support or to be necessary to maintain the viability of native Oregon bull trout, when surface water temperatures exceed 50.0°F (10.0°C);

(iv) In waters determined by DEQ to be ecologically significant cold-water refugia;

(v) In stream segments containing federally listed Threatened and Endangered species if the increase would impair the biological integrity of the Threatened and Endangered population;

(vi) In Oregon waters when the dissolved oxygen (DO) levels are within 0.5 mg/l or 10 percent saturation of the water column or intergravel DO criterion for a given stream reach or subbasin;

(vii)In natural lakes.

The BLM collected summertime stream temperature data at 16 locations on BLM-administered lands within the Horseshoe Bend-Rogue River Watershed (Table 8 and Map 8) from 1994 to 2009. Water temperatures in Mule, West Fork Mule, Kelsey, Whisky, East Fork Whisky, and West Fork Whisky creeks have exceeded the Oregon temperature criteria during some periods between June and September.

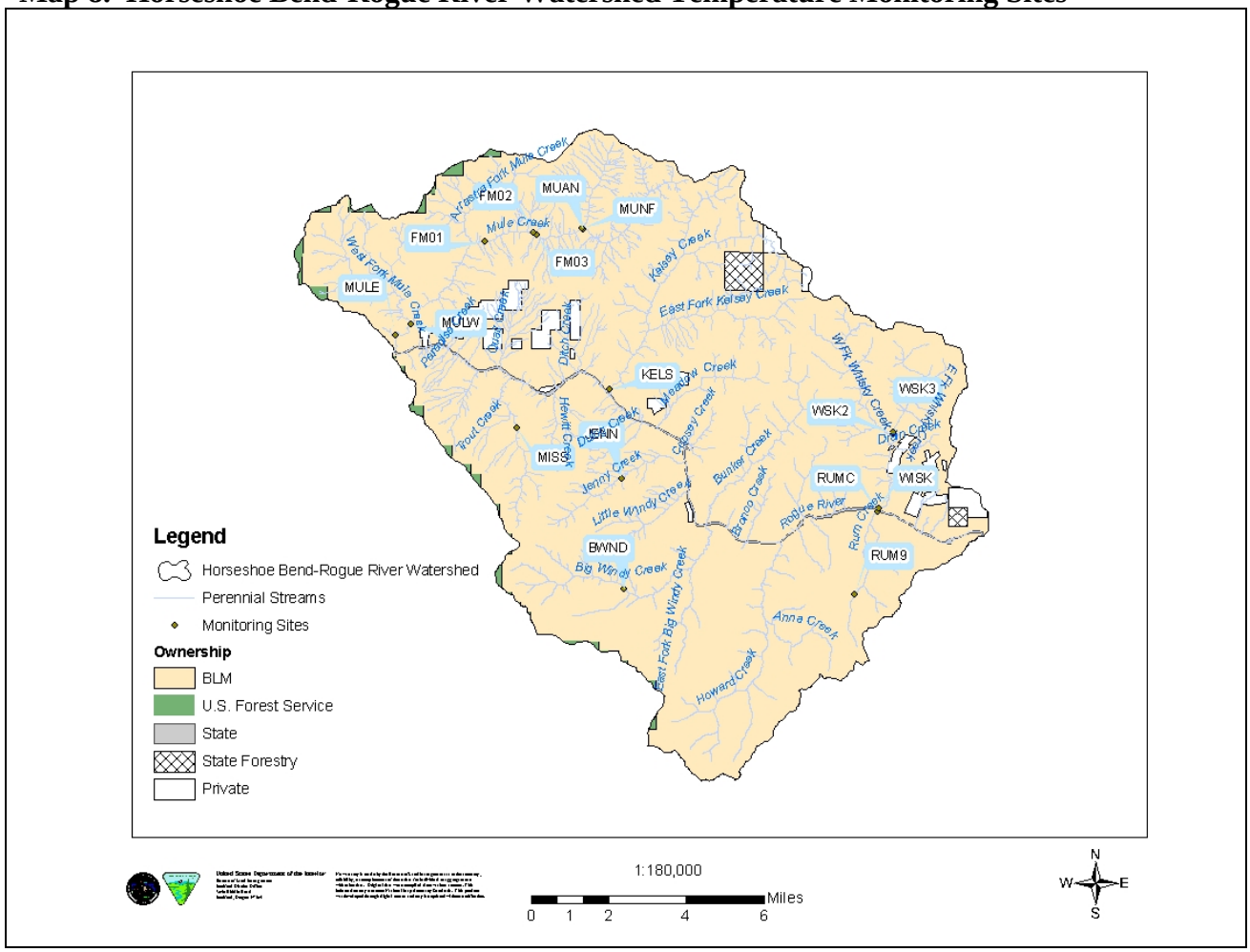
Table 8. Temperature Monitoring Summary

Site ID	Site Location Description	Period of Record[1]	7DADM[2] (ave. for period of record) (^oF)	Range of 7DADM (for period of record)	
				Minimum (^oF)	Maximum (^oF)
BWND	Big Windy Creek approx. 3.9 miles upstream from Rogue River confluence	1999	60.5	60.5	60.5
FM01	Mule Creek below Blossom fireline A	2007-2009	65.0	63.6	67.0
FM02	Mule Creek below Blossom fireline B	2007-2009	63.4	61.6	65.8
FM03	Mule Creek above Blossom fireline B	2007-2009	63.1	61.3	65.7
JENN	Jenny Creek at BLM road #34-8-36 crossing	1999	58.6	58.6	58.6

Site ID	Site Location Description	Period of Record[1]	7DADM[2] (ave. for period of record) (^oF)	Range of 7DADM (for period of record)	
				Minimum (^oF)	Maximum (^oF)
KELS	Kelsey Creek at Rogue River Trail	2002, 2008-2009	65.7	64.6	67.1
MISS	Missouri Creek near end of BLM road #33-9-21	1999	58.4	58.4	58.4
MUAN	Mule Creek above North Fork Mule Creek	1997	58.6	58.6	58.6
MULE	Mule Creek above Rogue River confluence	1994-1997, 2007-2009	66.7	65.6	68.4
MULW	West Fork Mule Creek above confluence with Mule Creek	1996-1997	66.1	65.7	66.5
MUNF	North Fork Mule Creek at confluence with Mule Creek	1997, 2009	62.1	60.0	64.1
RUM9	Rum Creek at BLM road #34-8-34 crossing	1999	57.2	57.2	57.2
RUMC	Rum Creek above Rogue River confluence	2008	62.2	62.2	62.2
WISK	Whisky Creek at Rogue River confluence	1994-1999, 2004, 2008-2009	68.4	65.6	71.4
WSK2	West Fork Whisky Creek at BLM road #33-8-26 crossing	1998-1999, 2004, 2008	66.7	64.8	67.6
WSK3	East Fork Whisky Creek about 200' downstream of BLM road #33-8-26 crossing	1998-1999, 2004, 2008	66.2	64.3	68.0

1/ Temperature measured from June to September
2/ 7DADM = Seven-day average of daily maximum temperature

Map 8. Horseshoe Bend-Rogue River Watershed Temperature Monitoring Sites



Nonpoint Source Temperature Factors

The term "nonpoint sources" applies to a diffuse or unconfined source of pollution where wastes can either enter into or be conveyed by the movement of water to waters of the state (OAR 340-41-0002(40)). The Rogue River Basin Temperature TMDL describes nonpoint sources as past or present human activities that contribute to warmer surface waters than that which would occur naturally (ODEQ 2008).

Stream temperature is influenced by riparian vegetation, channel morphology, hydrology, climate, and geographic location. While climate and geographic location are outside of human control, the condition of the riparian area, channel morphology and hydrology can be altered by human land use. Factors contributing to elevated stream temperatures in the Horseshoe Bend-Rogue River Watershed may include one or more of the following.

- Low summer discharge;
- Riparian cover is absent or reduced due to land practices adjacent to streams; past salvage logging within riparian zones; pre-NWFP logging has removed shade over streams;
- Wide streams and stream orientation allow for direct solar heating;
- Wide, shallow gravel and bedrock channels;

- Relatively low gradient channels result in slower velocities therefore longer water retention time;
- High percentage of roads in or adjacent to riparian zones; and
- Placer mining.

Uplands north of the Rogue River are steep and soils are relatively shallow thus limiting water storage. Recharge of streams by ground water is very limited during summer months. In addition, bedrock, which is a major component of the substrate, absorbs heat during the day and radiates it to the stream at night.

The Rogue River Basin Temperature TMDL (ODEQ 2008) identifies five nonpoint source categories that may increase thermal loads: 1) near stream vegetation disturbance/removal; 2) channel modifications and widening; 3) hydromodification-dams, diversions, and irrigation districts; 4) hydromodification – water rights; and 5) other anthropogenic sources.

Temperature Factor 1: Near-Stream Vegetation Disturbance/Removal

Near-stream vegetation disturbance/removal reduces stream surface shading via decreased riparian vegetation height, width and/or density, thus increasing the amount of solar radiation reaching the stream surface (ODEQ 2008). The ability of riparian vegetation to shade the stream throughout the day depends on vegetation height and the vegetation position relative to the stream. Furthermore, forests even beyond the distance necessary to shade a stream can influence the microclimate, providing cooler daytime temperatures (ODEQ 2008). Riparian vegetation also plays an important role in shaping channel morphology, resisting erosive high flows, and maintaining floodplain roughness. For a stream with a given surface area and stream flow, any increase in the amount of heat entering a stream from solar radiation will have a proportional increase in stream temperature (USDA and USDI 2005).

The primary reason for elevated stream temperatures on BLM-managed lands within the Horseshoe Bend-Rogue River Watershed is an increase in solar radiation reaching the stream surface following pre-NWFP timber harvest, road construction, and mining activities that removed stream shading vegetation. Pre-NWFP management activities along streams on federal lands in the plan area left a mosaic of vegetation age classes in the riparian areas. The amount of riparian area with late-successional forest characteristics has declined on federal lands primarily due to past timber harvest and road construction within or adjacent to riparian areas. In some cases the large conifers have been replaced by young, small diameter conifer stands and in other cases, hardwoods have replaced conifers as the dominant species in riparian areas. In riparian areas where the trees are no longer tall enough to adequately shade the adjacent streams, the water flowing through these exposed areas is subject to increased solar radiation and subsequent elevated temperatures.

Disturbance of the riparian area and stream channel from wildfires and floods can also lead to increases in summer stream temperatures. These disturbances are considered part of the natural processes, and are expected change agents considered by the ACS (FEMAT 1993). Horseshoe Bend-Rogue River Watershed has a frequent fire history with return intervals averaging between 30-80 years depending on the stand characteristics, weather, and topography. In this watershed, it appears that fires are probably more frequent and intense in the hot, low elevation areas along the Rogue River than in the upper ridges where conditions are cooler and wetter. The eastern portion of this watershed also experiences a greater risk of fire due to the lower amounts of precipitation

and higher summer temperatures. The Blossom Fire of 2005 burned through some riparian vegetation along Mule Creek.

Private mining operations on Whisky Creek have also resulted in loss of riparian vegetation. In addition, there are upstream effects from agriculture, industry, and urban communities that influence the segment of the Rogue River flowing through the Horseshoe Bend-Rogue River Watershed.

Temperature Factor 2: Channel Modifications and Widening

Stream channel morphology can also affect stream temperature. Wide channels tend to have lower levels of shade due to simple geometric relationships between shade producing vegetation and the angle of the sun. For wide channels, the surface area exposed to radiant sources and ambient air temperature is greater, resulting in increased energy exchange between the stream and its environment (ODEQ 2004). Conversely, narrow channels are more likely to experience higher levels of shade. An additional benefit inherent to narrower/deeper channel morphology is a higher frequency of pools that contribute to aquatic habitat or cold water refugia (ODEQ 2004).

Large wood plays an important role in creating stream channel habitat. Obstructions created by large wood help to settle out gravel. The deposition of gravel helps to decrease thermal loading by reducing the amount of water exposed to direct solar input, as a portion of the water will travel sub-gravel and not be exposed to sun. The loss of large wood in the Horseshoe Bend-Rogue River Watershed has had a direct impact on stream channel morphology. Once the large wood was removed, the alluvial material held behind it washed out, causing channels to down-cut and eventually widen, allowing for increased thermal loading and stream heating.

Channel widening is often related to degraded riparian conditions that allow increased streambank erosion and sedimentation of the streambed. Active streambank erosion and sedimentation both correlate strongly to riparian vegetation type and age. Riparian vegetation contributes to rooting strength and floodplain/streambank roughness that dissipates erosive energies associated with flowing water. Established mature woody riparian vegetation adds the highest rooting strengths and floodplain/streambank roughness. Annual grassy riparian vegetation communities offer less rooting strength and floodplain/streambank roughness. It is expected that width to depth ratios would be lower in narrower and deeper channels when established mature woody vegetation is present. Annual/grassy riparian communities may allow channels to widen and become shallower.

Changes in sediment input can lead to a change in channel morphology. When sediment input increases over the transport capability of the stream, sediment deposition can result in channel filling, thereby increasing the stream's width-depth ratio. During storm events, management-related sources can increase sediment inputs over natural and contribute to channel widening and stream temperature increases.

Natural erosion processes occurring in the watershed such as landslides, surface erosion, and flood events contribute to increased sedimentation (USDI 2000). Sediment sources resulting from human activities include roads and logging (tractor skid trails, yarding corridors, and landings) (USDI 2000).

Temperature Factor 3: Hydromodification: Dams, Diversions, and Irrigation Districts
There are no large dams or diversions and no irrigation districts within the Horseshoe Bend-Rogue River Watershed. Summer water flow in the Rogue River is augmented by Lost Creek and Applegate reservoirs located upstream of the watershed.

Temperature Factor 4: Hydromodification: Water Rights
The temperature change produced by a given amount of heat or thermal load is inversely proportional to the volume of water heated or, in other words, the discharge of the stream. A stream with less flow will heat up faster than a stream with more flow given that all other channel and riparian characteristics are the same.

There are approximately 36 small BLM-managed and Oregon Water Resources Department (OWRD)-permitted water developments on BLM-administered lands within the Horseshoe Bend-Rogue River Watershed. The developments range in size from 0.001 to 0.77 acre-feet and are primarily used for wildlife, road operations, and prescribed fire on BLM-administered lands. OWRD-permitted water diversions on private land for mining operations include two diversions from Whisky Creek for a total of 2.14 cubic feet per second (cfs), two on Rum Creek for a total of 10 cfs, and one on Jenny Creek for 5 cfs.

Temperature Factor 5: Other Anthropogenic Sources
The Rogue Basin TMDL addresses upland and floodplain development as other anthropogenic sources that have resulted in high percentages of impervious surfaces in some areas of the basin. This is not an issue in the Horseshoe Bend-Rogue River Watershed.

Temperature TMDL Loading Capacity and Allocations
Oregon's water quality standard mandates a loading capacity based on the condition where stream temperatures do not increase more than 0.3^{o}C (human use allowance) above the applicable criteria at the point(s) of maximum impact (ODEQ 2008). Allocations in the Rogue River Basin Temperature TMDL divide the loading capacity between individual point and nonpoint sources of heat and set the thermal load targets which will result in achieving the water quality standards.

The Rogue River Basin Temperature TMDL assigns each DMA load allocations that apply to all perennial and intermittent streams. The temperature TMDL targets system potential effective shade as the surrogate measure to meet the TMDL load allocation for forestry nonpoint sources (ODEQ 2008). Effective shade is defined as the percent reduction of potential daily solar radiation load delivered to the water surface (ODEQ 2008). It can be measured in the field and relates directly to solar loading. The system potential condition as defined in the TMDL is the near-stream vegetative community that can grow on a site at a given elevation and aspect in the absence of human disturbance. System potential is an estimate of a condition without anthropogenic activities that disturb or remove near stream vegetation (ODEQ 2008).

Current shade and system potential shade targets (percent-effective shade) were calculated for Whisky Creek and the Rogue River on BLM-administered lands within the Horseshoe Bend-Rogue River Watershed (Table 9). The data analysis method used for the shade assessment was the Shadow model (USDA 1993). The Shadow model determines the system potential targets and number of years needed to obtain shade recovery using forest growth curves for various tree species within southwestern Oregon. The growth curves project growth rates and maximum

heights for the dominant riparian tree species. Target shade values represent the maximum potential stream shade based on the site potential tree height.

The current shade on BLM-administered lands along Whisky Creek is greater than 80 percent and considered recovered. The recovery period for the BLM-administered lands along the Rogue River is 65 years. The shade assessment used 1996 aerial photos for the Rogue River; therefore, 14 years of recovery have transpired.

Table 9. Percent-Effective Shade Targets for BLM-Managed Lands in the Horseshoe Bend-Rogue River Watershed (ODEQ 2005)

Stream	Tributary to	Stream Miles on BLM	Current Shade[1]	Target Shade[1]	Additional Shade Needed[2]	Time to Recovery[3] (years)
Rogue River	Pacific Ocean	20.1	3	18	15	65
Whisky Creek	Rogue River	2.2	83	83	0	0

1/ Current shade and target shade refer to percent-effective shade defined as the percent reduction of solar radiation load delivered to the water surface.

2/ Additional shade needed is the increase in percent-effective shade required to meet the target shade.

3/ If current shade is ≥80%, the time to recovery is listed as 0 years. If current shade is <80%, the time to recovery is listed as the number of years needed to reach full site potential percent-effective shade. Any increase over 80% effective shade is considered a margin of safety. At a value of ≥80% effective shade, a stream is considered recovered and the stream should not be a candidate for active restoration. Additional shade should come from passive management of the riparian area. Years to recovery are a weighted average of recovery time for individual stream reaches.

The effective shade curves found in Figure 2.22 (Ecoregion 78e – Inland Siskiyous) of the Rogue River Basin TMDL (ODEQ 2008) apply to the water quality limited sections of the East and West Forks of Whisky Creek. Effective shade curves use ecoregion, stream channel width, stream aspect, and potential vegetation to determine the maximum possible effective shade for a given vegetation type. The effective shade curves account for latitude, critical summertime period (August 1), elevation and stream aspect. The values presented within the effective shade curves represent the effective shade that would be attained if the vegetation were at its stated potential height and density (ODEQ 2008).

Element 2: Goals and Objectives

The long-term goal of this WQRP is compliance with water quality standards for the 303(d) listed streams in the Horseshoe Bend-Rogue River Watershed. The WQRP identifies TMDL implementation strategies to achieve this goal. Recovery goals will focus on protecting areas where water quality meets standards and avoiding future impairments of these areas, and restoring areas that do not currently meet water quality standards.

The recovery of water quality conditions on BLM-administered land in the Horseshoe Bend-Rogue River Watershed will depend on implementation of the Medford District RMP (USDI 1995) that incorporates the NWFP (USDA and USDI 1994). The RMP includes best management practices (BMPs) that are intended to prevent or reduce water pollution to meet the goals of the CWA.

Paramount to recovery is adherence to the Standards and Guidelines of the NWFP to meet the ACS. This includes protection of riparian areas and necessary silvicultural treatments to achieve vegetative potential as rapidly as possible. The ACS was developed to restore and maintain the ecological health of watersheds and aquatic ecosystems on public lands. The NWFP requires federal decision makers to ensure that proposed management activities are consistent with ACS objectives. ACS objectives are listed on page B-11 of the NWFP Record of Decision (USDA and USDI 1994). Together these objectives are intended to enhance biodiversity and ecosystem function for fish, wildlife, and vegetation, enhance soil productivity and water quality, and reduce hazardous fuel loads and risk to uncharacteristic disturbance (USDA and USDI 2005). ACS objectives 3-8 contain guidance related to maintaining and restoring water quality. In general, the objectives are long range (10 to 100 years) and strive to maintain and restore ecosystem health at the watershed scale.

All recovery goals and plans are linked to maintaining ecosystem components currently functioning, and improving those sites that show the greatest potential for recovery. This approach will maximize recovery while minimizing expensive, extensive and risky treatments.

Recovery goals and management techniques that are being implemented on BLM-administered lands to promote the recovery of water quality limited streams, and those intended to protect streams that are currently properly functioning are specified in Table 10.

Table 10. Recovery Goals and Management Techniques for BLM-Administered Lands in the Horseshoe Bend-Rogue River Watershed

Element	Goal	Management Techniques	
		Passive Restoration	**Active Restoration**
Temperature *Shade Component*	Achieve coolest water temperatures possible through achievement of the percent effective shade target.	Allow riparian vegetation to grow to reach target values.[1]	Design and implement silvicultural projects to promote achievement of site potential hardwood and conifers in a more rapid manner. Plant native species from local genetic stock to create a stand that will result in increased tree height and density.[1]
Temperature *Channel Modification Component*	Maintain channel configuration of 1st through 4th order streams on BLM-administered lands which are currently hydrologically properly functioning	Allow natural hydrologic processes to occur within the Riparian Reserves. Follow standards and guidelines of NWFP Aquatic Conservation Strategy	Maintain roads to reduce sediment delivery to streams. Install drainage structures capable of passing 100 year flood events.

Element	Goal	Management Techniques	
		Passive Restoration	**Active Restoration**
	at this point.		Where no longer needed for management, decommission roads to minimize potential sediment sources and/or reduce the number of road stream crossings to reduce sediment delivery to streams.
Temperature *Hydromodification Component*	Maintain natural flow conditions. Maintain flow needed for aquatic life.	Minimize consumptive use in management of BLM-administered lands	Utilize authorized water storage facilities to avoid diverting streamflows during low flows. Reduce road densities by decommissioning roads which are no longer needed for management.

1/ Passive versus active restoration of riparian areas. If current percent effective shade is greater than or equal to 80 percent, the stream is considered recovered in terms of percent effective shade and the riparian area should not be a candidate for active restoration for the purposes of temperature recovery (ODEQ 2004). If current shade is less than 80 percent, the site may benefit from active restoration and should be examined.

Element 3: Proposed Management Measures

The NWFP ACS describes general guidance for managing Riparian Reserves to meet the ACS objectives. The Riparian Reserves, Key Watersheds, watershed analysis, and watershed restoration components of the ACS are designed to operate together to maintain and restore the productivity and resiliency of riparian and aquatic ecosystems.

Specific Standards and Guidelines found on pages C-31 to C-38 of the NWFP (USDA and USDI 1994) direct the types of activities that may occur within Riparian Reserves and how they will be accomplished. These Standards and Guidelines effectively serve as general BMPs to prevent or reduce water pollution in order to meet the goals of Clean Water Act compliance. As a general rule, the Standards and Guidelines for Riparian Reserves prohibit or regulate activities in Riparian Reserves that retard or prevent attainment of the Aquatic Conservation Strategy objectives.

Riparian Reserve widths are determined from the Standards and Guidelines (USDA and USDI 1994, p. C-30). Riparian Reserve widths are based on the site-potential tree height, which is 190 feet for the Horseshoe Bend-Rogue River Watershed. The reserve width for fish-bearing streams,

lakes, and natural ponds is 380 feet slope distance on each side of the stream or waterbody. Perennial nonfish-bearing streams, constructed ponds and reservoirs, and wetlands greater than 1 acre receive a reserve width of 190 feet slope distance on each side of the stream or waterbody. Intermittent streams receive a minimum reserve width of 190 feet slope distance on each side of the stream and Riparian Reserves for wetlands less than 1 acre include the wetland and extend to the outer edges of the riparian vegetation.

The Medford District RMP (pages 149-177) includes BMPs that are important for preventing and controlling nonpoint source pollution to the "maximum extent practicable" (USDI 1995). BMPs are developed on a site-specific basis and presented for public comment during the National Environmental Policy Act (NEPA) process. One element of BMP implementation includes effectiveness monitoring and modification of BMPs when water quality goals are not being achieved.

Although passive restoration will be the primary means for achieving the stream temperature goals (Table 10), active restoration measures will be considered for BLM-managed lands adjacent to streams with current shade that is less than 80 percent. The *Northwest Forest Plan Temperature TMDL Implementation Strategies* (USDA and USDI 2005) provides a tool for analyzing the effect of silvicultural practices in Riparian Reserves on effective shade. The strategy considers stream adjacent shade in the primary and secondary shade zones to determine the affect of silvicultural treatments on stream shade. Shade nomographs computed based on stream width, vegetation height, hill slope, and orientation are used to delineate no-cut buffers necessary for maintaining stream shade while allowing vegetation treatment that will ultimately improve and restore riparian condition.

The primary means to achieving the channel modification goals (Table 10) on BLM-administered lands will be through passive restoration and protection of unstable areas. Active restoration measures will focus on promoting riparian conifer growth for future large wood recruitment through silvicultural treatment, maintaining and improving road surfaces, making emergency road repairs as problems are discovered, reducing the number of road stream crossings, and reducing road densities. The highest priority areas for road treatments will be Riparian Reserves and unstable areas. Subwatersheds with high road densities (above 3 miles per square mile) will be the highest priorities for road decommissioning.

Element 4: Timeline for Implementation

The major provisions of this WQRP are being implemented. Protection of riparian areas along all streams has been ongoing since the NWFP became effective in 1994. Inherent in the NWFP is passive restoration of riparian areas (e.g., Riparian Reserves). Active restoration directed in part by watershed analysis will be achieved through site-specific projects. These projects will be subject to NEPA analysis and the timing will depend on available staff and funding.

The problems leading to water quality impairment and 303(d) listing have accumulated over many decades. Natural recovery and restoration management to address these problems likewise will require time before the affects can be measured. Implementation will continue until the restoration goals, objectives, and management measures as described in this WQRP are achieved. While

active restoration may provide immediate, localized improvement, recovery at the watershed scale is long term in nature. The ACS discusses these timeframes. The ACS seeks to "prevent further degradation and restore habitat over broad landscapes as opposed to individual projects or small watersheds. Because it is based on natural disturbance processes, it may take decades, possibly more than a century to achieve objectives."

Stream temperature improvement and habitat recovery depend on vegetation recovery. Actions implemented now will not begin to show returns in terms of reduced stream temperatures or improved aquatic habitat for a number of years. Full recovery of these conditions will not occur for many decades (Table 9). Stream temperatures will begin to decline and recover before the riparian areas reach their maximum potentials. Growth of site potential vegetation was modeled with the assumption that there will be no management activities such as thinning to enhance growth. If silvicultural activities were to occur, the vegetation would grow more quickly and recovery could be accelerated.

It will take a longer time for aquatic habitat recovery than for stream shade recovery. Instream conditions will recover only after mature conifers begin to enter the waterways through one of several delivery mechanisms, e.g. blowdown, wildfire, debris flows down tributary streams and into fish-bearing reaches, and flooding. Tree growth from the current condition of young conifers to mature age conifers will take approximately 200 to 250 years. This will represent full biological recovery of these stream channels, while temperature recovery and stabilization of streambanks will occur earlier.

Element 5: Responsible Parties

The BLM is recognized by Oregon DEQ as a DMA for implementing the CWA on BLM-administered lands in Oregon. The BLM has signed a Memorandum of Agreement (MOA) with the DEQ that defines the process by which the BLM will cooperatively meet State and Federal water quality rules and regulations. The Director of DEQ and the BLM State Director are responsible for ensuring implementation of the agency's MOA.

The BLM Glendale and Grants Pass Field Managers are responsible for ensuring this WQRP is implemented, reviewed, and amended as needed. These officials are responsible for all WQRPs for lands under their jurisdiction. The Field Managers will ensure coordination and consistency in plan development, implementation, monitoring, review, and revision. The managers will also ensure priorities are monitored and revised as needed and review and consider funding needs for this and other WQRPs in annual budget planning.

Element 6: Reasonable Assurance of Implementation

This WQRP will be submitted to the DEQ and it will be encompassed in the Rogue River Basin WQMP, which was completed in 2008. The WQMP covers all land within the Horseshoe Bend-Rogue River Watershed regardless of jurisdiction or ownership.

The BLM is committed to working cooperatively with all interested parties in the watershed. While

partnerships with private, local, and state organizations will be pursued, the BLM can only control the implementation of this WQRP on public lands. Other organizations or groups that are (or will be) involved in partnerships for implementing, monitoring, and maintaining the Rogue River Basin TMDL include Josephine County, Coos County, Curry County, and Douglas County, Oregon Department of Forestry (ODF), Oregon Department of Agriculture (ODA), Oregon Department of Transportation (ODOT), Department of State Lands (DSL), Department of Geology and Mineral Industries (DOGAMI), Oregon Department of Fish and Wildlife (ODFW), Oregon Water Resources Department (WRD), and Oregon DEQ. The problems affecting water quality are widespread; coordination and innovative partnerships are key ingredients to successful restoration efforts.

The BLM, Medford District intends to implement this plan within current and future funding constraints. Implementation and adoption of the MOA with the DEQ also provide assurances that water quality protection and restoration on lands administered by the BLM will progress in an effective manner.

Past improvement projects, such as road improvement, renovation, and decommissioning, were implemented for restoration of watershed function and water quality (Table 11).

Table 11. Past Horseshoe Bend-Rogue River Watershed Improvement Projects

Improvement Project	Year	Miles	Fish Species[1] Benefitted
Repair Whisky Creek Cabin Road T. 33 S., R. 8 W., Sec. 27, 34 Add rock, cross drains	1996	2.0	ST, CT
Install gates on Mule Creek basin roads T. 32 S., R. 9 W	1994	10.0	ST, CT
Stabilize Mule Creek Road T. 32 S., R. 9 W., Sec. 20	1997	1.0	CO, ST, CT, CH
Marial Road Improvement (#32-9-14.2)	1997, 1999	16.25	N/A
Bruin Spur Road Renovation (#32-9-31 and #33-10-2)	1999 and 2000	8.96	
Decommission Mule Creek Road T. 32 S., R. 9 W, Sec. 20. Includes culvert removal for fish passage	1998	1.5	CO, ST, CT, CH

1/CH = chinook, CO = coho, ST = steelhead, CT = cutthroat N/A= Not Applicable

Element 7. Monitoring and Evaluation

Monitoring and evaluation have two basic components: 1) monitoring the implementation and effectiveness of this WQRP and 2) monitoring the physical, chemical, and biological parameters for water quality. Monitoring information will provide a check on progress being made toward achieving the TMDL allocations and meeting water quality standards, and will be used as part of the Adaptive Management process.

The objectives of this monitoring effort are to demonstrate long-term recovery, better understand natural variability, track implementation of projects and BMPs, and evaluate effectiveness of

TMDL implementation. This monitoring and feedback mechanism is a major component of the "reasonable assurance of implementation" (Element 6) for this WQRP.

The NWFP and the BLM Medford District RMP are ongoing federal land management plans. The NWFP, effective in 1994, requires that if results of monitoring indicate management is not achieving ACS objectives, among them water quality, plan amendments may be required. These plan amendments could, in part, redirect management toward attainment of state water quality standards.

The RMP contains requirements for implementation, effectiveness, and validation monitoring of BMPs for water resources. The Medford District annual program summary provides feedback and tracks how management actions are being implemented. RMP monitoring will be conducted as identified in the approved BLM Medford District plan. Monitoring will be used to ensure that decisions and priorities conveyed by BLM management plans are being implemented, to document progress toward attainment of state water quality standards, to identify whether resource management objectives are being attained, and to document whether mitigating measures and other management direction are effective.

DEQ will use information generated by each of the agencies/entities gathering data in the Rogue River Basin to determine whether management actions are having the desired effects or if changes in management actions and/or TMDLs are needed. This detailed evaluation will typically occur on a 5-year cycle (ODEQ 2008). If DEQ determines that implementation on BLM-administered lands is not proceeding or if implementation measures are in place, but water quality standards or load allocations are not or will not be attained, then DEQ will work with the BLM to assess the situation and to take appropriate action. Such action may include additional implementation measures, modifications to the TMDL, and/or placing the water body on the 303(d) list when the list is next submitted to EPA.

WQRP Implementation and Effectiveness Monitoring

Restoration activities that benefit aquatic resources will be provided annually in the BLM Medford District's Annual Program Summary. Activities that are tracked include in-stream structure and passage, riparian treatments, upland treatments, road decommissioning and improvements, and wetland treatments.

Implementation and effectiveness monitoring will be accomplished for restoration projects according to project level specifications and requirements.

Water Quality Monitoring

Water quality monitoring is critical for assessing the success of this WQRP. This data will be used to evaluate the success of plan implementation and effectiveness. Monitoring will be conducted to evaluate improvements in water quality conditions as well as the progress toward attaining water quality standards.

Core indicators of water quality and stream health including stream temperature, stream shade, and stream channel condition will be monitored on BLM-administered land if funds and personnel are available.

Monitoring results associated with compliance with this WQRP will be submitted to the DEQ upon request.

Stream Temperature Monitoring

The BLM has collected stream temperature data in the Horseshoe Bend-Rogue River Watershed since 1994 and will continue to monitor stream temperatures (as long as funding is available) in order to detect any changes in temperature from long-term data sets. Monitoring will continue to be conducted to meet a variety of objectives, thus long-term monitoring sites as well as project-specific, short-term sites will be used. Objectives include: monitor long-term temperature recovery; better understand the natural temperature variability; and track potential project effects. Future stream temperature monitoring will be conducted as needed to track potential project effects. If funding is available, monitoring will continue on the following temperature-listed stream reaches until such time state standards are achieved in Whisky, East Fork Whisky, and West Fork Whisky creeks.

Sampling methods and quality control for any future temperature monitoring will follow DEQ protocol. Generally, stream temperatures will be monitored from June 1 to September 30 to ensure that critical high temperature periods are covered. Measurements will be made with sensors programmed to record samples at least hourly. Qualified personnel will review raw data and delete erroneous data due to unit malfunction or other factors. Valid data will be processed to compute the 7-day rolling average of daily maximum temperature at each site. The resulting files will be stored in the BLM's database.

Stream Shade Monitoring

Guidelines in the NWFP specify that vegetation management in the Riparian Reserves must have a goal of improving riparian conditions. The existing level of stream shade provided by stream-adjacent riparian vegetation will be determined prior to Riparian Reserve treatments that have the potential to influence water temperature. Measurement of angular canopy density (the measure of canopy closure as projected in a straight line from the stream surface to the sun) will be made in a manner that can be repeated within the portion of the adjacent stand within one tree height of the streambank at bankfull width. The measurement will occur within the stand, and not be influenced by the opening over the actual stream channel. Immediately after treatment, the shade measurement procedure will be repeated to verify that the treatment met the prescribed goals.

Stream Channel Condition Monitoring

Restoration activities designed to improve stream channel conditions (i.e. road surface and drainage improvements, road decommissioning, and unstable area protection) will be monitored for implementation and effectiveness according to project level specifications and requirements.

Monitoring Data and Adaptive Management

This WQRP is intended to be adaptive in nature. Sampling methodology, timing, frequency, and location will be refined as appropriate based on lessons learned, new information and techniques, and data analysis. A formal review involving BLM and DEQ will take place every five years, starting in 2015, to review the collected data and activity accomplishment. This ensures a formal mechanism for reviewing accomplishments, monitoring results, and new information. The evaluations will be used to determine whether management actions are having the desired effects or if changes in management actions and/or TMDLs are needed.

Element 8. Public Involvement

The Federal Land Policy and Management Act (FLPMA) and the NEPA require public participation for any activities proposed for federal lands. The NWFP and the Medford District RMP each went through an extensive public involvement process. Many of the elements contained in this WQRP are derived from these existing land use planning documents.

Public involvement was also included in the development of the *Wild Rogue North* and *Wild Rogue South* Watershed Analyses, as well as the Kelsey Whisky Environmental Impact Statement (USDI 2003). Additionally, the NEPA process requires public involvement prior to land management actions, providing another opportunity for public review. During this process, the BLM sends scoping letters and schedules meetings with the public. The public comment period ensures that public review of proposed projects is incorporated into the decision-making process.

The DEQ has lead responsibility for creating TMDLs and WQMPs to address water quality impaired streams for Oregon. This WQRP will be provided to the DEQ for incorporation into the Rogue River Basin WQMP.

Element 9. Costs and Funding

Funding for project implementation and monitoring is derived from a number of sources. Implementation of the proposed actions discussed in this document will be contingent on securing adequate funding. Funds for project implementation originate from grants, cost-share projects, specific budget requests, appropriated funds, revenue generating activities (such as timber sales), or other sources. Potential sources of funding to implement restoration projects on federal lands include special BLM restoration funds.

Active restoration can be quite costly, especially for road upgrades and major culvert replacements. The cost varies with the level of restoration. The cost of riparian silvicultural treatments on forested lands is generally covered with appropriated funds and will vary depending on treatment type. The cost of WQRP monitoring will depend on the level of water quality monitoring. The maximum that would be expended is estimated to be $5,000 per year and would include data collection, database management, data analysis, and report preparation.

It is important to note that many of the specific management practices contained in this WQRP are the implementation of BMPs during ongoing management activities such as timber harvest, silvicultural treatments, and fuels management. These practices are not dependent on specific restoration funding. Work on federal lands will be accomplished to improve water quality as quickly as possible by addressing the highest existing and at-risk management-related contributors to water quality problems. Every attempt will be made to secure funding for restoration but it must be recognized that the federal agencies are subject to political and economic realities. Currently, timber harvest is minimal due to litigation and Endangered Species Act (ESA) clearances needed to proceed. If this situation continues, a major source of funding is lost. Historically, budget line items for restoration are a fraction of the total requirement. Therefore, it must be recognized that restoration that is tied to some other land management objective is subject to funding availability for these other activities.

A final important factor for implementation time lines and funding is that managers must consider the Horseshoe Bend-Rogue River Watershed along with all other watersheds under their jurisdiction when determining budget allocations.

Element 10. Citation to Legal Authorities

The ESA and the CWA guide public land management. These laws are meant to provide for the recovery and preservation of endangered and threatened species and the quality of the nation's waters. The BLM is required to assist in implementing these two laws. The NWFP and RMP are mechanisms for the BLM to implement the ESA and CWA. They provide a planning framework for the development and implementation of this WQRP.

Clean Water Act Section 303(d)

Section 303(d) of the 1972 federal CWA as amended requires states to develop a list of rivers, streams, and lakes that cannot meet water quality standards without application of additional pollution controls beyond the existing requirements on industrial sources and sewage treatment plants. Waters that require treatment are referred to as "water quality limited" (WQL) and are identified as such by the EPA or by a delegated state agency. In Oregon, this responsibility rests with the DEQ. The DEQ updates the list of water quality limited waters every two years. The list is referred to as the 303(d) list. Section 303 of the CWA further requires that TMDLs be developed for all waters on the 303(d) list. A TMDL defines the amount of pollution that can be present in the waterbody without causing water quality standards to be violated. A WQMP is developed to describe a strategy for reducing water pollution to the level of the load allocations and waste load allocations prescribed in the TMDL, which is designed to restore the water quality and result in compliance with the water quality standards. In this way, the designated beneficial uses of the water will be protected for all citizens.

Northwest Forest Plan

In response to environmental concerns and litigation related to timber harvest and other operations on federal lands, the Departments of Agriculture, Interior, Commerce, and the EPA commissioned the Forest Ecosystem Management Assessment Team (FEMAT 1993) to formulate and assess the consequences of management on other resources. The assessment emphasizes producing management alternatives that comply with existing laws while maintaining the highest contribution of economic and social well being. The "backbone" of ecosystem management was recognized as constructing a network of late-successional forests and an interim and long-term scheme to protect aquatic and associated riparian habitat adequate to provide for threatened and at-risk species. Biological objectives of the NWFP were based on FEMAT science that examined what was necessary for management of federal lands to aid the "recovery" of late-successional forest habitat-associated species listed as threatened under the ESA and preventing species from being listed under the ESA.

The RMP for the BLM Medford District provides for water quality and riparian management and is written to ensure attainment of ACS objectives and compliance with the CWA.

Bibliography

FEMAT (Report of the Forest Ecosystem Management Assessment Team). 1993. Forest Ecosystem Management: An Ecological, Economic and Social Assessment.

Oregon Department of Environmental Quality (ODEQ). 2004. Draft Rogue Basin Riparian Condition Assessment Report. DEQ, Medford, Oregon.

Oregon Department of Environmental Quality (ODEQ). 2005. ODEQ Geographic Information Systems (GIS) database for Lower Rogue Subbasin shade assessment.

Oregon Department of Environmental Quality (ODEQ). 2008. Rogue River Basin Total Maximum Daily Load (TMDL). DEQ, Medford, Oregon.

USDA, Forest Service. 1993. SHADOW v. 2.3 – Stream Temperature Management Program. Prepared by Chris Park, USFS, Pacific Northwest Region.

USDA, Forest Service and USDI, Bureau of Land Management. 1994. Record of Decision, for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl: Standards and Guidelines for Management of Habitat for Late Successional Species Within the Range of the Northern Spotted Owl. Portland, Oregon.

USDA, Forest Service and USDI, Bureau of Land Management. 2005. Northwest Forest Plan Temperature TMDL Implementation Strategies. Portland, Oregon.

USDI-Bureau of Land Management. 1995. Record of Decision and Resource Management Plan Medford District, Medford Oregon.

USDI-Bureau of Land Management. 1999. Wild Rogue North Watershed Analysis. Medford District. Medford, Oregon.

USDI-Bureau of Land Management. 2000. Wild Rogue South Watershed Analysis. Medford District. Medford, Oregon.

USDI-Bureau of Land Management. 2003. Kelsey Whiskey Final Landscape Management Plan, Proposed Medford District Resource Management Plan Amendments and Final Environmental Impact Statement. Medford District. Medford, Oregon.