Water Quality Restoration Plan
Umpqua River Basin
South Umpqua Subbasin
West Fork Cow Creek

Bureau of Land Management (BLM), Medford District Office

2004

West Fork Cow Creek at a Glance

Hydrologic Unit Code (identification #)	1710030208
Watershed area/ownership	Total: 55,842 Federal Ownership: 29,935 acres (54%) Non-federal Ownership: 25,907 acres (46%)
Stream Miles assessed	Total: 5.6 miles
303(d) listed parameter	Temperature
Key Resources and uses	Timber Production, Recreation
Known Impacts (human)	Timber Production/roads
Natural Factors	High rainfall, low water holding capacity

Statement of Purpose

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

This plan covers land managed by the Bureau of Land Management (BLM) within the West Fork Cow Creek watershed from headwaters to confluence of Cow Creek.

The Oregon Department of Environmental Quality (DEQ) has lead responsibility for creating Total Maximum Daily Loads (TMDLs) and Water Quality Management Plans (WQMP) to address water quality impaired streams for Oregon. This WQRP will be provided to the DEQ for incorporation into an overall WQMP for the Cow Creek watershed. DEQ has a comprehensive public involvement strategy, which includes informational sessions, mailings, and public hearings. The BLM will provide support and participate in this public outreach.

Legal Authorities to be Used

Clean Water Act Section 303(d)

Section 303(d) of the Federal Water Pollution Control Act (Clean Water Act (CWA)) as amended in 1977, 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 need this additional help are referred to as "water quality limited" (WQL). Water quality limited waterbodies must be identified by the Environmental Protection Agency (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. The CWA section 303 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 TMDL, which will help to restore the water quality and result in compliance with the water quality standards.

Northwest Forest Plan

Federal land management is guided by the Northwest Forest Plan (NFP) which, although not law, creates a system of reserves to protect a full range of species and their habitats. Biological objectives of the NFP also include assurances that adequate habitat will be retained to aid in the “recovery” of late-successional forest habitat-associated species and prevention of species from being listed under the Endangered Species Act (ESA). The Aquatic Conservation Strategy (ACS) is an essential component of the NFP which ensures stream, lake, and riparian protection on Federal lands.

ACS Objectives. The ACS was developed to restore and maintain the ecological health of watersheds and aquatic ecosystems contained within USFS and BLM lands within the range of the northern spotted owl. The strategy seeks to protect salmon and steelhead habitat on lands within the range of Pacific Ocean anadromy.

The ACS strives to maintain and restore ecosystem health at watershed and landscape scales to protect habitat for fish and other riparian-dependent species and resources and restore currently degraded habitat. This approach seeks to prevent further degradation and restore habitat over broad landscapes. Because it is based on natural disturbance processes, it is recognized that it may take a century to accomplish all ACS objectives. Some improvements in aquatic ecosystems, however, can be expected in 10 or 20 years.

West Fork Cow Creek

Water Quality Restoration Plan

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West Fork Cow Creek
Watershed Analysis

Summary

MORPHOLOGY	
Geographic Province	Klamath
Watershed size	55,842 acres
Elevation range	1,000 feet – Confluence Cow Creek ~ 4,300 ft - Mt. Bolivar
Drainage pattern	dendritic
Total streams	704 miles
Drainage density	8.0 miles/square mile
Sixth-field watersheds	Upper West Fork Gold Mountain Creek Elk Valley Creek Bear Creek
METEOROLOGY	
Annual precipitation	60 - 90 inches; highest precip in western edge of basin
Precipitation Timing	80% occurring October thru May
Temperature range	0-100 degrees F
SURFACE WATER	
Minimum flow	3.0 cfs during several summers.
Maximum peak flow	15,700 cfs at USGS gauge
Reservoirs	None
Water quality limited streams	About 94 miles (listed for temperature above 64 degrees) 21% on BLM lands.

GEOLOGY			
Geologic Type	Metasediments, sedimentary, ultramafic		
Soils	Douglas County Soil Survey NRCS (SSURGO data)		
BIOLOGICAL			
Vegetation	Primarily mixed evergreen; conifers and hardwoods. Vegetative communities differ by slope, aspect, elevation and soils and distance from coast.		
Total fish streams	Approximately 66 miles		
Candidate, threatened, or endangered species	Spotted owl: fish:Oregon Coast coho salmon		
Survey and Manage species	Fungi, mollusks, bryophytes, lichens and red tree vole		
Special Status Plants	Numerous species and locations		
HUMAN INFLUENCE			
Counties	Douglas		
Roads	374 miles (3/09/99)		
Road density	4.6 mi./square mile		
Streams within one tree length of roads	319 miles		
Fish Streams within one tree length roads	29 miles		
Timber production	GFMA - 8,225 acres gross includes Connectivity Block About 50% of GFMA figure in Riparian Reserves		
Utility corridors	None		
Communities	None		
PUBLIC LANDS			
BLM Medford lands Forest Service lands	27,180 acres (48%) 1,836 acres (6%)		
	BLM Medford Land Use	**Acres**	**(Percent)**
	Late-successional Reserves/1	3,850	13
	Connectivity/Diversity Blocks	3,796	13
	General Forest Mgmt. Area/2	17,475	58
	Recreation Site	2,755	9
	Total	27,876	93
State of Oregon lands	625 acres (1%)		

Introduction

This document is prepared to comply with the Environmental Protection Agency requirements. This WQRP is the overall framework describing the management efforts to protect and enhance water quality on federal lands in the West Fork Cow Creek watershed.

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.

The WQRP will include the following elements:

1. Condition assessment and problem description
2. Resource Considerations
3. Limiting Factor Analysis
4. Goals and objectives
5. Timeline for implementation, cost, funding
6. Responsible Parties
7. Reasonable Assurance of Implementation
8. Monitoring/Evaluation Plan
9. Public Participation Plan

Element 1: Condition assessment and problem description

Table 1. Land Ownership in the West Fork Cow Creek watershed.

Ownership/Land Use	Acres	Percent of West Fork Cow Creek watershed
Medford BLM	26,452	47
Roseburg BLM	728	~ 1
Oregon State	625	~ 1
Private Timber Industry	25,282	45
Siskiyou National Forest	2,755	5
Total	55,842	99

A limited amount of placer mining has occurred within the watershed primarily above Walker Creek in the upper basin. Riparian vegetation that was removed from the stream banks was mainly a result of past timber harvests both on federal and non-federal lands. Much of the

vegetation has recovered adjacent to the channel. Floods of 1964, 1974, and 1981 destroyed much of the riparian vegetation along the creeks. New vegetation is now 20+ years of age. Most of the vegetation now providing shade to the stream is alder. There is no floodplain development within the basin although several stretches of the creek have over flow channels inundated during high water events.

APPLICABLE WATER QUALITY STANDARDS

Beneficial Uses

Oregon Administration Rules (OAR 340–41–322) list the designated beneficial uses for Umpqua River waters. The specific beneficial uses occurring in the West Fork Cow Creek watershed are presented in Table 2.

Table 2. Beneficial uses in the West Fork Cow Creek Watershed

Beneficial Use		***Beneficial Use***	
Public Domestic Water Supply	✓	Anadromous Fish Passage	✓
Private Domestic Water Supply	✓	Salmonid Fish Spawning	✓
Industrial Water Supply	✓	Salmonid Fish Rearing	✓
Irrigation	✓	Resident Fish and Aquatic Life	✓
Livestock Watering	✓	Wildlife and Hunting	✓
Boating	✓	Fishing	✓
Aesthetic Quality	✓	Water Contact Recreation	✓
Commercial Navigation & Trans.	✓		

The Oregon Environmental Quality Commission has adopted numeric and narrative water quality standards to protect designated *beneficial use*s. 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.

The Clean Water Act of 1972 as amended by the Water Quality Act of 1987, provides direction for designated beneficial uses. 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 West Fork Cow Creek has resulted in 303d listings for about 94 miles of streams that have failed to meet established criteria for one or more beneficial uses. See Table 3.

Table 3. Water quality limited streams in the West Fork Cow Creek watershed from mouth to headwaters.

Stream	Water Quality Parameter
West Fork Cow Creek	Temperature
Elk Valley Creek below East Fork Elk Valley Creek	Temperature
Elk Valley Creek above East Fork Valley Elk Creek	Temperature
Slide Creek	Temperature

Streams listed for temperature do not meet the criteria (e.g., the rolling 7 day average of the daily maximum temperature) for anadromous fish rearing (e.g., temperature exceeds 64 degrees). This also applies to the resident fish and other aquatic life, particularly resident cutthroat, which are present in these streams (Map 1).

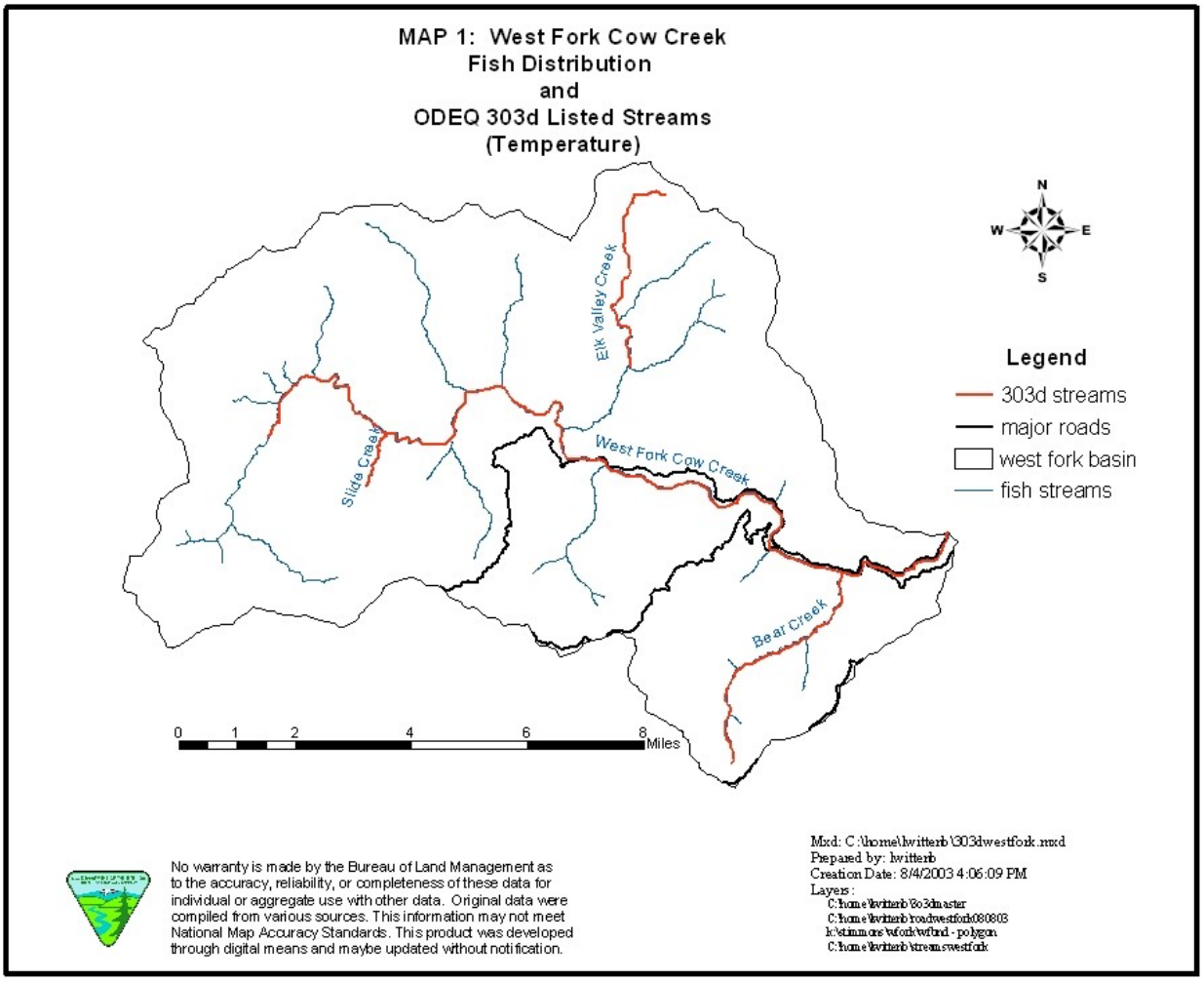


Table 4 lists historic and present condition information about elements that may affect temperature on West Fork Cow Creek.

Table 4. Historic and current conditions of selected elements.

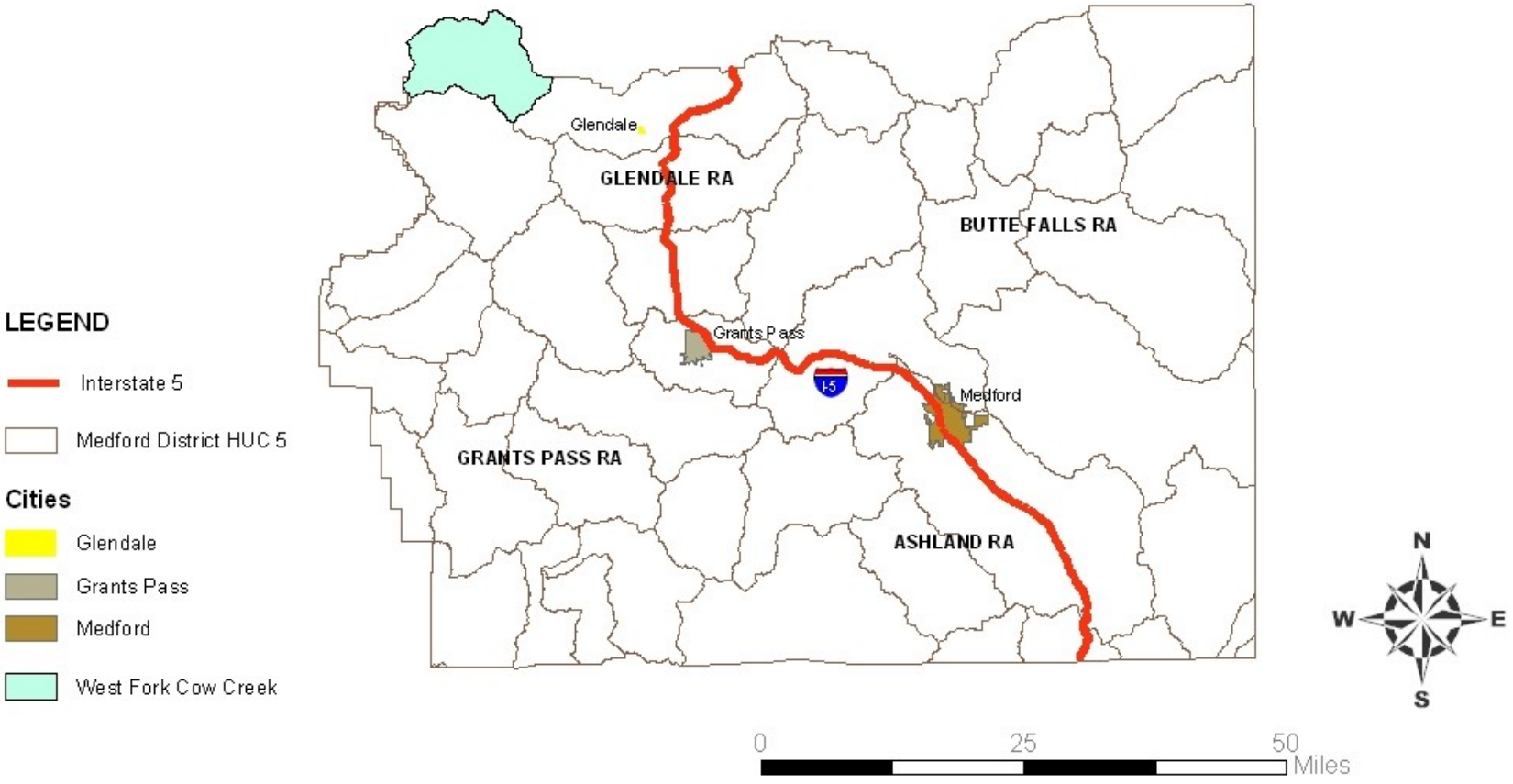
Riparian Vegetation	
Historical Condition	1953 photos show some portions containing old conifer interspersed with alder and maple.
Present Condition	Floods and salvage have reduced riparian cover as well as die off as a result of Port-Orford-cedar root rot.
Forest Health & Productivity	
Historical Condition	Mosaic of mature to old-growth integrated with young stands.
Present Condition	Most old-growth gone, many stands from 10-40 years old.
Roads	
Historic Condition	1953 photos show one road in the area up to Hayes Creek.
Present Condition	374 miles of road / road density 4.6 mile/square mile
Flow Regime	
Historic Condition	No historic data to refer to.
Present Condition	Probably approaching pre-harvest level now that stands are beginning to mature.

Element 2: Resource Considerations

West Fork Cow Creek is a 55,842 acre watershed that is tributary to the South Umpqua River in Southwest Oregon.

The West Fork Cow Creek Watershed is a fifth-field watershed in the Klamath Mountains province, located in southwest Oregon, approximately 20 miles northwest of Glendale (Map 2).

Map 2. West Fork Cow Creek



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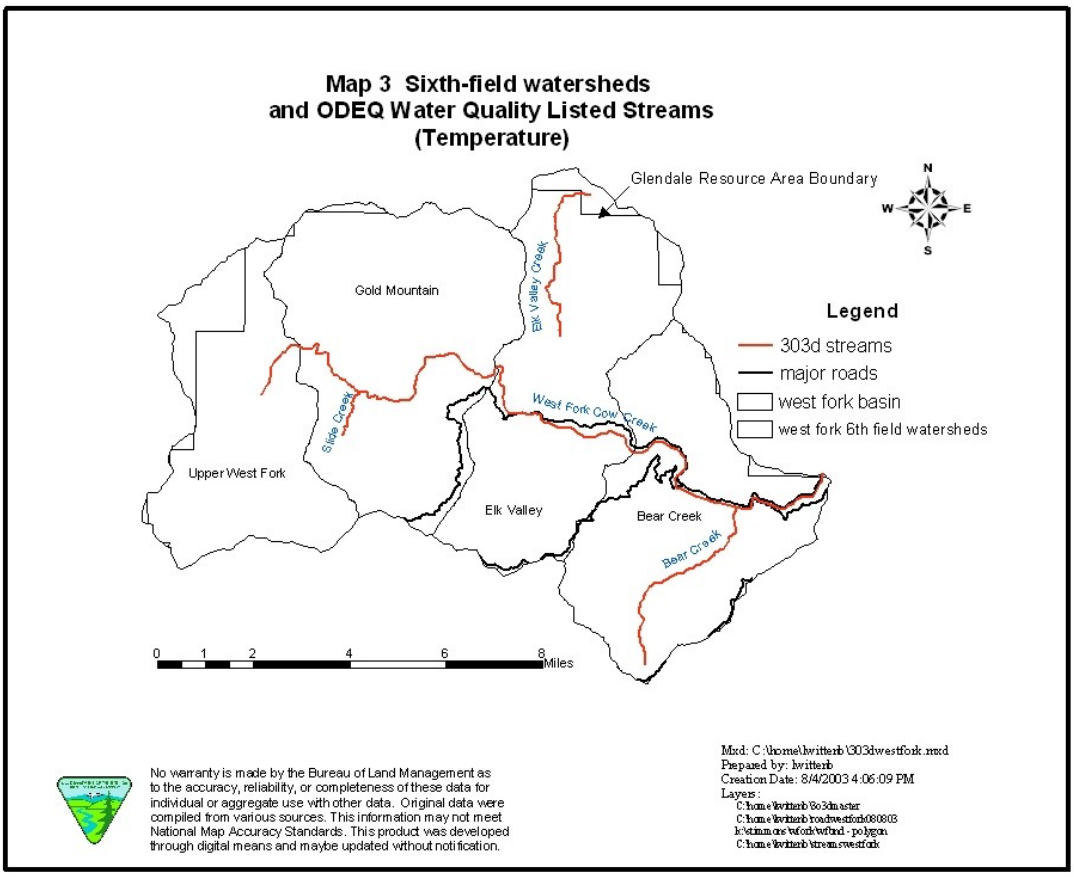
BLM administers about 27,180 acres (48 percent) of the watershed. No towns or communities are in the watershed. There are no residential areas located within the watershed.

Major tributaries of West Fork Cow Creek include Bear Creek, Elk Valley Creek, Walker Creek, and Wilson Creek. The unit has been divided into four sixth-field watersheds (Table 5) and 47 seventh-field watersheds ranging from about 10 acres to about 5,730 acres. These include a series of small unnamed creeks which drain directly into West Fork Cow Creek. Annual precipitation in the watershed averages about 80 inches. Extended summer drought is common (Map 3).

Table 5. Sub-watersheds within the West Fork Cow Creek watershed.

Sixth-field watershed	Acres	Percent of West Fork Cow Creek watershed
Bear Creek	13,855	25
Elk Valley Creek	14,654	26
Gold Mountain Creek	16,376	29
Upper West Fork Creek	10,958	20
Total	55,843	100

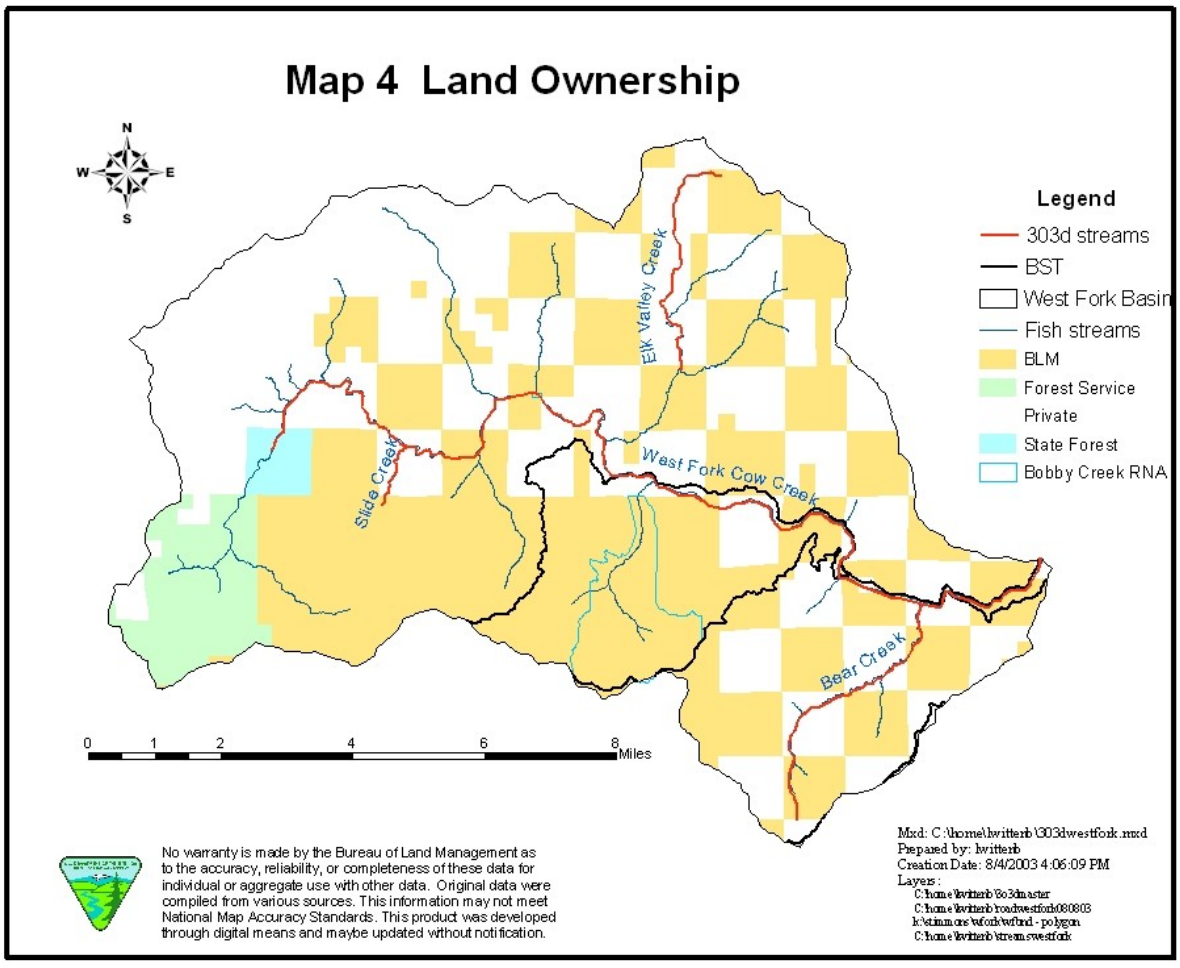


Soils in the unit are derived from sedimentary, metasedimentary and metavolcanic rock types. Soils associated with metasedimentary rocks tend to be deeper and have more nutrients available. Soils developed from metavolcanic rock types tend to be shallow and have less soil nutrients and soil development than the sedimentary. Organic matter plays an increasing role in the productivity of the metavolcanic sites. Some of the unit is 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. Seams of serpentinite can be observed near Mt. Bolivar and Gold Mountain.

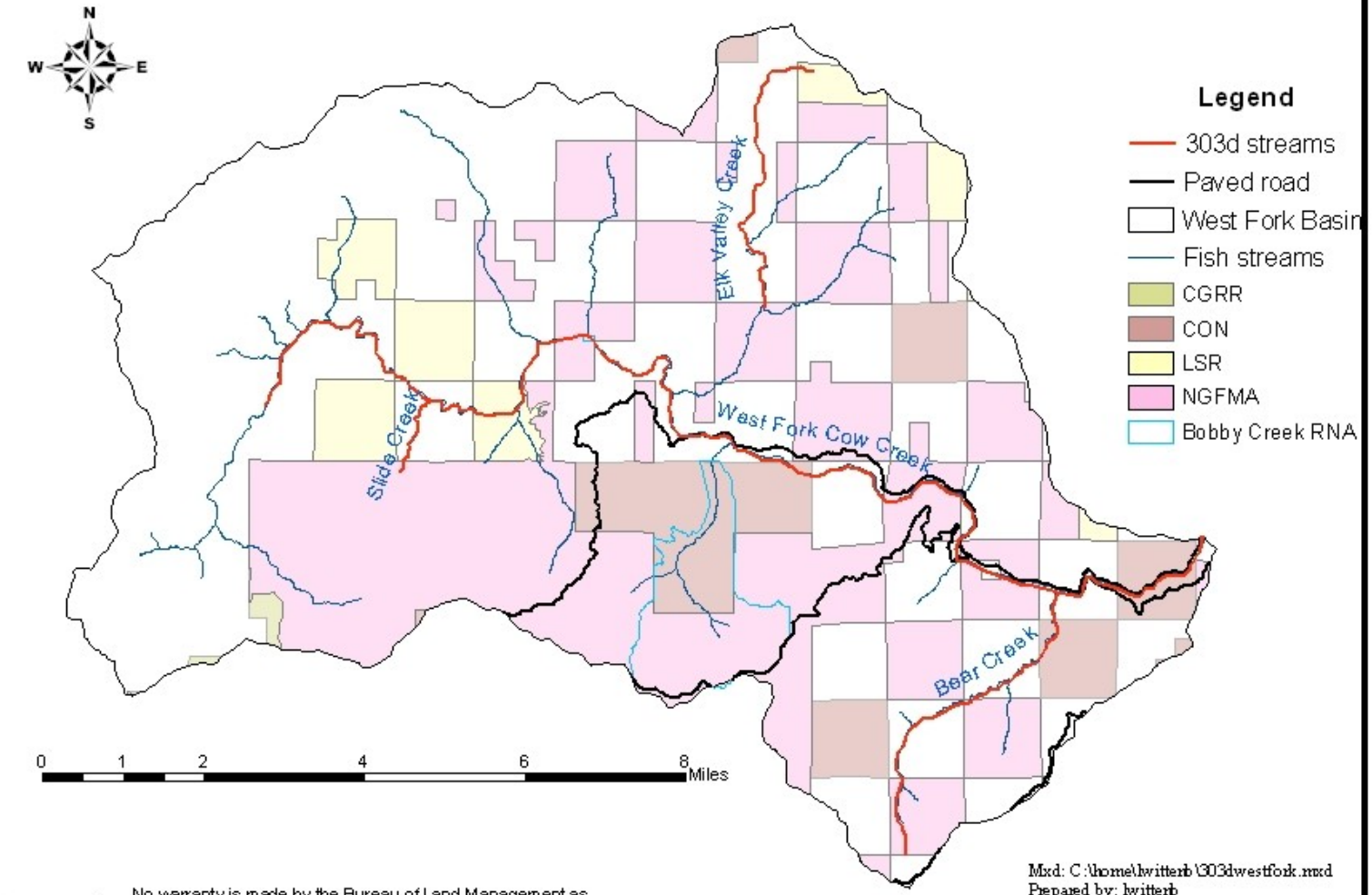
Federal lands are intermingled with non-federal lands in a "checkerboard" pattern characteristic of much of the Oregon and California (O & C) railroad lands of Western Oregon (Table 1) except for the area of the watershed south of the West Fork of Cow Creek west of Bear Creek (Map 4).

Land Use Allocations

The Medford District Resource Management Plan (RMP) designated several land use allocations for federal lands within the watershed. These allocations provide overall management direction and varying levels of resource protection. (Map 5)



Map 5 Land Use Allocation



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Area of Critical Environmental Concern/Research Natural Areas are set aside for protection of unique values and generally not available for timber harvest.

*Late-successional reserves (*LSRs) are areas designated in the RMP where the major management objective is to maintain or promote late-successional and old growth habitat. Only a small portion of LSR is in the watershed near the headwaters of Hayes Creek and Wilson Creek.

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 nine of these Connectivity/Diversity blocks in the watershed.

The General Forest Management Area (GFMA) is the allocation where timber harvest is a primary objective. The RMP calls for retaining at least 6-8 large trees per acre in regeneration harvests.

Table 6. Federal Land Use Allocations within the West Fork Cow Creek Watershed.

Land Use Allocation	Acres	(Percent)
Late-successional Reserves/1	3,850	13
Connectivity/Diversity Blocks	3,796	13
General Forest Mgmt. Area/2	3,796	58
ACEC/RNA	1,912	6
Forest Service	2,757	10
Total		100

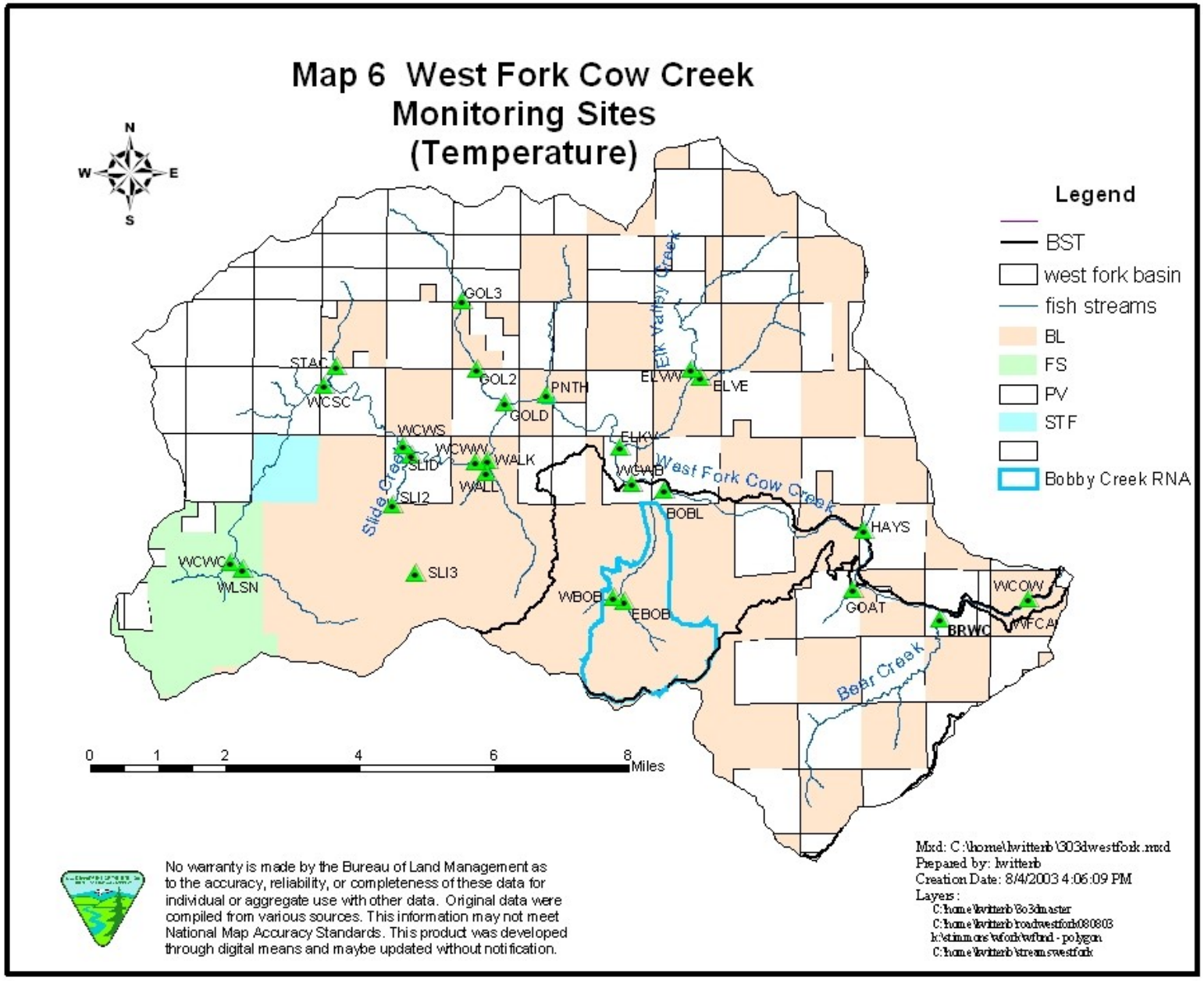
/1 Late-successional reserves include portions of large LSR and spotted owl core areas.
/2 General forest management area includes acres of riparian zones that are withdrawn from entry (see map 5). This constitutes about 40 to 50 percent of the GFMA.
Section 303(d)(1) of the Clean Water Act requires that TMDL "be established at a level necessary to implement the applicable water quality standard with seasonal variations." Both stream temperature and flow vary seasonally and from year to year. Water temperatures are cool during the winter months, and only exceed the State standard between the summer months of June and September when stream flows are lowest and solar radiation is the highest. The BLM monitored several 303(d) listed streams during the summers of 1998 and 1999 to determine which portion of the streams are water quality limited. Table 7 lists the site locations where BLM monitoring has occurred. Stream temperatures exceed the standard during some periods between June and September. Definitive information on where stream temperatures meet the

standard on stream reaches have not been analyzed. It will take several years of monitoring to determine the reaches that have temperature limiting problems.

Table 7. Temperature Monitoring Locations and years monitored

Site ID	Site Location Description	Highest 7 day temp for period of record	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
BRWC	Bear Creek above confluence with West Fork Cow Ck, @ road 32-8-10	69.2			x	x	x					
BOBL	Lower Bobby Creek @ confluence with West Fork Cow Creek	60.1	x				x					
EBOB	East Fork Bobby Creek above confluence with West Fork	59.7		x	x	x	x	x	x		x	x
WBOB	West Fork Bobby Creek above confluence with East Fork	59.1		x	x	x	x	x	x		x	x
ELKV	Elk Valley Creek @ confluence with West Fork Cow Creek	72.2		x	x	x	x					
ELVE	Elk Valley Creek East Fork above West Fork confluence	62.2		x	x	x	x					
ELVW	Elk Valley Creek West Fork above East Fork confluence	70.7		x	x	x	x					
GOAT	Goat Trail Creek @ confluence with West Fork Cow Creek	66.6				x	x					
GOLD	Gold Mountain Creek @ confluence with West Fork Cow Creek	65.6		x	x	x						
GOL2	Gold Mountain Creek @ 31-9-21/28 line	66.5									x	x
GOL3	Gold Mountain Creek above 31-9-22 road @ BLM/private line	60.4									x	x
HAYS	Hayes Creek above confluence with West Fork Cow Creek	61.2		x	x		x					
PNTH	Panther Creek @ confluence with West Fork Cow Creek	64.6	x		x	x	x					

SLID	Slide Creek @ confluence with West Fork Cow Creek	65.9		x	x	x					x	x
SLI2	Slide Creek below 32-9-6 line	59.3									x	x
SLI3	Slide Creek above 32-9-10 road	56.0									x	x
STAC	Stanley Creek above private in 31-9-19	56.3									x	x
WALK	Walker Creek near confluence with West Fork Cow Creek	62.4	x		x	x	x					
WALL	Wallace Creek @ confluence with Walker Creek	58.7				x	x					
WCOW	West Fork Cow Creek @ USGS Gaging Station	80.3	x	x	x	x		x			x	x
WFCA	West Fork Cow Creek Ambient **Air** Temp. @ USGS Gaging Station	82.4							x	x	x	x
WCWB	West Fork Cow Creek above Bobby Creek, @ bridge on road 32-8-11	78.6	x		x	x						
WCWC	West Fork Cow Creek above Wilson Creek	61.9					x				x	x
WCWS	West Fork Cow Creek above Slide Creek	77.9		x	x	x	x					
WCWW	West Fork Cow Creek above Walker Creek	70.3	x									
WCSC	West Fork Cow Creek above confluence with Stanley Cr.	73.0									x	x
WLSN	Wilson Creek @ confluence with West Fork Cow Creek	59.1					x					


Map 6 West Fork Cow Creek
Monitoring Sites
(Temperature)
N
W
E
S
Legend
BST
west fork basin
fish streams
BL
FS
PV
STF
Bobby Creek RNA
GOL3
STAC
WCSC
GOL2
PNTH
GOLD
ELVW
ELVE
Elk Valley Creek
WCWS
WCWW
SLID
WALK
WALL
SLI2
SLI3
Slide Creek
ELKV
WCWB
West Fork Cow Creek
BOBL
HAYS
WCWC
WLSN
WBOB
EBOB
GOAT
WCOW
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Element 3: Limiting Factor Analysis

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. In addition to these land allocations, there are also several other important designations that occur within the watershed. BLM manages approximately 48 percent of the watershed. Less than 32 percent of the water quality limited stream miles within this watershed occur on BLM.

Analysis of water quality limited streams in West Fork Cow Creek

Table 8 shows the approximate percentage of stream lengths administered by federal and non federal entities.

Table 8. Estimated Percent of West Fork Cow Creek Streams on Federal vs. Non-Federal Land.

Stream	Approximate Percentage of Streams on Non-Federal Land	Approximate Percentage of Streams on Federal Land	Length of Listed Stream	Federal Stream Miles
Elk Valley Creek	100	0	4.1 miles	
West Fork Cow Creek	70	30	17.9	5.4
Slide Creek	30	70	4.4	3.1
Total Stream Miles			26.4	8.5

It is felt that there is little that BLM could contribute to reducing water temperatures on most of the above listed streams due to ownership and the juxtaposition of BLM lands to the confluence of the smaller streams and West Fork Cow Creek. BLM lands are for the most part well vegetated and are in the higher portions of the streams with the exception of Elk Valley Creek above East Fork Elk Valley Creek which is all non-federal.

There are several conditions within the watershed that would explain the higher percentage of water quality limited miles on non-federal lands: Geology and soils of this watershed do not allow for a great degree of water storage. Uplands are steep and soils are relatively shallow. Recharge of streams by ground water is very limited during summer months. In addition land ownership and management of those lands differ greatly between federal and non federal lands.

Temperature

Maximum summer water temperatures in the West Fork Cow Creek probably always exceeded the current DEQ standard. Due to stream width and low summer flows. Low water of 3 to 5 cubic feet per second has been recorded for numerous years at the USGS stream gauge near the confluence with Cow Creek.

There are many factors that may contribute to elevated temperature in these streams. In many cases there is more than one factor operating on stream and may include:

- Several tributary streams have segments that have no surface flow during summer periods;
- Low summer discharge;
- Riparian cover is absent or reduced due to past salvage logging within riparian zones; logging has removed shade over streams as well as destruction of streamside vegetation by floods;
- Wide streams and stream orientation allow for direct solar heating;
- Wide, shallow gravel/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;
- Many of the larger tributaries to WF Cow Creek are on non-federal land and both Oregon Senate Bill 1010 (SB 1010) governing agricultural Water Quality and Oregon Forest Practices Act (OFPA) regulations regarding management activities in riparian areas are less restrictive than those of the Northwest Forest Plan and BLM's RMP;
- Placer mining.

Stream Flow

The lowest low flow for the USGS gauge station near the confluence with Cow Creek for the period of record was 3 cfs. (Map 1). 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. Historic data for the gaging station is available at web site address: http://www.wrd.state.or.us/cgi-bin/choose-gage.pl Tablized data is not included in this document due to volume of data on that web site.

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). This watershed has a fire history with return intervals averaging 50 to 70 years. Recovery of riparian vegetation in areas disturbed by fire and flood will most likely be offset by future events. The gain and loss of riparian vegetation by natural processes will fluctuate within the range of natural variability for this watershed and is outside the scope of this assessment. This Water Quality Restoration Plan (WQRP) focuses on areas where BLM management activities may exacerbate natural disturbance and result in impacts to water quality and quantity.

Factors Affecting Stream Temperature

The West Fork Cow Creek Water Quality Restoration Plan addresses stream shade, changes in channel form, and flow as the three management factors that may contribute to water temperature problems.

There are many interrelationships between riparian /floodplain vegetation, summer stream temperatures, sediment storage and routing and the complexity of habitats in the West Fork Cow Creek Watershed. It should be mentioned here that large mature conifers or hardwoods would likely continue to be rare on private lands, within the watershed unless major changes in land uses or land use regulations occur in the Oregon Department of Forestry. This translates to a continuance of unrecovered conditions on private lands, largely due to logging activities. These low gradient areas have high biological potential for salmon as "grubstake habitat" (Frissell 1993). In addition, recovery of large tree components on upstream public lands will not greatly benefit these habitats on private lands if these large tree lengths are not allowed to remain in the stream channel on private lands. An exception will be an anticipated decrease in sediment. Reduce runoff from upslope and upstream areas and the consequent affect of reduced sedimentation may benefit these downstream aquatic and riparian habitats on private lands.

Temperature Factor 1. - Stream Shade

For the listed parameter, i.e., stream temperature, the beneficial uses affected are: resident fish and aquatic life and salmonid fish spawning and rearing. The state standard for West Fork Cow Creek watershed requires that the seven (7) day moving average of the daily maximum shall not exceed 64 degrees Fahrenheit. A stream is listed as water quality limited when the rolling seven (7) day maximum average exceeds the standard.

Stream temperature is driven by the interaction of many variables. Energy exchange may involve radiation, longwave radiation, evaporative heat transfer, conduction and advection (e.g., Lee 1980, Beschta 1984). While interaction of these variables is complex, certain variables have a greater affect than others (Beschta 1987). 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. Solar radiation is the singularly most important radiant energy source for the heating of streams during daytime conditions (Beschta 1997).

Without riparian shade trees, most incoming solar energy would be available to heat the stream. Riparian vegetation can effectively reduce the total daily solar heat load. The stream shade assessment determined where the stream shade has been reduced by management activities and placer mining and calculated the resulting increase in total daily solar heat loading. To determine where shade problems exist and the magnitude of the problem, the stream network of West Fork Cow Creek was broken down into sections consisting of the main stem and its tributaries. Management activities such as harvesting trees in the riparian area can increase the amount of solar radiation entering a stream similarly increased bedload sediment that results in increases in the stream's surface area can also lead to increases in solar radiation.

Temperature Factor 2. - Channel Form

Changes in bedload that alter channel morphology result from sediment input that exceeds transport capability of the stream. Sediment deposition can result in channel filling, thereby increasing the width-depth ratio. An increase in channel width can increase the amount of solar radiation entering a stream. A wide, shallow stream will heat up faster than a narrow, deeper stream with the same discharge. Input of sediments associated with storm events, and

management-related sources of sedimentation can increase sediment over natural background and contribute to channel widening and subsequent stream temperature increases.

Temperature Factor 3. Flow

The temperature change produced by a given amount of heat 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 all other channel and riparian characteristics are the same.

Routing of surface and subsurface waters via interception by road cuts has resulting in more rapid runoff during storm events and has precluded infiltration and subsequent slower release of stored water.

A flood plain in West Fork Cow Creek watershed has not developed. The flat areas of deposition are currently the places where some braiding occurs during high flows.

Element 4: Goals & Objectives

Temperature Findings

Assessing the impact of BLM management on temperature will be based on a two-pronged approach that examines shade and channel form. Temperature goals with this plan are to produce the coolest water possible. Shade effects as a consequence of historic harvest will largely recover within the next 30 years on the smaller tributaries on BLM lands. This conclusion is based on age class on harvest units adjacent to streams on BLM lands taken from operations inventories. Riparian zones on larger tributaries and mainstem West Fork Cow Creek may take considerably longer (25 to 30 years) to recover (Table 9).

Table 9. Acres of Riparian Reserve by age class on Medford BLM lands West Fork Cow Creek Watershed.

HUC 6				
Age Class	**Upper West Fork**	**Gold Mountain**	**Elk Valley Creek**	**Bear Creek**
Non Forest	15	40	34	19
0-10 years	61	164	564	352
11-20 A	133	687	286	92
21-30 A	92	392	471	222
31-40 A	26	704	398	435
41-50 A	0	38	1	89

HUC 6				
Age Class	**Upper West Fork**	**Gold Mountain**	**Elk Valley Creek**	**Bear Creek**
51-60 A	0	272	41	17
61-70 A	10	206	34	0
71-80 A	0	118	86	185
81-200 yrs.	252	616	708	855
201+ A	814	950	1,922	2,023
81+ Modified	36	158	233	579
Total Acres:	**1,439**	**4,345**	**4,778**	**4,868**

Forest Service administers 2,755 acres primarily in Foggy Creek drainage. (BLM database)

Table 10. Acres by age class on Forest Service land in Upper West Fork HUC 6 Information from Forest Service 2/19/99

Age Class	Total	Riparian
Non Forest	6	2
0-10 years	94	21
11-20 "	80	18
21-30 "	134	29
31-50 "	602	151
51-80 "	1,016	210
81-200+	1,193	390
Total Acres:	3,125	821

Discrepancy of about 400 acres is a result of Rogue Wilderness acres not reflected in the 2,755 figure.

However, an assumption was made that smaller order streams would be shaded by brush, hardwood and conifer species at an earlier age than the larger order streams. Most of the smaller order streams are hill slope constrained and narrow. When the data in table 10 are compared to the data presented in the allocation for Federally-administered lands (Appendix 1) there was found to be a very strong correlation between modeled existing shade percentage and percentage of seral stages over 30 years of age. The recovery period in the TMDL is based on site potential and time required to reach maturity for conifer species and disregards hardwoods and brush species occurring along mainstem of West Fork Cow Creek

The recovery of water temperature conditions in the basin on federal lands will be dependent upon implementation of the BLM Medford District Resource Management Plan (RMP). Paramount to recovery is adherence to the Standard and Guidelines of the NFP to meet the ACS. This includes protection of riparian areas as reserves and may include some silvicultural work to reach vegetative potential as rapidly as possible.

Table 11. Goals for Federal Lands

Element	***Goal***	***Passive restoration***	***Active Restoration***
Temperature Shade Component	Achieve coolest water temperatures possible through achievement of shaded riparian reserves.	Allow vegetation to grow naturally in riparian reserves as described in the NFP Aquatic Conservation Strategy	Silvicultural projects designed to promote achievement of site potential hardwood and conifers in a more rapid manner.
Temperature Channel Form Component	Maintain channel configuration of 1st through 4 order streams on BLM lands which are currently hydrologically properly functioning at this point.	Allow natural hydrologic processes to occur within the riparian reserves. Follow standards and guidelines of NFP Aquatic Conservation Strategy	Maintain roads to reduce sediment delivery to streams. Install drainage structures capable of passing 100 year flood events. Decommission roads to minimize potential sediment sources.
Temperature Stream Flow Component	Maintain natural flow conditions. Maintain flow needed for aquatic life.	Minimize consumptive use in management of BLM lands	Work with state Watermaster to identify unauthorized diversions. Reduce road densities by decommissioning roads which are no longer needed for management.

The shade model ran by DEQ utilized 1995 black and white and 1999 color aerial photos. It is believed that some canopy closure has occurred since 1999 and therefore more shade is already on streams than is indicated in the TMDL portion of DEQ Water Quality Management Plan. BLM does not intend to implement items in are not mentioned in table 10.

Element 5: Time line for Implementation and Attainment

It is difficult to set an exact recovery time for optimum shade when the recovery process is storm dependent.

The goal of the Clean Water Act and associated Oregon Administrative Rules (OARs) is that water quality standards shall be met or that all feasible steps will be taken towards achieving the highest quality water attainable. This is a long-term goal in many watersheds, particularly where non-point sources are the main concern.

DEQ recognizes that TMDLs are values calculated from mathematical models and other analytical techniques designed to simulate and/or predict very complex physical, chemical and biological processes. Models and techniques are simplifications of complex processes, and, as such, are unlikely to produce an exact prediction of how stream surveys will respond to the application of various management measures.

WQMPs are plans designed to reduce pollutant loads to meet TMDLs. DEQ recognizes that it may take several decades – after full implementation before management practices identified in a WQMP become fully effective in reducing and controlling pollution. In addition, DEQ recognizes that technology for controlling nonpoint source pollution is, in many cases, in the development stages and will likely take one or more iterations to develop effective techniques. It is possible that after application of all reasonable best management practices, some TMDLs or their associated surrogates cannot be achieved as originally established.

DEQ also recognizes that despite the best and most sincere efforts, natural events beyond the control of humans may interfere with or delay attainment of the TMDL and/or its associated surrogates. Such events could be, but are not limited to, floods, fire, insect infestations, and drought.

The WQRP will address how human activities will be managed. It recognized that full attainment of target load reduction at all locations may not be feasible due to physical, legal or other regulatory constraints. To the extent possible, NFP identifies potential constraints, and provides the ability to mitigate those constraints should the opportunity arise.

Where nonpoint sources are given a zero load allocation, it does not necessarily mean that human-related activities on the land are prohibited or that human activity must be removed from riparian or other areas that might impact water quality. It does mean that anthropogenic activities that might increase heat discharge to the water body must be managed to prevent, to the maximum practicable extent, further warming. Specified management will allow riparian vegetative communities to grow and propagate, and natural fluvial processes such a flood plain formation and bank stabilization to occur.

In employing an adaptive management approach BLM understands DEQ expectations:

- the progress of the TMDLs and the WQMP on a five year basis
- evaluate the progress towards achieving the TMDLs
- Designated Management Agencies (DMAs) will monitor and document its progress in implementing the provisions of its WQRP implementation plan
- that DMAs will develop benchmarks for attainment which can be used to measure progress; for management agencies to revise the components of their WQRPs to address deficiencies
- to consult with DMAs on attainment of water quality standards, and revise it as appropriate.

Stream shade recovery will be realized more quickly than habitat recovery with the growth of hardwoods, e.g., alder, maple, ash and cottonwood. Habitat recovery and associated sediment storage/routing in the channel will only recover to an optimum range of conditions with the recovery of riparian conifers to mature size. This will afford some added shade as these trees reach more height. Lower summer water temperatures and creation of quality habitat conditions for trout and salmon are anticipated with maturation of riparian forests in these watersheds, addressing road-related problems in the watershed, and reduced timber harvest under the NFP. Harvest related slope failure issues will be addressed through the adaptive management measures within the NFP.

BLM proposes to accomplish reduction or maintenance of stream temperature through the following during the immediate and near future:
Renovate roads (outslope, gravel surface, water dip)
Use grants and other sources to fund road restoration projects
Make emergency repairs as problems are discovered
Maintain the BLM road network according to the State BLM Transportation Management Plan
Utilize passive restoration

Restoration Prioritization and Funding

Funding for instream restoration will likely be very limited for BLM. Activity plans include decommissioning of roads, road renovation projects and possible density management projects.

Much of the restoration activity that may occur will likely be funded indirectly through projects (timber sales and silvicultural projects).

As part of the Clean Water Action Plan, Oregon has begun an interagency effort that identifies high priority watersheds in need of restoration and protection as part of the Unified Watershed Assessment. It is possible that funding associated with the Clean Water Action Plan could be accessed to carry out protection and restoration actions in the West Fork Cow Creek Watershed.

Element 6: Responsible Parties

Federal Lands – The BLM and Forest Service are the only federal land managers in this watershed and are responsible for completion and implementation of the WQRP for federal lands.

Nonfederal Lands - A subsequent WQMP for the remainder of the watershed is expected to be developed by DEQ and other Oregon Departments responsible for lands within this watershed. That WQMP will deal with state and local government lands as well as private lands, including private forest lands within the watershed.

The Oregon Department of Forestry (ODF) is the Designated Management Agency (DMA) for regulation of water quality on nonfederal forest lands. The Oregon Board of Forestry in consultation and with the participation and support of DEQ has adopted water protection rules in the form of BMP's for forest operation. These rules are implemented and enforced by ODF and monitored to assure their effectiveness. ODF and DEQ will jointly demonstrate how the Oregon Forest Practices Act, forest protection rules (including the rule amendment process) and Best Management Practices (BMPs) are adequate protection for water quality.

Oregon Water Resources Division (WRD) is a participant within the implementation and monitoring components of this plan. WRD will be doing flow measurements.

The Oregon Department of Geology and Mineral Industries (DOGAMI) is also a participant with respect to mining impact assessment and permit modifications. DOGAMI covers mining operations that exceed one (1) acre of disturbance or 5000 cubic yards of production within a 12-month period. Operators are required to obtain an operating permit if they are located above the 2-year floodplain of creeks and rivers.

Element 7: Reasonable Assurance of Implementation

The following table lists instream and other improvements for restoration of watershed function and water quality through federal funding and implementation.

Table 12. Past West Fork Cow Creek Watershed Improvement Projects

Watershed Improvement Projects Glendale Resource Area, Medford District, BLM			
Project Name	**Year completed**	**Miles of Road Improved or Stream Improved**	***Fish Species Benefitted**
Rock Panther Creek roads 31-9-15, 31-9-27	1995	0.5	CO, ST, CT
Rip, barricade Panther Creek roads 31-9-11.3, 31-9-11.2 T. 31 S., R. 9 W. Sec. 11	1994	0.5	CO, ST, CT
Rock Wallace Creek Road 31-9-33.2 T. 31 S., R. 9 W., Sec. 33	1995	2.5	CO,ST, CT
Repair slide on road 31-9-35, T. 32 S., R. 9 W., Sec. 35	1995	0.1	CO, ST, CT
Repair Lower Walker Creek Road T. 32 S., R. 9 W., Sec 3 SW Replace stream culverts, add cross drains	1997	2.2	CO, ST, CT
Repair Bear Creek Road T. 32 S., R. 8 W., Sec. 15, 16 Unplug and replace culverts	1997	JITW 5.8 (rocked 1.3)	CO, ST, CT
Stabilize Gold Mountain Creek Road T. 31 S., R. 9 W., Sec. 21 (road is on unstable ground)	1997	0.1	CO, ST, CT
Replace E. Fk. Elk Valley Creek culvert #1 (fish passage) T31S R9W Sec25	1997	1.9/2.3/3.4 $121,000	CO,ST,CT
Replace West Fork Elk Valley Creek culvert (fish passage) T31S R9W Sec25	1998	1.9/2.5/3.7 $126,740	CO,ST,CT
Repair Middle Walker Creek Road slide Road 32-9-10 W1/2 SE1/4	2000		
Replace East Fk Elk Valley Creek culvert #2 (fish passage) JITW 6650 31S 8W Sec 30 NWNWNW	2001	2.4 miles $76,000 JITW	CO,ST,CT

The following standards and guidelines from the NFP will be used to attain the goals of the West Fork Cow Creek Water Quality Restoration Plan:

Stream Temperature – Shade

Aquatic Conservation Strategy: B-9 to B-11, C-30 (denotes section and page # of NFP)
Standard and Guidelines for Key Watersheds: C-7
Riparian Vegetation: B-31
Riparian Reserves: B-12 to B-17 and ROD 9
Watershed Restoration: B-30

Stream Temperature - Channel Form

Aquatic Conservation Strategy: B-9 to B-11, C-30
Standard and Guidelines for Key Watersheds: C-7
Riparian Vegetation: B-31
Riparian Reserves: B-12 to B-17 and ROD 9
Watershed Restoration: B
Roads: B-19, B-31 to B-33

Stream Temperature - Flow

BLM is currently upgrading its transportation objectives within each watershed. Part of the plan is to identify roads that need surfacing, pipe replacement or that could be decommissioned. All the sub-watersheds have high road densities and all are above the two miles per square mile target established by the National Marine Fisheries Service for proper functioning condition. Above 3 miles per square mile is considered not functioning properly by NMFS. Road densities would be decreased where possible.

Aside from elements covered under this heading, there is a general idea that restrictions within the Forest Plan have greatly contributed to reducing impacts on the aquatic system. These include, but are not limited to, wide riparian buffers on all streams, including intermittent channels; green-tree retention on harvest units; restrictions on new road construction and requirements for 100 year flood capacity for road crossing structures. Best management practices that were designed for implementation under the NFP would help reduce impacts and in some cases, actually restore conditions to “Properly Functioning”.

BLM has followed the standards and guidelines of the NFP aquatic conservation strategy and will continue to do so. Until the Plan is revised or replaced BLM is responsible for implementation of the Plan.

Temperature - Shade Component

It is unlikely that over the next few years that the Glendale Resource Area will prescribe riparian stand treatments in stands located adjacent to perennially flowing water (active restoration). Precommercial thinning (PCT) may occur in conjunction with normal stand maintenance in units having a stream flowing through or adjacent to them. BLM will continue to adhere to the ACS of the NFP by providing riparian reserves along streams.

Temperature - Channel Form Component

Through management activities such as timber sales, Jobs-in-the-Woods projects, Title II and routine maintenance, BLM will endeavor to reduce road generated sediment. Monitoring of actions will take place periodically to ensure desired reduction of sediment is achieved.

Temperature – Flow

BLM will continue to maintain or improve flow conditions on federal lands. Passive management will be stressed as there are no current identified opportunities for flow augmentation within the federal managed lands of this basin.

Element 8: Monitoring/Evaluation Plan

Assessing Potential for Recovery - Properly Functioning Condition Methodology

Recovery of riparian areas, stream channels, and aquatic habitat requires a base condition with adequate vegetation, channel form, and large woody debris to dissipate stream energy associated with high water flows. The BLM/USFS methodology known as Properly Functioning Condition (PFC) assesses the capability of streams to withstand 30-year interval storm events. This quick, interdisciplinary method is the first step in determining the feasibility of restoration and recovery. The entire system meets the minimum requirements of the PFC methodology for restoration and recovery.

BLM will continue to monitor stream temperatures at selected sites in cooperation with DEQ and other agencies.

Assessing Potential for recovery – ODFW Methodology

Restoration of the watershed will be both active and passive. Growth of vegetation on floodplains is integral to recovery. The overall goal is to move the attributes considered in this assessment; pool/riffle ratio, pool frequency, large wood, and riparian forest conditions from the present “poor” and “fair” ratings to “good” and “fair”, per ODFW benchmarks. These attributes are used to measure if and when the stream is nearing its biological potential for supporting dependent aquatic and riparian species, including anadromous fish. Natural variation will cause changes in stream and floodplain conditions and make allowance for some attributes as being rated “fair”. These attributes and benchmarks should be validated with subsequent inventory and monitoring work in the watershed, refining them to suit the range of conditions expected in the watershed as we learn more.

Monitoring will provide information as to whether standards and guidelines are being followed, and if actions prescribed in the WQRP are achieving the desired results. In addition to the monitoring identified in the WQRP, RMP/Forest Plan monitoring occurs annually to assess implementation of standards and guidelines. Information obtained from both sources of monitoring will ascertain whether management actions need to be changed. Continued monitoring would be prioritized upon review of findings.

The monitoring plan itself will not remain static and will be periodically adjusted, as appropriate; to assure the monitoring remains relevant. See Table 12.

Temperature

The BLM, with cooperators, will continue to monitor stream temperatures throughout West Fork Cow Creek. We monitor to meet a variety of objectives, so site locations will vary over time. Monitoring activities for BLM will try to determine the source area of temperature increase within reaches of streams that are listed for temperature. Through monitoring, BLM's goal is to determine the upper extent of the problem area and delist the reaches or streams that through time meet the water quality standard for temperature. Our objectives are to monitor long-term temperature recovery, better understand the natural temperature variability, and to track potential project effects. There are several locations that are monitored annually during the summer months to establish temperature ranges within the basin.

Table 13. Interim Benchmarks and monitoring strategy for West Fork Cow Creek

Element	**Management measure**	**Interim benchmark**	**Monitoring parameter**	**Monitoring frequency**
Temperature Shade component	Passive treatment of riparian vegetation. Implement standards and guides of NWFP. Some PCT may occur in conjunction with units that have streams flowing through or adjacent to them.	Allow stands to grow toward shade target.	Shade, canopy closure over stream focusing first on hardwood species.	Review of selected reaches every 5 to 10 years using aerial photos, field check condition of riparian vegetation. Within one year complete PFC surveys for selected streams within basin.
Temperature Channel form component	Maintain integrity of streams channels on land under BLM control.	Assess roads and culvert conditions within the watershed within the next 2 years.	Sedimentation resulting from roads by miles of road surfaced or decommissioned.	Review yearly miles of road decommissioned, renovated or maintained.
Temperature Flow component	Road management objectives	Yearly evaluation	Proper drainage and routing	Miles of road decommissioned, out sloped, rocked, number of culverts replaced.

Element 9: Public Participation Plan

This WQRP is a procedural step that focuses on water quality using elements of the NFP. Watershed analyses are a recommended component of the ACS under the NFP and RMP. The Record of Decision (ROD) for the RMP was signed in June of 1995, following extensive public review.

Public involvement for the WQRP will be coordinated by DEQ in conjunction with the effort addressing state, county and private lands within this watershed.

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Appendix1: Weighted Stream Recovery Time

West Fork Cow Creek	Stream Reach Identification	Stream length (f t)	Vegetation Class			% Shade		Years to Recovery (yrs.-d/c)
			Species (DEQ Code)	Height in Riparian (ft.)	Age (yrs.-d/c)	BLM Existing	Potential	
West Fork Cow								
Creek								
	wfc100e	60	521	40	15/20	50	70	25/35
	wfc100w	60	551	40	15/20	30	70	25/35
	wfc101e	76	521	40	15/20	50	70	25/35
	wfc101w	76	551	40	15/20	30	70	25/35
	wfc102e	113	521	40	15/20	50	70	25/35
	wfc102w	113	551	40	15/20	30	70	25/35
	wfc103e	362	701	50	15/20	75	75	25/35
	wfc103w	362	551	40	15/20	30	70	25/35
	wfc104e	327	701	50	25	75	75	30
	wfc104w	327	551	40	15/20	30	70	25/35
	wfc105e	579	701	50	25	75	75	30
	wfc105w	579	551	40	15/20	30	70	25/35
	wfc106e	147	751	50	25	40	75	30
	wfc106w	147	551	40	15/20	30	70	25/35
	wfc107e	92	751	50	25	40	75	30
	wfc107w	92	551	40	15/20	30	70	25/35
	wfc108e	245	751	50	25	40	75	30
	wfc108w	245	551	40	15/20	30	70	25/35
	wfc109e	200	520	70	40/40	50	70	0/15
	wfc109w	200	551	40	15/20	30	70	25/35
	wfc110e	105	520	70	40/40	50	70	0/15
	wfc110w	105	752	70	40	10	75	15
	wfc111e	303	520	70	40/40	50	70	0/15
	wfc111w	303	752	70	40	10	75	15
	wfc112e	827	520	70	40/40	50	70	0/15
	wfc112w	827	551	40	15/20	30	70	25/35
	wfc113e	216	520	70	40/40	50	70	0/15
	wfc113w	216	551	40	15/20	30	70	25/35
	wfc114e	1059	520	70	40/40	50	70	0/15
	wfc114w	1059	521	40	15/20	50	70	25/35
	wfc115e	265	520	70	40/40	50	70	0/15
	wfc115w	265	521	40	15/20	50	70	25/35
	wfc116e	337	520	70	40/40	50	70	0/15
	wfc116w	337	521	40	15/20	50	70	25/35
	wfc117e	498	520	70	40/40	50	71	0/15
	wfc117w	498	521	40	15/20	50	71	25/35

	Stream Reach Identification	Stream length (f t)	Vegetation Class			% Shade		Years to
			Species (DEQ Code)	Height in Riparian (ft.)	Age (yrs.-d/c)	BLM Existing	Potential	Recovery (yrs.-d/c)
	wfc118e	280	520	70	40/40	50	71	0/15
	wfc118w	280	500	70	40/40	70	70	0/15
	wfc119e	188	520	70	40/40	50	70	0/15
	wfc119w	188	500	70	40/40	70	70	0/15
	wfc120e	371	520	70	40/40	50	70	0/15
	wfc120w	371	500	70	40/40	70	70	0/15
	wfc121e	559	520	70	40/40	50	70	0/15
	wfc121w	559	500	70	40/40	70	70	0/15
	wfc122e	240	500	70	40/40	70	70	0/15
	wfc122w	240	521	40	15/20	50	70	25/35
	wfc123e	520	500	70	40/40	70	70	0/15
	wfc123w	520	551	40	15/20	30	70	25/35
	wfc124e	1835	500	70	40/40	70	70	0/15
	wfc124w	1835	501	40	15/20	70	70	25/35
	wfc125e	354	500	70	40/40	70	70	0/15
	wfc125w	354	501	40	15/20	70	70	25/35
	wfc126e	85	500	70	40/40	70	70	0/15
	wfc126w	85	501	40	15/20	70	70	25/35
	wfc127e	221	500	70	40/40	70	70	0/15
	wfc127w	221	551	40	15/20	30	70	25/35
	wfc128e	772	700	90	55	75	75	0
	wfc128w	772	500	70	40/40	70	70	0/15
	wfc129e	465	500	70	40/40	70	70	0/15
	wfc129w	465	500	70	40/40	70	70	0/15
	wfc130e	474	500	70	40/40	70	70	0/15
	wfc130w	474	500	70	40/40	70	70	0/15
	wfc131e	205	501	40	15/20	70	70	25/35
	wfc131w	205	551	40	15/20	30	70	25/35
	wfc132b	290	500	70	40/40	70	70	25/35
	wfc133b	890	500	70	40/40	70	70	25/35
	wfc134e	543	500	70	40/40	70	70	25/35
	wfc134w	543	700	90	55	75	75	0
	wfc135e	214	551	40	15/20	30	70	25/35
	wfc135w	214	700	70	55	75	75	0
	wfc136e	195	551	40	15/20	30	70	25/35
	wfc136w	195	701	50	25	75	75	30
	wfc137e	170	501	40	15/20	70	70	25/35
	wfc137w	170	701	50	25	75	75	30
	wfc138e	129	501	40	15/20	70	70	25/35
	wfc138w	129	700	90	55	75	75	0
	wfc139e	319	752	70	55	10	75	0

	Stream Reach Identification	Stream length (f t)	Vegetation Class			% Shade		Years to
			Species (DEQ Code)	Height in Riparian (ft.)	Age (yrs.-d/c)	BLM Existing	Potential	Recovery (yrs.-d/c)
	wfc140e	654	551	40	15/20	30	70	25/35
	wfc140w	654	700	90	55	75	75	0
	wfc141e	904	551	40	15/20	30	70	25/35
	wfc141w	904	700	90	55	75	75	0
	wfc142e	143	551	40	15/20	30	70	25/35
	wfc142w	143	700	90	55	75	75	0
	wfc143e	666	701	50	25	75	75	30
	wfc143w	666	700	90	55	75	75	0
	wfc144e	577	855	6	n/a	10	10	0
	wfc144w	577	700	90	55	75	75	0
	wfc145e	387	551	40	15/20	30	70	25/35
	wfc145w	387	701	50	25	75	75	30
	wfc146e	207	551	40	15/20	30	70	25/35
	wfc146w	207	701	50	25	75	75	30
	wfc147e	453	521	40	15/20	50	70	25/35
	wfc147w	453	701	50	25	75	75	30
	wfc148e	519	521	40	15/20	50	70	25/35
	wfc148w	519	700	90	55	75	75	0
	wfc149e	432	521	40	15/20	50	70	25/35
	wfc149w	432	700	90	55	75	75	0
	wfc150e	433	501	40	15/20	70	70	25/35
	wfc150w	433	700	90	55	75	75	0
	wfc151e	256	501	40	15/20	75	70	25/35
	wfc151w	256	701	50	25	75	75	30
	wfc152e	601	501	40	15/20	70	70	25/35
	wfc152w	601	700	90	55	75	75	0
	wfc153e	348	521	40	15/20	50	70	25/35
	wfc153w	348	700	90	55	75	75	0
	wfc154e	1050	521	40	15/20	50	70	25/35
	wfc154w	1050	700	90	55	75	75	0
	wfc155e	662	501	40	15/20	70	70	25/35
	wfc155w	662	700	90	55	75	75	0
	wfc156e	1282	521	40	15/20	50	70	25/35
	wfc156w	1282	700	90	55	75	75	0
	wfc157e	557	521	40	15/20	50	70	25/35
	wfc157w	557	501	40	15/20	70	70	25/35
	wfc158e	516	521	40	15/20	50	70	25/35
	wfc158w	516	501	40	15/20	70	70	25/35
	wfc159e	630	521	40	15/20	50	70	25/35
	wfc159w	630	700	90	55	75	75	0
	wfc160e	1068	521	40	15/20	50	70	25/35
	wfc160w	1068	700	90	55	75	75	0

	Stream Reach Identification	Stream length (f t)	Vegetation Class			% Shade		Years to
			Species (DEQ Code)	Height in Riparian (ft.)	Age (yrs.-d/c)	BLM Existing	Potential	Recovery (yrs.-d/c)
	wfc161e	693	521	40	15/20	50	70	25/35
	wfc161w	693	700	90	55	75	75	0
	wfc162e	318	521	40	15/20	50	70	25/35
	wfc162w	318	700	90	55	75	75	0
	wfc163e	273	521	40	15/20	50	70	25/35
	wfc163w	273	700	90	55	75	75	0
	wfc164e	600	521	40	15/20	50	70	25/35
	wfc164w	600	700	90	55	75	75	0
	wfc165e	285	501	40	15/20	70	70	25/35
	wfc165w	285	700	90	55	75	75	0

1. Average Potential Percent Shade value comes from averaging reach distances using the following shade values: 1.) If system potential is below 80% use the system potential value, 2.) If current vegetation is less than 80% and system is capable of achieving 80% or greater, 80% is used, 3.) If existing shade greater than 80% that value is used.

2. Average years to recovery is time estimated for percent effective shade to reach system potentials or 80%. If current shade is greater than 80% system is considered recovered and time to recovery is zero. Time to recovery is estimated as time from 2003 in the absence of natural disturbance.