Water Quality Restoration Plan

Southern Oregon Coastal Basin

Lower Little Butte Creek Analysis Area

Bureau of Land Management (BLM), Medford District
Ashland Resource Area
Butte Falls Resource Area

October 2010

Lower Little Butte Creek Analysis Area at a Glance	
Hydrologic Unit Code Number (Little Butte Creek)	**1710030708**
WQRP Area/Ownership	Total: 112,922 acres BLM: 27,828 acres (24.6%) Private: 85,094 acres (75.4%)
303(d) Stream Miles Assessed	Total: 62.7 miles BLM Ownership: 9.1 miles
303(d) Listed Parameters	Temperature, Bacteria, Dissolved Oxygen, Sedimentation
Key Resources and Uses	Salmonids, domestic, aesthetic
Known Human Activities	Agriculture, forestry, roads, rural residential development, and recreation
Natural Factors	Geology: volcanics (basaltic andesite, basalt, and andesite) Soils: various series and complexes

Statement of Purpose

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

Table of Contents Page

Element 1	**Condition Assessment and Problem Description**	1
	A. Introduction	1
	B. Watershed Characterization	1
	C. Temperature	13
	D. Bacteria	20
Element 2	**Goals and Objectives**	23
Element 3	**Proposed Management Measures**	25
Element 4	**Time Line for Implementation**	26
Element 5	**Responsible Parties**	27
Element 6	**Reasonable Assurance of Implementation**	27
Element 7	**Monitoring and Evaluation**	27
Element 8	**Public Involvement**	29
Element 9	**Costs and Funding**	30
Element 10	**Citation to Legal Authorities**	30
References		31
List of Preparers		32

List of Tables Page

1. Ownership within the Lower Little Butte Creek Analysis Area 3
2. Summary of Watershed Conditions on BLM-Administered Lands in the Lower Little Butte Creek Analysis Area 11
3. Beneficial uses in the Lower Little Butte Creek Analysis Area 12
4. 2004/2006 303(d) Dissolved Oxygen Listings in the Lower Little Butte Creek Analysis Area 12
5. 2004/2006 303(d) Sedimentation Listings in the Lower Little Butte Creek Analysis Area 13
6. 2004/2006 303(d) Temperature Listings in the Lower Little Butte Creek Analysis Area 14
7. Lower Little Butte Creek Analysis Area Temperature Summary 16
8. Percent-Effective Shade Targets for BLM-Administered Lands in the Lower Little Butte Creek Analysis Area 20
9. 2004/2006 303(d) Bacteria Listings in the Lower Little Butte Creek Analysis Area 21
10. Recovery Goals for BLM-Administered Lands in the Lower Little Butte Creek Analysis Area 24

List of Figures Page

1. Location of the Lower Little Butte Creek Analysis Area 2
2. Rogue Basin and the Upper Rogue Subbasin 3
3. BLM Land Ownership in the Lower Little Butte Creek Analysis Area 4
4. Coho Distribution in the Lower Little Butte Creek Analysis Area 7
5. Chinook Distribution in the Lower Little Butte Creek Analysis Area 8
6. Steelhead Distribution in the Lower Little Butte Creek Analysis Area 9
7. Resident Trout Distribution in the Lower Little Butte Creek Analysis Area 10
8. 2004/2006 303(d) Temperature-Listed Streams for the Lower Little Butte Creek Analysis Area 15
9. 2004/2006 303(d) Bacteria-Listed Streams for the Lower Little Butte Creek Analysis Area 22

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). The area covered by this Water Quality Restoration Plan (WQRP) includes all lands managed by the BLM, Medford District within the Lower Little Butte Creek Analysis Area from the confluence of the North and South Forks to the mouth of Little Butte Creek. This area is referred to as the analysis or plan area.

B. Watershed Characterization

The Lower Little Butte Creek Analysis Area covers approximately 176-square miles (112,922 acres) within Jackson County in southwestern Oregon (Figure 1). The plan area lies within the Upper Rogue Subbasin and the lower half of the Little Butte Creek Watershed (Figure 2). Major tributaries to Little Butte Creek in the analysis area include Antelope, Lick, Salt, and Lake Creeks. Agate Reservoir, located in the Dry Creek drainage of Antelope Creek, is the largest waterbody within the analysis area.

The plan area is east of the city of Medford and southeast of the town of Eagle Point. The analysis area is within the southern Cascade Range and elevation ranges from approximately 1,200 feet where Little Butte Creek joins the Rogue River to 5,922 feet at the top of Grizzly Peak.

Figure 1. Location of the Lower Little Butte Creek Analysis Area

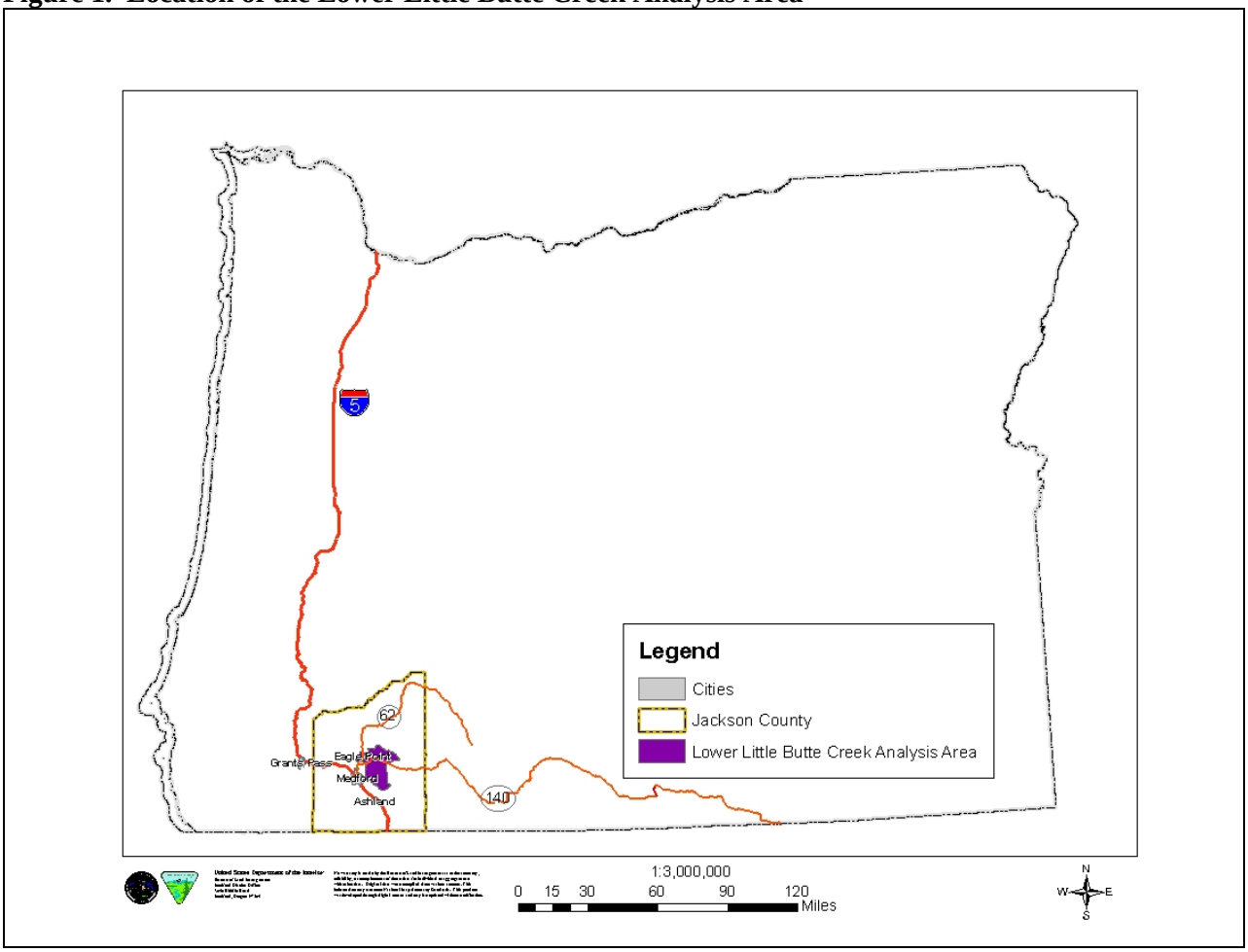
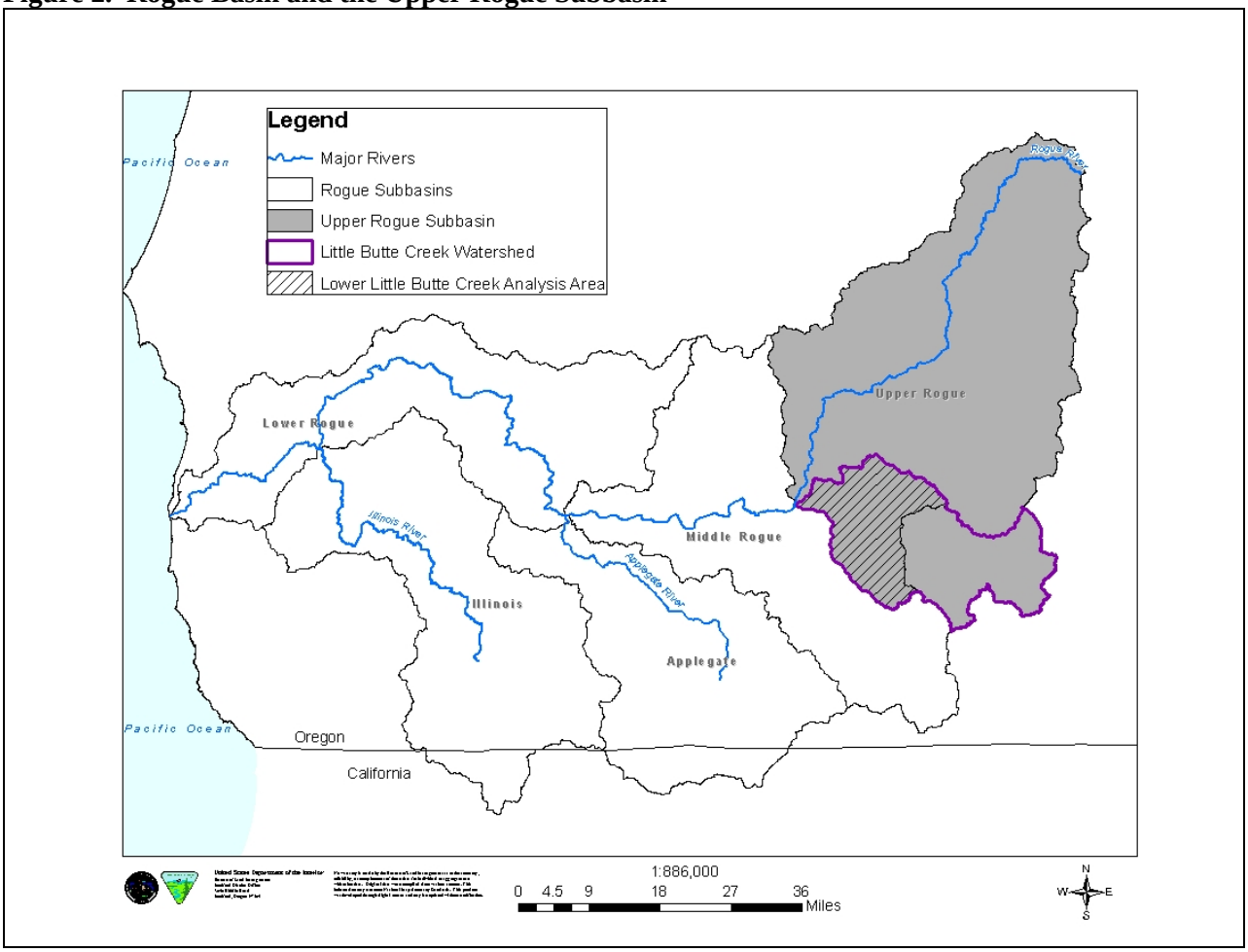


Figure 2. Rogue Basin and the Upper Rogue Subbasin



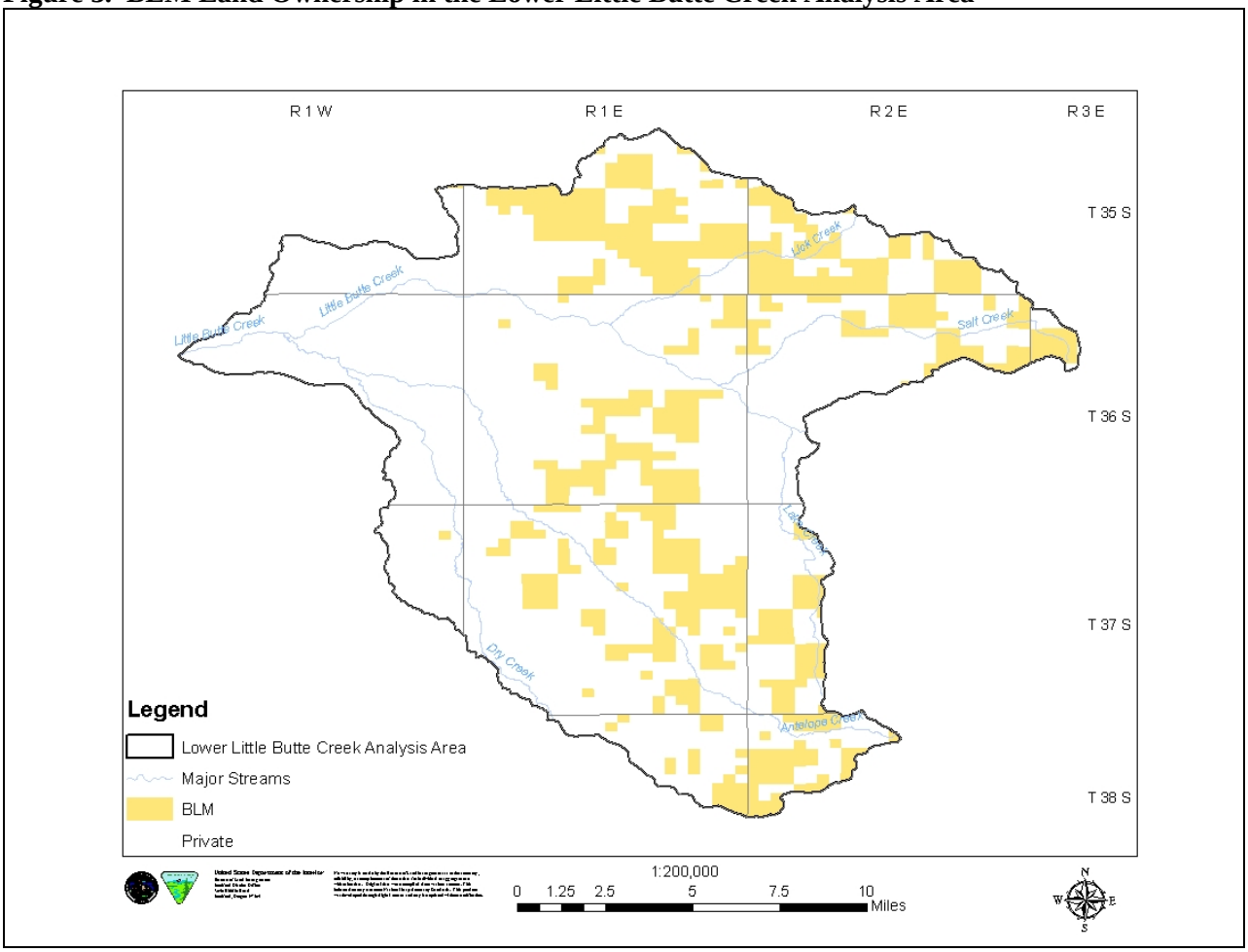
Land Ownership and Use

Land ownership is a mix of public and private (Table 1 and Figure 3). The BLM, Medford District, administers 24.6 percent of the lands and the remaining 75.4 percent of the plan area consists of private lands. Two BLM administrative units manage lands for the Medford District: Ashland and Butte Falls Resource Areas. The Butte Falls Resource Area lands are north of Highway 140 and the Ashland Resource Area manages the BLM lands south of Highway 140. The BLM parcels occupy a "checkerboard" pattern in the mid-to-high elevations of the analysis area, while the private lands are generally at lower elevations.

Table 1. Ownership within the Lower Little Butte Creek Analysis Area

Ownership	Acres	Percent
BLM	27,828	24.6%
Private	85,094	75.4%
Total	112,922	100%

Figure 3. BLM Land Ownership in the Lower Little Butte Creek Analysis Area



BLM land allocations within the plan area include Matrix and Riparian Reserves. The plan area includes one special area, the Round Top Research Natural Area. Objectives and management actions/directions for these land allocations and special areas are found in the *Medford District Record of Decision and Resource Management Plan* (USDI 1995: pp. 24-40 and 56-62).

Major land uses in the Lower Little Butte Creek Analysis Area include agriculture, timber, and recreation. Cattle operations are the largest non-forestry agricultural venture and 83 percent of the BLM-managed lands are allocated to 16 grazing allotments. The analysis area is designated as open range outside of incorporated towns or livestock districts.

Logging has occurred in the plan area since the 1870s when timber was used by early settlers. It wasn't until the second half of the twentieth century that timber became a major commodity when World War II spurred the economy and the lumber business worked at full production. The last timber sale harvested on BLM-administered lands in the analysis area was completed in 1996 (USDI and USDA 1997).

Recreational opportunities within the analysis area include hiking, rock climbing, picnicking, fishing, hunting, horseback riding, dispersed camping, mountain biking, pleasure driving, and mushroom and berry picking. Winter uses in the uplands include snowmobiling, snowshoeing, skiing, and sightseeing. There are no developed facilities managed by BLM within the plan area. Areas of concentrated off-

highway vehicle (OHV) use exist and have resulted in disturbances to soil and vegetation.

Roads distributed throughout the plan area provide vehicle access to managed forestlands, residences, and recreational areas. They vary from primitive four wheel drive roads to paved highways. Major roads include Oregon State Highways 62 and 140. There are approximately 618 road miles within the analysis area, of which 77 miles (12 percent) are controlled by the BLM (USDI 2010).

Geology/Soils

The Lower Little Butte Creek Analysis Area is located in the Cascade Mountain Geologic Province. The Cascade Mountain Province is divided into two belts (subprovinces) that trend north and south. The older, deformed rock on the west is referred to as the Western Cascade Subprovince, and the undistorted rock on the top and east flank is the High Cascades Subprovince. The analysis area lies entirely within the Western Cascade Subprovince. The Western Cascade geology is composed of older, softer volcanic materials than the High Cascades.

The Western Cascades developed from large composite and shield volcanoes. A majority of the Western Cascades in the analysis area are dominated by lava flows of basaltic andesite, basalt, and andesite. These lavas are interlayered with softer pyroclastic flows of andesitic tuff, basaltic breccia, ash flow tuff, dacite tuff, and andesitic breccia. These pyroclastic materials often interfinger with the lavas making the area subject to landsliding or soil movement during rain-on-snow or intense storm events (USDI and USDA 1997).

The soils and topography that formed in the analysis area were directly influenced by the weatherability of the parent material (USDA 1993). Soils that formed in material weathered from hard andesite and basalt, such as McMullin soils, are shallow and medium textured. Other soils that formed from hard bedrock and were also influenced by soft, easily weathered tuff and breccia are fine textured and often have an argillic horizon, such as the McNull and Tatouche soils. Soils that formed on concave slopes frequently are subject to increased weathering because of the concentration of water and the influence of easily weathered tuff and breccias. These soils, such as the Medco soils, have a dense claypan that is very slowly permeable. The Carney soils are influenced by accumulations of alluvium and colluvium of volcanic origin (USDA 1993).

Climate

Mild, wet winters and hot, dry summers characterize the Lower Little Butte Creek Analysis Area. During the winter months, the moist, westerly flow of air from the Pacific Ocean results in frequent storms of varied intensities. Average annual precipitation in the analysis area ranges from approximately 22 inches near the confluence with the Rogue River to 44 inches at Grizzly Peak (elevation 5,922 feet) (USDI and USDA 1997).

Winter precipitation in the higher elevations (above 5,000 feet) usually occurs as snow, which ordinarily melts during the spring runoff season from April through June. Rain predominates in the lower elevations (below 3,500 feet) with the majority occurring in the late fall, winter, and early spring. A mixture of snow and rain occurs between approximately 3,500 feet and 5,000 feet and this area is referred to as either the rain-on-snow zone or transient snow zone (USDI and USDA 1997). The snow level in this zone fluctuates throughout the winter in response to alternating warm and cold fronts. The majority (86 percent) of the analysis area is within the rain-dominated zone and less than one percent is in the snow zone.

During the summer months, the area is dominated by the Pacific high pressure system, which results in hot, dry summers. Summer rainstorms occur occasionally and are usually of short duration and limited area coverage. Air temperatures can display wide variations daily, seasonally, and by elevation. The

nearest NOAA weather station with air temperature data is the Medford Weather Station (west of the plan area). The highest average maximum monthly temperatures occur in July and August, where they reach 90.5°F and 90.8°F at the Medford Station (USDI and USDA 1997).

Streamflows

Streamflows in the Lower Little Butte Creek Analysis Area fluctuate with seasonal variation of precipitation. Moderate to high flows generally occur from mid-November through May. Streamflows during the months of April and May and part of June are augmented by melting snowpack in the high elevations of the Little Butte Creek Watershed.

Low flows for Little Butte Creek normally coincide with the period of low precipitation from July through September or October. Upstream of the analysis area, summer streamflows in the South Fork Little Butte Creek are dramatically altered by transbasin diversions. A total of 62,000 acre-feet is allowed to be transferred out of the South Fork and its tributaries during the irrigation season. Flows from the North Fork Little Butte Creek are diverted to the South Fork Little Butte Creek just upstream of the analysis area. From the South Fork, water is diverted via irrigation ditches to supply Agate Reservoir with irrigation water for the Bear Creek Watershed.

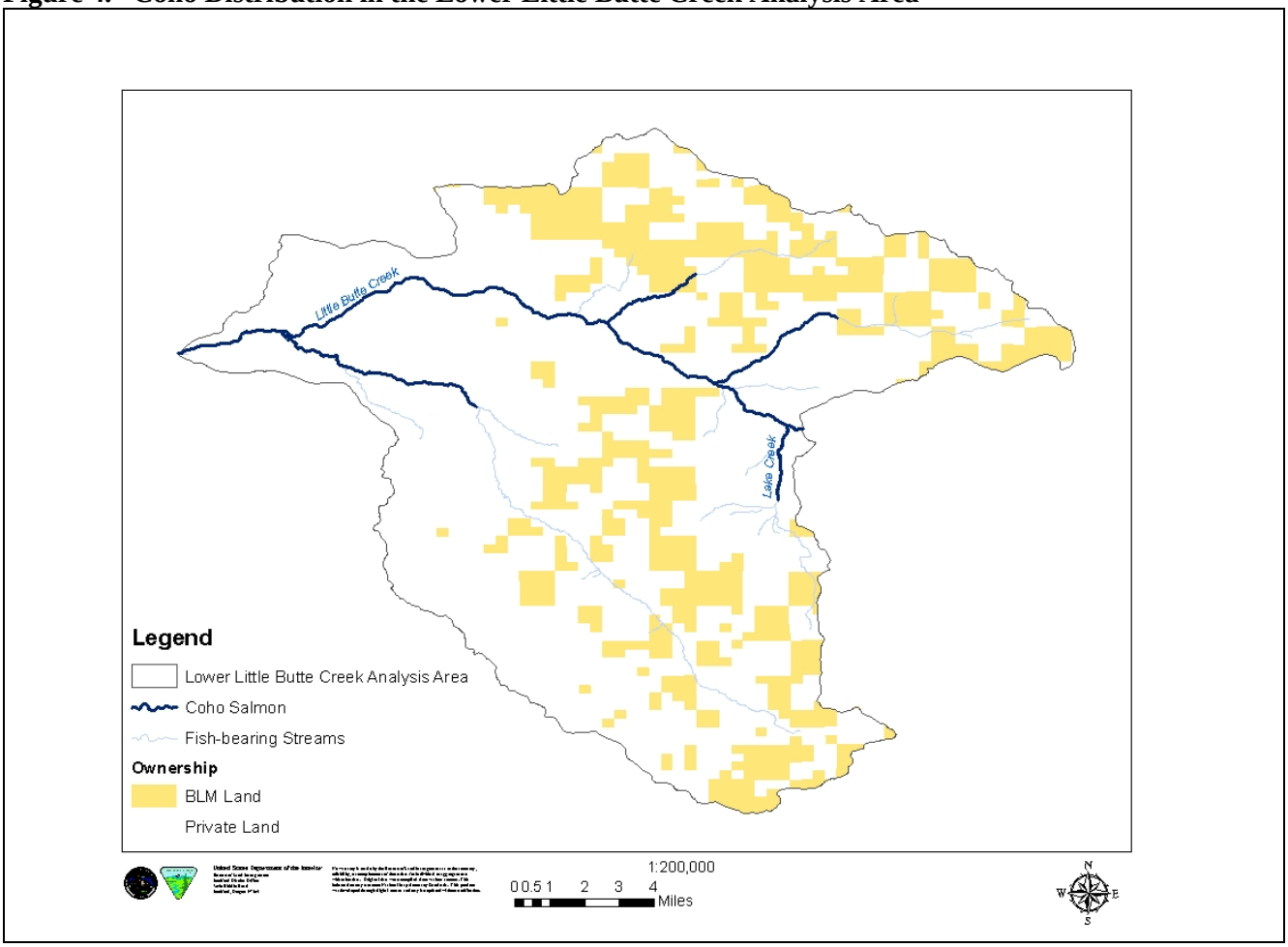
Aquatic Wildlife Species

There are three native anadromous salmonids that spawn and rear in the Lower Little Butte Creek Analysis Area: coho salmon, chinook salmon (spring and fall runs), and steelhead trout (summer and winter runs). Although the BLM manages almost 25 percent of the land within the plan area, only six percent of the anadromous salmonid habitat crosses BLM-administered land.

In spite of the extensive habitat modification and degradation that has occurred in Little Butte Creek, it still remains one of the most productive salmonid producing streams in the upper Rogue River basin. Annual smolt trapping efforts performed jointly between the BLM, U.S. Forest Service, and Oregon Department of Fish and Wildlife between 1999 and 2004 on select streams in the Rogue River basin have shown that among all surveyed streams, Little Butte Creek produced the highest densities of out-migrating smolts and fry (coho, chinook, and steelhead) (ODFW 1999-2004).

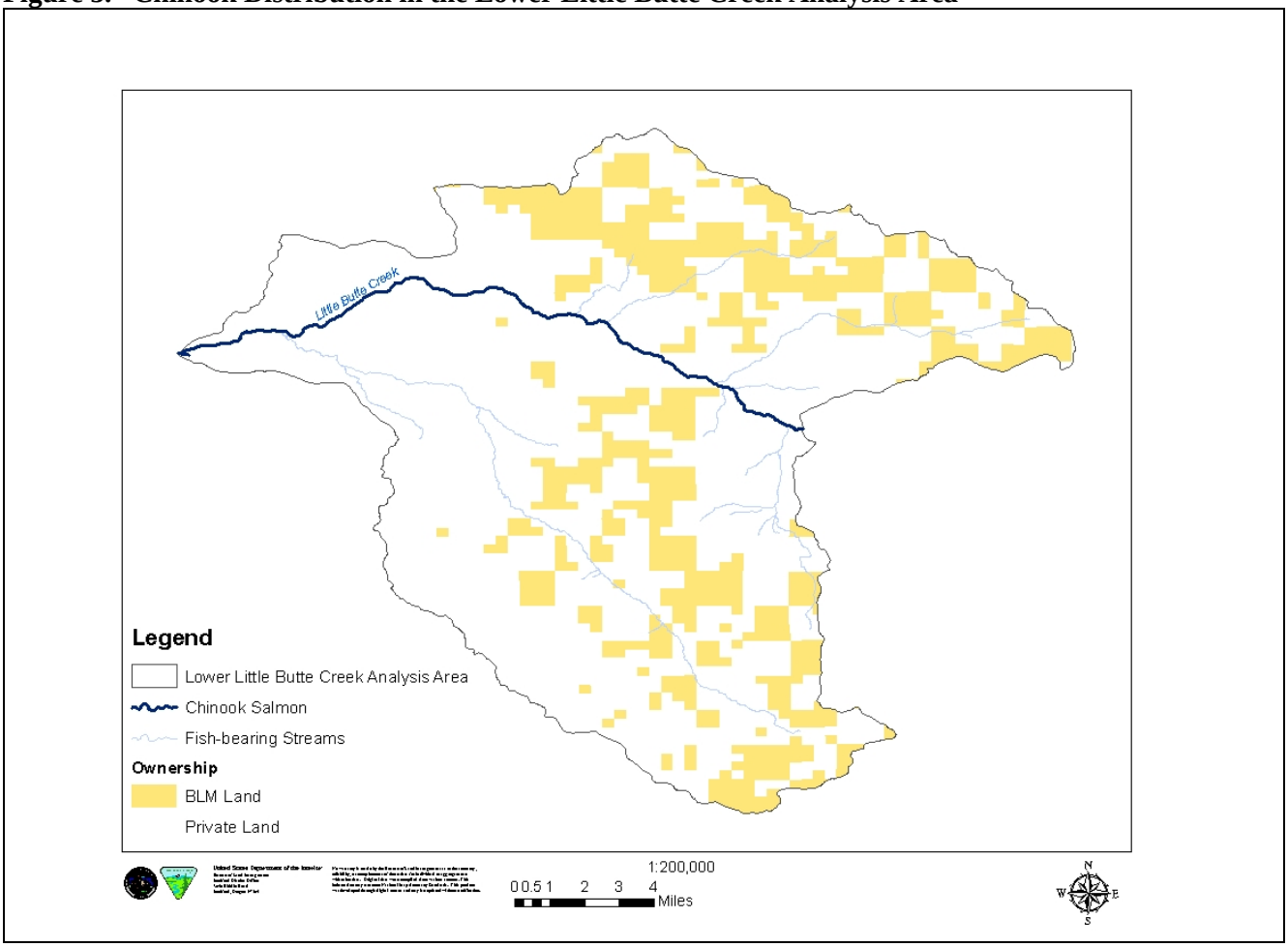
Southern Oregon/Northern California Coho salmon (*Oncorhynchus kisutch*), a species listed as threatened under the Endangered Species Act (May 1997) are present in Little Butte and Lake Creeks for a total of 31 miles, with 0.8 mile on BLM-administered land (Figure 4). Coho spawning occurs in the fall.

Figure 4. Coho Distribution in the Lower Little Butte Creek Analysis Area



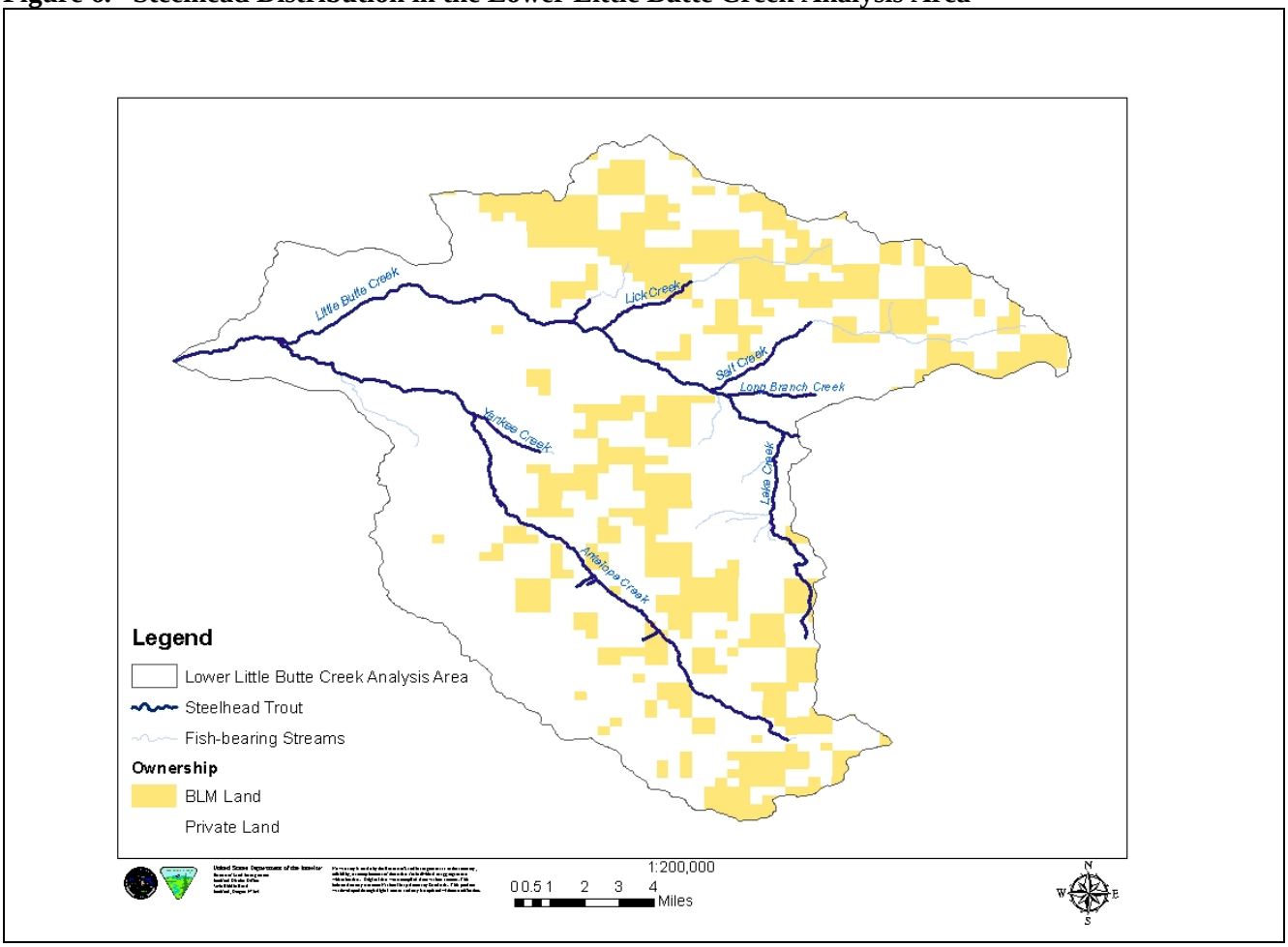
Spring and fall chinook salmon (*O. tshawytscha*) spawn in Little Butte Creek for a total of 17 miles, with none on BLM-administered land (Figure 5). The spring chinook population is depressed. Chinook salmon spawn in the fall.

Figure 5. Chinook Distribution in the Lower Little Butte Creek Analysis Area



Summer and winter steelhead (*O. mykiss*) use a total of approximately 55 miles of habitat in Little Butte, Antelope, and Lake Creeks and the lower reaches of Lick, Salt, and Long Branch Creeks (Figure 6). There are approximately 3.5 miles of steelhead habitat on BLM-administered lands within the plan area. Summer and winter steelhead trout spawn from January to May.

Figure 6. Steelhead Distribution in the Lower Little Butte Creek Analysis Area

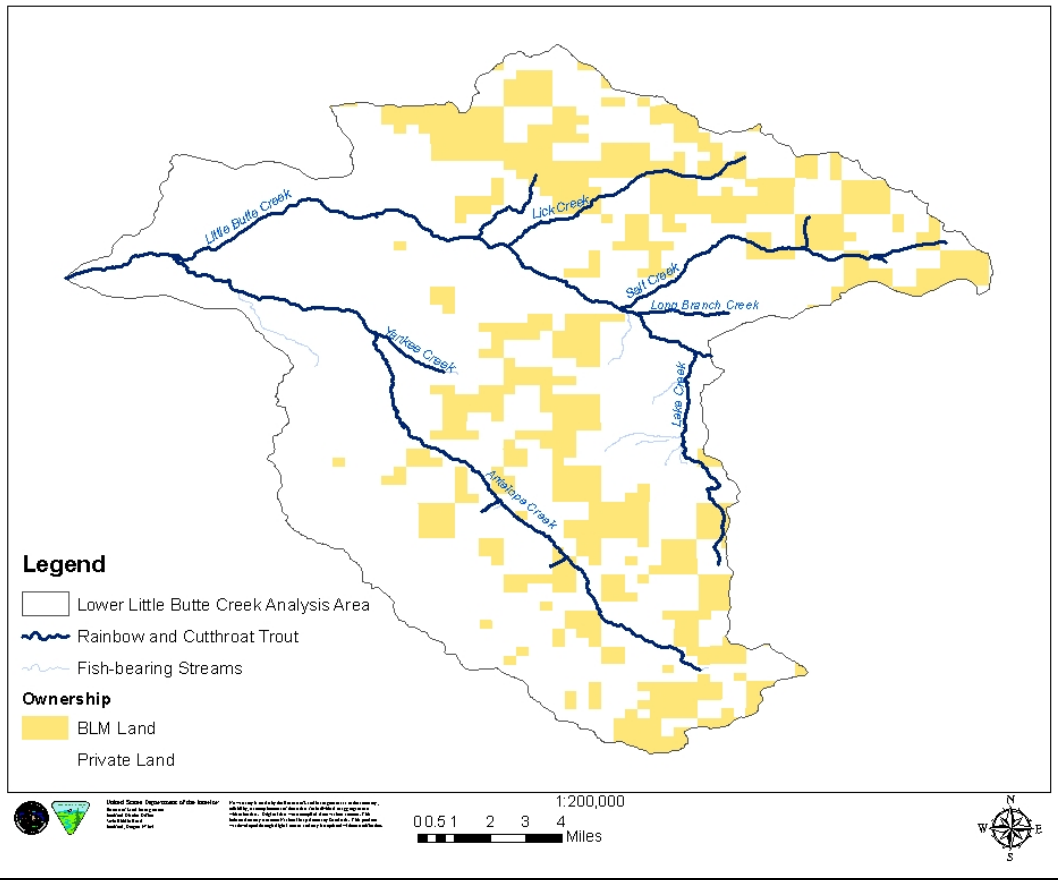


Native resident trout in the Lower Little Butte Creek Analysis Area (Figure 7) include cutthroat trout (*O. clarki*) and rainbow trout (*O. mykiss*). Other native fish species in the analysis area include Klamath smallscale sucker (*Catostomus rimiculus*) and reticulate sculpin (*Cottus perplexus*). Cutthroat trout are found in Little Butte, Antelope, and Lake Creeks and the lower reaches of Lick, Salt, and Long Branch Creeks for a total of 66.6 miles. Klamath smallscale suckers are probably found in habitat similar to coho salmon habitat. Pacific lampreys (*Lampetra tridentata*) are an anadromous species whose distribution in the analysis area is likely closest to that of chinook. The Oregon BLM recently developed best management practices for them as they are a species of concern.

Pacific giant salamanders have been observed within the plan area, although little is known about their status.

The major limiting factors influencing aquatic species distribution and instream habitat condition are: high summer stream temperatures and sedimentation. Other limiting factors include: riparian degradation, instream degradation, fish passage barriers, fish carcass reduction, and wetland and floodplain losses (USDI and USDA 1997).

Figure 7. Resident Trout Distribution in the Lower Little Butte Creek Analysis Area



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. The *Little Butte Creek Watershed Analysis* was completed in November 1997 (USDI and USDA 1997). This WQRP tiers to and appends the watershed analysis. A summary of historical and present watershed conditions in the Lower Little Butte Creek Analysis Area has been compiled from the watershed analysis (Table 2). The analysis and recommendations found in this WQRP use data from the watershed analysis. Additional analysis and recommendations have been included in this WQRP where the watershed analysis data were incomplete or new information was available.

Table 2. Summary of Watershed Conditions on BLM-Administered Lands in the Lower Little Butte Creek Analysis Area

Riparian Vegetation	
Historical Condition	• Late seral vegetation dominant. • Diverse mix of species and age classes.
Present Condition	• Mature hardwoods and small-diameter conifers with dense understory. • Non-native blackberries along lower elevation stream corridors.
Forest Health & Productivity	
Historical Condition	• Frequent, low intensity fires maintained low fuel levels and open under-story. • Forest stands had fewer trees per acre with trees of larger diameter. • Forest stands had diverse age classes. • Forests predominately composed of Douglas-fir, pine, and hardwood mixtures. • Areas of open mature oak forest.
Present Condition	• Fire exclusion resulting in high fuel loads. • High vegetation densities resulting in low vigor and/or poor growth. • Forest stands lack resiliency. • Forests experiencing mortality due to beetle infestations.
Large Wood	
Historical Condition	• Probably an adequate supply of large wood in the stream channels.
Present Condition	• Some stream reaches lack adequate large wood. • Road stream crossings disrupt transport of wood and sediment.
Roads	
Historic Condition	• Few roads before industrial timber harvesting began in the early 1950s.
Present Condition	• Areas with high road density. • Roads in riparian areas. • High number of stream crossings with many culverts undersized for 100-year flood. • Stream network extension (due to road ditch lines) increases winter peak flows.
Flow Regime	
Historic Condition	• Channel morphology developed in response to climatic conditions and natural ranges of streamflows. • Most likely, peak flows were lower in magnitude and frequency. • Summer low flows were directly related to the amount and timing of precipitation events.
Present Condition	• Summer low flows reduced by private water withdrawals and interbasin transfer.

Beneficial Uses

The Oregon Environmental Quality Commission has adopted numeric and narrative water quality standards to protect designated beneficial uses (Table 3). 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.

Table 3. Beneficial Uses in the Lower Little Butte Creek Analysis Area (OAR 340-41-271 (ODEQ 2008))

Beneficial Use	*Occurring*	*Beneficial Use*	*Occurring*
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	✓
Fish and Aquatic Life[2]	✓	Commercial Navigation & Trans.	
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 (http://www.deq.state.or.us/wq/rules/div041tblsfigs.htm#f1).

Listing Status

Section 303 of the Clean Water Act of 1972, as amended by the Water Quality Act of 1987, provides direction for designation of beneficial uses and limiting discharge of pollutants to waters of the state. The DEQ is responsible for designating streams that do not meet established water quality criteria for one or more beneficial uses. These streams are included on the state's 303(d) list, which is revised every two years, and submitted to the Environmental Protection Agency (EPA) for approval. Section 303 of the Clean Water Act (CWA) further requires that TMDLs be developed for waters included 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. The approach is designed to restore the water quality and result in compliance with the water quality standards, thus protecting the designated beneficial uses of waters of the state. This WQRP constitutes the BLM's commitment as a Designated Management Agency (DMA) responsible for compliance with the CWA on BLM-administered lands, to the implementation of the Rogue River Basin TMDL and WQMP.

At the time of this writing, the DEQ's 2004/2006 303(d) list is the most recent release. Surface waters in the plan area do not meet water quality standards for temperature, bacteria (fecal coliform and *E. coli*), dissolved oxygen, and sedimentation. The Rogue River Basin TMDL set TMDLs to address temperature and bacteria impairments and this WQRP will address those listings on BLM-administered lands. At the time of the writing of the TMDL, there were insufficient data to address the dissolved oxygen listings in the Rogue River Basin. DEQ intends to re-visit the Rogue River Basin dissolved oxygen impairments when the temperature and bacteria TMDLs are reviewed, on a 5-year basis. Improvements in dissolved oxygen levels are expected to occur as a result of implementing the Temperature TMDL (ODEQ 2008). There are three segments within the plan area that were listed in the 2004/2006 303(d) list as dissolved oxygen impaired (Table 4). Lick Creek is the only dissolved oxygen impaired segment that crosses BLM-administered land. It will be addressed in the WQRP after the TMDL is established by DEQ.

Table 4. 2004/2006 303(d) Dissolved Oxygen Listings in the Lower Little Butte Creek Analysis Area (ODEQ 2008)

303(d) List Date	Stream Segment	Season	Applicable Rule (at time of listing)	River Mile
2002	Lick Creek	Summer	OAR 340-041-0016	0 - 6.8
2004	Little Butte Creek	Sept. 15 – June 15	OAR 340-041-0016	0 – 16.7

303(d) List Date	Stream Segment	Season	Applicable Rule (at time of listing)	River Mile
2004	Little Butte Creek	Summer	OAR 340-041-0016	0 – 16.7

There are two segments in the analysis area that were listed in the 2004/2006 303(d) list as sedimentation impaired (Table 5). Of these two, Lake Creek is the only segment that crosses BLM-managed lands. At the time the Rogue River Basin TMDL was written, DEQ was in the process of developing a sedimentation assessment methodology that could be used for implementing the narrative sedimentation standard. The DEQ intends to re-visit the Rogue River Basin sedimentation impairments when the temperature and bacteria TMDLs are reviewed. Sedimentation will be addressed in the BLM's WQRP after the TMDL is established by DEQ.

Table 5. 2004/2006 303(d) Sedimentation Listings in the Lower Little Butte Creek Analysis Area (ODEQ 2008)

303(d) List Date	Stream Segment	Season	Applicable Rule (at time of listing)	River Mile
2002	Lake Creek	Undefined	OAR 340-041-0007(13)	0 - 7.8
2004	Little Butte Creek	Undefined	OAR 340-041-0007(13)	0 – 16.7

C. Temperature

Introduction

Cold-water aquatic life such as salmon and trout are the most temperature sensitive beneficial uses in the Lower Little Butte Creek Analysis Area (ODEQ 2008).

The Oregon water quality temperature standard that applies to the Lower Little Butte Creek Analysis Area was approved by EPA on March 2, 2004 and is found in OAR 340-041-0028 (4) (a-c) (ODEQ 2008). Excerpts of the 2004 standard 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 Lower Little Butte Creek Analysis Area temperature water quality standards can be found at: http://www.deq.state.or.us/wq/rules/div041tblsfigs.htm#f1. Perennial streams in the Lower Little Butte Creek Analysis Area are designated as core cold-water habitat on fish use map 271A, therefore the seven-day-average maximum for these streams may not exceed 16.0°C (60.8°F). Map 271B shows salmon and steelhead spawning use designations. The seven-day average maximum temperature may not exceed 13.0°C (55.4°F) from September 15 through June 15 for Little Butte Creek; October 15 through June 15 for Antelope Creek below Yankee Creek, and the lower reaches of Lick, Salt, and Lake Creeks; and January 1 through June 15 for Antelope Creek above Yankee Creek, Yankee Creek, and upper reaches of Lick, Salt (including Long Branch), and Lake Creeks.

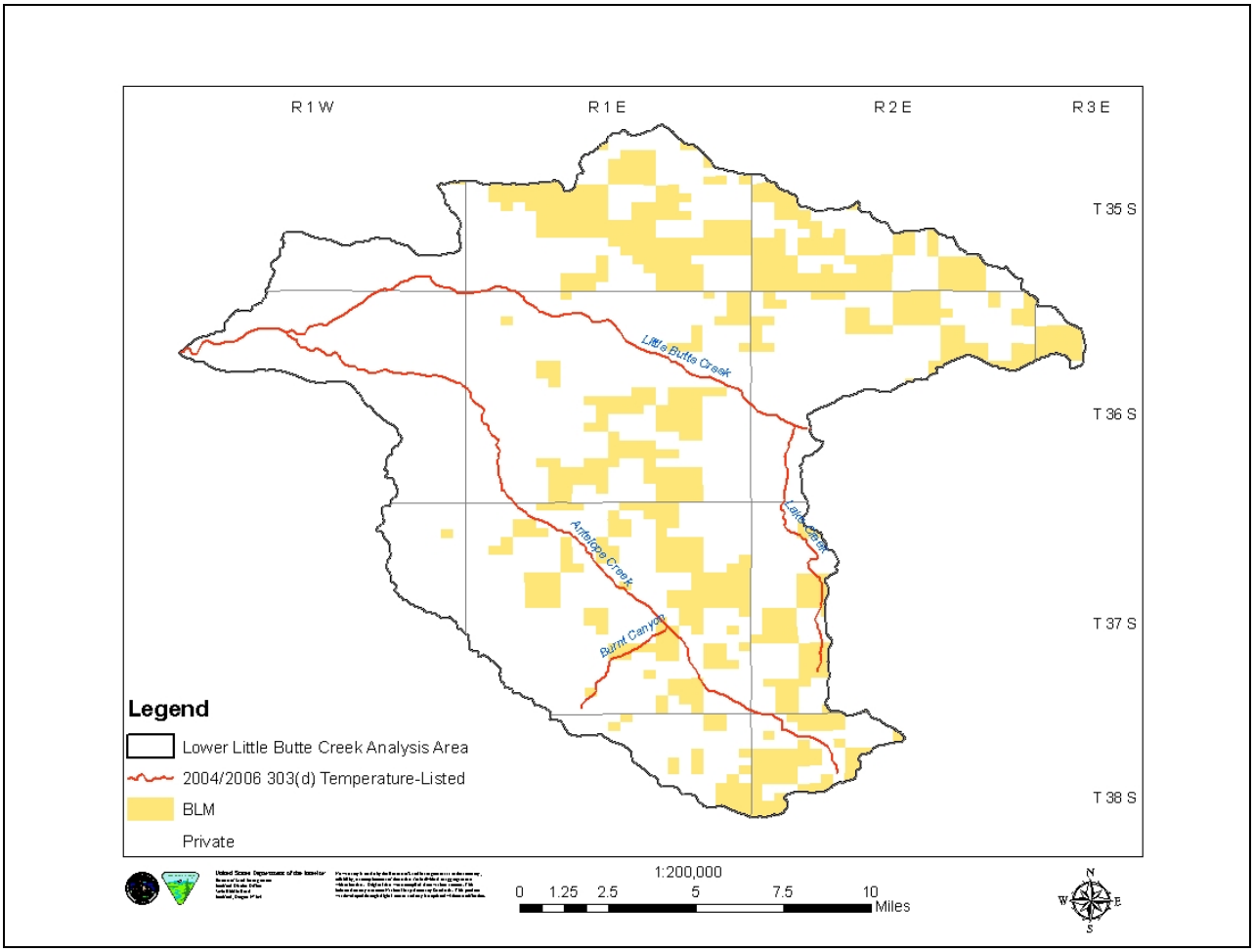
A stream is listed as water quality limited for temperature if there is documentation that the seven-day average of the daily maximum temperature (7DADM) exceeds the appropriate standard listed above. This represents the warmest seven-day period and is calculated by a moving average of the daily maximums.

The Rogue River Basin TMDL (ODEQ 2008) and this WQRP address all 2004/2006 303(d) temperature-listed streams within the Lower Little Butte Creek Analysis Area (Table 6). Within the plan area, there are a total of 47.4 stream miles on the 2004/2006 303(d) temperature list, of which 4.7 miles (10%) cross BLM-managed lands (Figure 8). The temperature impaired stream reaches on BLM-managed lands are: Antelope Creek, 1.1 miles; Burnt Canyon, 1.5 miles, and Lake Creek, 2.1 miles (USDI 2010).

Table 6. 2004/2006 303(d) Temperature Listings in the Lower Little Butte Creek Analysis Area (ODEQ 2008)

303(d) List Date	Stream Segment	Listed Parameter	Season	Applicable Rule (at time of listing)	River Mile
1998	Antelope Creek	Temperature	Summer	OAR 340-041-0365(2)(b)(A)	0 – 19.7
1998	Burnt Canyon	Temperature	Summer	OAR 340-041-0365(2)(b)(A)	0 – 3.2
1998	Lake Creek	Temperature	Summer	OAR 340-041-0365(2)(b)(A)	0 – 7.8
1998	Little Butte Creek	Temperature	Summer	OAR 340-041-0365(2)(b)(A)	0 – 16.7
Total Stream Miles listed for Temperature Criteria (Summer)					47.4

Figure 8. 2004/2006 303(d) Temperature Listed Streams for the Lower Little Butte Creek Analysis Area



The 2004/2006 303(d) temperature listings for the Lower Little Butte Creek Analysis Area are based on list dates from 1998 (Table 6). These listings use the State of Oregon water quality standards adopted in 1996. Excerpts of the 1996 standard (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 several locations within Lower Little Butte Creek Analysis Area between 1994 and 2005 (Table 7). The 7DADM for all sites monitored exceed both the 1996 and 2004 temperature criteria.

Table 7. Lower Little Butte Creek Analysis Area Temperature Summary

Stream Name	Period of Record[1]	7DADM[2] (ave. for all years) (°F)	Range of 7DADM[2] (for all years)	
			Minimum (°F)	Maximum (°F)
Antelope Creek above Burnt Canyon	1994-2001, 2005	73.7	69.0	78.5
Burnt Canyon above Antelope Creek confluence	1998-2000	64.8	63.1	67.5
Burnt Canyon at Antelope Creek confluence	1994-1999	72.4	63.5	81.8
Lake Creek at Little Butte Creek confluence	1995-2001	74.1	70.8	77.4
Little Butte Creek at Eagle Point	1994-2005	81.0	78.2	83.3

1/ Temperature measured from June to September.
2/ Seven-day average of the daily maximum temperature.

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. Human activities that contribute to degraded thermal water quality conditions in the Lower Little Butte Creek Analysis Area include: agricultural activity; suburban and rural residential developments; water withdrawals; timber harvests; local and forest access roads; and state highways (USDI and USDA 1997). Timber harvest, roads, and livestock grazing are the primary activities specific to federally managed lands that have the potential to affect water quality conditions in the plan area. For the Rogue River Basin temperature TMDL, there are five nonpoint source factors that may result in increased 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 (ODEQ 2008).

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. 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).

Activities in riparian areas such as timber harvest, residential and agricultural clearing, livestock grazing, and road construction, have reduced the amount of riparian vegetation in the Lower Little Butte Creek Analysis Area. Riparian areas in the plan area cover less area and contain fewer species than under historic conditions. They tend to be younger in age and dominated by hardwoods such as red alder, cottonwood, bigleaf maple, and Oregon ash (USDI and USDA 1997). Introduced blackberry species are successfully out-competing most of the native riparian shrubs. Large Douglas-fir and ponderosa pine that existed along higher elevation streams historically are often absent, especially in the lower reaches. Woodland stands are fragmented, creating a patchy, poorly connected landscape of simpler and less biologically productive habitat. These changes have resulted in less shade on stream surfaces and an increase in stream water temperatures (USDI and USDA 1997).

The primary reason for elevated stream temperatures on BLM-managed lands is an increase in solar radiation reaching the stream surface following timber harvest or road construction that removed stream shading vegetation. Pre-NWFP management activities along streams on federal lands in the plan area have 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 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.

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 Lower Little Butte Creek Analysis Area 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. Both active streambank erosion and sedimentation 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 analysis area such as landslides, surface erosion, and flood events contribute to increased sedimentation (USDI and USDA 1997). Sediment sources resulting from human activities include roads; OHV trails; logging (tractor skid trails, yarding corridors, and landings); concentrated livestock grazing in riparian zones; residential clearing of riparian zones; irrigation ditch blowouts; and poor irrigation practices (USDI and USDA 1997).

Temperature Factor 3: Hydromodification: Dams, Diversions, and Irrigation Districts

Diversion dams affect stream temperature by dewatering the downstream reach of the stream. Reductions in stream flow in a natural channel slow the movement of water and generally increase the amount of time the water is exposed to solar radiation. Stream temperatures downstream of diversion dams can be substantially warmer than those above (ODEQ 2008).

Canals and other unpiped water conveyance systems generally are open ditches. These ditches are usually unshaded and increase the surface area of water exposed to solar radiation. Where canal waters are allowed to mix with natural stream flows, stream temperatures can increase (ODEQ 2008).

Dams and reservoirs may contribute to stream warming. Reservoirs increase the surface area of water exposed to solar radiation and may delay the movement of water through the river system. Throughout the summer months reservoirs store solar radiation as heat in the warm surface waters pooled behind the dam, causing thermal stratification to occur. Accumulated heat is discharged with the stored water from each reservoir into downstream reaches during annual draw down which occurs from early summer until late fall (ODEQ 2008).

There are approximately 40 small BLM-managed and Oregon Water Resources Department (OWRD)-permitted water developments on BLM-administered lands within the analysis area. The developments range in size from 0.001 to 0.83 acre-feet (over 80 percent are less than 0.25 acre-feet) and are primarily used for wildlife, livestock, road operations, and prescribed fire on BLM-administered lands.

Temperature Factor 4: Hydromodification-Water Rights

The influence of stream flow is generally inversely related to the daily maximum stream temperature with higher flows moderating the diel swing of temperatures as long as everything else is unchanged (ODEQ 2008). Water diversions generally result in warmer stream temperatures.

There are serious geographical and seasonal deficiencies in water supply within the Little Butte Creek Watershed (USDI and USDA 1997). Summer streamflows have been dramatically altered by transbasin diversions upstream of the analysis area. The majority of OWRD-permitted water right diversions in the analysis area are for irrigation (USDI and USDA 1997). The BLM diverts a maximum of 5.8 acre-feet annually for the water developments described above under Temperature Factor 3.

Temperature Factor 5: Other Anthropogenic Sources

Upland and floodplain development has resulted in high percentages of impervious surfaces in some areas of the Lower Little Butte Creek Analysis Area. Increased impervious area results in greater stormwater runoff and diminished groundwater recharge. Warmer stream temperatures and poorer water quality are associated with these diminished flows (ODEQ 2008). For the analysis area, paved areas in the town of Eagle Point and roads are the main source of impervious areas.

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 site potential shade targets (percent-effective shade) were calculated for three streams on BLM-administered lands within the Lower Little Butte Creek Analysis Area: Antelope, Burnt Canyon, and Lake Creeks (Table 8). The data analysis method used for the shade assessment was the Shadow model (USDA 1993). The Shadow model determines the site 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 BLM-administered lands along the assessed reaches of Antelope, Burnt Canyon and Lake Creeks meet the target shade.

Table 8. Percent-Effective Shade Targets for BLM-Managed Lands in the Lower Little Butte Creek Analysis Area (ODEQ 2005)

Stream	Tributary to	Stream Miles Assessed on BLM	Current Shade[1]	Target Shade[1]	Additional Shade Needed[2]	Time to Recovery[3] (years)
Antelope Creek	Little Butte Creek	1.2	87	87	0	0
Burnt Canyon	Antelope Creek	2.0	95	95	0	0
Lake Creek	Little Butte Creek	1.0	92	92	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.

D. Bacteria

Introduction

Water contact recreation is the most sensitive beneficial use addressed in the Rogue River Basin Bacteria TMDL.

The current Oregon water quality bacteria standard is found in chapter 340, division 41, section 9 of the Oregon Administrative Rules (OAR) (ODEQ 2010). The following is an excerpt from the standard that applies to nonpoint sources in the Lower Little Butte Creek Analysis Area.

> *(1) Numeric Criteria: Organisms of the coliform group commonly associated with fecal sources (MPN or equivalent membrane filtration using a representative number of samples) may not exceed the criteria described in paragraphs (a) and (b) of this paragraph:*
>
> *(a) Freshwaters and Estuarine Waters Other than Shellfish Growing Waters:*
> *(A) A 30-day log mean of 126 E. coli organisms per 100 milliliters, based on a minimum of five (5) samples;*
> *(B) No single sample may exceed 406 E. coli organisms per 100 milliliters.*
>
> *(3) Animal Waste: Runoff contaminated with domesticated animal wastes must be minimized and treated to the maximum extent practicable before it is allowed to enter waters of the State.*
>
> *(4) Bacterial pollution or other conditions deleterious to waters used for domestic purposes, livestock watering, irrigation, bathing, or shellfish propagation, or otherwise injurious to public health may not be allowed.*
>
> *(10) Water Quality Limited for Bacteria: In those water bodies, or segments of water bodies identified by the Department as exceeding the relevant numeric criteria for bacteria in the basin standards and designated as water-quality limited under section 303(d) of the Clean Water Act, the requirements specified in section 11 of this rule and in OAR 340-041-0061 (12) must apply.*
>
> *(11) In water bodies designated by the Department as water-quality limited for bacteria, and in accordance with priorities established by the Department, development and implementation of a*

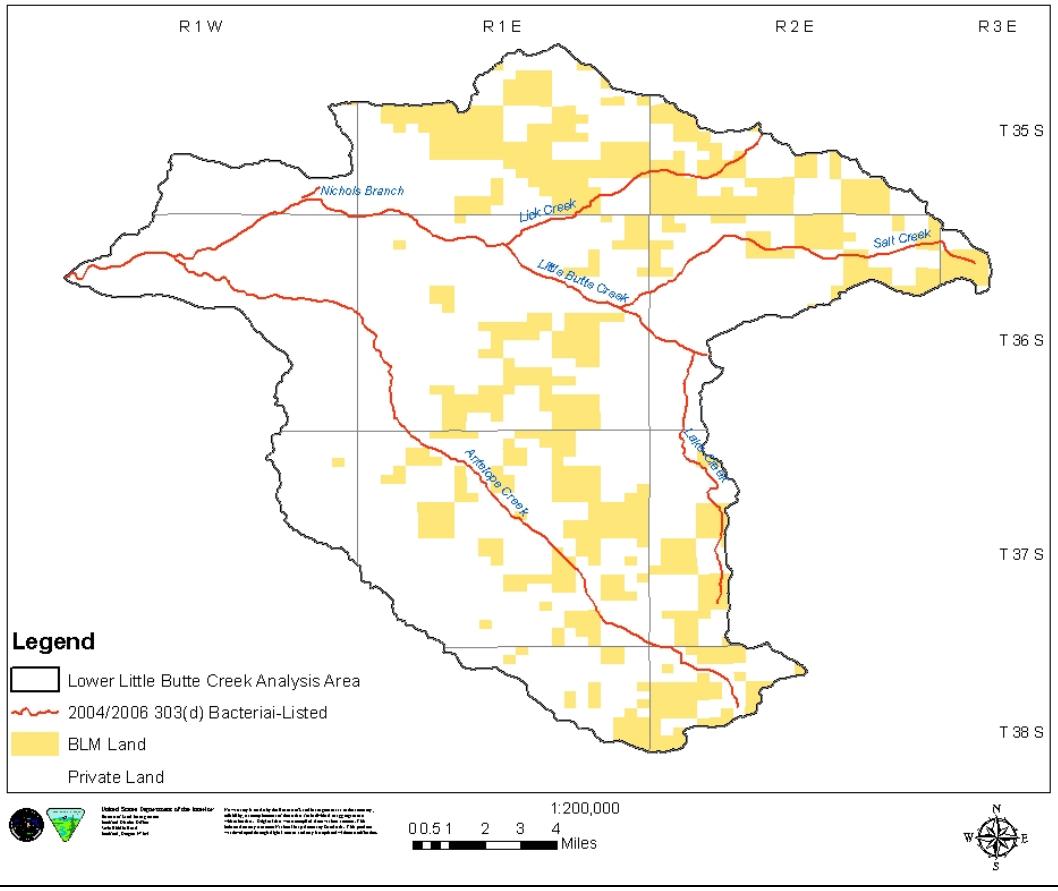
bacteria management plan may be required of those sources that the Department determines to be contributing to the problem. The Department may determine that a plan is not necessary for a particular stream segment or segments within a water-quality limited basin based on the contribution of the segment(s) to the problem. The bacteria management plans will identify the technologies, best management practices and/or measures and approaches to be implemented by point and nonpoint sources to limit bacterial contamination. For nonpoint sources, the bacteria management plan will be developed by designated management agencies (DMAs) which will identify the appropriate best management practices or measures and approaches.

DEQ's 2004/2006 303(d) list includes six streams within the analysis area that are listed for exceeding *E. coli* standards: Antelope, Lake, Lick, Little Butte, Nichols Branch, and Salt Creeks; Little Butte Creek is also listed for exceeding fecal coliform standards (Table 9 and Figure 9). There are 9.1 miles of summer *E. coli*-listed streams on BLM-administered lands within the analysis area: 1.1 miles on Antelope Creek, 2.1 miles on Lake Creek, 3.2 miles on Lick Creek, and 2.7 miles on Salt Creek. There are 5.9 miles of fall/winter/spring *E. coli*-listed streams on BLM-administered lands within the analysis area: 1.1 miles on Antelope Creek, 2.1 miles on Lake Creek, and 2.7 miles on Salt Creek.

Table 9. 2004/2006 303(d) Bacteria Listings within the Lower Little Butte Creek Analysis Area

303(d) List Date	Stream Segment	Listed Parameter	Season	Applicable Rule (at time of listing)	River Mile
2004	Antelope Creek	*E. coli*	Summer	OAR 340-041-0009(1)(a)(A,B)	0 – 19.7
2004	Antelope Creek	*E. coli*	Fall/Winter/Spring	OAR 340-041-0009(1)(a)(A,B)	0 – 19.7
2002	Lake Creek	*E. coli*	Summer	OAR 340-041-0009(1)(a)(A,B)	0 – 7.8
2002	Lake Creek	*E. coli*	Fall/Winter/Spring	OAR 340-041-0009(1)(a)(A,B)	0 – 7.8
2004	Lick Creek	*E. coli*	Summer	OAR 340-041-0009(1)(a)(A,B)	0 – 6.8
2004	Little Butte Creek	*E. coli*	Summer	OAR 340-041-0009(1)(a)(A,B)	0 – 16.7
2004	Little Butte Creek	*E. coli*	Fall/Winter/Spring	OAR 340-041-0009(1)(a)(A,B)	0 – 16.7
1998	Little Butte Creek	Fecal Coliform	Summer	OAR 340-041-0365(2)(e)(B)(i)	0 – 16.7
1998	Little Butte Creek	Fecal Coliform	Fall/Winter/Spring	OAR 340-041-0365(2)(e)(B)(i)	0 – 16.7
2002	Nichols Branch	*E. coli*	Summer	OAR 340-041-0009(1)(a)(A,B)	0 – 2.7
2004	Nichols Branch	*E. coli*	Fall/Winter/Spring	OAR 340-041-0009(1)(a)(A,B)	0 – 2.7
2004	Salt Creek	*E. coli*	Summer	OAR 340-041-0009(1)(a)(A,B)	0 – 9
2004	Salt Creek	*E. coli*	Fall/Winter/Spring	OAR 340-041-0009(1)(a)(A,B)	0 – 9
Total miles listed for summer fecal coliform					16.7
Total miles listed for fall/winter/spring fecal coliform					16.7
Total miles listed for summer *E. coli*					62.7
Total miles listed for fall/winter/spring *E. coli*					55.9

Figure 9. 2004/2006 303(d) Bacteria-Listed Streams for the Lower Little Butte Creek Analysis Area



E. Coli Sources

The pollutant of concern is fecal-related microorganisms. Fecal coliform bacteria are produced in the guts of warm-blooded vertebrate animals and found in the feces of humans and other warm-blooded animals. They indicate the presence of pathogens that cause illness in humans. *E. coli* is a subset of fecal coliform bacteria. A variety of everyday activities cause bacterial contamination in surface waters (ODEQ 2004). Fecal bacteria sources include wildlife, livestock waste, failing septic systems, and agricultural, rural residential and urban runoff (ODEQ 2008). Potential nonpoint sources of bacteria from BLM-administered lands may include animal feces (wild and domestic, including livestock such as cattle) and inadequate waste disposal by dispersed recreational users.

There is little data locally that indicate the potential input of bacteria from forest areas. Bacterial TMDL studies in the Willamette and North Coast Basins have indicated that background levels coming from forested areas are well below standards. The *E. coli* sample sites used in the Rogue River Basin TMDL were located well-below BLM-administered lands.

E. Coli TMDL Load Allocations

The criteria that apply to nonpoint sources are a log mean of 126 *E. coli*/100 ml in 30 days and 406 *E. coli*/100 ml as a daily maximum. The surrogate measure is the percent reduction target (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 Lower Little Butte Creek Analysis Area. 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 Lower Little Butte Creek Analysis Area will be dependent upon implementation of the BLM *Medford District Resource Management Plan* (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 (ROD) (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.

Recovery goals for temperature on federal land are specified in Table 10.

Table 10. Recovery Goals for BLM-Administered Land in the Lower Little Butte Creek Analysis Area

Element	Goal	Passive Restoration	Active Restoration
Temperature ***Shade***	• Achieve coolest water possible through achievement of target percent effective shade or at least 80 percent effective shade if the target is greater than 80 percent (Table 8).	• Allow riparian vegetation to grow up to reach target values.[1]	• Use prescriptions that ensure long-term riparian vegetation health. • Implement prescriptions that increase growth rate and survival of riparian vegetation. • Plant native species from local genetic stock to create a stand that will result in increased tree height and density.[1] • Reduce impacts to riparian vegetation from unauthorized OHV use.
Temperature ***Channel Modification***	• Increase the amount of large wood in channels. • Improve riparian rooting strength and streambank roughness. • Decrease bedload contribution to channels during large storm events. • Maintain or improve channel types, focusing on width-to-depth ratios. • Increase the ratio of wood-to-sediment during mass failures.	• Follow NWFP Standards and Guidelines or watershed analysis recommendations for Riparian Reserve widths (including unstable lands). • Allow historic streambank failures to revegetate. • Allow natural channel evolution to continue. (Time required varies with channel type.)	• Promote riparian conifer growth for future large wood recruitment. • Encourage woody riparian vegetation versus annual species. • Stabilize streambanks where indicated. • Maintain and improve road surfacing. • Reduce road and trail densities by decommissioning non-essential roads and trails. • Increase culverts to 100-yr flow size and/or provide for overtopping during floods. • Minimize future slope failures through stability review and land reallocation if necessary. • Ensure that unstable sites retain large wood to increase wood-to-sediment ratio.
Temperature ***Hydromodification***	• Maintain optimum flows for fish life. • Maintain minimum flows for fish passage.		• Utilize authorized water storage facilities to avoid diverting streamflows during low flows.
Temperature ***Other Anthropogenic Sources***	• Reduce impervious surfaces.		• Reduce impervious surfaces by decommissioning non-essential roads and trails.

Element	Goal	Passive Restoration	Active Restoration
Bacteria	• Decrease *E. coli* contamination caused by livestock.		• Manage livestock to prevent concentrations in streams or riparian zones.

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 NWFP Standards and Guidelines (USDA and USDI 1994, pp. C-31-C-38) 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). The minimum reserve width for fish-bearing streams, lakes, and natural ponds is 300 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 minimum reserve width of 150 feet slope distance on each side of the stream or waterbody. Intermittent streams receive a minimum reserve width of 100 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 includes BMPs that are important for preventing and controlling nonpoint source pollution to the "maximum extent practicable" (USDI 1995, pp. 149-177). 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, 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, reducing the number of road crossings, and reducing

road and trail densities. The highest priority areas for road/trail treatments will be Riparian Reserves and unstable areas.

Livestock grazing on BLM-administered lands will be managed in accordance with the *Standards for Rangeland Health and Guidelines for Livestock Grazing Management for Public Lands Administered by the Bureau of Land Management in the States of Oregon and Washington* (USDI 1997). The Standards and Guidelines identify five specific standards that address the health, productivity, and sustainability of the BLM-administered public rangelands. The water quality standard requires that agency actions comply with State water quality standards.

Evaluation of allotments as part of the Standards and Guidelines implementation will assess the effects of livestock grazing on watershed function (uplands and riparian/wetland areas) and water quality. Livestock grazing will be managed to maintain or restore proper functioning condition in riparian areas. Management measures used to limit the presence of livestock in stream channels or riparian zones will minimize the amount of bacterial contamination in surface water from BLM-managed lands. These management measures will be applied to all allotments within the plan area. Grazing allotment assessments and evaluations will identify specific grazing problems that are contributing bacteria. Corrective management measures will be implemented according to site-specific NEPA analysis.

Element 4. Time Line 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 be dependent 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. 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 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 Ashland and Butte Falls 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 as part of the TMDL in 2008. The WQMP covers all land regardless of jurisdiction or ownership within the Lower Little Butte Creek Analysis Area.

The BLM is committed to working cooperatively with all interested parties in the plan area. While partnerships with private, local, and state organizations will be pursued, the BLM can only control the implementation of this WQRP on public lands. It must be noted that only 10 percent of the 303(d) temperature-listed stream miles and less than 15 percent of the 303(d) bacteria-listed stream miles in the plan area are located on lands under BLM jurisdiction. Other organizations or groups that are (or will be) involved in partnerships for implementing, monitoring, and maintaining the Rogue River Basin WQMP in the Little Butte Creek Watershed include the Little Butte Creek Watershed Council, Jackson County, Oregon Department of Forestry (ODF), Oregon Department of Agriculture (ODA), Oregon Department of Transportation (ODOT), 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.

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" 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 evaluate progress of actions to attain water quality standards after TMDLs are developed and implemented. If DEQ determines that implementation 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 analysis area 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 is 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. If funding is available, annual monitoring will continue on the following

temperature-listed stream reaches until such time as they reach the state standard: Antelope, Burnt Canyon, and Lake 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 *Little Butte Creek Watershed Analysis* (USDI and USDA 1997). 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, fuels management, grazing management, etc. 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 Lower Little Butte Creek Analysis Area 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.

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