Upper Cow Creek:
Bureau of Land Management
Watershed Analysis

Loren Wittenberg
Sherwood Tubman
Bob Bessey
Rose Hanrahan
Amy Sobiech
Donni Vogel
Doug Stewart
Steve Timmons
Marylou Schnoes
Rachel Showalter
Michelle Calvert
Katie Wetzel
Dave Eichamer
Dustin Wharton

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Table 1. Summary of Watershed Characteristics

MORPHOLOGY	
Watershed size	• 47,416 acres Upper Cow Creek watershed • 9,941 acres BLM land (21 %)
Elevation range	• 1,880-5,104 ft Galesville Reservoir to Cedar Springs Mountain
Transient Snow Zone (land above 2,500 ft)	• 32,670 acres
Drainage pattern	• Dendritic
Orientation	• East to west
Drainage density	• 5.09 miles/mile^2
Total stream miles	• 377.2 miles
Total fish stream miles	• 71.7 miles
METEOROLOGY	
Annual precipitation	• 41-60 inches south to northwest
Type	• Rain and snow
Timing	• 80% occurring October thru May
Temperature range	• 0-100 degrees F
SURFACE WATER	
Minimum flow Near Azalea Above Galesville	• 1.1 ft^3/s Recorded on August 1981 • 3.5 ft^3/s Recorded on December 1989
Maximum peak Near Azalea daily flow Above Galesville	• 10,600 ft^3/s Recorded on January 1974 • 6,980 ft^3/s Recorded on January 1995
Reservoirs	• Galesville Reservoir – NW corner of watershed
Water quality limited stream miles	• (303d listed for temperature above 64 degrees) 26 miles, plus Galesville Reservoir
GROUNDWATER	
Aquifers	• None
Springs	• Numerous springs (not mapped)
Wells	• Numerous wells (public sites and private ownership)

GEOLOGY	
Geographic Province	• Klamath Mountains
Formations	• May Creek Terrane - metavolcanic rock 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 prone to landslides. • White Rock Pluton - prone to extreme erosion if disturbed.
Soils	• Vary from relatively deep soils Acker-Norling series to shallow soils in the Lettia/Sharpshoot Complex. • Basin wide, generally a low water holding capacity and relatively infertile. • Nutrient quality, depth and fertility increase moving from east to west across the watershed. Douglas County Soil Survey (BLM lands)
HUMAN INFLUENCE	
Roads	• 308.9 miles
Streams within 170 ft (one site-potential tree) of roads	• 86.0 miles (23 % of total stream miles)
Fish-bearing streams within 340 ft (two site-potential trees) of roads	• 39.4 miles (10 % of total stream miles)
Road density	• 4.2 miles/mile^2
Agriculture	• Historical and current use on private lands
Communications sites	• Cedar Springs Repeater • Buried fiber optic line under Snow Creek road - Cow Creek road
Communities	• Upper Cow Creek residences • No towns (Azalea is nearest - 6 miles from eastern boundary of Upper Cow Creek Watershed) • Some private residences in this watershed

HUMAN INFLUENCE (Cont.)	
Mining	• Current placer claims near roads 31-5-21.4, 32-4-12.1, & 32-4-1.2 as well as on Beaver Creek on BLM land. • Numerous historical claims within the watershed • Large quarry development on Snow Creek, several sites.
Recreation * improvements within the last 30-50 years	• Galesville Reservoir • Special Recreation Management Area (SRMA) • Devils Flat campground (US Forest Service) • Cow Creek Falls (US Forest Service) • Angel Camp (US Forest Service) • Rail Road Gap Shelter (US Forest Service) • Richter Cabin (US Forest Service) • Chief Miwaleta Park (day use area)
Timber production	There are 1,213 acres (10%) of BLM land within the watershed that are available for timber harvest (General Forest Management Area). 0-10 years: 22 ac 11-40 years: 415 ac 41-80 years: 158 ac 81-200 years: 406 ac 201+ years: 176 ac 81+ modified 34 ac
Special Forest Products	• Beargrass • Tree boughs • Christmas trees • Mushrooms • Firewood • Hardwoods
Progeny Test Sites	• One located north of Galesville Reservoir, T.31S., R.4W., Sec.22
Utility corridors	• Fiber optics line along Snow Creek, McGinnis Creek, and Cow Creek Roads

BIOLOGICAL	
Vegetation	• Primarily mixed conifer and hardwood. • Vegetative communities differ by slope, aspect, elevation and soils.
Special Status Species	• northern spotted owl (Threatened) (3 known sites on BLM) • bald Eagle (Threatened) • fisher (Federal Candidate) • steelhead trout (Federal Candidate) • northern goshawk (Bureau Sensitive) • peregrine falcon (Bureau Sensitive) • black-backed woodpecker (Bureau Sensitive) • flammulated owl (Bureau Sensitive) • mollusk (*Helminthoglypta hertleinii*) (Bureau Sensitive) • western pond turtle (Bureau Sensitive) • townsend's big-eared bat (Bureau Sensitive) • pallid bat (Bureau Assessment) • foothill yellow-legged frog (Bureau Assessment) • Vascular plants - Camassia howellii (Bureau Sensitive) - Cimicifuga elata (Bureau Sensitive) - Cypripedium fascicula (Bureau Sensitive) - Fritillaria glauca (Bureau Assessment) - Mimulus douglasii (Bureau Assessment) • Nonvascular plants - Crumia latafolia (Bureau Assessment) - Funaria muhlenbergii (Bureau Assessment) - Limnanthes gracilis var. gracilis (Bureau Assessment) - Silene hookeri ssp. Bolanderi (Bureau Assessment)

I. Introduction

Watershed analysis is an iterative process intended to be updated as new information becomes available (Federal Guide for Watershed Analysis, 1995). It conforms to the *Ecosystem Analysis at the Watershed Scale, Federal Guide for Watershed Analysis; August 1995*. This watershed analysis is designed to summarize the characteristics of the physical and biological elements, processes, and interactions in this watershed. It is not a decision-making document, but serves to set the stage for future decisions by providing a context in which plans and projects can be developed while considering all important issues within the watershed.

Several environmental impact statements have been completed over the past 10 years that address resource management concerns pertaining to this watershed. An interdisciplinary team utilized these analyses when developing this watershed analysis: *Final Supplemental Environmental Impact Statement* and *Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl* (Northwest Forest Plan FSEIS,1994 and ROD, 1994); the *Final-Medford District Proposed Resource Management Plan/Environmental Impact Statement* and *Record of Decision* (EIS, 1994 and RMP/ROD, 1995); the *Final Supplemental Environmental Impact Statement: Management of Port-Orford-Cedar in Southwest Oregon* (FSEIS, 2004 and ROD, 2004); the *Final Supplemental Environmental Impact Statement To Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines* (FSEIS, 2004 and ROD, 2004) and the *Final Supplemental Environmental impact Statement Clarification of Language in the 1994 Record of Decision for the Northwest Forest Plan National Forests and Bureau of Land Management Districts Within the Range of the Northern Spotted Owl*, and *Proposal to Amend Wording About the Aquatic Conservation Strategy* (FSEIS, 2003 and ROD, 2004).

The process for conducting ecosystem analysis at the watershed scale has six steps:

1. Characterization of the Watershed, in which the physical setting and the land allocations and designations are described;
2. Identification of Key Analysis Topic and Key Questions, which define the scope and level of detail of the analysis;
3. Description of Current Conditions within the watershed;
4. Description of Reference Conditions or historic conditions;
5. Synthesis and Interpretation of Information; and
6. Recommendations.

This analysis is generally organized around this format. The Current Conditions and Reference Conditions are combined into one chapter. The chapters are based on the Key Analysis Topics identified; however, overlap does occur among some sections.

The first part of the watershed analysis addresses the physical, biological, and human processes, or features of the watershed which affect ecosystem functions or conditions. The second part of the watershed analysis, the Current and Reference Conditions of these important functions are described; followed by Synthesis and Interpretation, which is the comparison of these conditions and their significant differences, similarities, or trends and their causes. Finally, recommendations are made to guide the management of the watershed toward the desired future condition.

This document contains planning level figures and numbers generated from Geographic Information System (GIS) derived from data available as of April 2004. Data sets were compiled over a large geographic area utilizing aerial photographs and existing knowledge of the area. Site specific project level numbers will change as site specific ground verification occurs. Watershed analysis revision is periodic and changes to the landscape are constant. Periodic updates and revisions will be made available on the Medford District BLM website at http://www.or.blm.gov/Medford/.

The Upper Cow Creek watershed is a fifth-field watershed (REO HUC5#1710030206) of which the BLM manages 21 %. This Watershed Analysis primarily provides information on the portion managed by the Bureau of Land Management and will be referred to as the Watershed Analysis Area (WAA) in this document. The rest of the watershed is managed by the U.S. Forest Service, multi-government agencies (federal, state, & county), and private land owners. The portion of the Upper Cow Creek watershed managed by the Forest Service has been analyzed by the Tiller Ranger District in a separate Watershed Analysis. Where available, Forest Service data was incorporated into this watershed analysis.

There were five Key Analysis Topics identified for the Upper Cow Creek watershed:

Hydrology and Fisheries
Forest Management
Mature and Late-Successional Forests/Species
Roads and Developments
Recreation and Visuals

II. Key Analysis Topics and Key Questions

Hydrology/Fisheries

- What are the effects of roads on hydrologic functions, water quality and riparian habitat?
- What are the effects of timber harvest and fire on hydrologic functions, water quality and riparian habitat?
- What are characteristics of mass wasting?
- What are the effects of roads on mass-wasting?
- Are there fragile soil areas for management?
- What are the current hydrologic risk factors?
- What are current water quality concerns (e.g. 303d list, non-point pollution)?
- What are the effects of mining on water quality and aquatic habitat?
- What are the causes of sedimentation?
- Are there sediment problem areas which need special management actions?
- What are the distribution and barriers to fish species from Oregon Department of Fish and Wildlife (ODFW) surveys?
- What is the condition of fish and aquatic habitat?
- What are the historic variations of fish distributions and runs?
- How do current conditions relate to the Aquatic Conservation Strategy (ACS)?
- What is the status of riparian habitat conditions and enhancement opportunities, private vs. federal?
- What are the conditions of culverts for fish passage?
- Where is the transient snow zone, what percent of the watershed is it?
- What is the peak flow for this watershed?

Key Analysis Topics and Key Questions (Cont.)

Forest Management

- What are the transportation planning needs for forest management?
- What Special Forest Products (SFPs) occur in the watershed?
- What are the current timber inventory and characteristics of the available timber?
- What are the effects of reserves and other allocations on timber availability?
- What are the productivity concerns in the watershed?
- Where do noxious weeds and invasive species occur; what problems do they pose?
- What changes are occurring in reforestation practices?
- What is the harvest history in the watershed and in adjacent areas?
- What is the future harvest likely to be?
- Where are recent timber sales located?
- How would stand density management be applied to maintain or improve health and vigor?
- Where are the harvest opportunities to improve forest health and stand vigor?
- How has fire suppression affected species composition or stand density?
- Are there insect, disease or other problems?
- What are the current and historic characteristics of forest diversity?
- Where are the greatest fire risk, hazard and values?
- What are the fuels characteristics?
- What is the fire history within and adjacent to the watershed?
- What are prescribed fire and other fuels treatment opportunities and management direction?
- What are the factors affecting wildfire suppression efforts?
- What effect do weather patterns have on fire in the watershed?
- How does smoke management affect fire and fuels management?
- How is the Late-Successional Reserve affected by fire and fuels?

Key Analysis Topics and Key Questions (Cont.)

Late-successional Forests/Species

- How do roads affect wildlife?
- How does timber harvest affect late-successional forest fragmentation?
- How is the analysis area functioning for intra- and inter-watershed connectivity?
- What is the current distribution of late-successional forests within the watershed?
- What and where are the special status species and habitats within the watershed?
- How is the function of late-successional forests potentially affected by disturbances such as fire and disease?
- How has previous management affected the quality and quantity of wildlife habitat?
- How does the habitat within this watershed interact with surrounding watersheds?
- How does habitat conditions in this watershed relate to other watersheds?

Roads and Development

- What are the surface types of roads in the watershed?
- What is the status and location of road closures?
- What are the road densities in the watershed?
- Where are the main travel corridors?
- What is the potential for new road construction?
- Which types of roads have a high level of erosion?
- How does present and future road network affect Port-Orford-cedar root disease?
- Where are the unstable areas for road construction?
- What is the status of noxious weeds and how does the road network affect their spread?

Recreation and Visuals

- How does recreation affect fish?
- How does recreation affect other resources?
- What are the Visual Resource Management (VRM) designations in the watershed?
- How does VRM affect timber management?
- What are the anticipated future recreational opportunities?
- What are the current recreational uses in the watershed?
- How has increased visitor use affected the Galesville Reservoir area?
- What are the characteristics of recreational use of the Galesville Reservoir and the Devils Flat campground?

III. Characterization

The Upper Cow Creek watershed is a fifth-field watershed in the Klamath Mountains province, located in southwest Oregon, approximately 20 miles northeast of Glendale (Map 1). The ownership pattern is checkerboard with private land holdings, industry land holdings, U.S. Forest Service (Tiller Ranger District) and BLM (Roseburg District, Medford District [Glendale & Butte Falls Resource Area]) land in the Upper Cow Creek Watershed. The entire fifth-field watershed is approximately 47,416 acres. BLM administers about 9,941 acres (21%), of which most is in the Glendale Resource Area. The U.S. Forest Service, Tiller Ranger District of the Umpqua National Forest administers 24,136 acres (51%). Private ownership comprises 12,688 acres (27%) of the watershed, and the State of Oregon manages 651 acres (1 %) (see Figure 1 and Map 2).

There are some private residences within the watershed as well as the Cow Creek Community. Azalea is the nearest town, approximately 6 miles southwest outside of the western border of the Upper Cow Creek watershed.

Land Uses / Ownership

The total Upper Cow watershed contains about 47,416 acres. The BLM administers about 9,941 acres or 21 % (Table 2 and Map 2), most of which is in the Glendale Resource Area. The remaining portion of BLM ownership falls within the Butte Falls Resource Area and Roseburg District.

The Forest Service, (Tiller Ranger District and Umpqua National Forest) manages 24,136 acres (Figure 1). Private ownership is 12,688 acres and the State of Oregon is 651 acres. These acreages are approximate figures and could vary between data sets and GIS coverages.

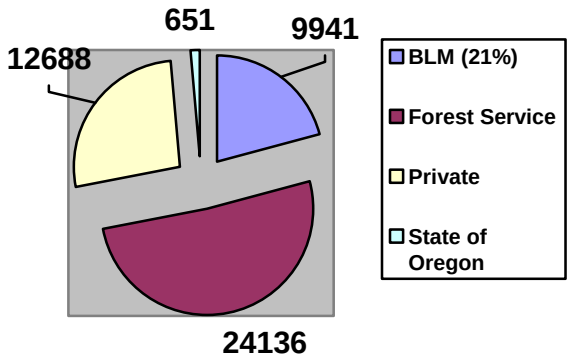

Figure 1: Land Ownership within the Upper Cow Creek Watershed

Table 2. BLM ownership by sixth-field watersheds, Upper Cow Creek watershed.

Drainage	Total Acres	BLM Acres	Percent BLM
South Fork Cow Creek	11,094	516	4.7
Dismal Creek	21,214	922	4.3
Upper Cow Creek - Galesville	15,108	8,503	56.3
TOTAL	47,416	9,941	21

Federal Land Use Allocations

The Medford District Resource Management Plan (RMP) designated several land use allocations for federal lands within the watershed (Map 3 and Table 3). The RMP provides overall management direction, management objectives, and levels of resource protection for each allocation.

Table 3. BLM Land Use Allocations within the Upper Cow Creek watershed.

Land Use Allocation	Acres	Percent of BLM land
Late-successional Reserves/1	8,707	87.6
Northern General Forest Management Area/2	1,213	12.2
District Designated Reserves	21	0.2
Total	9,941	100

/1Late-successional reserves include portions of large LSR and 100-acre spotted owl core areas
/2 General Forest Management Area includes Riparian Reserves

Table 3 shows the distribution of lands, on BLM administered land, within the Upper Cow Creek 5th Field Watershed by land use allocation (LUA). The majority of these lands are classified as Late-Successional Reserves.

Late-successional reserves (LSR) are areas designated in the RMP where the major management objective is to maintain or promote late-successional (i.e., mature and old-growth) forest. In this watershed a large checkerboard area in the eastern portion of the watershed has been designated LSR. It is part of the South Umpqua River/Galesville LSR (#RO223) which extends south and east into the Umpqua National Forest. There are 3 spotted owl core areas of about 100-acres each which are also considered LSR. There are approximately 475 acres of lands classified as withdrawn from intensive timber harvest by the TPCC (Timber Productivity Capability Classification) inventory, before they became part of the LSR land use allocation. They are no longer considered for intensive forest management. Most of these lands were withdrawn due to steep gradients or rocky soils.

General Forest Management Area (GFMA) is the allocation where timber harvest is a primary objective. Land allocated to this category in the Upper Cow Creek watershed is classified as northern GFMA, where the RMP calls for retaining at least 6-8 large trees per acre in regeneration harvests.

Within the General Forest Management Area lands there are approximately 19 acres which have been withdrawn from intensive forest management using the TPCC inventory. These lands were withdrawn due to low site conditions and shallow soil profile resulting in rocky meadows.

Riparian Reserves – intermittent and perennial streams and specified areas along each stream channel where resource management activities are limited to protect fish, wildlife, and water quality.

> Fishbearing streams and Lakes or natural ponds – distance equal to the height of two site-potential trees from stream bankful width. For this watershed, this length averages 340 ft on each side of stream.
>
> Perennial streams without fish, Intermittent streams, and unstable or potentially unstable areas – distance equal to one site-potential tree height from stream bankful width. One site-potential tree length is equal to the average maximum tree height of the tallest dominant trees (200 years or older). For this watershed, this averages 170 ft on each side of stream.
>
> Riparian Reserves serve three functions within the watershed: (1) as wildlife dispersal corridors- including invertebrate and vertebrate species, (2) as protection for the ecological integrity of the stream or wet area (seeps, springs, and wetlands), and 3) as protection for riparian dependent plant communities. Riparian Reserves widths serving to meet the Aquatic Conservation Strategy objectives to protect the ecological integrity of the stream or wetland for fish and other aquatic species may be different than the width necessary to serve as wildlife dispersal corridors. The width of Riparian Reserves necessary to protect the ecological integrity of streams varies with slope and rock type (see Figure B-1 of the NFP ROD, Standards & Guides, p. B-15). Activities intended to enhance

riparian reserve characteristics to attain ACS objectives are authorized under the NWFP following the completion of a Watershed Analysis (Standards and Guidelines, pg. B-30-31, C-31-32, C-37-38). "No treatment zone" (NTZ) widths would be designated based on the Ecological Protection Width Needs chart (B-15, Standards and Guidelines), which is based on slope and rock type, and takes into account protection of streams from "surface erosion of streamside slopes, fluvial erosion of the stream channel, soil productivity, habitat for riparian-dependent species, the ability of streams to transmit damage downstream, and the role of streams in the distribution of large wood to downstream fish bearing waters" (B-15, Standards and Guidelines). Included within NTZ widths would be protection of the primary shade zone, as described in the NWFP Temperature TMDL Implementation Strategies (US Forest Service and BLM, 2005), and sufficient canopy closure within the secondary shade zone to maintain or improve microclimate conditions within the riparian zone in the long term, without measurably increasing stream temperatures in the short or long term. Activities outside the NTZ, but within the boundary of the Riparian Reserve would be conducted as to meet ACS objectives; and would use the best available science to dictate their scale and magnitude.

District Designated Reserves – areas designated for the protection of specific resources, flora and fauna, and other values. These areas are not included in other land use allocations nor in the calculation of the Probable Sale Quantity. This particular reserve within the Upper Cow Creek Watershed was designated to protect late successional species.

Visual Resource Management

BLM implements four different land classes of visual resource management, with Class I lands being the most visually protected. These management classes guide the level of allowable change to the natural environment from any given management activity. The area immediately surrounding the Galesville Reservoir is classified as VRM (Visual Resource Management) Class II by the BLM rating system. The objectives for VRM II lands limit management activities within this area to those not noticeable by the casual observer.

The remaining lands in the watershed are designated as VRM IV lands where management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the effect of these activities through careful location, minimal disturbance, and should repeat the basic elements of form, line, color, and texture (RMP, p. 70). See Map 4 for a visual description of VRM classes designated in the Upper Cow Creek watershed.

Other Designations: There are 8,151 acres within the Upper Cow Creek WAA which have been designated as Critical Habitat for the northern spotted owl, a federally-listed threatened species. This Critical Habitat Unit "coincides with the Rogue-Umpqua Area of Concern, which provides an essential link in connecting the Western Cascades Province with the southern portion of the Coast Ranges and northern end of the Klamath Province and associated Area of Concern. The land ownership patterns elevate the importance of maintaining areas of owl nesting habitat to link the Western Cascades, Coast Ranges, and Klamath Mountains Province" (p. 2 of Appendix B. 2003. Rogue River/Siskiyou National Forests and Medford BLM-Biological Assessment FY 04-08.)

Geology

Cedar Springs Mountain, Red Mountain, part of Skeleton Mountain, Wildcat Ridge, and Galesville Reservoir are some of the prominent features in the watershed.

The Upper Cow Creek watershed is located within the Klamath Geomorphic Province and is characterized by deeply weathered and eroded sandstone. The Klamath Mountains were formed from old (Mesozoic-Jurracic) geologic formations which were folded and faulted and intruded by the collision of the North American and Farallon Plates. Extensive erosion has created steep canyons with slopes averaging 50-55 percent. Ridges are oriented mostly east and west with north and south slopes. Drainage is tributary to the Umpqua River.

The geologic map of the watershed (Map 5) shows the northeast trend of the rock formations. The northward extension of the Galice formation occurs westward of Snow Creek. Much of the White Rock Pluton is south and northeast of Snow Creek. The May Creek terrain is east of the White Rock Pluton in the upper reaches of the watershed on Forest Service land.

Soils

Soil Development

Soils in the watershed are derived from metasedimentary, metavolcanic and granitic 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, have less nutrients and soil development than sedimentary. Soils are poorly developed on granitic rock areas and are prone to extreme erosion if disturbed. Organics play a more important role in the productivity of the metavolcanic and granitic sites since the overall nutrient availability is less in granitics than in many other soil types. Some areas within the watershed are dominated by serpentine derived soils, which are low in calcium, and high in magnesium and other minerals which preclude many plant species which are adapted to calcium based soils (including Douglas-fir).

Vegetative communities within this watershed vary by slope position, aspect, geologic type, and elevation. Vegetation on south aspects includes mixed conifers and hardwoods with understory being typical of fire dependent species such as ceanothus and manzanita. Typically, north aspects support mixed conifers and hardwoods with understories of salal and rhododendron. Vegetation on soils derived from metasedimentary rock types contains a greater proportion of Douglas-fir. The size and growth rate tends to be greater on these soils than in metavolcanic derived soils. Granitic soils tend to support mixed conifers and are relatively productive if organics are undisturbed. Site specific vegetative community analysis needs to be assessed during prescription surveys since the area is geologically and geographically very complex.

Soil Survey

Soils in the Upper Cow Creek WAA on BLM can be found in the Douglas County Soil Survey of the Natural Resource Conservation Service (NRCS) on-line in the Soil Survey Geographic database files (www.ftw.nrcs.usda.gov/ssur_data.html). This soil survey of Douglas County is available for detailed investigations in project planning activities. The draft of the Douglas County soil survey information is available on blue line maps. These maps are contained in community files in the Resource Area. No NRCS soils information is available for Forest Service land.

Soil Types

The nutrient content of both Vermisa and sandstone and granitic derived soils is dependent upon organic matter, therefore consumption of organic matter during broadcast burning is of some concern. These shallow, low nutrient content soils are susceptible to nutrient depletion if the soil becomes hot enough as is often the case in broadcast burning. Handpile and burning is less likely to cause nutrient depletion for Vermisa, sandstone, and granitic soils since burning activities are localized at specific points instead of across an entire landscape.

There are extensive areas of rocky outcrops and talus slopes in the upper portion of the watershed. Slide areas on BLM land are found in Snow Creek, Meadow Creek and Ike Butte Basin. These conditions may create management constraints especially where road construction is concerned.

Soil types that are considered to be sensitive to management activities such as timber harvest, road construction and broadcast burning are shallow soils (less than 20 inches deep), soils derived from granite or schist, and soils derived from serpentine or peridotite. Granite and schist soils are erosive. Fault lines are formed along the borders between granite and sandstone and peridotite soils (Map 6).

Shallow soils are found in complexes with deeper more developed soils but are often associated with metasediments, metavolcanics, and hard sandstone bedrock. The location of these soils is usually on ridge tops and oversteepened slopes. These shallow soils are often found in

alternating bands with deeper and more developed soils. Sandstone derived soils tend to be nutrient deficient with low cation exchange capacities which require care to ensure the productivity is maintained. Shallow soils are vulnerable to drought conditions particularly on south and west facing slopes.

In general soil types and geology become more of a factor, influencing vegetation as the annual precipitation drops to less than 60 inches. This occurs in an easterly direction from the ocean and progressively at lower elevations.

Soils derived from granitic geologic formations vary in texture and fertility but behave similar to schists. The organic horizon is important to the granitic soils as they have a relatively low cation exchange capacity. When disturbed by management activities granitic and schist soils are prone to extreme erosion if control measures are not taken.

Soils derived from ultramafic rock types (serpentine, peridotite gabro) are known to have a mineral imbalance due to a high magnesium to calcium ratio. These soils are particularly unproductive in terms of commercial conifer species. Typical conifer species that may occupy these sites are incense cedar and jeffery pine. Several BLM Special Status plants are known to occur on these soil types.

Soils derived from sedimentary rock types are generally fertile and productive. The exception as mentioned before is sandstone soils.

There are four categories of fragile soils sensitive to surface-disturbing activities identified in the Medford District's timber production capability classification (TPCC):

Fragile Slope Gradient (FG) - steep to extremely steep slopes that have a high potential for surface ravel. Gradients commonly range from 60 to greater than 100 percent.

Fragile Mass Movement (FP) – deep seated, slump, or earth flow types of landslides with undulating topography and slope gradients generally less than 60%. Soils are derived from volcanic tuffs or breccias.

Fragile Surface Erosion (FM) – soil surface horizons that are highly erodible. Soils are derived from granite or schist bedrock.

Fragile Groundwater (FW) – sites have higher water tables where water is at or near the soil surface for sufficient periods of time that vegetation survival and growth are affected.

Climate / Precipitation

The area has a Mediterranean climate, characterized by cool, wet winters and hot, dry summers. Annual precipitation ranges from 41-60 inches within the watershed (Map 7), summer precipitation averages about 6 inches between June and September.

Table 4. Precipitation Levels within Upper Cow Creek Watershed

HUC 6 (Sixth-field) Watershed	Annual Precipitation Range (inches)
South Fork Cow Creek	46-52
Dismal Creek	42-54
Cow Creek –Galesville	46-60

In-stream Flows

Major tributaries within the Upper Cow Creek watershed include: McGinnis, Negro, Sugar, Meadow, Snow, French, Granite, West Fork Dismal, Devil, Jack, Applegate, Copper, Beaver, South Fork Cow, and East Fork Cow (Map 8). The geology and soils of this basin do not allow for a great degree of water storage. Uplands on the eastern side of the watershed are steep and soil profiles are relatively shallow. While soils are deeper and upland slopes more moderate on the western edge, the seasonal nature of precipitation does not supply much rainfall between June and October. As a result, recharge of streams by ground water is very limited during the summer months. Summer daily high air temperatures are typically 80-100 degrees, with moderate humidity. Summer drought is common.

The movement of water through a watershed is greatly influenced by the vegetative cover. The extent of vegetative cover can be estimated by seral stage classification. Early seral stage stands located in the TSZ (Transient Snow Zone) function as openings subject to earlier and faster snow melt, often resulting in surface runoff. During rain or snow events, older seral stage stands are likely to have reduced overland flows, as compared to younger stands and openings (Jones & Grant). This is attributable to less snow pack accumulating under the forest canopy which helps moderate fluctuations in water flow rates within the streams. There are several portions of the watershed with large openings created by clearcuts or fire.

The TSZ covers approximately 32,670 acres in this WAA (Map 8). The checkerboard pattern of ownership limits BLM management within the watershed. There are private residential properties on the lower end of the watershed and water withdrawals in the watershed- mostly by landowners for ranching and agriculture.

Floodplains

Although 69 % of this watershed is in the TSZ, floods have not been a major disturbance agent. The steepness of many of the headwater streams does not allow for floodplain development. However, in the lower reaches of major tributaries and of the mainstem of Cow Creek there are several areas that have developed local floodplains.

There is limited stream gauge data available for the streams in the upper Cow Creek watershed. The gauges on Cow Creek above Galesville, on Galesville Reservoir, and on Cow Creek near Azalea have a relatively short period of record, 1985 to the present.

Cow Creek has had several large scale events that have been recorded. Cow Creek near Azalea had 10 year flood events or greater in 1955, 1964, 1974, and 1981-1983. The flood in December 1964 was between a 25-50 year event [8,430 cfs (cubic feet per second)]. A hundred year record flood occurred in January 1974 (10,600 cfs).

Winter storms during January 1996 caused above bankful streamflow conditions with low land flooding and road damage in the Cow Creek watershed. In one 24 hour period (January 9, 1996) there was 2.27 inches of precipitation at Devil's Flat and 1 inch of water from snow melt. The peak streamflow for Cow Creek above Galesville stream gauge was greater than a 5 year event. Peak streamflow downstream at the gauge on Cow Creek near Riddle was estimated as a 9 year event.

Flood frequency analysis, probability is often expressed as a "1-in-X-year" chance. For example, a 1-in-100-year flood is one which would be expected to occur, on average, once every 100 years. This average length of time between two floods of a given size or larger is called the average recurrence interval. The 1-in-100-year flood would have a probability of 0.01 or 1 % of occurring in any given year.

Probability of flood = 1/ time interval

Probability only tells us the likelihood of a flood event. It says nothing about when it will actually happen. Thus, a 100-year event could occur this year, next year, several times or not at all during our lifetime (Gordon, p.352).

The 5th field watershed has been divided into three sixth-field watersheds (Map 2 and Table 5) which include 28 seventh-field watersheds. Table 5 lists the miles of streams within each HUC 6. Stream miles for the entire HUC 5 watershed are presented in Table 6.

Table 5. Miles of Stream by HUC6 Watershed for the Upper Cow Creek watershed.

HUC	Drainage	Miles
HUC6	South Fork Cow Creek	70.4
	Dismal Creek	174.4
	Upper Cow Creek -Galesville	132.4
HUC5	Upper Cow Creek	377.2

Table 6. Sixth-field watersheds and major streams within the Upper Cow Creek watershed. Table generated from Medford local database, REO (Regional Ecosystem Office), & BLM GIS.

Sixth-field Watershed	HUC 7 Number*	HUC 7 Fish-bearing Streams	Miles of Non-anadromous (Resident) Trout
South Fork Cow Creek 171003020601*	17100302060103	Cow Creek above East Fork Cow Creek	8.4
	17100302060106	East Fork Cow Creek	4.7
Dismal Creek 171003020602*	17100302060203	Cow Creek above Beaver Creek	0.6
	17100302060206	Beaver Creek	1.6
	17100302060209	Cow Creek below Beaver Creek above Applegate Creek	3.3
	17100302060212	Applegate Creek and Unnamed Tributary	5.4
	17100302060215	Applegate Creek below Applegate Creek and Unnamed Tributary and above Cow Creek	6.8
	17100302060218	Cow Creek below Applegate Creek above Devil Creek	0.4
	17100302060221	Devil Creek	0.5
	17100302060224	Negro Creek	1.0
	17100302060227	Dismal Creek	6.7
	17100302060230	Cow Creek below Dismal Creek above French Creek	1.9
	17100302060233	Galesville Reservoir North Shorefront from McGinnis Creek to Galesville Dam	1.9
	17100302060236	Cow Creek below French Creek above Unnamed Tributary	1.4

Sixth-field Watershed	HUC 7 Number*	HUC 7 Fish-bearing Streams	Miles of Non-anadromous (Resident) Trout
	17100302060239	Unnamed Tributary	0.9
	17100302060242	Cow Creek	2.0
Upper Cow Creek-Galesville 171003020603*	17100302060303	Cow Creek below Unnamed Tributary, above Snow Creek	0.5
	17100302060306	Snow Creek	10.1
	17100302060309	Cow Creek below Snow Creek, above Meadow Creek	0.1
	17100302060312	Meadow Creek	2.0
	17100302060315	Cow Creek below Meadow Creek, above Sugar Creek	0.4
	17100302060318	Sugar Creek	2.2
	17100302060321	East Galesville Reservoir & Lower Cow Creek	1.5
	17100302060324	Negro Creek	2.8
	17100302060330	McGinnis Creek	1.7
	17100302060333	Galesville Reservoir North Shorefront from McGinnis Creek to Galesville Dam	0.3
	17100302060336	Galesville Reservoir	5.4
Total fish stream miles (excluding Galesville Reservoir shoreline)			72

*Hydrologic Unit Code (HUC) for 6th and 7th field watersheds.

Range of natural variability

The following narrative is taken from the United States Forest Service Great Lakes Assessment http://www.lic.wisc.edu/gla/range.htm and is a description of the concept of Range of Natural Variability and its usefulness as a tool to resource management.

> Range of Natural Variability (RNV) is a term used to reference the variation of physical and biological conditions within an area due to climatic fluctuations and disturbances of wind, fire, and flooding. This range is determined by studying the ecological history of the area in question. The RNV description provides information on characteristics of the environment that apparently sustained many of the species and communities that are now reduced in number, size, or extent, or changed functionally. It does not imply that federal lands intend to return the area to historical conditions; indeed, it is impossible to do so and may be undesirable within the context of achieving multiple-use objectives. The description of RNV is used as a baseline for comparison with current conditions to assess the degree

of past change and to better predict future vegetative succession. Maintaining or restoring some lands to resemble historic systems, and including some structural and compositional components of the historic landscape within actively managed lands, provides part of an ecological approach to multiple-use management. An ecosystem within its RNV provides a coarse-filter for biological diversity and meets many of the legal and regulatory requirements for maintaining viable populations of native species.

Our ability to describe RNV is limited by availability of information on past landscapes. We draw information from research findings and descriptive records of historical conditions, and from recent fire, wind, or flood disturbances. Information quality varies depending on the geographic area in question, time period, and type of disturbance. Thus, some inferences are made based on information from other areas, and some portions of RNV descriptions will not be complete without further research.

A central assumption in the application of RNV is that species are adapted to certain environmental conditions and can tolerate a range of disturbances similar to that which influenced them over evolutionary time. Loucks (1970) has noted that genetic differentiation within major forest genera occurred between 30 million and 2 million years ago, and it was at this time that one or more species in each genus adapted as "opportunists" capitalizing on different kinds of disturbances, and on shade or open conditions. This is why most species will generally be adapted to disturbance regimes that have historically dominated an area (Alverson et al. 1994). Many species are known to depend on natural disturbances to complete portions of their life cycles, as in the example of jack pine, which has serotinous cones that open in fire. It is essential to have information about the type, frequency, severity, and spatial arrangement of natural disturbances to provide for species' needs.

The time frame used for describing RNV is chosen based on certain criteria; we used a period of similar climate and species presence as exists in current times. Because species migrated northward at different rates after Pleistocene glaciation, community composition was unstable for some time after major climatic trends had stabilized. At about 3,000 years ago, today's forest species were present in the northern Wisconsin-western Upper Michigan area, and the climate had stabilized after a major shift in the mid-Holocene (Davis et al. 1993, Webb et al. 1993). Thus, we have selected the period beginning 3,000 years before present as an appropriate time frame for analysis of RNV" (USFS—Great Lakes Assessment 1997, Cleland and Padley http://www.lic.wisc.edu/gla/range.htm).

Table 7 summarizes some of the important watershed elements in comparison with a RNV

(Range of Natural Variability) in the Upper Cow Creek watershed. The precise relationships are often very uncertain because we have little data on pre-historic conditions. Most of the relationships are based on professional judgment and on observed ecological processes.

Table 7. Comparison of present conditions to the range of natural variability thought to exist during the period of 3,000 years ago to 200 years ago (i.e., pre-European settlement), Upper Cow Creek watershed. The table below is a best professional estimate of specialists, based on personal knowledge and source materials of history of the area.

ELEMENTS, PARAMETERS, or INDICATORS	Less than RNV	Within RNV	Greater than RNV	COMMENTS
WATER QUALITY				
Temperature		X		• Xeric periods in the past may have resulted in higher water temperatures due to extreme low flow periods. • Relatively shallow soils have low water holding capacity, causing stream flows to respond quickly to storm events. • Low ground water input to streams during summer contributes to heating during low flow months. • High ambient air temperatures combined with low flows result in elevated water temperatures during the summer months.
Sediment/substrate			X	• Historically, episodic events probably produced more sediment. • Placer mining and roads probably produce more continuous risk to fish requirements by degrading water quality.
HABITAT ACCESS				
Physical Barriers			X	• Natural barriers and steep instream gradients restrict movement of aquatic species. • Galesville dam • Several roads crossing culverts prevent upstream movement of resident fish and other aquatic species.

ELEMENTS, PARAMETERS, or INDICATORS	Less than RNV	Within RNV	Greater than RNV	COMMENTS
FISH HABITAT ELEMENTS				
Fish	X			• Loss of anadromous fish due to Galesville Reservoir.
Large woody debris	X			• Wildfire and Native American burning may have reduced LWD (Large Woody Debris) and potential LWD. • Modern fire suppression over several decades is probably slowly contributing to less LWD. • Timber harvest and mining have reduced both standing and down LWD in isolated areas.
Pool frequency		X		• Existing condition is highly variable between streams.
Pool quality	X			• Less LWD for pool complexity and depth.
Off-channel habitat	X			• Braided channels and beaver dams are absent. • Higher gradient streams probably more closely resemble conditions within RNV.
Refugia		X		• Not much initially but what is existing is in good condition.
CHANNEL CONDITION AND DYNAMICS				
Width/depth ratio		X		• Higher gradient streams are generally within RNV.
Stream bank		X		• Same as above.
FLOW/HYDROLOGY				
Peak/base flows		X		• Low flows may be affected by partial conversion of riparian vegetation from conifer to hardwood, which consume large amounts of water. • Peak flows in some streams may be affected to some degree by roads (timing) but riffle substrate does not currently indicate that peak flows have increased to a level that is causing adverse effects to aquatic habitat.
Drainage network increase			X	• Many more miles of streams resulting from road ditches.

ELEMENTS, PARAMETERS, or INDICATORS	Less than RNV	Within RNV	Greater than RNV	COMMENTS
WATERSHED CONDITIONS				
Riparian reserves	X			• Timber harvests on federal (pre-Northwest Forest Plan activities) and non-federal lands have reduced riparian structural diversity buffering of the riparian microclimate and natural connections between lowlands and uplands.
TERRESTRIAL HABITAT				
Large Down Wood (in upland areas)	X			• Fire suppression has increased tree density, increased competition in stands and reduced growth, producing more *small* down wood (less than 16 inches in diameter and 16 ft long) than in pre-European times and smaller diameters of snags and resulting down wood. • Wildfire removes relatively little of large down wood. • Recruitment of large snags has been reduced by timber cutting and fire suppression (due to decreased mortality of large trees from fire).
Meadow associates (wildlife, e.g. elk and great gray owl)	X			• Reduction in fire frequency and extent, compared with pre-European times, has probably reduced the amount and quality of habitat.
VEGETATION				
Forest Openings	X			• The amount of forested area in the watershed is probably within the range of natural variability, but some stands may be younger and have a different species composition due to selective logging and fire suppression.
PHYSICAL				
Fire-Return Interval	X			• Greater disturbance agent in the past due to Native American burning practices and lack of wildfire suppression efforts.
Soil Compaction			X	• Mainly as a result of roads, agricultural activities and timber harvest.

IV. Current and Reference Conditions

A. Hydrology/Fisheries

Stream and riparian habitat quality varies widely within and among subwatersheds of the Upper Cow Creek WAA (Watershed Analysis Area). Activities on one ownership often influence quality of aquatic habitat on other ownerships, especially on streams third order and larger. Various activities and conditions such as the checkerboard ownership pattern, the high level of past timber harvest-related activities, fire suppression, grazing on private land, road construction, placer mining, water diversion, land clearing, and various agricultural practices have left portions of watershed degraded and the integrity of the streams are not as healthy as they could be. In general, lower order streams are in better condition than higher order (e.g. fish bearing) streams since the former are considerably smaller and their integrity is influenced by activities on fewer ownerships.

Administrative Guidance

The Oregon DEQ (Department of Environmental Quality) designated beneficial uses of streams in the Upper Cow Creek Basin. Designated beneficial uses for Cow Creek include: private domestic water supply, public domestic water supply, industrial water supply, irrigation, livestock watering, anadromous fish passage, salmonid fish rearing and spawning, resident fish and aquatic life, wildlife and hunting, fishing, boating, water contact recreation, aesthetic quality, and hydro power (Oregon Administrative Rules Chapter 340, Division 41).

The Clean Water Act of 1977, as amended by the Water Quality Act of 1987, provides direction for designation of beneficial uses and limits of pollutants (section 303d). DEQ is responsible for designating streams which fail to meet established water quality criteria for one or more beneficial uses. These designated streams are often referred to as the 303d list. Water quality monitoring by several agencies throughout the Upper Cow Creek Watershed has resulted in 303d listing for streams which have failed to meet established criteria for one or more beneficial uses (Map 9), regardless of ownership.

Temperature is listed as being the major limiting factor for the beneficial use of waters in the Upper Cow Creek Watershed (Table 8). Salmonids have survived major changes in climate and habitat condition for thousands of years because they are highly resilient. Our knowledge of their habitat needs is imperfect; the interrelationships among habitat factors are complex and poorly understood.

The BLM, as well as other natural resource management agencies and the legal system (through litigation related to the Endangered Species Act), requires descriptions and rating of current

habitat conditions of fish-bearing streams, especially for ESA-listed fish species. The Glendale Resource Area uses a system for rating stream habitat quality using "properly functioning" criteria from NOAA Fisheries Matrix of Habitat Indicators (as adapted for the Klamath Province) and from Oregon Department of Fish and Wildlife (ODFW) "Habitat Benchmarks". Data for each rating has been obtained from ODFW stream habitat surveys, watershed analysis and also from professional opinion when there were no data.

Table 8. Water quality limited streams (303d list) in the Upper Cow Creek watershed.

Stream	Boundaries	Water Quality Parameter	Land Ownership
Cow Creek	Reservoir to S. Fork Cow Creek 12.8 miles	Temperature	Forest Service/ BLM/ private
Snow Creek	Mouth to Headwaters 5.3 miles	Temperature	BLM/ private
Dismal Creek	Mouth to Headwaters 2.7 miles	Temperature	Forest Service/ private
Applegate Creek	Mouth to Headwaters 4.8 miles	Temperature	Forest Service/ private
Galesville Reservoir	Reservoir	Mercury	Douglas County/ Bureau of Reclamation
25.6 miles of water quality limited streams within Upper Cow Creek watershed			

1. Water Quality

a. Stream Temperature

Streams listed for temperature do not meet the DEQ designated criteria for salmonid fish rearing (a seven day running average where water temperature exceeds 64^0F). Stream temperatures during the summer and early fall have been monitored on BLM lands within the Upper Cow WAA since 1993. The monitoring program will continue with coordination from the Forest

Service, Tiller RD, and the Oregon Department of Environmental Quality under the 303d Program.

There are many factors which contribute to listing these streams as water quality limited. In many cases there is more that one factor operating on a stream. The most important factors are:

- Low summer flows
- Riparian cover is sparse or absent in the wider reaches of Cow Cr., especially below Devil Creek
- Past logging practices removed shade over streams,
- Placer mining
- Habitat modification

Historic mining activities contributed to the removal of riparian canopy, which increased stream temperatures on a localized level. Though sufficient time has passed since the major activity period between 1880 and 1950 to have allowed for recovery, it is plausible that the disturbance effects are still, partially, influencing these streams.

The BLM, USFS, and the Umpqua Basin Watershed Council have monitored several sites within the Upper Cow Creek. WAA to determine which sections of the streams are water quality limited for temperature. The methodology for tabulating these results is in Appendix C and the preliminary results are shown in Appendix D. Maximum temperatures in the mainstem of Cow Creek and the South Fork of Cow Creek showed continued warming in the downstream direction. There are no tributaries that significantly affect the temperature on the mainstem of Cow Creek. The mainstem of Cow Creek becomes noticeably wider and the canopy cover shading the stream is greatly reduced below Devil Creek. This is also where we see the largest temperature increase in the mainstem of Cow Creek.

Temperatures at most of the monitored sites on BLM lands are elevated between one and four weeks per year. During this period of time, it is believed fish and other aquatic organisms find thermal refuge by moving into smaller tributary streams, into deeper pools, areas shaded by undercut banks, or areas where groundwater enters the stream channel.

Between 1990 and 1998 the ODEQ (Oregon Department of Environmental Quality) monitored several water quality parameters such as: pH, dissolved oxygen, nitrate, phosphorus, sediment, and turbidity. Sampling sites were on Snow Creek 1.2 miles upstream from County Road number three, South Fork Cow Creek at stream mile 0.15, and East Fork Cow Creek at stream mile 0.47. All samples met ODEQ's and/or the OWEB (Oregon Watershed Enhancement Board's) water quality standards. For a more in-depth discussion regarding these parameters please see the Upper Cow Creek Watershed Assessment and Action Plan, Umpqua Basin Watershed Council, Nov. 2003 (pgs 86-110).]

A limited water temperature monitoring program was initiated in 1993 and will be continued. The Glendale Resource area has monitored water temperature in Snow Creek since 1998 (BLM

Medford District, Glendale R.A. files). The U.S. Forest Service, Tiller Ranger District, and the Umpqua Watershed Council have also been monitoring water temps in the Upper Cow Creek watershed the last several years.

b. Sedimentation

There are currently no standards set for measuring this parameter and there is no consensus on how to measure stream sediment levels. ODEQ and the EPA (Environmental Protection Agency) are currently developing a standard to assess sediment. Although no streams are listed by DEQ for sediment, we know we have fine sediment deposits in streams within the watershed. Increased fine sediment within a channel may fill pools and cause embeddedness- the process of fine sediment filling the interstices between the larger substrate particles. Filling these openings precludes the use of these spaces by fish and aquatic insects, reduces interstitial flow, and increases the impacts of high flows due to increased water velocity along the stream bed. There are several causes of sedimentation and mass wasting within this watershed. Examples include: road building in valley bottoms and erosion from roads located on sensitive soils.

i. Mass Wasting

Mass wasting also has beneficial effects by providing gravels and large wood to stream channels.

a) Frost heave: The single most prevalent mechanism for particle movement on bare soil areas on steep slopes. This is a major contributor to ditch lines along roads for areas of granitic soils (see Map 6 for areas of granitic soils).

b) Dry ravel (small lose rock): the rate of this mass movement phenomenon is unknown but occurs yearly especially during summer months. This is most common during and shortly after fires which release stored accumulations of ravel as branches and other organics burn. This is the major delivery mechanism for stream sediment except for roads.

c) Geologic contact zones: Map 5. These areas are potentially unstable. The majority of the natural landslides in this watershed are associated with these faults and contacts. Though episodic and rare they have the potential of causing the most sediment delivery to streams.

ii. Roads

Roads, if not maintained and surfaced, potentially contribute to mass movement of soils and rock regardless of the parent material on which they are constructed. Improper drainage and improper position on the landscape has resulted in many human caused slides within the watershed. Unless maintained, roads will continue to be major source of sediment in the watershed. Natural

surfaced roads contribute most of the sediment to streams through erosion of the surface. This is most prominent in this watershed in the areas dominated by granitic soils.

Roads, if not properly rocked or maintained, are typically a chronic sediment source to streams. Increased road densities increase the potential for reduced water quality and fish habitat degradation. Water dips and frequent cross-drain culverts can help to minimize road damage from erosion that results from storm runoff and other drainage problems.

Due to the checkerboard pattern of ownership within this watershed it is possible that private industry could be building new roads or road systems in the near future. Because the majority of federal land (88 % of BLM) in the watershed is LSR (Late Successional Reserve), it is unlikely that the BLM will be building extensive new road systems in the near future.

Peak flow

High road densities result in more rapid runoff and increase ground water interception. In essence, each mile of ditched road becomes a mile of first order intermittent stream. And, in some cases, the creation of a road may uncover a subsurface channel that then flows down the road as a perennial channel. In some cases, the "spring" source may be protected during timber harvest. In general, the road channel/ditch line is not protected because it is human caused and not a "natural" condition.

The NOAA Fisheries (National Oceanic and Atmospheric Administration) has set a target of no more than two miles of road per square mile for proper functioning condition of streams (see Appendix C). Proper functioning streams are riparian areas with adequate vegetation, landform, or large woody debris to dissipate stream energy associated with high water flows, thereby reducing erosion and improving water quality. These streams filter sediment, capture bedload, aid floodplain development, improve flood-water retention, and ground-water recharge. Proper functioning streams develop root masses that stabilize streambanks against cutting action. Other identifying features include: diverse ponding and channel characteristics that provide the habitat and the water depth, duration, and temperature necessary for fish production, waterfowl breeding, and other uses. In general proper functioning streams support greater biodiversity.

Subwatersheds with road densities above three miles per square mile are considered to be not functioning properly. Also, road densities, in several drainages, that exceed four miles per square mile may have altered the duration and timing of localized runoff rates during storm events.

On BLM lands within the Upper Cow Creek Watershed road densities vary. South Fork Cow Creek has a road density of 3.6 mi/mi^2, Dismal Creek is 4.0 mi/mi^2, and Upper Cow Creek-Galesville is 4.8 mi/mi^2. All three sixth field subwatersheds have road densities above the 2 mi/mi^2 target and exceed 3 mi/mi^2.

About 10 % of all streams within the Upper Cow Creek drainage have a road within 340 ft. and there are 660 places where roads cross streams (data generated from BLM GIS). As discussed previously in the document, the fish-bearing stream riparian reserve width is equal to 340 ft for this watershed. In order to meet the objectives of the Aquatic Conservation Strategy, activities that disrupt the natural hydrologic flow path of streams should be minimized, such as the presence of roads. Natural surface roads can also contribute sediment into streams.

Table 9. Proximity of streams to roads in the Upper Cow Creek watershed.

Sixth-field Watershed	Miles of Road	Miles of Streams	Miles of Fish Streams	Miles of Streams Within 170 ft of roads	Miles of Fish Streams Within 340 ft of roads
South Fork Cow Creek	62.4	70.4	13.1	8.7	1.1
Dismal Creek	132.9	174.4	34.5	41.3	22.6
Upper Cow Creek-Galesville	113.6	132.4	24.1	36.0	15.7
Totals:	**308.9**	**377.2**	**71.7**	**86.0**	**39.4**

iii. Sediment Regime

Map 6 shows areas that are high potential sources for stream sedimentation resulting from erosion on sensitive soils such as schist and granitic. As described in the Characterization Section, soils are poorly developed on granitic rock and are prone to extreme erosion if disturbed. Surface disturbance by road building and tractor logging as well as natural processes such as landslides and mantle creep pose a potential for stream sedimentation. The majority of non-federal lands have been heavily logged, some on steep ground resulting in exposed soil and compaction. This results in reduced infiltration, more runoff, and subsequent erosion.

Lands in non-federal ownership contribute to downstream effects and need to be considered when proposing any management activity. The Oregon Forest Practices Act, governing private lands, does not require as much protection for streams from temperature and sediment increases as much as the Northwest Forest Plan which has more restrictive guidelines. Division 640 of the Act calls for leaving at least 40 live conifers, at least 11 inches dbh (diameter at breast height) and at least 30 live conifers, at least 8 inches dbh, per 1,000 feet along large and medium size fish-bearing streams (respectively), within 20 feet of the stream. Small fish-bearing streams and non-fish bearing streams receive less protection. The buffer widths may be variable, and in some instances, there does not appear to be enough of a filter zone to adequately reduce sediment loading.

iv. Landslides and Areas of Instability

Though they occur infrequently, landslides and debris torrents in gullies and stream channels are very evident in the Upper Cow Cr. landscape, particularly in the granitic and schistose soils. Contact zones between geologic types are known to be unstable, particularly when associated with serpentine. Volcanic ash deposits are inherently unstable, especially when disturbed by roading and timber harvest.

Slides may move more or less as a unit, as in a rotational slide, or they may also completely break apart, as in a debris torrent. Both types of mass-wasting failures occur in the Upper Cow Cr. WAA.

More landslides occur on high and very high risk lands with steep slopes where trees are cut and roads have been built particularly mid-slope roads; usually when large storms cause rare flood peaks. Slopes steeper than 60 % have the highest probability for failure.

The Medford District RMP states that Non-suitable Woodlands, which includes all landslide prone areas and other unstable soils, are identified as not suitable for timber harvest. "Other surface-disturbing activities will be prohibited unless they are adequately mitigated to maintain site productivity and protect water quality," (RMP, p.41). See also Map 5 of this watershed analysis.

c. Macroinvertebrates

Changes in turbidity, channel substrate characteristics, and water flow regime have varying impacts on different species, life stages, and activities of organisms. The health of aquatic macroinvertebrate communities may be a better indicator of sedimentation effects and overall water quality conditions in aquatic systems. Macroinvertebrates are good indicators of water quality, in part, because they respond quickly to changes, they reside in their streams during most of their life cycle, they are relatively immobile and cannot avoid events, such as pollutants or other stressors, and are relatively abundant.

While sampling macroinvertebrates is gaining popularity as a monitoring tool in professional organizations, there are some drawbacks with respect to the interpretation of results and the need for repeated monitoring over time in order to draw accurate conclusions regarding trends. On BLM lands, a monitoring program for macroinvertebrates was conducted in 1991, 1996 and 2001 on Snow Creek, and in 1991 on Negro Creek. On USFS lands, monitoring was conducted in 1990 on Applegate, Cow Creek, and the East Fork Creek and South Fork Cow Creek.

A RSI (Relative Stability Index) study (USDA, Umpqua National Forest, 1995) was completed by the Forest Service in 1995 to compare macroinvertebrate data at several locations within French, Devil, Beaver, Dismal, and Applegate Creeks, the mainstem of Cow Creek, and both the East and South Forks of Cow Creek. For the BLM, Snow Creek was in the moderate to high habitat and water quality range. For the USFS, Applegate Creek was in the moderate range for habitat and biotic integrity, but overall at the lower end of the range. The East Fork had high

habitat and biotic integrity, and the South Fork was within the moderate habitat and biotic integrity range. Cow Creek was in the very low to severe habitat and water quality limited range.

In general, stream habitat and biotic integrity were better at locations higher in the watershed compared to the samples taken lower in Cow Creek. However, two years of data is insufficient to make any solid conclusions regarding overall quality of the watershed. With subsequent monitoring this data will be useful for future analysis.

Surveys at RSI sites (Forest Service) along the mainstem of Cow Creek indicate sediment transport and storage within the system changes from what appears to be equilibrium at upstream sites to sediment storage lower in the system. This could be due to lower stream gradient in lower portions of the watershed. Macroinvertebrate samples also support indications that fine sediments are being stored. Species requiring stable crevice space or large pore space are rare or absent in the lower reaches of the mainstem of Cow Creek.

Sampling for aquatic macroinvertebrates was initiated in the Upper Cow Creek watershed in 1991. Sampling will be repeated at 3-5 year intervals (as funding permits) to track watershed condition and trend. Aquatic insects are sensitive indicators of habitat and water quality changes in forested watershed and are an important source of food for most native fish. Macro invertebrate sampling was done in Snow Creek in 1991, 1996, and 2001 (Aquatic Biology Associated Report, Medford BLM files).

2. Fire and Riparian Areas

Fire is a fundamental ecosystem process that has served as a dominant disturbance function in riparian zones throughout Southern Oregon. Scientific evidence indicates that fire-return intervals in forest types found in the Upper Cow Creek watershed occurred relatively frequently, prior to Euro-American settlement (Agee 1993, p. 284). This recurrence interval resulted from both natural fires ignited by lightning strikes and from human-caused fires ignited by Native American tribes. While the majority of naturally occurring fires were ignited by lightning along ridge tops, many Native American burning activities were concentrated in river valleys (USFS 1995).

While fire intensity varied widely across the landscape, low-intensity surface fires generally burned through the riparian zones of most intermittent and some perennial streams in the Upper Cow Creek watershed (USFS 1995). However, as fire-return intervals have lengthened, initially due to diminishing Native American populations and more recently due to aggressive fire suppression efforts, fire intensity has increased.

The woody debris component is also affected by fire intensity. The Medford District Resource Management Plan requires that forest management practices leave a minimum of 120 linear feet of logs per acre greater than or equal to 16 inches in diameter and 16 feet long. This material is

referred to as LWD (Large Woody Debris). High frequency, low-intensity fires may have increased LWD and potential LWD in the past, but fire suppression during the last century has slowly contributed to less LWD. Fire suppression also increases stand density which increases competition, thereby reducing tree growth. This results in smaller diameter snags and therefore increased small down wood, less than 16 inches in diameter and 16 ft. long (BLM 1997).

3. Fisheries Resources

Seventeen streams, the North and South Forks of Cow Creek and the reservoir provide habitat for 16 species of endemic and introduced fish species (Table 10 and Map 10). Of approximately 377 miles of streams in this watershed, 72 miles, or 19 % are fish bearing. Most sport fishing activity focuses on Galesville Reservoir, which supports several species of warm and cold water game fish. Prior to the construction of Galesville Reservoir in 1985, coho salmon, winter steelhead, sea-run cutthroat and possibly chinook salmon and Pacific lamprey were found in the headwaters of Upper Cow Creek.

Though the construction of Galesville Dam has blocked migration of anadromous species since 1986, aquatic issues such as degradation of water quality and simplification of habitat are still potential limiting factors for resident salmonids and are applicable to this watershed. Galesville Reservoir has high enough mercury levels from natural sources to warrant health warnings concerning consumption of fish. For more information regarding effects of mercury and concentrations in Galesville Reservoir see the DEQ website: www.deq.state.or.us or Oregon Department of Fish and Wildlife's, Fish and Game Regulations.

In 1998 the ODFW (Oregon Department of Fish & Wildlife) began stocking fewer coho salmon smolts and more steelhead (Appendix F) as mitigation for loss of fish habitat due to dam construction. Coho smolts (progeny of adults trapped at several locations within the South Umpqua River basin, including at the base of Galesville dam) are released into Cow Creek below the dam, using both direct release and net pen acclimation. Coho stocking will continue, but not at the same level as in the past. Steelhead smolts (also from adults trapped at various locations within the South Umpqua River basin) are released at the Galesville site, as well as at Canyonville and 7 Feathers.

Returning adult fish of both species that are excess to hatchery needs are stocked into Galesville Reservoir to provide sport fishing, as well as into Cow Creek below the dam to spawn naturally (Appendix F).

There is evidence that adult coho salmon and steelhead trout (excess to hatchery needs) that have been stocked in the reservoir are spawning successfully in upper Cow Creek and tributaries and that their progeny are contributing to sport fishing in the lake (personal communication, Dave harris, Roseburg ODFW, 2004).

Table 10. Fish species found within the Upper Cow Creek watershed.

Family	Common Name	Anadromous	Resident	Native	Exotic
TROUT and SALMON					
	Cutthroat		x	x	
	Rainbow		x	x	
	Steelhead		x	x	
	Coho salmon		x	x	
SUNFISH					
	Smallmouth Bass		x		x
	*Largemouth Bass		x		x
	*Bluegill Sunfish		x		x
	*Black Crappie		x		x
SUCKERS					
	Largescale Sucker		x	x	
MINNOW/CARP					
	Umpqua Pike Minnow		x	x	
	Umpqua Dace		x	x	
	Speckled Dace		x	x	
	Longnose Dace		x	x	
	Redside Shiner		x		x
SCULPIN					
	Riffle Sculpin		x	x	
	Reticulate Sculpin		x	x	
OTHER					
	Western Brook Lamprey		x	x	

*Found only in Galesville Reservoir.

4. Fish Habitat Condition

Completion of Galesville Dam in 1986 blocked passage of steelhead and coho salmon to important spawning areas upstream of the dam, including Snow Creek and Upper Cow Creek. McGinnis, Negro, Meadow and Sugar creeks provided marginal anadromous fish spawning and rearing habitat within the BLM Medford District prior to dam construction. Regulated streamflow from the dam has appreciably improved migration conditions for adult salmon in Cow Creek below the dam during late fall. Juvenile coho and steelhead rearing in Cow Creek upstream of the town of Glendale benefit from the dam's multi-level outlet structure, which releases 40 cfs of 50-60 ^{0}F water to Cow Creek during summer months.

Low summer flows and elevated water temperatures are inherent to interior southwest Oregon. Natural contributors to these conditions include geology, geography, climate, low elevation and stream morphology and orientation. Streams in this watershed, especially Snow Creek, provide a thermal refuge for adult and juvenile salmonids during the summer. Conversion of forest land to pasture, with subsequent livestock grazing on private land, has significantly altered structural diversity and potential productivity for aquatic and terrestrial wildlife along Cow, Sugar, Meadow, and the lower end of Snow Creek on private land. These practices have resulted in stream bank destabilization, siltation and loss of stream shade and sources of large woody debris. Livestock grazing is not authorized on public lands in the WAA. While the majority of streams are small first or second order channels and do not directly support fish, they do drain into the larger, fish-bearing channels and directly affect the overall water quality of the watershed.

Logging in riparian zones, erosion from tractor skid roads, and poorly constructed and maintained road systems have degraded streams on public and private lands throughout the WAA for several decades. This problem has been especially severe in the Snow Creek and McGinnis creek watersheds. Salvage operations commonly removed woody material from streams prior to the 1980s. Stream cleaning operations had occasionally been conducted to prevent perceived fish passage problems. Streams on public land have received a high degree of protection for only the last decade.

Table 11 describes the general condition of fish habitat in the analysis area, along with perceived causes for degraded habitat. *Ratings are based on field observations.*

Stream Productivity is defined by a stream’s ability to sustain insect populations and diverse species, rearing habitat for fish species (cobble size), and the presence of pools, large woody debris, and fine sediment.

The term stream productivity is also interchangeable with biological integrity, which is “the ability to support and maintain a balanced, integrated, and adaptive community of organisms having a species composition, diversity, and functional organization comparable to those of natural habitats within a region” (Karr, J.R. and D.R. Dudley p.55-68).

Table 11. Fish Habitat Condition in the Upper Cow Creek Watershed

Stream	Condition[1]	Factors Limiting Potential Stream Productivity[2]	Ownership
Snow	P	T, R, A	BLM
Meadow	F/P	A, T, W	
Sugar	F/P	A, T, W	
Negro	G/F	T	
McGinnis	F/P	T, R	
Cow	F/P	A, T	Forest Service
S. Fork	G/F	T	
E. Fork	G	R	
Applegate	F	R, T	
Dismal	G/F	T	
Beaver	F	R, T, M	
Devil	F	R	
French	F	R	
Cow Creek	P	A, T	

USDA 1995. U.S. Forest Service Cow Creek Watershed Analysis

[1] G = Good, P = Poor, F = Fair, U = Unknown (See Appendix C)

[2] T = Timber harvest-related (i.e., timber harvest near streams, soil erosion from roads or from tractor logging)
M = Historical or current placer mining
A = Agricultural practices
R = Road location or density
W = Water diversion

Watershed condition across all ownerships does not have optimum fish habitat condition. But it is likely that water quality, as well as quality of riparian and aquatic habitat will steadily improve on federal lands in the future in response to watershed restoration activities, project design measures, and through natural recovery. However, improved conditions on public lands will likely be limited to where there are large blocks of public land, such as Forest Service lands in the headwaters of this WAA and on 1st and 2nd order streams where headwaters are entirely on federal land. Activities on private lands frequently degrade aquatic habitat (e.g. sediment and

temperature) and riparian structural diversity and connectivity throughout a watershed because there are fewer land use restrictions on private lands than on federal land for activities such as timber harvest and road construction. State-authorized diversion of water from streams will also continue to limit aquatic productivity in some instances on public and private lands within this watershed.

Implementation of the Northwest Forest Plan in 1994 has greatly contributed to reducing impacts on the aquatic system on public and, to a lesser extent, on water quality downstream on private lands. These include wide Riparian Reserves 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. BMP (Best Management Practices) in the Medford District's RMP (Appendix D) also help to reduce impacts and in some cases actually restore condition to "Properly Functioning". Current direction by the 2004 Record of Decision to Clarify Provisions Relating to the Aquatic Conservation Strategy states that ACS objectives "were intended to be applied and achieved at the fifth-field watershed and larger scales, and over a period of decades or longer rather than the short term." The Upper Cow Creek watershed is trending toward meeting the ACS objectives on public lands. The major factors contributing to this trend are the presence of thermal refuge for aquatic species, the majority of stream headwaters are located on federal land, and 87.6 perctent of BLM land has been designated as LSR.

a. Distribution, Diversity, and Connectivity of Aquatic Watershed Features

The characterization of any point on the stream continuum will provide a characterization of what is occurring upstream of that point. This may be especially true for water quality parameters such as turbidity and temperature as well as sediment transport and water flow. The disturbed nature of the landscape features within this WAA do not maintain the conditions necessary to promote healthy aquatic systems.

Areas of high road densities and heavily harvested lands are of great concern for connectivity and diversity. Along with increased potential drainage problems, roads fragment the landscape and cause stream sedimentation. There are several culverts, for instance in the Snow Creek drainage, that prevent the upstream passage of fish and other aquatic species (Appendix G). According to the U.S. Forest Service's Cow Creek Watershed Analysis (U.S.D.A, Umpqua National Forest, 1995), the South Fork of Cow Creek has fairly good connectivity. However, connectivity between this sub-watershed and downstream sub-watersheds is poor.

This WAA is predominately checker board BLM ownership and solid block Umpqua National Forest. Other publicly owned land in the area includes state (T 32 S, R 3 W, Sec. 36), and Douglas County lands around Galesville Reservoir and rights-of-way along maintained roads.

Sixty to seventy percent of the 7,500 acres of private lands in the WAA is industrial forest land. Small land owners (Map 2) are generally located along Cow Creek or on patented mining claims on creeks that flow into Cow Creek.

Due to the construction of the Galesville Reservoir, this area is no longer an important corridor for anadromous fish migration to and from spawning grounds. In the lower reaches of Upper Cow Creek, riparian connectivity is inadequate due to private residences fragmenting the landscape, decreases in flow due to water diversion, and mining operations. This is a closed riparian system in the sense that this watershed is disconnected from the Middle Cow Creek watershed.

b. Physical Integrity of the Aquatic System

There is potential for serious erosion in the Upper Cow Creek WAA. Examples of types of erodible soils present within the WAA are: schist, granitic, and parasols (within serpentinite). There are also several contact zones (e.g. Cedar Mtn.) and fault lines (e.g. Goolaway Gap) which are inherently unstable areas (Map 5).

Field examinations of the streams in this watershed indicate that stream banks are generally stable and in good condition. There are some instances of down-cutting along a few of the smaller streams. Some small slides have been documented by survey crews, particularly in the Snow Creek drainage. Numerous areas in the granitics soils have concave shaped basins indicating debris flows as the primary component of erosion and mass movement. There is also a small area in the tertiary volcanics along the South Fork of Cow Creek that has been identified as an earthflow zone.

Some slides are within the range of the natural variability. However, given that some areas have been affected by a high level of management activity (e.g. roads, timber harvest) some slides are probably a result of unnatural (human caused) disturbance.

Though mining and mineral exploration over the past decade has been minimal, currently there are three mining sites located throughout the WAA. Placer mining and slope failure of mine tailing piles can increase sediment in streams. Mine workings, tailings, and processing sites may also be point sources for toxic metals, acids, and other toxic leachates (e.g. mercury).

5. Riparian

Riparian Reserves comprise approximately 34 % of BLM land within the Upper Cow Creek watershed. Currently, about 52 % (1,779 acres) of the Riparian Reserves on BLM lands are greater than 80 years of age (Table 12 and Map 11). Approximately 49 % (520 acres) of riparian reserves along fish bearing streams are greater than 80 years of age (Table 13). The 804 riparian acres in the 0-30 year age classes comprise 24 % of the total riparian reserve acres and 16 % of riparian zones along fish-bearing streams (Table 13).

Stream surveys from Snow Creek indicate that the majority of streams investigated are perennial but, functional-at-risk. Riparian and upland vegetation is typically young, even aged stands between twenty and thirty years old. Some riparian areas are densely stocked with mid-seral understory firs. Riparian Reserves in the 11-40 year age classes are concentrated in the upper reaches of the subwatersheds (Map 11).

Riparian vegetation has been altered as a result of past harvest activities and subsequent damage resulting from storms which occurred in 1964 and 1974. When these areas were harvested decades ago, there were no established federal guidelines to protect riparian areas. Consequently, in the absence of riparian buffers, timber from the riparian areas along streams was removed. Over the past several decades, conifer seedlings and other plant species have revegetated these areas. The channels are stable at this point and will probably remain stable since harvest levels on private land are much lower than in the past.

Many of the riparian areas along fish streams have not remained in their natural condition and are functional-at-risk. The majority of riparian areas within the watershed have had a moderate to high level of disturbance. Historic and current mining activity has impacted riparian zones. Valley bottom roads, and land treatments have affected the majority of riparian areas to the extent that they are functional at risk or, in some cases, not properly functioning.

An inventory of riparian or stream habitat condition for this watershed was conducted by riparian survey crews in 1996 and 2003. Riparian condition ratings are based upon the extent and quality of existing riparian vegetation adjacent to the stream, average tree age/size within the riparian zones, and erosional characteristics of each stream reach. The major factors with the potential to influence riparian condition include stream bank stability, clearcuts, and roads. Habitat condition is based on the riparian condition, as well as subjective evaluations of stream bank stability, amount of disturbance, influence of roads and other sources of sediments, total sediment loads, effects of sensitive soil areas and other factors. Existing evidence suggests that most stream reaches were in properly functioning condition with some areas at risk due to activities occurring on private land (BLM Proper Functioning Condition Surveys, 1996, 2003).

Table 12. BLM acres of Riparian Reserves by age class, Upper Cow drainages.

Age Class	Upper Cow Creek Total	Sixth-field watersheds		
		Upper Cow Creek Galesville	Dismal Creek	South Fork Cow Creek
Non Forest	85	85	0	0
0-10 years	62	50	0	12
11-20 "	567	501	17	49

Age Class	Upper Cow Creek Total	Sixth-field watersheds		
		Upper Cow Creek Galesville	Dismal Creek	South Fork Cow Creek
21-30 “	175	151	24	0
31-40 “	556	547	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 “	365	305	38	22
151-200 "	233	221	11	1
201+ “	510	492	7	11
81+ Modified*	636	633	3	0
Unclassified	35	30	5	0
Total Acres:	3393	3114	173	106

Table 13. BLM Riparian Reserve age classes along fish streams, Upper Cow Creek watershed.

Vegetation Class (Age)	Acres	Percent of the BLM Riparian Reserves acres along fish streams
Unclassified	12	1
Non-Forest	65	6
0-10 years	13	1
11-20 “	142	13
21-30 “	25	2
31-40 “	251	24

Vegetation Class (Age)	Acres	Percent of the BLM Riparian Reserves acres along fish streams
41-50 “	11	1
51-60 “	5	1
61-70 “	0	0
71-80 “	23	2
81-150 “	90	8
151-200 “	91	9
200+ “	139	13
Modified 80+ “	200	19
Total	1067	100

B. Forest Management

Successional Processes and Patterns

Bingham and Sawyer (1991) portrayed the succession of Douglas-fir/hardwood forests of the Klamath Province (this watershed’s physiographic region) by examining the structures present in 70 unmanaged stands. Their results, which are portrayed in the Appendix B, are the **ranges of the means** (average values) and do not represent the minimum and maximum values. The table represents information gathered in coastal Northern California and the Siskiyou mountains. It contains general descriptions of Douglas-fir forests in the northern California and southwest Oregon region. Upper Cow Creek watershed is comprised of forests similar to these descriptions.

Forested Stand

Differentiation of the upland forests can be categorized by seral stages or age classes. The Medford BLM RMP describes five seral stages for each major plant grouping: early seral, mid-seral, late seral, mature and old-growth/potential natural community (p.112-113). Acreages of age classes within the WAA are presented in Table 14, Map 12, and Figure 2.

However, the combination of late and mature seral stages provides the most dynamic influence over landscape flows. Most of the late and mature seral stages are within lands designated as Late Successional Reserve.

Early Seral – 0-10 years, the period from disturbance to the time when crowns begin to close and conifers and hardwoods dominate the site. The stage may be dominated by grasses and forbs or by sprouting brush or hardwoods. Conifers develop slowly at first and gradually replace grasses, forbs, or brush as the dominant vegetation. Forage may be present; hiding and thermal cover may not be present. Douglas-fir is the principle planted species with sugar pine, incense cedar, and ponderosa pine also planted that are matched to specific site conditions. Forage for seed eaters and grazers are more abundant than in other seral stages. This constitutes only 172 acres of BLM administered land in this watershed.

Mid-Seral – 11-40 years, occurs from crown closure to the time when conifers begin to die from competition and stand growth slows. Stands are dominated by conifers or hardwoods, canopy closures approach 100 %, forage and understory vegetation is minimal. Conifer mortality rates and snag formation are rapid. There are 3,480 acres of this age class in the Upper Cow Creek Watershed.

Late seral – 41-80 years. Stand growth slows. Forest stands are dominated by conifers and hardwoods; canopy closure approaches 100 % with stand growth decreasing. Stand diversity is minimal; conifer mortality rates and snag formation are rapid. Wildlife hiding and thermal cover is present. Forage and understory vegetation is minimal except in under stocked stands or in meadow inclusion. This amounts to 794 acres of BLM administered land in this watershed.

The term *late seral* is not interchangeable with the term *late successional.* The term late successional is instead a biological category for stands greater than 80-100 years of age that provide habitat for affiliated species of this age class, such as the northern spotted owl. Late successional forests are also defined by forest composition and structure, not just stand age class or size of trees. Some of these features are "large standing dead trees, large accumulations of fallen tree boles, and small- and intermediate-sized shade tolerant trees are also important components of late successional forests. These components and other characteristics combine to produce unique habitat and influence ecosystem processes" (Franklin, p.191).

Mature Seral- 81-200 years. Forest begins to develop structural diversity. Conifer and hardwood growth gradually declines. Larger trees increase significantly in size. Stand diversity gradually increases. Wildlife hiding cover, thermal cover and some forage are present. With slowing growth, insect damage increases and stand breakup may begin on drier sites. Understory development is significant in response to openings in the canopy created by disease, insects and windthrow. Vertical diversity and the height of the stand increases. The canopy's volume and its carrying capacity for canopy-dwelling lichens, bryophytes, insects, birds and mammals increases. Larger snags are formed. There are 2,062 acres of BLM administered lands in this age class within this watershed.

Old-Growth – 201+ years until the time when conifer stand replacement occurs and secondary succession begins again. This stage constitutes the potential plant community capable of existing on a site given the frequency of natural disturbance events. This constitutes 1,597 acres of coniferous forests on BLM administered land in this watershed. Structure, species composition and age distribution is dependant upon fire frequency. As mortality occurs, stands develop greater structural diversity. Replacement of individual trees lost to fire results in the creation of a multi-layered canopy.

81+ Modified – Mature or old-growth stands that have undergone a partial harvest yet retain a canopy closure greater than 40 %, have trees greater than 21 inches dbh. Composition and structure of these stands have been altered enough that some no longer function as late-successional habitat. Overstories may be too sparse and understories, in the more open stands, are in early to mid-seral condition. Modified stands compose 1,618 acres of BLM administered land in the Upper Cow Creek Watershed.

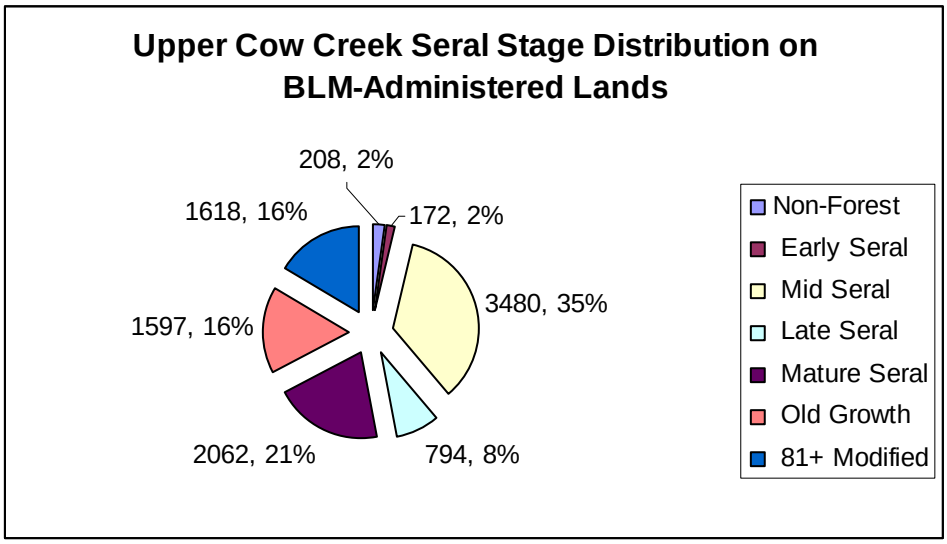

Figure 2. Seral Stage Distribution

Table 14. Upper Cow Creek Seral Stages on BLM-administered land

	Upper Cow Creek Fifth-Field Total		Sixth-field watersheds					
			Upper Cow Creek Galesville		Dismal Creek		South Fork Cow Creek	
	LSR	GFMA	LSR	GFMA	LSR	GFMA	LSR	GFMA
Non Forest	204	4	203	0	1	4	0	
0-10 years	150	22	150	0	0	0	0	22
11-20 "	1517	335	1508	0	9	63	0	272
21-30 "	453	53	453	0	0	53	0	0
31-40 "	1096	26	1096	0	0	26	0	0
41-50 "	200	75	200	0	0	75	0	0
51-60 "	33	58	28	0	5	58	0	0
61-70 "	114	25	2	0	112	0	0	25
71-80 "	289	0	289	0	0	0	0	0
81-150 "	995	371	973	0	21	201	0	172
151-200"	661	35	630	0	32	29	0	6
201+ "	1421	176	1406	0	15	148	0	30
81+ Modified	1584	34	1554	0	30	34	0	0
Total Acres:	8717	1214	8492	0	225	687	0	527

Structure, species composition, and age distribution in the forest varies from one part of the landscape to another, especially on opposing north/south slopes. South-facing slopes are exposed to a greater intensity and duration of sunlight and are therefore generally hotter and drier than northern aspects. As a result of this differential sunlight exposure, southern slopes tend to exhibit sparse vegetation patterns and drier conditions and more frequent fire events compared to north-facing slopes. Aggressive fire suppression efforts in recent decades, however, have altered stand structure by leading to an increase in small tree density and heavy fuel loading regardless of aspect (Chapell and Kagan. In Johnson and O'Neil 2001). These fires often consume varying amounts of vegetation, creating various sized openings within the burned areas. Frequently the

stand is not completely reset to the early seral stage. Instead, inclusions of younger aged and remnant older trees, both conifers and hardwoods, create multiple canopy levels within a mosaic of structural features and seral elements. Remaining large conifers generally have a patchy distribution, compared to north slopes which often have a more continuous canopy of larger coniferous trees. However, across all aspects, following fire many mature hardwoods can survive fairly hot fires if the fuels do not extend into the canopy. As a result, complex multi-layered canopies of conifers and broadleaf evergreens are typical (Ibid.)

The forest can be further differentiated by classifying the older forest stands according to structural and functional features.

The primary variable affecting the classification of the older forest within the Upper Cow Creek landscape is the extent of partial cutting. Partial cut stands alter the structural and functional features found in stands without logging disturbance. For instance, partial cutting opens up the canopy, sometimes removes hardwoods and snags, reduces the amount of potential large down wood, and can increase brush in the understory. With at least the partial loss of hardwood snags and down wood, the structural diversity is sometimes greatly reduced, compared to unmanaged stands. Partial cutting can also increase the natural regeneration of conifers in some of the openings created in the overstory. These stands are represented by the "81+ modified" stand category.

The land ownership pattern in this watershed is typical of O&C lands on the Medford District. BLM managed lands tend to be every other section in a township, managing approximately ½ of the land within a 5th field watershed. This holds true in the portion of the watershed that BLM manages, with 21 % managed by BLM and 15 % managed by private entities, with these lands intermingled. The remaining portion of the watershed is blocked ownership, managed primarily by the U. S. Forest Service.

On BLM lands, partial cutting was common in roaded areas of the WAA. A relatively light partial cut or salvage entry was a typical harvest practice, particularly in McGinnis Creek, Meadow Creek, and the lower reaches of Negro Creek and Snow drainages. These stands are now dominated by large conifers with a single, undifferentiated understory layer of brush and conifer saplings. In the absence of intense fires, partial cuts on south slopes of Sugar Divide, tend to have regenerated with a uniform coverage of Douglas-fir regeneration. Heavier partial cuts, similar to a shelterwood harvest, occurred in Sugar Creek, east slopes of Snow Creek, and the upper reaches of Negro Creek. These stands have widely scattered overstory conifers with a patchy understory of conifer reproduction, brush, and a limited distribution of conifer seedlings and saplings.

Approximately 27 % of the Upper Cow Creek landscape is managed by private industry. On these lands, most merchantable timber was removed, beginning in the 1950s. These stands were reforested by planting and natural seeding. The resulting stands are predominately single-storied Douglas-fir stands with varying canopy closures, and age classes from 1 to 60 years old. Some

of these stands are being thinned, both pre-commercially and commercially. Regeneration harvest, followed by intensive management for conifers and the widespread use of herbicides on private lands has greatly simplified the resulting structure on private lands: few snags and large down wood are present, the early seral stages include no hardwoods and the sites are overwhelmingly dominated by commercially valuable species, especially Douglas-fir. Remnant old-growth seed trees are being removed in conjunction with commercial thinning operations. This practice is expected to continue. It is likely that most of these stands on private industry lands would be harvested by the time they reach 60 years of age. After clearcutting, the privately-owned stands would be considered early seral stage stands without the usual diversity of herbaceous and shrub species so valuable to wildlife and typical of Forest Service and BLM – administered lands.

A very minor portion of the watershed is in private woodlots and pasture. These are primarily located along Cow creek. Most of these lands have been harvested, leaving similar conditions as those found on industrial lands. These lands generally contained a higher proportion of large diameter Ponderosa pine but remaining large pine are becoming more scarce as landowners harvest these trees.

There are 794 acres of late seral forest and 3,480 acres of mid-seral forest on BLM-administered lands in this watershed. Many of these stands have a one-layer closed canopy of evenly spaced Douglas-fir. These stands are in a stem exclusion phase of development with mortality occurring among the less dominant and suppressed trees. Fire hazard in these stands is increasing with closed canopies combined with increasing dead vegetative material from the mortality. Wildlife needs in these intensively managed stands were not clearly identified in the past and tree species diversity is limited along with size variability in many of the existing stands. The wildlife populations and species diversity are limited as a result. In general, these stands provide little habitat for species dependent on large structure, snags, down wood; or most birds and mammals (e.g., bats and flying squirrels) that need open space to move in the canopy.

A major consideration, in these stands, due to their re-designation as Late-successional Reserves, from primarily timber production, is to encourage the return of old-growth forest inhabitants, such as the spotted owl. In these stands, acceleration of the attainment of late-successional characteristics, such as multi-species and multi-layerd canopies, the presence of large snags, down wood, and large overstory trees with large limbs and cavities, is an important goal. The existing mature seral stage, 2,062 acres, and old-growth stage, 1,597 acres, contain many and sometimes all of these characteristics of late-successional forest. The Northwest Forest Plan (p. C-44) and Medford District RMP (p. 73 & 74) direct management actions to retain at least 15% of all matrix federal land within each fifth-field watershed as late successional forest. The BLM portion of the Upper Cow Creek Watershed contains 582 acres of matrix late successional forest or approximately 48% of BLM matrix land in this watershed.

There are 1,618 acres of modified stands and these vary in their late-successional characteristics, with a varied overstory canopy closure. The stands with heavier overstories, that received lighter

past partial harvest, tend to have more late-successional characteristics in place. Some of these stands with more sparse overstories have dense areas of hardwoods and shrubs with varied levels of regeneration.

Patches - Origin, Stability, and Pattern

Three structural elements within a forest ecosystem are critical in maintaining ecological diversity and complexity. These are forested stands, patches and corridors.

The structure, amount and spatial arrangement of the forested stands, patches and corridors determine the function, resiliency and species diversity of a forest landscape.

The checkerboard ownership pattern, in this watershed, has resulted in a highly fragmented landscape. Human caused patches were created through clearcutting and shelterwood harvests beginning in the 1950s. A pattern of rectangular shaped openings connected by a network of roads has been created in all drainages. The majority of the early seral patches within the Upper Cow Creek watershed are located on private lands while old-growth seral patches are located on federally managed lands. The mid and late seral stage stands are mixed throughout the private land and BLM-administered land. The general pattern of these seral stage patches tends to be blocky in shape, as harvest units tend to be this pattern, following ridge lines, draws, or property and section lines. The composition, structure, and function of early/mid seral stages that were initiated by harvests tend to be different than those initiated by natural causes. These differences include: fewer number of snags remaining in harvest units, particularly larger diameter classes, in harvested units, more soil disturbance and soil compaction from harvest activities, and a reduction in the amount, and size, of downed woody debris. In the early and mid seral stands created by harvest the diversity of tree species tends to be less, however conifers are generally present in greater densities and more evenly distributed due to reforestation through planting or seeding. The boundaries between stands of different seral stages tends to be more abrupt due to harvest practices. There are also fewer large remnant conifers present in past harvest units, than would generally be remaining after natural disturbance events such as fire or wind. Also, the introduction of noxious weeds has been increased due to human activity and the presence of roads. By 1990 treatments on BLM-administered land in this watershed began shifting reforestation, precommercial thinning, and maintenance practices away from producing uniform closed canopy Douglas-fir stands towards structurally diverse young stands with a significant increase in the retention and growth of deciduous trees and shrubs. A lengthened period of herb and shrub dominance that precedes tree canopy closure is one noticeable result. Developmental difference of early/mid seral stage stands, silviculturally treated in the early 1990s and later vs. stands treated in previous years should carry a higher degree of diversity into their next seral stage.

Other patches created by human disturbance are in the form of road prisms, pasture/farms, rock quarries and recreation sites.

Naturally occurring patches also occur in the form of a few meadows, rock outcrops, talus slopes and brush fields. These occur primarily in the Cedar Mountain drainage, largely within Meadow Creek and the small Cow Creek frontal basins. In addition, fire-induced patches within the matrix also frequently occur in unentered stands along the Sugar Divide and the small frontal basins. The results of theses fire disturbances created even-aged understory vegetation associated with under canopy fires, as well as blocks of even aged, Douglas-fir stands associated with catastrophic stand replacement fires.

The location and amount of patches on the landscape has created a high degree of contrast, porosity and edge effect across the Upper Cow Creek landscape. Edge is the interface area between open canopy early/mid seral stands and closed canopy late/mature/old-growth stands. Environmental conditions (temperature, light, wind and humidity) are different within this area, resulting in a drier, windier microclimate along the stand edge. Generally a 500 foot wide strip adjacent to the edge is affected. The altered microclimate in this area causes a successional change in the kind and density of herbaceous vegetation and shrub species. Patches of forest 25 acres or less are effectively all edge.

WAA Stability

Landscape stability is a measure of constancy in the absence of major disturbance. Over 87 % of the BLM-administered land in this watershed is classified as Late Successional Reserve. The spatial arrangement, amount and characteristics of early/mid seral stages clearly have a dominating influence on Upper Cow Creek landscape. However, because of the emphasis on structural diversity in early successional stands, and the direction to retain and improve late-successional conditions in this land allocation, the older forest will likely persist. Compared to the early and mid seral patches, the late and mature forest seral types are considered stable. The older the stand the less likelihood that the structure and compositional elements will change significantly overtime, and any change that would occur should be slow, with the exception of sudden drastic changes, such as would result from large fires.

Disturbance Characteristic Patterns

The major natural disturbance in the WAA is fire. Wind and floods have had some effect.

Fire

A survey completed by the GLO (General Land Office) in 1916 showed that most of the area was covered with young trees, less than 100 years of age, corresponding with the time when burning began to be severely curtailed. These records indicate that fires were burning in the watershed at the time of the survey but do not mention whether they were human or natural caused or if attempts were made to extinguish them. Original survey maps from the 1850s to the 1870s show multiple areas of burn scars, most of which were fairly small and widely dispersed.

Comments in the hand written notes refer to some large trees on the uplands, especially north facing slopes, but with the majority of the area in an open condition with fir "brush," indicating that the area had been burned in the past. The Cow Creek tribes were known to utilize the area throughout the year with one camp recorded in the Upper Cow Creek area during the original survey.

In the mid-1990s, the Forest Service conducted a detailed evaluation of the fire history (including frequency, intensity, and size) in an area representing the various landscapes found within the Upper Cow Creek watershed. Evidence from this study revealed twelve separate fire episodes between the late 1800s and early 1930s (USFS 1995). Signs of large, stand replacing fires in the early 1900s are apparent on approximately 21 % of National Forest land within Upper Cow Creek (USFS 1995). According to BLM data (GIS information) between the years 1951-2002, approximately 3,533 acres burned in the Upper Cow watershed. The largest of these is the Angel fire, affecting 3,262 acres within this watershed.

Higher precipitation and less drought-prone conditions indicative of the Upper Cow Creek area make it less vulnerable to wildfire than the other portions of the Glendale Resource Area, but fire danger is still considered moderately high. The normal wind pattern during the summer months is from the northwest, while most storm events exhibit southeast to west winds, with wind speeds up to 35 to 45 miles per hour. Relative humidity in the summertime may range from 30 to 100 percent. Rainfall is usually scattered because it accompanies thunderstorm activity and it is also generally sparse, with some areas receiving only 1 to 3 inches. East wind events normally occur in the spring from mid-May to mid-June and again in the fall from mid-September to mid-October. When this occurs, the area can experience extremely low relative humidity. Dry summertime conditions, coupled with east wind events and the fact that some areas within the watershed have limited road access may present serious challenges to firefighting efforts in the event of a wildfire.

Fire is a major factor in the development of the forest types found within the Upper Cow Creek watershed (Agee 1993, p.284). For centuries, human and naturally ignited fires were a frequent disturbance agent in Southwestern Oregon. Anthropogenic use of fire by native tribes throughout the region is well-documented in the accounts of early explorers, trappers, and pioneers. Information from these sources and from more recent archeological studies indicates that tribes in the area used fire as a tool to maintain the various landscapes upon which their subsistence patterns depended. Hunting grounds were burned periodically to enhance the habitat of ungulate prey and natural open areas and meadows were burned regularly to prevent encroachment and to encourage the growth of dietary plants (Tveskov 2000). Ridgelines were also burned in order to maintain travel corridors (Agee 1993, p.283).

Fire frequencies prior to Euro-American settlement in the region varied a great deal, depending on stand characteristics, weather, and topography. Fires were more frequent and more intense in hot, low elevation areas and on south slopes than at higher elevations and on north aspects where conditions are wetter. Historic lightning fire data for this watershed indicate that fires ranged

from less than an acre to more than 21,000 acres (Map 13). It is likely that the fire-return interval for the Upper Cow Creek watershed was roughly every 30 years prior to Euro-American settlement, but in some areas the mean fire-return interval was as frequent as 14 years (USFS 1995).

Beginning in the 1870s, fire-return intervals began to increase in length. This alteration occurred for two reasons. First, the frequency of human-caused fires decreased with declining Native American populations and increasing Euro-American settlements. Second, the advent of the Forest Service and the Civilian Conservation Corps in the early 1900s lead to aggressive federal fire suppression policies.

Fire plays several major roles in fire-dependant ecosystems including species establishment, development, composition, and diversity, along with establishment and maintenance of wildlife habitat and populations (Spurr and Barnes 1992, p.275). The exclusion of fire, however, has allowed encroachment of pine and fir tree species into natural open areas and has increased the biomass in understories of oak woodland areas. This dense vegetation acts as ladder fuel and creates an uncharacteristic fuel loading, which may result in catastrophic fire behavior.

Three factors are used to assess fuel loadings and the potential for wildland fires on Bureau of Land Management administered areas.

Risk is defined as the probability of ignition. A rating of high, moderate or low is assigned based on the concentration and/or frequency of human presence and on historic lightning occurrence. Map 14, shows areas that fall into the High Risk category.

Hazard is defined by the ability of a fire to spread based on resistance to control once ignition has occurred. Hazard is rated using a numerical point system for each of the following factors: slope, aspect, position on slope, adjacent fuel model, ladder fuels, and estimated fuel loading. A point summary is then calculated and a rating of high, moderate or low is assigned. Areas categorized as High are shown on Map 15.

Values at risk are based on human values within planning areas. Conditions considered include land allocation such as agricultural and residential designation, special use areas like recreation sites, and other areas containing human improvements and/or monetary investment. Private residences within 1.5 miles of federal land may be classified as being within the Wildland Urban Interface area as described by the National Fire Plan as depicted on Map 16. This assessment ranks values at risk as high, moderate or low. Areas that have been ranked as High can be found on the High Value Areas Map (Map 16).

The following areas are considered high value:

- Private residences within 1.5 miles of BLM administered land
- SRMA (Special Recreation Management Area)
- Devils Flat campground
- Cow Creek Falls
- Angel Camp
- Chief Miwaleta Park
- Cold Springs Camp Ground
- Rail Road Gap Shelter
- Richter Cabin
- Cedar Springs Repeater
- spotted owl core areas
- the LSR

High Priority Fuels Management Areas include those tracts of land designated as High Fire Hazard Areas that fall within the High Value Area (Map 17). Roadside treatments along major travel routes within the High Value Area are a high priority since frequently traveled roads pose a high degree of risk. Other areas that fall under the highest priority for treatment are those located on southern aspect slopes, along ridgelines, and adjacent to existing silviculture, fuels management, or timber harvest units. Actual fuel reduction treatment of these areas is dependant upon available funding and is subject to further prioritization in relation to District-wide management concerns.

Upper Cow Creek is used as a water source during fire suppression activities, including use for helicopter dip sites. Other water sources within the watershed may also be used as pump chances for fire engines. These water developments are listed below and displayed on Map 16.

1. Galesville Reservoir:	T31S, R4W, Sec. 27, 28, 34, 35
2. Sugar Creek	T31S, R4W, Sec. 25
3. McGinnis Creek pump chance:	T31S, R4W, Sec. 27
4. Anchor Ranch	T32S, R4W, Sec. 1
5. Overlook	T32S, R4W, Sec. 13
6. Angel Camp	T33S, R3W, Sec. 1

Wind

Major wind storms are rare, but do occur. In 1962, on Columbus Day (October) the Pacific Northwest received such an event with winds in excess of 90 miles per hour. In some cases entire stands could be blown over mainly near up slopes and ridge tops. Most often single tree damage or loss is associated with winds in combination with heavy snow or saturated ground conditions. These tend to be dispersed and help to create small openings in the canopy. Thunderstorms are probably responsible for most damage. Strong updrafts and downdrafts have the potential for uprooting trees and causing limb damage. Several small areas of wind throw timber on the Umpqua Cow divide appear on the survey maps.

Spring Conditions- The normal wind pattern over the WAA during spring are a west to northwesterly flow. Average wind speed is 5 to 15 miles per hour. Humidities will average 25 to 60 percent. Spring storms will normally have southwest to northwest winds with humidities 50 to 100 percent. Normal duration of spring storms is from 4 to 8 days. Rain fall will vary from a trace to several inches.

Summer conditions- The normal wind pattern during summer is a northwesterly flow. Most storm events will have southwest to west winds. Wind speed will approach 35 to 45 mph. Humidities will vary from 30 to 100 percent. Rain fall is usually scattered with some areas receiving 1 to 3 inches.

Fall Conditions- The normal wind pattern during fall is a southwest to northwest flow. Fewer high pressure areas develop than at other times of the year. Storm events usually last from 3 to 7 days. Rain fall amounts will vary from light to several inches.

Winter Conditions- The normal wind pattern during fall is a northwesterly flow. Average wind speeds are from 6 to 12 mph. Most storms will approach from the southwest or west. Large cold fronts will have winds that exceed 40 mph. Rain fall will vary from light to several inches in a 24 hour period.

East Wind Conditions- When a strong high pressure area develops over northern Nevada the WAA will experience east winds. Normally this will occur in mid-May to mid-June and again mid-September to mid-October. When this occurs the area can experience very low humidity's and a very dry wind that increases in speed as it moves west.

Galesville Reservoir- This body of water influences wind direction on a local scale.

Earthflows

Earth flows, including translation and rotational slides occur infrequently but are present within the WAA. Contact zones between geologic types are known to be unstable particularly when

associated with serpentine. Volcanic ash deposits are inherently unstable particularly when disturbed by roading and timber harvest. Sliding can be accelerated in shallow soiled steep (>60% slope) areas when root strength of vegetation is disrupted by scarification and harvest. This is particularly true in sedimentary rock types associated with sandstone. Earth flow

deposits often support stands of fast growing and larger trees than the surrounding area as a result of increased soil depth. This is dependent, however on soils type and stability of the site.

Floods

Flooding has not been a major disturbance agent for this area and is believed to have occurred with the same basic frequency as today. (For more information on flooding please see Floodplain section under Characterization.)

Air Quality

The Oregon Department of Environmental Quality has designated several areas of air quality concern that may affect fuels management activities within the Upper Cow Creek watershed:

Crater Lake National Park is designated a Class 1 smoke sensitive area and is located approximately 40 miles to the east. Regulations curtail prescribed burning between July 4 and Labor Day.

The Grants Pass non-attainment area is approximately 20 miles to the south.

Forest/Ecological Health

Ecological health is defined as "the state of an ecosystem in which processes and functions are adequate to maintain the diversity of biotic communities commensurate with those initially found there" (FEMAT 1993).

One of the most notable forest ecological processes which can serve as an indicator of forest health is widespread tree mortality. Healthy forests are able to remain productive and resilient over time in the face of natural stresses such as fire, disease, insect attack, drought and climatic changes which result in tree mortality. A dynamic forest ecosystem is able to retain its basic character throughout many generations. However, stand characteristics and ecological processes will fluctuate over a range of natural variability (see section on Natural Disturbances and successional patterns). When management practices result in ecosystem components being pushed outside of the range of natural variability there is an increased risk of a decline in forest resiliency.

Ecological health requires that the diversity of biotic communities is maintained. The extent of the old-growth community has been decreased due to past timber harvests and is a concern. However, the land use allocations as Late Successional Reserve directs management to maintain and improve late seral conditions. While diseases and insects are present, they are currently at low levels and do not constitute a management concern. Some of the factors which have been observed within the WAA include: red ring rot (*Phellinus pini*), sugar pine blister rust (*Cronartium ribicula*), black stain (*Leptographium wagerneri*), other fungus infections, and various insects such as wood borers and bark beetles. These "factors" are part of the biotic community and are agents that produce snags and down wood, which are part of the diversity of the old-growth community. Various mistletoe infestations have been observed particularly in the Snow Creek Drainage on BLM managed lands.

Port-Orford Cedar

The Upper Cow Creek watershed is outside the natural range of Port-Orford-cedar. The spread of *Phytophthora lateralis* (Port-Orford cedar root disease) is not a concern in this area.

Noxious weeds

Noxious and nonnative species are a serious threat to the natural biological community. The number of introduced species is growing and their range is spreading very rapidly as a result increasing levels of human activities. Most species are prolific seed producers or develop extensive root systems that out compete and exclude native species. Local fauna have not evolved with these foreign species, and acres occupied by them are no longer useable by wildlife. Thus, areas of noxious weed invasion are, in reality, a loss of wildlife habitat. A broader list of nonnative species exists than noxious weed species and exerts a more significant influence on the biological community than the species classified as noxious weeds.

Important means of introduction of noxious and nonnative species is through management activities such as road construction, pipeline construction, transportation of unclean tools and equipment from one geographic area to another, seeding of grasses and legumes, and other human activities. Agricultural crops, farm animals, and residential homes in the valley floors of the forest/rural interface are other key means of introduction and spread of noxious and nonnative plants. The Upper Cow Creek watershed has a number of serious noxious weeds invasions as outlined in Table 15 and Map 18.

The publication "A Guide to Selected Weeds of Oregon" by the Oregon Department of Agriculture (ODA), Noxious Weed Control Program, 1985 provides physiological description, habitat, vectors of dissemination, detrimental effects and economic impact along with color photos of the species. Additionally, ODA Noxious Weed Control Program bulletin of 1993 describes the policy, classification system, the economic significance of noxious weeds and the ODA Noxious Weed Rating system.

The above sources on the distribution of noxious and nonnative plant species are good reference information. Ken French, ODA Southwest Oregon Noxious Weed Control Program coordinator, located in Canyonville OR has additional site specific knowledge. Some additional locations are available from sightings obtained in the 1993 Stocking Survey and observant Resource Area personnel.

Currently, BLM has an agreement with ODA where locations of noxious weed invasions are identified and monitored by BLM and control measures are administered by ODA.

Table 15. Noxious Weeds within BLM portion of the Upper Cow Creek Watershed

GENUS/SPECIES	COMMON NAME	LOCATION	HABITAT	NOTES
Carthanus lanatus	distaff Thistle	Douglas Co, Riddle	no known sites in Upper Cow Creek area	new invader highest priority
Centaura diffusa	diffuse knapweed	Blackwell Hill/Rt 140-Greensprings Rd.	roadsides/ dry sites	High priority. Small infestations. Manual or biological controls
Centaurea maculosa	spotted knapweed	Butte Falls Progeny site.	good soils/disturbed areas	new invader highest priority herbicide control
Centaurea pratensis	Meadow knapweed	everywhere perennial	disturbed areas, roadsides, field, and pastures	biological control and herbicide
Centaurea calcitrapa L.	purple/iberian starthistle	no known locations in Oregon. prevalent in Northern California	pastures, meadows, and fields	new invader
Centaurea solstitialis	yellow starthistle	scattered populations/valley bottoms Jackson Josephine, Douglass Co.	wide range-roadways/dry sites	high priority bio-control measures - seeds
Chondrilla juncea	rush skeletonweed	scattered locations rather common Douglas Josephine Co.	disturbed areas/roadways	bio-control-Mite /midges/rust, seed & roots.

GENUS/SPECIES	COMMON NAME	LOCATION	HABITAT	NOTES
Cirsium arvense	canada thistle	everywhere perennial	wide range of conditions	bio-control low effectiveness (Urophara carduii). seeds/roots
Cirsium vulgare	bull thistle	most clearcuts	wide range of conditions	bio-control (Urophora stylata) insects available in May Seed producer
Spartium junceum L.	spanish broom	Rogue River and Ashland	disturbed areas, roadsides	new invader no leaf no bio-control agents
Cytisus monspessulanus	french broom	Cow Creek area	disturbed areas, roadsides	new invader larger leaf species
Cytisus scoparius	scotch broom	Brushy Gulch/Wolf Creek	good soils/disturbed area	biological control roadways/seed producer 3 million acres
Euphorbia esula	leafy spurge	no known sites	streams/ open areas	high priority new invader seed producer/roots
Hypercium perferatum	klamath weed	very common all drainages	wide range of conditions	low priority bio-control - very effective - (Chrysallina Beetle)
Isatis tinctoria	dyers woad	gravel bars Jackson/Josephine Co.	sandy/gravel soils	low priority seeds
Lythrum salicaria	purple loosestrife	no known sites. S. Umpqua/ Rogue River.	riparian/wetlands	new species bio-control. no chemical control seed/rhizomes

GENUS/SPECIES	COMMON NAME	LOCATION	HABITAT	NOTES
Senecio jacobaea	tansy ragwort	fringe of Range. Jackson, Josephine, Douglas Co	wide range of soils	moderate priority. effective bio-control. (Cinnabar moths/Flea beetle) / seeds.
Sorgham haepense	johnson grass	Douglas, Josephine Co.	roadsides/ good soils	low priority. seed/roots. ag/roadways
taeniatherum caput-medusae	medusahead rye	everywhere.	pasture/ open forest	low priority seed producer
Ulex europaeus L.	gorse	scattered sites in vicinity, north and west of Glendale	good soils. moist.	potential for invasion. dense thickets. flammable

Forest Products

Up until 1958 the Public Lands contained primarily unmanaged forest timber. Timber harvesting in this watershed began around 1958, by tractor and ground lead methods. In the late 1970s skyline systems were used. By the mid-1980s, most of the major road systems were complete in the area. During this time some of the second growth stands were managed for commercial thinning.

Major economic important species found within the Upper Cow Creek WAA consists of the following:

Douglas-fir (*Pseudotsuga menziesii*)
incense cedar (*Calocedrus decurrens*)
ponderosa pine (*Pinus ponderosa*)
sugar pine (*Pinus lambertiana*)
western red cedar (*Thuja plicata*)
white fir (*Abies concolor*)
western hemlock (*Tsuga heterophylla*)
knobcone pine (*Pinus attentuata*)
Pacific yew (*Taxus brevifolia*)
grand fir (*Abies magnifica*)
tan oak (*Lithocarpus densiflorus*)
chinquapin (*Castanopsis chrysophylla*)
madrone (*Arbutus menziesii*)

white oak (*Quercus garryana*)
black oak (*Quercus kelloggii*)
bear grass (*Xerophyllum tenax*)
huckleberry (*Vaccinium spp*.)
Various species of mushrooms

Projections and Sustainability

The Medford District RMP analyzes the timber and forest commodity production and harvest on BLM-administered lands. The two primary land use allocations in this watershed, on BLM-administered lands, are Late-Successional Reserves (LSR) and Northern General Forest Management Areas (GFMA). There are also riparian reserves within these allocations, however management of these reserves within the LSR is similar to management direction for the LSR. Over 87 % of the BLM-administered land in this watershed is designated as LSR, while approximately 12 % is designated as GFMA. The GFMA allocation also contains riparian reserves whose primary purpose is to provide habitat for species associated with late successional habitat and further the Aquatic Conservation Strategy. Management and vegetation treatments, in these reserves, would be to maintain or improve habitat for late-successional species. One of the primary objectives of the GFMA allocation is to "produce a sustainable supply of timber and other forest commodities". (Medford District ROD, June, 1995, pg 38). While this is not an objective of LSRs or Riparian Reserves, commercial timber can be a by-product of treatments to improve late-successional habitat, consistent with management objectives (Medford RMP, p. xv).

The allowable sale quantity (ASQ) is the "estimate of annual average timber sale volume likely to be achieved from lands allocated to planned, sustainable harvest" (Medford RMP, p. xiv). ASQ is calculated on the Medford District level, not on a watershed level and therefore volume of timber removal is not set for a watershed. There are 1,213 acres designated for timber production in GFMA allocation in this watershed. The sustainability of timber in this watershed is tied to the allowable sale quantity for the district and is just a small portion of this amount for the Medford District. It is not practicable to give a specific volume of timber that could be removed annually from the northern GFMA lands in this watershed, since it is part of the calculations as a district. Scheduled harvest from these lands would be part of a larger plan for the Medford District and the Glendale Resource Area.

Special Forest Products

In the NFP, there are guidelines for the harvest of Special Forest Products (SFP). With fewer traditional forest-related jobs now compared with a decade ago, some workers have converted to working with SFPs as an alternative occupation, full or part time. For this reason, there is a slightly greater demand for SFPs, which is expected to continue in years to come. The harvest and management of SFPs has not adversely affected the management of other resources.

Major Products

Beargrass (*Xerophyllum tenax*): this member of the Lily family appear throughout areas at nearly all elevations, establishing itself after the fire and other disturbances, and flourishing under 50-75 % canopy closure, moderate rainfall, and poor to moderate sites.

Seasonal decorative tree boughs: The dominant species within the WAA include: incense cedar (*Calocedrus decurrens*), sugar pine (*Pinus lambertiana*), and Ponderosa Pine (*Pinus ponderosa*). Occurring in lesser amounts but of higher value is: western red cedar (*Thuja plicata*). Douglas-fir (*Pseudotsuga menziesii*) while occurring in great amounts has little value when used as bough decoration.

Christmas trees: Historically, the Upper Cow Creek WAA has not been a significant source of Christmas trees because of the distance from any major community and lack of suitable type of trees.

Mushrooms: This watershed is in the appropriate range for all the wild mushrooms deemed commercially valuable. They include. Chaterelle (*Cantharellus cibarius*), morel (*Morchella conica* and *Morchella esculenta*), matsutake (*Armillaria ponderosa* and *Tricholoma matsutake*), bolete (*Boletus edulis* and others), and hedgehog (*Detinum repandum*). There has been no inventory for these species. There have been a few commercial permits in the past, but increased interest could lead to greater activity.

Firewood: Firewood is an important product in this watershed for both personal and commercial purposes. Slash, leftover from cutting activities, is the primary source of material and therefore firewood abundance is related to cutting occurrences. Pacific madrone (*Arbutus menzieii*), tanoak (*Lithocarpus densiturius*), golden chinkapin (*Castanopsis chrysophylla*), and California black oak (*Quercus kelloggii*) are the species of choice among the hardwoods. Douglas-fir, any pine, cedar, or other conifer are much less desirable but would be taken when no hardwoods are present. All of these species are abundant in the WAA.

Other Wood Products: Other potential forest products include: decorative wood, burls, furniture, toys and other specialty products. Primarily, the hardwoods are used, especially pacific madrone (*Arbutus menziesii*), tanoak (*Lithocarpus densiflorus*), golden chinkapin (*Castanopsis chrysophylla*), California black oak (*Quercus kelloggii*) as well as big leaf maple (*Acer macrophyllum*), manzanita and pacific yew (*Taxus brevifolia*). Other products coming from conifers, such as poles, shakes, etc. are also present.

Other forest products: Special forest products are quite diverse. Within the Upper Cow Creek WAA, there have been permits sold for evergreen huckleberry (*Vaccinium ovatum*), and salal (*Gaultheria shallon*). In the future there will likely be permits sold for prince's pine (*Chimaphila umbellate*), vine maple (*Acer circinatum*), herbs (too numerous to mention), ferns,

pacific rhododendron (*Rhododendron macrophyllum*), dwarf Oregon grape (*Berberis nervosa*), cones and mosses, all of which occur in large in amounts in the Glendale Resource Area.

C. Terrestrial Vegetation and Habitats

Vegetation Associations and Communities

Plant communities in the Upper Cow Creek watershed are representative of the diversity encountered in the Klamath Mountains Province. The geologic and geographic features, in addition to climatic conditions, greatly influence the development of soils and vegetation. The mountainous terrain accentuates the watershed diversity. Extensive erosion and stream hydrology activity has created steep canyons. Topographic features influence the natural disturbance patterns. Fire has disturbed the watershed frequently and has played an important role in the development of existing plant communities within the forests and meadows of the landscape unit. Within the last several decades, timber management has altered portions of the watershed most drastically.

Historic vegetation patterns or reference conditions refers to the conditions that existed prior to European-American modification. Examples of significant European modification include clearing for settlement and agriculture, timber harvesting, mining, grazing, and fire suppression.

Potential natural vegetation in the Upper Cow Creek watershed was mapped on three levels (Table 16 and Map 19). The series is the broadest category and is determined by the most abundant, reproducing tree species in the understory of mature and late-successional stands; often, this is the most shade-tolerant species present. Plant associations are fine scale divisions based on the indicator species present in late-successional stands. Indicator species are usually the most dominant species present. These associations are aggregated into plant association groups, which are intermediate between series and associations, to ease interpretation. The plant associations used were described by Atzet et. al. (1996). The plant groups or cells, are described in Oregon State University, Oregon Natural Heritage, Natural Areas Program, at (http://oregonstate.edu/ornhic/). More detailed descriptions of these classifications are presented in Appendix A.

Table 16. Plant groups on private and BLM-administered lands within the BLM boundary of the Upper Cow Creek watershed. (Excludes USFS and private parcels within the USFS boundaries). See Map 19.

Plant Groups	Acres
Douglas-fir/Dwarf Oregongrape/Western sword fern (PSME/BENE2/POMU)	371
Douglas-fir/Salal/Western sword fern (PSME/GASH/POMU)	5,592
Douglas-fir/Jeffrey pine (PSME/PIJE)	478
Douglas-fir/Poison Oak/Braken (PSME/RHDI/PTAQ)	6,451
White fir/Vine Maple/Vanillaleaf (ABCO/ACCI/ACTR)	1,045
White fir/Western hemlock/Vine maple (ABCO/TSHE/ACCI)	1,699
Oregon white oak/Douglas-fir/Poison oak (QUGA4/PSME/RHDI)	231
Oregon ash / Bigleaf maple (FROR /ACMA)	276
Water (Galesville Reservoir)	604
TOTAL	16,746

The plant series and association groups, in the Upper Cow Creek WAA, are within the two major plant community groups “mixed conifer/madrone-deciduous brush/salal” and “white oak-ponderosa pine/manzanita-wedgeleaf/grass” as described in the Medford RMP, Volume I, Chapter 3-27. Both overstory and understory vegetation is controlled by several environmental factors and physical attributes. Soil type, aspect, and landform generally have a greater influence in this landscape’s upland areas than annual precipitation, summer precipitation or elevation bands on the vegetation abundance and relative dominance of species. Plant communities can be further categorized by aggregation soil influence and location on the slope.

A plant community within the mixed conifer/madrone grouping which shows strong serpentine influence in both species and stand density is located on Cedar Springs Mountain. This area contains a higher mix of western hemlock, incense cedar, and white fir than the adjoining granitic and meta-sedimentary midslope vegetation. The serpentine influence lessens down slope from Cedar Springs Mountain as the amount of serpentine content lessens and greater organic matter accumulates.

Inclusions of a knob cone pine overstory are throughout this grouping. The largest concentrations are found in the Snow Creek drainage and immediately north of Cedar Springs Mountain. Sugar pine is more abundant midslope in the granitic based soil from Sugar Divide to Cow Creek. Douglas-fir-western hemlock overstory occupies the east facing midslope and ridge areas from Sugar Divide to Cow Creek. Ponderosa pine is mixed with the Douglas-fir overstory in the lower slopes of this area as heavier clay soils are encountered near Cow Creek. A gradual transition to the white oak-ponderosa pine grouping occurs near Cow Creek.

Smaller vegetation communities associated with riparian areas, meadows, rock outcrops, cliffs, or talus slopes occur within the defined major plant grouping. Meadow habitat is very limited in distribution within the WAA. Sites dominated by rock are common within the upper reaches of the Cow Creek drainage. Riparian areas are extensive throughout the unit. Special status plant species are most likely to occur in these unique ecosystems.

Late Successional Forest and Special-Status Species

Desired Late-successional and old-growth coniferous forest characteristics include: "1) multi-species and multi-layered assemblages of trees, 2) moderate-to-high accumulations of large logs and snags, 3) moderate-to-high canopy closure, 4) moderate-to-high numbers of trees with physical imperfections such as cavities, broken tops, and large deformed limbs, and 5) moderate-to-high accumulations of fungi, lichens, and bryophytes", NFP, April, 1994, p. B-5.

Late-successional forests are characterized by the relative abundance of several types of structures important to wildlife: large live trees, large snags and large logs (Bingham and Sawyer 1991). Old trees and abundant dead and down wood appear to be important to bird (Ralph et al. 1991) and amphibian (Welsh and Lind 1991) species. While reptiles attain their greatest diversity in stands of 20 years of age or less, amphibian (Ibid.), avian and mammalian (Raph et al. 1991) species diversities attain their maximums in stands over 150 years.

For birds with limited geographic distributions, that is, endemic birds, the importance of late successional habitat is crucial. The forests of this region have a greater number of endemic bird species than any other in the U.S. Ralph et al.(1991) suggest that the potential for "profound changes in the abundance" of many species is likely with "further alterations of the landscape" (p.393). They further suggest that the decline and extinction of endemics in the forests of the Southeastern U.S. are probably due to the elimination of that region's old-growth forests in during the 1800s.

Current and Historic Conditions

The Upper Cow Creek WAA has a variety of wildlife habitats, with relatively small areas of old-growth coniferous forest in the BLM portion of the landscape. Large portions of forested private and public lands have been harvested, resulting in a reduced number of mature or old-growth forested stands, and poor connectivity between stands. Historically, many of the stands that are now under 40 years old, were once older stands of mixed conifers and hardwoods that provided late-successional forest characteristics. In this watershed there are 9,941 acres of BLM-administered land. Of that acreage, there are 3,652 acres of forest stands that are 40 years old or younger. Many of these early and mid seral stands are the result of past timber harvest and once supported mature and old-growth mixed conifer stands, with Douglas-fir as the primary conifer species. They no longer provide late-successional characteristics.

There are 5,277 acres of BLM-administered stands over 80 years of age and these lands support a range of late-successional forest characteristics. Of these there are 1,597 acres of stands greater than 200 years old and these areas generally retain the best late-successional forest characteristics, as described under "Late-Successional Forest and Special Status Species". Nesting habitat for the northern spotted owl begins at approximately 150-200 year old conifer stands as noted in A Conservation Strategy for the Northern Spotted Owl, 1990. Roosting and foraging habitat can be present in stands generally greater than 80-100 years old. The areas identified as "81-200 years"on Map 12 – "Seral Stage and TPCC Withdrawn Lands" account for 3,680 acres of forest stands. These stands have some of the characteristics of late-successional forests but often lack either the high overstory canopy closures, the desired levels of snags and coarse woody material or, in the younger of these stands, the imperfections in older trees such as cavities, broken tops, and deformed limbs. Old-growth structure is generally limited to small-to-mid size blocks. Block size of old-growth patches range from only a few acres to a few hundred acres. Large blocks are rare with only a few patches greater than 100 acres in size. Features of forest stands are described in Appendix A, "Potential Natural Vegetation in the Upper Cow Creek Watershed" and Appendix B "Features of Douglas-fir/hardwood forests in Southwestern Oregon and Northern California".

Timber Harvest and Fragmentation of Late Successional Forests

Fragmentation is the creation of breaks in forest stands of formerly contiguous habitat. Timber harvest fragments stands directly through the loss of trees and often indirectly through the construction or upgrading and increased use of roads.

"Loss of habitat and the less obvious phenomenon of habitat-patch isolation are aspects of forest fragmentation that threaten the viability of wildlife populations, the components of biotic diversity" (Lehmkuhl and Ruggiero 1991, p.35).

The following factors have been identified as direct consequences of such fragmentation: competition from edge species, increased nest predation and parasitism, "edge creep" from processes that are promoted by aggravating the edge effects with the invasion of open-habitat or edge species (both native and exotic, and both plant and animal) such as microclimatic changes, and isolation and stochastic events that extirpate subpopulations (e.g., disease in a stand that is isolated from recolonization) (Ibid.).

If consideration is given to the following mitigations, Lehmkuhl and Ruggiero (1991) suggest that the probability of persistence of late-successional species will be improved: planning for the replacement over time of late-successional forest patches; large trees and snags; retaining green trees and coarse woody debris in harvest units; and providing for adequate corridors to maintain connectivity across the landscape.

Roads and Wildlife

Roads affect the ability of mature or late seral habitat to support some species by creating barriers to movement for certain species, increasing human harassment and thereby increasing energy demands on wildlife, increasing opportunities for poaching and by creating miles of edge where there would otherwise be intact stands. The open-canopied nature of roads may isolate subpopulations or also affect the movements of species intolerant of openings (e.g., fisher). Road openings may also reduce the cover for nests and dens that happen to be located along the road, and therefore affect vulnerability to predation. A road affects the forest environment for plants and animals well beyond the actual right-of-way. The physical effects of such edges on the biotic components of old-growth stands—through increased dessication, wind speed, temperature fluctuations and other factors—were found to extend over 150 yards into the forest interior (Chen 1991). Such openings may produce an edge effect that makes micro-climatic extremes harsher. That is, large road openings may reduce the moderating effects of the surrounding forest for a distance of approximately 400' into the stand, making winter days colder and summer days hotter and drier within that distance of the road (J. Chen. 1991).

Roads also increase the rate of spread of most noxious weeds, which, in turn reduces native species on which wildlife depend. Roads also result in the direct mortality of wildlife, and occasionally, humans. Over 200 people are killed annually in the U.S. in wildlife-vehicular accidents (Johnson and O'Neil 2001).

Biological Corridors

Biological corridors are bands of habitat between late-successional forest areas which address concerns for species needs for dispersal, movement, feeding and genetic exchange across the landscape through the provision of forested habitat that can provide connections between protected areas.

Providing a distribution of older forest stands across the landscape is both an important component of ecosystem diversity and a means of assisting those species with limited dispersal capabilities through younger forest stands (p.C-44, USDA/USDI 1994). Connectivity is particularly important for certain furbearers, such as fisher and marten (USDA and USDI, 1994), and species such as the northern spotted owl, which depends on high levels of canopy closure to successfully move between habitats without becoming a victim of predators such as great-horned owls or red-tailed hawks (Forsman 1984). Movement of spotted owls between large areas with multiple pairs is thought to be crucial to long-term population viability (Thomas et al. 1990).

Two major issues surrounding biological corridors for species associated with late-successional forest are: (1) how the watershed is linked to other watersheds and reserves outside the watershed and (2) how blocks of older forest within the watershed are connected to, or isolated from, each other.

Riparian zones are naturally occurring corridors. One significant natural corridor is the Cow Creek Canyon which runs through the middle of the WAA. The 8,707 acre South Umpqua/Galesville LSR will provide sufficient movement between Upper Cow Creek and the adjoining Middle Cow Watershed to the west in the long term, since land management activities within the reserve would be driven by the objectives of further developing late successional conditions. However, stands within the LSR block are interrupted by private ownership where stands are harvested on a 40-60 year rotation cycle and will not attain late successional conditions. Currently, corridors linking what little old-growth occurs in this watershed with adjacent watersheds are relatively narrow. Considering the larger stands of old-growth on BLM lands just within the bounds of this watershed (T31S R4W sections 11 and 31, and T32S R3W section 30), only one (the latter) has a good connection with old-growth beyond the watershed. See Map 12. Old-growth-dependent species do not have viable habitat after traveling less than 0.25 miles outside this watershed in the first two cases. Because habitat information is not available for the Forest Service's portion of the watershed, little can be said with certainty. But it is likely that the chances of connectivity are greater because of the management objectives within Late Successional Reserves on federal lands. Within the Upper Cow Creek drainages, the forested riparian corridors provide movement between the blocks of older forest, where private blocks do not intersect the streams. Since most of the riparian corridors are intersected with younger stands on both public and private lands, connectivity within the watershed for older forest structure is poor.

Logging activities have altered vegetative communities within the riparian zones of all the creeks. Ownership patterns dictate the presence or absence of buffer areas adjacent to the creeks. On private and industrial lands, past harvesting activities have occurred down to the edge of the creek with no trees or scattered trees less than 8-10" dbh left. On private industrial timberlands commercially valuable tree species such as Douglas-fir are managed to dominate stands. Before the Northwest Forest Plan (1995), federally managed lands provided some riparian buffers on major creeks. Since that time, federal land management activities protect riparian reserves on all federally managed perennial and intermittent streams. The riparian reserve width corresponds to the stream class of each of the creeks: an average of 170 ft from bankful width on each side for non-fish bearing perennial stream and intermittent streams, and 340 ft from bankful width on each side for fish-bearing streams for this watershed. However, the resulting pattern of buffered and non-buffered areas along each creek has led to broken, poorly connected riparian corridors. This pattern is particularly evident in Sugar Creek.

Special status species and habitats

Special status species include several classifications, among which are:

- Federally listed Threatened, Endangered, and Candidate species which are listed or considered for listing under the Endangered Species Act (Table 17).

- Special Status Species, which include those species identified in the FSEIS To Remove or Modify the Survey and Manage Mitigation Standards and Guidelines ROD" as needing special consideration due to their association with late-successional habitat (Tables 18).

- Species of Concern, which include species which were formerly listed as Candidate species under the Endangered Species Act.

-Bureau Status BS (Bureau Sensitive), species that could easily become endangered or extinct in a state. Bureau Sensitive species are restricted in range and have natural or human-caused threats to survival. Bureau Sensitive species are not FE, FT, FP, FC, SE, or ST, but are eligible for federal or state listing or candidate status. Thus species that are Oregon state critical or Oregon Natural Heritage Program List 1 are considered Bureau Sensitive species. Bureau Sensitive species are designated by the State Director and are typically tiered to the state wildlife agencies' designations. The BLM 6840 Manual specifies policy which requires any Bureau action will not contribute to the need to list any of these species (i.e. equivalent to policy applied to federal candidate species). All anadromous fish species, unless federally listed, proposed, or candidate, are under review and are considered Bureau Sensitive until status is determined.

-Bureau Status BA (Bureau Assessment), species which are not presently eligible for official federal or state status but are of concern in Oregon may, at a minimum, need protection or mitigation in BLM activities. These species will be considered as a level of special status species separate from Bureau Sensitive, and are referred to as Bureau Assessment (BA) species.

-Bureau Status BT (Bureau Tracking), species which need an early warning to prevent becoming listed as threatened or endangered in the future. It is encouraged that occurrence data is collected on these species for which more information is needed to determine status within the state or which no longer need active management (IM No. OR 2003-054).

- Species identified by the state of Oregon as warranting special attention, either through listing under the Oregon Endangered Species Act, or identified as an Oregon Special Status Species.

Federal guidance for managing Survey and Manage species was revised on March 22, 2004 under the Record of Decision for the *Final Supplemental Environmental Impact Statement To Remove or Modify the Survey and Manage Mitigation Standards and Guidelines*.

The spotted owl and the bald eagle are the only federally listed terrestrial wildlife species known to occur within the watershed, although marbled murrelets have been documented a few miles

west. Steelhead trout (winter run) is listed as federal candidate species (see Analysis Topic #1 - Fish Habitat). The Oregon coast coho salmon is a previously listed threatened species.

On February 24, 2004 the Ninth Circuit Court ruled on the appeal to relist the Oregon coast coho salmon. Based on this ruling, the original Judge Hogan Opinion issued that , "The August 10, 1998 NMFS listing decision [Oregon Coast coho salmon], contained at 63 Federal Register 42,857, is declared unlawful and set aside as arbitrary and capricious." ONRC (Oregon Natural Resources Council) et al. is in effect until such time as NOAA Fisheries (NMFS) proposes a new listing decision in the Federal Register which deals with the issue of hatchery coho. NOAA Fisheries is scheduled to make a decision on the listing on this species June 14, 2005. Galesville Dam is a complete barrier to anadromous fish passage. It is currently proposed under the Northwest Regions Federal Register, that if the OC coho salmon are re-listed under the August 2005 NWR Federal Register, critical habitat will only occur below Galesville Dam.

Table 17 lists the special status plants which may occur within the Upper Cow Creek watershed. Surveys completed for the most current projects within this watershed have yielded minimal findings of special status vascular and nonvascular plants.

The Oregon Department of Fish and Wildlife (1993) notes that the relatively small Klamath Province supports the highest number of vertebrate species of any Province in Oregon.

Table 17. Special Status Species within the BLM portion of the Upper Cow Creek watershed.

Common Name	Scientific Name	Status	Presence/ Inventory	Habitat
Threatened & Endangered				
bald eagle	*Haliaeetus leucocephalus*	FT,ST	D/4	Y
northern spotted owl	*Strix occidentalis caurina*	FT,ST	D/4	Y
steelhead trout (winter run)	*Oncoryhnchus kisutch*	FC		Y
Plants – Bureau Sensitive & Bureau Assessment				
	Camassia howellii	BS		serpentine soils
	Cimicifuga elata	BS		moist environments within conifer forests
	Crumia latafolia	BA		rock outcrops, seeps

Common Name	Scientific Name	Status	Presence/ Inventory	Habitat
Plants – Bureau Sensitive & Bureau Assessment (continued)				
	Cypripedium fascicula	BS		moist, heavy duff mix conifer forest
	Fritillaria glauca	BA		barren dry rock slope
	Funaria muhlenbergii	BA		rock outcrops
	Limnanthes gracilis var. gracilis	BA		wet ground serpentine
	Mimulus douglasii	BA		open gravel moist serpentine
	Silene hookeri ssp. bolanderi	BA		rock knolls serpentine
Plants – Bureau Tracking				
	Allium bolanderi var. mirabile	BT		clay soils open woods
	Tortula subulata	BT		disturbed areas in conifer forests
Amphibians– Bureau Assessment				
Foothill yellow-legged frog	*Rana boylii*	BA, XC, SV	U/N	U
Amphibians– Bureau Tracking				
cascade frog	Rana cascadae	BT, XC, SV	U	N
clouded salamander	*Aneides ferreus*	BT, SU	S/2	Y
northern red-legged frog	*Rana aurora*	BT, XC, SU	U/N	U
tailed frog	*Ascaphus truei*	BT, XC	D/N	Y
western toad	*Bufo boreas*	BT, SV	S/N	Y

Common Name	Scientific Name	Status	Presence/ Inventory	Habitat
Birds – Bureau Sensitive & Bureau Assessment				
black-backed woodpecker	*Picoides arcticus*	BS, SC	S/N	Y
flammulated owl	*Otus flammeolus*	BS, SC	U/N	U
northern goshawk	*Accipiter gentilis*	BS, XC, SC	S/1	Y
Birds – Bureau Tracking				
acorn woodpecker	*Melanerpes formicivorus*	BT	D/N	Y
bank swallow	*Riparia riparia*	BT, SU	U/N	U/N
great gray owl	*Strix nebulosa*	BT, SV	U/3	Y
pileated woodpecker	*Dryocopus pileatus*	BT, SV	D/2	Y
western bluebird	*Sialia mexicana*	BT, SV	D/N	Y
common nighthawk	*Chordeiles minor*	BT	U/N	Y
mountain quail	*Oreortyx pictus*	BT, U	D/N	Y
northern pygmy owl	*Glaucidium gnoma*	BT	D/N	Y
olive-sided flycatcher	*Contopus cooperi*	BT, SV	D/2	Y
Western meadolark	*Sturnella neglecta*	BT	D/N	Y
Mammals - Bureau Sensitive & Bureau Assessment				
fisher	*Martes penanti*	FC, SC	S/3	Y
pallid bat	*Antrozous pallidus*	BA, SV	S, 2	Y
Townsend's big-eared bat	*Corynorhinus townsendii*	BS, XC, SC	U/N	Y

Common Name	Scientific Name	Status	Presence/ Inventory	Habitat
Mammals - Bureau Tracking				
Ameican marten	*Martes Americana*	BT, SV	S/3	Y
California myotis	*Myotis californicus*	BT	S/N	Y
fringed myotis	*Myotis thysanodes*	BT, XC, SV	U/N	Y
long-eared myotis	*Myotis evotis*	BT, SU	S/N	Y
long-legged myotis	*Myotis volans*	BT, SU	S/N	Y
Oregon red tree vole	*Arborimus longicaudus longicaudus*	BT	D/3	Y
ringtail	*Bassariscus astutus*	BT, SU	U/N	U
silver-haired bat	*Lasionycteris noctivagans*	BT/SU	D/N	Y
Common Name	**Scientific Name**	**Status**	**Presence/ Inventory**	**Habitat**
Mammals - Bureau Tracking (continued)				
Yuma myotis	*Myotis yumanensis*	BT	S/N	Y
Western gray squirrel	*Sciurus griseus*	BT/SU	S/N	Y
Reptiles - Bureau Sensitive				
western pond turtle	*Clemmys marmorata marmorata*	BS, XC	D/3	Y
Reptiles - Bureau Tracking				
California mountain kingsnake	*Lampropeltis zonata*	BT, SV	S/N	Y
common kingsnake	*Lampropeltis getulus*	BT, SV	S/N	Y
sharptail snake	*Contia tenuis*	BT, SV	S/N	Y
western rattlesnake	*Crotalus viridis*	BT, SV	S/N	Y

Table generated from the May, 2005 edition of the BLM Oregon/Washington BLM State Director's Special Status Species List and Database, at http://web.or.blm.gov/or930/sssdb/

Legend for Tables 17

Status:
FE- Federal Endangered
FT- Federal Threatened
FP- Federal Proposed
FC - Federal Candidate
XC-Former Federal Candidate
PB- Protection Buffer
BA-Bureau Assessment
BS- Bureau Sensitive
BT-Bureau Tracking
SE-State Endangered
ST- State Threatened
SC- State Critical
SV- State Vulnerable
SP- State Peripheral
or Naturally Rare
SU- State Undetermined Status

Presence:
D- Documented
S- Suspected
U- Uncertain
A- Absent

Habitat:
N - Habitat is not present
Y - Habitat is present
U - Habitat is uncertain

Inventory:
N-No surveys done
1- Literature search only
2- One field search only
3- Limited surveys done
4- Protocol completed

Additional Legend Clarification:

The categories of FE, FT, FP, FC, ST, SE, BS, BA, and BT are mutually exclusive. Hence, if a species is a federal candidate or state listed as endangered or threatened, it is not also Bureau sensitive.

Oregon State Status SC (State Critical): Species for which listing as threatened or endangered is pending; or those for which listing as threatened or endangered may be appropriate if immediate conservation actions are not taken. Also considered critical are some peripheral species which are at risk throughout their range, and some disjunct populations.

Oregon State Status SV (State Vulnerable): Species for which listing as threatened or endangered is not believed to be imminent and can be avoided through continued or expanded use of adequate protective measures and monitoring. In some cases the population is sustainable and protective measures are being implemented; in others, the population may be declining and improved protective measures are needed to maintain sustainable populations over time.

Oregon State Status SP (State Peripheral/Naturally Rare): Peripheral species refer to those whose Oregon populations are on the edge of their range. Naturally rare species are those which had low population numbers historically in Oregon because of naturally limiting factors. Maintaining the status quo for the habitats and populations of these species is a minimum requirement. Disjunct populations of several species which occur in Oregon should not be confused with peripheral species.

Oregon State Status SU (Undetermined Status): Species for which status is unclear. Species may be susceptible to population decline of sufficient magnitude that they could qualify for

endangered, threatened, critical, or vulnerable status, but scientific study will be required before a judgment can be made.

Special status habitats within this watershed include critical habitat for the northern spotted owl.

Critical habitat for the northern spotted owl is a legal designation under the Endangered Species Act (ESA). It was designated in January 1992, defined in Section 3(5)(A) of the ESA as those areas which provide the physical and biological features that are "essential to the conservation of the species" and "which may require special management considerations or protection." [(16 U.S.C. 1532 (5)(A)]. The Fish and Wildlife Service determined that the primary constituent elements to the conservation of the spotted owl were those physical and biological features that support nesting, roosting, foraging, and dispersal (USDI 1992). The Service's Biological Opinion on the Northwest Forest Plan (Appendix G in the FSEIS) was that destruction or adverse modification of critical habitat would not occur. However, the analysis supporting this opinion was done at a scale covering the entire range of the spotted owl, and the opinion notes that a more localized analysis should occur to ensure that the LSRs and other reserve areas are meeting the needs of the Critical Habitat network.

The spotted owl critical habitat unit within this watershed is OR-32. "This unit coincides with the Rogue-Umpqua Area of Concern, which provides an essential link in connecting the Western Cascades Province with the southern portion of the Coast Ranges and northern end of the Klamath Mountains Province. This unit provides the single link from the Western Cascades Province to the Klamath Mountains Province and associated Area of Concern. The land ownership patterns elevate the importance of maintaining areas of owl nesting habitat to link the Western Cascades, Coast Ranges and Klamath Mountains Provinces" (p. 2, Appendix B of the BO in the Rogue River/Siskiyou National Forests and Medford Bureau of Land Management. 2003. Biological Assessment/Biological Opinion 1-7-03-F-511.)

Habitat for snag-dependent species has been severely reduced in the BLM portion of the landscape, mainly by past clearcutting and salvage harvest practices. Adequate sized snags would be present in stands with a 200 year harvest rotation, however most matrix lands are harvested on a 100 year rotation basis. The same is true for species associated with down logs. In the BLM portion of the WAA, snag and log habitat remains scarce, averaging only about 30 % of optimum population levels for woodpeckers.

Galesville Reservoir provides a food source for osprey, bald eagles, Canada geese and other waterfowl, deer and many other species. The standing trees in the reservoir provide bass habitat and western pond turtle habitat.

Much of the landscape consists of steep, forested and/or brushy terrain, which provides habitat for songbirds, deer, elk, cougar and many other wildlife species. Black-tailed deer are present throughout the watershed. Roosevelt elk are present, particularly in the Meadow and Snow Creek basins. The bottom farmlands provide forage and refuge for elk and deer.

Since only a handful of wildlife species have been inventoried in this area, little or nothing is known about relative abundance of most of the vertebrate species in the WAA.

Songbirds have been monitored at a site at the mouth of Snow Creek since 2000 at a Monitoring Avian Survivorship and Productivity Station aka a *MAPS* site. The sample sizes for captured birds are too small to draw any conclusions about how the species are faring in this watershed, but along with dozens of other MAPS stations, do contribute to regional and continental trends for those species.

The following paragraphs describe the current management, specific concerns and management opportunities for the species listed.

Northern Spotted Owls

There are six active spotted owl sites known within the landscape unit. Other sites might be found with higher intensity inventory. There are approximately 2,630 acres (GIS generated) of suitable owl habitat in the BLM portion of the landscape unit (Table 18). For the entire watershed, there are 14,959 acres of Critical Habitat Unit (OR-32 & OR-33). The stand value and functions within much of the Critical Habitat Unit OR-32 is uncertain because it has largely not been surveyed. Table 19 shows the owl sites, their current pair and reproductive status, which are monitored annually in the WAA. Approximately twenty years ago, a handful of areas that were timber sale planning areas were surveyed for spotted owls. Until the early 1990s, the sites were not followed in a systematic manner.

Table 18. Suitable Northern Spotted Owl Habitat of Upper Cow Creek watershed on BLM land.

Designation	Suitable Owl Habitat Acres
Late Successional Reserve	2,416
Forest Matrix	214
Critical Habitat Unit (OR-32)	2,630

Table 19. Current status of the Northern Spotted Owls in the watershed.

Owl Site	2005 Pair Status	2005 Reproduction Status	1st Year Detected	Last Year Detected
Galesville	AP	NY	1997	2005
Meadow Creek	AP	NY	1990	2005
Negro Creek	AP	NY	1980	2005
Not So Bad	AP	Y	1998	2005
Snowy Owl	AP	NY	1991	2005
Sugar Mama	AP	NY	2003	2005
Ump Cow	NS	-----	1978	1978

2005 Pair Status

AP- Active pair site

UP- Unoccupied site

RS- Resident single

NS- No longer viable

2005 Reproductive status

Y- Young produced/fledged

NY- No young produced

There are 13,104 acres designated to the spotted owl Critical Habitat Unit (CHU) OR-32 and 1,855 acres to CHU OR-33 within the watershed (Map 20).

Spotted owl dispersal habitat is generally considered adequate for ensuring successful movement of young birds away from their natal areas and locating potential new core areas. "Where federal ownership is prevalent, both reserved and unreserved land-use allocations are expected to provide for spotted owl connectivity" (p. 70, Conroy and Reuwsaat. 2003. Biological Opinion (FWS) 1-7-03-F-511.)

Bald Eagles

The following is a history of the bald eagle pair at Galesville Reservoir:

1994
Two nesting pairs produced two sets of young.

1998
16 April 1998. Frank Isaacs discovered nest on Sugar Ridge, T31 S R4W Section 21 NE1/4 SW 1/16. One young fledged.

Winter 1998/1999.
M. Schnoes trench barricaded (blocked road) spur near nest.

1999
Female seen brooding on nest in April. By June, no longer observed on nest. Nest must have failed.

2000
Two juveniles observed fledging in August.

2001
No eagles observed nesting.

2002
No eagles observed nesting, but occupied (perched near, fished in) the west end of the lake and were seen flying into stand near lake.

2003
M. Schnoes discovered nest in stand near lake. Two juveniles fledged.

2004
M. Schnoes observed completed nesting and one juvenile fledged.

2005
K. Fukuda observed at least 2 eggs in the nest and this document was completed before the close of the nesting season.

This nest was large (5 ft in diameter or greater) and probably had been used for several years. Because of its proximity to industrial timber lands, which were clearcut, aerially sprayed with herbicides and hand-planted with many pedestrians accessing within 300 ft of the nest tree during the courtship season in the late 1990s through 2000, it may have originally been the primary nest site and the previously observed Sugar Ridge location may have actually been an alternate nest site.

The Resource Management Plan has reserved 80 acres in the Galesville Reservoir area for a potential bald eagle nesting stand. In addition, the Plan places restrictions on harvest activities and prescriptions within a half mile of eagle nests.

The bald eagle is a federal and state listed threatened species in the state of Oregon.

Marbled Murrelet

Because marbled murrelets have not been detected this far inland at this latitude after thousands of survey points in the region, the USDI Fish and Wildlife Service has confirmed the BLM and USDA Forest Service's recommendation to discontinue surveys for the species in this area. (Appendix H of the Biological Assessment in the Rogue River/Siskiyou National Forests and Medford Bureau of Land Management. 2003. Biological Assessment/Biological Opinion 1-7-03-F-511.)

Other Species of Interest

Western Pond Turtles

Western Pond Turtles have been found in Galesville Reservoir. There is no specific management direction for this species. The western pond turtle is believed to be declining throughout its range. The causes stem from habitat loss, habitat alteration, both directly the loss of aquatic habitats and elimination of terrestrial nesting sites; introduced predators, notably bullfrog and bass; predation on hatchlings and juveniles; direct and indirect predation by humans through illegal shooting, pet trade collecting, capture by fishermen for food; drought, population fragmentation and disease (Marshall, 1992).

The status of pond turtles in the WAA area is presently unknown.

Dominant Woodpeckers

Dominant woodpeckers (here we consider downy, hairy and pileated woodpeckers, the common flicker and the red-breasted sapsucker) are of high interest to the public. No field inventories have been conducted for the above-mentioned species. However, in areas being inoculated with a heartrot fungus, use of treated trees by cavity nesters will be monitored.

The Resource Management Plan for the Medford District, Bureau of Land Management, directs managers to "provide for 100 % of optimum woodpecker populations. …Provide for 40 % of the mean number of snags found in unentered stands" (p. 45, RMP). While first maintaining the intent of the Late Successional Reserve system for treatments to be "beneficial to late-successional forest conditions" (p. C-12, NWFP).

Osprey

Osprey nesting platforms have been erected for these birds around Galesville Reservoir. Snags are left at nesting sites where they do not pose a safety hazard. Road construction and recreation development near nest sites are avoided.

Osprey are sensitive to suitable nest trees and to fish population fluctuations, which are affected by water quality and other factors which reduce fish availability.

Non-native fauna

Several non-native species have become established in the watershed. These species sometimes directly compete with native animals for food, water, cover and shelter. Bullfrogs compete and consume native frogs and young western pond turtles. Opossums compete with native striped skunks and raccoon. Brown headed cowbirds and starlings parasitize native bird nests. Turkeys compete with native wildlife species for acorns.

Special or unique habitats- meadows, cliffs, etc.

Special or unique habitats may account for a small amount of the total land base, but they are disproportionately significant as wildlife habitats. Each unique habitat often supports at least one species which is highly adapted to it, and often concentrates and supports a unique animal complex. Unique habitats are often highly fragile areas, usually where little can be done to improve them, while they can be easily adversely affected or destroyed by habitat alteration or removal, with subsequent loss of important wildlife habitat. Cliffs, caves, and springs are generally recognized as characteristic of these types of habitats. In this watershed, meadows are also very uncommon, and therefore fall in this category.

There are large areas of cliff and rock outcrop habitat throughout the upper area and in places along Cow Creek. Many of these areas have not been inventoried or characterized as wildlife habitat.

There are a few man-made ponds and pump chances throughout the unit and one man-made Reservoir. Western pond turtles are known to inhabit Galesville Reservoir. There are additional ponds located in the watershed however little is known about their location, number, or condition.

There are some areas of meadow habitat located within the landscape unit, mostly in the bottom farmlands. Cave habitat is limited in the Upper Cow Creek unit.

D. Roads and Developments

Current Road Conditions

Overview

Most roads in the watershed are presently in fair to good condition. There are approximately 309 miles of road, 90 of which are system roads, within the Upper Cow watershed. There are some roads in the watershed that have erosion and slumping problems, however the majority of these are not major arterial roads and do not receive heavy use. Some early travel ways that were improved into roads or constructed as a means of entry for fire suppression and timber harvest years ago are now vegetated and are no longer drivable.

The following definitions are used to describe the various transportation features within the watershed:

System Road: A constructed road that has a road number, a recorded history, an assigned road maintenance level, and management objectives.

Non-System Road: A constructed road that has no road number, no recorded history, no assigned maintenance level, no management objectives. Non-system roads may also include roads of other ownerships such as county, private, and the state.

Most of the roads in the watershed were constructed for one of three reasons - access to private lands, to provide initial entry for timber harvest, or for fire suppression. Some ridge-top roads were originally constructed as a preventive measure for fuel breaks and for fire suppression access in order to move people and equipment into an area if a fire were to start. Other roads were quickly constructed in direct response to a fire ignition, as a part of the fire suppression activities.

There is a wide variation in the current condition of roads in the watershed. In some cases, the road is frequently traveled, regularly maintained and repaired and is easily located on maps and aerial photographs; there is no question that these features are roads. These are generally "system roads" which means that the BLM has road records for that road. At the other extreme are roads that have not been maintained, the surface is dominated by sapling trees and brush, the original soil compaction has largely been improved through natural processes of frost heaving and actions by animals and plants, and they are difficult to locate on maps or aerial photographs. There are many examples in between these two extremes.

Road maintenance funding, often attached to timber sale levels, has been declining in recent years. Maintenance of roads, especially non-system roads, has been substantially reduced as a result. Several of the roads in this watershed have not been maintained and as a result are in various stages of deterioration, most often being overgrown by brush, hardwoods or conifers and in some cases having slid out as a result of landslides. Plugged culverts and ditch lines have resulted in several washed out roads and numerous failures. Many local, "dead end" roads have received only minimal maintenance in recent years.

Maintained Roads within the Upper Cow Creek watershed

Collector Roads connect to arterial roads for overall watershed access. These routes make a direct single connection to management areas outside the reach of the arterial system. Collector roads give the best access to management areas outside the proximity of the arterial network. Collector roads are primarily aggregate surfaced roads connecting to similar features as arterial roads. Passenger cars are capable of using most of these collector roads in fair weather by

traveling at prudent speeds and avoiding obstacles. Designation of collector roads is based on the following criteria:

1. Roads that give the best access to management areas outside the proximity of the arterial roads.
2. Roads that are assigned maintenance level 3 or 4.
3. Roads that require permanent vehicle access to areas such as recreation sites, wilderness trailheads, multiple resource management areas, and special sites and facilities.

Local Roads receive minimal maintenance and are generally used by BLM personnel to access the remaining portion of the watershed not accessed by arterial or collector roads. High clearance vehicles are recommended for use on these roads, which can be aggregate or natural surface. Some local roads that do not pose a significant risk to safety or the environment will be maintained at a maintenance level 1. Cross ditching and water baring/dipping should be the primary method of roadbed drainage. Roads not designated as part of the arterial or collector system will be classified as local roads and are defined by the following criteria:

1. Usually roads that are for single purpose resource management.
2. Roads needed only for short-term access or intermittent use over a longer period. This may include roads under special use or road use permits.
3. Roads assigned a maintenance level 1 or 2 or assigned an increase maintenance level (3) for a limited period of time as a result of management activities.
4. These are not roads that have a terminus (e.g. comfort station, trail head, wayside) to attract publics.

Maintenance Levels 1 – 5

Minimum standards for Level 1 – Emphasis is given to maintaining drainage and runoff patterns as needed to protect adjacent lands. Grading, brushing, or slide removal is not performed unless roadbed drainage is being adversely affected, causing erosion. Closure and traffic restrictive devices are maintained.

Minimum standards for Level 2 – Drainage structures are to be inspected within a 3 year period and maintained as needed. Grading is conducted as necessary to correct drainage problems. Brushing is conducted as needed to allow administrative access. Slides may be left in place provided they do not adversely affect drainage.

Minimum standards for Level 3 – Drainage structures are to be inspected at least annually and maintained as needed. Grading is conducted to provide a reasonable level of riding comfort at prudent speeds for the road conditions. Brushing is conducted as needed to improve sight distance. Slides adversely affecting drainage would receive high priority for removal, otherwise they will be removed on a scheduled basis.

Minimum standards for Level 4 – The entire roadway is maintained at least annually, although a preventative maintenance program may be established. Problems are repaired as discovered.

Minimum standards for Level 5 – The entire roadway are maintained at least annually and preventative maintenance program is established. Problems are repaired as discovered. These roads may be closed or have limited access due to snow conditions.

The U.S. Department of Interior, BLM Western Oregon Districts Transportation Management Plan, 1996 (updated 2002) provides a framework for updating road transportation management objectives, maintenance levels, closures, and other government actions.

Non-maintained Roads

There are also a number of non-maintained non-system roads in the area. Some of these have become so overgrown with vegetation that they are no longer able to be driven.

Private Land Access

There are existing roads to all private lands within the watershed. Many of these land parcels are also accessible by more than one road. Many areas of the watershed are governed by reciprocal right-of-way agreements, which are legal agreements that allow private landowners to construct and use roads over lands belonging to other parties, or in this case over BLM lands.

Road Densities

There are approximately 309 miles of roads in the Upper Cow Creek WAA (Map 21). Road densities for each compartment are displayed in Table 20. About 12 % of the roads are unsurfaced.

Table 20. Road mileage and densities in the Upper Cow Creek watershed.

Sixth-field Watershed	Acres	Native Surface	Rock Surface	Paved Surface	Unclassified* Surface	All Roads (miles)	Road Density (mi/mi^2)
South Fork Cow Creek	11,094	13.2	36.1	0	13.1	62.4	3.6
Dismal Creek	21,214	8.1	30.7	8.7	85.4	132.9	4.0
Upper Cow Creek-Galesville	15,108	14.7	50.4	11.6	36.9	113.6	4.8
Totals:	**47,416**	**36.0**	**117.2**	**20.3**	**135.4**	**308.9**	**4.2**

* private land roads in which surface type has not been determined

In recent years, many of the roads in the BLM portion of the Upper Cow Creek watershed have been gated, which helps reduce motor vehicle use (Map 22). The gates also reduce the need for maintenance that arises from inappropriate use during periods of wet weather, such as increased erosion and sediment delivery, and problems which occur through heavy and prolonged use.

Cultural Resources

Environmental Setting

A portion of the watershed drains into Whitehorse Creek, flows north into Cow Creek, and continues west and north into the South Umpqua River. The geologic component is characterized by quaternary sedimentary rock which occurs along the lower terraces above Cow Creek where placer gold deposits are known to develop. Currently the area is characterized by a mosaic of mixed conifer, conifer-hardwood forests.

Ethnographic divisions in southwestern Oregon have been based for the most part on linguistic data. The Cow Creek Band of the Umpqua tribe inhabited the area of lower Cow Creek near its confluence with the South Umpqua River. Settlement and subsistence patterns for this group centered around small permanent villages typically located on the terraces above major waterways with seasonal migration into the surrounding uplands. The inhabitants of southwestern Oregon were hunter, fisher, gatherers who capitalized on the many local seasonally abundant resources of the area.

Historic Background

Although the first European presence in the Pacific Northwest occurred in the late 1500s with exploration by the Spanish and the English, inland regions of southwestern Oregon were not explored or settled until the exploration and trapping expeditions of the 1820s through the 1840s and the gold rush days of the 1850s.

Individuals leading early documented exploration into or through the watershed area may have included Alexander McLeod, Hudson's Bay Company and American trapper and exhibition leader Jedediah Smith.

In 1846 Jesse and Lindsay Applegate led a group of trailblazers through the area establishing the Applegate Trail. Though the trail is not located within the Upper Cow Creek watershed, it did serve as a major conduit for populating Douglas County and surrounding areas. By 1853 Jesse Applegate had surveyed a regular road route through the southwestern Oregon.

Discovery of gold in the Rogue Valley eventually led to mining activity that created settlements in or near the watershed area such as those at Wolf Creek and Golden (Coyote Creek). A subsistence way of life developed and persisted through the Depression era of the 1930s. Placer

and lode mining for gold, silver, copper, mercury, and nickel were the primary minerals mined. As of October 23, 2004**,** there were 203 historic mining claims dispersed throughout this WAA.

Archaeological Background

The kinds of archaeological sites that occur and could occur in this watershed consist of the following historical site types: mining ditches, wooden flumes, wooden structures (associated with mining operations), historic can and bottle scatters and tailings. In 1852 the gold mining of the Rogue Valley sparked placer mines in other areas of southwest Oregon such as the Upper Cow Creek watershed.

These sites should be avoided during any future ground disturbing projects that may occur in the watershed area such as timber sales or fuels projects.

As of October 29, 2003, there were 4 active mining claims numerous mining sites located throughout the Upper Cow Creek watershed (Map 23). Mining and mineral exploration over the past decade has been minimal, however, some portions of the WAA still have a potential for mining gold, silver, copper, lead/zinc, chromium/nickel, and chrysotile asbestos deposits.

Other Developments

Communication Sites:

Cedar Springs Repeater T.32S., R.4W., Sec. 25.
Fiber Optic Telephone line: Snow Creek Rd, Cow Creek Rd., McGinnis Cr. Rd.

Quarry Sites:

1. T.32S., R.4W., Sec. 11. Black Jack Quarry. This is just outside the WAA.
2. T.32S., R.4W., Sec. 2. Owned by C&D. It is now part of Galesville Reservoir.
3. T.32S., R.3W., Sec. 19. Spring Snow Quarry. Still active.
4. T.31S., R.4W., Sec. 25. (not named).
5. T.31S., R.4W., Sec. 25. McGinnis Quarry. Reclaimed.
6. T.31S., R.4W., Sec. 25. McBug quarry. Reclaimed.
7. T.31S., R.4W., Sec. 27. Ump Cow Divide. Old borrow pit. no longer noticeable.
8. T.32S., R.4W., Sec. 11. Gage Station. A proposed borrow source.
9. T.31S., R.3W., Sec. 32. located on private land.
10. T.32S., R.3W., Sec. 30. (not named). This is just outside of the WAA.

Quarry Sites was provided by the Glendale Resource Area Rock Quarry Inventory (Regulations, permit, & guidelines). The quarry site data is current as of October 2003.

Minerals and Mines

The upper portion WAA is in a zone identified in the RMP as having moderate potential for the accumulation of mineral resources. The area has had some mineral development

in the past. The remaining area in the WAA has been identified as having low potential for the accumulation of mineral resources.

E. Recreation and Visuals

The Upper Cow Creek WAA encompasses a variety of recreation opportunities ranging from fishing and hiking to water skiing and horseback riding with most of the recreation activities taking place on, or surrounding, the popular Galesville Reservoir. These recreation opportunities are incorporated on lands within the watershed managed not only by the BLM but also include lands managed by the Umpqua National Forest, ODF&W, Army Corps of Engineers, Federal Energy Regulatory Commission, and the Douglas County Parks Department. To date, no known privately operated recreation developments or operations are located in the watershed.

The more dominate recreation features in the watershed are the Galesville Reservoir encompassing 368 acres, the Galesville Special Recreation Management Area (SRMA) surrounding the Reservoir which encompasses approximately 3,977 acres, Chief Miwaleta Park which is a day use area and boat ramp (Douglas County Parks), and Devils Flat Campground (USFS) (Map 4). The *South Umpqua/Galesville Late Successional Reserve Assessment (June 1998 and May 2004 amendment)* p. 85-86 identifies that the dispersed recreation activities near the reservoir, on private and public, have resulted in widespread impacts of untreated human waste, litter, increased fire hazard and risk, and other impacts associated with frequent use of sites. The largest recreational unit in the area is the Galesville Special Recreation Management Area (SRMA) established by the Medford District RMP and encompassing several recreational development opportunities.

Galesville Reservoir

Galesville Reservoir, established in 1985, located on Cow Creek in the northwest corner of the watershed has had a profound effect on the watershed as a whole. Water based recreation has increased dramatically in the watershed is concentrated within the reservoir itself. The influx of users to the area has led to a “discovery” of the area by a new group of recreationists from outside the local area. Increased recreation use to the watershed has the potential to lead to conflicts between recreationists and private landowners, vegetation management within the watershed, as well as possible safety hazards from dispersed camping such as exposure to uncontained human waste and increased fire hazard and risk.

Galesville Special Recreation Management Area (SRMA)

The SRMA currently encompasses very few recreation oriented developments other than water-related recreation on the Reservoir itself and the Douglas County owned Chief Miwaleta Park

day use area with boat ramp located on the Reservoir. Future visitor use will increase as will the demand for more diverse recreation opportunities in the SRMA due to increases in tourist numbers and southern Oregon's population. Several potential recreational development opportunities exist within the SRMA such as overnight camping facilities, hiking trails, canoeing trails, wildlife viewing areas, and various other interpretive opportunities.

A final SRMA management plan has not been completed, and there are no current plans to do so. However, before any additional recreation orientated facilities or opportunities are introduced into the SRMA, such a plan would be required. At this time the recreation use within the SRMA is continually being monitored and managed by Douglas County Parks Department park hosts and BLM recreation. Periodic site visits record user numbers and note occurrence of resource damage. Collecting such data helps to determine if the demand for recreation is exceeding what the area can currently support.

Galesville Reservoir Wildlife Management Area:

The uppermost area of the Reservoir, near the Cow Creek inlet to the Reservoir, is designated a Wildlife Management Area by the Oregon Fish and Wildlife Department.

Recreation User Profile

The majority of the recreation use in the Upper Cow Creek area takes place around Galesville Reservoir. The primary user in the summer is engaged in a water-based activity such as water skiing, swimming or fishing. Throughout the remainder of the year, fishing, both from a boat and shore, is the primary activity in the area. Other activities observed in the area are sightseeing/pleasure driving, picnicking, camping, hiking, and horse back riding with the latter two occurring mostly around the Devil's Flat area.

Recreational users of the area come from local communities as well as distant Oregon metropolitan areas. Visitors typically come to the Reservoir in groups of 4 or less. However, on the weekends, holidays, and during the summer months, large gatherings of 15 to 40 people are fairly common in the day use area of Chief Miwaleta Park.

Douglas County Parks Department estimated 24,000 visitors at Galesville Reservoir for the year 2004. This estimation was determined by monitoring visitor use per traffic counters located on the pavement and eye witness accounts/monitoring by the Park Hosts and staff. It is estimated that a total of 29,000 visitors recreated in Upper Cow Creek watershed in 2004.

Other developed sites in the area include Devil's Flat Campground and several trails in that generally vicinity. An estimate of the use these trails receive is not available at this time though it is believed that the majority of the use is by local hikers and horse back riders as well as down-hill mountain bikers. Observations of the area conclude that people using Devils Flat Campground are there because of the lack of overnight facilities at Galesville Reservoir. The

majority of the visitors camping at Devils Flat were from outside of the area, and many were repeat users.

Other developed recreation sites in the area include the following:

- Cow Creek Falls (T32S, R3W, Section 2)
- Angel Camp (T32S, R3W, Section 35)
- Rail Road Gap Shelter (T32S, R2W, Section 32)
- Richter Cabin (T32S, R2W, Section 20)

Map 4 sites locations of campgrounds and trailheads within the Upper Cow Creek Watershed. For trail locations see the US Forest Service Cow Creek Watershed Analysis, 1995.

Visuals Resource Management (VRM)

Visual resources within the Galesville Reservoir viewshed area are managed differently by the two major landowners in the area, the BLM and USFS. The area immediately surrounding the Galesville Reservoir is classified as Visual Resource Management (VRM) Class II by the BLM rating system (Map 4). VRM Class II rating is described as follows per the direction of the Medford District BLM Resource Management Plan:

"Manage for low levels of change to the characteristic landscape. Management activities may be seen but should not attract the attention of the casual observer. Changes should repeat the basic elements of form, line, color, texture, and scale found in the predominant natural features of the characteristic landscape".

The remaining viewsheds managed by BLM in the WAA are classed VRM III and IV. VRM Class III directives state: "Manage lands for moderate levels of change to the characteristic landscape. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements of form, line, color, texture, and scale found in the predominant natural features of the characteristic landscape". One portion of this viewshed is managed by the Roseburg BLM and classified as VRM IV which directives state; "Manage for moderate levels of change to the characteristic landscape. Management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the effect of these activities through careful location, minimal disturbance, and should repeat the basic elements of form, line, color, and texture".

The remainder of the area is managed by the USFS, Tiller Ranger District and is subject to their management regulations. USFS VRM management is broken down into more categories than BLM based on sensitivity of viewers of a given viewshed, distance from the critical viewing area, and quality/uniqueness of the area itself (see USFS Cow Creek Watershed Analysis 1995

for further information). For this WAA, management for BLM and USFS is generally more restrictive the closer it is to Upper Cow Creek Road and Cow Creek.

V. Synthesis and Interpretation

A. Hydrology/Fisheries

Aquatic Conservation Strategy

The intent of the Aquatic Conservation Strategy (ACS) is to maintain and restore the ecological health of watersheds and the aquatic ecosystems on public lands (USDA/USDI 2003b). The strategy is a framework for managing federal lands and was designed to provide a scientific basis for protecting aquatic ecosystems and to enable planning for sustainable resource management at the fifth-field watershed scale over the long term. There are four principal components to the ACS: (1) analysis of watershed conditions and hydrologic function, (2) Riparian Reserves, (3) delineation of key watersheds, and (4) watershed restoration (RMP, p.22).

Adherence to the ACS objectives affect many other management activities on federal lands. Road construction, timber harvest, fire management, and recreational opportunities are all affected by this strategy, usually by restricting or preventing such activities from occurring in riparian areas.

Hydrologic Conditions

Galesville Dam, completed in 1986, blocks passage of anadromous fish to streams in the WAA.

There are 377.2 miles of 2nd through 7th order stream in the WA. Resident cutthroat trout and several non-game fish species use approximately 72 miles for migration, spawning and/ or rearing.

Virtually all stream miles and large proportion of the associated riparian habitat in the WAA has been extensively influenced by timber harvest-related activities, water diversion or other agricultural practices.

Increased size of peak flows appears to be related to cumulative effects of timber harvesting, primarily clearcut logging in the Transient Snow Zone (TSZ) (Map 8). Given that the majority of the BLM lands are LSR, it is unlikely any new large openings will occur in the BLM portion due to timber harvesting activities of this WAA.

Fish habitat condition is summarized in Table 11. Riparian condition is based on average age within the riparian zones of each stream order. Stream habitat condition is based on the riparian condition, but also includes subjective evaluations of stream bank stability, amount of

disturbance, influence of roads and other sources of sediments, total sediment loads, effects of sensitive soil areas and other factors. The major factors used in this WAA include stream bank stability, percentage of stands less than 30 years of age, condition of the riparian zone, and roads.

Riparian Habitats and Large Woody Debris

Given the large percentage of Riparian Reserves and adjacent upland areas within the LSR, existing late-successional characteristics are likely to be maintained into the future. Connectivity across the watershed via riparian corridors appears to be somewhat functional and provides some access to adjacent watersheds. Large woody debris is probably below the natural potential due to logging, salvage and effective fire suppression. The proportion of this WAA in LSR status further ensures recovery and future recruitment of woody debris on federally managed lands.

Riparian reserves containing an understory largely composed of an even aged, mid-seral firs would benefit from thinning some of the younger firs. Such treatment would allow more adequate spacing for retained conifers to grow larger. As these trees become larger, they would provide more riparian shade for aquatic species and also serve as a future source of LWD. Other areas have dense alder stands that would benefit from thinning and planting with shade tolerant conifers.

Impacts on Fisheries Conditions

-Galesville Dam prevents migration of anadromous fish in Cow Creek to the upper watershed.

-A number of culverts are barriers to upstream movement of resident cutthroat trout (Appendix G).

-Valley bottom roads have significantly reduced the quality of riparian habitats.

-Current management direction for Riparian Reserve protection and Best Management Practices for road building and road maintenance on federal land serve to enhance the protection of the riparian zones, as well as unstable areas that could result in stream sedimentation.

B. Forest Management

The Medford District RMP provides management direction for the land use allocations in the watershed. The two primary allocations in this watershed are LSR (88%) and GFMA (12%). The GFMA allocation amounts to 1,213 acres, in this watershed on BLM-administered land with timber production as a primary goal. The remaining 8,707 acres designated as LSR have late-successional habitat as a primary emphasis for management actions. Map 3, Land Use Allocations shows the distribution of these land allocations. Map 12 Seral Stage Distribution and

TPCC Withdrawn Lands show the spatial arrangement of forest stands by seral stage. It is evident from this map that past harvest activity has occurred, at various levels, in all portions of BLM-administered land in this watershed. There are a variety of age classes and seral stage development intermixed throughout these lands.

Reforestation with conifers has occurred on most all BLM-administered land harvested in the past, where conifer stocking has been reduced below 40 % canopy retention. This includes past clearcuts and partial cut harvests. Thinnings have generally not been planted as they are well stocked with tree species after treatment. Reforestation should continue to occur whenever an area received a regeneration harvest, however regeneration harvests would not be planned for the majority of the BLM-administered lands in this watershed as they are designated as Late Successional Reserve. Approximately 1,200 acres are designated as GFMA land allocation, and regeneration harvest could be planned for some of these lands. Reforestation of conifers, through tree planting, should occur on these lands harvested when a majority of the overstory is removed.

Late-Successional Habitat and Commodities

The most significant interaction with commodity management occurs with late-successional habitat values. There is a large percentage of land in the watershed that is formally directed to be managed as late-successional habitat, including:

- the large amount of Late-successional Reserve (LSR) , where the priority under the RMP is to maintain or improve late-successional habitat (88% of BLM-administered land in this watershed).
- Riparian Reserves which, over time, will develop late-successional characteristics. Protection of fish habitat, hydrologic values, and wildlife movement here will restrict harvests.

There are additional GFMA lands that may have timber management restricted for other resources, including:

- Protection measures for managing Special Status Species and their habitat with written policy guiding their management under BLM Manual 6840.

Commodity extraction, such as timber harvest, in the LSR portion of the watershed (88% of BLM-administered land), would be as a by-product of treatments to improve late-successional habitat or reduce the risk of large scale disturbance such as from wildfire. Commodity extraction in the GFMA portion of the watershed (12% of BLM-administered land) would be as part of the objective to produce a sustainable supply of timber.

The South Umpqua/Galesville Late Successional Reserve Assessment (#RO223) has been revised in light of recent analyses conducted by the Roseburg and Medford BLM, and the Tiller

Ranger District of the Umpqua National Forest that indicates adjustments to opening size and proportion, stand density, thinning method, and total treatment acreage guidelines would allow for more ecologically appropriate density management (USDA/USDI 2003a, p.1).

In summary, the REO approved revisions are to:

- Increase the maximum opening size in treated stands to 1.5 acres.
- Change the proportion of openings to a maximum of 2 % of the treated area. This letter clarifies that "treated area" equates to the combined treatment unit acres within a project area.
- For commercial treatments, allow for up to 50% of the treated area to be in heavily thinned patches (i.e. from 25 to 50 dominant and codominant trees per acre)
- For pre-commercial treatments, allow for 25-50% of the treatment area to be thinned to a density of 25-100 trees per acre, with a maximum density of 220 trees per acre anywhere in the treatment area.
- Allow for a proportional thinning method with the language, ". . . thinning will generally be from below, but proportional thinning across diameter classes may occur to achieve the desired diameter distribution."

For further discussion of this analysis, see "South Umpqua/Galesville Late-Successional Reserve Assessment (July 1999 and Amended May 2004).

Past Timber Management Activities

<u>BLM Timber Sales within the past 20 years of the Upper Cow Creek Watershed</u>

Wildcat Thin 2005
Galesville Valley Project 2005
Galesville Danger Tree Removal 1992
Meadow Creek 1992
McBug Salvage 1991
McGinnis Firewood 1991
McGinnis Salvage 1989
Whitehorse 1989
Snow Creek 1988
Anchor Ranch 1987
Cedar Spring 1987
Snow Rerun 1986
Sugar Creek 1985

<u>Forseeable Future Timber Sales within the Upper Cow Creek Watershed</u>
-Slim Jim Project – Medford BLM - 2005

-Cow Creek Shaded Fuel Break Project (USFS) - watershed-wide fuels reduction project to be implemented within 3 to 5 years
-Shively LSR Density Management - Roseburg BLM - 2005

Map 24 provides a detailed illustration of past clearcuts within the Upper Cow Creek Watershed on federal, private, and local government managed lands. The Medford Change Detection data presented on this map was collected through satellite imaging between 1974 to 2002. Satellite imagery can track changes on the landscape to be used for cumulative effect analysis. This tool also provides a broader, more complete analysis than in the past since changes can now be detected on multiple land ownerships.

Satellite imagery was acquired through the MRLC Consortium for five time periods between 1974 and 2002 (1974, 1985, 1990, 1994, 1999, 2002). The data were processed to produce a single GIS compatible coverage indicating gross vegetative change for each time period. Regions that had overlapping change results were grouped into the latest date of change. The smallest detectable change was at a scale of about 0.22 acre. For analysis at the HUC 5 and HUC 6 scales, changes smaller than 1.1 acres were screened out to create a more accurate result. (Changes smaller than 1.1 acre is likely due to isolated mortality, such as one-tree blow down, small scale mass wasting, etc., and were therefore screened out before analysis.)

From 1974 through 2002, approximately 8,842 acres (19 percent) of the entire Upper Cow Creek watershed (47,416 acres) experienced detectable reduction in vegetative cover based on Medford District geographical information system (GIS) layer, Vegetation Change Detection. This reduction in vegetative cover could be attributed to wildfire, management practices (i.e., logging, road construction), urban growth, or natural disturbances such as wind throw.

C. Terrestrial Vegetation and Habitats

Fire and Fuels

The approximate 30 year fire-return interval of the Upper Cow Creek watershed has been altered by fire suppression efforts during the past century. Excluding fire as a natural ecosystem process has increased vegetation density in both young and mature forest stands and has resulted in a shift in plant species composition in some areas. Many areas have been allowed to develop a dense stocking level of small Douglas-fir, hardwoods and brush. This excessive build-up of vegetation throughout the WAA compromises the overall health of the stands by increasing competition for sunlight and soil moisture and by increasing susceptibility to insect and disease damage. Unhealthy, overstocked forests increase the risk of catastrophic fire behavior which may pose a potential threat to wildlife habitat and also the continued existence of late successional stands.

Continued aggressive fire suppression tactics perpetuate this pattern and will increase fuel loading, thereby increasing fire intensity in the event of a wildfire. Fuel loading in some

drainages is an increasing management concern. Mitigation measure such as vegetation manipulations like slashing, hand-piling, pile burning, and underburning are designed to reduce both the risk of ignition as well as the hazard of catastrophic fire behavior.

Three factors are used to analyze and prioritize fire management and mitigation decisions: hazard, risk and value. Areas where all three factors were rated as *High* were deemed highest priority for fuels reduction treatments. These factors are used to evaluate and set priorities for treatments while giving consideration to other management opportunities, such as wildlife habitat enhancement and/or restoration.

Late-successional Forests/Species

Late-successional forest has been influenced by both natural succession and disturbances. In this watershed, fires have largely been patchy in nature, resulting in areas with great vegetative diversity. When combined with past timber harvest activity, this has resulted in a variety of age classes and seral stage development in forest stands in this watershed. As a result of longer fire return intervals caused by improved fire suppression efforts, there has been a buildup of ladder fuels, with some stand overstocking, and a subsequent increased risk of stand-replacement fires. This risk is further heightened by the presence of plantations. In areas of prior partial overstory removal, there has been a large increase in the brush understory, with a corresponding increase in fire risk. Catastrophic, stand-replacement fire would reduce the effectiveness of the Late-successional Reserve in this watershed.

This Late Successional Reserve "coincides with the Rogue-Umpqua Area of Concern, which provides an essential link in connecting the Western Cascades Province with the southern portion of the Coast Ranges and northern end of the Klamath Mountains Province. This unit provides the single link from the Western Cascades Province to the Klamath Mountains Province and associated Area of Concern. The land ownership patterns elevate the importance of maintaining areas of owl nesting habitat…" here. (p. 2 from Appendix B of the Rogue River/Siskiyou National Forests and Medford BLM-Biological Assessment FY 04-08).

There are 5,277 acres of BLM-administered stands over 80 years of age out of a total of 9,930 acres of BLM-administered land in the watershed. Of these 5,277 acres, 1,618 acres have received partial timber harvest and are referred to as "modified" in Map 12, and probably do not possess all of the characteristics of late successional forest. In addition, stands less than 150 years of age are not likely to have all the characteristics of late-successional forests as listed on page 73, in particular "moderate to high accumulations of large logs and snags" and "moderate to high numbers of trees with physical imperfections such as cavities, broken tops, and large deformed limbs". It is likely for mature seral (80-200 yr old) stands to continue to develop late-successional and old-growth characteristics. With 87% of the BLM-administered land in this watershed designated as LSR, project emphasis will be on late-successional habitat improvement in this land allocation. Past harvest activities have occurred in all portions of BLM-administered land in this watershed as shown by Map 24 Forest Clearing Detection Satellite Image

Comparison. This has reduced the amount of large blocks of mature and late-successional forests but increased the variety of habitat types and habitat "edge" effect.

Coarse woody debris levels are likely below historical levels in the younger seral stages, up to 50 years old, due to past timber harvest activities. Given the large percentage of the watershed in LSR land allocation, coarse woody debris should increase over time as the younger stands grow. Much of the GFMA is on granitic soil. Because of its erosive nature, harvests on these soil types would likely be thinnings or regeneration harvest that retains at least 16-25 large, green conifer trees per acre as described in the RMP (p.44).

D. Roads and Developments

Existing Roads

Roads provide many useful benefits including access for timber extraction, fire suppression, and recreation. However, road construction can result in a high level of disturbance to the forest ecosystem, potentially affecting hydrology, soil stability, fish passage, and downstream transport of material through the stream network. Road construction can expose bare soil on cutslopes, fillslopes, and ditches, which are vulnerable to erosion until it becomes vegetated. The extent of impact is dependent on many factors, including road location, soil type, proximity to streams, slope, and construction technique. Ridgetop roads on slopes less than 35% depending on soil type have little impact on streams. Valley bottom and midslope roads, especially those on steep slopes or near streams have a greater potential for sediment delivery to streams.

Road density exceeds 3.5 miles/miles^2 in all three 6th field HUCs. High road densities increase the potential for reduced water quality and fish habitat degradation. Continued improvement of the road system, including closure of unnecessary or problematic road segments, replacement of undersized culverts/fish barriers, and ongoing maintenance, will be necessary to minimize the impacts of roads on sediment delivery to streams.

E. Recreation and Visuals

Increased recreation use to the watershed has the potential to lead to conflicts between recreationists, private landowners, and vegetation management activities including possible safety hazards from dispersed camping such as such as exposure to uncontained human waste and increased fire hazard and risk.

VI. Recommendations

Management recommendations are presented here based on the analyses in this document. First a long-term landscape design is discussed. Specific recommendations for individual issues are presented. They are not all inclusive.

It should be stressed that these recommendations are not to be considered management decisions. They are intended as recommendations to be considered for future management actions and may help frame the context for developing future projects. They should not be viewed by the public, BLM staff or managers as a commitment or as binding on future management. Watershed analysis is clearly not a decision document. Actual implementation decisions need to be developed through the National Environmental Policy Act (NEPA) process using this watershed analysis, public input and other information and considerations.

A. Projected Long-Term Landscape Design

The primary factors shaping the long-term landscape patterns for the Upper Cow Creek watershed are the land use allocations and ownership patterns. This watershed analysis does not indicate a need to modify land use allocations identified in the RMP.

Ownership

Private lands: It is assumed these lands will continue to be intensively managed for timber. In the future, forest stands will generally be 0-40 to 60 years old. Only very limited areas will exist in an older condition.

State Lands: It is assumed that these lands will continue to be intensively managed for timber, but on a slightly longer rotation than industry lands. Only very limited areas will exist in stands older than 60 years old.

Federal lands: These lands will continue to be managed in accordance with existing land use plans.

Late-successional forest habitat: This category includes several land allocations where late-successional habitat is a direct management objective (e.g., LSRs, spotted owl core areas, district designated reserves, and riparian reserves). If a major disturbance such as fire or a major wind storm eliminates late-successional forest, management direction is to actively promote the re-establishment of late-successional conditions as rapidly as possible.

There are approximately 8,707 acres of late-successional reserves within the Upper Cow Creek Watershed. This represents approximately 88 % of the BLM watershed and 18 % of the entire watershed. Late-successional habitat in these reserves are expected to develop and persist in the next several decades, although natural disturbances such as wildfire and windstorms are likely to remove some habitat. Natural mortality of large conifers is also expected to occur.

General Forest Management Area (GFMA): These lands have intensive timber management and commodity production as a primary objective. They are prescribed for a minimum rotation length of 100 years. The result will be a mosaic of stands between 0 and 100 years. Large structure legacies (green trees, large snags and coarse woody debris) will be retained on these lands. Some of these stands (80-100 years) will function as late-successional forest before they are regeneration harvested again.

B. Short-term (10-20 years) Landscape Recommendations

Plantations resulting from past timber harvest are located throughout the watershed. Management in these stands should focus on maintaining conifer stands, promoting their growth so that land use allocation objectives can be met. The specific prescriptions will vary, based on the land allocation in which the plantation occurs.

Modified older stands have been partial cut in the past and may not be fully stocked. Management in these stands should promote establishment of fully stocked conifer stands. Stands should be evaluated for their current ability to meet LUA objectives. Treatments should place stands on desired developmental paths.

Stands 40-80 years old should be examined as a high priority for **commercial thin treatments**.

The highest priority fuels management areas should be treated to reduce wild fire hazard and the risk of wildfire.

Areas of high road densities should be looked at for possible decommissioning to reduce sedimentation, habitat fragmentation and disturbance to wildlife.

C. Recommendations for Key Analysis Topics

1. Hydrology/Fisheries

Roads located in riparian reserves or pose substantial sedimentation threat to streams should be a priority consideration for decommissioning, road gating, storm-proofing, and if not necessary for immediate forest management activities could be barricaded to reduce traffic and stream

sedimentation. Where roads, landings, and skid trails are no longer necessary they should be decommissioned.

Future road construction should be avoided in valley bottoms.

Inspect roads during storm/flood events to assure proper drainage and to detect new problems such as plugged culverts, recent slides and slumps, etc. Periodically conduct road inspections to determine existing road conditions and need for drainage improvements. Conduct road maintenance to reduce sedimentation, reduce future road maintenance costs, and minimize the chances for major road failure.

Continue to replace culverts that are barriers to movement of anadromous and resident fish.

Improve riparian reserve function, by implementing the following activities: creating openings in dense alder stands, under planting to create a more diverse species composition or with shade tolerant conifers, thinning stands of conifer saplings, thinning around conifers in dense hardwood patches, and falling large alders and conifers into streams to create pools, spawning areas, and habitat complexity.

Place large wood in streams to create habitat for fish and amphibians.

Medford District established a policy for operations on granitic soils through a Memorandum Area Policy on Management Activities in Granitic Soils which recommends all haul roads to be surfaced (i.e. with gravel) in order to reduce erosion of these fragile soils.

Special consideration should be given for tractor logging in areas with sensitive soils. Generally, tractor logging can cause greater soil disturbance than suspension-cable logging. However, in some areas (e.g. flat or gradual slopes) cable logging may cause greater disturbance than tractor logging would. (Adams, 1998).

2. Forest Management

In stands over 80 years old, where ponderosa pine are dominant in the overstory, reduce the density of understory vegetation within a 30-100 foot radius of the overstory pine to allow for the initiation of ponderosa pine regeneration by either planting or natural seeding."

Consider thinning in young stands. Promote biological and structural diversity in early, mid, and late seral stands 1-80 yrs old, when thinning and treating these stands.

In stands with low canopy closures of mature seral and old-growth trees, such as the modified stands, reduce the density of understory vegetation where those understory trees have slowed growth rates due to competition from high understory tree densities. Treat these understories

with thinning and removing of associated fire hazard material through such means as piling and burning, chipping, or underburning.

FUELS

Fuel reduction treatments are recommended: in the areas where all three factors (risk, hazard, and value) are high; along well traveled roads; in PCT treated stands to reduce slash if needed; and to treat activity fuels after commercial harvest. This might be accomplished through density management techniques including slashing, hand-piling, hand-pile burning, underburning, and broadcast burning. Expand the role of prescribed fire to reduce wild fire hazard and risk to help promote healthy forests and protect resources

In older stands, treatments should be conducted to reduce competing vegetation and ladder fuels, remove accumulation of small diameter trees, dead fuels, and improve the vigor of existing stands. This could be accomplished in some cases by removing the intermediate canopy through commercial thinning. This action would remove ladder fuels and competing young conifers, improve forest health, and reduce the risk of crown fires. This may or may not be a commercially viable option, based on the value of material removed and the cost of the removal.

Existing water sources suitable for supplying helicopters with water should be inventoried and included in a fire management plan. Water sources need to be maintained when vegetation has obstructed access and siltation has substantially filled in the ponds.

A detailed revised fire management plan for the South Umpqua/Galesville LSR Assessment should be developed with consideration given to preserving the habitat of special status species of plants and animals, and their habitat where practicable. All wildfires should be suppressed in the WAA in the interim.

Noxious Weeds

Inventory presence of noxious weeds within the watershed and conduct treatments, as appropriate, to reduce the spread of noxious weeds. The highest priority areas for treatment are relatively small populations of noxious and invasive weeds to keep them in check or eradicate them, if possible. This could include more insect releases, spraying or manual removal, or some combination of methods.

3. Terrestrial Vegetation and Habitats

Pursue grant opportunities to fund wildlife and riparian restoration projects.

When managing conifer-dominated stands of 40 years and older in the Late Successional Reserve, consider and attempt to mimic the abundance of hardwoods as observed in unentered

stands of a similar age class in the watershed. In the absence of such data from this watershed, consider information presented in Appendix B, which may be modified by the professional judgement of the local silviculturalist.

In subwatersheds where woodpecker habitat is lower than that recommended in the RMP, accelerate the development of snags by using heartwood inoculation, topping trees with chainsaws or explosives, or by other means, as funding allows.

Develop a Galesville Bald Eagle Management Plan to provide direction for land management activities within a proposed 80 acre bald eagle reserve as recommended in the Medford District Resource Management Plan (p. 55).

When maintaining pump chances and ponds, consider the needs for local bat species which require either a large pond (over 50 ft in diameter) or a small pond with no tall (over 3 ft above the water level) vegetation obstructions.

Avoid human disturbance within ¼ mile of any goshawk nest areas between March 15 and August 15, this modifies the original RMP protection timeline of March 1 through July 15 (IM No. 1999-036).

Maintain a 5 acre core area around each of the existing osprey nest trees to maintain the nest trees and perch trees. This is a modification of the RMP directive of a 0.25 mi. buffer. Medford District biologists recognize ospreys' accommodation of humans and have recommended this buffer reduction.

Where human safety or bat use are at risk due to human use of abandoned mines, consider closing adits using gates impenetrable to humans but permeable to bats, when funding and mining claims permit. Establish monitoring sites for inventorying bats in locations likely to be productive mist-netting sites (usually over isolated bodies of water or at mine entrances). The objective would be to determine which species are present and to begin a replicable form of monitoring for all bats.

4. Roads and Developments

Continue a high level of maintenance on major arterial roads to minimize sedimentation.

Develop partnerships with private land owners to cooperatively manage road systems and use.

Due to high road densities in Negro, Sugar, and Ike Butte Creeks, effort should be made to reduce open road densities in the watershed through decommissioning, barricading, and gating.

Continue to update the GIS data for roads to more accurately reflect current conditions.

As funding allows, rock natural surface roads located on granitic and schist soils to reduce erosion and minimize sedimentation.

5. Recreation and Visuals

A Special Recreation Management Area (SRMA) management plan needs to be completed to guide management of the area consistent with the designation of the area and per the BLM Manual. This plan would need to be developed prior to the creation of new recreation opportunities.

Continued management and monitoring of recreation usage, use demands, and natural resource issues should be accomplished to assess future recreation needs and protect the natural values of the area.

Recreation and Goals Common to the Entire Watershed:

*Consider and provide adequate interpretive opportunities.
*Consider and provide a diversity of recreation opportunities.
*Consider and provide adequate physical and legal access for all visitors.
*Consider and provide designations such as OHV use and ROS classes.
*Consider and provide Recreation and Public Purpose Leases.
*Consider and provide Special Recreation Use Permits.
*Provide resource protection.
*Assure visitor safety to every extent possible.
*Follow all regulatory directives associated with the land base in the watershed.

VII. Data Gaps and Monitoring Needs

A. Hydrology/Fisheries

Future Information Needs

Point data flowing off public lands on some streams listed for temperatures >64.5 degrees F. This information would be required in de-listing portions of 303d listed streams.

Determining population size of fish, amphibians, and macroinvertebrates to document natural variation in the absence of disturbance and in response to land management activities. This data would provide a better understanding if population numbers and species diversity are in line with natural variation for our region and whether management activities are contributing to substantial declines or increases.

Although there is no good inventory of active landslides in the watershed, information will be gathered on a project basis. Such conditions may create management constraints in the future.

B. Forest Management

FOI (Forest Operation Inventory) data may classify some stands based on the average age class. Averaging a stands age frequently does not represent the total spectrum of age classes present within a particular stand. For example, a stand classified as 50 years old could contain trees between the ages of 20-120 years. Field verification is needed during project planning to determine the accuracy of FOI information and discrepancies are to be noted for FOI update.

Ground inventories of the watershed would be useful to accurately measure the existing Special Forest Product commodities and more accurately project future availability and locations of those commodities.

Gathering information on insect and disease problems in the watershed would determine where silviculture activities such as pruning are needed to prevent further spread of disease beyond the natural level of disturbance.

Determining trends in pine occurrence, mortality, and other aspects of forest health would indicate where density management is needed to maintain or re-establish the natural composition of tree species.

Additional data is needed on the noxious and nonnative plant species within the Upper Cow Creek WAA (i.e. species inventory, distribution, invasive mechanism, rate of spread and potential expansion; GIS mapping; and Monitoring).

FUELS

The condition and maintenance needs of pump chances and ponds are not well known.

Conducting a fire history assessment for the watershed would aid in determining the frequency of wildland fire intervals and historic tree species composition. The study would provide a better picture of reference conditions, help assess whether the system is outside the natural range of variability, and what management activities are needed to restore the natural tree species composition.

C. Terrestrial Vegetation and Habitats

Inventory presence of noxious weeds through the watershed, particularly areas of treatable size populations.

Update and refine the vegetation and habitat conditions in the Forest Operations Inventory data base.

There is a lack of baseline data on snag abundance. Surveys should be conducted to obtain information on snag densities in major plant associations.

There is a lack of baseline data on quantities of large woody debris. Surveys should be conducted to obtain information on amounts of large woody debris in unentered stands of different age classes of major plant associations.

There is a need to more fully inventory special habitat features, including meadows, springs, cliffs, and caves. Monitor known adits for bats during the spring, summer maternity season, fall swarming and winter hibernating periods, using state-of-the-art precautions regarding disturbance.

Evaluate potentially suitable sites of bald eagle and goshawk to assess occupancy status and distribution.

Conduct inventories to ascertain the status of late-successional species, including furbearers, Special Status Species. This may include an inventory program using remote camera stations to document the presence of furbearers and other mammals. Additional inventory programs should

also be considered for these species groups, including snow-track surveys, track-plate surveys, and pitfall trapping.

There are some mine adits in the WAA area, but little is known of their wildlife habitat potential as these adits have not been surveyed for bats or other wildlife. Survey the area for adits and shafts for wildlife (bats), safety and cultural resources.

Monitor annually for the first 5 years and then at 5 year intervals for the long term. Survey the WAA for Cascade frog and tailed frog. These species are believed to be in decline. The tailed frog is believed to be very sensitive to poor connectivity, and remnant subpopulations might be assisted by intensive vegetation management along riparian areas with low canopy closure.

D. Roads and Developments

A thorough inventory of current road conditions, unknown surface types and culvert characteristics should be conducted to identify future improvement projects, decommissioning opportunities and maintenance priorities.

Update the GIS road data to accurately reflect the current conditions. Data gaps between on the ground conditions and GIS inventory effects the accuracy of assessing other resource information. For example, making the assumption that the total road miles present within the GIS database is current could result in an overestimate of actual stream miles within close proximities to roads, if recent road decommissioning has not yet been updated within the GIS database.

Inventory and monitor gates and barricades to determine effectiveness and identify maintenance needs.

The TMOs (Transportation Management Objectives) were last updated approximately 10 years ago.

E. Recreation and Visuals

Recreation Opportunity Spectrum (ROS):

The watershed has not been designated into recreation management opportunity zones. The entire watershed has yet to be evaluated with respect to the Recreation Opportunity Spectrum (ROS) classification management directives. ROS management zones designated through

coordination between the public land management agencies in the area help in the protection of the outstanding values of the area. Areas are stratified and assigned defining classes of outdoor recreation environments, activities, and experience opportunities. The settings, activities, and opportunities for experiences are arranged along a continuum or spectrum divided into six classes: primitive, semiprimitive nonmotorized, semiprimitive motorized, roaded natural, rural, and urban.

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Appendix A. Potential Natural Vegetation in the Upper Cow Creek Watershed

Potential natural vegetation, in this watershed, is mapped on three levels; series, group, and association. The series is determined by the most abundant reproducing tree in the understory of late-successional stands. Often, this is the most shade-tolerant species present. This is the broadest collection. Plant associations are fine scale divisions based on the indicator species present in late-successional stands, and the most narrow grouping. Plant groups are collections of plant associations within a series.

A series is an aggregation of plant associations with the same climax species dominant. The tanoak series, for example, consists of plant associations in which tanoak is the climax dominant, i.e., tanoak is the most abundant tree in old, undisturbed stands. The series, groups and associations define the potential natural vegetation that would exist on the site at the climax stage of plant succession, or the theoretical end point of succession.

Plant series are listed as the primary category. Within these series, the watershed is mapped to a level of detail of plant groups. (Acreage listed below includes BLM-administered and private lands within the BLM boundary or Upper Cow Creek Watershed. It excludes USFS and private lands within the USFS boundaries.)

***Douglas-fir Series*. 12,893 acres**

Douglas-fir is the most common tree species in southwestern Oregon. This tree species grows under a wide variety of climatic conditions and its "latitudinal range is the greatest of any commercial conifer in Western North America" (Atzet, Martinez, 1996). In this series, Douglas-fir typically dominates the overstory in all seral stages, usually its presence indicates some type of disturbance, and its dominance in the understory can indicate hot dry conditions characteristic of this series. Many other species will be found in both the overstory and understory in association with Douglas-fir, but it will tend to be the dominant species present in both.

Douglas-fir / Jeffrey Pine, PSME / PIJE 478 acres
This plant group includes the Douglas-fir/incense cedar/Jeffrey pine, the tanoak/western white pine/huckleberry oak/common beargrass, and the western white pine/tanoak/huckleberry oak/common beargrass plant associations. This group is found on serpentine sites in this watershed. This tends to be a droughty site with incense cedar and Douglas-fir along with Jeffrey pine in the overstory and canyon live oak, poison oak and madrone in the understory.

Douglas-fir / Poison Oak / Braken , PSME / RHDI / PTAQ 6,452 acres

This plant group includes the Douglas-fir/salal/dwarf Oregongrape, the Douglas-fir/incense cedar/piper's Oregonegrape, the Douglas-fir/ponderosa pine/poison oak, and the Douglas-fir/canyon live oak/dwarf Oregongrape plant associations. This is a dry, cool plant group within the Douglas-fir series. Douglas-fir and ponderosa pine tend to dominate the overstory with Douglas-fir, incense cedar, pacific madrone, poison oak and dwarf Oregongrape frequently in the understory.

Douglas-fir / Salal / Western Sword Fern, PSME / GASH / POMU 5,591 acres
This plant group includes a variety of associations but the most abundant in this watershed include Douglas-fir/salal/dwarf Oregongrape, white fir/salal/dwarf Oregongrape, Douglas-fir/vine maple/dwarf Oregongrape, and Douglas-fir/salal/pacific rhododendron plant associations. This grouping has a range of moisture regimes but includes some of the more cool, wet plant associations in the Douglas-fir series. Douglas-fir is dominant in the overstory with sugar pine also present. The understory is dominated by Douglas-fir, incense cedar, pacific madrone, vine maple, salal, pacific rhododendron, and golden chinquapin.

Douglas-fir/Dwarf Oregongrape/Western Sword Fern, PSME/BENE2/POMU 371 acres
This plant group includes the Douglas-fir/white fir, Douglas-fir/pinemat manzanita/SWO, Douglas-fir/vine maple/dwarf Oregongrape, and the Douglas-fir/salal/dwarf Oregongrape plant associations. This group has a cool, moderately moist environment. Douglas-fir is the dominant overstory species with sugar pine and white fir present. The understory has Douglas-fir, white fir, western hemlock, vine maple, pacific madrone, and salal.

White Fir Series, 2,744 acres

The white fir series includes areas with both white fir and grand fir; these species are lumped in Atzet et al. (1996).This series has a high vascular plant species diversity and generally occurs on cool sites. In early seral stages, Douglas-fir is often the dominant species. White fir is the dominant species in the understory, in this series, but will be present in variable abundance in the overstory, and particularly abundant in the older stands with a low frequency of disturbance.

White Fir / Vine Maple / Vanillaleaf, ABCO / ACCI / ACTR 1,045 acres
This plant group includes the white fir/dwarf Oregonegrape/vanillaleaf, the white fir/dwarf Oregongrape, the white fir/western hemlock/dwarf Oregongrape/western twinflower, and the white fir/pacific rhododendron/dwarf Oregongrape associations. The overstory is dominated by Douglas-fir and white fir. Douglas-fir, western hemlock, white fire, golden chinquapin, vine maple, and pacific madrone.

White Fir / Western Hemlock / Vine Maple, ABCO / TSHE / ACCI 1,699 acres
This plant group includes the white fir/western hemlock/dwarf Oregongrape/western twinflower, and the white fir/dwarf Oregongrape plant associations. The overstory is

characterized by dominance of Douglas-fir and white fir, with common understory species being white fir, western hemlock, Douglas-fir, vine maple, pacific madrone, and Oregongrape.

White Oak Series, 231 acres

Oregon white oak is the most abundant and widely distributed oak in Oregon. It tends to be restricted to islands of shallow soils and hot, dry microclimates, however. It is generally found along the valley floor and at low elevations. It occurs on all slope positions but is more commonly found on southerly aspects. White oak has the ability to survive as a climax species as it is able to survive in environments with low annual or seasonal precipitation, droughty soils, and where fire is a repeated natural occurrence (Stein, 1990). Due to the success of fire suppression over the last 70 years, the prominence of this series has declined.

White Oak / Douglas-fir / Poison Oak, *QUGA4 / PSME / RHDI* 231acres
This plant group is also a plant association as there are only 2 associations within the white oak series in Southwestern Oregon. The overstory tends to be more sparse than the other plant groups in this watershed. It is dominated by white oak with Douglas-fir and ponderosa pine present in various densities. Douglas-fir has become more prevalent since the advent of fire suppression. The understory primarily includes white oak, Douglas-fir, incense cedar, ponderosa pine, California black oak, pacific madrone, and poison oak.

Oregon Ash / Maple / Riparian Zone 276 acres

This plant grouping is generally within the Oregon white oak series however it is comprised of riparian vegetation that is directly influenced by the microclimate of the stream. It constitutes a narrow band along Cow creek, and the lower reaches of the main tributary streams flowing into Cow creek. Oregon ash and bigleaf maple are the primary overstory vegetation, along with red alder and occasional large conifers such as Douglas-fir. Understory vegetation generally includes willow, Oregon ash, red alder, sedge and grasses.

Appendix B. Features of young, mature and old-growth Douglas-fir/hardwood forests in southwestern Oregon and northern California (Bingham and Sawyer 1991).

	young forests	mature forests	old-growth forests
canopy	<130' tall, single-tiered, 65–80% cover	<180' tall, 2 indistinct tiers, 65–80% cover	>180' tall, well-defined 2 tier, 65–80% cover
trees All stages had stands with means from 40 – 150' tall.	Dominant stems: conifers <18"dbh & 100–315/ac., hardwoods <18"dbh & 65-270/ ac.	Dominant stems: conifers 18-35"dbh & 16-28/ac., hardwoods <18"dbh & 100-300/ac.	Dominant stems: conifers >35"dbh & 8-16/ac, hardwoods <18"dbh & 172-280/ac.
seedlings <3'tall	Conifers 40-1,012/ac. Hardwood seedlings or sprouts 121-2,834/ac.	Conifers 100-486/ac. Hardwood seedlings or sprouts 1,214 – 3,644/ac.	Conifers 61-445/ac. Hardwood seedlings or sprouts 263-607/ac.
saplings 3-26' tall	Conifers 61-182/ac. Hardwoods 121-486/ac.	Conifers 20-162/ac. Hardwoods 12-445/ac.	Conifers 12-121/ac. Hardwoods 263-607/ac.
understory cover All stages had trees<28'tall	Conifers 2-10%, hardwoods 5-20%	Conifers 1-5%; hardwoods 5-35%	Conifers 1-5%; hardwoods 15-30%
ground cover All stages had ground cover <6' tall.	Cover 10-25%; moss & lichen cover on ground 1-5%	Cover 5-55%; moss lichen cover on ground 1- 20%	Cover 10-65%; moss & lichen cover including epiphytes on ground 5-25%.
snags	>4"dbh 18-55/ac. Hardwood snags 20-60%. Snags>17"dbh & >13'tall, 0.2-2/ac.	>4"dbh 14-51/ac. Hardwood snags 20-90%. Snags>17"dbh & >13' tall, 0.2-1.6/ac.	>4"dbh 8-16/ac. Hardwood snags 15-75%. Snags>17"dbh & >13'tall, 0.2-5/ac.
logs	>4" in diameter 81-215/ac. Hardwood logs 20-65%. Logs >17" in diameter & >13' long 3-19/ac.	>4" in diameter 91-156/ac. Hardwood logs 45-75%. Logs >17" in diameter & >13' long 0.2-6/ac.	>4" in diameter 87-156/ac. Hardwood logs 20-55%. Logs >17" in diameter & >13' long 6-15/ac.

From observations of forest development in the Klamath Province (see Appendix A) the following characteristics are apparent. Dominant stems become larger and less abundant with age. Canopy cover is high in each stage. One implication of this is that in every phase, these young trees are continuously ready to fill in any gaps created by disturbance.

While conifers dominate every stage, hardwoods represent a high fraction of stems in the stand. Hardwoods continue to contribute to both snags and logs throughout all phases. Seedlings of both conifers and hardwoods continue to be present in good numbers. Another observation is the abundance of hardwoods in every stage of stand development. The implications for wildlife are many: Hardwood fiber and leaf litter provide for a more diverse and, therefore, resilient insect community; and therefore provide a more stable food source for insectivorous birds and mammals. Hardwoods also continue to contribute to both snags and logs throughout the life of the stand.

Tables 3, 5, and 6 are contained in the Galesville LSR assessment. They give general descriptions of forest stands in the Douglas-fir plant group series which is the major plant series in the Upper Cow Creek Watershed.

Table 3. Definitions for Old-Growth in the Douglas-fir/Chinkapin and Tanoak Vegetation Zones (Based on Bingham and Sawyer, 1991) DFC is based on exceeding the Average standards. Minimum standards shown for reference only.

Stand Characteristic	Minimum Standards	Average Standards
Live Trees		
Conifers ≥ 35" dbh or ≥ 200 years old	≥ 6 per acre	12 ± 1 per acre
Hardwood basal area	≥ 10% of total BA	30% ± 5% of total BA
Intermediate and small size classes, Conifers and hardwoods ≤ 26' tall	> 10% total cover	25% ± 5% cover for hardwoods 2% ± 1% cover for conifers
Canopy		
Two distinct canopy layers: Douglas-fir over conifers and hardwoods	Upper tier > 130' tall Lower tier < 130' tall Canopy cover > 60%	Conifers ≥ 130' tall, 18 ± 1 per acre Conifers 40-130' tall, 16 ± 6 per acre Hardwoods 40-130' tall, 89 ± 17 /acre Canopy cover 71% ± 3%
Snags		
Conifer or hardwoods ≥ 4"	> 5 per acre	13 ± 2 per acre
Conifers ≥ 16" dbh ≥ 13' tall	> .1 per acre	2 ± 1 per acre
Down Logs		
Down logs	1 ton per acre	12 ± 4 tons per acre
≥ 17" diameter, ≥ 13' long	> 0.4 pieces per acre	10 ± 2 pieces per acre

≥ 17" diameter, > 50' long	> 0.1 pieces per acre	2 ± 1 pieces per acre

Table 5. Live Tree Standards for Young and Mature Douglas-fir/Hardwood Forests
(Based on Bingham and Sawyer, 1991) Provided for reference only.

Stand Characteristic	**Young Stands** (40-100 years)	**Mature Stands** (100-200 years)
Live Trees		
Trees 40 to 130' tall	Conifers 42 to 212 per acre Hardwoods 64 to 267 per acre	Conifers 24 to 87 per acre Hardwoods 48 to 134 per acre
Tree ≥ 130' tall	N/A	Conifers 12 to 24 per acre
Dominant stems < 18" dbh	Conifers 105 to 315 per acre Hardwoods 91 to 492 per acre	Hardwoods 103 to 308 per acre
Dominant stems 18 to 35" dbh	N/A	Conifers 16 to 28 per acre
Hardwood basal area	30 to 75% of total BA	15 to 45% of total BA
Canopy		
Canopy	< 130' tall, single tiered Total cover 65 to 80%	< 180' tall, indistinct two tiered Total cover 65 to 80%

Table 6. Snag and Down Log Standards for Young and Mature Douglas-fir Forests on Western Hemlock or Mixed Conifer Sites (Spies, Franklin, and Thomas, 1988) These are average conditions for these stands and not Desired Future Conditions.

Stand Characteristic	Young Stands (< 80 years)	Mature Stands (80-199 years)	Old-growth Stands (≥ 200 years)
Snags			
Snags ≥ 4" dbh	81 per acre	44 per acre	24 per acre
Snags ≥ 20" dbh > 16' tall	3 per acre	3 per acre	6 per acre
Snags ≥ 20" dbh > 49' tall	1 per acre	1 per acre	3 per acre
Down Logs			
≥ 4" diameter	245 per acre	167 per acre	169 per acre
> 24" diameter	22 per acre	13 per acre	26 per acre
% cover	10.6%	6.6%	10.0%

Appendix C. Methodology For Stream Habitat Rating

Salmonids have survived major changes in climate and habitat condition for thousands of years because they are highly resilient. Our knowledge of their habitat needs is imperfect; the interrelationships among habitat factors are complex and poorly understood.

The BLM, as well as other natural resource management agencies and the legal system (through litigation related to the Endangered Species Act), requires us as biologists to describe and rate current habitat conditions of fish-bearing streams per stream, especially for ESA-listed fish species. The ratings may be used to identify site-specific conditions or to evaluate the general stream habitat condition for the entire fifth-field watershed by assimilating individual stream ratings. What follows is an imperfect system for rating stream habitat quality using "properly functioning" criteria from NOAA Fisheries Matrix of Habitat Indicators (as adapted for the Klamath Province) and from ODFW "Habitat Benchmarks". Point values have been arbitrarily assigned to various habitat conditions. No habitat factor in this analysis is considered more important than any other. Data for each rating was obtained from ODFW stream habitat surveys, watershed analysis and also from professional opinion when there were no data.

P = Properly Functioning
FAR = Functioning At Risk
NPF = Not Properly Functioning

Maximum Water Temperature:
Based on data collected by the Resource Area June to October since 1993; data on file. 64 degrees F or lower for "Good" condition is based on State criteria for 303(d) water quality - limited streams and NMFS Matrix for Klamath Mt. Province. Based on 7-day moving average of daily maximum water temperature.

< 64 F	=	4 = PF
65-70 F	=	2 = FAR
>70 F	=	0 = NPF

Habitat Integrity Rating For Aquatic Insects (Sediment on NMFS Matrix):
Based upon macroinvertebrate reports from Bob Wisseman, Aquatic Biology Associates (reports on file, Glendale R.A.). Although the rating considers many factors, crevice space (embeddedness) is primary.

Very High/High	=	4 = PF
Moderate	=	3 = FAR
Low	=	2 = NPF
Severe	=	1 = NPF

Substrate: Use percent gravel in riffles (which are by definition low gradient). An indicator of retentive ability of in-stream structure (LWD, boulders, etc). Also, may be an indicator of whether magnitude of peak flows may have been increased by management activities.

>35%	= 3 = PF
15-35%	= 2= FAR
<15%	= 1= NPF

PLUS
Consider embeddedness/insect habitat integrity rating

The percentage of gravel is reduced one rating if the HIR (Habitat Integrity Rating) is low or severe. Sometimes Wisseman addresses embeddedness and sometimes not- e.g. 35 percent is Properly Functioning but downgraded to Functional At Risk if there is substrate embeddedness or if the HIR is low or severe. Also, if there is reference to moderate abundance of sediment tolerant species.

Barriers To Fish Movement (human related):

None	=	4	= PF
One or more located high in the watershed	=	3	= FAR
Several throughout the watershed	=	2	= NPF
One or more near the mouth or main stem	=	0	= NPF

Large Woody Debris (Minimum size of a key piece is 0.6m x 10m)
Data source is ODFW stream survey data. Score is dependent on how close the amount of LWD is to the ODFW benchmark for "Good" condition.

>2 key pieces per 100 meters	=	2
1-2 " " "	=	1
<1 " " "	=	0

The above rating is probably more appropriate for this WAA and the Glendale R.A. than the ODFW and NMFS Matrix.

Pool Habitat by Area:
Percentage of all habitat types in **dammed, backwater and scour** pools. Percentages were summed based on ODFW stream survey data.

>35%	=	3	= PF
10 to 35%	=	2	= FAR
<10%	=	1	= NPF

Pool Quality:
a) Number of complex pools per km of stream surveyed by ODFW. Rating based on ODFW benchmark.

>2.5 per km	=	4
1-2.4 per km	=	2
<1 per km	=	0

AND

b) Residual pool depth

Less than or equal to 3 % (low gradient):

>0.5m	=	4	= PF
0.2 to 0.4m	=	2	= FAR
<0.2m	=	0	= NPF

Greater than 3 % gradient:

>1.0m	=	4	= PF
0.6-0.9m	=	2	= FAR
<0.5m	=	0	= NPF

There can be good or reasonably good residual pool depth but no large wood to form complex pools; Downgrade the rating accordingly.

Off-Channel Habitat:
Alcoves, side channels, LWD on low gradient streams (<3 %). Streams greater than 3 % are usually rated as "Good" because higher gradient streams typically do not have alcoves and side channels. Historic mining or road proximity would lower the rating, especially on low gradient reaches/streams. Points/rating depends on how far existing conditions deviate from projected pre-settlement conditions.

Good	=	3
Fair	=	2
Poor	=	1

The factor is rated as Properly Functioning on stream reaches >3 % where the riparian reserve has not been logged or roaded, but FAR or NPF where riparian reserves have been highly disturbed.

Refugia:
Quality aquatic habitat in the watershed or subwatershed that serves as a gene pool to repopulate adjacent streams in the event that habitat is lost through human-related or natural events.

Good	=	3
Fair	=	2
Poor	=	1

Width : Depth Ratio:
Rating based on ODFW stream survey data and suggested NMFS benchmarks. An indicator of excessive peak flows or physical alteration.

Stream Gradient	Rosgen Channel Type	Ratio Considered "Good"
4 - 10%	A	<12
2 - 4%	B	12-30
< 2%	C	12-30

The score/rating for this factor represents how far the average ratio for the stream or stream reach (lower, middle, upper) deviates from the NMFS benchmark.

Well within the expected range:	3 points
Somewhat outside the expected range:	2 points
Well outside the expected range:	0 points

There is a great deal of natural variability that is dependant on geology, soil type, rainfall characteristics, etc. It is questionable whether NMFS benchmarks can/should be applied only on the basis of stream gradient. Score has been designed to allow for W:D ratios that are somewhat outside the expected range in order to allow for natural variability.

Percent Habitat Units With Erosion:
For ODFW stream surveys conducted up to and including 1997, the rating is based on the percentage of habitat units surveyed with active bank erosion -- not the percentage of the total stream bank length that is eroding. However, the way it is recorded does give an indication of stream bank stability. Beginning in 1998 ODFW reported the percentage lineal distance of both streambanks in the reach that are actively eroding.

<10% unstable	=	4	= PF
10-25% unstable	=	2	= FAR
>25% unstable	=	1	= NPF

Flood plain Connectivity:
Since most streams in the watershed are Rosgen A and B channels, there are few riparian terraces that could be inundated during peak flow. Unless there is channelization, stream bank rip rapping, a road or historic mining next to or within A and B channels, most are considered properly functioning. The degree of development (agricultural land, homes, roads, railroads, historic mining, etc.) determines the rating. A road next to an A or B channel is potentially less damaging than a road or other development on a C channel.

At potential	=	3	= PF
Moderate impacts	=	2	= FAR
Highly impacted	=	1	= NPF

Score for each stream is based on field observations, but not data.

Road Density and Location :
Road density information was derived from Watershed Analysis. Road location derived from aerial photos and field knowledge. Threshold/benchmark for road density is based on NMFS matrix. Rating points can be affected by road density and location (i.e. valley bottom vs. Mid-slope or ridge top).

<2 miles per square mile	=	4	= PF
2-3 " " " "	=	3	= FAR or NPF depending on location
3-4 " " " "	=	2	= FAR or NPF depending on location
>4 " " " "	=	1	= NPF

Riparian Habitat Integrity:
High rating dependant on riparian reserve being in mature/old-growth condition with no or few roads adjacent to fish habitat benchmark per NMFS matrix.

Riparian Reserve at least 80 % intact (no/minimal historic or or recent harvest, roads or significant mining) with conifers and hardwoods of any age, as long as the stand shows no stumps and it is naturally regenerated (historic wildfire)	=	3	= PF
Riparian Reserve disjunct (60-80 % intact) with some valley bottom roads, extensive mining, logging, or stumps	=	2	= FAR
Riparian Reserves have been considerably cut and are in second growth, mining and valley bottom roads common	=	1	= NPF

The NMFS matrix requires that riparian forest be mature or old-growth. This is certainly appropriate for managed watersheds but may not be for watersheds with no/minimal historic or current human activity such as logging, agriculture or mining.

Percent of Vegetation Acres >20 years of Age :
Primarily applies to acreage in the transient snow zone, which is subject to rain-on-snow storm events.

None/Low	<15%	=	3
Moderate	16-25%	=	2
High	26-50%	=	1
Extreme	>50%	=	0

Compaction:

Percent of acreage in roads and landings.

Low	<5%	=	2
High	>5%	=	1

Peak/Base Flows:
Are generally going to be AT RISK if road density exceeds 4 miles per square mile of road, which converts to about a 25 % increase in drainage density.

Total Score For Each Subwatershed:
Only factors with known values were considered in the final determination, so each stream was rated individually based upon the amount of information currently available on that drainage. All factors were given equal weight when determining a total score. That is, riparian condition was not considered more important than road density or large woody debris. Many factors are inter-related and some may in fact be more important than others for determining stream health. However, weighting several factors that seem to be of primary importance may be imposing a personal bias on the procedure.

80-100% of potential points	=	Good (Properly Functioning)
60-80% " " "	=	Fair (Functioning At Risk)
<60% " " "	=	Poor (Not Properly Functioning)

Appendix D. Water Quality Monitoring Locations, Upper Cow Creek Watershed – BLM sites.

Site ID	Site Location Description	Highest 7 day temp for period of record	1998	1999	2000	2001	2002
SNOW	Snow Creek @ end of road 32-3-7.4	65.6	X	X	X	X	**X**
SNO2	Unnamed trib to Snow Creek in 32S 3W 07; Tributary parallels road 32-3-7.5	59.6		X	X	**X**	X
SNO3	Unnamed trib to Snow Creek in 32S 3W 07; Tributary parallels road 32-3-7	59		X	X	**X**	X
SNO4	Snow Creek @ road 32-3-5 crossing	61.4		X	X	**X**	X
SNO5	Unnamed tributary west of Snow Creek in 32S 3W 17 SW ¼	59.1		X	X	**X**	X
SNO6	Snow Creek upstream of unnamed tributary @ site SNO5	60		X	X	**X**	X
SNO7	Snow Creek – East Fork in 32S 3W 20 NW NW NW	58.6		X	X	X	**X**
SNO8	Snow Creek – West Fork in 32S 3W 19 NE NE NE	59.3		X	X	**X**	X

The bold-type "**X**" indicates the year with the highest 7-day running average.

Appendix E. South Umpqua Winter Steelhead Acclimination History Releases & Marks

Prior to 1999, all release of winter steelhead were direct releases to the South Umpqua or top of Cow Creek below Galesville Dam.

Year	Brood year	Type of Release	Mark	Number Released
1999	97 (2 yr)	CV Acclim	ADLV	10,262
	98 (1 yr)	CV Acclim	ADLV	17,530
	98 (1 yr)	Direct @ Galesville	ADLV	26,880
				49% Direct Release Total 54,672 released
2000	98 (2 yr)	CV Acclim	ADLV	14,715
	99 (1 yr)	CV Acclim	ADLV	18,183
	99 (1 yr)	GV Acclim	ADLV	21,868
	99 (1 yr)	@ GV after 4-days, so direct	ADLV	9,060
	99 (1 yr)	Direct @ S. Umpqua	ADLV	2,609
	98 (2 yr)	Direct @ Galesville	AD	19,481
				29% Direct Release Total 107,997 released
2001	99 (2 yr)	CV Acclim	AD	16,814
	99 (2 yr)	CV Acclim	AD	14,505
	00 (1 yr)	CV Acclim	AD	14,287
	99 (2 yr)	GV Acclim	AD	12,868
		Direct @ S. Umpqua RM 13		3,000
				5% Direct Release Total 61,474 released
2002	99 (3 yr)	CV Acclim	ADLM	14,388
	00 (2 yr)	CV Acclim	AD	16,001
	00 (2 yr)	CV Acclim	AD	14,487
	00 (2 yr)	CV Acclim	AD	15,043
	00 (2 yr)	GV Acclim	AD	30,369
				100% ACCLIMATED Total 90,288
2003		CV Acclim	AD & ADLM	66,522
		7F Acclim	AD & ADLM	11,695
				100% ACCLIMATED Total 78,217

Codes:

CV	Canyonville, Canyon Creek
GV	Cow Creek below Galesville Reservoir
7F	Seven Feathers at mouth of Canyon Creek
AD	Adipose Clip
LM	Left Maxillary Clip

Release times are between mid-February and early May

Galesville and Cow Creek
Coho and Winter Steelhead

Coho:

Smolts Released:

1999	72,170 netpens, Cow Creek below Galesville Reservoir
2000	19,481 direct release into Cow Creek below Galesville Reservoir
2001	0
2002	0
2003	15,000 netpens. Cow Creek below Galesville Reservoir

Adults Returned:

2000	75 pair for brood 171 recycled to Galesville Reservoir 215 placed back into Cow Creek below Galesville Reservoir Closed Trap
2001	74 M and 64 F for brood (82% hatchery) 1,423 recycle to Galesville Reservoir 402 placed back into Cow Creek, below Galesville Reservoir Closed Trap
2002	60 M 50 F for brood (only 1 hatchery) 30 placed back into Cow Creek below Galesville Reservoir

Steelhead:

Smolts Released (see attached)

Adults Returned:

	Recycled	**Brood**
1998	144 to Cow Creek (10 wild)	42 (8 wild)
1999	104 to Galesville Res.	62 (20 wild)
2000	36 to Galesville Res. (6 wild)	29
2001	58 to Galesville Res.	37 (all wild)
2002	49 to Templin boat ramp near Roseburg	14 (all wild)
	1 to Cow Creek below Galesville Reservoir	(wild)
2003	90 to Galesville Res.	16 (6 wild)

Note fish recycled into Galesville Reservoir were hatchery unless otherwise noted

Appendix F. Galesville Reservoir History of Steelhead & Coho Salmon Stocking

Coho:

Smolts Released:

1999	72,170 netpens, Cow Creek below Galesville Reservoir
2000	19,481 direct release into Cow Creek below Galesville Reservoir 43,144 netpens, Cow Creek below Galesville Reservoir
2001	0
2002	0
2003	15,000 netpens, Cow Creek below Galesville Reservoir

Adults Returned:

2000	75 pair for brood
	171 recycled to Galesville reservoir
	215 placed back into Cow Creek below Galesville Reservoir Closed Trap
2001	74 M and 64 F for brood (82% hatchery)
	1,423 recycle to Galesville Reservoir
	402 placed back into Cow Creek, below Galesville Reservoir Closed Trap
2002	60 M and 50 F for brood (only 1 hatchery)
	30 placed back into Cow Creek below Galesville Reservoir

Steelhead: **Smolts Released - see Appendix E**

Adults Returned:

Year	Recycled	Brood
1998	144 to Cow Creek (10 wild)	42 (8 wild)
1999	104 to Galesville Res	62 (20 wild)
2000	36 to Galesville Res.(6 wild)	29
2001	58 to Galesville Res.	37 (all wild)
2002	257 to Galesville Res.	14 (all wild)
	49 to Templin boat ramp near Roseburg	
	1 to Cow Creek below Galesville Reservoir (wild)	
2003	90 to Galesville Res.	16 (6 wild)

Note fish recycled into Galesville Reservoir were hatchery unless otherwise noted

Appendix G. Status of fish passage at road crossings in the BLM Medford portion of the Upper Cow Creek (Galesville) Watershed.

Stream	Road Number	Quarter-Section	Culvert Dimensions L x W x H (ft)	Percent Slope	Culvert Outfall Drop (ft)	Cutthroat Passages
McGinnis	31-5-27.3	T31SR4WSec27 SESE	55 x 6	3	1	N
Snow #1	32-3-7	7 SE	55 X 12 X 8	1	1	N
Snow trib	32-3-7.2	7 SE	50 X 6	5	2	N
Snow #2	32-3-5C	17 SW	150 X 6	5	3	N
Snow #3	32-3-5C	19 NE at hairpin turn	100 X 6	10	4	N
Snow #4	32-3-19.3	19 NE	35 X 4	0	0	Y
Snow trib	32-3-5	Sec 8/17 common border	80 x 3	2	1	N
Meadow Creek	County Road	T31S R3W Sec31	50 x 6		5	N
Sugar #1	County Road	T31S R3W Sec31SW	50 X 5	5	3	N
Sugar #2	31-3-31	25 SE	100 X 7	3	2	N

Multiple crossings on the same stream are numbered consecutively in an upstream direction.

Tributaries are numbered and lettered consecutively in an upstream direction.

Culvert Dimensions are approximate.

Percent Slope: Refers to culvert.

Culvert Outfall Drop: Distance from the bottom of the downstream end to the pool or streambed surface.

Passage: Y=yes, N=no, P=partial; depending on stream discharge and/or water velocity through the culvert

Appendix H. Range of Natural Variability

Paleoclimatological evidence from fossil and pollen data taken from lake and ocean sediments throughout the Northwest indicates that since 20,000 years before present (BP) up to present, climate and vegetation have changed (Whitlock 1992). Climate change associated with the recession of glacial ice sheets resulted in plant associations shifting on the landscape as a result of the environmental conditions. No 1,000-year period in the last 20,000 years was the same in climate or vegetation. Vegetative communities changed with changing environmental conditions, such as extended periods of cold dry to periods of warm wet. Present day vegetative communities did not become established until approximately 3,000 years ago and have continued to shift in location and range even during this time period.

Reneau and Dietrich (1990) describes studies of colluvial deposits of hill slopes and discovered that landslides tended to occur during dry periods, presumably due to more frequent fires and or intense rainstorms. These events were dated to 10,000 years BP up to 4,000 years BP. This suggests mass movement activity has shaped present day topography and continues to be a change agent. Volcanic activity, earthquakes, landslides and floods have, and will, change the present day landscape.

Tree ring data dating from the 1600s to present day indicated periods of wet and dry conditions. Drought periods lasting up to 25 years have occurred during this time frame. Fire frequency was high during the periods of drought. Data from Graumlich (1987) indicates that the period of l910 to l935 was a drought period which corresponds to the age of many of the natural stands that are now between 50 and 80 years of age. This suggests that fire is an important agent of vegetative landscape change in the Klamath Province.

Human activities described by Boyd (1986) indicate that present day landscapes are not the same as they were 200 to 300 years ago. Native Americans in the valley regions used fire and other agricultural practices to control their environment for hunting and food gathering. Low lands and traditional hunting sites along ridges were burned repeatedly resulting in open understory conditions that favored vegetation adapted to frequent ground fires such as pine and oak. During European settlement of the western valleys in the mid-1800s, burning stopped and vegetative communities began to change. Fire frequency has declined since the period of active fire suppression (Taylor and Skinner 1994). Current day fire suppression activities continue to be a cause of plant community change across the landscape.

Wills and Stuart (1994) noted that pre-settlement landscapes on Douglas fir/hardwood forest in Northern California were a matrix of various aged forests. The Klamath Province, in which their study was done, includes all of the Rogue Basin and the Cow Creek basin of the Umpqua River, areas that are much more like Northern California than the regions to the north. This suggests that the region did not have continuous forests of old-growth. Other studies indicate that late seral forests comprised 43 to 71 percent of the landscape (Ripple 1994).

The Glendale Resource Area queried Forest Operations Inventory data to obtain the extent of naturally generated stands between the age of 46 and 86 years, which corresponded to a 25 year drought period that lasted from 1910-1935. Forests of this age class, which are thought to be of fire origin, comprised about 10 % of the forest on federal land. It was assumed that non-federal land had approximately the same percentage. Openings within the forest included valley bottoms, accounting for 10 % of the RA, and rock outcrop, natural meadows and serpentine effect areas, which accounted for another 5 percent. Postulating unequal distribution, openings within the forest canopy would have ranged between 15 and 25 percent at any given time. Entire seventh field watersheds (60 to 600 acres) would have been in completely open condition as a result of fire, as evidenced by fires in 1987 and l995. The denudation of the landscape by miners and earlier by Native Americans could have resulted in more than 25 % of the area being in an open condition in the early part of this century.

The distribution and abundance of aquatic species and characteristics of stream habitat in the Rogue and Umpqua River basins have responded to changing climate for millennia. The extent that climate changes in the Rogue and South Umpqua basins have affected habitat and aquatic species has probably varied considerably depending on each species habitat and life history requirements. Spencer (1991) provides a model for how climate has affected streams, aquatic species and indigenous peoples in the Rogue basin and Klamath Province over the last 13,000 years.

During recent geologic times, climate in the Klamath Province has shifted between mesic and xeric eight times over the last 13,000 years (Spencer 1991). Approximately 13,000 to 10,000 years ago when permanent glaciers and snow fields were in retreat, major floods caused by meltwater resulted in large scale mass wasting, unstable stream channels and extreme stream sedimentation. Depositional material may have created partial or total barriers to fish migration. This rapid shift to a drier climate after mesic conditions that had existed for at least the previous 60,000 years undoubtedly had dramatic consequences for fluvial ecology of the Rogue and Umpqua River basins. Many streams changed from perennial to intermittent. Stream flow decreased, as did the amount and extent of riparian vegetation. Water temperatures increased in response to lower flow and less steam shading.

As climate continued to warm and permanent snow field disappeared, summer peak flow from annual snow melt was replaced by a winter-spring peak originating primarily from rainfall. Salmon stocks migrating and spawning in the winter were enhanced; stocks dependent on a spring-summer peak, if they existed, were depressed or extirpated as the region entered a very xeric period 7000 years ago. Dramatic shifts in character of aquatic habitat during this time undoubtedly caused major changes in abundance, distribution and composition of aquatic communities.

Shifting of climate from xeric to mesic conditions about 4000 years ago resulted in an expanded network of perennial streams, higher stream flow, more riparian vegetation and cooler water

temperatures and better spawning and rearing conditions for salmonids. Aquatic and riparian systems have continued to fluctuate and to affect suitability for various aquatic and riparian plant and animal species in response to climate change.

Animal species and populations have probably changed in response to environmental variation during the last 20,000 years. In addition, hunting pressure and habitat modification has most likely caused local shifts in species abundance and distribution. For instance early trappers found beaver to be abundant in local streams in the early 1800s (Boyd 1987). But it did not take long for the beaver to be trapped out. Without beaver dams, low gradient stream channels and associated riparian zones experienced major and rapid changes which resulted in conditions that are typical today in some streams (e.g. vertical streambanks, disconnecting the stream from its flood plain). Ground water levels would have dropped and resulted in lower summer flow and presumably higher water temperatures.

The frequency of fire and its effects on stream and riparian habitat also changed as climate fluctuated. The amount of large wood in streams was probably higher during mesic than during xeric periods because trees were larger and higher stream flows undercut stream banks; saturated soils may have increased the potential for large trees to fall into streams through windthrow. Conversely, fire probably consumed sources of large wood for stream channels during xeric periods. But increased incidence of landslides following stand replacement fires (Reneau and Dietrich 1990) during xeric times may have delivered large quantities of wood and sediment to streams. Water temperatures probably increased in response to loss of riparian canopy.

Considering the dynamic nature of climate and its complex effects on streams and riparian habitat, it is questionable whether aquatic systems have ever been in “pristine” condition.

Table 1 summarizes some of the important watershed elements in comparison with a RNV (Range of Natural Variability). The precise relationships are often very uncertain because we have so little data on pre-historic conditions. Most of the relationships are based on professional judgment and on observed ecological processes.

Range of Natural Variability References

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Appendix I. Glossary and Acronyms.

ACS	Aquatic Conservation Strategy
BLM	Bureau of Land Management
BMP	Best Management Practices
cfs	cubic feet per second
CHU	Critical Habitat Unit
CWD	Coarse Woody Debris
DBH	Diameter at Breast Height
DEQ	Department of Environmental Quality
ESA	Endangered Species Act
FSEIS	Final Supplemental Environmental Impact Statement
FEMAT	Federal Ecosystem Management Assessment Team
GFMA	General Forest Management Area
GIS	Geographic Information System
GLO	General Land Office
HUC	Hydrologic Unit Code
LSR	Late-Successional Reserve
LWD	Large Woody Debris
NEPA	National Environmental Policy Act
NFP	Northwest Forest Plan
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
ODFW	Oregon Department of Fish and Wildlife
ORV	Off Road Vehicle
RMP	Resource Management Plan
ROD	Record of Decision
RR	Riparian Reserves
RSI	Relative Stability Index
SEIS	Supplemental Environmental Impact Statement
SRMA	Special Recreation Management Area
TPCC	Timber Productivity and Capability Classification
TSZ	Transient Snow Zone
USDA	United States Department of Agriculture
USDI	United States Department of Interior
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
VRM	Visual Resource Management

Glossary

Aquatic Conservation Strategy. Developed to restore and maintain the ecological health of watersheds and aquatic ecosystems contained within public lands.

Arterial roads. Roads typically characterized by high traffic volumes and vehicle speeds, long trip distances, unimpeded travel mobility, and limited property access. These generally bituminous (asphalt) surfaced roads are identified on the Medford District transportation maps, e.g. Interstate 5. (There are no aertial roads within the Upper Cow Creek watershed.)

Air Quality Refers to standards for various classes of land as designated by the Clean Air Act, P.L. 88-206, Jan. 1978.

Anadromous Fish. Fish that are born and reared in freshwater, move to the ocean to grow and mature, and return to freshwater to reproduce. Salmon and steelhead are examples.

Best Management Practices (BMP). Practices determined by the resource professional to be the most effective and practicable means of preventing or reducing the amount of water pollution generated by non-point sources; used to meet water quality goals (See Appendix D in RMP (USDI BLM 1995)).

Diversity. The relative distribution and abundance of different plant and animal communities and species within an area.

Broadcast Burning. Allowing a prescribed fire to burn over a designated area within well defined boundaries for reduction of fuel hazards or as a silvicultural treatment, or both.

Candidate Species. Those plants and animals included in Federal Register "Notice of Review" that are being considered by the U.S. Fish and Wildlife Service for listing as threatened or endangered.

Canopy. The more or less continuous cover of branches and foliage formed collectively by adjacent trees and other woody species in a forest stand.

Coarse Woody Debris. Portion of trees that have fallen or been cut and left in the woods. Usually refers to pieces at least 20 inches in diameter.

Commercial Thinning. The removal of merchantable trees from most often an even-aged stand to encourage growth of the remaining trees.

Compaction. Refers to soil becoming consolidated by the effects of surface pressure often from heavy machinery or vehicle and pedestrian traffic.

Connectivity. A measure of the extent to which conditions between late-successional/old-growth forest areas provide habitat for breeding, feeding, dispersal, and movement of late-successional/old-growth-associated wildlife and fish species.

Core Area. That area of habitat essential in the breeding, nesting and rearing of young, up to the point of dispersal of the young.

Cover. Vegetation used by wildlife for protection from predators, or to mitigate weather conditions, or to reproduce. May also refer to the protection of the soil and the shading provided to herbs and forbs by vegetation.

Critical Habitat. Under the Endangered Species Act, (1) the specific areas within the geographic area occupied by a federally listed species on which are found physical and biological features essential to the conservation of the species, and that might require special management considerations or protection; and (2) specific areas outside the geographic area occupied by a listed species when it is determined that such areas are essential for the conservation of the species.

Cultural Resources. The physical remains of human activity (artifacts, ruins, burial mounds, petroglyphs, etc.) that have scientific, prehistoric or social values.

Cumulative Effect. The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can also result from individually minor, but collectively significant actions taking place over a period of time.

Early Seral. 0-10 year old stand, the period from disturbance to the time when crowns begin to close and conifers and hardwoods dominate the site. The stage may be dominated by grasses and forbs or by sprouting brush or hardwoods. Conifers develop slowly at first and gradually replace grasses, forbs, or brush as the dominant vegetation. Forage may be present; hiding and thermal cover may not be present. Douglas-fir is the principle planted species with sugar pine, incense cedar, and ponderosa pine also planted that are matched to specific site conditions. Forage for seed eaters and grazers are more abundant than in other seral stages.

Edge. Where different plant communities meet, or where variations in successional stage or vegetation conditions within the plant community come together.

81+ Modified. Mature or old-growth stand that has undergone a partial harvest yet retains a canopy closure greater than 40 %, have trees greater than 21 inches DBH. Composition and structure of these stands have been altered enough that some no longer function as late-

successional habitat. Overstories may be too sparse and understories, in the more open stands, are in early to mid-seral condition.

Endangered Species. Any species defined through the Endangered Species Act of 1973 as amended, as being in danger of extinction throughout all or a significant portion of its range and published in the Federal Register.

Erosion. Detachment or movement of soil or rock fragments by water, wind, ice, or gravity. Accelerated erosion is more rapid than normal, natural, or geologic erosion, primarily resulting from the activities of people, animals, or natural catastrophes.

Floodplain. The lowland and relatively flat area adjoining inland and coastal waters, including, at a minimum, areas that are subject to a one percent or greater chance of flooding in any given year.

Forb. Any herb other than grass.

Forest Health. The ability of forest ecosystems to remain productive, resilient, and stable over time and to withstand the effects of periodic natural or human caused stresses such as drought, insect attack, disease, climatic change, flood, resource management practices and resource demands.

Fuels. Combustible wildland vegetative materials present in the forest which potentially contribute to a significant fire hazard.

Fuels Management. Manipulation or reduction of fuels to meet forest protection and management objectives while preserving and enhancing environmental quality.

General Forest Management Area (GFMA). Forest land managed on a regeneration harvest cycle of 70-110 years. A biological legacy of six to eight green trees per acre would be retained to assure forest health. Commercial thinning would be applied where practicable and where research indicates there would be gains in timber production.

Habitat Fragmentation. The breaking up of habitat into discrete islands through modification or conversion of habitat by management activities.

Hardwoods. A conventional term for broadleaf trees and their wood products.

Hydrologic. Pertains to the quantity, quality and timing of water yield from forested lands.

Indicator species. An organism whose presence or state of health is used to identify a specific type of biotic community or as a measure of ecological conditions or changes occurring in the environment.

Intermittent Stream. Any nonpermanent flowing drainage feature having a definable channel and evidence of scour or deposition. This includes what are sometimes referred to as ephemeral streams if they meet these two criteria.

Land Use Allocation. Allocations of a land area which defines allowable uses/activities, restricted uses/activities, and prohibited uses/activities. Each allocation is associated with a specific management objective.

Landscape. A heterogeneous land area with interacting ecosystems that are repeated in similar form throughout.

Large Woody Debris (terrestrial). Portion of tree that has fallen or been cut and left in the woods. Medford District Resource Management Plan requires that forest management practices leave a minimum of 120 linear feet of logs per acres greater than or equal to 16 inches in diameter and 16 feet long.

Large Woody Debris (aquatic). A piece of wood greater than or equal to 3 meters long (1.1 ft) and 0.15 meters (0.5 ft) diameter. A "Key" piece of LWD is greater than or equal to 10 meters (33 ft) long and 0.6 meters (24 inches) in diameter. Note: Key pieces are the most important of the large wood because they are the big logs that fall into streams and trap/sieve smaller stuff that floats along during high winter flows. LWD creates complex habitats in the channel for fish and other aquatic species (ODFW Stream Survey manual).

Late seral. 41-80 year old stand. Stand growth slows. Forest stands are dominated by conifers and hardwoods; canopy closure approaches 100% with stand growth decreasing. Stand diversity is minimal; conifer mortality rates and snag formation are rapid. Wildlife hiding and thermal cover is present. Forage and understory vegetation is minimal except in under stocked stands or in meadow inclusion. (This does not refer to *late successional* and also may differ from *late seral* as defined in some peer-reviewed literature.)

Late Successional Reserve. Forest reserved under a land use allocation to maintain as mature or old-growth forest or in order to promote its development into mature or old-growth forest and habitat.

Mass Movement. The downslope movement of earth caused by gravity. Includes but is not limed to landslides, rock falls, debris avalanches, and creep. It does not include surface erosion.

Matrix Lands. Federal lands outside of reserves and special management areas that will be available for timber harvest at varying levels.

Mature Seral. 81-200 year old stand. Forest begins to develop structural diversity. Conifer and hardwood growth gradually declines. Larger trees increase significantly in size. Stand diversity gradually increases. Wildlife hiding cover, thermal cover and some forage are present. With

slowing growth, insect damage increases and stand breakup may begin on drier sites. Understory development is significant in response to openings in the canopy created by disease, insects and windthrow. Vertical diversity and the height of the stand increases. The canopy's volume and its carrying capacity for canopy-dwelling lichens, bryophytes, insects, birds and mammals increases. Larger snags are formed. At the 81-149 year old spectrum, conditions are suitable for northern spotted owl foraging and roosting. Starting at approximately 150 years, characteristics are favorable for spotted owl nesting habitat.

Mid-Seral. 11-40 year old stands, occurs from crown closure to the time when conifers begin to die from competition and stand growth slows. Stands are dominated by conifers or hardwoods, canopy closures approach 100%, forage and understory vegetation is minimal. Conifer mortality rates and snag formation are rapid. There are 3,480 acres of this age class in the Upper Cow Creek Watershed.

Mitigation. Mitigation includes (1) avoiding the impact altogether by not taking a certain action or parts of an action; (2) minimizing impacts by limiting the degree or magnitude of the action and its implementation; (3) rectifying the impact by repairing, rehabilitating, or restoring the affected environment; (4) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and (5) compensating for the impact by replacing or providing substitute resources or environments.

Monitoring. The process of collecting information to evaluate if objectives and anticipated or assumed results of a management plan are being realized or if implementation is proceeding as planned.

National Environmental Policy Act (NEPA) Process. An interdisciplinary process, which concentrates decision making around concerns, alternatives, and the effects of alternatives on the environment.

Natural Regeneration. Renewal of a tree crop by natural means using natural seed fall and/or tree regeneration existing before stand harvest.

Non-attainment. Failure of a geographical area to attain or maintain compliance with ambient air quality standards.

Noxious Weeds. Rapidly spreading plants that can cause a variety of major ecological or economic impacts to both agriculture and wildland. These species are generally non-native.

Old-Growth Forest. A forest stand usually at least 180-220 years old with moderately high canopy closure; a multi-layered, multi-species canopy dominated by large overstory trees; high incidence of large trees, some with broken tops and other indications of old and decaying wood (decadence); numerous large snags; and heavy accumulations of wood, including large logs on the ground (coarse woody debris).

Old-Growth Seral Stage. 201+ year old stand until the time when conifer stand replacement occurs and secondary succession begins again. This stage constitutes the potential plant community capable of existing on a site given the frequency of natural disturbance events. Structure, species composition and age distribution is dependant upon fire frequency. As mortality occurs, stands develop greater structural diversity. Replacement of individual trees lost to fire results in the creation of a multi-layered canopy.

Overstory. That portion of trees which form the uppermost layer in a forest stand which consists of more than one distinct layer (canopy).

Overstory Removal. The final stage of cutting where the remaining overstory trees are removed to allow the understory to grow. Overstory removal is generally accomplished three to five years after reforestation and when adequate stocking has been achieve.

Peak Flow. The highest amount of stream or river flow occurring in a year or from a single storm event.

Perennial Streams. Streams that flow continuously throughout the year.

Plant Community. An association of plants of various species found growing together in different areas with similar site characteristics.

Prescribed Burning. The intentional application of fire to wildland fuels in either their natural or altered state. Burning is conducted under such conditions as to allow the fire to be confined to a predetermined area and to produce an intensity of heat and rate of spread required to meet planned objectives (e.g., silvicultural, wildlife management, reduction of fuel hazard, etc.).

Prescribed Fire. A preplanned wildland fire burning under specified conditions to accomplish specific planned objectives. It could result from either a planned or unplanned ignition.

Prescription. Management practices selected and scheduled for application on a designated area to attain specific goals and objectives.

Reforestation. The natural or artificial restocking of a forest area with trees--includes measures to obtain natural regeneration, as well as tree planting and seeding. Reforestation is used to produce timber and other forest products, protect watershed functioning, prevent erosion, and improve other social and economic values of the forest, such as wildlife, recreation, and natural beauty.

Regeneration. The renewal of a forest stand, whether by natural or artificial means. This term might also refer to individual trees themselves (seedlings, saplings).

Regeneration Harvest. A silvicultural system using stand regeneration methods that include modified versions of the seed tree, shelterwood and overstory removal harvest methods. Stands remaining after regeneration harvest will generally resemble reserve seed tree cuts.

Resource Management Plan (RMP). A land use plan prepared by the BLM under current regulations in accordance with the Federal Land Policy and Management Act. (See USDI, BLM 1995).

Riparian Area/Zone/Habitat. Those terrestrial areas where the vegetation complex and microclimate conditions are products of the combined presence and influence of perennial and/or intermittent water, associated high water tables and soils which exhibit some wetness characteristics. Normally used to refer to the zone within which plants grow rooted in the water table of these rivers, streams, lakes, ponds, reservoirs, springs, marshes, seeps, bogs and wet meadows.

Riparian Reserves. Designated riparian areas in which resource management activities are limited.

Road Maintenance. The upkeep of the entire road system including surface and shoulders, parking and side areas, structures, and traffic-control devices necessary for its safe and efficient utilization.

Sediment. Any material carried in suspension by water, which would ultimately settle to the bottom. Sediment has two main sources: from the water channel itself and from disturbed upland sites.

Seed Tree. A tree selected as a natural seed source within a shelterwood or seedtree harvest cut. Sometimes, these trees are also reserved for seed collection.

Seedlings and Saplings. Non-commercial-size young trees.

Seral Stages. The series of relatively transitory plant communities that develop during ecological succession from bare ground to the climax stage. Generally there are five stages recognized: early-seral, mid-seral, late-seral, mature-seral, and old-growth.

Slash. The residue on the ground following felling and other silvicultural operations and/or accumulating there as a result of a storm, fire, or girdling.

Snag. A standing dead tree usually without merchantable value for timber products, but having characteristics of benefit to cavity nesting wildlife species.

Soil Compaction. An increase in bulk density (weight per unit volume) and a decrease in soil porosity resulting from applied loads, vibration, or pressure.

Special Status Species. Includes proposed species, listed species, and candidate species under the ESA; State-listed species; and BLM State Director –designated sensitive species.

Stand. A community of trees or other vegetation uniform in composition, physiognomy, spatial arrangement, or condition to be distinguishable from adjacent communities.

Structural Diversity. Variety in a forest stand that results form layering or tiering of the canopy and the die-back, death and ultimate decay of trees. In aquatic habitats, the presence of a variety of structural features such as logs and boulders that create a variety of habitat.

Succession. A series of dynamic changes by which one group of organisms succeeds another through stages leading to potential natural community or climax. An example is the development of series of plant communities called seral stages following a major disturbance.

Successional Stage. A stage or recognizable condition of a plant community which occurs during its development from bare ground to some climax plant community.

Surface Erosion. The detachment and transport of soil particles by wind, water, or gravity. Surface erosion can occur as the loss of soil in a uniform layer (sheet erosion), in many rills or dry rattle.

Transportation Management Objective (TMO). Recommend one or several management actions for each Bureau-controlled road and identify (1) current and future use and constraints, (2) maintenance level, (3) improvement and maintenance needs, and (4) roads that may be closed. Required for all existing and newly constructed BLM controlled roads.

Threatened Species. Any species of plant or animal which is likely to become endangered within the foreseeable future throughout all or a significant portion of its range, and which has been designated in the Federal Register as such. In addition, some states have declared certain species in their jurisdiction as threatened or endangered.

Underburning. The use of prescribed fire, most often below an overstory canopy to remove excess forest fuels. Generally conducted in the spring months and a cooler fire than broadcast burning.

Understory. Vegetation (trees or shrubs) growing under the canopy formed by taller trees.

Viable Population. A wildlife or plant population that contains an adequate number of reproductive individuals to appropriately ensure the long-term existence of the species.

Water Quality. The chemical, physical and biological characteristics of water.

Water Yield. The quantity of water derived from a unit area of watershed forming streamflow.

Watershed. Entire area that contributes water to a drainage system or stream.

Wildfire. Any wildfire not designated and managed as a prescribed fire with an approved prescription.

Yarding. The act or process of moving logs to a landing.