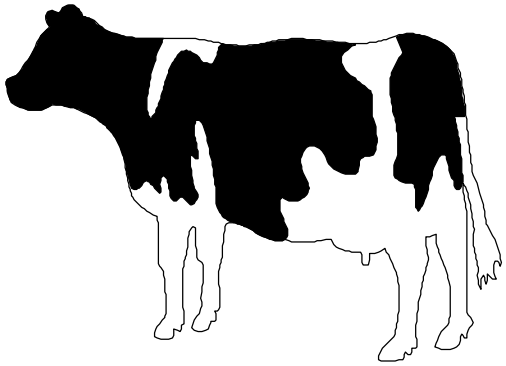
Middle Cow Creek
Watershed Analysis

Version 2.0



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Summary

MORPHOLOGY

Geographic Province	Klamath mountains	
Watershed size	113,023 acres	
Elevation range	1,029 - 5,103 feet	
Drainage pattern	dendritic	
Total streams	1,339 miles	
Drainage density	7.6 miles/square mile	
Sixth-field watersheds	Starveout	21,930 acres
	Quines	18,292 acres
	Fortune Branch	13,870 acres
	Windy	15,688 acres
	McCollough	13,865 acres
	Dad's	15,735 acres
	Riffle	13,643 acres
	Total	113,023 acres

METEOROLOGY

Annual precipitation	36 - 70 inches; the highest amounts on the western edge
Precipitation Timing	80% occurring October thru May
Temperature range	0-100 degrees F

SURFACE WATER

Minimum flow	1.0 cfs during several summers. Many stream segments were dry during summer months; the main stem Cow Creek is now regulated by Galesville Dam
Maximum peak flow	10,600 cfs on 1/15/74 at Cow Cr. near Azalea - now regulated by Galesville Dam
Reservoirs	Galesville Reservoir upstream, just outside watershed Numerous small private ponds
Water quality limited streams	94.6 miles (listed for temperature above 64 degrees)

GEOLOGY

Formation	Marine volcanic, metamorphic sedimentary and ultra-mafic rock (typical of Klamath Mountains province).
Soils	Shallow depth, many different series and complexes. Generally very low water holding capacity, relatively infertile.

VEGETATION Primarily mixed evergreen; conifers and hardwoods. Vegetative communities differ by slope, aspect, elevation and soils.

BIOLOGICAL

Total fish streams	154 miles
Candidate, threatened, or endangered species	Spotted owl: 35 active sites; 18 100-acre core areas Marbled murrelet: west half of watershed within 50 miles of coast (none found) fish: Umpqua cutthroat trout - Endangered Oregon Coast coho salmon- Threatened
Survey and Manage species	Del Norte salamanders mollusks red tree voles peregrine falcons bald eagles fungi bryophytes lichens
Special Status Plants	Numerous species and locations

HUMAN INFLUENCE

Counties	Douglas Josephine (very small portions along southern boundary) Jackson (very small portions along southwest boundary)
Roads	811 miles
Road density	4.6 mi./square mile
Streams within one tree length of roads	707 miles (53 percent of streams)
Fish Streams within one tree length roads	143 miles (93 percent of fish streams)
Timber production	GFMA - 18,392 acres gross - 9,237 acres outside all reserves Major BLM timber component is large, mature and old growth trees.
Utility corridors	Natural gas line, fiber optics line, electric power line, railroad.
Communities	Glendale, Azalea, Quines Creek, numerous residents in valleys

PUBLIC LANDS

BLM lands 44,577 acres (39 percent)

BLM Land Use Allocation	Acres	(Percent)
Late-successional Reserves/1	20,366	(45)
Connectivity/Diversity Blocks	6,679	(15)
General Forest Mgmt. Area/2	18,392	(40)
Recreation Site	30	0
Total	45,510	(100)

Middle Cow Creek
Watershed Analysis

I. Introduction

The area covered under this ecosystem analysis was first analyzed in a preliminary watershed analysis document completed for the Middle Cow Creek watershed on September 1, 1994. The current analysis is designed to update information and analyses and conform with the recent interagency guidance for ecosystem analysis.

This Watershed Analysis is designed to characterize the physical and biological elements, processes and interactions within the 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 the important issues within the watershed.

The format for the Ecosystem Analysis follows the format in Ecosystem Analysis at the Watershed Scale, Federal Guide for Watershed Analysis; August 1995. The first two steps, Characterization and Issues, are separate chapters. The next three steps, Current Conditions, Reference Conditions and Synthesis and Interpretation, have been combined into one discussion based on the Key Issues identified. Hence, for each issue, current and reference conditions are described and the significance, cause/effects and relationships in those conditions are discussed in one section. Finally, recommendations are developed as a separate chapter.

II. Characterization

The Middle Cow Creek watershed is located in southwest Oregon approximately 22 miles north of Grants Pass via Interstate 5 (Map 1).

The area encompasses the drainages of Cow Creek from the lower end of Galesville Reservoir along the divide between Whitehorse and Snow Creeks on the east end, to the confluence with the West Fork Cow Creek and Middle Creek on the west end. The unit is oriented east and west for approximately thirty miles and north and south for approximately eight miles. This fifth-field contains 7 sixth-field watersheds (Table 1, Map 2).

Table 1. Sub-watersheds within the Middle Cow Creek watershed.

Sixth-field watershed		Acres	Percent of Middle Cow Creek watershed
Starveout	(CM01)	21,930	19
Quines	(CM02)	18,292	16
Fortune Branch	(CM03)	13,870	12
Windy	(CM04)	15,688	14
McCollough	(CM05)	13,865	12
Dad's	(CM06)	15,735	14
Riffle	(CM07)	13,643	12
Total		113,023	100

The Cow Creek drainage is located in the northernmost portion of the Klamath Province between the Cascade and Coast range mountains in southwest Oregon. Cow Creek is a tributary of the Umpqua River flowing in a westerly direction then turning abruptly north and east near the west boundary of this landscape unit.

Adjacent watersheds include the Wild Rogue and Grave Creek which drain into the Rogue River; while Upper Cow Creek drains into the Middle Cow Creek which later combines with the West Fork Cow Creek and Middle Fork Cow Creek from the Roseburg District of BLM all of which ultimately drain into the South Fork of the Umpqua River.

This unit comprises approximately 110,000 acres in the Cow Creek watershed north of Glendale.

The BLM administers 45,642 acres (40 percent) in the watershed (Table 2, Map 3). Approximately 1,000 acres within the watershed are administered by the Roseburg District, BLM. Private lands comprise approximately 67,365 acres of the unit, which for the most part, have been harvested within the past 40 years. Private lands consist of many small holdings. Significant non-federal land owners include the State of Oregon, Rogue Resources, Roseburg Resources and Superior Lumber.

Table 2. Land Ownership in the Middle Cow Creek watershed.

Ownership/Land Use	Acres	Percent of Middle Cow Creek watershed
Medford BLM	44,577	39
Roseburg BLM	1,065	1
Oregon State	7,276	6
Local Government	147	0
Private Timber Industry	40,519	36
Private Forest: Non-industry	13,206	12
Agricultural	5,302	5
Residential	929	1
Total	113,021	100

The town of Glendale is the major community within the watershed, but there are also small communities of Azalea and Quines Creek. There are some dispersed rural residences, mainly along Cow Creek and the lower reaches of some of the tributary streams.

Elevation ranges from 1,029 feet to 5,103 feet. The nature of the land is that of steep hills (average 45% slope), narrow ridge tops, and sharp creek bottoms.

Temperatures range from 0 degrees (F) on King Mountain in January to 110 degrees in the interior valleys in August. Extended summer drought is common. Most of the area has southerly aspects. Precipitation varies from near 30 inches per year in the interior eastern valleys to approximately 60 inches/year in the western portions. Approximately 10 percent of the yearly total falls in the months June to September.

Soils in the watershed are primarily derived from metasedimentary rock types, with metavolcanic derived soils downstream of Reuben and in the upper portions of Quines, Starveout and Whitehorse Creeks. Soils associated with metasedimentary rocks tend to be deeper and have more nutrients available. Some areas have serpentine-derived soils which are low in calcium and high in magnesium and other minerals which preclude Douglas-fir and many other plant species which are adapted to calcium-based soils. Some soil types are considered to be sensitive to management activities such as timber harvest, road construction and broadcast burning, including shallow soils (less than 20 inches deep), soils derived from granite or schist, and soils derived from serpentine or peridotite.

Potential natural vegetation is mapped on three levels. Plant Associations are the most fine scale divisions and are based on indicator species present in late-successional stands. These associations are further aggregated into Plant Association Groups, to ease interpretation and to provide categories for most management actions. Plant Association Groups are italicized below. The Plant Associations used are described by Atzet et al. (1996), who provides more detailed information on species composition. The Plant Series is the largest grouping and is determined by the most abundant reproducing tree in the understory of late-successional stands. Often, this is the most shade-tolerant species present.

Small variations were not mapped. These variations include rocky areas, riparian areas, canyon bottoms, and some ridge top variations. In general, most variations smaller than the size of the county soil map polygons were not mapped.

The plant association is the closest fit from Atzet et al. (1996), but the actual map unit will not always be the same as the book description. Vegetation which fell outside the range described in Atzet et al. (1996) is found; especially prominent cases are noted.

Tanoak Series 51,061 acres

Tanoak-Douglas-fir, dry 28,666 acres

Tanoak-Douglas-fir-canyon live oak/dwarf Oregon grape 13,408 acres

This association is widespread and diverse. Included are stands with canyon live oak and salal, and stands with neither canyon live oak nor salal, but having dwarf Oregon grape. Grand fir is found in this association near the eastern extent of the tanoak series.

Tanoak-Douglas-fir-canyon live oak/poison oak 15,258 acres

The driest tanoak sites supported this association. This association is distinguished by its lack of salal and dwarf Oregon grape. Hairy honeysuckle is common. The association is mostly found on south and west facing slopes.

Tanoak-big-leaf maple-canyon live oak/sword fern Not mapped

This type is found on moist rocky canyon bottoms. Species such as canyon live oak, poison oak and hairy honeysuckle indicate rocky conditions, while big-leaf maple and vine maple indicate the moisture associated with the riparian influence. This type is not mapped, however, as the long, narrow strips do not coincide with any soil polygons.

Tanoak-Douglas-fir, moist 20,820 acres

Tanoak-Douglas-fir/salal-rhododendron 2,484 acres

Only the westernmost portion of the watershed supports this association. Salal and rhododendron are always abundant. Dwarf Oregon grape is less abundant.

Tanoak-Douglas-fir/salal-evergreen huckleberry 7,028 acres

This association is found at lower elevations in the western portion of the watershed. It is distinguished by the dominance of salal and huckleberry. Dwarf Oregon grape is less abundant.

Tanoak-Douglas-fir/salal-dwarf Oregon grape 11,308 acres

This association has little or no rhododendron or evergreen huckleberry, and is the most widespread of the wetter tanoak associations.

Tanoak on ultramafics, shrub dominated. 99 acres

Tanoak/manzanita/beargrass 99 acres

This association is found in only one small area. Manzanitas (possibly four species) are abundant in the shrub layer.

Tanoak with white fir and/or Sadler's oak, cool site. 1,477 acres

Tanoak-white fir/dwarf Oregon grape 1,477 acres

This type is relatively uncommon, occurring on north slopes where the tanoak, Douglas-fir and white fir series are nearby. White fir (actually grand fir, in this case) is found consistently, increasing in late-successional sites. Canyon live oak and salal are uncommon to absent.

Douglas-fir Series 52,893 acres

Douglas-fir on ultramafics 3,238 acres

Douglas-fir/huckleberry oak 1,649 acres

Huckleberry oak distinguishes this association. It occurs on the slopes of King Mountain and adjacent areas. Beargrass is prominent in the understory.

Douglas-fir-incense cedar 1,589 acres

This association is highly variable in both canopy cover and species composition. The drier sites are similar in composition to those described in Atzet et al. (1996), having Jeffrey pine, rock fern and fescue. Open areas sometimes include buck brush. Canyon live oak and poison oak are also sometimes present. Cooler, wetter sites at high elevation contained beargrass, pinemat manzanita, dwarf Oregon grape and sometimes rhododendron. These sites are not adequately described by any association in Atzet et al. (1996), but were best grouped with the Douglas-fir-incense cedar association.

Douglas-fir/vine maple/dwarf Oregon grape 697 acres

Douglas-fir/vine maple/dwarf Oregon grape 697 acres

High cover (greater than 10%) of vine maple typified this association. This association is localized to north trending valley bottoms in the eastern portion of the watershed. Soils are moist and deep, with a riparian influence. Some grand fir and western hemlock are often present. Salal and creambush ocean spray are not abundant, unlike nearby associations.

Douglas-fir with salal and/or sword fern, cool 14,378 acres

Douglas-fir/salal-rhododendron 4,294 acres

Only the easternmost portion of the watershed supports this association. Salal and rhododendron are always abundant. Dwarf Oregon grape is less abundant. This association is often developed on ultramafic rocks, in which case canyon live oak is often prevalent.

Douglas-fir/salal-dwarf Oregon grape 9,978 acres

This association is widespread on cool, wet sites east of the tanoak series. Grand fir and tanoak are absent to sparse or localized. Canyon live oak is sometimes present.

Douglas-fir/dwarf Oregon grape/sword fern 106 acres

This association is very close to the previous, being distinguished only by the relative amounts of salal and sword fern. Most occurrences are on small, north-facing coves, and were not mapped. The only large, mappable occurrence is located in an ultramafic area, near King Mountain.

Douglas-fir-canyon live oak, hot and dry 15,391 acres

Douglas-fir-canyon live oak/poison oak 11,649 acres

This association is the most widespread, occurring on rocky, dry sites all across the watershed. Canyon live oak is often abundant, and reaches its greatest stature in this type. Poison oak is often absent from the higher elevation sites, but hairy honeysuckle is more consistently present. Many of these sites are probably not feasible for commercial timber harvest, due to slow growth and problems in regenerating the stands. Well-developed old-growth stands have an open canopy of large Douglas-fir, and a somewhat dense lower canopy of canyon live oak.

Douglas-fir-canyon live oak/dwarf Oregon grape 3,742 acres

Like the previous association, this type is often found on rocky sites. It is wetter, and has dwarf Oregon grape and often sword fern. It is often found on wet, rocky ultramafic sites, or on nearby metavolcanics.

Douglas-fir shrub, moderate temperatures 19,189 acres

Douglas-fir/creambush ocean spray/whipple vine 17,596 acres

This common association is found in the relatively dry portion of the watershed. On valley floors, most of the area has been converted to pasture or other anthropogenic landscapes. Ponderosa pine is sometimes present as a result of historic fires or other disturbance; it does not reproduce in older stands.

Douglas-fir/dry shrub 1,593 acres

The driest south-facing slopes supported this association. Common shrubs included snowberry, poison oak, hairy honeysuckle, and Piper's Oregon grape. Some areas on private lands are currently grasslands ringed with ponderosa pine and Oregon white oak. This state is probably a result of historic fires, along with continued grazing.

Western Hemlock Series 497 acres

Western hemlock-salal 497 acres

Western hemlock/salal-dwarf Oregon grape 348 acres

This association is found in canyon bottoms and north slopes. It is probably the wettest of the plant associations. Grand fir and tanoak are abundant in some stands. Small patches in canyon bottoms are often not mappable, given the scale of mapping used.

Western hemlock-incense cedar/salal 149 acres

Only one area of this association was found, developed on serpentine. The relatively great abundance of incense cedar coincides with the serpentine influence. Species composition is highly variable, with much dwarf Oregon grape and sword fern. Salal and rhododendron are sparse. This site does not fit the description in Atzet et al. (1996) very well, but is grouped with the best-fitting association.

Jeffrey Pine Series 636 acres

Jeffrey pine on grass, low precipitation 478 acres

Jeffrey pine/buck brush/Idaho fescue 478 acres

This association is developed on dry serpentine sites. The canopy is very open, with Jeffrey pine, incense cedar and Douglas-fir. Buck brush and fescue are the most abundant understory cover.

Jeffrey pine with incense cedar and shrubs, low precipitation 159 acres

Jeffrey pine-incense cedar-Douglas-fir 159 acres

This association is less dry than the last. Besides the above trees, madrone, canyon live oak, and California coffeeberry are characteristically present.

White Fir Series 7,653 acres

The white fir series includes areas with both white fir and grand fir; these species are lumped in Atzet et al. (1996). These species grade into one another over a large area. Variation with environment has been reported, with more grand fir characteristics in warmer, wetter environments, and more white fir characteristics in cooler, drier environments (Zobel 1973). Physiological characteristics vary along with morphology (Zobel 1974, 1975). The Oregon firs in this species complex appear to be either grand fir, or grand/white intermediates (Donald Zobel, personal communication). No pure populations of white fir have been recorded in Oregon, although some trees within intermediate populations may not show grand fir characteristics. In Oregon, it is conventional to call intermediate trees "white fir," to distinguish from typical grand fir (Donald Zobel, personal communication).

Within the Middle Cow watershed, most of these trees are grand fir. There are intermediates at higher elevations in the King Mountain area. The bark of most of these intermediates is red inside (a grand fir trait), but some trees have yellow bark, and have stomates (whitish bands) on the leaf upper surfaces; the latter traits are characteristic of white fir. These populations are intermediate in genetic composition.

White fir at high elevations, often with Shasta red fir 474 acres

White fir/beargrass 474 acres

This association occurs at the highest elevations near King Mountain. Beargrass is prominent, as well as dwarf Oregon grape, ocean spray, pinemat manzanita and rhododendron. Shasta red fir is codominant at the very highest elevations, but absent somewhat lower. Firs intermediate in character between grand fir and white fir are present.

White fir with western hemlock, moist sites 4,618 acres

White fir/salal-dwarf Oregon grape 4,618 acres

Valley bottoms, particularly in the Windy Creek drainage, supports this association. Much of the area has been converted to pastures. Tanoak and western hemlock are sometimes found, along with grand fir and Douglas-fir.

White fir on moderately dry sites 2,561 acres

White fir/dwarf Oregon grape/twinflower 772 acres

This association is found in canyon bottoms, apparently on deep alluvial soil, in the Fortune Branch region. Grand fir is the characteristic fir.

White fir/dwarf Oregon grape 483 acres

North-facing slopes at high elevations near King Mountain supports this association. The fir is intermediate in character between grand fir and white fir. The understory is sparse, with dwarf Oregon grape and a number of herbaceous species.

White fir-Douglas-fir/baldhip rose 1,307 acres

This association is the driest of the white fir series, and contains grand fir. Grand fir is codominant with Douglas-fir. The presence of canyon live oak, creambush ocean spray, or madrone distinguishes the association. The Douglas-fir-white fir association is the same in composition. The only difference being relatively more Douglas-fir in old growth stands. As most stands are not in an old growth condition, these two associations could not be readily distinguished. Therefore, some areas mapped as white fir-Douglas-fir/rose may actually be the Douglas-fir-white fir type.

Oregon White Oak Series 95 acres

Oregon white oak-Douglas-fir/poison oak 95 acres

This association occurs in small areas on south-facing slopes at low elevation. Most areas with white oak were classified in conifer series, as white oak is not a major reproducing species in the understory of closed forests. In addition, small groves of oaks on private land were impractical to map. Even the areas mapped under the white oak series may eventually become Douglas-fir series forests with continued fire suppression. Fire may be necessary to preclude conversion to conifer forests.

Shrubfields 60 acres

Manzanita

Manzanita spp. 60 acres

One area supported a shrubfield of manzanita species, buck brush, and huckleberry oak. Some scattered Douglas-fir and white fir are present, but this dry, rocky site does not appear to be able to support a closed forest. The trees that are present are sparsely scattered, stunted and windswept. This area is on the top and the southwest side of Green Mountain. This plant association is not described in Atzet et al. (1996).

Anthropogenic Prairies or Pastures

Valley bottoms and adjacent south slopes were often not forested. The potential natural vegetation was difficult to ascertain, but small, relatively mature groves existed on roadsides. These groves indicate that most of the area is in the grand fir or Douglas-fir series, and the areas were mapped accordingly. These prairies were probably created by Native Americans, using fire, as is documented for the Willamette Valley. The prairies are currently maintained by grazing and other human activity. These areas are used as pastures and rural residential areas. Droughty soils on the slopes, saturated soils in the valley bottoms, and competition from dense grass cover may further inhibit tree establishment. Oregon white oak and ponderosa pine are prominent on the drier edges. Riparian forests of big-leaf maple, alder and ash can occur in the middle of these pastures; these forests are highly variable, and influenced by disturbance.

Some large areas were heavily affected by disturbance; potential natural vegetation was difficult to discern. Intensive clearcutting, site preparation, herbicide use and dense plantations have often affected the understory vegetation. Where the vegetation is early successional, the potential was assumed to be the same as types on similar soils and aspects within the local area. This assumption may lead to errors.

Fire has also greatly affected the vegetation patterns in the watershed. Frequent, low intensity fires were the rule in this area, resulting from both lightning and Native American ignitions. There have been large, stand-replacement fires, most recently in the Stevens Creek and Whitehorse drainages. Effective fire suppression has allowed many areas to develop a higher level of stocking of small Douglas fir, hardwoods or brush. This shift in plant species composition and density in some areas has generated concerns for long term forest health. The high density of small trees and brush may result in increased risk of large, intense fires or widespread disease or insect damage. The extent and locations of these conditions are not well documented, but are known to exist in the Dad's Creek area and elsewhere.

The Medford District RMP (and the Roseburg District RMP) designated several land use allocations for federal lands within the watershed (Map 4, Figure 1 and Table 3). These allocations provide overall management direction and varying levels of resource protection.

Late-successional Reserves are areas designated in the RMP where the major management objective is to maintain or promote late-successional habitat. The eastern third of this watershed is designated as an LSR (the South Umpqua/Galesville LSR). Small portions along the northern edge are part of an LSR that is mostly in the Roseburg District, BLM. In addition, there are 18 spotted owl core areas of 100 acres each.

Connectivity/Diversity blocks are generally square-mile sections in which at least 25-30 percent of each block will be maintained in late-successional conditions. They are designed to promote movement of late-successional species across the landscape and add richness and diversity to the land outside the LSRs. There are portions of 16 Connectivity/Diversity Blocks in this watershed.

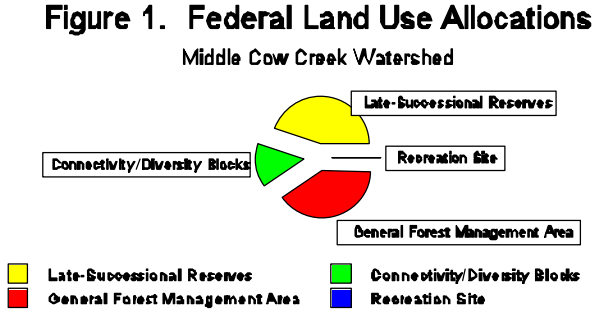
The General Forest Management Area (GFMA) is the allocation where timber harvest is a primary objective. The GFMA and the connectivity/diversity blocks combined make up the "Matrix" lands in the Northwest Forest Plan.

Table 3. Federal Land Use allocations on Public Land, Middle Cow Creek watershed.

Land Use Allocation	Acres	(Percent)
Late-successional Reserves/1	20,366	(45)
Connectivity/Diversity Blocks	6,679	(15)
General Forest Mgmt. Area/2	18,392	(40)
Recreation Site	30	0
Total	45,510	(100)

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

Figure 1. Federal Land Use Allocations



Within the General Forest Management Area lands there are 1,124 acres (5 percent) which have been withdrawn from intensive timber harvest. The majority of these acres were withdrawn due to rocky soils which preclude successful replanting.

In addition to these land allocations, there are also several other important designations that occur within the watershed.

There are 27,786 acres within the watershed which have been designated as critical habitat for the northern spotted owl, a federally-listed threatened species. The primary purpose of the critical habitat unit (CHU) is to help provide east-west dispersal of owls between the Klamath and Coast Range provinces and the Cascade Mountain province.

All fish-bearing streams in the watershed have been designated as Critical Habitat for the Umpqua cutthroat trout and the Oregon Coast Coho salmon, which have been federally listed as Endangered and Threatened, respectively.

III. Issues and Key Questions

The Federal Guide to Watershed Analysis calls for focusing analyses on Key Questions for each of the major issues in a watershed. This section documents the Key Questions the watershed analysis team used in preparing the document.

Issue 1. Fish/Aquatic Habitat/Streams

1. What is the current distribution of habitat for Special Status fish species in the watershed? How would the presence and maintenance of these species and their habitats affect management activities? How would future management activities affect the presence of these species and their habitats?

2. Are present land allocations contributing significantly to the viability of habitats for aquatic species now and will they in the future?

3. What is the present quality of aquatic habitat within the watershed? Where is the best habitat and where are the greatest opportunities for improvement?

4. How does the presence of roads, drainage structures and their condition affect the quality of riparian and aquatic habitat?

5. What are the sources of sedimentation?

6. Have past management practices and changes in watershed vegetation affected the timing and quantity of peak flows and thus affected aquatic plant and animal communities?

7. Are there natural or human-caused barriers to movement of aquatic species? If so, what are the effects?

8. Are riparian zones in the watershed functioning at their hydrologic and biological potential for the benefit of aquatic ecosystems?

9. What are the current conditions of riparian zones? Are there opportunities to improve riparian habitat and where?

10. What are the effects of mining, agricultural activities and rural urbanization on riparian and aquatic habitat and water quality?

11. What is the current status of water quality and quantity in the watershed? How have activities on private and public lands altered stream flows and water quality? How are the current conditions related to Oregon Department of Environmental Quality (DEQ) water quality-limited streams?

12. How are the timing and quantity of runoff affected by compaction (from roads, skid trails and landings) and by other management activities?

13. How do roads, drainage structures and their distribution/condition affect water quality and quantity?

14. How do the aquatic conservation strategy objectives (NFP p. B-11) relate to this watershed?

Issue 2. Late-successional Habitat/Sensitive Species

1. What has been the role of fire and other natural processes in the development and maintenance of terrestrial biological diversity (plant and animal)?

2. What has been the effect of resource management on private and government lands on the diversity, quantity, and quality of wildlife habitats and on stand condition? How do existing roads and their condition affect the quality of wildlife habitat and connectivity between habitat blocks?

3. Are there any unique habitat features (cliffs, high elevation meadows, wetlands, etc.) within the watershed? How do they contribute to biological diversity in the watershed/region?

4. Are the amounts, distribution, and spatial arrangements of habitats adequate to maintain sufficient wildlife and plant dispersal? How are these patterns likely to change in the future? What are the connectivity characteristics within this watershed and between watersheds?

5. How will management activities on both private and public lands affect the spread and control of noxious weeds and other nonnative wildlife and plant species?

6. What is the current distribution of habitat and of Threatened or Endangered, Survey and Manage, or Special Status species in the watershed? How would the presence and maintenance of these species and their habitats affect management activities? How would future management activities affect the presence of these species and their habitats?

7. Are the current conditions of lands within the various allocations (Connectivity/Diversity blocks, LSR, 100-acre core areas, Riparian Reserves, etc.) adequate in contributing to the viability of wildlife habitats in the short-term? In the long-term?

8. What is the condition of the riparian zones and their effects on wildlife habitats in the watershed?

Issue 3. Commodity Production

1. What are the natural vegetation types in the watershed and how do they affect management?

2. What are the effects of measures to maintain biological diversity (such as retention of green trees within timber harvest units, Survey and Manage Species, Riparian Reserves, 15% late successional habitat retention on federal lands in the watershed, etc.) on timber production and the harvest of Special Forest Products (SFPs)?

3. What is the effect of the current age class distribution on private and public lands on BLM management practices? What age class distributions are likely in the future?

4. Can harvest of SFPs within the watershed be maintained at a sustainable level where desirable?

5. What local direct and indirect economic opportunities could arise from BLM management in the watershed? Examples.

6. What factors such as site productivity, compaction, nutrient concerns, forest health, in the watershed affect production?

Issue 4. Rural Interface

1. Are rural interface areas (RIA) adequately identified? What factors contribute to management concerns?

2. How does public and private land management affect recreation use and the demand for activities such as hunting, fishing, biking, and viewing?

3. How will BLM management affect Visual Resources?

4. How will BLM management incorporate/mitigate concerns of people in the Rural Interface?

5. What opportunities exist for partnership agreements with local landowners?

6. Is there an increased hazard of fire to homes and property due to increased fuel loading that is the result of fire exclusion, seral succession, and untreated slash from management of public and private lands?

7. What is the role of fuel management techniques in meeting management objectives such as site preparation, control of competing vegetation and reducing the fuel hazard in the watershed and especially in the RIA?

Issue 5. Non-federal lands

1. How do private and state lands affect BLM timber harvest?

2. How do non-federal land ownership patterns affect other resources such as fish, wildlife, water quality and vegetation?

3. What are the likely forest management practices on private industrial and non-industrial forest lands in the watershed?

4. What are the opportunities for cooperative agreements in the watershed?

IV. Current Conditions, Reference Conditions and Interpretations

This section combines steps 3, 4 and 5 in the Federal Guide. The purposes of this section are to:

< develop information relevant to the issues and key questions that is more detailed than the information in the Characterization section.
< document the current range, distribution and condition of the Key Issues and other relevant ecosystem elements
< explain how ecological conditions have changed over time as the result of human influence and natural disturbances
< compare existing and reference conditions of specific ecosystem elements
< explain significant differences, similarities, or trends and their causes, and
< identify the capability of the system to achieve key management plan objectives.

Issue 1. Fish/Aquatic Habitat/Streams

Water Quality

The Oregon Department of Environmental Quality (DEQ) designates beneficial uses of all tributaries of the Umpqua River Basin. This includes both North and South Forks of the Umpqua River. Cow Creek is tributary to the South Umpqua. The following have been designated beneficial uses for the Cow Creek System:

- Private domestic water supply,
- Public domestic water supply,
- Industrial water supply,
- Irrigation,
- Livestock watering,
- Anadromous fish passage, rearing, and spawning,
- Resident fish and aquatic life,
- Wildlife and Hunting,
- Fishing,
- Boating,
- Water contact recreation, and
- Hydro power (Oregon Administrative Rules Chapter 340, Division 41).

In this analysis these beneficial uses apply to the Middle Cow Creek basin.

The Clean Water Act of 1977, as amended by the Water Quality Act of 1987 provide 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 Middle Cow Creek Basin has resulted in 303d listings for 94.6 miles of streams which have failed to meet established criteria for one or more beneficial uses (Map 5 and Table 4).

Table 4. Water quality limited streams in the Middle Cow Creek watershed.

Stream	Water Quality Parameter
Whitehorse Creek	Habitat modification
Windy Creek	Temperature, and Habitat Modification
Dad's Creek	Temperature
Fortune Branch	Temperature
Quines Creek	Temperature
Riffle Creek	Temperature
Skull Creek	Temperature
Woodford Creek	Temperature
Cow Creek (W. Fk. Cow up to Quines Cr)	Temperature
Note: Cow Creek below West Fork Cow Creek is also limited by Temperature, Habitat Modification and pH. This stream reach is outside the Middle Cow Creek watershed.	

Streams listed for temperature do not meet the criteria for anadromous fish rearing (temperature exceeds 64 degrees F). This also applies to resident fish and other aquatic life, particularly resident cutthroat trout, which are present in these streams.

Streams listed for habitat modification do not meet the large woody debris and pool frequency criteria for anadromous fish rearing. Stream survey results indicate that a majority of the smaller streams (Order 2-5) in the watershed do not contain the desired amount of large woody debris (for 50% of the stream length, at least four functional key pieces per 100 meters of stream) and/or the desired pool frequency (60% of stream length there should be no more the 5-8 channel widths between pools).

Streams listed for pH exceed the established criteria of a pH maximum standard range of 6.5-8.5.

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

-Riparian cover is absent,
-Agricultural practices are adjacent to streams,
-Past salvage logging has occurred within riparian zones,
-Logging has removed shade over streams,
-Wide streams (e.g., main stem Cow Creek) and stream orientation allow for direct solar heating,
-Wide, shallow gravel, bedrock channel,
-Relatively low gradient channels result in longer water retention time, and
-High percentage of roads in or adjacent to riparian zones.

Some other, less important factors contributing to water quality limitations in this watershed include:

-Many of the larger tributaries to Cow Creek are on privately owned land,
-Flow is regulated by Galesville Dam (both positive and negative effects),
-Sewage treatment plant for Glendale,
-Septic tanks and cess pools,
-Diversions for irrigation and pumping,
-Gravel operations,
-Stream channelization.

While the BLM manages 40 percent of the watershed, only 22 percent of the water quality limited streams in the watershed occur on BLM lands (Table 5). Since the major water quality problem in the watershed is high stream temperatures, this discrepancy is an indication that streams on non-federal lands may be warmed up more than the BLM streams. This is probably due to the additional shading retained along BLM streams compared to non-federal streams during logging.

Table 5. Water quality limited stream mileage by ownership category, Middle Cow Creek watershed.

Ownership	Miles	Percent	Trends in Quality
BLM	20.7	22	Improving
State of Oregon	3.8	4	Improving
Local Government	0.4	0	-
Private Timber Industry	32.5	34	Declining or stable
Private - Non-industry	37.2	39	Declining

Total	94.6	100	

In addition, sedimentation is also known to be a major problem for streams in this watershed. However, no standards are set for this parameter, and there is no consensus on how to measure stream sediment levels, so it is not included in these listings. Some sediment data were collected during the stream surveys. However, these were qualitative ratings, so the value of the data is severely limited. The health of aquatic macroinvertebrate communities may be a better indicator of the extent of sedimentation.

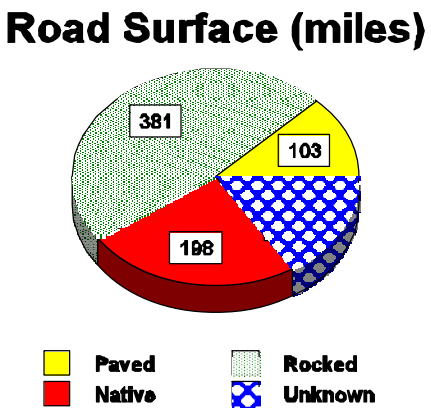
Roads are the primary sediment source to streams in this watershed. There are 811 miles of roads in the watershed (Table 6, Map 6), representing approximately 4,869 acres in roads. There is an average road density of 4.6 miles of road per square mile. The surface classification of 130 miles of roads (16 percent) is currently unknown. Most of these roads are on private timber industry lands and the vast majority are probably native surface. If so, the native surface roads total 228 miles (28 percent). The native surface roads are generally the largest sediment sources, especially if these roads are open to public motor vehicle use. Map 7 indicates the closure status of the roads in the watershed. It is unlikely that private timber industry will be building extensive new road systems in the near future; most of the private lands have already been well roaded.

All sub-watersheds have high road densities and all are far above the two miles of roads per square mile target established by the National Marine Fisheries Service (NMFS) for proper functioning condition. Above 3 miles of roads per square mile is considered not functioning properly. The highest road density is in McCullough Creek watershed, with 5.4 miles of roads per square mile; the lowest road density is in Windy Creek, with 3.5 miles of roads per square mile. Road densities are important in that roads create more rapid runoff and intercept ground water. In essence, each mile of ditched road becomes a first order intermittent stream.

Table 6. Road mileage and road densities in Middle Cow Creek watershed.

Sixth-field Watershed	Square Miles	Native Surface	Rock Surface	Paved Surface	Unclassified Surface	All Roads	Road Density (mi/sec.)
Starveout	34.3	46.8	87.1	10.9	14.5	159.3	4.6
Quines	28.6	25.7	56.6	28.4	24.4	135.1	4.7
Fortune	21.7	18.1	44.1	27.1	16.4	105.7	4.9
Windy	24.5	20.2	39.4	5.7	21.6	86.9	3.5
McCollough	21.7	40.9	46.8	15.8	14.4	117.9	5.4
Dad's	24.6	23.6	53.1	6.3	24.9	107.9	4.4
Riffle	21.3	22.5	53.7	8.4	13.8	98.4	4.6
Totals	176.6	198	380.8	102.6	130	811.2	4.6

Figure 2. Road surface categories, Middle Cow Creek watershed.



Another important factor in determining sediment production is the proximity of roads to streams; a ridge top road usually delivers much less sediment into streams than a road running right next to a stream for a long distance. In this watershed, of the 154 miles of fish streams, 143 miles (93 percent) are within 330 feet of a road; 120 miles (78 percent) are within 165 feet of a road (Table 7). In other words, virtually all the fish streams in the watershed have a road in close proximity, which will provide a continuous source of sediment in most cases.

Table 7. Proximity of roads to streams; Middle Cow Creek watershed.

Ownership	Miles of Road	Miles of Streams	Miles of Fish Streams	Miles of fish stream w/in 165 feet of a road	Miles of fish stream w/in 330 feet of a road	Miles of stream w/in 165 feet of a road
BLM	300	498	45	40	31	236
Non-BLM	511	841	109	103	89	471
Total	811	1,339	154	143	120	707

Analysis of the hydrologic functions in the Middle Cow Creek basin was conducted in 1994. Equivalent clearcut acreage (ECA), transient snow zone openings (TSZ), compaction, and road density values were computed based on existing data. Examination of the figures indicated compaction, high road densities and to some degree transient snow zone openings were above levels that were desirable (Appendix G). Of the 36 sub-watersheds, 25 show high levels of compaction and one (Wood Creek) has a high level of transient snow zone openings; none had high equivalent clearcut area values. Nine sub-watersheds are above the 5-mile/square mile road density value considered important for hydrologic functioning. However, only one sub-watershed (Hogum Creek) had less than the 2 miles/square mile road density considered important by the National Marine Fisheries Service from a fisheries perspective. These conditions could potentially lead to erosion detrimental to fish habitat.

Other erosional processes which could adversely affect fish habitat in this watershed include:

-road building,
-logging activities which create soil disturbance,
-dry ravel from adjacent slopes which fill intermittent channels,
-translational and rotational land slides blocking channels,
-floods, and
-normal road maintenance activities.

Flood plains

Flood plain inundation is controlled by Galesville Reservoir, which restricts the input of large wood and channel migration during flood events and prevents the transport of stream bedload from upper Cow Creek to middle Cow Creek. Channelization by roads will have impacts on disturbance of natural erosion and deposition of gravel both in the stream and on the flood plain.

Almost 100% of the historic flood plains in the Middle Cow Creek analysis area is under private ownership. Most of the flood plain is under agricultural use with the majority being cattle grazing.

Potential Sources of Sedimentation

Map 8 shows areas that are potential sources of some magnitude for sedimentation resulting from erosion. Fortune Branch and upper frontal basins of Middle Cow Creek basin are situated in an area of decomposing ultramafic rock. Surface disturbance by road building and tractor logging as well as natural processes, such as landslides and mantle creep, pose a potential hazard of extreme sedimentation. Other areas such as Marion, Dad's, Whitehorse, Starveout and Quines Creeks are potential sources of sedimentation due to the nature of the soils and logging activities within these drainages.

Current management direction for Riparian Reserves, road building, and road maintenance serves to enhance the protection of the riparian zones as well as unstable areas that could result in sedimentation of fish streams. Best Management Practices (BMPs) established in the RMP were designed for maintaining and restoring the existing aquatic habitat. Current RMP directives will produce properly functioning riparian zones on federal lands in the long term and contribute to better water quality and less sedimentation. But there are already many miles of roads within Riparian Reserves, which will continue to produce sediment into streams until they are decommissioned.

Industrial and private lands, on the other hand, have a very large potential for sediment movement to fisheries streams. The Oregon Forest Practices Act does not protect streams from temperature and sediment increase on private lands as well as the requirements for federal lands do. Division 640 of the Act allows leaving only 30-40 conifers, 8-11" dbh, for every 1,000 feet of fisheries stream, within 20 feet of the stream; non-fisheries streams receive even less protection and shading. The buffer width often varies, however, and there does not appear to be enough of a filter zone to adequately reduce sediment loading. Although protection of soils and other language exists in Division 630 of the Act, observations within this watershed indicate that skid trails and yarding corridors result in damaged stream banks and subsequent erosion.

The practice of grazing within the riparian zone has a potential to contribute sediment also. Soil compaction and loss due to erosion, reduced soil percolation and loss of riparian vegetation all contribute to reduction in summer stream flow, increase in winter runoff and sediment to the stream throughout the year.

Poorly designed waterbars that dam, rather than direct, water are potentially the largest source of sedimentation and erosion occurring in the basin. Unmaintained roads and skid trails are a continual source of erosion leading to sedimentation of salmonid habitat.

Aquatic Habitat

Fish habitat quality is in fair to poor condition throughout the watershed, with a stable or declining trend. Stream condition (Table 9) is based on the riparian seral stage and human disturbance, stream bank stability, influence of roads and other sources of sediments, large woody debris in the stream channel, water diversion and other factors. Activities on land owned by one owner often influence quality of aquatic habitat on lands with other owners, especially on streams third order and larger. In general, first- and second-order streams and associated riparian habitat, which comprise the vast majority of all stream miles in the watershed, are often in better condition than larger fish bearing streams since their watersheds are considerably smaller and their integrity is influenced by activities on fewer ownerships. Stream and riparian habitats in natural (unmanaged) condition are relatively common but limited to unroaded and unharvested first and second order watersheds that are often separated from similar habitats by areas that have been extensively disturbed by logging and road building. Aquatic communities in small watersheds, unaffected by human disturbance, may contain relict populations of species (e.g., mollusks) that once had a wider, more continuous distribution in the watershed. Little is known about aquatic species upstream of fish habitat in the Middle Cow Creek watershed.

Riparian habitat in older forests, which occurs almost exclusively on public lands, provides the greatest structural diversity of all seral stages and potentially supports a great variety of plant and wildlife species. Virtually all known riparian habitat is associated with streams. More than 80 percent of the wildlife species believed to occur in the watershed are dependent upon riparian habitat to varying degrees.

Fish Resources

Distribution and Status

The Middle Cow Creek watershed contains approximately 85 miles of stream habitat for winter steelhead, coho and fall chinook salmon. Resident cutthroat and rainbow trout inhabit about 154 miles (Table 8 , Map 9). Non-game species such as Umpqua dace, Pacific lamprey, sculpin, and redside shiner also inhabit streams in the watershed.

Nearly 80 percent of the anadromous fish habitat is on private lands (Figure 3) and is often potentially the most important because of its lower gradient and unconstrained reaches that allow for high habitat complexity. Unfortunately, these same reaches and associated riparian habitat have been extensively modified by human activities over the years and have lost much of their fish production potential. BLM lands are more important for cutthroat trout because cutthroat prefer habitat upstream of anadromous fish, in smaller, headwater streams.

Figure 3. Miles of fish streams by ownership

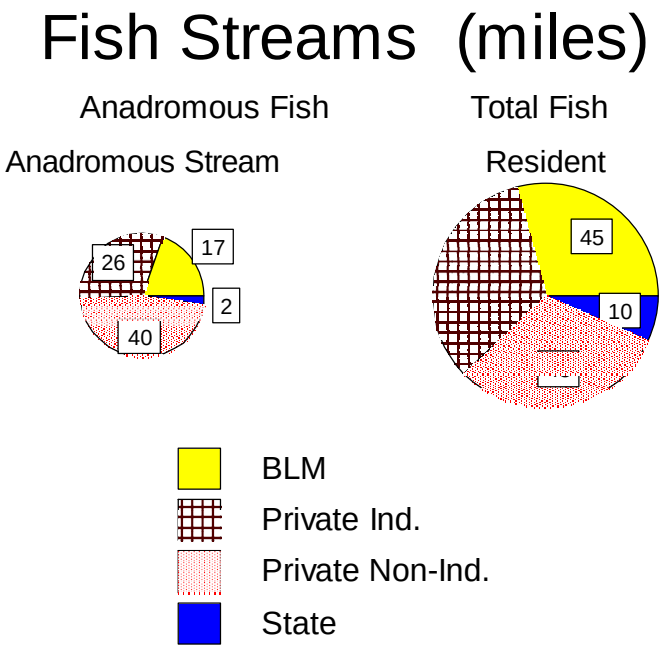


Table 8. Approximate miles of Fish Stream Habitat in the Middle Cow Creek watershed.

STREAM NAME	COHO	CHINOOK	STEELHEAD	RESIDENT TROUT
BATTLE				0.5
BEAR	1.0		1.0	2.4
BONNIE			0.4	5.6
BOULDER				1.1
*BULL RUN	1.9		1.9	2.9
BULL RUN-LITTLE			0.5	1.8
BLACK HORSE				2.1
COW	35.0	15.1	35.0	35.0
DADS	2.6		2.6	5.5
FIZZLEOUT	1.1		1.1	1.6
FORTUNE BRANCH	1.8		3.0	4.5
HOGUM	1.3		1.3	1.7
JONES				0.6
LAWSON	1.4		1.4	2.3
McCOLLUM				1.8
McCULLOUGH	2.0		2.0	5.3
MARION				2.2
MILL				1.4
PANTHER BUTTE				1.7
PERKINS				2.1
*QUINES	5.5		5.5	9.5
*RATTLESNAKE	1.5		2.4	2.8
RIFFLE	2.5		3.2	4.6
RUSSELL				1.6
SECTION				1.9
*SKULL	1.5		1.5	2.7
STARVEOUT	4.8		4.8	6.0
STEVENS				1.4
SUSAN	0.5		0.5	2.5

STREAM NAME	COHO	CHINOOK	STEELHEAD	RESIDENT TROUT
TENNESSEE GULCH	0.1		0.2	0.8
TOTTEN	1.7		1.7	2.9
TULLER				1.9
*WHITEHORSE	2.0		2.0	7.2
WILDCAT			0.6	1.2
*WINDY	7.5		7.5	10.2
WOODFORD				3.3
WOOD	1.5		1.5	5.0

*Streams with stream improvement projects (log and boulder combinations) installed.

No streams in the watershed are stocked with hatchery trout. Recent concerns about the health of anadromous salmonid populations have prompted the Oregon Department of Fish and Wildlife to close all streams to fishing to prevent mortality of juvenile salmon and steelhead. The lone exception is Cow Creek below the Middle Creek bridge, where angling remains open for adult steelhead during winter. The Department stocks 60,000 coho and 60,000 winter steelhead smolts in Cow Creek at the base of Galesville Dam as mitigation for habitat lost from dam completion in 1986.

The number of adult salmon and steelhead that have historically returned each year to spawning streams is unknown. However, anecdotal information from long time residents living on Quines and Fortune Branch Creeks strongly suggests that anadromous fish runs to the Cow Creek basin are currently only a fraction of their historic levels.

Several ponds on private property have been stocked with warm-water game fish which have been found in local streams. Blue-gill, large-mouth bass and small-mouth bass have been reported.

The National Marine Fisheries Service has reviewed the population status of several fish species throughout Western Oregon to determine whether individual stocks warrant listing as Threatened or Endangered under the Endangered Species Act. Current species status in the Middle Cow Creek watershed are:

Umpqua cutthroat trout - Endangered
Oregon Coast coho salmon - Threatened

The National Marine Fisheries Service has designated Critical Habitat for Umpqua River cutthroat

trout and for Oregon coast coho salmon. The designation, which applies only to federal lands or federal actions on private land, includes Cow Creek and all tributaries below natural waterfall barriers. Also included is the adjacent riparian zone, defined as 300 feet horizontal distance from the normal high water mark on each side of the stream channel. Critical Habitat designation has no effect on BLM management because all actions must be consistent with the Aquatic Conservation Strategy of the Northwest Forest Plan. Streams above Galesville Dam are included in the critical habitat designation for the cutthroat trout, but not for the coho salmon.

Habitat Condition

It is believed that degraded conditions on all Cow Creek tributaries are limiting salmonid production, as well as limiting habitat suitability for other native aquatic species. Although there is no historic data for streams in the watershed, it is believed that habitat condition trend for fish-bearing streams is stable at a moderate to low level of productivity. This conclusion is based on current data for stream habitat (Appendix D), information on aquatic insect communities (Appendix E), and summer water temperature data (Table 4). Activities and environmental conditions outside the watershed such as ocean productivity, sport angling, commercial harvest of coho salmon and private and public land management activities downstream of the watershed also greatly influence the number of adult fish returning spawn in this watershed.

Three natural factors may limit stream productivity to a minor extent: isolated pockets of serpentine soils, high water temperatures and low summer flow in tributaries. Serpentine soils, which are less productive than many other soil types, border portions of Whitehorse, Starveout, Quines, Marion, Tuller and Dad's Creeks and may limit the amount and size of wood that enters streams. Maximum summer water temperatures in Cow Creek have probably always exceeded the current DEQ standard because its width, low gradient, and east-west orientation create a condition that allows for maximum absorption of solar radiation throughout the day. In addition, bedrock, which is a major component of the substrate, absorbs heat during the day and radiates it to the stream at night. But natural factors by themselves do not appear to be significantly limiting stream productivity. Rather, habitat problems appear to be the direct result of management activities.

Regulated stream flows from Galesville Dam have considerably improved migration conditions for adult fall chinook and coho salmon in Cow Creek during fall and have stimulated growth of riparian vegetation, especially red alder. Juvenile coho and steelhead rearing in Cow Creek benefit from the dam's multi-outlet structure, which releases 40 cfs of 50F to 60F water to Cow Creek during summer months. These temperatures provide optimum conditions for growth of juvenile salmonids. However, temperatures about 18 miles downstream of the dam, at Glendale, exceed optimum conditions throughout the summer.

Stream channel widths on all Cow Creek tributaries in this watershed appear to be narrow enough for streamside vegetation to provide adequate shade.

Naturally low summer flows readily result in elevated water temperatures when streams are subjected to timber harvest, land clearing and water diversion. Water diversion in lower Starveout, Russell, Windy, Fortune Branch, Quines, Wildcat, Totten and McCullough Creeks during summer limits the amount of habitat available for fish and other aquatic species.

Much of what was once prime salmon and steelhead habitat in low gradient reaches of Cow Creek tributaries (low elevation habitat) is under private ownership and has been dramatically modified by water diversion, land clearing and by timber harvest beginning in the late 1800s. Historically Windy Creek was probably the most productive coho salmon stream in the Middle Cow Creek watershed due its low gradient and abundance of small gravel. Coniferous forests probably bordered the stream, providing an abundance of large woody debris. Beaver dams in this low gradient stream probably provided optimum coho rearing habitat. Beavers, which are very important in coho salmon production, are on the rebound, but often are trapped because of their tendency to plug culverts and interfere with water diversion. Much of the land adjacent to Windy Creek is now farmland with only a narrow band of alder or young conifers bordering most of the stream for the first 4.4 miles above the mouth.

Analysis of fish habitat data for Middle Cow Creek watershed indicates that pool area is less than optimum, as is pool frequency, pool complexity and depth during summer (Appendix D). Large wood, which plays a major role in pool formation, especially in streams less than 5 percent gradient and up to fifth-order magnitude (this includes portions of all fish-bearing streams in the watershed), is an essential component of fish habitat because pools provide resting and hiding cover and refuge from high water velocity. They are especially important for survival of cutthroat trout, juvenile coho salmon and to a lesser extent, juvenile steelhead. Juvenile coho and steelhead remain in small tributaries 1-3 years before emigrating to the ocean as smolts. During this critical time they are susceptible to impacts from land management activities. Resident trout never leave freshwater environments. Large wood also dissipates stream energy, creates complex pool habitat, creates spawning areas by trapping gravel and sieves small organic debris and salmon carcasses from stream flow.

With the exception of portions of Starveout, Bull Run, Dads and Tuller Creeks the number of key pieces of large woody debris (defined as minimum 20 inches diameter by 30 feet long) is extremely limited (Appendix D). The widespread lack of adequate large wood in streams appears to be largely due to an extensive road network in valley bottoms. About 80 percent of all stream miles that provide habitat for fish are within one site potential tree height (roughly 165 feet) of a road (Table 7). Road construction and timber harvest close to streams removes potential sources of large wood for streams and also facilitates salvage of logs that have fallen into streams. Only a very small portion of riparian zones across all ownerships in the watershed is in the late successional stage of development and virtually all of that older habitat is on public lands. Conifer forests in late seral condition provide optimum amounts of large wood for streams. In addition stream cleaning operations occasionally removed large accumulations of logs to correct perceived fish passage problems. In retrospect some projects were appropriate, while others were not.

Historic, as well as some contemporary placer mining activity, has removed large conifers from riparian areas, added large quantities of sediment to streams and has simplified stream habitat. Placer mining has extensively disturbed riparian and aquatic habitats on Whitehorse, Starveout, Quines, Bull Run, Tennessee Gulch, Dads and Skull Creeks, sometimes relocating a stream channel from one side of a valley bottom to the other.

Aquatic macroinvertebrates are sensitive indicators of habitat and water quality changes in forested watersheds and are a major food source for most native fish. Information on species diversity and abundance (Appendix E) indicates that functioning of all fishery streams in the watershed is impaired because of excessive sediment in rock crevices, lack of large wood in the channel, poor riparian condition and elevated water temperatures in some streams. There are a moderate number of sediment-tolerant species in most streams, indicating that sedimentation probably limits aquatic productivity. Erosion from tractor skid trails, as well as from poorly constructed and maintained road systems, has degraded streams throughout the watershed. Cool water taxa are common but they are fewer and less abundant than would be expected in streams with consistently cold water (i.e., <60F). No streams sampled to date in the Middle Cow Creek watershed have high habitat quality. Tennessee Gulch and Windy Creek appear to be in the worst condition, based on samples that have been taken at the mouth of both streams. Data from Dads Creek and Hogum Creek are inconclusive because samples were taken under drought conditions.

Natural barriers block or restrict upstream movement of aquatic species in Bonnie, Dads, Perkins, Rattail, Skull, Susan and Whitehorse Creeks. It is important that these waterfalls not be modified to provide fish passage so that populations of cutthroat trout or amphibians above the barriers are not exposed to levels of competition and predation beyond which they have presumably adapted to over the millennia. Road constructions, and to a lesser extent, water diversion dams, have created numerous barriers to aquatic species. Man-made barriers, primarily culverts (Appendix F), may be preventing genetic interchange and some species from accessing habitats that are necessary for meeting life history requirements. They will also prevent recolonization of areas if subpopulations are extirpated through human-caused or natural events.

Because of the checkerboard ownership pattern, and because 64 percent of all fish habitat occurs on private lands, significant improvement in the quality of stream habitat is unlikely until logging practices and road management on private lands are implemented in a manner that meets Aquatic Conservation Strategy objectives. Sediment and temperature problems originating on private lands will continue to affect steam habitat quality on public lands downstream. Quality riparian habitats on federal lands will be maintained and degraded areas will recover under standards and guidelines of the NFP.

Table 9 describes the general condition of habitat in each fish-bearing stream, along with perceived causes for degraded habitat. Detailed information on the status of key components of fish habitat is contained in Resource Area files.

Table 9. Fish Habitat Condition in the Middle Cow Creek watershed

Stream	Condition[1]	Human-related Factors Negatively Affecting Stream Productivity[2]
Cow	F	R,L,T
Russell	F	T, R
Whitehorse	F	T, M, R
Black Horse	F	T, R
Starveout	F	T, M, R, L
Boulder	F	T
Hogum	F	T
Fizzleout	F	T, R
Booth Gulch	F	T, L, W
Wildcat	P	T, W, R, L
Quines	F	T, W, M, A, R, L
Tennessee	P	T, M
Bull Run	F	T, L, W, R, M
McCollum	P	L, W
Woodford	F	T, L, W
Fortune Branch	F	T, L, W, R
Windy	P	T, L, I, W, R
Bear	F	T
Lawson	F	T, L
Wood	F	T, L
Mill	F	T, W, L
Section	F	T, W, L
McCullough	F	T, L, W, R
Totten	F	T, L, W, R
Rattlesnake	F	T, R
Stevens	F	T, L, R
Perkins	F	T, R
Panther Butte	F	T, W
Tuller	F	T
Marion	F	T
Battle	F	T
Dads	F	T, M, R
Rattail	F	T, M
Skull	F	T, M, R

Stream	Condition[1]	Human-related Factors Negatively Affecting Stream Productivity[2]
Riffle	F	T, R
Bonnie	F	T, R
Susan	P	T, R

[1] G = Good, P = Poor, F = Fair, U = Unknown

[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
L = Land has been cleared for home sites or agricultural use
I = Industrial discharges
R = Road location
W = Water diversion

Current Monitoring Efforts

The Resource Area fisheries biologist has established index areas to monitor annual spawning activity of winter steelhead and coho salmon in Whitehorse, Hogum, Bull Run, Skull and Riffle Creeks. ODFW and volunteers monitor spawning escapement in Cow, Rattlesnake, Stevens, Windy, Lawson and Quines Creeks. Counts of redds (i.e., areas where fish have spawned) and adult fish over a long time period (minimum of 6 life cycles for a species) can provide an indication of whether the number of adult fish returning to spawn is increasing or decreasing. Although spawning surveys for anadromous fish are an important component of a watershed monitoring program, they are not as sensitive an indicator of watershed health as resident fish, water quality and aquatic macroinvertebrates.

Monitoring sites using aquatic macroinvertebrates as indicators of habitat quality have been established on all fish-bearing streams in the watershed that flow through public land. Sampling to establish baseline information has been conducted since 1991. Additional samples will be collected at 5-10 year intervals to track watershed condition and trend.

Stream temperatures have been monitored since 1993; the program will continue in coordination with Oregon Department of Environmental Quality under the 303d Program.

Issue 2. Late-successional Habitat/Sensitive Species

The major characteristics of the late-successional habitat in the Middle Cow Creek watershed is a function of human logging practices rather than natural processes. The watershed is quite fragmented by clearcuts and small residential tracts. The eastern half is more fragmented and has more variety as a result of the proximity to I-5. Road construction near the main travel route and communities allowed access for timber harvesting much earlier. In the western half, larger blocks of federal ownership left larger amounts of contiguous late seral stages, and therefore an older landscape. In addition to the clearcuts on private and federal lands, there has been considerable partial cutting, especially on BLM lands. In some cases this has resulted in an open overstory and conifers have become established in the understory. But in many areas, the practice resulted in dense brush and hardwood stands under the residual conifer overstory trees.

Logging has altered vegetative communities within the riparian zones of all of the streams. On private industrial lands logging has often occurred down to the edge of the streams, retaining scattered trees less than 8-10" dbh. Early seral herbaceous and shrub species are the dominant vegetative type within these areas. On federally managed lands no-cut riparian buffers have been retained since 1995 on all streams, and on the larger, fish-bearing streams before that. The resulting pattern of buffered and non-buffered areas along each creek has led to broken, poorly connected riparian corridors.

Fire has also greatly affected the vegetation patterns in the watershed. Frequent, low intensity fires were the rule in this area, resulting from both lightning and Native American ignitions. There have been large, stand-replacement fires, most recently in the Stevens Creek and Whitehorse drainages. Effective fire suppression has allowed many areas to develop a higher level of stocking of small Douglas fir, hardwoods or brush. This shift in plant species composition and density in some areas has generated concerns for long term forest health. The high density of small trees and brush may result in large, intense fires or widespread disease or insect damage. The extent and locations of these conditions are not well documented, but are known to exist in the Dad's Creek area and elsewhere.

Current seral stages

Table 10 shows the seral stage distribution within the Middle Cow Creek watershed. Table 11 shows the seral stage distribution on BLM lands in more detail. Locations of seral stages on BLM lands are illustrated on Map 11.

Table 10. Seral stage distribution in the Middle Cow Creek watershed, by ownership.

Age/Structure Class	BLM Acres (Percent)	Estimated Private/State Acres (Percent)	Total Acres (Percent)
Non-forest	626 (1)	100	726
Early Seral (0-20 yrs)	6,914 (15)	24,344	31,258
Mid Seral (21-40 yrs)	4,713 (10)	17,966	22,679
Closed Poles (41-80 yrs)	6,639 (15)	22,426	29,065
Mature (81-200 yrs)	13,355 (29)	2,641	15,996
Old Growth (200+yrs)	8,651 (19)	0	8,651
Modified Older Stands (81+ yrs)	4,612 (10)	0	4,612
Total	45,510 (99)	67,513	113,023

Table 11. Acres of seral stages on BLM lands, by land use allocation, within the Middle Cow Creek watershed.

Age/Structure Class	LSRs	Connectivity/ Diversity Blocks	Recreation Sites	GFMA	Total
Non-forest	400	136	1	89	626
Early Seral (0-20 yrs)	3,437	777	0	2,700	6,914
Mid Seral (21-40 yrs)	2,158	596	0	1,959	4,713
Closed Poles (41-80)	3,170	442	0	3,027	6,639
Mature (81-200)	5,895	2,206	10	5,201	13,355
Old Growth (200+)	2,953	2,264	19	3,415	8,651
Modified Older Stands (81+ yrs)	2,353	258	0	2,001	4,612
Total	20,366	6,679	30	18,392	45,510

Late-successional Habitat

This is a key issue because of the considerable controversy and planning emphasis given it in the Northwest Forest Plan and the Medford District Resource Management Plan.

In this watershed, late-successional forest habitat generally includes all forest stands more than 80 years old, including mature and old growth seral stages. Some stands have been partial cut, or are naturally open-grown, so that the canopy is too open to provide typical late-successional habitat characteristics; these are called "Older Modified" stands and are not considered late-successional habitat.

Acreage and Fragmentation

In this watershed, there are 22,000 acres of late-successional habitat (Map 12, Table 11). This represents 19 percent of the entire watershed; 49 percent of the federal forest land. Late-successional habitat includes mature stands (80-200 years old) and old growth (200+ years old). Modified older stands, most old partial cuts were not included in the acreage. Of the 22,000 acres of late-successional habitat, 8,651 acres (39 percent) is considered old growth. This is important because while some late-successional species do well in mature stands, optimum conditions for most of these species occur in older stands. There are few late-successional stands on non-federal lands, although there are some in the north-central portion of the watershed.

The late-successional stands are highly fragmented and often isolated from other stands because of the checkerboard pattern of federal land ownership and past logging (Map 12). The largest patches of late-successional habitat occur in the western portion of the watershed (Riffle, Bonnie, Skull, Sled and Dad's Creeks) and in the southeastern corner of the watershed (north slope of King Mountain and Quartz Mill Peak, Quines Creek). In most of the rest of the watershed, late-successional habitat occurs in small, scattered patches. There are few patches larger than 500 acres and only about 7 patches larger than 1,000 acres.

The eastern third of the watershed is covered by a large LSR (the South Umpqua/Galesville LSR) for which an Assessment has been prepared and was submitted to the Regional Ecosystem Office (REO) in 1999. This assessment documents and analyzes late-successional habitat issues in the LSR. It is important to note that 45 percent of the LSR is in younger seral stages (less than 80 years old) and another 12 percent is in modified older stands which may provide only marginal habitat for late-successional species. The LSRs were designed to provide a reserve of late-successional forest habitat. But it will be several decades before they are fully functional in that capacity, even without major habitat loss from wildfires, wind or other causes.

The Northwest Forest Plan calls for retaining late-successional patches in watersheds where less than 15 percent of the federal forest land remains in late-successional conditions (ROD pp. C-44,45). The Middle Cow Creek watershed is well above this threshold now (48 percent) but future logging will remove much of this habitat on General Forest Management Area lands.

There are currently 13,248 acres of late-successional habitat within established reserves, representing 29 percent of the federal forest lands. Reserves include the large LSRs, 100 acre core areas, Riparian Reserve (Map 13), TPCC withdrawn lands and recreation sites. This indicates that even if all the GFMA lands were logged, there would still be more than the required 15 percent of the federal forest lands in the watershed in a late-successional habitat condition. For this reason, the 15 percent late-successional stands were not specifically mapped as part of this watershed analysis process.

One question concerns the future development and condition of existing late-successional stands. In this watershed most older stands are 200-275 years old. Very few are older than 400 years. There is considerable uncertainty whether these stands will maintain themselves in a late-successional conifer forest habitat condition in the long term, or whether the older conifers will gradually die out, leaving a stand dominated by hardwoods and brush. The roles of site productivity and light ground fires in this successional process are also uncertain.

Distribution and Connectivity

Late-successional habitat in the Middle Cow Creek watershed is concentrated in the eastern and western thirds of the watershed (Map 12). The center of the watershed has more private lands and these lands are dominated by more agricultural and residential areas than are the east and west ends of the watershed. The center also has the towns of Glendale and Azalea, Interstate 5 and is dominated by the wide, flood plain valley bottom of Cow Creek. These conditions create a barrier to east-west movement of species associated with late-successional habitat.

This watershed is located in a key area in western Oregon for east-west connectivity between the Cascades province and the Coast and Klamath provinces. There are major physiographic and vegetative barriers both north and south, caused by the major western Oregon interior valleys. Providing for east-west connectivity should be a major consideration for management plans in this watershed.

Map 12 illustrates how this watershed is situated in relation to adjacent Late-successional Reserves. Similar to the discussion about connecting provinces, Middle Cow Creek plays a key role in connecting three LSRs, again largely providing east-west connections.

At a smaller scale, connectivity within the watershed is also problematic. The checkerboard ownership pattern often allows for connectivity only at section corners and these do not usually correspond with riparian zones or other natural habitat connections. The small, isolated BLM parcels in the center of the watershed in particular are situated where long term connectivity will always be a problem, since private lands around them will continue to be managed on short rotations.

Connectivity/Diversity Blocks

There are 16 Connectivity/Diversity Blocks at least partially within the watershed (Map 4). The Northwest Forest Plan and the RMP designated these sections to provide islands of late-successional habitat to improve connectivity between Late-successional Reserves. Management direction for these Connectivity Blocks calls for maintaining at least 25-30 percent of the block in late-successional condition and retaining 18-25 trees per acre in regeneration harvests.

Table 12 summarizes the current seral stage distribution of the Connectivity Blocks. Virtually all of the blocks have enough late-successional habitat currently within reserves to meet the minimum management guidelines of 25-30 percent. The only exception is T 32S, R 5W, sec. 33. More than half this section is included in the large LSR, the other portion is designated as a Connectivity Block and this part of the section only has five acres (2 percent) in late-successional habitat. The other Connectivity Blocks in the watershed range from 37 percent to 98 percent in late-successional condition.

Four sections occur in a "cluster" in the Dad's Creek watershed (Map 4) and two others occur as part of another four-section cluster which extends outside the watershed into West Fork Cow Creek. Both these clusters of Connectivity Blocks occur in the western portion of the watershed where late-successional habitat is still the most abundant and contiguous. The other Connectivity Blocks occur singly, in the more fragmented part of the watershed. There may be a higher value in the clustered blocks, where future habitat will be located in closer proximity to other blocks, allowing for continued recolonization and genetic interchange. The more isolated blocks definitely have a value for many species, but it is much less likely they will be recolonized by many plants and animal species with low mobility.

Table 12. Preliminary Assessment of Connectivity Blocks in the Middle Cow Creek watershed Glendale Resource Area

C/D Block Legal	Total Federal Acres	Acres by Vegetation Classification						Acres Capable of LS Habitat	Percent of Fed. Land in LS	Acres in Reserves		LS Habitat within Reserves	
		Non Forest	0-40 years	41-80 years	81-200 years	200+ years	Modified (80+ yrs.)				%*		%*
32-5-3	639		360	44	235			639	37%	274	43%	88	14%
32-5-33	223	23	8	55	5		133	200	2%	114	51%	0	0%
32-6-1	594		6	103	485			594	82%	219	37%	190	32%
32-6-3	385		190	14		166	14	385	43%	243	63%	104	27%
32-6-5	629		235		19	375		629	63%	332	53%	199	32%
32-6-6	40			25	15			40	37%	16	40%	8	21%
32-6-21	508	9	89		25	386		499	81%	188	37%	154	30%
32-7-15	626		175		339		112	626	54%	413	66%	187	30%
32-7-21	624		244		225	138	17	624	58%	343	55%	196	31%
32-7-23	610	37		76		496		572	81%	199	33%	161	26%
32-7-27	429	56			374			374	87%	256	60%	217	50%
32-7-31	620			83	224	313		620	87%	298	48%	266	43%
32-8-11	606		100	97		336	73	606	55%	327	54%	142	23%
32-8-13	602	13	134		184	271		589	76%	185	31%	147	24%
32-8-14	228	6				222		222	98%	59	26%	59	26%
32-8-15	600		75		221	178	126	600	67%	392	65%	268	45%
32-8-23	614		139	23	39	414		614	74%	238	39%	153	25%
33-6-1-	601	44	190	15	342	11		557	59%	268	45%	155	26%
33-7-1	492		85	106	301			492	61%	202	41%	78	16%
33-7-15	617		7	65	421	124		617	88%	274	44%	263	43%

*Percentage of Federal Land within the Section
Note: Acreage for non-forest and other Vegetation Classifications do include road acres. Approximately 2% of acres are in roads.

Special Status and Survey and Manage Species

Special status species include

- federally designated Threatened, Endangered and Candidate species which are listed under the Endangered Species Act
- Species of Concern, which were formerly listed as Candidate species
- Bureau Sensitive species
- Bureau Assessment species
- species identified by the state of Oregon to merit special attention.

Survey and Manage Species are those which were identified in the Northwest Forest Plan and the RMP as needing special consideration because of their association with late-successional forest habitat.

Table 13 lists the wildlife species in these categories and their status in the watershed. Table 15 summarizes the plant species. Some of the species which have greater impacts on management activities are discussed in greater detail in this section.

Table 13. Special Status and Survey and Manage Species (wildlife) within the Middle Cow watershed.

Species	Status	Presence/ Inventory	Habitat	Monitoring
Peregrine Falcon	FE,ST	S/N	U	N
Bald Eagle	FT, ST	D/2	N	N
Northern Spotted Owl	FT, ST	D/4	Y	Y
Marbled Murrelet	FT, ST	U/3	N	N
Umpqua Cutthroat Trout	FE	D/4	Y	Y
Northern Goshawk	FC, AS, SC	D/2	Y	N
Coho Salmon	FC,AS, SC	D/3	Y	Y
Steelhead trout(Winter run)	AS	D/3	Y	Y
Great Gray Owl	PB,AS, SV	U/N	U	N
Del Norte Salamander	SM,SoC,SV	D/3	Y	N
Blue-grey tail-dropper slug (*Prophysaon coeruleum*)	SM	D	Y	N
Papillose tail-dropper slug (*Prophysaon dubium*)	SM	D	Y	N
Chace sideband snail (*Monadenia chaceana*)	SM	S	Y	N
Oregon Megomphix snail (*Megomphix hemphilli*)	SM	S	Y	N
Oregon Shoulderband snail (*Helminthoglypta hertleini*)	SM	S	Y	N
Western Pond Turtle	SC	D/3	Y	N
Cascades Frog	SoC,AS,SC	U/N	N	N
Mtn. Yellow-legged frog	SoC, SU	U/N	N	N
Red-legged Frog	SoC, SU	U/N	U	N
Mountain Quail	SoC	D/3	Y	N

Species	Status	Presence/ Inventory	Habitat	Monitoring
Townsend's Big-eared Bat	SoC, SC	S/3	Y	U
White-footed Vole	SoC, SP	U/N	U	U
Fisher	SoC, AS, SC	U/N	U	U
Fringed Myotis	BS, SV	U/N	U	U

Status:
FE - Federal Endangered
FT - Federal Threatened
FP - Federal Proposed
FC - Federal Candidate
SoC - Species of Concern
SM- Survey and Manage
PB - Protection Buffer
BS - Bureau Sensitive
AS - Assessment Species (BLM)
SE - State Endangered
ST - State Threatened
SC - State Critical
SV - State Vulnerable
SP - State Peripheral or Naturally Rare

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

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

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

Monitoring:
N - None planned or completed
U - More information needed to monitor
NA - Not Applicable
Y - Currently being monitored

Spotted owls

There are approximately 26,000 acres of suitable spotted owl habitat in the Middle Cow Creek watershed. The amounts and distribution patterns parallel those discussed for late-successional habitat.

There are 35 active spotted owl sites within the Middle Cow Creek watershed. Of these, 18 have 100-acre core areas designated under the RMP. There are 14 sites within the LSR. The others are either new sites which do not receive a 100-acre core area designation, or are historic sites but were not considered active when the designations were made. The sites are distributed fairly evenly across the watershed, with notable gaps around Glendale and along the valley where Interstate-5 is located.

Many of the owl sites are below the minimum levels of habitat required before "Take" occurs as defined by the Endangered Species Act (i.e. less than 40 percent of the area within 1.3 miles of the center of activity is suitable habitat). The stability and productivity of the owl sites in this watershed varies considerably. Generally, sites in the center of the watershed, where the habitat is more fragmented, have been less stable and less productive than sites in the eastern and western portions of the watershed.

There are parts of four spotted owl Critical Habitat Units (CHU) in the watershed (Map 14) although one (OR-65) barely touches the southwest corner of the watershed. Table 14 summarizes the acreage included in these CHUs. Most of the CHUs are centered on large LSRs; but OR-64 is an exception in that it is placed over General Forest Management Area lands.

The primary function of most of the CHUs is to maintain the range-wide distribution of the northern spotted owl since this area provides an integral portion of the link from the Klamath Mountains province to the southern end of the Oregon Coast Ranges province. Management activities within the CHU need to ensure that its function is not impaired.

With the implementation of the President's Forest Plan and Medford District RMP, LSRs, Marbled Murrelet Reserves, and Riparian Reserves could supplement the CHU in providing this important provincial link. The original function of the CHUs should continue in the future despite timber harvest because so much of it is protected as marbled murrelet reserves, and Riparian Reserves. If management activities within the CHU are designed such that the designated reserves can sustain the function of the CHUs, despite a degradation of spotted owl habitat within the CHUs themselves, then these actions would not adversely modify spotted owl critical habitat or jeopardize the existence of this subspecies. Future management actions which may affect critical habitat or a listed species would need U.S. Fish and Wildlife Service concurrence through the consultation process under the Endangered Species Act.

The primary function of OR-64, however, was originally to provide more opportunities for viable owl sites, rather than provide movement and dispersal of owls across the landscape. Exactly how this emphasis will affect timber harvest and other management activities is uncertain, although it is likely the impacts on individual owl sites will be a larger concern than within other CHUs.

Table 14. Spotted Owl Critical Habitat within the Middle Cow Creek watershed.

CHU	Total Federal Acres	Suitable Spotted Owl habitat	Percent CHU in LSR	Federal Acres within watershed
OR-32 (E)	71,265	35,653	64	20,252
OR-62 (N)	49,562	27,470	75	5,271
OR-64 (S)	5,531	3,833	0	1,910
OR-65 (SW)	86,322	55,578	65	353

Marbled murrelets

There are 9,461 acres of marbled murrelet habitat on this watershed unit. Marbled murrelet habitat is defined to occur within 50 miles from the coast. The 50 mile line is located approximately through the center of the watershed, near the town of Glendale; the closest point of the watershed to the coast is about 37 miles. The distribution and fragmentation patterns of murrelet habitat are similar to those described for late-successional habitat.

Surveys have been conducted since 1992 and have failed to document any murrelets using this watershed. An analysis done by the Siskiyou National Forest provides strong support for the contention that in this part of southern Oregon, murrelets do not fly inland beyond the first major coastal ridge, about 12 miles from the coast (Dillingham, et. al. 1995; Witt, 1998). This boundary is the limit of the coastal fog belt and the eastern edge of the Douglas-fir/hemlock community.

If this hypothesis is correct, the Middle Cow Creek watershed should be considered outside the range of the marbled murrelet. In this case, the watershed would not play a part in the maintenance or recovery of this threatened species.

Del Norte salamanders

Del Norte salamanders were designated as a protection buffer species in the NFP. Known sites become Managed Late-successional Areas, a distinct land use allocation under the NFP. This species is associated with rocky, slopes which provide adequate canopy cover to retain sufficient moisture to support the species. Del Norte salamanders primarily occur in stands with greater than 62 percent canopy cover (Survey and Manage Amphibian Subgroup 1995). Small pockets of talus habitat are patchily distributed across the watershed. Because this species requires habitat characteristics which occur in disjunct patches, the species is susceptible to activities that degrade or destroy the suitability of those patches. Salamanders are susceptible to micro-climatic changes, particularly temperature and relative humidity. As timber harvest progresses in the watershed, this species will need to rely on isolated talus patches connected by riparian reserves for gene pool exchange and population viability.

Del Norte salamanders have been documented in the watershed, in Bonnie Creek and Dad's Creek in the western portion of the watershed. These sightings represent an extension of the species' known distribution and may be near the northern and eastern limits of this species' range. Extensive surveys were conducted in Lawson Creek, in the north-central part of the watershed, and none was found. It is likely they do not occur in the central and eastern parts of this watershed, but the exact limit of their distribution is uncertain.

Red tree voles

Surveys have documented red tree voles in most areas of the watershed. Red tree voles generally occur in forested stands older than 40 years old. Currently there are 21,123 acres of forest considered to be suitable habitat on federal lands in the watershed, which represents 46 percent of federal lands. However, the large areas of young stands in the central part of the watershed may be a significant dispersal barrier for this species

Molluscs (terrestrial and aquatic)

Two species of slugs, which have been designated as Survey and Manage species are known to occur within the Middle Cow Creek watershed (blue-grey tail dropper and papillose tail-dropper). These species have been found to be widely distributed in southwest Oregon and have been discovered in relatively large numbers since surveys began in 1997. As of October, 1999 there are 933 known locations of the blue-grey tail dropper in the Glendale Resource Area and 152 locations in the Middle Cow Creek watershed. Fewer papillose tail-droppers have been found, with 235 locations in the Glendale Resource Area and 80 locations in the watershed. There are several potential reasons for the smaller number of papillose locations. Surveys have been done on stands being proposed for timber sales, which may be more suitable habitat for blue-grey tail-droppers. Early surveys in 1997-98 keyed in on blue-grey tail-droppers; papillose were included in more recent surveys. The papillose may be more difficult to locate. Or, they may simply be less abundant. More information is needed to better determine relative population levels.

Locations for both of these species are concentrated in the western half of the watershed because that is where timber sale clearance surveys have been conducted. These species have been located in all areas where surveys have been conducted.

Three other Survey and Manage mollusc species are suspected to occur in the watershed: the Oregon shoulderband snail, the Oregon megomphix snail and the Chace sideband snail.

The Oregon shoulderband snail often occupies very dry, open, scrubby vegetation with rocky areas nearby, but is not dependent on that habitat. The other four mollusc species occupy moist conifer and conifer/hardwood forest habitats. Little is known about the habitat relationships of these mollusc species.

Some specimens of Oregon tight coil (*Pristiloma arcticum*) have been found in the watershed, but to date these specimens have not been identified as the subspecies listed as a Survey and Manage species (*Pristiloma arcticum crateris)* It is unlikely that the tiny snails found in the watershed are the Survey and Manage subspecies since this watershed is outside the suspected range of the *crateris* subspecies. However, identification is extremely difficult and it will be some time before identification is confirmed.

There are no Survey and Manage aquatic mollusc species known or suspected to occur within the watershed.

Northern goshawks

The Middle Cow Creek watershed is on the edge of the known distribution for northern goshawks (ODFW 1992, Breeding Bird Survey data). They generally do not breed west of the Cascades and north of Josephine County. There have been several sightings, but breeding has been confirmed at only one site (a juvenile was observed in McCullough Creek in 1995). It is likely they nest within the watershed only in very low numbers.

Great grey owls

Great grey owls are generally associated with open grassy meadows, where they forage, with adjacent older forest for nesting habitat. Meadow habitat is extremely limited in this watershed. There are a few small meadows and open rock outcrops. It is possible this species could breed near the valleys where agricultural fields and pasture may provide some foraging habitat.

There are no confirmed great grey owl sightings within the watershed. Since this species will respond to spotted owl calls, and there have been extensive spotted owl surveys, it is likely this species does not occur, or is very rare in the watershed.

Plants

Eleven special status plant species have been found at 26 sites within the Middle Cow Creek watershed (Table 15). These sites are generally small, most covering only a few acres. More sites undoubtedly occur, and will be found with continued surveys. Protection is currently required for the Bureau Sensitive and Assessment species, and the Survey and Manage strategy 2 species. The other categories are currently tracked only for review purposes.

Two other survey and manage species, the fungi *Hydnum umbilicatum* and *Cantharellus tubaeformis*, have been found sparsely scattered over a wide area in the watershed. They are mostly found in mature and old-growth forests. These species are listed as strategy 4, and don't require surveys or protective mitigation measures.

Table 15. Special Status, and Survey and Manage Plants in the Middle Cow watershed

Species	Common Name	Status	Plant Association Group	Habitat	No. of Sightings
Allium bolanderi var. mirabile ALBOM.	Potato-bulb bolander's onion	Bureau Watch	Tanoak, w/Douglas fir, dry	Rocky clay soils, including serpentine; forest openings.	1
Allotropa virgata ALVI2.	Sugar stick	Survey and Manage, Strategy 2	Tanoak, w/Douglas fir, moist; Tanoak, w/Douglas fir, dry; Douglas fir with salal	Coniferous forest, old-growth associated.	26
Asarum caudatum var. novum ASCAN.	White-flowered ginger	Bureau Tracking	Tanoak, w/Douglas fir, dry	Coniferous forest.	1
Cimicifuga elata CIEL.	Tall bugbane	Bureau Sensitive	Douglas fir/shrub; Tanoak, w/Douglas fir, dry	Moist areas in coniferous forest.	2
Cypripedium fasciculatum CYFA.	Clustered lady's slipper	Bureau Sensitive, S&M Strategy 2.	Tanoak, w/Douglas fir, dry	Coniferous forest; old-growth associated.	2
Eschscholtzia caespitosa ESCA.	Gold poppy	Bureau Assessment	Tanoak, w/Douglas fir, dry	Dry, open areas; often brushy.	1
Fritillaria glauca FRGL.	Siskiyou fritillary	Bureau Assessment	White fir, high elevation	Dry, open, rocky areas; often serpentine.	1

Species	Common Name	Status	Plant Association Group	Habitat	No. of Sightings
Montia diffusa. MODI3.	Branching montia	Bureau Watch	Douglas fir, canyon live oak; Tanoak, w/Douglas fir, dry	Coniferous forest, often disturbed areas.	3
Nephroma resupinatum. NERE60.	Lichen	S&M Strategy 4	Tanoak, w/Douglas fir, dry	On bark, e.g., lower limbs of tanoak.	1
Peltigera collina. PECO60.	Lichen	S&M Strategy 4	Tanoak, w/Douglas fir, dry	Mossy ground or rock.	1
Sarcosoma mexicana.	Fungus	S&M Strategy 3, Protection buffer.	White fir, dry	Litter and duff, rotting wood.	1
Ulota megalospora ULME	Moss	Protection buffer	Tanoak w/Douglas fir,dry	Bark of tanoak trees >4"dbh	62
Phaeocollybia olivacea PHOL	Fungus	S&M Strategy 3	Tanoak w/Douglas fir,dry	Forest Floor	1
Gymnopilus punctifolius GYPU	Fungus	S&M Strategy 1, 3	Tanoak w/Douglas fir, moist	Large snags and down logs	3
Phaecollybia dissiliens PHDI	Fungus	S&M Strategy 1, 3	Tanoak w/Douglas fir, moist	Forest Floor	2
Buxbaumia viridis BUVI2	Moss	Protection Buffer	Tanoak w/Douglas fir, moist	Well-decayed down logs	5
Otidea leporina OTLE	Fungus	S&M Strategy 3 Protection Buffer	Tanoak w/Douglas fir, moist	Forest Floor	2
Otidea onotica OTON	Fungus	S&M Strategy 3 Protection Buffer	Tanoak w/Douglas fir, moist	Forest Floor	1

Species	Common Name	Status	Plant Association Group	Habitat	No. of Sightings
Ptilidium californicum PTCA	Liverwort	S&M 1,2 Protection Buffer	Tanoak w/Douglas fir, moist	Base of large Douglas-fir	22

Issue 3. Commodity Production

Timber Products

The primary forest product from BLM land in this watershed is large, old-growth timber from unmanaged stands. Some smaller timber is also available from commercial thinnings, but these are much less common. Virtually all of the old growth timber on private lands has been cut; recent harvest has consisted of smaller trees left in previously logged lands, and of second growth stands.

On BLM lands, timber productivity and management is closely tied to natural plant series (see discussion in the Characterization section) and site productivity. The most productive lands occur on deeper soils in the north and east portions of the watershed. Some BLM lands have been administratively withdrawn from timber harvest through the Timber Productivity and Capability Classification (TPCC) based on rocky soils, fragile slopes, high water tables and other factors. There are 1,819 acres of TPCC withdrawn lands included within the General Forest Management Area (GFMA) land allocation; these also overlap Riparian Reserves. Subtracting the TPCC withdrawn lands and the estimated Riparian Reserves, there are an estimated 9,327 acres of GFMA lands available for intensive forest management in the watershed.

Under the RMP, regeneration harvest would not be programmed for stands less than 100 years old and would generally not occur in stands less than 120 years old in the first decade of the plan; before 2005 (RMP p. 189).

Assuming a 100 year rotation age, and with 9,237 acres of General Forest Management Area lands outside reserves, an evenly distributed timber harvest on BLM lands in the watershed would result in approximately 920 acres of regeneration harvest per decade. This is a greatly simplified analysis, since productivity varies greatly between locations, but it is a useful aid in assessing relative timber availability and future projections of impacts.

Currently there are 4,000 acres of GFMA lands in stands younger than 80 years, largely resulting from timber harvest. Intensive logging has occurred on BLM lands in the watershed since the late 1950s (four decades). The hypothetical rate of 920 acres per decade would have resulted in about 3,600 acres cut over that time period, which is relatively close to the observed level of cutting, given the coarse nature of this assessment. Thus, it would appear that the BLM lands in the watershed have not been greatly over-cut, from an acreage control standpoint.

Efforts have been made to distribute the past logging on public lands throughout the watershed. The seral stage map (Map 11) does not indicate any concentration of logging in one portion of the watershed.

BLM does not generate its inventory and its projections of the Allowable Sale Quantity by HUC 5 or HUC 6 watersheds. It is actually calculated by a formula based on BLM lands within a Sustained Yield Unit, which can encompass several HUC 5 watersheds and are located roughly on county boundaries. Acres to be cut may be chosen from anywhere within this large area and not necessarily proportionately from any HUC 5 or HUC 6 within it. There is no requirement to harvest approximately 920 acres each decade from the Middle Cow Creek watershed. It may actually be a much larger or smaller amount in any given decade.

Several timber sales have been sold in this watershed in the last five years (Reuben Overlook, High 5, Pointless Fir, Lost Fortune, McCollum Creek, McLawson and Bonnie and Slyde) resulting in 734 acres of regeneration harvest (Map 16). Several more have been planned over the next five years (Cotton Snake, Papa Cow, Soukow) which could result in 500-700 acres of additional regeneration harvest. This could result in 1,200-1,400 acres regeneration harvested in the current decade; considerably greater than the projected 920 acres of decadal regeneration harvest. So in more recent years, timber harvest has been accelerated at a higher rate than the overall average.

Table 16. Projections of seral stage distribution for BLM GFMA lands outside reserves, assuming a decadal timber harvest of 927 acres. This table does not include harvest in Connectivity Blocks.

YEAR	2000	2020	2040	2060	2080	2100
0-20 yr	1,551	1,847	1,847	1,847	1,847	1,849
21-40 yr	746	1,551	1,847	1,847	1,847	1,847
41-60 yr	810	746	1,551	1,847	1,847	1,847
61-80 yr	811	810	746	1,551	1,847	1,847
81-100 yr	538	811	810	746	1,551	1,847
101-200 yr	2,155	1,663	1,414	1,003	298	0
200+ yr	1,595	1,425	1,022	396	0	0
81-200 yr (MOD)	1,031	384	0	0	0	0

Table 16 compares seral stages on BLM land only against time. Some conclusions from this data include:

- By year 2040, all modified (partially harvested acres) have been harvested. Stands in all the older classes have been reduced to slightly less than half of Year 2000 levels.
- By 2080, only remnants of older classes remain.
- By 2100, an even seral stage distribution will be achieved, with seral stages of 0 - 100

years.

Table 17. Projection of seral stages on public and private lands in Middle Cow Creek watershed assuming a BLM harvest of 920 acres per decade of timber harvest.

YEAR 2000	BLM Lands		Non-federal Lands*	TOTALS	YEAR 2100	BLM Lands		Non-federal Lands*	TOTALS
SERAL STAGE	GFMA IN BASE OUTSIDE RIPARIAN	TOTAL WATER SHED			SERAL STAGE	GFMA IN BASE OUTSIDE RIPARIAN	TOTAL WATER SHED		
0-20 yr	1,551	5,363	24,344	31,258	0-20 yr	1,849	1,000	24,344	27,193
21-40 yr	746	3,967	17,966	22,679	21-40 yr	1,847	1,000	17,966	20,813
41-60 yr	810	2,509	17,966	21,285	41-60 yr	1,847	1,000	17,966	20,813
61-80 yr	811	2,509	4,460	7,780	61-80 yr	1,847	1,000	4,460	7,307
81-100 yr	538	1,772	2,641	4,951	81-100 yr	1,847	1,000	2,641	5,488
101-200 yr	2,155	8,860		11,015	101-200 yr	0	15,617		15,617
200+ yr	1,595	7,056		8,651	200+ yr	0	15,000		15,000
81-200 yr (MOD)	1,031	3,581		4,612	81-200 yr (MOD)	0	0		0
NON	0	626		626	NON	0	626		626
TOTALS	9,237	36,243	67,377	112,857	TOTALS	9,237	36,243	67,377	112,857

*The following timber harvest rotation age assumptions were made for non-federal lands:

-Industrial timber companies -60 year rotation
-state of Oregon lands -80 year rotation
-small private land owners -100 year rotation

Table 17 projects seral stages on both private and public land age classes in the watershed. It was assumed that BLM would harvest an average of 924 acres per decade and that private land owners would harvest on a shorter rotation length. An allowance was made in this projection for disturbance (e.g. fire) in the reserve areas of 500 acres each decade. By the year 2100 there are no acres of GFMA lands outside of reserves older than 100 years. All older stands occur in reserves. The projection shows a significant shift to seral stages older than 100 and 200 years for the watershed as a whole, as BLM reserves recover from past logging. This is a feature of the Northwest Forest Plan that calls for Riparian Reserves and other reserves to remain uncut for this period. This shift would occur exclusively on BLM lands.

By no means are all older stands in the Middle Cow Creek watershed being harvested in this projection. Features of the NFP allow for retention of over 20,000 acres in LSR and other reserves. The Plan also calls for over 7,000 acres to be reserved for riparian habitat. These designations will provide virtually all of the older stands in the Middle Cow one-hundred years from now.

The NFP places numerous limitations on which lands the BLM may offer timber for sale, which are not taken into account in these projections and may not be accounted for in the TRIM-plus growth and yield modeling used in setting the Allowable Sale Quantity (ASQ) in the RMP. The model assumed approximately 50 percent of the potential GFMA would be taken up in Riparian Reserves. The actual, estimated deduction for Riparian Reserves in this watershed is 45 percent. However, deductions for Survey and Manage species protection measures were not factored into the modeling at the time. Recent experience in surveying for these species in recent timber sales indicates an additional reduction will occur in future sales (Table 18).

Table 18. Potential future restrictions on timber availability on GFMA lands in Middle Cow Creek watershed.

Type of restriction on timber availability	Estimated percent reduction of GFMA availability within the watershed (range)
Del Norte Salamander - retain 40% canopy around talus	20 (15-40)
Mollusks - **Very Uncertain**	15 (10-30)
Uneconomical/Unfeasible (UE/UF)	5 (2-10)
Red Tree Voles	5 (1-5)
New owl sites/CHU	0
Raptors and other Special Status Species	0
Watershed parameters (compaction, transient snow zone, ECA, etc.)	0
Recreation/Wildlife/Late-successional retention	0
Potential fish listing as T/E	0
Total Potential Reduction	**45 Percent**

If these projections are accurate, it may indicate that the actual levels of timber harvest available under the current plan in this watershed may be considerably less than those projected in the ASQ modeling. In the long term a reduction in the ASQ may be called for or the plan may be modified.

Special Forest Products

Middle Cow Creek watershed has a diverse array of special forest products. The potential for commercial use is relatively high because of the ready access off Interstate 5 and the close proximity to several population centers. Some of the more important special forest products found in the watershed include:

Firewood: In the Middle Cow Creek watershed, this is by far the special forest product most in demand, for both personal and commercial purposes.

Beargrass (*Xerophyllum tenax*) :
Most of the Middle Cow Creek watershed will produce beargrass.

Decorative tree boughs:
In the Middle Cow Creek watershed there is demand for several species of conifer boughs. Those species are incense cedar, true firs, douglas fir, and sugar pine. Incense cedar is the species of most value and most demand. Demand for hardwood limbs from manzanita, red alder, vine maple and ocean spray occurs sporadically.

Christmas trees: Historically, there has not been a large demand for either commercial or personal use of Christmas trees in this watershed.

Mushrooms: The watershed is within the ranges for all of the wild mushrooms deemed commercially valuable: chanterelle (*Cantharellus cibarius*), morel (*Morchella conica* and *Morchella esculenta*), matsutake (*Armillaria ponderosa* and *Tricholoma matsutake*), bolete (*Boletus edulis* and others), and hedgehog (*Dentinum repandum*).

Other wood products: Numerous possibilities exist within the watershed for products such as decorative wood, burls, furniture, toys, and other specialty products. Primary demand is for hardwoods: Pacific madrone (*Arbutus menziesii*), tanoak (*Lithocarpus densiflorus*), golden chinquapin (*Castanopsis chrysophylla*), California black oak (*Quercus kelloggii*) as well as bigleaf maple (*Acer macrophyllum*), manzanita spp., Pacific yew (*Taxus brevifolia*). Other products coming from conifers have been sold such as posts, poles and shakes.

Pacific Yew: This tree occurs throughout the watershed, but is no longer in high demand.

Other products: Evergreen huckleberry (*Vaccinium ovatum*), salal (*Gaultheria shallon*). In the future, there will likely be demand for prince's pine (*Chimaphila umbellate*), vine maple (*Acer circanatum*), herbs (too numerous to mention), ferns, Pacific rhododendron (*Rhododendron macrophyllum*), dwarf Oregon grape (*Berberis nervosa*), and mosses, all of which occur in large amounts in the Middle Cow Creek watershed.

There is virtually no information on inventory, trends or sustainable levels of harvest for these products in this watershed. Some projections could be made based on the vegetation mapping

for this watershed analysis, but this has not occurred at this time.

Issue 4. Rural Interface

The town of Glendale is located in the center of the watershed, along Cow Creek at the confluence with Windy Creek. The small communities of Azalea, Quines Creek and Fortune Branch are clustered upstream from Glendale. Rural residences and agricultural land occur scattered along Cow, Windy, Quines and Starveout Creeks and the old town site of Reuben. West of Reuben there are few permanent residences and several mining sites with seasonal residents.

The Rural Interface was identified as a major issue in the Medford District Resource Management Plan (RMP). For that effort, BLM lands within 1/4 mile of private lands zoned for five acre parcels were designated as Rural Interface Area (RIA) lands. However, based on recent experience with the public it is clear that other areas in the watershed have a potential for being sensitive in terms of neighboring residents, visual concerns or other factors. Additional areas within the watershed have been identified in this analysis as ‘potential sensitive areas" (Map 17).

Some of the factors which have surfaced in recent management activities include logging noise, impacts on visual resources, potential impacts on private water sources and dust from log hauling. In recent years, residents within the watershed have voiced their concerns about roads in the area being gated or decommissioned, thus denying access to traditional hunting and recreational areas. Others have voiced concerns over the increase in vehicle traffic in their area as a result of newly constructed roads built under timber sale contracts. However, an increasing problem along BLM road systems within the RIA has been the dumping of trash, car bodies, and household appliances on federal lands. This is due in part to increases in fees at local landfills.

Where feasible, resource management activities such as site preparation and harvest systems would be altered within the RIA to lessen the fire hazards and visual impacts as well as avoid adverse impacts to water quality. Construction, gating, and decommissioning of roads may also be implemented within the RIA where feasible.

Visual Resource Management (VRM) classes are based on scenery quality ratings, public sensitivity ratings and distance zone-seen area mapping criteria. Class I is wilderness and Wild and Scenic River Corridor none of which are part of Middle Cow WAA. Class II includes areas seen from trails and main highways and reservoirs with high recreational use. In this watershed, VRM Class II has been designated in two areas: within one mile of Interstate 5, or to the first ridge, whichever is closer; and a small part of the Galesville Reservoir Special Recreation Management Area which extends into the northeast corner of the watershed. Class III is anything seen from the Cow Creek road. It also includes Rural Interface Areas where BLM land would be managed to mitigate potential conflicts with neighboring residents. Class IV includes areas visible from lesser used roads and pose no restrictions for management activities.

Most recreation use in the watershed occurs as dispersed recreation, including hunting, fishing, camping and sightseeing. The Glendale-to-Powers Bicycle Area, which is approximately 72 miles long, is partially within the unit. There is one established campground along the bike route, located at Skull Creek. The road from Glendale to Riddle has been designated as a Back Country Byway. The King Mountain Rock Garden ACEC occurs on the southern boundary of the watershed.

The municipal water source for the City of Glendale is within the Middle Cow Creek watershed. Although only one domestic water source (spring box and pipeline) is noted in BLM records, many of the residents within the RIA depend upon developed springs and small streams, both on private and federal lands, for domestic water supply.

Fire Hazard and Risk

Within the Rural Interface Areas there exist moderate to high fire hazards and risks to adjacent lands, BLM to private and private to BLM, due to site prep burning and the burning of trash and/or debris piles from land clearing activities.

In analyzing the potential for wildfire in the Middle Cow Creek watershed, three primary factors were considered:

-Hazard - How the fuels and other factors affect a fire's intensity and spread.
-Risk - The chance a wildfire will be ignited, either by lightning or human causes
-Value - The relative value of a resource which might be damaged by a wildfire

Areas in the watershed were rated either High, Medium or Low for each of the three categories. Areas rated "High" in all three categories were mapped to determine highest priority for fuels management to prevent major wildfires and other management practices.

High Hazard (defined as most dangerous fuels, flashy, dense, continuous fuel ladders, etc.)

-Pre-commercial thinning and brushing units since 1993
-timber harvest units since 1993
-dry pastures (agricultural lands)
-I-5

High Risk (defined as greatest potential for ignition)

-major travel routes
-RIA/residential areas
-lumber mills in Glendale
-Skull Creek recreation site
-mining claim at Riffle Creek

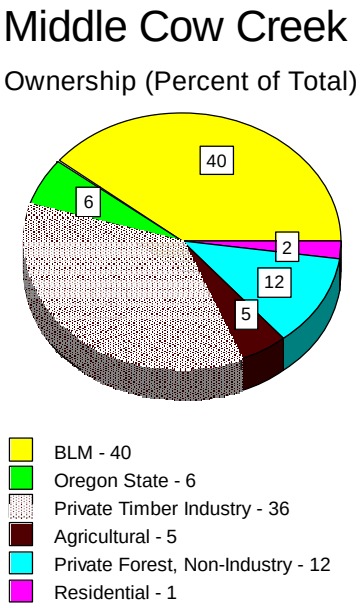
High Value

-LSR and spotted owl core areas
-communication sites
-progeny test sites
-Glendale, Azalea
-municipal watershed for Glendale
-RIA - neighbors
-King Mountain ACEC
-Skull Creek Recreation site
-LIM study plots

Issue 5. Non-federal lands

The Middle Cow Creek watershed is a blend of federal, state and private lands, arranged in a checkerboard pattern (Map 3). Forty percent of the watershed is managed by the BLM, six percent by state of Oregon and 54 percent is privately owned (Figure 4, Table 2). The private lands can be divided into five major categories: timber industry lands (36 percent of the watershed), private non-industrial forest lands, residential, agricultural, and local government (the town of Glendale). Differentiating the categories of non-industry private lands is problematic, since many residential properties also have some agricultural practices (small 1-20 acres parcels) and some forested aspects. In general, however, it appears that most private forest lands will be managed on a 40-60 year rotation and are subject to the provisions of the Oregon Forest Practices Act and the enforcement of those provisions by the Oregon Department of Forestry.

Figure 4. Ownership categories, Middle Cow Creek watershed.



As discussed in other sections, some of the greatest impacts on resources in this watershed occur as a result of the checkerboard ownership pattern and the associated variability in management practices between different land-ownership categories. Non-federal lands, while making up 36 percent of the watershed, contain 35 percent of the road miles, 33 percent of the fish streams, 31 percent of the anadromous fish streams and 34 percent of the miles of streams with water quality limitations. Cumulative effects on fish, wildlife and water resources may result in deferring BLM timber harvest in some areas of recent logging.

The private, non-industry lands also have major impacts on resources in the watershed. These lands comprise 18 percent of the watershed, and contain 22 percent of the road miles, 32 percent of the fish streams, 47 percent of the anadromous fish streams and 40 percent of the miles of streams with water quality limitations. There is virtually no late-successional forest habitat on non-federal lands. The valley bottom and the I-5 corridor pose a major barrier to east-west movement of many species associated with older forests. And the diverse interests of the residents and users of the watershed pose complex and wide ranging challenges to the management of all lands.

Virtually all of the public lands in this watershed are subject to reciprocal right-of-way agreements between BLM and private timber companies. This allows each party to construct roads across the others' land and gives rights to each party for those roads. These agreements make it very difficult for BLM to barricade or decommission roads.

Isolated parcels of public land located along the I-5 corridor pose several management problems for the Bureau. There is limited access for administrative purposes, which increase the amount of time and the costs involved in planning and implementing land management actions. The lack of access and the close proximity of private residents and other private lands often constrain management activities (see RIA section).

All the lands within this watershed are classified as Tenure Class 2. This means the lands are available for dispersal through exchange. The tenure classes were mapped during the RMP process.

V. Synthesis

In this section, major interactions between the Key Issues and other relevant factors will be discussed in an attempt to bring the preceding material together and emphasize the most important management concerns and opportunities for future management direction.

Roads

Road density in this watershed is directly related to timber production, both on private and public lands. The stability of roads is often affected by the position on the slope. Roads were often built in stream bottoms and, in many cases, through unstable slumps and midslope areas, which carry the potential for road failure.

Inadequate maintenance of the roads, particularly in slide-prone areas, lack of surfacing, unrestricted access and plugged culverts all affect the stability and integrity of the road system. Lack of funding prevents an aggressive maintenance program to avoid road failure. A major concern is the erosion caused during winter storms, particularly on unsurfaced roads. Recreational use and log hauling during the wet season causes road sub-grade failure and subsequent damage to other resources. A large number of culverts in this watershed impede or block upstream movement of fish and other aquatic species.

Recent consultation with NMFS has indicated that when a new road is constructed, another road should be decommissioned to offset the environmental effects. However, intermingled public and private land ownership patterns and existing reciprocal right-of-way agreements often prevent BLM from closing or decommissioning roads in this watershed.

Lack of maintenance from federal funding sources, new construction on private land and lack of maintenance on private land all point to a decline in stability and overall increase in sediment production. The trend is seen as a decline in stability and maintenance for the long term.

Commodity Production

Many restrictions have been placed on the availability of timber through implementation of the NFP and the RMP, including late-successional reserves, owl core areas, riparian reserves, VRM restrictions, survey and manage, T&E and special status species buffers, TPCC withdrawals, and green tree retention requirements.

Hydrologic cumulative effects resulting from private logging, checkerboard ownership and recent BLM actions may defer timbered stands for a period of time to allow the watershed to recover. The Aquatic Conservation Strategy of the plan and restrictions on new road construction place further restrictions on timber availability. Restrictions on road building create situations where the cost of timber yarding is much greater since helicopters may be the only option.

Special forest products are affected by low demand, except for boughs, fire wood and some bear grass. No formal inventories are currently available for special forest products and little cottage industry has developed in the Cow Creek Basin to place a high demand on these products. The potential exists for meeting a higher demand, with fewer restrictions than exist for timber sales.

Rural Interface Areas may defer harvest and alter prescriptions due to several factors such as domestic water supplies, fire hazard, noise, dust and even visual concerns.

Timber production is seen on a downward trend since private industry is now cutting areas of second growth. State of Oregon lands are being harvested along with the private cutting, reducing for the next several decades (even out to 50 years) the supply of timber. The RMP has restricted and substantially reduced timber availability. Currently only about 20 percent of federal ownership is available for some types of timber harvest. The trend in timber harvest on federal land is seen as downward, especially as more restrictions are enforced.

Late-successional habitat

The most important factor affecting late-successional habitat is fragmentation and loss of habitat through logging. The causes of fragmentation are checkerboard ownership, timber cutting on private and federal lands, and road construction. It is anticipated that natural disturbance and continued timber cutting will not improve the overall situation in the near future. Land ownership patterns of Middle Cow watershed inhibit east/west connectivity along Cow Creek since most of this land is under private ownership. The Interstate 5 corridor is a major barrier for many species

Few streams have intact riparian zones; virtually all have been logged on private land and many were logged on public lands. In addition, roads encroach on almost all major streams, reducing their capability to function as effective connecting corridors.

Land allocations resulting from the NFP and RMP will help in the future (long term) providing a greater portion of late-successional habitat. Connectivity blocks, LSRs, Riparian Reserves and other buffers and withdrawn lands will provide the majority of late-successional habitat and connectivity as these areas grow.

Riparian zones are in worse condition than historically. Recovery will be episodic as harvest on private lands will continue to disturb these areas. The reoccurrence of disturbance is expected to be 40 to 60 years. Currently, due to recent harvest, the trend on private lands is thought to be upward. It is expected that on BLM lands that the trend will be up in the long term due to establishment of wide riparian buffers as established in the NFP.

The overall trend for late-successional habitat is expected to be downward in most of the watershed due to cutting of the remaining isolated stands. On BLM lands in the LSR, habitat conditions will improve in the long term as young stands grow into mature and old-growth

habitat.

Rural interface areas

Potential fire hazards, timber harvest above or near domestic water sources, dust and noise all affect the RIA. Current GIS mapping does not include many of the new residences in the watershed.

Population levels in the watershed appear to be stable. Due to its remote character, except for I-5, little expansion in homes and population is likely, at least in the short term (10 to 20 years).

Fire hazard is believed to be on an upward trend due to fire suppression, allowing for more build up of fuels. Recent clearcutting has resulted in young, even-aged stands, making the forest more vulnerable to stand-replacement fires. Urban interface areas are considered a higher risk due to the increased hazard.

Water quality

The major factors that affect water quality include: roads, timber harvest, agricultural practices (i.e. ranching and farming) and climate. Many roads have been constructed in the vicinity of stream courses. Many of these roads contribute sediment to streams and have modified riparian vegetation so that shading and micro climate have been affected. Elevated water temperature have occurred due to removal of streamside shading, irrigation diversion and other factors. There are numerous irrigation diversions which reduce flows and water levels in streams. Low gradient slows the flow of water which means longer retention time and more exposure to solar radiation and ambient air temperature, resulting in higher water temperature. Contaminants from agricultural fields, potential failing septic tanks, and sewage effluent from the treatment plant all contribute to impaired water quality. Construction of Galesville Reservoir has augmented low flows during the summer months, which helps to reduce water temperatures well downstream on Cow Creek itself. The increased flow also serves to dilute other pollutants that may be present.

Water quality is probably stable on the major tributaries and along Cow Creek due to private ownership. Water releases from Galesville Dam have augmented flows during recent years providing better than historical flows during the summer months. Water quality on BLM lands will be on an upward trend in the long-term as riparian zones grow and provide better shading and filtration.

Fish/fish habitat

The major factors affecting fish and fish habitat are roads, private lands, habitat removal, and water temperature. Roads are adjacent to almost every fish stream in the watershed. Sediment, generated by traffic, lack of maintenance and road failures, enters the creeks and reduces spawning and rearing habitat. Removal of riparian vegetation from stream banks has increased

water temperature and has caused several low gradient streams within the basin to be listed by DEQ as water quality limited due to high water temperatures in excess of 64 degrees F.

Large woody debris (LWD) is very low in most streams in the basin (Appendix D). Channelization, caused by road building, has reduced habitat and riparian vegetation. Placer mining has affected fish and their habitat by removal of vegetation and displacement of gravels and sediment. Galesville Reservoir currently augments flow to Cow Creek but it is a barrier to upward migration of aquatic species. Most of the lower elevation fish streams are bordered by private lands or flow through private lands where stream protection measures are least effective. Timber salvage operations within riparian zones in the past has reduced the immediate potential for LWD and thus habitat producing structure.

Habitat quality and quantity for salmonid fish is seen as being substantially lower than historic levels due to human activities. Analysis of data indicates a static to declining trend on private and industrial forest lands and agriculture. A short term 20 to 30 year upward trend may be apparent in Wood Creek, Fortune Branch, Skull Creek and Rattlesnake Creeks where recent harvest or fire has occurred. Rotation age on industrial lands is about 40 years. BLM, and to a lesser extent, State of Oregon-controlled streams will see an upward trend in habitat quality due to better management of riparian zones.

Private lands

The Oregon Forest Practices Act restricts logging activities on private lands to some degree. The major factor controlling harvest activities in the Cow Creek watershed is market conditions and other economic factors.

Protective buffers for Endangered or Threatened species resulting from Endangered Species Act listings, has reduced some commodity extraction from private lands but this is not thought to be a substantial controlling factor. A large portion of the private land has been harvested recently and supplies of harvestable timber may decline in the near future within this basin.

VI. Recommendations

Management recommendations are presented here based on the analyses presented in this document. First a long-term landscape design is described and presented in a map. Following this is a discussion and map showing priority management actions for the next 10-20 years. Finally, specific recommendations for individual issues are presented.

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 NEPA process using this watershed analysis, public input and other information and considerations.

A. Projected Long-Term Landscape Design

The primary factor shaping the long-term landscape design for the Middle Cow Creek watershed is the land use allocations in the RMP and the Northwest Forest Plan (Map 4). This watershed analysis did not develop significant departures from, or modifications to, these allocations.

The projected long-term landscape design is presented in Map 18. This map shows the general vegetative condition expected to be present in the watershed 100 years from the present.

There are ten categories of vegetation conditions and land uses based on the projected management in this watershed:

Private timber industry lands,
Private forest, non-industry,
State,
Residential,
Agricultural,
Late-successional habitat,
Connectivity/Diversity Blocks,
Lands withdrawn from intensive timber management due to biological limitations,
General Forest Management Area (GFMA), and
GFMA where connectivity is an added consideration.

These categories are briefly described here.

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

Private forest, non-industry lands: It is assumed that these lands will continue to be managed for timber to varying degrees. Some will resemble industry lands, while others will attain older conditions, perhaps averaging 100 years old. Only very limited areas will have stands over 100 years old.

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.

Residential: These areas will continue in their current rural character. Housing density will increase to some degree, but not substantially.

Agricultural: These areas will generally remain with agriculture as their primary land use, but some conversion to residential property will take place. Where or to what extent that will occur is difficult to project.

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 and Riparian Reserves). Virtually all the late-successional forest habitat will occur on BLM land.

Lands withdrawn from intensive timber management due to biological limitations (TPCC): These lands will generally resemble conditions in the late-successional category. There is no direction to manage these lands for late-successional habitat, but they are not to be managed for timber either, so they will generally develop into late-successional conditions on their own. A small sub-set of this category will naturally remain in a non-forested condition due to their rocky soils or low productivity.

Connectivity/Diversity Blocks: These blocks will consist of at least 25-30 percent late-successional habitat. The rest will contain lands similar to those in the GFMA, but would be somewhat older and with larger number of green trees, snags and down logs.

General Forest Management Area (GFMA): These lands are prescribed for a rotation length of 100 years. The result will be a mosaic of stands between 0 and 100 years old, distributed relatively evenly within the watershed, with each age class in approximately even proportions. Large structure legacies (green trees, large snags and coarse woody debris) will be retained on these lands.

GFMA where connectivity is an added consideration: These areas, located along the northern and southern ridges of the watershed, are the only major modifications to the basic land allocations. In these areas at least 30 percent of each section (s) should be maintained in late-successional condition to promote East - West connectivity of species associated with late-successional habitat across the watershed and between provinces. This would generally be

accomplished through harvest scheduling.

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

Map 19 displays the priority management recommendations for federal lands over the next two decades based on this watershed analysis and the desired long term conditions.

Plantations resulting from timber harvest are located throughout the watershed. Management in these stands should focus on maintaining conifer stands, promoting their growth and developing habitat conditions. The prescriptions will vary based on the land allocation in which plantations occur. Priority should be given to plantations in the LSR and in GFMA connectivity bands on the north and south ridges. The tools and practices described in the RMP would be utilized.

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

Regeneration harvests within the GFMA connectivity bands on the north and south ridges should be avoided in the next decade or two to allow more contiguous forest stands to develop.

Isolated BLM parcels near the Interstate 5 corridor should be considered for disposal through exchange to eliminate management problems and to aid in acquiring more valuable lands.

C. Recommendations for Key Issues

Fish/Aquatic Habitat/Streams

An aggressive effort should be made to reduce open road densities in the watershed through decommissioning, barricading and gating. Specific road closure recommendations considered under this watershed analysis are included in Appendix I. A major focus of future road decommissioning should be to remove valley bottom roads in order to restore proper functioning of riparian habitat. Other possibilities will come up as projects are examined in more detail.

Opportunities to improve private roads or reduce road densities on private lands should be explored through partnerships, cooperative agreements and other means.

Projects to improve spawning and rearing habitats for adult and juvenile anadromous fish have been constructed in Whitehorse, Quines, Bull Run, Rattlesnake and Skull Creeks. Additional opportunities may become apparent as data from stream surveys is analyzed and field checked. Proposals to improve fish habitat through placement of in-stream structures should be reviewed by an interdisciplinary team and implemented only as one component of a watershed restoration plan. Placing large logs and boulders in streams is expensive and only a small percentage of all

stream miles with low habitat complexity can realistically be treated. More importantly, such projects have only short term benefits.

The most effective, long-term approach for restoring habitat complexity and productivity is through riparian restoration, protection and ensuring that all activities within and outside the riparian area are conducted in accordance with Aquatic Conservation Strategy objectives. This applies to public as well as on private lands. There appear to be opportunities to manipulate riparian vegetation (riparian restoration) and to improve stream channel complexity in segments of the following fish habitat: Dads Creek, Rattlesnake Creek, Whitehorse Creek, Fortune Branch Creek, Skull Creek and others. Potential activities would include creating openings in dense alder stands and under planting 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 and spawning areas. Thinning dense stands of conifer sapling and poles along streams should be a high priority, provided that increases in water temperatures and adverse effects to terrestrial wildlife are short term.

Acquisition of lands in watersheds with greater than 50 percent already in public ownership should be a high priority in order to maximize benefits of BLM land management practices and watershed rehabilitation measures on entire stream and riparian ecosystems (e.g. T 32S, R 8W, sec. 25 and 34 in Riffle Creek).

Riparian Reserves should be protected and enhanced where necessary to improve habitat conditions both for aquatic species and species associated with late-successional terrestrial habitat.

Existing culverts should be improved, where necessary, to provide free passage of aquatic organisms both up and down stream. A list of culvert needs and status is provided in Appendix F. Other problems will arise as projects are developed in more detail. In general, culverts should be maintained and replaced as needed to prevent road failures.

In sensitive soil areas (Map 8):

- retain additional overstory trees when conducting regeneration harvests on serpentine soils (similar to the Southern GFMA prescriptions in the RMP),
-restrict road construction, or consider alternatives to constructing new roads,
-attempt to decommission existing roads where feasible.

Late-successional habitat/Sensitive Species

A higher level of connectivity should be maintained along the north and south ridges to promote east-west movement of organisms between provinces.

Acquisition of high value private lands, in areas of strategic importance to providing habitat connectivity along the north and south ridges, should be explored and pursued.

Late-successional habitat in the LSR and in owl core areas should be promoted through treatments of younger stands. More details on this proposal can be found in the LSR assessment for the South Umpqua/Galesville LSR.

Overstocked stands and stands with remnant pines over dense Douglas-fir saplings and poles should be examined as a high priority for commercial or non-commercial density management treatments to improve forest health and reduce abnormally high fuel loadings. Priority should be given to stands in rural interface areas, near other residents, in the LSR, in owl core areas, and in Riparian Reserves.

Marbled murrelet surveys should not be considered necessary for projects in this watershed. There is no evidence this species utilizes the vegetation types in this area.

Occupied Del Norte salamander sites should be managed in this watershed using the following guidelines:

- one site-potential tree length protection buffers should be designated around each talus site,
- within the site and the surrounding buffer, at least 40 percent canopy closure should be retained,
- in helicopter Commercial Thin units, falling and yarding within the talus sites would be allowed only between June 1 and September 30 to reduce impacts to Del Norte populations,
- in other helicopter units, and in units with cable or tractor yarding, no falling or yarding would be allowed within the talus sites to avoid disturbing the talus,
- no burning would be allowed over talus, and
- any other activities that would directly disrupt the talus layer (e.g., fire, lateral yarding over talus, yarding corridors through talus, tractor yarding and road building) should be avoided.

A program should be initiated to re-introduce fire into the watershed as a natural disturbance agent to promote native plant species and communities.

Noxious and invasive weeds should be eradicated from the watershed. Priority should be given to small, isolated populations where control efforts are most effective.

Commodity Production

Tree pruning should be done in Connectivity/Diversity blocks to promote development of high quality, knot-free lumber. The C/D blocks are a priority since they have a longer rotation than the GFMA, so the trees would have longer to respond to the pruning.

The production of Special Forest Products in the watershed should be enhanced through silvicultural practices. Markets should be expanded.

Rural Interface

The "Potential Sensitive Areas" mapped on Map 17, should be officially designated as Rural Interface Areas. Continuing efforts should be made to identify sensitive areas.

Forest fuels should be reduced and managed in the rural interface and near other residential areas.

An interpretive display, describing forest management activities should be developed at the I-5 rest areas north of Glendale.

The Glendale to Powers bicycle area should continue to be promoted and maintained as a high profile recreation attraction to benefit the local communities.

Non-federal Lands

Partnerships and cooperative agreements should be pursued with non-federal land owners with the aim of improving resource conditions in the watershed. The Wyden amendment is one vehicle which can be used; watershed councils and individual agreements are others.

VII. Data Gaps and Monitoring Needs

Fish/Aquatic Habitat/Streams

A thorough inventory of current road conditions and culvert characteristics would help to identify future improvement projects, decommissioning opportunities and maintenance priorities.

Detailed information on stream and riparian characteristics should continue to be gathered. ODFW, under contract with BLM, has nearly completed stream habitat surveys for this watershed. Quality information is critical for establishing a baseline for measuring effects of land management activities on aquatic resources on-site, as well as cumulative effects across a landscape. This information can also provide an estimate of a stream's steelhead and salmon smolt production capability. Surveys should be repeated at 10 to 15 year intervals and more

frequently if a major hydrologic event or project causes major changes in stream condition.

Source and flow characteristics of each GIS stream reach (intermittent or perennial) is needed.

The number of salmon and steelhead that spawn in each stream annually should be determined.

The number of smolts that emigrate from selected subwatersheds during spring should be documented. This information, in combination with counts of spawning adult fish the previous winter(s), could provide an estimate of fish survival from egg to smolt and an indication of watershed health.

The range of daily water temperatures and the duration that they exceed 60F in all fishery streams during summer should be determined.

Population characteristics of fish and other aquatic life (including macroinvertebrates) in several representative subwatersheds throughout the watershed should be determined to track response of aquatic animal communities to projects that are implemented, to document their recovery as degraded habitat recovers and to track population fluctuations in watersheds with no management activity.

Late-successional habitat/Sensitive Species

A more detailed strategy for managing the Connectivity/Diversity blocks, as well as the GFMA connectivity areas on the north and south ridges, is needed.

An assessment of the habitat characteristics, fuels and management opportunities in the spotted owl core areas is needed.

An inventory of the habitat conditions in "Modified Older Stands" should be undertaken. These stands are generally old partial cuts; some provide no value to late-successional species, others may provide fairly high quality habitat.

The stand dynamics of older forests should be examined to project future consequences of protection measures and long term retention of late-successional habitats.

An inventory of special habitat features (caves, cliffs, talus, etc.) is needed.

An extensive inventory of Survey and Manage species should be conducted to better understand habitat requirements, determine the affects of past management actions, determine distributional limits for species and establish baseline conditions for the LSR, Riparian Reserves and other areas.

There are significant unmet needs relating to noxious weeds in the Middle Cow Creek watershed

which include: inventory of species distribution, determining invasive mechanisms and routes, and evaluation and monitoring of current condition and expected growth.

A more detailed assessment of late-successional habitat from a conservation biology perspective should be conducted. This would involve patch size analysis, corridor design and gap analysis.

Commodity Production

There is a need for a more effective inventory of the Modified Older stands, both in terms of timber management and habitat characteristics for plants and wildlife.

An inventory of Special Forest Products should be conducted to determine productivity, access and to aid in expanding markets.

Rural Interface

A more complete inventory of residents is needed to identify neighbors and potential conflicts.

An inventory of private water sources is needed.

A more detailed map of forest fuels and hazards should be developed and management opportunities explored.

Non-federal Lands

Road surfacing and conditions on private lands is generally unknown. An inventory would aid identifying priority areas for cooperative agreements. This is a sensitive issue since many private land owners have legitimate concerns with proprietary information on resources and facilities on their lands. The BLM should discuss this situation with private land owners to see where such information could be shared to meet mutual concerns and needs.

Appendix A. Glossary/Acronyms

ASQ	Allowable Sale Quantity
BLM	Bureau of Land Management
CHU	Critical Habitat Unit
CWD	Coarse Woody Debris
ECA	Equivalent Clear-cut Area
GFMA	General Forest Management Area
HUC	Hydrologic Unit Code
LSR	Late-successional Reserve
LWD	Large Woody Debris
NFP	Northwest Forest Plan
NMFS	National Marine Fisheries Service
ODFW	Oregon Department of Fish and Wildlife
PSQ	Probable Sale Quantity
ROD	Record of Decision
RMP	Resource Management Plan
TPCC	Timber Productivity and Capability Classification
USFWS	US Fish and Wildlife Service
VRM	Visual Resource Management

Appendix B. References

Atzet, T., D.E. White, L.A. McCrimmon, P.A. Martinez, P.R. Fong and V.D. Randall. 1996. Field guide to the forested plant associations of southwestern Oregon. USDA-Forest Service Technical Paper R6-NR-ECOL-TP-17-96.

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Appendix C. Adjacent Watershed Analyses and other planning documents

Other planning documents which affect this watershed include:

Medford District Resource Management Plan (RMP)
Northwest Forest Plan Record of Decision (NFP)
Upper Cow Creek Watershed Analysis
West Fork Cow Creek Watershed Analysis
South Umpqua Watershed Analysis (Roseburg BLM)
South Umpqua/Galesville Late-successional Assessment.

Appendix D. Stream survey data for the Middle Cow Creek Watershed.

Stream	Reach Number	Length (m)	gradient %	LWD Key Pieces Per 100m	Silt/Sand (%)	Residual Pool Depth (m)	Active Erosion (%)	Pool Area (%)	Pool Frequency*
Susan	1	2381	5.4	0.6	10	0.5	3	14	14
Susan	2	1864	8.3	0	15	0.7	44	2	209
Riffle	1	3361	2.4	0.4	2	0.7	2	16	10
	2	1417	3.8	1	3	0.6	0	17	7
	3	1017	5.4	3.3	2	0.7	12	21	9
	4	1558	8	0	3	1.1	61	7	37
Riffle trib A	1	1726	15.2	0.8	12	0.6	0	1	441
Riffle trib B	1	2183	12.4	1.1	5	0.8	2	2	162
Riffle trib C	1	1923	6.9	0.3	6	0.9	22	5	27
	2	845	7.3	0.9	dry riffle	0.6	9	3	65
	3	1008	20.3	0.2	dry	0	11	0	0
Bonnie	1	2566	5.3	0.8	9	0.8	9	18	12
	2	2626	10	1.8	54	0.6	8	2	113
Bonnie trib A	1	1339	9.4	1.3	7	0.7	10	2	152
	2	807	26.7	1	dry	0	0	0	0
Skull	1	1848	3.7	0.4	13	0.5	5	20	11
	2	2448	15.5	1.9	dry riffle	0.5	47	3	80
Skull trib A	1	773	11	0.8	23	0	77	0	0
Dads	1	1086	4.1	0.1	12	0.9	6	22	8
	2	2511	2.2	0.4	19	0.5	81	8	20
	3	1873	9.5	0.7	22	0.5	74	3	98
	4	611	41.4	4.6	dry	0	16	0	0
Dads trib A	1	1420	4.3	0.2	10	0.4	34	7	132
Dads trib B	1	1716	8.1	0.5	15	0.5	41	5	220

Stream	Reach Number	Length (m)	gradient %	LWD Key Pieces Per 100m	Silt/Sand (%)	Residual Pool Depth (m)	Active Erosion (%)	Pool Area (%)	Pool Frequency*
Tuller	1	1155	9.1	1	15	0.7	39	9	18
	2	1727	10.7	2.4	17	0.5	74	3	71
Tuller trib A	1	980	13	0.5	22	0.6	64	4	92
Marion	1	1263	8.5	0.4	16	0.7	10	3	39
	2	2157	12.2	0.7	dry riffle	0.5	13	2	167
	3	246	26	0.4	dry	0	0	0	0
Battle	1	1928	16.3	0.5	dry riffle	0.5	39	1	824
Perkins	1	409	4.8	0	15	0.7	8	9	28
	2	738	5.8	0.1	dry riffle	0.7	28	1	208
	3	2678	11.7	0.9	21	0.6	24	3	175
Perkins trib A	1	2032	7.1	0.2	39	0.5	76	1	231
Panther Butte	1	1034	5.6	0	8	0.7	4	7	42
	2	1288	13.2	0	15	0.7	1	4	212
Rattlesnake	1	1335	2.2	0	6	0.6	3	14	29
	2	2261	4.1	0.6	10	1	21	12	34
	3	681	8	0.3	5	0	32	0	0
Stevens	1	2333	10.7	0.4	7	0.6	4	3	137
Benchmarks:				Desir:>3	Desir:<15		Desir:<10	Desir:>35	Desir:<8
				Unde:<1	Unde:>30		Unde:>30	Unde:<10	Unde:>20
					Desir: >0.5; Undesir: <0.2 when stream is <7m wide or when gradient is <3%				

Stream	Reach Number	Length (m)	gradient %	LWD Key Pieces Per 100m	Silt/Sand (%)	Residual Pool Depth (m)	Active Erosion (%)	Pool Area (%)	Pool Frequency*
					Desir: >1.0m Undesir: <0.5m when stream is >7m wide, or when gradient is >3%				

Stream	Reach Number	Length (m)	Gradient (%)	LWD Key Pieces Per 100m	Silt/Sand (%)	Residual Pool Depth	Active Erosion (%)	Pool Area (%)	Pool Frequency*
Totten	1	508	4.9	0	0	0.6	7	29	11
	2	2007	4.4	0.2	4	0.3	6	14	12
	3	1630	10.3	0.7	0	0.3	15	8	21
Windy	1	2531	1	0	0	0.6	8	61	5
	2	3088	1	0	3	0.8	21	57	7
	3	847	0.3	0	dry	0	0	dry	dry
	4	4983	1.2	0.2	6	0.5	26	47	10
	5	2923	2.3	0.2	4	0.5	15	40	13
	6	1162	3.6	0	39	0.4	22	17	40
Wood	1	891	0.7	0	18	0.5	26	43	8
	2	3588	2	0.1	18	0.4	6	20	16
	3	1431	0.7	0.5	24	0.4	17	14	16
Bear	1	824	1.1	0.1	20	0.7	32	59	11
	2	2581	4.2	0.2	22	0.4	47	12	39
	3	900	8.7	0.2	25	0.3	54	10	56
Lawson	1	1704	2.7	0.1	32	0.5	18	32	27
	2	1860	7.9	0.8	15	0.3	30	6	105
Fortune Branch	1	2472	2.6	0.2	16	0.5	38	46	11
	2	2854	8	0.4	23	0.5	25	25	25
Quines	1	2304	1.4	0	15	0.6	19	53	5
	2	3022	3.4	0.4	15	0.7	2	33	9
	3	2242	4.6	0	15	0.4	0	27	10

Stream	Reach Number	Length (m)	Gradient (%)	LWD Key Pieces Per 100m	Silt/Sand (%)	Residual Pool Depth	Active Erosion (%)	Pool Area (%)	Pool Frequency*
	4	2508	12.7	0.8	14	0	5	dry	dry
Quines trib 1	1	2585	21.8	0.7	15	0.3	28	5	113
Bull Run	1	2821	3.4	0.4	15	0.6	37	19	17
	2	2006	16.4	2.2	15	0.3	4	5	112
Little Bull Run	1	1474	6.7	1	15	0.4	48	17	27
	2	1501	16.2	1.3	23	0.3	17	11	58
Tennessee Gulch	1	1223	4.8	0.1	37	0.4	9	21	24
	2	690	13.5	0.7	30	0.3	0	2	190
Starveout	1	3092	0.8	0	15	0.7	15	38	9
	2	1178	1.7	0.2	15	0.5	9	23	15
	3	951	2.6	0	15	0.4	9	26	12
	4	1949	3.9	0.2	15	0.4	5	13	20
	5	2248	11.5	2.8	15	0.4	1	12	26
Fizzleout	1	1426	1.8	1	15	0.4	10	30	28
	2	1896	5.4	1.1	15	0.4	31	7	78
Hogum	1	1608	3.9	0.2	16	0.3	21	18	19
	2	2103	11.8	0.5	15	0.4	38	1	305
Boulder	1	1372	11.8	0.7	15	0.4	2	13	37
Whitehorse	1	2820	2.1	0.2	7	0.5	8	18	12
	2	1374	4.1	0.2	10	0.5	4	25	9
	3	554	4.1	0.2	16	0.4	0	17	11
	4	807	5.3	0.9	14	0.4	0	14	15
	5	838	6.2	0.8	23	0.3	7	9	30
	6	1268	12.3	0.4	no riffles	?	5	11	39

Stream	Reach Number	Length (m)	Gradient (%)	LWD Key Pieces Per 100m	Silt/Sand (%)	Residual Pool Depth	Active Erosion (%)	Pool Area (%)	Pool Frequency*
Whitehorse trib A	1	2073	12.2	0.3	15	0.3	8	7	49
Whitehorse trib A1	1	823	20.3	0.5	15	0.4	12	3	137
Whitehorse trib B	1	2012	18	0.1	15	0.5	24	7	69
Blackhorse	1	482	2.7	0.2	8	0.3	22	17	13
	2	1369	5.5	0.1	21	0.4	38	10	27
	3	433	15.5	0	30	0.3	45	5	160
Benchmarks				Desir:>3	Desir:< 15		Desir:< 10	Desir:> 35	Desir:<8
				Unde:<1	Unde:> 30		Unde:> 30	Unde:< 10	Unde:>20
						Desirable: >0.5m Undesirable: <0.2m			
						when stream is <7m wide or when gradient			
						is <3%			
						Desirable: >1.0m Undesirable: <0.5m			

Stream	Reach Number	Length (m)	Gradient (%)	LWD Key Pieces Per 100m	Silt/Sand (%)	Residual Pool Depth	Active Erosion (%)	Pool Area (%)	Pool Frequency*
						when stream is >7m wide or when gradient			
						is >3%			

Appendix E. Habitat Integrity rating using aquatic macroinvertebrates as indicators.

Fifth Field Watershed: Middle Cow Creek					
Stream	**Year Sampled**	**Habitat Type**			**Comments**
		Erosional	**Margin**	**Detritus**	
Black Horse at mouth	1996	79.0	82.6	68.0	
Bonnie at mouth	1995	80.6	76.5	74.0	
Bull Run at BLM boundary	1996	66.1	61.6	74.2	
Dads at Cow Cr Road	1994	43.5		60.4	Extreme drought
Fortune Branch 0.2 miles upstream of Road 32-5-7	1995	70.2	73.5	82.3	
Hogum near mouth	1995	58.9	54.1	61.5	
Quines at lower BLM boundary	1996	68.5	74.7	61.9	
Rattlesnake above Stevens Cr	1994	77.4		80.2	Extreme drought
Riffle below Bonnie	1992	60.0	72.0	88.0	
Riffle at mouth	1995	59.7	58.2	67.7	
Starveout above bridge on Road 32-4-20 near Hogum Creek	1995	66.1	80.6	80.2	
Tennessee Gulch at mouth	1996	56.5	76.8	67.7	
Windy at Glendale High School	1996	54.0	72.7	62.9	
Whitehorse at mouth	1992	63.0	61.0	77.0	

Biological Condition Categories			
Biotic Integrity	**Erosional**	**Margin**	**Detritus**
Very high	90-100	90-100	90-100
High	80-89	80-89	80-89
Moderate	60-79	70-79	70-79
Low	40-59	50-69	50-69
Severe	<40	<50	<50

Appendix F. Status of Fish Passage at Road Crossings in the Middle Cow Creek watershed.

Stream	Road Number	Quarter-Section	Culvert Dimensions L x W x H(ft)	Percent Slope	Culvert Outfall Drop(ft)	Passage	
						Coho/ St	Res/Juv
Cow			Numerous bridges between West Fork and Galesville Dam			Y	Y
Russell #1	31-4-31	31 SE	63 X 5	5	2	NA	N
Russell #2	32-4-6	32 NW	50 X 3	5	2	NA	N
Whitehorse #1	32-4-4.1	4SW	ford			Y	Y
Whitehorse #2	32-4-4	15 SE	45 X 10 X 6	5	2	P	N
Whitehorse #3	32-4-22	23 NW	40 X 10 X 6	3	2	NA	N
Whitehorse #4	32-4-22.1	22 SE	50 X 6 X 5	5	1	NA	N
Black Horse	32-4-4	15 SE	culvert washed out	0	0	Y	Y
Starveout #1	County	12 SESE	bridge			Y	Y
Starveout #2	County	18 NWNWNW	bridge			Y	Y
Starveout #3	32-4-20	20 ctr	bridge			Y	Y
Starveout #4	32-4-20	20 SE	bridge			Y	Y
Fizzleout	32-4-20.2	21SW	50 X 5	5	0.5	P	N
Wildcat	32-5-23	14 SE	55 x 9 x 6	3	2	P	N

Stream	Road Number	Quarter-Section	Culvert Dimensions L x W x H(ft)	Percent Slope	Culvert Outfall Drop(ft)	Passage	
						Coho/ St	Res/Juv
Quines #1	County Road	22NE	bridge			Y	Y
Quines #2	32-5-26	26 NW	bridge			Y	Y
Quines #3	32-5-35.2	35SW	55 X 10 X 8	1	1	Y	N
Quines #4	32-5-35.2	1SE	60 X 10	7	1.5	P	N
Quines #5	32-5-35.2	12NW	ford			NA	Y
Tennessee Gulch	32-5-35.2	35SW	40 X 6 X 4	1	0	Y	Y
Bull Run #1	32-5-26.2					Y	
Bull Run #2	32-5-26	25SE	ford			Y	Y
Bull Run #3	32-5-25	31NE	65 X 9 X 6	0	0.5	Y	Y
Fortune #1	County Road	20SE	box culvert	0	2	P	N
Fortune #2	32-5-20	17	40 X 6 40 X 6 40 X 6 40 X 6	0 0 0 0	0 0 0 0	Y Y Y Y	Y Y Y Y
Fortune #3	32-5-17	17 NW	bridge			Y	Y
Fortune #4	32-5-9	9 SE	bridge			Y	Y
Woodford #1	I-5	30 NWNE	bridge			P	P
Woodford #2	County	30 SESE	55 x 6 x 5	5	1	P	N
Windy	County/ City/Pvt		Numerous bridges between the mouth and State land in section 13			Y	Y
Windy #1	State	13 SESE	railroad flatcar			Y	Y

Stream	Road Number	Quarter-Section	Culvert Dimensions L x W x H(ft)	Percent Slope	Culvert Outfall Drop(ft)	Passage	
						Coho/ St	Res/Juv
Windy #2	32-5-7 BLM? State?	7 NWNE	culverts pulled; road is closed			NA	Y
Windy #3	State 32-5-6.2	6 NENENE	culverts pulled; road is closed			NA	Y
West Fk. Windy	State? 32-5-6	6 NENE	45 x 9 x 6	0	0	NA	Y
Lawson	County	23 NW	bridge			Y	Y
Bear	State	12 SWNW				N	N
Mill #1	private	Sec 33; 100 yds from Cow Creek	35 x 6	3	1	Y	N
Mill #2	City	4 NWNW	150 x 4	1	0	P	N
Mill #3	City	4 NWNW	50 x 6 x 3	2	0	Y	Y
Section	City	5NE	bridge			Y	Y
McCullough #1	County	31 ctr	bridge		2	Y	N
McCullough #2	State	31 NWNE	70 x 8	3	1	P	N
McCullough #3	private	19 SESE	bridge			Y	Y
McCullough #4	State	19 NENE	bridge			Y	Y
McCullough #5	State	17 SW	70 x 6 x 4	3	1	P	N
Totten	County	31 SW	60 x 5	3	1	P	N

Stream	Road Number	Quarter-Section	Culvert Dimensions L x W x H(ft)	Percent Slope	Culvert Outfall Drop(ft)	Passage	
						Coho/ St	Res/Juv
Rattlesnake #1	County Road	2 NW	90 X 6	3	1	P	N
Rattlesnake #2	33-7-11	11	85 X 10	0	1	P	N
Stevens #1	33-7-2.1	2 SE	65 X 9 X 6	0	2	P	N
Stevens #2	33-7-2.2	2 SE	65 X 9 X 6	0	2	N	N
Perkins	County	2 NW	80 x 8	5	2	NA	N
Panther Butte	County	2 NW	75 x 5	3	1	P	N
Marion	Private						
Tuller	Private	5 NENE				P	N
Dads #1	33-7-2	28NW	225 X 12	0	0	P	N
Dad's #2	33-7-15	15 SESE	70 X 6	3	1	P	N
Dad's #3	32-7-15.1	15 NESE	60 X 5	5	0.5	NA	N
Dads #4	private? 32-7-22	14 center	31 x 2; the crossing is washing out	1	1	NA	N
Dad's trib A1	32-7-21	21 SW	60 X 8	10	2	N	N
Dad's trib A2	32-7-21.1	21 SW	65 X 6 X 4	5	1	P	N
Dad’s trib A3	private 32-7-21.1	16 SESESW	30 x 3	5	1	NA	N
Rattail	33-7-2	19SE	150 X 5	10	0	NA	N
Skull #1	33-7-2	19 SW	bridge			Y	Y
Skull #2	32-8-36	30 SW	bridge			Y	Y
Riffle #1	33-7-2		bridge			Y	Y
Riffle #2	32-8-26	26 NE	bot. arch			Y	Y

Stream	Road Number	Quarter-Section	Culvert Dimensions L x W x H(ft)	Percent Slope	Culvert Outfall Drop(ft)	Passage	
						Coho/ St	Res/Juv
Riffle Trib.	32-8-24.1	34 NWNW	42 x 5	5	8	NA	N
Bonnie #1	32-8-26	35NE	bridge			NA	Y
Bonnie #2	32-8-35.3	35 ctr	75 x 5	0	0	NA	Y
Bonnie #3	32-8-35.3	35 ctr	60 x 3 60 x 4	1 5	3 2	NA NA	N N
Bonnie #4	32-8-35.3	35 SE	55 x 3	3	1	NA	N
Susan	32-7-20.1	8 NENE	36 x 5	5	1	NA	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; only a visual estimate.
- Culvert Outfall Drop: Distance from the bottom of the downstream end to the pool surface.
- Passage: "COHO/ST" refers to upstream movement of adult coho and/or steelhead; RES/JUV refers to cutthroat trout and juvenile salmon and steelhead.
- Passage: Y=yes
  N=no
  P=partial, depending on stream discharge and/or water velocity through the culvert and swimming ability of the fish.
  NA = the species probably does not use the habitat; based on knowledge of barriers downstream or merely stream size. Rating is biologist's professional judgment. No presence/absence data for anadromous above waterfalls (e.g. Dads, Perkins).

-The only structures that qualify for Y almost always are limited to those with natural stream bed.

-Structures rated P or N should be replaced with a bridge, or bottomless arch (not a box culvert) or with a galvanized culvert that has been oversized and buried 1 to 2 feet in order to maintain stream bed in the bottom of the pipe. BLM has a mandate, through the ACS, to restore habitat connectivity for all aquatic species, not just fish.

- There probably are crossings on private residential lands that are not on this list.

Appendix G. Summary of hydrologic parameters for sub-watersheds in the Middle Cow Creek watershed.

These data were current as of 1994. They are being updated as individual project areas are being reviewed in connection with timber sale planning. There is no doubt that conditions have changed; the greatest changes involve additional logging on non-federal lands. The highlighted items are above the trigger values for levels of concern. This table does not include many of the small frontal basins which face directly into Cow Creek.

Sub-watershed	BLM Land (%)	Non-BLM Land (%)	Total Acres	ECA (%)	Compacted Area (%)	Total TSZ Area (%)	TSZ Openings Area (%)	Road Density mi. per sq. mi.
Russell	60	40	4,943	14.5	10.2	40	24.1	6.6
West Fk Russell	48	52	862	7.9	13.5	53	38.1	4.1
Fortune	66	34	3,165	11.1	9.1	40	29.5	4.5
Windy	23	77	8,716	15.1	13.0	25	27.1	4.1
Bear	32	68	1,234	2.2	1.2	34	2.5	2.7
Lawson	41	59	1,360	10.8	2.5	39	25.4	2.7
Wood	15	85	4,390	21.8	9.7	46	51	3.3
McCollough	18	82	4,063	11.4	6.9	38	41.4	3.6
Totten	29	71	1,705	10.0	7.0	32	22.3	3.4
Dad's	48	52	4,553	9.9	4.9	22	15.7	3.2
Sled	43	57	1,016	10.6	7.7	11	48.7	5.2
Susan	35	65	1,932	8.9	6.5	20	35.0	5.0
Blackhorse	62	38	1,424	12.9	8.4	88	25.1	4.1
Whitehorse	60	40	4,943	9.3	5.7	63	23.8	3.5
Boulder	73	27	405	8.3	6.3	79	3.1	3.9
Hogum	61	39	768	14.7	4.3	49	10.7	1.9
Fizzleout	47	53	980	19.5	7.4	41	8.4	2.5
Starveout	52	48	4,517	7.7	6.6	51	8.9	3.8
Jones	23	77	617	7.0	5.6	33	20.8	5.8
Wildcat	57	43	943	10.5	4.2	27	41.8	3.5
Quines	46	54	6,338	7.3	5.2	58	13.9	4.2
Bull Run	71	29	1,792	11.8	4.2	41	23.4	5.1
L. Bull Run	34	66	970	7.5	6.5	37	7.6	3.3
Tennessee	56	44	844	9.9	4.2	37	28.1	2.8
McCollum	57	43	1,034	14.6	11.7	20	14.4	2.6

Sub-watershed	BLM Land (%)	Non-BLM Land (%)	Total Acres	ECA (%)	Compacted Area (%)	Total TSZ Area (%)	TSZ Openings Area (%)	Road Density mi. per sq. mi.
Woodford	45	55	2,585	16.7	11.4	28	33.1	5.1
Swamp	26	74	1,315	17.1	7.2	6	34.3	5.9
Tunnel	15	85	1,360	3.5	3.2	2	7.1	3.9
Section	18	82	1,614	3.2	4.8	21	6.2	3.0
Mill	4	96	926	8.2	7.0	8	2.5	7.2
Rattlesnake	55	45	2,766	10.5	4.5	18	14.2	4.3
Perkins	14	86	1,569	8.6	7.5	31	17.1	3.5
Tuller	13	87	1,460	11.2	7.9	42	29.0	3.5
Skull	57	43	1,887	7.1	6.4	26	18	2.5
Bonnie	64	36	3,301	7.1	4.5	39	14.8	3.7
Riffle	40	60	5,759	11.2	5.0	32	17.5	4.1

Watershed Parameter	Trigger Value
ECA percentage	25
Compacted area percentage	5
Transient snow zone (TSZ) percentage	50
TSZ openings percentage	25
Road density (hydrologic concerns)	5

EQUIVALENT CLEAR-CUT AREA (ECA) is a computed value which is time-weighted from the time of disturbance and decreases annually as the vegetation grows back. Hydrologic conditions return to pre-disturbance level in approximately 20 to 27 years. The trigger value is 25% of the watershed in equivalent clear-cut area openings at any one time. Values nearing the trigger value for any given HUC 7 are scrutinized according to the soils and stability of the watershed. The trigger value for some watersheds may be lower than 25% due to conditions in that particular watershed.

TRANSIENT SNOW ZONE OPENINGS (TSZ) percentages are used to evaluate the risk of rain-on-snow events which potentially can destabilize stream channels downstream. Values having openings exceeding 25% of the entire basin have the potential for channel alteration. Analysis of stream channel stability and other factors within the watershed are then analyzed to further assess the risk.

SOIL COMPACTION figures are correlated with increased runoff during rainfall events where percolation has been reduced. Erosion and resulting sedimentation of stream courses are partially responsible for reduce spawning and rearing habitat for aquatic species. Compaction values above 5% of the watershed are considered problematic.

ROAD DENSITY is a measure of drainage alteration and increase in intermittent stream channels. The ditches on these roads act as streams during runoff events. Roads also intercept subsurface water thereby altering the natural hydrologic regime. Road densities above 5 miles per square mile are cause for concern from a hydrologic perspective. National Marine Fisheries Service considers road densities over two miles per square mile to not be in proper functioning condition.

Appendix H. Seral Stage Distributions for sub-watersheds in the Middle Cow Creek watershed.

Table H-1. Seral Stage Distribution acreage on BLM lands in the McCullough Sub-watershed

SERAL STAGE OR STRUCTURAL CLASS	LSR MMR SHR RESERVES	CONNECTIVITY	REC SITES ACEC's	GENERAL FOREST MGMT AREA	TOTAL WATERSHED	GFMA IN-BASE	GFMA IN-BASE OUTSIDE RIPARIAN
0-20 YEARS	5	57	0	633	695	618	327
21-40 YEARS	0	36	0	249	285	239	120
41-80 YEARS	87	156	0	695	938	692	378
81-200 YEARS	130	301	0	485	916	394	246
200+ YEARS	1	37	0	636	674	520	309
81-200 YEARS MODIFIED	0	0	0	428	428	428	214
NON-FOREST	0	0	0	6	6	0	0
TOTALS	223	587	0	3132	3942	2891	1594

Table H-2. Seral Stage Distribution acreage on BLM lands in the Dads Sub-watershed

SERAL STAGE OR STRUCTURAL CLASS	LSR MMR SHR RESERVES	CONNECTIVITY	REC SITES ACEC's	GENERAL FOREST MGMT AREA	TOTAL WATERSHED	GFMA IN-BASE	GFMA IN-BASE OUTSIDE RIPARIAN
0-20 YEARS	11	292	0	512	815	507	305
21-40 YEARS	32	133	0	328	493	293	49
41-80 YEARS	0	109	0	288	397	336	168
81-200 YEARS	315	967	0	1161	2443	946	564
200+ YEARS	267	917	18	926	2128	788	318
81-200 YEARS MODIFIED	6	123	0	100	229	100	44
NON-FOREST	0	93	1	50	144	0	0
TOTALS	631	2634	19	3365	6649	2970	1448

Table H-3. Seral Stage Distribution acreage on BLM lands in the Fortune Sub-watershed

SERAL STAGE OR STRUCTURAL CLASS	LSR MMR SHR RESERVES	CONNECTIVITY	REC SITES ACEC's	GENERAL FOREST MGMT AREA	TOTAL WATERSHED	GFMA IN-BASE	GFMA IN-BASE OUTSIDE RIPARIAN
0-20 YEARS	16	270	0	674	960	674	419
21-40 YEARS	14	79	0	523	616	517	278
41-80 YEARS	69	56	0	865	990	801	418
81-200 YEARS	286	65	0	639	990	615	468
200+ YEARS	0	0	0	247	247	247	170
81-200 YEARS MODIFIED	109	124	0	683	916	683	416
NON-FOREST	6	16	0	11	33	0	0
TOTALS	499	610	0	3642	4751	3537	2169

Table H-4. Seral Stage Distribution acreage on BLM lands in the Windy Sub-watershed

SERAL STAGE OR STRUCTURAL CLASS	LSR MMR SHR RESERVES	CONNECTIVITY	REC SITES ACEC's	GENERAL FOREST MGMT AREA	TOTAL WATERSHED	GFMA IN-BASE	GFMA IN-BASE OUTSIDE RIPARIAN
0-20 YEARS	0	122	0	265	387	256	175
21-40 YEARS	0	32	0	189	221	168	84
41-80 YEARS	111	97	0	911	1119	532	488
81-200 YEARS	108	522	0	822	1452	679	509
200+ YEARS	101	419	0	137	657	137	99
81-200 YEARS MODIFIED	0	9	0	172	181	484	124
NON-FOREST	1	8	0	8	17	0	0
TOTALS	321	1209	0	2504	4034	2256	1479

Table H-5. Seral Stage Distribution acreage on BLM lands in the Starveout Sub-watershed

SERAL STAGE OR STRUCTURAL CLASS	LSR MMR SHR RESERVES	CONNECTIVITY	REC SITES ACEC's	GENERAL FOREST MGMT AREA	TOTAL WATERSHED	GFMA IN-BASE	GFMA IN-BASE OUTSIDE RIPARIAN
0-20 YEARS	2108	0	0	0	2108	0	0
21-40 YEARS	1410	0	0	0	1410	0	0
41-80 YEARS	2505	0	0	0	2505	0	0
81-200 YEARS	2424	0	0	0	2424	0	0
200+ YEARS	1411	0	0	0	1411	0	0
81-200 YEARS MODIFIED	1435	0	0	0	1435	0	0
NON-FOREST	188	0	0	0	188	0	0
TOTALS	11481	0	0	0	11481	0	0

Table H-6. Seral Stage Distribution acreage on BLM lands in the Quines Sub-watershed

SERAL STAGE OR STRUCTURAL CLASS	LSR MMR SHR RESERVES	CONNECTIVITY	REC SITES ACEC's	GENERAL FOREST MGMT AREA	TOTAL WATERSHED	GFMA IN-BASE	GFMA IN-BASE OUTSIDE RIPARIAN
0-20 YEARS	1295	36	0	38	1369	38	36
21-40 YEARS	685	43	0	9	737	9	9
41-80 YEARS	398	1	0	2	401	2	1
81-200 YEARS	2432	127	0	60	2619	48	30
200+ YEARS	1173	10	0	2	1185	2	2
81-200 YEARS MODIFIED	547	2	0	1	550	1	1
NON-FOREST	183	0	0	0	183	0	0
TOTALS	6713	219	0	112	7044	100	79

Table H-7. Seral Stage Distribution acreage on BLM lands in the Riffle Sub-watershed

SERAL STAGE OR STRUCTURAL CLASS	LSR MMR SHR RESERVES	CONNECTIVITY	REC SITES ACEC's	GENERAL FOREST MGMT AREA	TOTAL WATERSHED	GFMA IN-BASE	GFMA IN-BASE OUTSIDE RIPARIAN
0-20 YEARS	2	0	0	578	580	554	289
21-40 YEARS	17	273	0	661	951	571	206
41-80 YEARS	0	23	0	266	289	265	168
81-200 YEARS	243	224	10	2034	2511	1556	906
200+ YEARS	0	881	1	1467	2349	1291	697
81-200 YEARS MODIFIED	256	0	0	617	873	582	232
NON-FOREST	22	19	0	14	55	0	0
TOTALS	540	1420	11	5637	7608	4819	2498

Table H-8. Seral Stage Distribution of acreage on <u>All BLM lands</u> in the Middle Cow Creek HUC-5 watershed

SERAL STAGE OR STRUCTURAL CLASS	LSR MMR SHR RESERVES	CONNECTIVITY	REC SITES ACEC's	GENERAL FOREST MGMT AREA	TOTAL WATERSHED	GFMA IN-BASE	GFMA IN-BASE OUTSIDE RIPARIAN
0-20 YEARS	3437	777	0	2700	6914	2647	1551
21-40 YEARS	2158	596	0	1959	4713	1797	746
41-80 YEARS	3170	442	0	3027	6639	2628	1621
81-200 YEARS	5895	2206	10	5201	13355	4238	2693
200+ YEARS	2953	2264	19	3415	8651	2985	1595
81-200 YEARS MODIFIED	2353	258	0	2001	4612	2278	1031
NON-FOREST	400	136	1	89	626	0	0
TOTALS	20366	6679	30	18392	45510	16573	9237

Appendix I. Proposed road closures and other road treatments for the Middle Cow Creek watershed

ID No.	Road No.	Proposed Action	Length (miles)	Road Control	Comments
	31-4-29	Full Decommission	0.3	BLM	Along stream
1	31-4-34	Full Decommission	1.0	BLM	Silviculture access a problem
2	32-4-3 (outside watershed)	Gate	1.3	BLM 2 encumb.	
3	31-4-34.2	Full Decommission	0.3	2 encumb.	Rocked road
4	32-4-5.1B (last segment)	Leave alone	1.2	Roseburg BLM	Silviculture access a problem; main reason to keep open.
5	31-4-31	Full Decommission	0.3	BLM	
6	32-4-6.1	Full Decommission	1.0	BLM	Native surface, along creek. Part is on private land.
7	32-4-7.1	Leave alone			Power line access
8	32-4-7	Look at in the field	1.6		
	32-4-9.1	Leave alone			
9	32-4-9.4	Look at in the field			
10	32-4-8.1	Look at in the field	1.0		

ID No.	Road No.	Proposed Action	Length (miles)	Road Control	Comments
11	32-4-17.2	Leave alone		2 encumb.	
12	32-4-17.1(end)	Full Decommission	0.2	BLM	Decommission past the helicopter landing.
13	32-4-15.1	Leave alone	0.05		Landing spur.
14	32-4-15.2	Leave alone			On ridge
15	32-4-22.4	Leave alone			On ridge
16	32-4-19.8	Storm-proof			Road is in good condition
17	32-4-19.7	Storm-proof			Road is in good condition
18	32-4-19.3	Storm-proof			Road is in good condition
19	32-4-19.5	Storm-proof			Road is in good condition
20	32-4-19.6	Storm-proof			Road is in good condition
21	32-4-19.2	Storm-proof			Road is in good condition
22	32-4-19.4	Full Decommission	0.1	BLM	
	32-4-20.3	Storm-proof			
23	32-4-21.1	Partially Decommission	0.4	BLM	Fizzleout owl core; depleted quarry (don’t need)
24	32-4-21.2	Partially Decommission	0.4	BLM	Fizzleout owl core
25	32-4-30	Storm-proof		BLM	
26	32-4-29.1	Storm-proof	0.1		

ID No.	Road No.	Proposed Action	Length (miles)	Road Control	Comments
27	32-5-25.1 (last segment)	Abandon	0.1		Already overgrown
28	32-5-25.5	Full Decommission	0.8		May already be decommissioned
	32-5-26 (part in section 24)	Storm-proof			
29	32-4-28	Leave alone			
30	32-4-21	Gate (past B&B); Storm-proof	5		Private roads behind gate (Superior)
31	32-4-28.1	Gate (past B&B-off #21) Storm-proof			Behind the proposed gate on road 32-4-21
32	32-4-33.3	Full Decommission	0.8		
33	32-4-32.5	Look at in the field			Active mine area?? Is there an existing gate?
34	32-5-23	Leave alone			Wildcat thin road - already has water dips
35	32-5-23.3	Full Decommission	0.2		Mostly all Riparian Reserves
36	32-5-23.2	Storm-proof	0.3		
37	32-5-25.2	Full Decommission	0.6		
38	32-5-25.6	Partial Decommission	0.5		Old mine - Maybe look at Full Decommission??
39	32-5-35.3	Leave alone			

ID No.	Road No.	Proposed Action	Length (miles)	Road Control	Comments
40	32-5-36	Full Decommission	0.5		Mostly all Riparian Reserves
41	32-5-35.2	Partial Decommission	0.8		Possible access to private ??
42	33-5-13.4	Gate (on 33-5-10); Storm-proof	0.2		King Mountain
43	33-5-10	Gate; Storm-proof	1.2		King Mountain
44	33-5-13.3	Gate (on 33-5-10); Storm-proof	0.4		King Mountain
45	32-5-3	Full Decommission	1.0		Silviculture access problems ???
46	31-5-34	Surface (rock)	1.1		Native surface, keep open for silviculture
47	32-5-27	Full Decommission	0.2		
48	32-5-27.2	Gate; Storm-proof	0.5		Possible access to private land???
49	33-5-2	Storm proof			Mining claims??
50	33-5-35 (part in sec. 3)	Full Decommission	0.3		Along stream
51	33-5-3	Full Decommission	0.5		Along Stream
52	33-5-3.3	Leave alone			Good condition; high in watershed
53	33-5-3.5	Full Decommission			Grave Creek watershed

ID No.	Road No.	Proposed Action	Length (miles)	Road Control	Comments
54	33-5-3.4	Full Decommission			Grave Creek watershed
55	33-5-3.1	Leave alone			Good condition; high in watershed
56	33-5-10.4	Leave alone			Good condition; high in watershed
57	32-5-9.2	Abandon			Already overgrown
58	32-5-9.3	Full Decommission	0.1		
59	32-5-17.1	Leave alone			Progeny test site
60	32-5-29	Barricade			Already barricaded under McCollum Creek TS.
61	32-5-33.2	Barricade			Already barricaded under McCollum Creek TS.
62	33-5-4	Full Decommission	0.2		Owl core area
63	33-5-4.1	Leave alone			
64	33-5-9.2	Leave alone			
65	32-7-15.2	Full Decommission	1.0		Upper Dad's Creek Jeep road
66	33-7-9	Leave alone			
67	33-7-1	Leave alone			
68	32-8-35.3	Full Decommission	1.0	BLM	Decommission the main road going up along the stream (Bonnie Creek). Build a future road from the top to access the end of the 35.3 road and the 33-8-2 road.

ID No.	Road No.	Proposed Action	Length (miles)	Road Control	Comments
	32-8-35.3	Storm-proof end of road	1.2	BLM	
69	33-8-2	Storm-proof	0.8	BLM	See above
70	32-8-27	Full Decommission	1.3	Private	Robert Dollar Road - Look into possibility of purchasing rights to the road; mostly on BLM, runs right up along a major tributary to Bonnie Creek
71	33-5-11.4	Surface; Storm-proof	0.5		
72	33-5-11	Surface; Storm-proof	0.5		
73	33-5-31.2	Full Decommission	0.1		Circle road.
74	32-6-16	Full Decommission/ or fix up road	1.0	Private	Wood Creek
75	32-6-9 (in sec. 3)	Full Decommission	0.2		
76	33-6-9	Full Decommission		Private	Mill Creek - Glendale municipal watershed
	32-7-14	Full Decommission		Private	Private roads in Dad's Creek area - sec. 14
	33-8-2.1	Gate			Prepare for connection to Riffle Creek roads
	33-7-20.1	Surface; Storm-proof		BLM	Susan Creek Road
	T32, R4, sec 14	Look at for decommissioning		Private	Need to look at road system to determine if some of them should be decommissioned.

ID No.	Road No.	Proposed Action	Length (miles)	Road Control	Comments
	T32, R4, sec 16	Look at for decommissioning		Private	Need to look at road system to determine if some of them should be decommissioned.
	T32, R4, sec 23	Look at for decommissioning			Need to look at road system to determine if some of them should be decommissioned.
	T32, R4, sec 27	Look at for decommissioning			Need to look at road system to determine if some of them should be decommissioned.
	T32, R4, sec 31	Look at for decommissioning			Need to look at road system to determine if some of them should be decommissioned.
	T33, R4, sec 1	Look at for decommissioning			Need to look at road system to determine if some of them should be decommissioned.

Appendix J. Potential Noxious weeds; Middle Cow Creek watershed

GENUS/SPECIES	COMMON NAME	LOCATION	HABITAT	NOTES
Cirsium vulgare	Bull Thistle		wide range of conditions	seeds
Cirsium arvense	Canada Thistle		wide range of conditions	seeds/roots
Centaura diffusa	Diffuse knapweed		roadsides/dry sites	
Catharmus lanatus	Distaff Thistle			Douglas Co.
Isatis tinctoria	Dyers woad		sandy/gravel soils	Jackson/Jos. Co./seeds.
Sorgham haepense	Johnson grass		disturbed areas/good soils	Douglas, Josephine Co./seed & roots/agr /roadways
Hypiscium perfatum	Klamath Weed		Wide range of conditions	
Euphorbia esula	Leafy spurge		streams/open areas	seed producer/roots
Taeniatherum caput-medusae	Medusahead rye		pasture/open forest	seed producer
Lythrum salicaria	Purple loosestrife		riparian/ wetlands	seed/rhizomes
Chondrilla juncea	Rush skeletonweed		disturbed areas/ roadways	Douglas, Josephine Co./seed & roots
Centaurea repens	Russian Knapweed		good soils/ disturbed areas	
Cytisus scoparius	Scotch broom		good soils/ disturbed areas	roadways/seed producer some plantations
Senecio jacobaea	Tansy ragwort		wide range of soils	Jackson, Josephine, Douglas Co./seeds.
Centaurea solstitialis	Yellow starthistle		wide range - roadways/dry sites	Jackson, Josephine, Douglas Co./seeds