Water Quality Restoration Plan
Umpqua River Basin
South Umpqua Subbasin
Upper Cow Creek

Bureau of Land Management (BLM), Medford District Office
2004

Upper Cow Creek at a Glance

Hydrologic Unit Code (identification #)	1710030206
Watershed area/ownership	Total: 47,415 BLM Ownership: 9,940 acres (21 %) Forest Service: 24,135 acres (51 %) Non-Federal Lands: 13,340 acres (28 %)
Stream Miles assessed	Total: 0.8 miles
303(d) listed parameter	Temperature: Snow Creek, Dismal Creek, Applegate Creek Mercury: Galesville Reservoir
Key Resources and uses	Fisheries, recreation, timber production
Known Impacts (human)	Federal and private industrial logging, roads, mining, recreation, communications, agriculture, and grazing

* All values given for acreages or mileages above are approximate.

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 Upper Cow Creek watershed from the U.S. Forest Service boundary to Galesville Dam.

The Oregon Department of Environmental Quality (ODEQ) 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 ODEQ for incorporation into an overall WQMP for the Cow Creek watershed. ODEQ 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 ODEQ. The ODEQ 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 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 to 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 decades to accomplish all ACS objectives. Some improvements in aquatic ecosystems, however, can be expected in 10 or 20 years.

Upper Cow Creek

Water Quality Restoration Plan for BLM

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Upper Creek
Watershed Analysis

Summary *

MORPHOLOGY	
Geographic Province	Klamath Mountains
Watershed size	47,415 acres
Elevation range	1880 - 5104 ft – Galesville Reservoir to Cedar Springs Mountain
Drainage pattern	Dendritic
Total streams	380 miles
Drainage density	5.1 miles/miles^2
Sixth-field watersheds	South Fork Cow Creek (171003020601) - 11,094ac Dismal Creek (171003020602) - 21,214ac Upper Cow Creek-Galesville (171003020603) -15,108ac
METEOROLOGY	
Annual precipitation	41 - 60 inches; south to northwest
Precipitation Timing	80% occurring October thru May
Temperature range	0-100 degrees F
SURFACE WATER	
Minimum flow - Cow Creek near Azalea - Cow Creek above Galesville	1.1 Cfs* – recorded on 8/12/81 (prior to flow regulation at dam) 3.5 cfs – recorded on 12/26/89 (period of record 1986-2001) *Many smaller stream segments were dry during summer months
Maximum flow - Cow Creek near Azalea - Cow Creek above Galesville	10,600 cfs - recorded on 01/15/74 (prior to flow regulation at Galesville dam) 6,980 cfs – recorded on 01/09/95 (period of record 1986-2001)
Reservoirs	Galesville
Water quality limited streams	26 miles listed for temperature above 64 degrees - Cow Creek: reservoir to S. Fork Cow Creek (12.8 mi) - Snow Creek: mouth to headwaters (5.3 mi) - Dismal Creek: Mouth to headwaters (2.7 mi) - Applegate Creek: Mouth to headwaters (4.8 mi) (Galesville Reservoir listed for mercury)

GEOLOGY	
Geologic Formations/ Types	May Creek Terrane: composed of volcanic rock including altered greenish lava flows and rocks comprised of lava cinders and fragments Galice: metasedimentary rock composed of thick sandstone layers alternating with other sedimentary rock, dense pillow lava flows, and inclusions of serpentine. Sand, silt, and mudstone contact zones prone to landslides White Rock Pluton: composed of granitics; prone to erosion if disturbed
Soils	Vary from relatively deep soils in the Acker-Norling soil series, to shallow soils in the Lettia/Sharpshoot complex. All soils generally have low water holding capacity and are relatively infertile. Nutrient quality, depth, and fertility increase moving east to west across the watershed.
BIOLOGICAL	
Vegetation	Primarily mixed conifers and hardwoods. Vegetative communities differ by slope, aspect, elevation and soil characteristics.
Total fish streams	71.7 miles
Candidate, threatened, or endangered species	Northern spotted owl – 2 active BLM sites Bald Eagle
Survey and Manage species	Fungi, Red tree vole, mollusks, bryophytes, and lichens
Special Status Plants	Numerous species and locations
HUMAN INFLUENCE	
Counties	Douglas County
Roads	300 miles
Road density	4 mi./square mile
Streams within one tree length of roads	82.5 miles (22% of total stream miles)
Timber production on federal land	GFMA (gross) - 21,600 acres FS+BLM LSR - 10,900 acres
Utility corridors	Fiber optics line along Snow Creek Rd and McGinnis Creek
Communications	Cedar Springs repeater
Communities	None, several private residences

PUBLIC LANDS			
Medford BLM lands	9450 acres (20%)		
	BLM Medford Land Use	**Acres**	**Percent**
	Late-successional Reserves	7,940	17
	Riparian Reserves (outside LSR)	240	.5
	General Forest Mgmt. Area -net acres (usable acres after riparian reserves, owl cores, etc)	1,250	2.5
	Administratively Withdrawn Area	20	(minimal)
	Total	**9,450**	**20**
Roseburg BLM lands	490 acres		
State of Oregon lands	650 acres		
Forest Service lands	24,135 acres		

*All numerical values given in this summary are approximate

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 Upper 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.

All numerical values given within this document are approximations compiled from the best data available at this time.

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 Upper Cow Creek watershed.

Ownership/Land Use	Acres	Percent of Upper Cow Creek watershed
Medford BLM	9450	20
Roseburg BLM	490	1
Forest Service	24,135	51
State of Oregon	650	1
Other Non-Federal Lands	12,690	27

Historic mining activities contributed to riparian canopy removal on a localized level during the major activity period of 1880–1950. Though there are still numerous mining sites within this

watershed, mining and mineral exploration over the past decade has been minimal. Currently there are several legally established mining sites, of which BLM and Forest Service have no control over, that are contributing toxic metals, acids, and toxic leachates to the environment.

Riparian vegetation and channel form have been altered as a result of past timber harvest activities. Heavy harvesting and the conversion of uplands and riparian zones to agricultural lands has caused changes in stream patterns and reduced bank stability. Past practices that utilized splash dams and water diversions for transport of logs also contributed to changes in the riparian zone. Flood events, such as those which occurred during the storms of 1964 and 1974, further eroded these drainages. Currently, as a result of reduced timber activities in many of these areas, riparian vegetation and channel stability appear to be in a state of recovery. Because a majority of the lands in this watershed are managed by federal agencies which are required to maintain or improve riparian areas under the Aquatic Conservation Strategies of the NWFP, and harvest levels on private are much lower, riparian zones in this watershed should, for the most part, remain in equilibrium in the future.

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 Upper Cow Creek watershed are presented in Table 2.

Table 2. Beneficial uses in the Upper 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	✓
Hydro Power	✓		

***** Salmonid fish spawning and rearing have been removed from this list of beneficial uses because Galesville dam at the boundary of Upper Cow Creek watershed is a complete barrier to fish passage. However, adult hatchery steelhead trout are planted in streams above Galesville reservoir to create recreational opportunities. These fish have been known to spawn in at least one creek (Snow Creek) above Galesville reservoir but juveniles are unable to migrate to the ocean and as a result become resident trout rather than anadromous steelhead. The Oregon coast coho salmon no longer occurs in this watershed.

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. Cold-water aquatic life, such as resident trout, is the most sensitive *beneficial use* in the watershed.

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 Upper Cow Creek has resulted in 303(d) listings for about 26 miles of streams that have failed to meet established criteria for one or more beneficial uses. See Table 3 (Map 1).

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

Stream	Miles	Water Quality Parameter
Cow Creek	12.8*	Temperature
Dismal Creek	2.7	Temperature
Snow Creek	5.3	Temperature
Applegate Creek	4.8	Temperature
Note: *portion occurring within upper cow creek watershed		

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 trout, which are present in these streams (Map 1).

Quality of fish bearing streams in this watershed varies widely within and among subwatersheds in Upper Cow Creek Basin as a result of the varying levels of protection they receive, depending on ownership. High levels of past timber harvest related activities, fire suppression, grazing, roads, placer mining, water diversion, land clearing, and an assortment of agricultural practices, have left some portions of this watershed in less than desirable conditions. Limiting factors in this watershed include low summer flows, both as a result of natural conditions and water withdrawals, elevated water temperatures, and a reduced amount of instream habitat structure such as large woody debris, boulders, side channels, and pools.

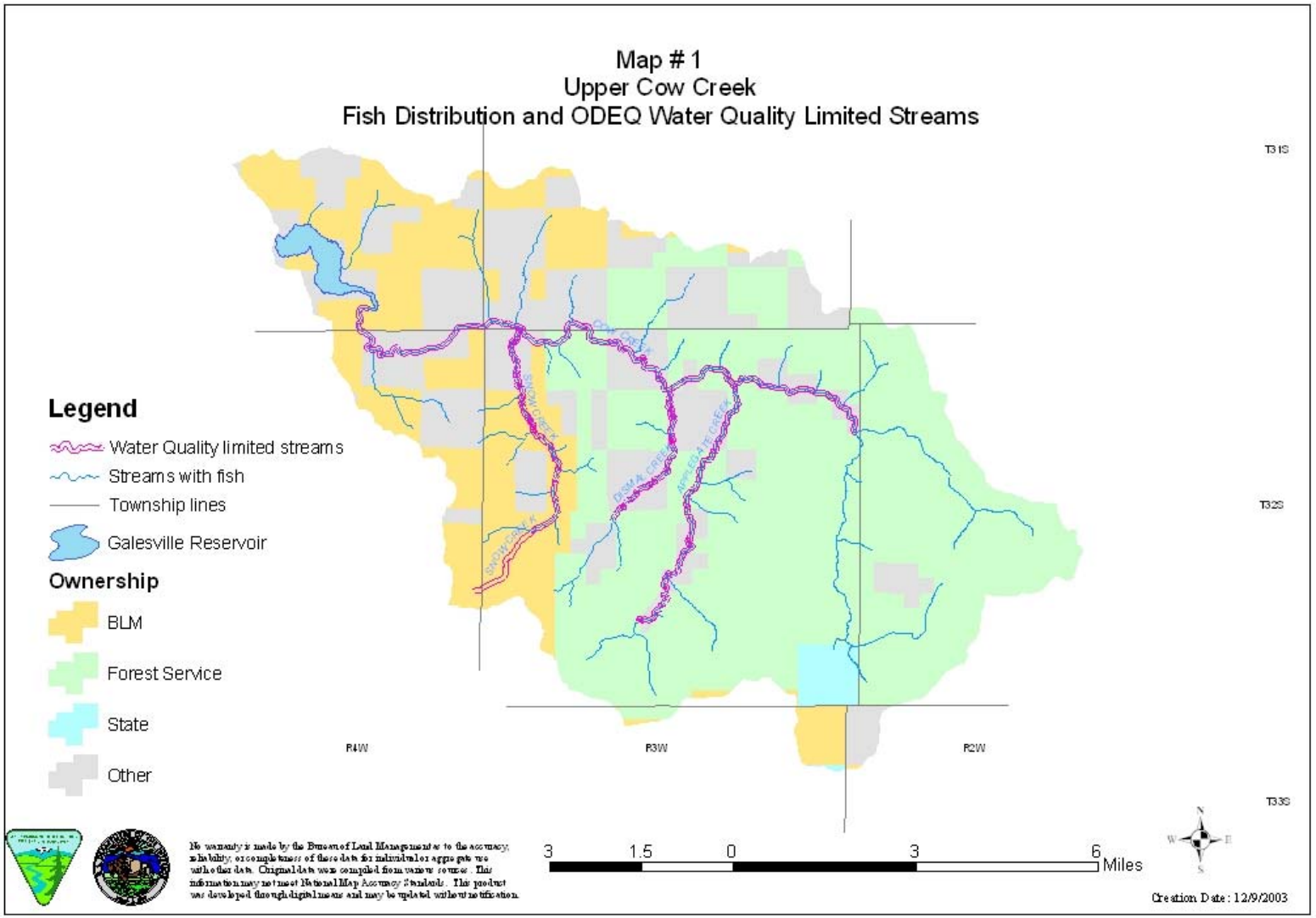
Map # 1
Upper Cow Creek
Fish Distribution and ODEQ Water Quality Limited Streams
T31S
T32S
T33S
R4W
R3W
R2W
Legend
Water Quality limited streams
Streams with fish
Township lines
Galesville Reservoir
Ownership
BLM
Forest Service
State
Other
3 1.5 0 3 6 Miles
N
W
E
S
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Table 4 lists historic and present condition information about elements that may affect temperature in Upper Cow Creek.

Table 4. Historic and current conditions of selected elements.

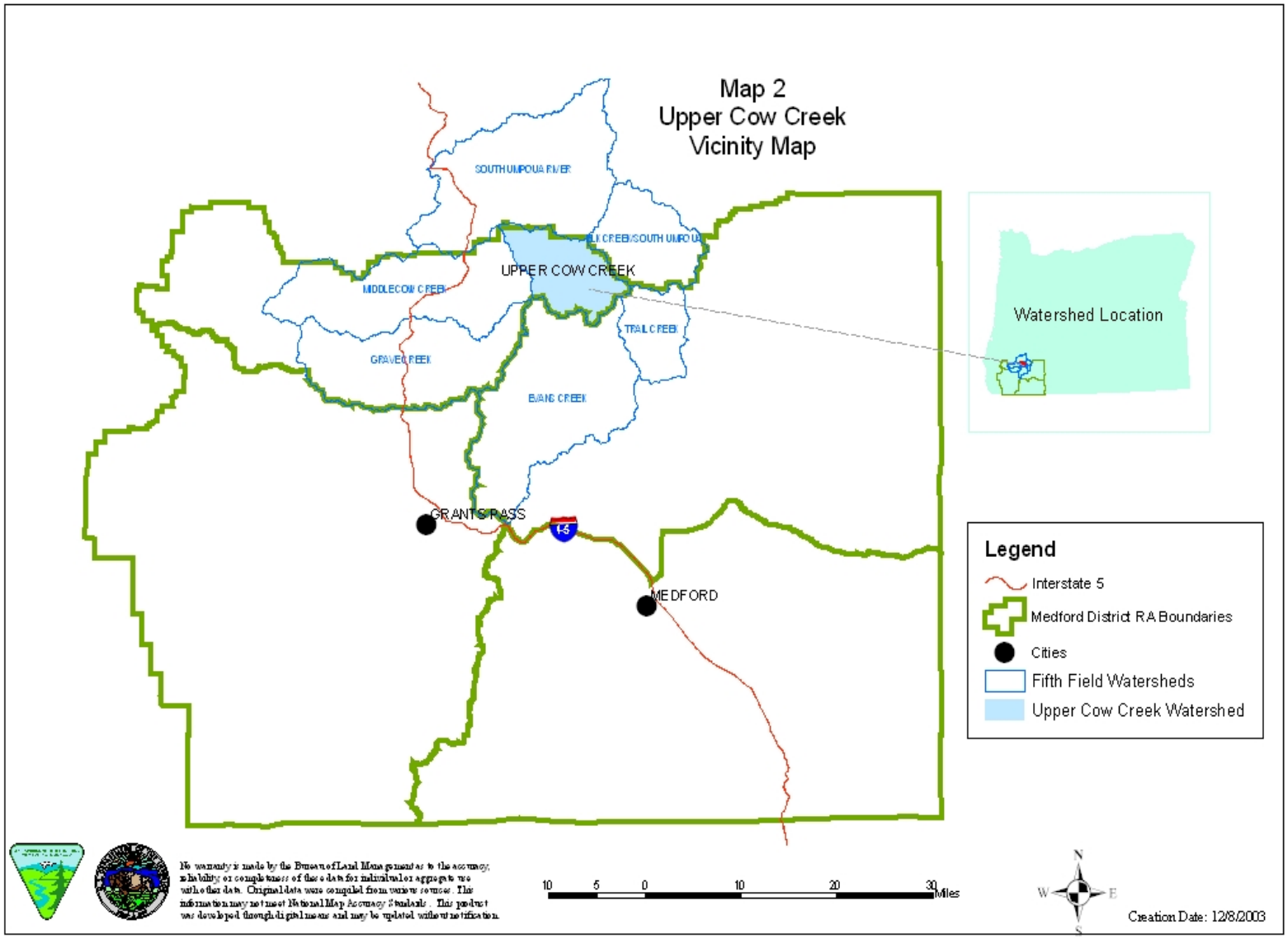
Riparian Vegetation:	
Historical Condition	- Until 1958 public lands in this watershed were mostly unmanaged timber. Streams flowed through a mosaic of stand ages due to fire activity, but riparian areas of lower ordered streams were generally well shaded by the large brush and shrub component along these narrow channels. It is considered likely, that historically, 40-60 percent of riparian vegetation within this watershed was in the late seral stage.
Present Condition	- Currently over 30 percent of riparian vegetation on BLM land is over 80 years of age in this watershed. Another approximately 75 percent is over 30 years of age. Among the remaining stands, many are even aged between 20-30 years of age. Some of these stands have understories that are crowded by young firs. Many riparian areas in this watershed have been altered from historic conditions as a result of past timber harvest and mining activities. In some areas, stretches of riparian vegetation have been removed for grazing and agriculture. A loss of trees within the riparian zone results in greater potential for streambank erosion and less available large woody debris for aquatic habitat in these stream reaches.
Forest Health & Productivity:	
Historical Condition	- The Upper Cow Creek watershed harbors a diverse array of plant communities based primarily on the variety of different parent materials from which the soils are derived. Human and natural caused fires have also altered both riparian and upland vegetation for centuries, creating a mosaic of age classes and densities.
Present Condition	- Many areas of this watershed still exhibit historical conditions. Portions of harvested areas have densely planted and overstocked (increased competition) stands. Some of these stands are experiencing minor outbreaks of insects and disease that has led to self thinning of stands and in some cases increased fuels.
Roads:	
Historic Condition	- Prior to 1950 few roads existed in the Upper Cow Creek watershed. By the mid 1980's most major road systems were complete in this area. Many of the earlier roads in this watershed were built using side cast excavation and undersized culverts and cross drains.
Present Condition	- Most roads in this watershed are presently in fair to good condition. New roads on public lands in this watershed are uncommon, but when they are built, standard techniques to minimize erosion and sedimentation are required. There is currently a total of about 300 miles of road with varying distribution. Maintenance on some non-arterial roads has been reduced as a result of decreased funding. These roads are in various stages of deterioration from being overgrown to, in some cases, having sections that have slid. Many of these deteriorating roads occur on granitics soils, and have been inventoried for decommissioning. - Roads have increased overland flow by creating additional channels in the form of ditchlines, and soil compaction has altered hydrologic patterns in areas where roads occur or tractor harvest was used. Road density averages 4 mi/mi^2

Flow Regime:	
Historic Condition	- Average monthly flows on Cow Creek prior to building of Galesville dam were generally very low during the months of May- October. USGS records, on Cow Creek near Azalea, show that during the months of July, Aug, and Sept average monthly flows were less than 20 cfs for the 30 years prior to building of the dam. This likely caused Cow Creek to experience similar, or worse, problems with stream temperature as those seen currently. Also prior to flow regulation below the dam, peak flow events, on average, were much higher, sometimes resulting in flooding of low-lying areas. Within the thirty years prior to flow regulation, the USGS recorded 4 years with events above 7,900 cfs with one event reaching 10,600 cfs. Creeks above Galesville were not monitored historically but flows are assumed to be consistent with those measured on Cow Creek near Azalea just downstream of the watershed. Using this assumption, these streams likely experienced very low, to no, summer/early fall flow, with higher flows occurring during the winter and spring months. However, high flow events on these upper streams are less likely to result in flooding as a result of the characteristic high gradient and confined channels that are common in these streams.
Present Condition	- Regulation of flow on Cow Creek below the dam has significantly altered flow patterns in the lower portion of the stream. However, in the portion of Cow Creek within the Upper Cow Creek watershed flow regimes remain consistent with those in that historically occurred on Cow Creek near Azalea prior to the dam. USGS data, which began to be recorded at this station above the dam in 1986, shows that in Cow Creek above Galesville, flows are generally lowest during the months of July, Aug, and Sept. Peak flows above 6100 cfs have occurred during the winter in this section, twice between 1986- 2002. These flows now act primarily to raise reservoir levels and thus generally only minimally effect peak flow below the dam. Even with increased summer flows below the dam, Cow Creek both below and above the dam still experiences limited water quality as a result of high temperatures during the summers.

Element 2: Resource Considerations

Upper Cow Creek is approximately a 47,415 acre watershed that is tributary to the South Umpqua River in Southwest Oregon.

The watershed is a fifth-field watershed in the Klamath Mountains province, located in southwest Oregon, approximately 30 miles northeast of Grants Pass (Map 2).


Map 2
Upper Cow Creek
Vicinity Map
SOUTH UMPQUA RIVER
ELK CREEK/SOUTH UMPQUA
UPPER COW CREEK
MIDDLE COW CREEK
TRAIL CREEK
GRAVEL CREEK
EVANS CREEK
GRANTS PASS
I-5
MEDFORD
Watershed Location
Legend
Interstate 5
Medford District RA Boundaries
Cities
Fifth Field Watersheds
Upper Cow Creek Watershed
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10 5 0 10 20 30 Miles
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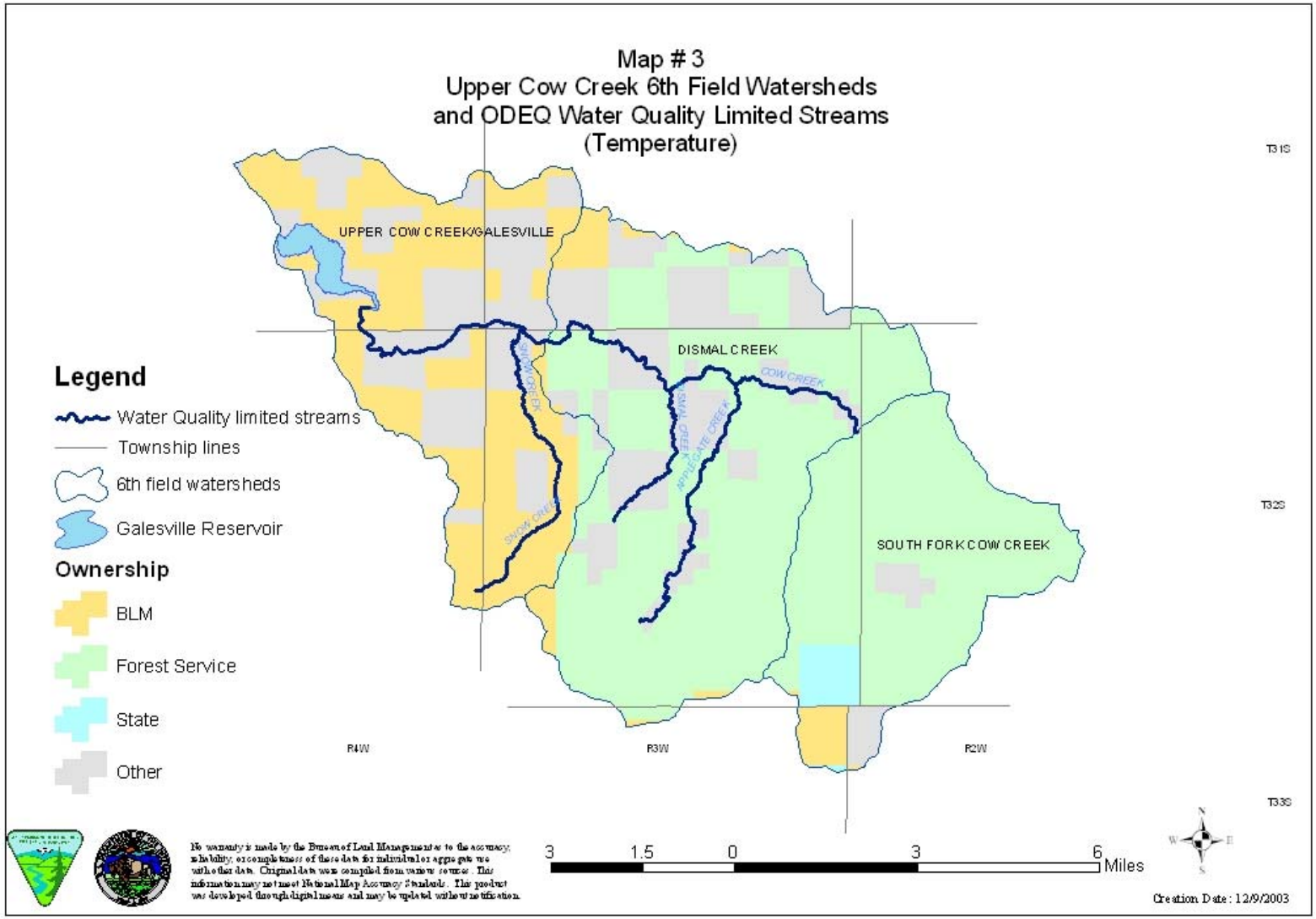
BLM (Medford and Roseburg Districts) administers about 9940 acres (21%) of the watershed. No major towns are present in the watershed. There are some residential areas located near the mainstem of Upper Cow Creek and some of the larger tributaries.

Major tributaries of Upper Cow Creek include Snow Creek and Dismal Creek. The watershed has been divided into three sixth-field subwatersheds (Table 5) and 27 seventh-field subwatersheds ranging from about 8.5 acres to about 7630 acres. Within these watersheds are a series of small unnamed creeks which drain directly into Upper Cow Creek. Annual precipitation in the watershed averages between approximately 41-60 inches, with 80% occurring between October and May. Extended summer drought is common (Map 3).

Table 5. Sub-watersheds within the Upper Cow Creek watershed.

Sixth-field watershed	Estimated Acres	Percent of Upper Cow Creek watershed
Galesville	15,110	32
Dismal Creek	21,215	45
South Fork Cow Creek	11,090	23
Total	47,415	100


Map # 3
Upper Cow Creek 6th Field Watersheds
and ODEQ Water Quality Limited Streams
(Temperature)
UPPER COW CREEK/GALESVILLE
DISMAL CREEK
SOUTH FORK COW CREEK
COW CREEK
T31S
T32S
T33S
R4W
R3W
R2W
Legend
Water Quality limited streams
Township lines
6th field watersheds
Galesville Reservoir
Ownership
BLM
Forest Service
State
Other
3 1.5 0 3 6 Miles
Creation Date: 12/9/2003

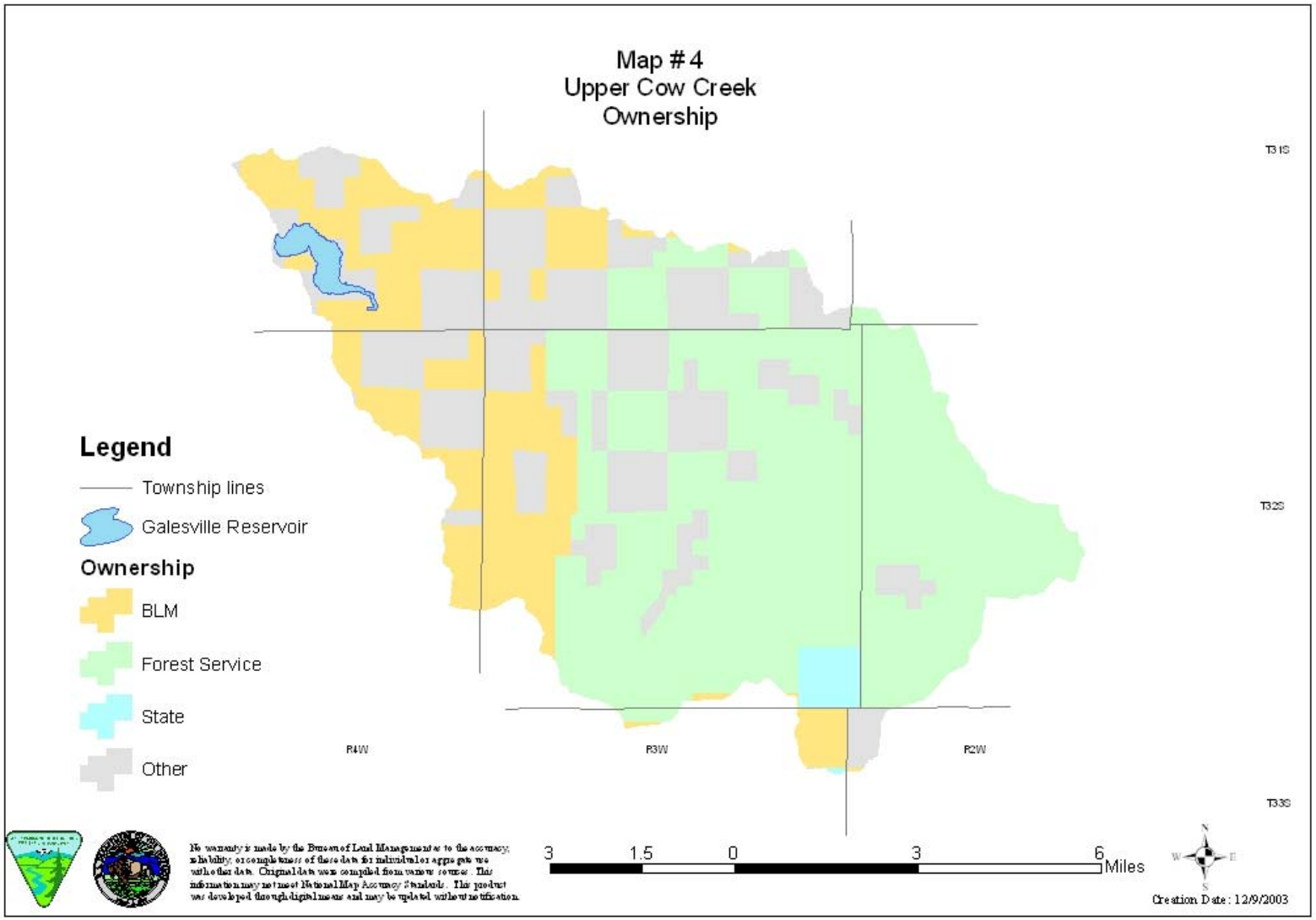
Soils

Soils in the Upper Cow Creek watershed are derived mostly from the metasedimentary rock of the Galice Formation, on the west side, the volcanic rock of the May Creek Formation in the east, and the plutonic rock that occurs in regions of the White Rock Pluton intrusions. Soils associated with the Galice formation typically occur as part of the Acker-Norling and Kanid-Atring soil complexes. Within the Acker-Norling complex, soils tend to be well-drained, but are moderately deep with a fairly high water and nutrient holding capacity. Soils in the Kanid-Atring complex are also well drained, but tend to be somewhat shallower and have less ability to hold water and nutrients then those of the Acker-Norling complex. Soils developed from volcanic rock types are generally within the May Creek soil series. These soils tend to be well drained, fairly shallow, and have less soil nutrients and soil development than the metasedimentary soils. Those soils derived from the White Rock Pluton intrusions are generally part of the Lettia or Sharpshooter complexes. Both of these complexes are relatively well drained, with a fairly high water and nutrient holding capacity. Because of the erosive nature of plutonic soils, and the steep slopes at which they occur, soils in these complexes tend to be very shallow. Some portions bordering the White Rock Pluton are dominated by serpentine-derived soils which share similar physical characteristics with other soils of this origin, but are also usually low in calcium and high in magnesium and other minerals. These soils produce unique vegetative communities, and preclude many plant species which are adapted to calcium-based soils. Organic matter plays an increasing role in the productivity of the volcanic and granitic sites. In general, soils in this watershed tend to increase in depth and fertility moving east to west across the watershed.

Land Use Allocations

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) (Map 4). This pattern is consistent with much of the BLM managed land within the Upper Cow Creek watershed.

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 #4
Upper Cow Creek
Ownership
T31S
T32S
T33S
R4W
R3W
R2W
Legend
Township lines
Galesville Reservoir
Ownership
BLM
Forest Service
State
Other
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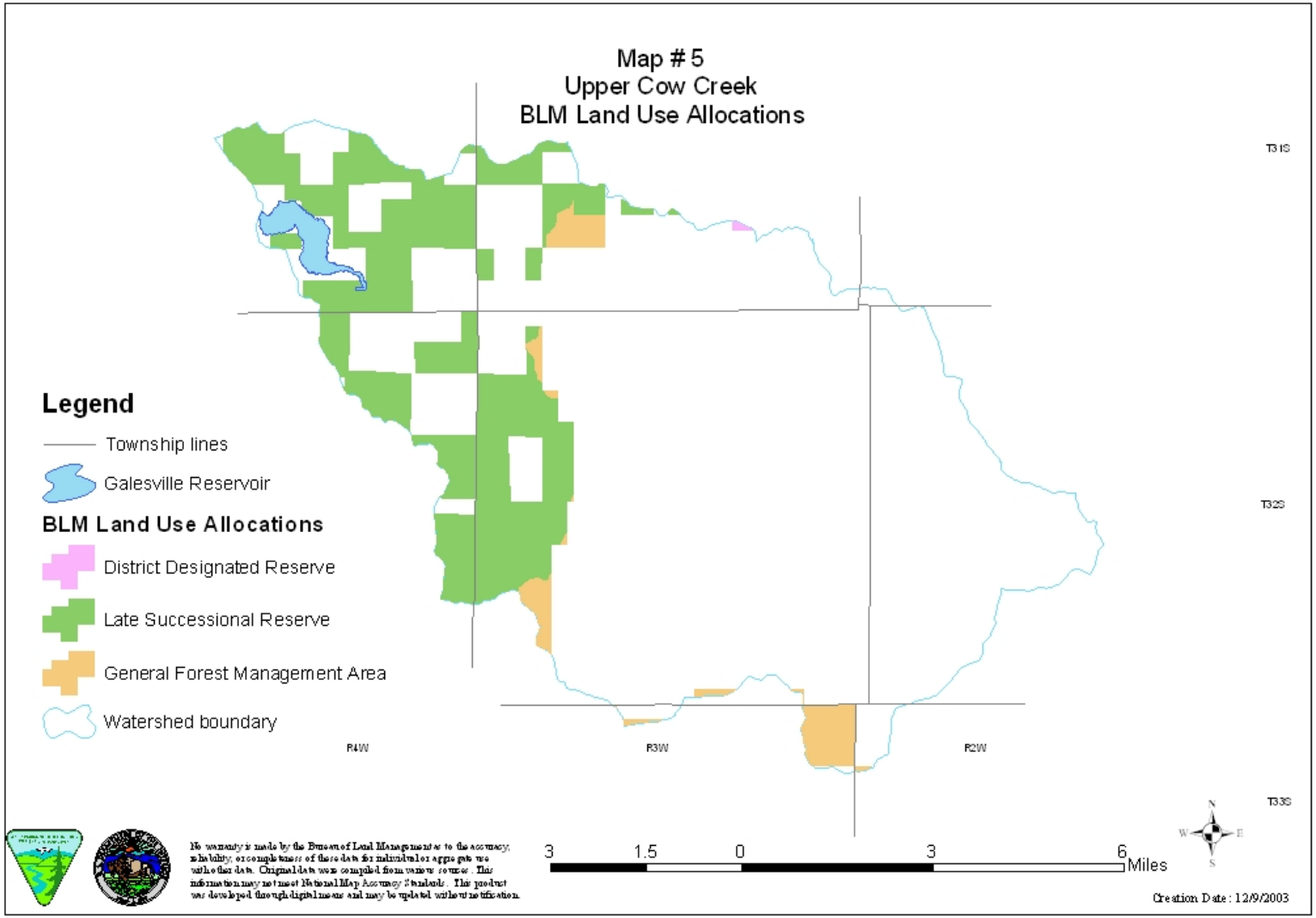

Map # 5
Upper Cow Creek
BLM Land Use Allocations
T31S
T32S
T33S
R4W
R3W
R2W
Legend
Township lines
Galesville Reservoir
BLM Land Use Allocations
District Designated Reserve
Late Successional Reserve
General Forest Management Area
Watershed boundary
3 1.5 0 3 6 Miles
Creation Date : 12/9/2003

*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. On BLM land, 85% of the land base is designated LSR. LSR lands in the Upper Cow Creek watershed that are managed by BLM provide habitat protection for two Northern spotted owl pairs in the form of 100 acre owl cores, as well as late successional habitat protection for a Bald Eagle, several survey and manage species, and at least two BLM sensitive wildlife species. There is approximately 10,900 total LSR acres on federal land within Upper Cow Creek watershed.

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. On BLM lands within this watershed, a majority of available acreage is already designated at a level of protection that is superior to what would be provided with Connectivity/Diversity blocks would provide.

The General Forest Management Area (GFMA) is the allocation where timber harvest is a primary objective. Upper Cow Creek watershed falls into what is known as Northern GFMA. Under the RMP, this designation requires 6-8 trees to remain following any harvest activity. There are approximately 1250 acres of NGFMA land available for harvest on BLM lands within this watershed. Throughout the watershed on federal lands, an estimated 21,600 acres are designated as Riparian Reserve/ GFMA, however, information about total riparian zone acreage on non-BLM land is unavailable and thus a determination of the percent of each cannot be made at this time.

Table 6. Federal Land Use Allocations on BLM (Medford and Roseburg) lands within the Upper Cow Creek Watershed.

Land Use Allocation	Acres	Percent of BLM lands
Late-successional Reserves /1	8430	85
General Forest Mgmt. Area/2 (Gross, including Riparian Reserves)	1490	15
Administratively Withdrawn Areas	20	minimal
Total	9940	100

/1 Late-successional reserves include portions of large LSRs and two100 acre 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 17 percent of the GFMA lands managed by BLM.

Water monitoring:

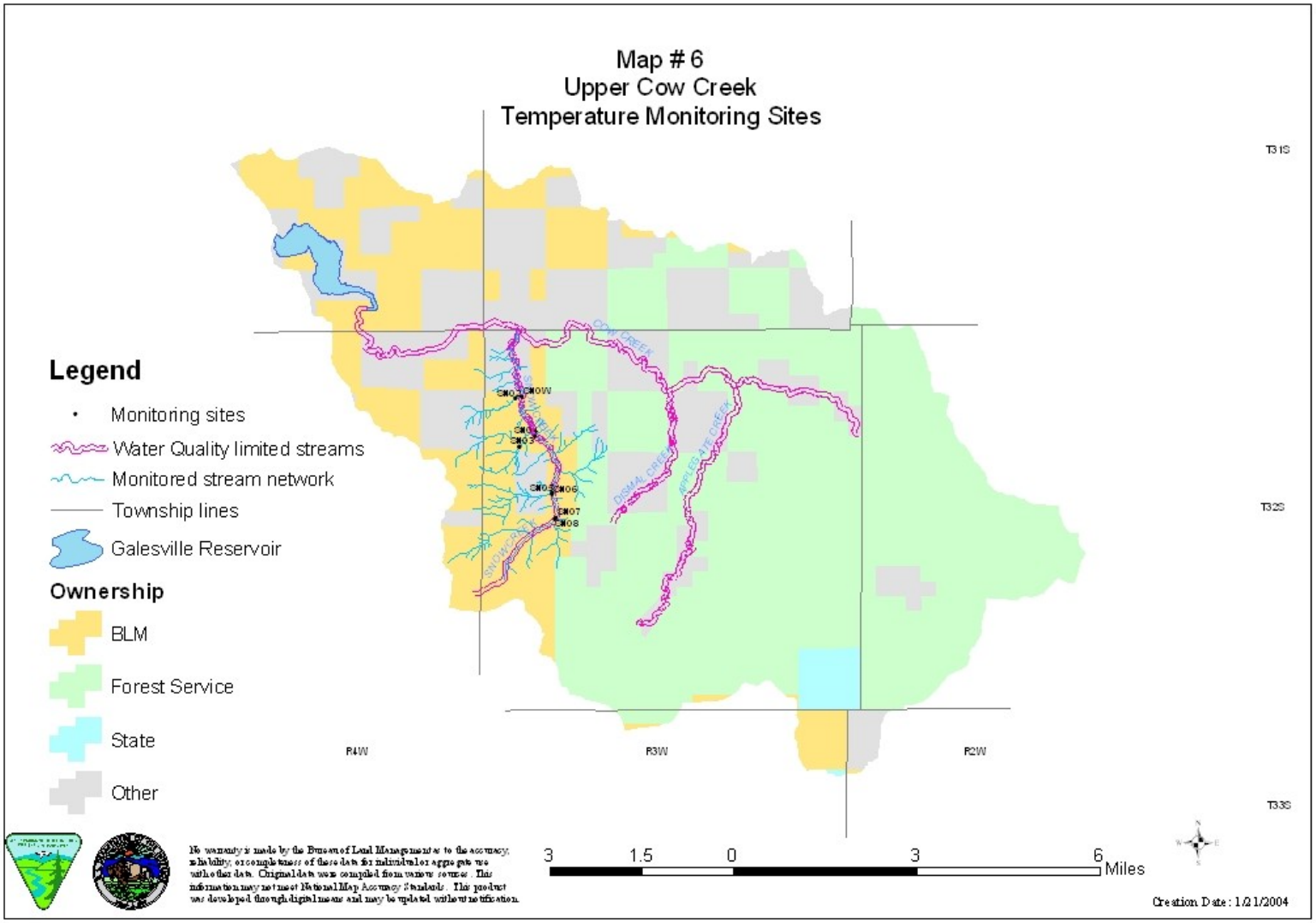
Section 303(d)(1) of the Clean Water Act requires that TMDL "be established at a level necessary to implement the applicable water quality standard with seasonal variations." Both

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 the summer between the months of June and September, when stream flows are lowest and solar radiation is the highest. Table 7 lists the site locations where BLM monitoring has occurred. Stream temperatures exceed the standard for seven day maximum between June and September in both 1998 and 2001 in Snow Creek. This standard has been exceeded in only one monitored location (SNOW, Table 7) within the Upper Cow Creek watershed.

Table 7. Temperature Monitoring Locations and years monitored

Site ID	Site Location Description	Highest 7 day temp for period of record	1998	1999	2000	2001	2002
SNOW	Snow Creek at end of BLM road # 32-3-7.4	65.6	**X**	X	X	X	**X**
SNO2	Unnamed Tributary to Snow Creek in T32S R3W S07; Parallel to BLM road # 32-3-7.5	59.6		X	X	X	X
SNO3	Unnamed Tributary to Snow Creek in T32S R3W S07; Parallel to BLM road # 32-3-7	59.0		X	X	X	X
SNO4	Snow Creek @ BLM road # 32-3-5 crossing	61.4		X	X	X	X
SNO5	Unnamed Tributary west of Snow Creek in T32S R3W S17 SW 1/4	59.1		X	X	X	X
SNO6	Snow Creek Upstream of Unnamed Tributary @ site SNO5	60.0		X	X	X	X
SNO7	Snow Creek- East Fork in T32S R3W S20 NW	58.6		X	X	X	X
SNO8	Snow Creek #8 T32S R3W S19 NE	59.3		X	X	X	X

X- indicates temperatures in excess of 64 degrees during a 7 day period


Map # 6
Upper Cow Creek
Temperature Monitoring Sites
Legend
Monitoring sites
Water Quality limited streams
Monitored stream network
Township lines
Galesville Reservoir
Ownership
BLM
Forest Service
State
Other
COW CREEK
SNOWCREST CREEK
DISMAL CREEK
APPLEGATE CREEK
CNOW
CNO1
CNO2
CNO3
CNO4
CNO5
CNO6
CNO7
CNO8
T31S
T32S
T33S
R4W
R3W
R2W
3 1.5 0 3 6 Miles
Creation Date: 1/21/2004

Element 3: Limiting Factor Analysis

Within NGFMA lands there is some acreage that has 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 21 percent of the watershed. Approximately 19 percent of the water quality limited stream miles within this watershed occur on BLM. Roughly an additional 21 percent of these streams are on Forest Service land, and the remaining approximately 60 percent are on private lands within the Upper Cow Creek watershed.

Analysis of water quality limited streams in Upper Cow Creek

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

Table 8. Percent of Upper Cow Creek Streams on Federal (BLM & FS) vs. Non-Federal Land

Stream	Approximate Percentage of Stream on Non-Federal Land	Approximate Percentage of Stream on Federal Land
Cow Creek (portion within Upper Cow Creek watershed)	94	6
Snow Creek	23	77
Dismal Creek	100	0
Applegate Creek	100	0

Analysis of water quality limited streams in the Upper Cow Creek watershed

Maximum summer water temperatures in the Upper Cow Creek watershed have probably always exceeded the current ODEQ standard because the geology and soils of this watershed do not allow for a great degree of water storage. Uplands are steep and soils are relatively shallow. As a result, recharge of streams by ground water is very limited during summer months, generally causing stream flow to be minimal. In addition, bedrock, which is a major component of the substrate, absorbs heat during the day and radiates it to the stream at night. With RMP allocations and management directions, the acreage harvested on federal land in this watershed is relatively small. Riparian areas for all perennial and intermittent streams managed by federal agencies in this region are managed to promote late successional characteristics. Because mining operations and non-federal timber activities are not required to provide streams with the same level of protection as on federal land, some areas in Upper Cow Creek watershed are still experiencing a localized loss of riparian vegetation on non-federal land.

Temperature

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

- Low summer discharge as a result of natural water holding capacity of soils, or human caused through water withdrawals; Several tributary streams have segments that have no surface flow during summer periods
- Riparian cover is absent or reduced due to past or present land practices adjacent to streams; logging, grazing, or agriculture within riparian zones
- 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
- Placer mining
- Habitat modification

Stream channel widths on most 1st through 4th order tributary streams are narrow enough for stream-side brush and hardwood vegetation to provide adequate shade. In well developed riparian zones, stream side vegetation usually consists of some combination of brush, hardwood and conifer species.

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 Upper Cow Creek. BLM lands are for the most part well vegetated and are in the higher portions of the streams.

Stream Flow

The lowest 7-day low flows for the historic gage on Cow Creek near Azalea for the period of record from 1932-2002 was minimum discharge, 1.1 cfs on Aug. 12, 1981, but may have been less during period of no gage-height record on Sept. 4-30, 1970. 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?huc=17100302. Tabulated data is not included in this document due to volume of data on that web site. Flows in the lower portion of Cow Creek, where this gage is located, are now augmented by the Galesville Dam. Low flow for the upper portion of Cow Creek above Galesville dam within the Upper Cow Creek watershed was 3.5 cfs on Dec. 26, 1989. This gage was only installed after Galesville dam was built in 1986; therefore the period of record for this gage is from1986 - 2002.

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). The Upper

Cow Creek watershed has a frequent fire history with the hotter, low elevations, and south facing slopes likely having more frequent fires than those in the moister, cooler conditions of the higher elevations. This is not only because fuel characteristics at lower elevations are more conducive to ignition of fires, but also because these low lying valleys, foothills, and riparian zones were subject to more frequent burning by Native Americans in the past. Historically the fire return interval was likely on the order of 30-80 years in the Upper Cow Creek watershed. The intensity of fires within this watershed has also varied based on the areas elevation, aspect, and vegetation characteristics. 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 Upper 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 watershed. It should be mentioned here that large mature conifers or hardwoods will likely continue to be rare on private lands, particularly agricultural lands, within the watershed unless major changes in land uses or land use regulations occur. This translates to a continuance of unrecovered conditions on private lands, largely due to agricultural activities. These low gradient areas have high biological potential for salmonids as “grubstake habitat” (Frissell 1993). In addition, recovery of large tree components on public lands upstream 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. Reduced 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 spawning and rearing. The state standard for Upper 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, 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 single 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 Upper 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, increases in channel width, as a result of increased bedload sediment, can also affect the amount of solar radiation entering the stream by increasing the streams available surface area. Water withdrawals during summer months (Jun-Oct) may exacerbate maximum temperatures as demonstrated by Brown's equation.

The BLM monitored several 303(d) listed streams during the summers of 1998 - 2003 to determine which portion of the streams are water quality limited. Definitive information on where stream temperatures meet the standard on stream reaches has not been analyzed. It will take several years of monitoring to determine the reaches that have temperature limiting problems.

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 loads above natural background levels, and can 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 alike.

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

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 related to this plan are intended to produce the coolest water possible. Shade effects, as a consequence of historic harvest, will largely recover within the next 30 years along the smaller tributaries on BLM lands. This conclusion is based on age class of harvest units adjacent to streams on BLM lands, as taken from operations inventories. Riparian zones on larger tributaries and mainstem Upper Cow Creek may take considerably longer (20-40+ years) to recover (Table 9).

Table 9. Approximate Acres of Riparian Reserves by age class on BLM lands Upper Cow Creek Watershed.

Age Class	HUC 6			
	Total Medford BLM Riparian Acreage	Upper Cow Creek-Galesville	Dismal Creek	South Fork Cow Creek
Non Forest	88	88	0	0
0-10 years	62	50	0	12
11-20	590	524	17	49
21-30	175	151	24	0
31-40	563	554	9	0
41-50	54	49	5	0
51-60	20	6	14	0
61-70	51	0	40	11
71-80	44	44	0	0
81-150	370	310	38	22
151- 200	317	305	11	1
201+	520	502	7	11
81+ Modified	640	637	3	0
Total Acres:	**3494**	**3220**	**168**	**106**

However, an assumption was made that smaller order streams $6^{th}/7^{th}$ field 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 hillslope constrained and narrow. When the data in table 10 are

compared to the data presented in the allocation for Federally-administered lands of 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 for conifer species to reach maturity and disregards hardwoods and brush species.

TMDL
The recovery of water temperature conditions 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 10. 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 1996 aerial photos. It is believed that some canopy closure has occurred since 1996 and therefore more shade is already on streams than is indicated in the TMDL portion of DEQ Water Quality Management Plan.

Element 5: Time line for Implementation and Attainment

It is difficult to set an exact recovery time for channel form when the recovery process is storm dependent. There is still active placer mining taking place within the basin so channel condition and storage of ground water surrounding these sites will likely slow recovery of the system.

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.

ODEQ 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. ODEQ 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, ODEQ 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.

ODEQ 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
- DMA 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 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)
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 Upper Cow Creek Watershed.

Element 6: Responsible Parties

Federal Lands - Participants in this plan for lands include the Oregon Department of Environmental Quality (ODEQ) and all federal agencies. The BLM and the Forest Service are

the 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 ODEQ 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 ODEQ 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, and will also assist in identifying opportunities for converting consumptive uses to instream rights.

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.

Table 11. Past Upper Cow Creek Watershed Improvement Projects

Project Name, Type, and Reason	Year	Project location or project road number	Miles of road improved or stream habitat improved (by species)	Fish species benefited
Cow Creek Road Rehab -Part A: Drainage Improvement – (4 roads) -reduce sediment & overland flow	1999	Roads 31-3-19.0: 31-4-25.3: 31-3-31.0:	Miles 0.94 0.48 2.32	CO, ST, CT
Cow Creek Road Rehab -Part B: Decommissioning – (4 roads) - watershed health	1999	Roads 31-3-19.2: 31-4-24.0:	Miles 0.17 0.28	CO, ST, CT

Standards and Guidelines used:

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

Standards and Guidelines for 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

Standards and Guidelines for 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

Standards and Guidelines for 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.

Goals of WQRP

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). Pre-commercial 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, 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 in 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 BLM administered lands. 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 12. Interim Benchmarks and monitoring strategy for the BLM in Upper 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. 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	Sedimentation resulting from roads by miles of road surfaced or decommissioned.	Review miles of road decommissioned, renovated or maintained.
Temperature Flow component	Road management objectives		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

Upper 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	
Upper Cow								
Creek								
	uc100e	267	521	40	15/20	50	70	25/35
	uc100w	267	700	90	55	75	75	0
	uc101e	202	521	40	15/20	50	70	25/35
	uc101w	202	750	90	55	40	75	0
	uc102e	85	521	40	15/20	50	70	25/35
	uc102w	85	700	90	55	75	75	0
	uc103e	349	521	40	15/20	50	70	25/35
	uc103w	349	700	90	55	75	75	0
	uc104e	282	521	40	15/20	50	70	25/35
	uc104w	282	700	90	55	75	75	0
	uc105e	242	521	40	15/20	50	70	25/35
	uc105w	242	521	40	15/20	50	70	25/35
	uc106e	391	551	40	15/20	30	70	25/35
	uc106w	391	521	40	15/20	50	70	25/35
	uc107e	420	521	40	15/20	50	70	25/35
	uc107w	420	551	40	15/20	30	70	25/35
	uc108e	1201	521	40	15/20	50	70	25/35
	uc108w	1201	700	90	55	75	75	0
	uc109e	109	521	40	15/20	50	70	25/35
	uc109w	109	700	90	55	75	75	0
	uc110e	736	521	40	15/20	50	70	25/35
	uc110w	736	700	90	55	75	75	0
Galesville	mc111b	144	301	n/a	n/a	0	0	n/a
Reservoir	mc112b	89	3252	n/a	n/a	0	0	n/a

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.