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Acronyms Used

ACS Aquatic Conservation Strategy

CCC Civilian Conservation Corps

CHUs Critical Habitat Units

cfs cubic feet per second

dbh diameter at breast height

DEQ Department of Environmental Quality

DWD Down Woody Debris

FLRMP Umpqua National Forest Land and Resource Management Plan (USDA 1995)

FEMAT A report of the Forest Ecosystem Management Assessment Team titled Forest Ecosystem Management: An Ecological, Economic, and Social Assessment, July, 1993. USDA.

FSEIS Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl

LSOG Late Successional Old Growth

LWM large woody material

mmbf million board feet

NWP Northwest Forest Plan

NRV natural range of variation

ODEQ Oregon Department of Environmental Quality

PACFISH an inter-regional, inter-agency strategy to provide habitat conditions that contribute to the conservation and restoration of naturally-reproducing stocks of Pacific salmon and anadromous trout

PNW-447 Old Growth Refers to a Pacific Northwest Region Research Note (447) titled Interim Definitions for Old-Growth Douglas-fir and Mixed-Conifer Forests in the Pacific Northwest and California written by the Old-Growth Definition Task Group chaired by J.F. Franklin.

REAP Regional Ecosystem Assessment Project, June, 1993. USDA.

RMP Resource Management Plan, Bureau of Land Management, Eugene District (USDI 1995)

RR Riparian Reserve lands

ROD The Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl

LWD large woody debris

UFP Umpqua Forest Plan

WAA watershed analysis area

Executive Summary

Sharps Creek watershed analysis area is a sixth field watershed of 42,508 acres located in the Coast Fork Willamette sub basin east of the small city of Cottage Grove south of Eugene, Oregon.

Comprised of Forest Service, Bureau of Land Management and privately-managed land, the Northwest Forest Plan allocations on Federal lands include Late Successional Reserve, Matrix, Matrix/Connectivity Blocks and Riparian Reserves.

The geology, climate, wildlife and vegetation are typical of the Western Cascade Province. Dorena Dam, completed in 1949, blocks the passage of all anadromous fish to the upper Row River, which includes Sharps Creek.

The Revised Federal Guide for Watershed Analysis (Version 2.1) was used as a basis for this ecosystem analysis. In addition to the core topics from the Federal Guide, geology and fire were added as major topics used to organize the analysis. Reference conditions are dated from 1936.

Information for analysis came from a variety of sources including field data, historical maps and photos, and personal descriptions. Habitat analysis, local databases and field guides for the area were also used to describe both current and historical conditions.

The Northwest Forest Plan (1994), the Umpqua National Forest Plan (1990), the Eugene District BLM Resource Management Plan (1995) and the FEMAT report (1993) were used extensively as guidelines and reference documents.

This analysis was a joint effort by the Forest Service and the BLM. The Cottage Grove Ranger District of the Umpqua National Forest took the lead on preparing this document with cooperation, participation and assistance from the South Valley Resource Area of the BLM Eugene District.

Public involvement included an open house in the winter of 1997 and 1998 and a newsletter to key government agencies and local landowners describing our process.

This small watershed has many competing resource demands. The most important are timber, wildlife habitat, aquatic habitat, recreation and mining. Issues were a combination of core topics from the federal guide, unique resource concerns, perceived public concerns and potential conflicts among management objectives.

Some important findings

1. Three drainage groups, Lower Sharps West, Walker and Quartz, appear to have significant increases in debris flows as a result of past timber harvest and road construction activities.
2. High road density in earthflow terrain with high stream density has contributed to the degradation of riparian and aquatic habitat.
3. In Sharps Creek, current low flow conditions are among the lowest in the western Cascades Mountains. Flows under reference conditions, while still low, may have been higher because of the storage of water in flood plains caused by log jams and gravel bars.
4. Sharps and Martin Creeks exceed Oregon Department of Environmental Quality (ODEQ) water temperature criteria of 64 degrees and are on the Oregon 303(4) list of water quality limited streams.
5. There is a possibility of a mercury source in the Sharps Creek system.
6. Past management practices such as harvesting riparian trees and instream salvage, have reduced the amount of large woody debris resulting in a lack of channel complexity. This is particularly evident where a valley bottom road is adjacent to a main stream channel, such as Sharps Creek from the mouth up to Mineral Campground.
7. Valley bottom roads and removal of riparian vegetation limit opportunities for future recruitment of large woody debris.
8. Fire has played a major role in the past. In areas where we want to emulate reference conditions, fire should be employed as a management tool.
9. Reference conditions contained more mature (age 81 to 150 years) and less late successional vegetation (age 151+ years) than currently exists.
10. At 50 percent, late successional vegetation is currently within the natural range of variability of 45 to 75 percent. Under current allocations the proportion of late successional vegetation could drop to approximately 35 percent.
11. Landunits were identified for the northwest, northeast, and southern portions of the watershed.
12. There may be effects on amphibian and other aquatic species from placer mining activities.
13. Fragmentation from harvest, road building, mining and recreation sites in riparian reserves may prevent full recovery and maintenance of habitat connectivity within the watershed.
14. Sixty-one percent of the Sharps Creek portion of South Cascade LSR 222 (managed by BLM) is in late successional forest, compared to forty-three percent for the entire LSR.
15. Public lands within the watershed support approximately 75 placer claims along Sharps Creek and its tributaries and 100 lode mining claims in the mineral-rich area of Fairview Peak and Bohemia Mountain.

16. Recreational use is increasing along the riparian corridor.

Some important recommendations

1. Participate in a watershed council with private and other public agencies to improve water quality in the basin.
2. Where feasible maintain and restore large wood in streams and terrestrial habitat.
3. Continue working with the DEQ to identify sources of mercury within the Sharps Creek and upper Row watershed.
4. Identify and evaluate opportunities for prescribed natural or management-ignited fire in select areas to restore fire's role of maintenance of vegetative conditions.
5. Use landunits and plant association groups for the development of benchmark prescriptions, snag and down wood guidelines and prescribed fire priorities.
6. Obtain more survey information on amphibians and other aquatic species in the placer mining areas.
7. In riparian habitat on Federal land, evaluate opportunities to manage for a high density of snags to mitigate the loss of habitat on Matrix and private lands.
8. Retain recommended Riparian Reserve standards and Reserve widths from the Northwest Forest Plan for all streams on Federal lands.
12. The best aquatic habitat is found within the Forest Service roadless areas and should be protected.
13. In the Clark Creek drainage within the LSR, reduce landslide potential, decommission roads where feasible, and implement instream restoration and riparian silviculture projects.
14. Maintain the roadless character of the Fairview and Puddin Rock roadless areas on Forest Service managed lands.
15. Pursue consistency of mineral administration and interpretation of regulations and policies by BLM and Forest Service to the extent allowed under current polices.
16. Continue to operate and maintain existing developed recreation sites at BLM Sharps Creek Recreation Site and Mineral Camp but limit dispersed recreation use in Riparian Reserves.

1. Characterization

Introduction

The Sharps Creek watershed (42,509 acres) is located in the southernmost headwaters of the Willamette River along the western slope of the Cascades Range in west central Oregon. Sharps Creek flows in a generally northwestern direction to its confluence with Row River which flows into Dorena Lake above Dorena Dam. The Row River enters the Coast Fork of the Willamette River below Dorena Dam near the small community of Saginaw.

Dorena Dam is operated by the US Army Corps of Engineers (COE) and lies below the Sharps Creek watershed. It blocks the passage for anadromous fish into the Sharps Creek watershed.

Elevations range from a low of 974 feet at the confluence of Sharps Creek and Row River, to a high of 5,979 feet at Bohemia Mountain. The Calapooya Divide forms the southern boundary and is an important topographic feature in the watershed, separating the Willamette and Umpqua Basins.

Sharps Creek watershed is located mainly in Lane County with approximately 1,337 acres located in Douglas County.

Because of ownership and land use patterns, Sharps Creek retains large areas of intact mature and late seral vegetation and large areas of intensively managed young plantations. Areas that burned frequently before European settlement are now the mature, intact stands and the areas where old growth dominated are now the young plantations. This pattern is a reversal from historical vegetation patterns.

Core Topics

This document is organized along the lines of the following core topics from the Federal Guide for Watershed Analysis;

- ***Erosional Processes***
- ***Hydrology***
- ***Stream Channels***
- ***Water Quality***
- ***Vegetation, Soils & Disturbance***
- ***Species and Habitats***
- ***Human Uses***

Watershed Analysis Organization

Chapter 1 begins with a substantial discussion of the geomorphology of the Sharps Creek watershed analysis area. The geology determines and affects many of the physical processes operating and functioning in the watershed and determines the responses to management activities.

Other physical processes such as hydrology and stream channels are described in terms of watershed dynamics, setting and physiography.

Disturbance plays a major role in shaping the landscape patterns in the Sharps Creek watershed. Historically, fire determined the vegetation patterns as well as erosion, insect and disease. More recently, fire suppression and other human management activities such as timber harvesting and road building have been the primary disturbance. A description of fire and other disturbances are found in the Vegetation section.

The dominant biological processes in the Sharps Creek watershed analysis area are characterized in terms of vegetation and associated insect and disease, wildlife habitat and aquatic habitat.

Processes associated with human use are varied and substantial. Logging, recreation and mining are just some of the uses heavily influencing the watershed.

Chapters 1, 3 and 5 are organized by core topic. Chapters 2 and 4 are organized within core topics by issues and key questions. Although Sharps Creek is a sixth field SUBWATERSHED, the terms subwatershed, watershed and watershed analysis area are used somewhat interchangeably throughout this document.

The Sharps Creek Watershed was analyzed jointly by a team from the USDA Forest Service (FS) Umpqua National Forest, Cottage Grove Ranger District, and the USDI Bureau of Land Management (BLM) Eugene District, South Valley Resource Area. References to the District or Layng Creek and Brice Creek refer to lands managed by the Forest Service Cottage Grove District; and references to Cottage Grove Lake/Big River refer to lands in the South Valley Resource Area managed by the BLM Eugene District. Watershed analysis was completed for Layng Creek in 1995, for Brice Creek in 1997 and Cottage Grove Lake/Big River watersheds in 1997.

Watershed Hierarchy

Figure 1, the Hierarchy of Watersheds, illustrates the watershed setting for Sharps Creek. The hierarchy of watersheds containing Sharps Creek is part of the Lower Columbia sub region.

River Basin ..... **Willamette River**

Subbasin ..... **Coast Fork Willamette**

Watershed ..... **Row River**

Subwatershed ..... **Sharps Creek**

Figure 1. Hierarchy of Watersheds

Land Ownership

Figure 2 indicates the distribution of federal and private land in the watershed. The USDA Forest Service is the largest landowner with 17,753 acres (42 percent) and the USDI Bureau of Land Management retains 9,208 acres (21 percent) for a total federal land ownership of 26,961 acres or 63 percent of the watershed analysis area. Private ownership totals 15,728 acres or 37 percent of the subwatershed. The largest private landowners include Weyerhaeuser, Giustina Resources and Willamette Industries.

Landscape Stratifications

Two general stratifications of the landscape are used in this document. Drainage groups are composed of the smallest drainages identified on the Cottage Grove District and BLM Resource area. Figure 3 is a map of the groups and drainages. Landscape Areas are the second stratification criteria and follow drainage boundaries; they are composed of landunits which are defined by patterns of vegetation, elevation and disturbance processes.

Table 25. Sharps Creek Landscape Areas and Drainage Groups

Landscape Areas	Drainage Groups
Lower Sharps East	Adams, Lick, Lower Sharps East, Pony
Lower Sharps West	Buck, Lower Sharps West, Straight,
Upper Sharps	Adams, Clark, Fairview, Martin, Quartz, Upper Sharps, Walker

Figure 2. Ownership

Figure 3. Drainage Groups

Watershed Geology

Bedrock and Surficial Geology

Sharps Creek lies along the western margin of the older and deeply eroded Western Cascades volcanic terrain. West of Sharps Creek the geology of Mosby Creek is dominated by the interfaced Fisher and Eugene Formations (sedimentary and volcanic rocks deposited in a coastal environment). The bedrock geology of the watershed consists of an elaborately interlayered sequence of lava flows, pyroclastic fall and flow deposits, and volcaniclastic sediments that are correlated with the poorly understood Little Butte Volcanic Group. Intrusive rocks of granitic composition locally invade this volcanic assemblage.

Sherrod (1986) reports that the Little Butte Volcanic Group was gradually deposited into a slowly subsiding basin or trough of mostly subdued topography between approximately 35 and 17 million years ago. Over the millennia these volcanic deposits were gradually buried to a depth of several thousand feet. Low-grade burial metamorphism transformed the primary mineral constituents of the volcanic deposits into various clays, and other secondary minerals. Accelerated chemical weathering processes acted to weaken the volcanic rock mass forming saprolite (thoroughly decomposed rock).

The regional tilting of the volcanic layers has profound consequences for structural stability as reflected by large-scale mass-wasting events that occurred during the Pleistocene epoch when wetter climatic conditions prevailed. Uplift of the Western Cascades was still fairly intense during this time and stream entrenchment was at its maximum.

Regional geologic investigations and reconnaissance-level mapping efforts by Peck et al. (1964), MacLeod (1983-84), and Sherrod and Smith (1989) provide the framework for outlining the fundamental volcanic stratigraphy and structural elements within the Western Cascade Range of south-central Oregon.. The State Geologic Map, compiled by Walker and MacLeod (1991), was incorporated into the Forest Geographic Information System (GIS) for landscape-level resource geology and ecosystem land planning applications. This highly generalized map presently serves as the sole source of geologic coverage for the entire Umpqua National Forest and provides the basis for the geologic map units that underlie the Sharps Creek watershed. The geologic map and accompanying legend for the Sharps Creek watershed is portrayed in Figure 4.

Figure 4. Geomorphic Groups

Lithology

There are five principle bedrock units that are identifiable in the watershed, all of which are associated with the Little Butte Volcanic Group. Figure 5 portrays the relative distribution of these units at the watershed scale.

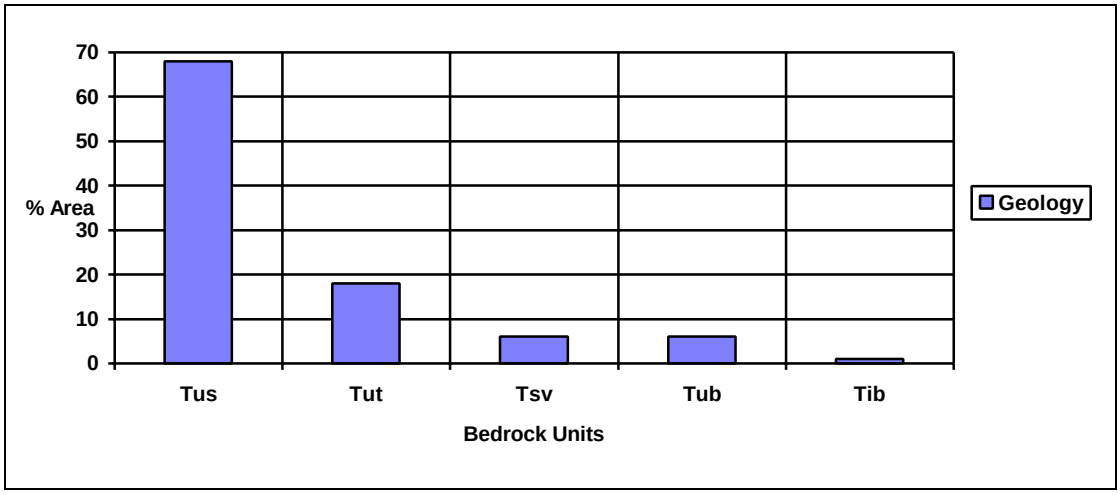


Figure 5. Distribution of Bedrock Units

The most abundant rock unit in the watershed is identified as **Tus**, which is an amalgamation of pyroclastic, volcaniclastics and lava flows. This rock unit underlies about 29,000 acres and is one of the most common rock units in the Western Cascades. In Sharps Creek there are several large bodies that tend to be found in the upslope and headwater areas of the basin. One feature commonly found associated with these interbedded volcanic rocks are large Pleistocene era landslide complexes.

The rock unit **Tut** encompasses about 7500 acres that is oriented in a Northwest/Southeast direction. This rock unit is predominantly a series of pyroclastic ash-flows and tuffs and is typified by a large massive unit that bisects Sharps Creek. On the northern end of the watershed this unit forms the steep ridge between Brice Creek and Sharps Creek with numerous rock outcrops and a number of cliff developments.

The **Tsv** rock unit is an intrusive volcanic deposit that has a lot of similarities with granitic rocks. Several of these Intrusions are found in the watershed and typically have caused extensive alteration of the surrounding rocks. Holderman Mountain is predominantly composed of this Tsv unit. The deep weathered soils in these areas are often mistaken for decomposed granites.

Rock unit **Tub** is a basaltic flow rock that is massive in nature and very resistant to erosion. The lower reaches of Sharps Creek are controlled by this linear basaltic unit, and also serves as a resistant layer which controls the development of prehistoric

earthflow features. This rock typically makes high quality rock aggregate as is noted by the large quarries adjacent to lower Sharps Creek.

Unconsolidated deposits of stream alluvium (**Qal**) are confined to valley floor floodplains and terraces along Sharps Creek. Massive deep-seated landslide deposits (**Qls**) consisting of gravity-transported colluvial debris are widely dispersed throughout the north portion of watershed, but the largest complexes are situated on the broad dip slope face west of Lower Sharps Creek.

Mining

Underground hardrock mining has played a significant and historic role in development of the Sharps Creek watershed, and has thus been a major source of human disturbance. The focus of hardrock mineral development within the watershed has been in the Bohemia mining district which straddles the crest of the Calapooya Divide separating tributaries of the Steamboat drainage on the North Umpqua side with tributaries of the Brice Creek and Sharps Creek on the Willamette side. The District encompasses roughly a circular area of about 60 square miles with the main mineralized belt occupying an area 5.5 miles long by 1.5 miles wide along a west-northwest trend. For additional information, The Brice Creek Watershed Analysis should be consulted.

Recreational placer mining by suction dredging (generally using a 4-inch diameter or smaller intake nozzle) has become a popular activity along stream courses that drain the Bohemia mining district. Within the Sharps Creek watershed, virtually all suction dredge operations are conducted within the stream channel where “flood gold” deposits are replenished by seasonal peak flows. One reason for the proliferation of recreational suction dredging is its affordability. Capital expenditures for equipment and daily operating costs are minimal compared to commercial placer mining and underground hardrock mining.

Geomorphic Processes

Over the past 40+ million years, episodic volcanism was the single most important geomorphic process that led to the formation and development of the Western and the High Cascade physiographic sub-provinces. Mass-wasting processes greatly accelerated in the Western Cascade Range during the early Pliocene epoch, roughly 5.5 to 6 million years ago in response to a marked increase in the rate of differential uplift of the landmass (Sherrod, 1986). Regional uplift caused drainage systems throughout the Western Cascade Range to acquire steeper gradients and increased erosive power.

Today, the dominant geomorphic process of erosion occurring within the Western Cascade Range is mass wasting with small and widely disseminated shallow-seated landslides as the principal agent (Swanson, 1987). Surface erosion mechanisms also play a role in shaping the landscape, but not to the same degree or extent as that of mass-wasting. Soil erosion potential can be severe when the vegetative cover is removed and the soil mass is disrupted by either natural or human-related disturbance events. In Sharps Creek watershed stream bank erosion is often localized along drainage networks that are deficient in natural armoring materials.

In unmanaged landscapes both mass wasting and surface erosion are natural cyclic functions in the watershed, and as such, strongly influence hydrologic patterns and water quality. Geomorphic processes control stream channel development as they affect water discharge, sediment load, channel bank and bed substrate, riparian vegetation, and recruitment of large woody debris (Murphy and Meehan, 1991).

Landslides

Landslides are generally initiated by infrequent climatic events such as intense winter storms, rapid snowmelt (rain-on-snow), or prolonged periods of precipitation. Landslide distribution, frequency, and magnitude are influenced by hillslope gradient and form, amount of subsurface water, degree and depth of chemical weathering of the parent bedrock material, and frequency and coincidence of natural disturbance patterns (Montgomery and Buffington, 1993; and Swanston, 1991).

The deeply weathered Western Cascade volcanic rocks that underlie Sharps Creek readily decompose into mostly fine-textured soils. Residual soils developed upon these slopes tend to have some cohesion. Root cohesion associated with conifer stands binds the soil mass together and largely inhibits surface erosional processes. Accelerated channel incision and bank erosion often occurs along the steeper-gradient stream channels following severe natural disturbance events, or in association with some management-related practices or activities. Bedrock lithologies consisting of pyroclastic deposits and volcaniclastic sediments are prone to developing into "earthflow terrain" or slump-earthflow complex -- a very sensitive landform with respect to fluvial erosion. Stream channels developed upon these bedrock lithologies usually lack sufficient roughness in the form of bedrock, boulders and cobbles, and large woody debris. Large wood and riparian vegetation play a vital function in maintaining channel stability in areas deficient in bedrock and large size rock materials. Such armoring acts to dissipate flow energy and mitigates the potential for accelerated erosion during periods of peak flow.

Slumps and Earthflows

The rotational slumps and earthflows found in Sharps Creek analysis area often develop in deeply weathered pyroclastic deposits (tuffs, breccias) and volcaniclastic sediments (tuffaceous mudstones, siltstones, sandstones) where groundwater movement is restricted due to low soil permeability and where particle size of decomposed bedrock materials are dominated by clay-size fraction (Burroughs, et al., 1976). Pyroclastic deposits, primarily the green-colored tuffs and volcanic breccias are present in Sharps Creek watershed and have a significant content of high shrink-swell clay (smectite), that are noted for their susceptibility to chemical weathering and formation of deep residual soils (Paeth, et al., 1971).

This rotational slump and earthflow movement in unstable terrain is predominantly seasonal, with most displacement occurring after fall and winter storms have thoroughly wetted affected hill slopes. When active, the toe of a rotational slump or earthflow may slowly advance into an adjacent stream channel where it is gradually

eroded away by high winter and spring flows. Several examples of this process can be seen in Layng Creek watershed (Layng Creek Watershed Analysis, 1995). Sediment delivery into stream channels can be quite high and chronic. The channel obstruction usually results in deposition of coarse sediment wedges above the entry point, usually creating new or revitalizing existing spawning gravel deposits. Downstream effects from an obstruction result in chronic long-term deposition of fine sediment and organic debris as blankets or windrows overlying spawning gravel deposits (Swanston, 1991).

Debris Slides and Debris Avalanches

Debris slides and debris avalanches are common natural processes found in Sharps Creek watershed analysis area. Debris slides and debris avalanches are generally shallow, rapid landslides resulting from the failure of a block or wedge of soil, rock, and organic debris along planar or undulating surface that is parallel to the slope. Debris avalanches differ from debris slides in that they contain a significantly higher component of coarse rock fragments (Varnes, 1978).

Both debris slides and debris avalanches constitute the most common types of mass wasting movements on steep, forested terrain such as the Upper Sharps Creek watershed. Typically in rain-dominated regions, debris slides and debris avalanches occur in shallow coarse-grained soils with high soil moistures. Most debris slides and debris avalanches develop after a high-intensity storm or after rapid snowmelt has caused a temporary elevated water table and associated high pore-pressure in the saturated soil mass, as well as a reduction in cohesion.

Debris Flows

Debris flows represent rapid movements of large volumes of water charged with soil, rock, and organic debris that mobilize down steep stream channels**.** Debris flows are one of the most common forms of mass wasting in mountainous watersheds of the Pacific Northwest and are the principal process transporting sediment and coarse woody debris to low order stream channels. Concave headwalls or colluvial swales, which serve to concentrate ground and surface water, flow and accumulate sediment via gravity transport processes are the primary sources for debris flows in mountainous terrain.

Hydrology

Sharps Creek. as part of the Willamette River basin, flows north to the Columbia River and the Pacific Ocean. One of the Willamette's major tributaries, the Coast Fork Willamette, has a 642-square mile watershed with Cottage Grove reservoir on its upper Coast Fork and Dorena reservoir on the Row River. From the west slopes of the Cascades, the 375 square miles of the Row River basin gathers the flow of Mosby Creek below Dorena, and Sharps, Brice and Layng Creeks upstream. Just above the reservoir, and below Wildwood Falls, Sharps Creek flows into the Row.

Sharps Creek's watershed is 66 square miles. The annual precipitation at the mouth (about 1200 feet elevation) is 53 inches, increasing to 75 inches at 4900 feet. A maritime climate brings heavy snow and rain in winter, and very dry summers. The Row River stream gage below Sharps Creek showed flooding of 33,100 cubic feet per second (cfs) in December 1964; however, flows are as low as 24 cfs in August of some years (2-year, 30-day low flow). Figure 6 shows the annual variability in the mean daily flow for the drainage.

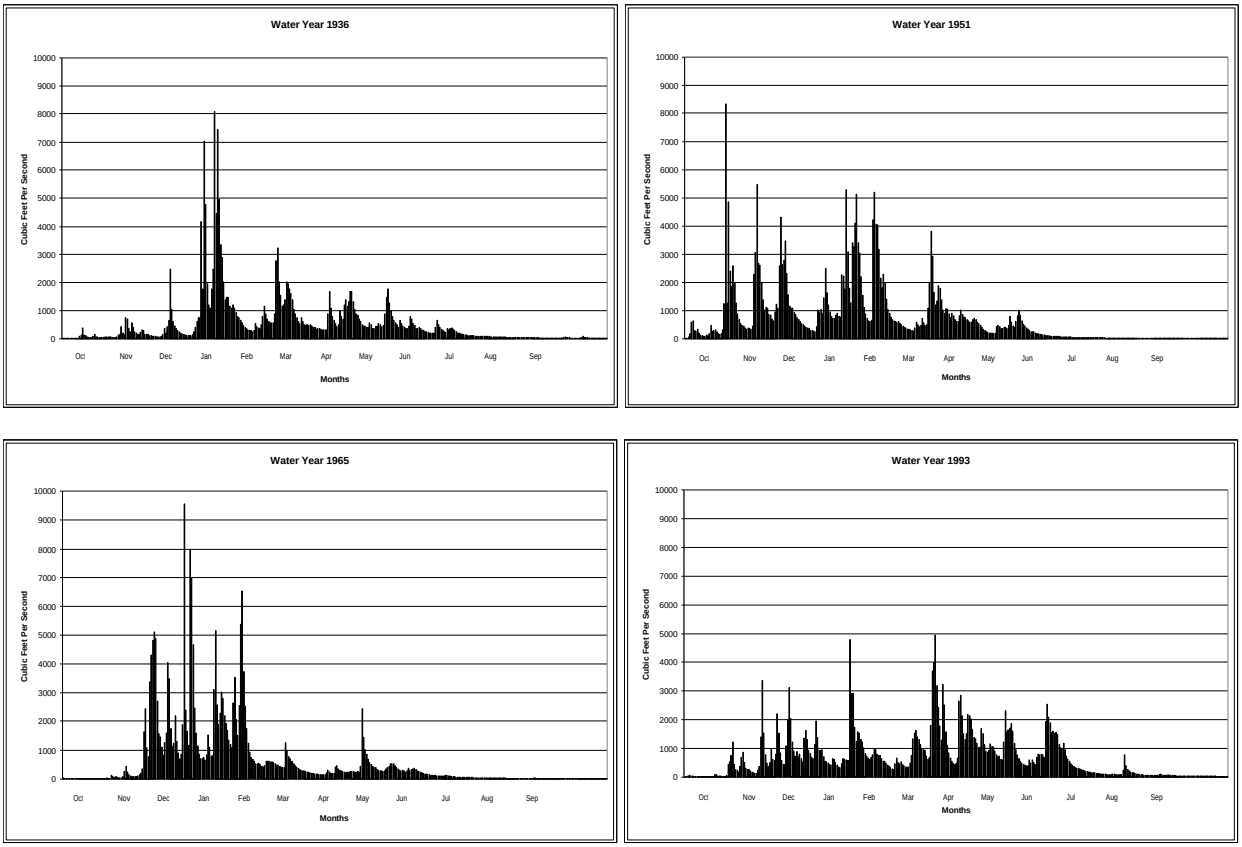


Figure 6. Flow Patterns

Figure 7 shows the annual instantaneous peak, the total annual runoff, and the annual daily low flows for the period of record at the Row River gage. Dorena Reservoir stores flood flows and augments low flows downstream on the Row and Willamette Rivers.

The streams flowing into Sharps Creek from the west are lower gradient, and many have fish for a mile or two. The largest tributaries are Walker, Clark, Martin and Upper Sharps Creek, but only Upper Sharps above Martin Creek has extensive stands of old-growth conifers along its banks.

In the fall of 1996, the Row River experienced the largest flood since 1964, nearly equaling that flood and peaking at 30,400 cfs the night of November 18. Flood damage to roads was greatest in Layng Creek to the north, but logs, cobble and boulders reshaped Sharps Creek in many places. Water flowed over the streambanks, eroded roads next to the creek, and blocked ditches and culverts with debris.

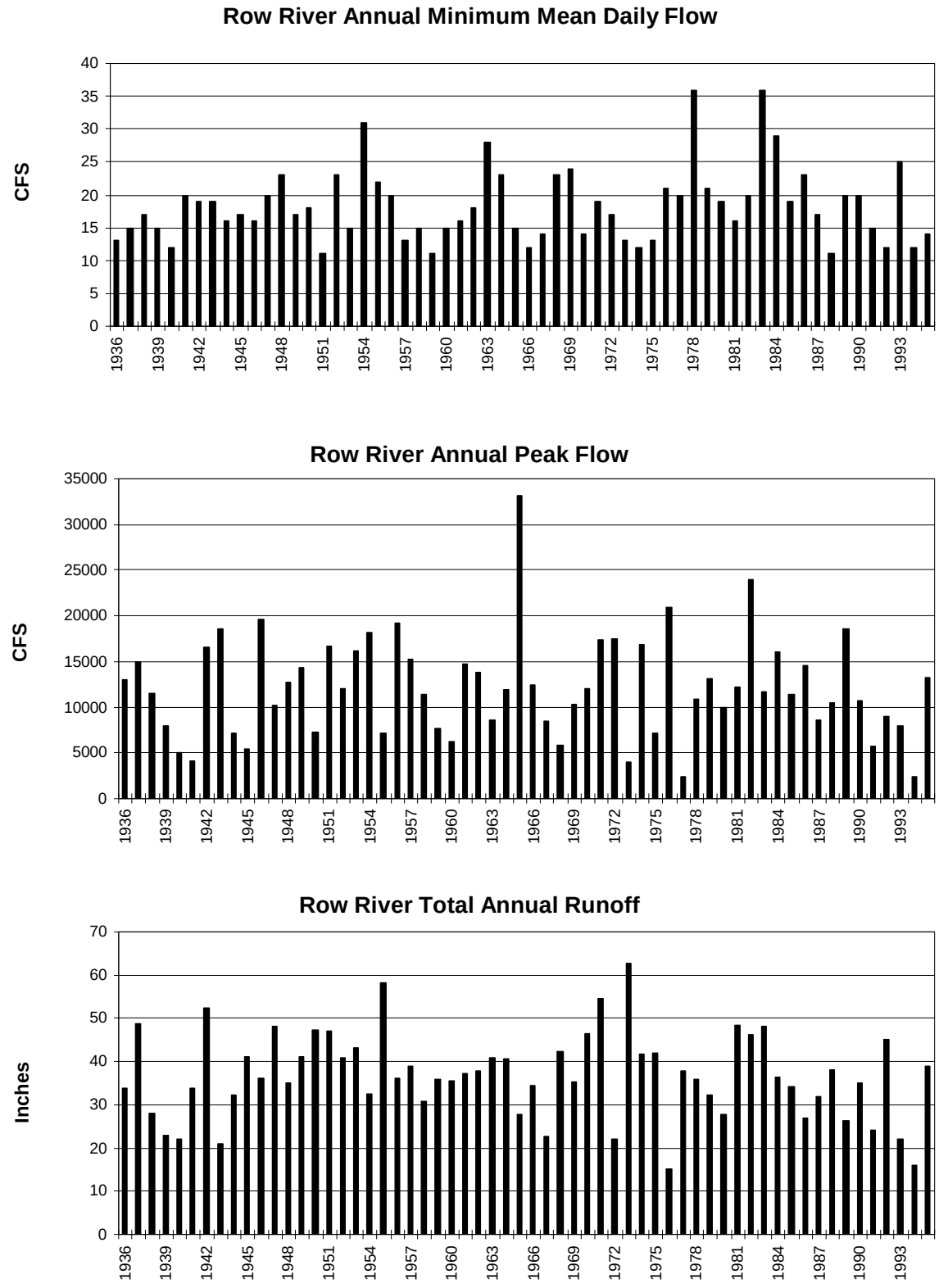


Figure 7. Peak, Total, and Flows of Row River

Figure 8. Elevation

Table 26. Elevation & Slope

Elevation	% of Watershed
1000-2000 feet	22%
2000-3000 feet	45%
3000-4000 feet	26%
4000-5000 feet	6%
5000-6000 feet	1%

Percent Slope	% of Watershed
0-20	10%
20-40	25%
40-60	31%
60-80	22%
>80	12%

Stream Channels

The Sharps Creek Watershed Analysis Area has 447 miles of streams, 60.4 of those are fish bearing. The stream channels tend to be steep, high gradient. The lower mainstem of Sharps Creek is where deposition processes occur, while the upper reaches of Sharps Creek and all the tributaries are source and transport sections. Hill slopes are highly dissected, with many tributaries. The stream density averaged at 6.7 miles per square mile. These high gradient, incised streams allow for "flashy" storm events. Winter flows are generally high, due to a large amount of precipitation and to naturally occurring rain-on-snow events. The steep gradient, deeply entrenched channels are efficient in moving the high flows downstream.

Large woody debris, bedrock, and boulder substrate control channel processes. Stable channels have well armored banks where vegetation and large woody debris provide much of that stability. Mature conifers in riparian areas are essential for future recruitment of large woody debris. Many of the riparian areas within the watershed analysis area are lacking in large wood and mature trees. The current and past management on private and federally administered land has differed, resulting in more intact riparian areas on federally administered land.

Mining is common throughout Sharps Creek and other tributaries. Channel bottom sediments are regularly altered through dredging and other mining practices. A valley bottom road has confined mainstem Sharps Creek, limiting the meander pattern. Heavy roading on private land has also affected stream channels.

Water Quality

Sharps Creek has clear water with low levels of dissolved ions, especially in summer. Winter floods are more turbid, as the high flows carry mostly coarse sand and gravels eroded from the channel and hillslopes. Water temperature is warm in summer, especially for the cold-water aquatic life typical of western Cascade streams.

Beneficial Uses

Downstream, below the watershed analysis area, there are several documented uses of water between the mouth of Sharps Creek and the Dorena reservoir, including drinking water and irrigation. There is also a municipal water intake for the city of Cottage Grove a short distance below the reservoir. Within Dorena reservoir, trout and bass fishing are common.

Within the analysis area, native cutthroat trout, along with other riparian and aquatic species are an important resource providing beneficial uses. Recreational uses of the water in the Sharps Creek watershed analysis area include swimming, fishing, mining, viewing and kayaking. Fire sumps have been developed throughout the watershed to provide rapid tanker truck access to the streams for fire fighting.

Critical Water Quality Parameters

Sharps and Martin Creeks have warm summer water temperatures exceeding the Oregon Department of Environmental Quality (ODEQ) criterion of 64 degrees (7-day average of maximum daily temperature). As of November 1998, Sharps Creek, from the mouth to the confluence of Martin Creek, and Martin Creek, from the mouth to the headwaters, are on the Oregon 303(d) list of Water Quality Limited streams. High water temperatures clearly affect aquatic life. Near its mouth, Sharps Creek reached 76 degrees Fahrenheit (F) in summer 1996. Upper Sharps Creek and Martin Creek, 10 miles upstream, were about 65 F. The main stream warms quickly from there, to 73 degrees just two miles downstream.

Low flow is also critical because low flows typical of the dry summers in the Cascades affect aquatic life. As flow drops in summer, water temperature increases, less flowing water habitat is available for fish and other organisms, and there is less water for downstream users.

The highest risk for catastrophic damage to beneficial uses (like fish and drinking water) is from a motor vehicle accident and spill of gas or diesel. Mercury levels in fish tissue are another cause for concern. The tissue of fish in Dorena reservoir has been found to be near the health advisory level. The source of this contamination is being investigated in a state-wide program of the ODEQ.

Vegetation, Disturbance and Soils

Vegetation

The vegetation in the Sharps Creek WAA is typical of the southern portion of the Western Oregon Cascades Province. The majority of the watershed lies in the western hemlock vegetation zone, with areas of Douglas-fir association series on lower, warmer sites, and grand fir and silver fir series at higher elevations. Mountain hemlock is the coolest series represented in the Sharps Creek watershed analysis area, and occurs at the highest elevations on the District. On the valley floor, the White oak series are present.

Common tree species include Douglas-fir (Pseudotsuga menzii), western hemlock (Tsuga heterophylla), western redcedar (Thuja plicata), incense cedar (Calocedrus decurrens), silver fir (Abies amabilis), sugar pine (Pinus lambertiana), white pine (Pinus monticola), white fir (Abies concolor), yew (Taxus brevifolia), chinquapin (Castanopsis chrysophylla), madrone (Arbutus menziesii) and bigleaf maple (Acer macrophyllum). Minor species include mountain hemlock (Tsuga mertensiana), Shasta red fir (Abies procera shastensis), Alaska yellow cedar (Chamaecyparis nootkatensis) and white oak (Quercus garryana).

Shrub and understory species include vine maple (*Acer circinatum),* rhododendron (*Rhodendron macrophyllum),* salal *(Gaultheria shallon*), dwarf Oregon-grape (*Berberis nervosa*), currant (*Ribes* spp.), huckleberry (*Rubus* spp.), Pacific dogwood (*Cornus nuttallii*), oceanspray (*Holodiscus discolor*), ceanothus (*Ceanothus* spp.) and red elderberry (*Sambucus racemosa).* Characteristic herbaceous species include twinflower (*Linnaea borealis),* whipple vine(*Whipplea modesta),* vanillaleaf (*triphylla*), foamflower (*Tiarella trifoliata*) and swordfern (*Polystichum munitum).*

Landunit Stratification

In order to facilitate understanding of vegetation types along moisture and temperature gradients, the Sharps Creek Watershed Analysis Area was stratified into six broadly-defined environments, called "Landunits", that represent different moisture and temperature regimes. Sharps Creek Landunits were characterized and mapped using elevation, aspect and slope classes, those physiographic properties that most effect the distribution of soils and vegetation types in Sharps Creek and elsewhere in Oregon and Washington (Spies and Franklin, 1991).

The Sharps Creek Landunits characterize six physiographic environments that closely approximate the landunits of Brice Creek watershed. They are named for the moisture and temperature environments that they define:

Table 27. Sharps Creek Landunit Physiography

Landunit Name	Landunit Physiography		
	Elevation (feet)	Aspect (azimuth)	Slope (%)
Cool	>= 4000	SE to NW	< 60
	>3200	NW to SE	< 60
Cool,/Dry/Steep (C_D_S)	>= 4000	SE to NW	>= 60
Warm/Dry/Gentle (W_D_G)	<4000	SE to NW	< 60
Warm/Dry/Steep (W_D_S)	< 4000	SE to NW	>= 60
Warm/Moist/Gentle (W_M_S)	< 4000	NW to SE	< 30
Warm/Moist/Steep (W_M_S)	< 4000	NW to SE	>= 30

Figure 9. Landunits and Landscape Areas

Cool Landunits

In the Sharps Creek Watershed Analysis Area, Cool Landunits occur above 3200 feet on north aspects (northwest to southeast azimuths) and above 4,000 feet on south aspects (southeast to northwest azimuths). At these higher elevations, cool temperatures become more of a factor and soil moisture deficits less a factor affecting vegetation. The presence of cool western hemlock plant associations and absence of warm hemlock associations was used as an indicator of this cool environment on north aspects in upper Sharps Creek (see Figure 9). The Douglas-fir forest dominates the cool environment on south aspects.

Warm Landunits

The Warm Landunits occur primarily in the western hemlock and Douglas-fir vegetation zones, where soil moisture is the principle site factor affecting vegetation. The Warm Landunits are separated in Warm/Moist and Warm/Dry based on aspect. Warm/Dry Landunits are located on south aspects, with the driest sites being those on slopes greater than 60 percent (Warm/Dry/Steep) where soils are shallow and rocky.

The Warm/Dry Landunits are dominated by Douglas-fir plant associations. In general, plant associations found in a Warm/Dry environments are less productive because they have lower levels of soil moisture, organic matter and large woody material. Comparable Willamette National Forest plant associations have site indices for Douglas fir that range from 107 (TSHE/GASH) to 87 (PSME/HODI/WHMO) [King , 1966 (50-year site indices for Douglas-fir)].

The Warm/Moist Landunits occur on north aspects with the wettest sites being on slopes less than 30 percent (Warm/Moist/Gentle). The Warm/Moist environment is dominated by a group of moisture-loving western hemlock plant associations and the western redcedar plant series. The moist hemlock plant association group occupies the most productive sites that typically have deep soils with good drainage and lower slope positions. Within this group of moist western hemlock and western red cedar associations. those with *Rhododendron* generally occupy less productive sites where moisture, fertility and/or temperature limits plant growth. On comparable Willamette National Forest western hemlock associations, Douglas-fir site indices range from 120 (THSE/POMU) to 99 (TSHE/RHMA/BENE).

Plant Associations

Common plant associations found in the watershed analysis area have been combined into Plant Association Groups (PAG), and their distribution along environmental gradients in Sharps Creek watershed were used to determine the elevation bands that define Cool landunits on different aspects. The hemlock series was broken into four PAGs, CH1 to CH4; warm/moist; warm/dry; cool/dry and cool respectively. The plant association group CD2 characterizes cool Douglas-fir sites. The plant associations, codes, PAGs and characteristics are listed in Table 4. The plant associations were identified through timber stand exam data from upper Sharps Creek and lower Brice Creek watersheds.

Table 28. Common Plant Associations in Sharps Creek

Plant Association	Plant Association Code	PAG	Temperature/ Moisture
Mountain hemlock/rhododendron/beargrass	TSME/RHMA/XETE	CM1	
Silver fir/Rosa gymnocarpa/vanilla-leaf	ABAM/ROGY/ACTR	CF1	
Silver fir-hemlock/big huckleberry/vanilla leaf	ABAM-TSHE/VAME/ACTR	CF1	
White fir-western hemlock/dwarf Oregon grape/twinflower	ABCO-TSHE/BENE2/LIBOL	CW1	
White fir/rhododendron-dwarf Oregon grape	ABCO/RHMA3-BENE2	CW1	
Western hemlock/salal-swordfern	TSHE/GASH/POMU-SWO	CH1	warm/moist
Western hemlock/vine maple-salal	TSHE/ACCI-GASH-SWO	CH1	warm/moist
Western hemlock/dwarf Oregon grape – Willamette	TSHE/BENE	CH1	warm/moist
Western hemlock/salal-rhododendron	TSHE/GASH-RHMA3-SWO	CH2	warm/dry
Western hemlock/salal-dwarf Oregon grape	TSHE/GASH-BENE2-SWO	CH2	warm/dry
Western hemlock-golden chinquapin/salal-rhododendron	TSHE-CACH6/GASH-RHMA3	CH2	warm/dry
Western hemlock-Douglas-fir/salal	TSHE-PSME/GASH-SWO	CH2	warm/dry
Western hemlock-incense cedar/salal	TSHE-CADE27/GASH	CH2	warm/dry
Western hemlock/rhododendron-salal	TSHE/RHMA3-GASH-SWO	CH3	transitional
Western hemlock-western redcedar/rhododendron	TSHE-THPL/RHMA3	CH3	transitional
Western hemlock/vine maple-rhododendron	TSHE/ACCI-RHMA3	CH4	cool
Western hemlock-silver fir	TSHE-ABAM	CH4	cool
Western redcedar/dwarf Oregon grape/swordfern	THPL/BENE2/POMU	CC1	
Douglas-fir/vine maple-dwarf Oregon grape	PSME/ACCI-BENE2	CD1	warm
Douglas-fir/salal-dwarf Oregon grape	PSME/GASH-BENE2	CD1	warm
Douglas-fir-white fir	PSME-ABCO	CD2	cool

Fire and Other Disturbances

Historically, fire has been the primary disturbance process affecting vegetation within the Sharps Creek watershed analysis area. However, in the last 90 years, a policy of aggressive fire suppression has led to changes in the vegetation by allowing understory trees and shrubs to mature and fuels to accumulate. Wind, floods, slides and insect and disease play a disturbance role as well. Timber harvesting and mining activity have impacted vegetation by reducing the proportion of acres in late successional stages and the associated reduction in stand characteristics such as snags and down logs.

Phellinus weirii and *Phellinus pini* are the most prevalent root and stem diseases affecting the major conifer species. White pine blister rust (caused by *Cronartium ribicola*) has had a major effect on white pine and sugar pine conifer component of the watershed. Douglas-fir beetle (*Dendroctonus pseudotsugae*) is the most common insect causing damage and disturbance to conifers.

Fuel Models

The watershed is characterized by five fire behavior (FBO) fuel models. The FBO fuel models consider primarily the 0-3 inch size classes, and are the standard models used to estimate fire behavior. These fuel models are representative of both current and reference times, though their distribution over the landscape has differed.

Table 29. Fuel Models

Type	Character	Intensity
Fuel model 1	meadows, grass	surface fire
Fuel model 2	young reproduction, open canopy	surface fire
Fuel model 8	poles, small timber, closed canopy	slow, ground fire
Fuel model 10	mature timber	surface, ground intensity > 8
Fuel model 11	slash, thinnings, clearcuts < 5 years	active ground fire, discontinuous
Fuel model 12	slash, continuous	rapid spread, high intensity

Current Fuel Models

Fuel Model 1: The meadow areas within the watershed are represented by Fuel Model One. In this grass fuel model, fire spread is governed by the fine, very porous, and continuous herbaceous fuels that have cured or are nearly cured. Fires are surface fires that move rapidly through the cured grass and associated material. Very little shrub or timber is present, generally less than one third of the area.

Fuel Model 2: Open shrub lands, and open stands that include clumps of fuels that generate higher fire intensities, represent this fuel model. Fire spread is primarily through the fine herbaceous fuels, either curing or dead. These are surface fires where the herbaceous material, in addition to litter and dead down stem wood from the open shrub or timber overstory, contribute to the fire intensity.

Fuel Model 5: Young reproduction, prior to canopy closure, is fairly well represented by Fuel Model Five. Fire is generally carried in the surface fuels that are made up of litter cast by the shrubs and the grasses or forbs in the understory. The fires are generally not very intense because surface fuel loads are light, the shrubs are young

with little dead material, and the foliage contains little volatile material. Usually shrubs are short and almost totally cover the area.

Fuel Model 8: Portions of the timbered areas are represented by Fuel Model Eight, and the remainder by Fuel Model 10. In Fuel Model Eight slow burning ground fires with low flame lengths are generally the case, although the fire may encounter an occasional heavy fuel concentration that can flare up. Only under severe weather conditions involving high temperatures, low humidities, and high winds do the fuels pose high fire hazards.

Fuel Model 10: Fires burn in the surface and ground fuels with greater fire intensity in Fuel Model ten than in fuel model eight. Dead down fuels include greater quantities of 3 inch or larger limb wood resulting from over-maturity or natural events that create a large load of dead material on the forest floor.

Fire Regimes and Range of Variability

Sharps Creek Fire Regime

A fire regime is a generalized description of the role fire plays in an ecosystem, and is described using combinations of frequency and intensity. The moderate severity fire regime, which has the most complex mix of low, moderate, and high severity fires characterizes the Sharps Creek watershed. In *Fire Ecology of Pacific Northwest Forests* (1993), Fire ecologist James Agee describes a moderate severity regime as having infrequent fires (25-100 years); that are partial stand replacement fires, including significant areas of high and low severity; that fires occur in areas with typically long summer dry periods and will last weeks to months. Periods of intense fire behavior are mixed with periods of moderate and low intensity fire behavior; variable weather is associated with variable fire effects.

The overall effect is a patchiness over the landscape as a whole, and individual stands will often consist of two or more age classes. Stands in the higher elevations of the watershed, with the exception of riparian areas and some north facing aspects, tended to burn in a high intensity, stand replacing manner in 100-150 year intervals. Stands in the lower elevations tended to burn at lower intensities with variable fire effects, and at similar intervals.

Fire Regimes by Forest Type

Approximately 75 percent of the Sharps Creek watershed is in a western hemlock (*Tsuga heterophylla*) series. The remainder is composed of a variety of other Pacific Northwest forest potential vegetation types. Douglas-fir (*Pseudotsuga menzieseii*) comprises approximately 15 percent and there is approximately 5 percent white fir/grand fir (*Abies concolor, Abies grandis*) vegetation series. The remainder is silver fir (*Abies amabalis),* mountain hemlock (*Tsuga mertensienis*) or hardwood (mainly white oak) series. The silver and white fir forests are primarily high elevation sites in the eastern-most portion of the watershed. The Douglas-fir is intermixed with the western hemlock throughout the watershed.

Western Hemlock

Agee characterizes the western hemlock forest by saying that the dominance of Douglas-fir in the zone at the time of European settlement was largely due to regular disturbance, primarily by fire, for many centuries before such settlement. He further states that throughout the western hemlock zone, there is considerable variability in the age of stands that burn, as well as in fire frequency, intensity, and extent, which creates a variety of post-fire effects. He cites Morrison and Swanson's work (1990), that suggested a higher fire frequency in the drier western hemlock forests, and a natural fire rotation of 95-145 years over the last five centuries. He also cites Teensma's work (H. J. Andrews, 1987), in which Teensma calculated a mean fire return interval for stand replacement fires of 130-150 years. Agee's description of the western hemlock forest represents those portions of the Sharps Creek watershed fairly well.

Pacific Silver Fir

The fire regime for Pacific silver forests is characterized by infrequent fires of high severity, with lower elevation and drier forests possibly having fire return intervals of 100-300 years. Fires in these forests usually occur under unusual conditions of summer drought and east wind and tend to be of high intensity, killing most or all of the trees on the site. The fire return interval for the western hemlock/silver fir transition zone in the central Oregon Cascades is 149 years, according to Morrison and Swanson, 1990. In the central western Cascades, Morrison and Swanson found pre-1800 fires in this forest type to be predominately stand-replacing, but between 1800 and 1900 only about 25 percent of the area burned was of high severity, with 32 percent of moderate severity and 43 percent of low severity. This description of the Pacific silver fir forest seems to fit this watershed as well.

White Fir/Grand Fir and Douglas-fir

According to Agee the most complex set of forest types in the Pacific Northwest includes those called mixed-conifer or mixed-evergreen forests. He identifies four types, including the white fir and Douglas-fir.

He writes that the *Abies concolor* forests of the Pacific Northwest are a northern extension of more widespread forest in the Sierra Nevada to the south, and that the zone is not widespread in the Pacific Northwest. Agee theorizes that in an environment as prone to burn as the drier *Abies concolor* forests, human ignitions may only have substituted for inevitable lightning fires. Fire history of white fir areas in the Crater Lake National Park and Siskiyou National Forest has been studied, and the average fire-return intervals ranges from 9-42 years in lower elevations, 43-61 years in higher elevation white fir/Douglas-fir communities, and up to 64 years in white fir/herb communities, which reflects a lengthening of the fire-return interval with increasing elevation. The intensity of these historical fires was usually low because the frequent fires removed understory ladder fuels and consumed the forest floor. Fires occurring after an extended fire-free period would probably have been more intense and were probably the norm in the higher elevation stands with larger proportions of white fir. *Abies concolor* forests have a gradient of stand development patterns associated with the fire regime gradient. Three white fir communities occur with increasing elevation;

a dry Douglas-fir/white fir type, a mesic Douglas-fir/white fir type, and a white fire/herb type. As fire return intervals lengthen, due to cooler, wetter climate, there is a tendency to have higher proportions of white fir in the overstory. This description appears to fit the stands in the higher elevations of the watershed.

Soils

Soil Productivity, suitability and resiliency

Soil productivity ratings describe the ability of a site to grow vegetation; it is an indication of tree growth potential. Soil suitability indicates whether a site is capable of growing trees above a threshold productivity level within a certain time frame, without irreversible damage to the site from removal of trees through harvest. Soil resiliency is the ability of a soil to readily recover from disturbance and to maintain its productivity when growing repeated rotations of trees.

There is a wide variability in site productivity in Sharps Creek watershed because of the varied geology, the mixture of gentle and steep slopes, the range in elevations and the extensive north and south exposures. The most productive sites are the moist, north gentle slopes. The least productive sites are at higher elevations on steep slopes with south aspects. Approximately 6,122 acres (one third) are considered unsuitable for regeneration harvest on lands managed by the Forest Service in Sharps Creek watershed analysis area because of reforestation concerns.

Terrestrial Species and Habitat

The Sharps Creek watershed is inclusive of the Cascade Physiographic Province, ranging in elevation from 1,100 feet to 5,500 feet. Historically, successive stand replacing wildfires have reduced the level of large snags and down wood habitat throughout much of the watershed. Most of remaining large old growth trees are found along the major riparian systems. The high demand for wood products within an area of multiple ownerships has resulted in a contrasting landscape of managed and natural stands. Valley bottom roads appear to have had a major impact on the quality of riparian habitat along the main fork of Sharps Creek. The loss of late successional habitat from natural or man-caused events has reduced the quality of wildlife habitat and, presumably, a corresponding reduction in the abundance of wildlife species that utilize late successional habitat.

Threatened and Endangered Species

The Northern Spotted owl is the only Threatened or Endangered (T&E) species known to reside and breed within the watershed. Currently, habitat for sixteen pairs is being managed. Eleven sites have been determined to be viable, based on available suitable habitat within a 1.2 miles radius home range. Critical habitat has been designated by U.S. Fish and Wildlife in a draft plan, and portions of three Critical Habitat Units (CHU) occur within the watershed.

Other T&E species which are known to use the watershed for foraging and/or roosting are bald eagle, peregrine falcon, and wolverine. There is a large number of State and

Federal wildlife species that are listed as Sensitive because of concerns about viability. Some of these species are known to reside and others are suspected to reside in the watershed. No data exist on the viability of these species in this watershed.

State and Federal Sensitive Species known or suspected to reside in Sharps Creek Watershed Analysis Area include:

- Northern goshawk
- Western blue bird
- Townsend's big-eared bat
- Marten
- clouded salamander
- Willow flycatcher
- Ringtail
- Foothill yellow-legged frog
- red legged frog
- Western pond turtle
- pileated woodpecker
- northern pygmy-owl
- fringed myotis
- white-footed vole
- sharp-tailed snake
- harlequin duck
- tailed frog
- cascade frog
- Cascade salamander

Survey and Manage Species

Another group of species of concern are the Survey and Manage species. This group evolved because of viability concerns addressed in the effects analysis of the Northwest Forest Plan (1994). Suspected or documented species in Sharps Creek watershed analysis area include: Townsend's big-eared bat, Long-eared myotis, Fringed myotis, Long-legged myotis, Yuma myotis, Silver-hair bat, Red tree vole and Great gray owl. No data exists on the viability of these species within the watershed.

Maintaining viable populations of wildlife species on Forest Service matrix lands can be achieved through the effective planning and management of large blocks of unmanaged forest, thus providing options for future management. The BLM portion of the matrix is identified as Connectivity/Diversity Blocks. Standards and Guideline from the Northwest Forest Plan require each of the seven Connectivity/Diversity Blocks within the watershed to retain 25-30 percent late successional habitat. The northern third of the watershed consists mostly of forested vegetation in the establishment and thinning stages of development, which lacks late successional components. The majority of this area is in private ownership. Only mobile species will be able to disperse through this area. Smaller, less mobile species will have a difficult time maintaining or establishing connectivity.

Key Raptor Area # 138 is an important regional raptor reproduction and habitat area. The target raptor species are northern spotted owls, golden eagles, goshawks, pygmy owls, red-tail hawks, great horned owls, saw-whet owls, Coopers hawks, screech owls, and kestrel hawks. All of these species either require late successional habitat or prefer late-successional structural components for nesting. The loss of this habitat will have an adverse effect on these species for many decades.

Elk Emphasis Areas are an important component in the management of elk as a resource available for harvest. This resource provides recreational and economic benefits. Through modeling, road densities have been determined as marginal for habitat conditions. However, road densities are just one aspect of habitat requirements.

The benchmark of 1.5 road miles per square mile (USDI BLM 1995) RMP may not be obtainable because of current road right-of-way agreements and ownership patterns.

The Sharps Creek watershed contains a small portion of the Late Successional Reserves 222 (LSR 222). This portion falls within the natural range of late successional conditions, retaining late successional conditions over 60 percent of the LSR. Fragmentation and the loss of late successional components from previous timber harvest management activities will reduce the functionality and recovery of this habitat for many decades.

Unique Habitats

Many special plant habitats exist in the Sharps Creek Watershed. Approximately 8 percent of the drainage contains the majority of the diversity of plant habitats and species. These unique habitats include native grasslands made up of perennial and annual grasses and herbs which have been relegated to relic fragments of habitat in the lowest elevation valley bottoms, with shallow soils and/or are associated with southern exposures (hot/dry). Other unique habitats include moist and dry meadows, oak habitat, rock outcrops and cliffs, talus slopes, riparian/wetland areas and high elevation beargrass communities.

The Calapooya Divide forms the southern boundary of the watershed and marks the transition between the central Cascade and interior valleys of the Willamette and the drier region of the Umpqua Basin. Floristically, this area is known as the divide between the "Mediterranean" flora of the drier regions of southern Oregon and northern California, and the flora of the Western Interior Valleys. The two distinct floristic regions are well-documented in herbaria and literature; the divison is marked by the major regional manuals of vascular plant species. *The Flora of the Pacific Northwest* (Hitchcock and Cronquist, 1973) treats the lands to the north, and *The Jepson Manual* (Hickman et al., 1993) is necessary for species to the south, including the rest of the Umpqua National Forest in Douglas County and the Roseburg BLM.

Known sensitive species found in the Sharps drainage include *Romanzoffia thompsonii*. There are six Survey & Manage plant species known to occur in the watershed analysis area including *Allotropa virgata*, two Survey and Manage bryophytes and there is habitat for forty-seven lichen species.

Noxious Weeds

Exotic plant species have a significant effect on the composition of plant communities in the watershed. Noxious weeds have become established accidentally and deliberately by seeding, road construction and maintenance, logging and livestock. The majority of noxious weed infestations occupy road shoulders; and vehicles appear to be the primary vector for long distance movement of most species

Figure 10. Unique Habitat

(Trunkle & Fay, 1991). Introduced grasses and shrubs such as Scotch broom are especially competitive with conifers in the early seral stage. Some of these species have the ability to dominate areas permanently, precluding the development of native species in natural seral progression, effectively causing permanent loss of habitat for native plants (Wolf, 1997).

Noxious weeds known to occur in Sharps Creek watershed are: *Cytisus scoparious,* (Scotch broom), *Rubus discolor* (Himalayan blackberry), *Senecio jacobaea* (tansy ragwort), *Hypericum perforatum* (Klamath weed or St. Johnswort), *Cirsium arvense (Canada thistle) and Cirsium vulgare* (bull thistle*).*

Areas with the heaviest concentration of noxious weeds are along the valley bottom roads and on private land.

Aquatic Species and Habitat

Historic records indicate that small runs of spring chinook, winter and summer steelhead occurred in the Coast Fork Willamette River. Passage for the upper Row River upstream from the Sharps Creek confluence was limited by Wildwood Falls. However, no potential migration barriers hindered passage to Sharps Creek. Dorena Dam was built in 1949, blocking all passage, including to Sharps Creek, in the upper Row River.

Sharps Creek supports a population of coastal cutthroat trout (*Onchorynchus clarki clarki*). Rainbow trout (*Onchorychus mykiss*) are also present, they may be native, but have also been stocked over the years. Other native fish found in the Sharps Creek watershed analysis area include largescale sucker (*Catostomus macrocheilus*), speckled dace (*Rhinichthys osculus*) and/or longnose dace (*Rhinichthys cataractae*), and a few species of sculpin (*Cottus sp.*). Some fish from the reservoir may be entering the mouth of Sharps Creek.

The Oregon chub *(Oregonichthys crameri*) is an endangered minnow indigenous to the Willamette Valley. A few individuals have been found in the Coast Fork Willamette Subbasin in the Camas Swale area. This species prefers warm pond type water with depositional substrate and abundant aquatic vegetation. No known population or habitat have been found within the Sharps Creek watershed analysis area.

The historic abundance of large conifers as a significant component of the riparian vegetation and linchpin of channel morphology has been dramatically reduced in modern times. Quality habitat and channel stability are dependent on the presence and availability of large woody debris (Sedell et al., 1988). Past management practices included the removal of riparian trees and instream salvage of large wood. The lack of large woody debris has limited aquatic habitat throughout the watershed analysis area. As a result, Sharps Creek tends to have long riffles with limited pool habitat and an overall lack of channel complexity. Tributaries entering Sharps Creek are steep gradient and tend to have more stairstep pool habitat. The removal of much of the riparian vegetation limits opportunities for future recruitment of large woody debris, reducing quality habitat.

Figure 11. Fishbearing Streams

Human Uses

Allocations

Three management plans provide direction and land allocations for the Sharps Creek watershed analysis area (WAA). The Northwest Forest Plan (1994) is a regional plan covering the national forests and Bureau of Land Management districts impacted by the listing of the northern spotted owl as Threatened on the Endangered Species List. Both the Umpqua Forest Plan (1990) and the BLM Eugene District Resource Management Plan (RMP) (1995) provide additional direction on managing resources on Federal forest land and tier to the Northwest Forest Plan. Figure 12 shows the allocations for both land management agencies.

Table 30. Land Allocations

Northwest Forest Plan Land Allocations	Acres	Percent by Ownership	Percent of Sharps Creek	
Forest Service Matrix	10,015	56%	24%	
Riparian Reserves	7,738	44%	18%	
Total Forest Service Acres	17,753	100%		42%
BLM Matrix				
Connectivity/Diversity Blocks	2,247	42%	9%	
Riparian Reserve	1,773	21%	4%	
Late Successional Reserve	5,008	37%	8%	
Total BLM Acres	9,028	100%		21%
Private Land Acres	15,728			37%
Total Sharps Creek Acres	42,509			100%

Private Land

The majority of private land lies to the north and west of the National Forest except for one section within upper Quartz Creek and the patented mining claims in the headwaters of Sharps Creek known as the Bohemia Mining District. BLM managed lands are west of the National Forest with additional small scattered blocks spread throughout the private acreage.

This mixture of BLM managed land and privately owned acreage continues to the west across the Willamette Valley into the Coast Range and south towards Roseburg. Except for the 278 acres of patented mining ground, timber management is the major human use of private forest land in Sharps Creek watershed with some agriculture and rural residential in the western valley bottom.

The Weyerhaeuser Company, Guistina Resources and Willamette Industries, Inc. are the largest private landowners in Sharps Creek Watershed.

Figure 12. Land Allocations

Matrix and Connectivity/Diversity Blocks

The majority of the Federally managed land is in Matrix allocations under the Northwest Forest Plan. BLM managed matrix is designated as Connectivity/ Diversity Blocks; it is part of the Matrix Land Use Allocation (LUA) except there are three additional "standards and guidelines" established in the Northwest Forest Plan that apply only to Diversity Blocks. First, the blocks are managed on a 150-year area control rotation. Second, 25-30 percent of each Diversity Block is to be maintained in late successional forest (defined as 80 years of age or older). Third, regeneration harvests will leave 12 to 18 green trees per acre post-harvest.

Late Successional Reserve

There are 5,221 acres of late successional reserve land in Sharps Creek watershed. This acreage, which is managed by BLM, is part of LSR 222, which surrounds the Cottage Grove Ranger District to the south, east and north. This is the most westerly portion of the late successional reserve before crossing over the valley and connecting to the Coast Range.

Riparian Reserve

Riparian reserve widths of 180 feet on lands managed by the USFS and 200 feet on lands managed by the BLM are established based on the height of one site potential tree. Differences reflect the higher site productivity of lower elevation BLM land in the drainage. Fish bearing streams will retain two site tree width reserves. There are approximately 9,429 acres of riparian reserves outside of the LSR are in this watershed.

Stream protection buffers required by the State of Oregon vary on private land but rarely exceed 50 feet. In general, the most intact and connected riparian areas are in the roadless areas and the riparian zones in the poorest condition are on private land. For example, important pond habitat for pond turtles is located at the confluence of Sharps and Row River. Roads, lack of vegetation and other human disturbances all contribute to the elimination of habitat for pond turtles and other riparian dependent species in this area.

Roadless Area

There are two major roadless areas in Sharps Creek on land managed by the Forest Service: Fairview with 4,929 acres and Puddin Rock with 4,808 acres. A small portion of the Canton Creek Roadless Area (233 acres) extends north from the North Umpqua District. Fairview Roadless Area extends into Brice Creek for a total acreage of 7,343 acres. These three roadless areas are described in Appendix C of the Umpqua Forest Plan (1990). They were evaluated during the RARE II process and non-wilderness use was recommended. Subsequent development has reduced the acreage

of Puddin Rock and Fairview somewhat. However, they are still the largest unroaded and intact areas of late successional vegetation in the Coast Fork sub basin.

Figure 13. Vicinity Map with Roadless Areas

Figure 14. Road System 1998

Timber Production

Timber harvest is a major use of the Sharps Creek watershed analysis area. All three ownerships harvest timber and practice forest management to varying degrees. Approximately 50 percent of the drainage has been harvested to date. The majority of the harvest has been by clearcut with typical site productivity at 85 to 150 cubic feet per acre mean annual increment.

Roads

The Sharps Creek Watershed analysis area has a total of 259 miles of roads with an overall road density of 3.9 miles/square mile. There are 53 miles of road in Forest Service jurisdiction, 48 miles in Bureau of Land Management jurisdiction, and 158 miles of road on private land owned by Weyerhaeuser, Giustina, Willamette Industries, and by patented mining claimants. Road density is noticeably higher on private land. Most roads in the Sharps Creek Watershed area were built to facilitate timber harvest and mining activity. Historical use has also included fire management and recreation access. These roads provide essential access to public land but also have impacts on the riparian and aquatic species habitat, contribute to slides and debris flows, and reduce connectivity of terrestrial species habitat.

Mining

The predominant human uses on the public lands of the Sharps Creek watershed are timber production and mining. The upper or south and east portion of the watershed corridor has also supported varying levels of mineral activity both historically and currently. Based on the Umpqua Forest Plan (1990), 8,399 acres lie within the Fairview-Bohemia mineralized management area, which provides emphasis for the orderly exploration, development, extraction and production of mineral resources. Sharps Creek Road is one of the main access points into the Bohemia mining district. Public lands within the watershed support approximately 75 placer claims and 100 valid and active lode mining claims. The lode claims are predominantly located in the higher elevations of the watershed around the mineral rich area of Fairview Peak and Bohemia Mountain, while Sharps Creek and several of its tributaries support extensive placer mining claims. Activity on these claims ranges from mostly intense weekend and holiday recreational mining activities to less intense but more consistent exploration and production milling of hard rock activities. Mineral activity on the private lands of the Weyerhaeuser Company are not allowed with the exception of recreational gold panning in Sharps Creek. No dredges are allowed. Very little mining activity has been observed along the other private lands along Sharps Creek.

Recreation

The Sharps Creek watershed is less than an hour's drive from the metropolitan area of Eugene-Springfield and 30 minutes from the Cottage Grove-Interstate 5 area. However due to the considerable amount of mining activity and human presence on the mining claims, general public recreational use is limited. Recreational development and opportunities are also somewhat limited . Recreation development in the

watershed includes two campgrounds: BLM Sharps Creek Camp with 10 camp sites and a popular day use area (swimming and picnicking), and Forest Service Mineral Camp, a 2-unit camp/picnic area.

Figure 15. Recreation

There are numerous dispersed camps on the public lands along Sharps Creek which are often utilized as camp spots for the mining claimants that have placer claims located in the same area. These sites remain as public land and on occasion non-mining recreationists utilize these dispersed camp spots.

There are many old mining trails and cat roads throughout the watershed; however, only a few are currently maintained and promoted for public recreational use. These maintained trails are on Forest Service lands and include Fairview Creek (3+ miles), Knott (4.5 miles), Bohemia National Recreation (6.5 miles), and Bohemia Mountain (0.8 miles) Trails. The Knott, Bohemia National Recreation, and Bohemia Mountain Trails follow the upper ridges of the Sharps Creek watershed boundaries. Trail use is predominantly hikers; however, there is a growing popularity with ATV, motorcycle and mountain bike use. ATV, motorbike, and 4x4 vehicle use is more common with the lode miners in the Bohemia area who use many of the historic trails and roads to access their claims.

The lookout station at Fairview Peak provides a scenic vista of the High Cascades and the Cottage Grove Ranger District, and is a popular destination site for visitors. Another popular recreation activity in the watershed is recreational driving and viewing scenery as well as viewing past and present activities on the mining claims, particularly along Sharps Creek Road. The Sharps Creek area has historically attracted a large percentage of local residents. There are, however, more visitors traveling from the Eugene area, as well as several other northern Willamette cities, searching for more remote and less occupied areas.

2. Issues & Key Questions

Sharps Creek Watershed Analysis

The watershed analysis team identified issues by considering unique resource concerns, relevant management programs, conflicts with plans of a higher order and perceived public concerns in the watershed. During the course of several meetings, the team prioritized the issues and evaluated our ability to answer the questions during this iteration of watershed analysis. As the analysis progressed, we reviewed and modified the original list of issues and concerns and looked for ways to stratify the landscape. We then described the processes at work in the watershed, identified indicators to evaluate the conditions and developed key questions that would help us address the issues.

Issue #1: Erosional Processes

Management activities such as harvest and road building affect erosional processes in Sharps Creek by increasing landslides, sedimentation and channel erosion. While road building practices have improved since the 1960's and harvest activities, especially slash disposal practices, cause less surface erosion than in the past, there are still concerns about maintaining the road system, activities on earthflow terrain and the potential for increased landslides and debris torrents.

Key Questions:

What are the important erosional processes in the watershed?

How do disturbances affect erosional processes?

Are the erosional processes outside the natural range?

Issue #2: Hydrology

Mining road construction and timber harvest have changed stream channels and habitat for aquatic life throughout the Sharps Creek watershed. Since settlement, these activites have removed trees and simplified channels, routing runoff more quickly down road ditches to streams and down wider, more open channels. This has probably caused local increases in peak flows. Sometimes these same streams have been affected by landslides and debris flows, further altering channels.

Key Questions:

What are the local peak flow effects on stream channels and erosional processes?

What is the hydrologic response to earthflow, weathered bedrock and resistant bedrock?

Issue #3: Stream Channel

Instream salvage, valley bottom roads, mid slope roads, harvest of riparian vegetation, increased debris flows, and mining have altered stream channels considerably. The effects of these activities are manifested in less stable channels causing erosion concerns and decreased habitat complexity. In some areas stream channel function has been altered.

Key Questions:

How have management activities affected the function of the stream channels in the mainstem of Sharps Creek and tributaries?

Issue #4: Water Quality

Sharps and Martin Creeks have warm summer water temperatures exceeding the Oregon Department of Environmental quality (ODEQ) criterion of 64 degrees Fahrenheit (7-day average of maximum daily temperature). As of November 1998, Sharps Creek, from the mouth to the confluence of Martin Creek, and Martin Creek, from the mouth to the headwaters, are on the Oregon 303(3) list of Water Quality Limited streams. High water temperatures clearly affect aquatic life. Sharps Creek and many of its tributaries have lost the tall conifers that once shaded the streams and provided habitat for riparian and aquatic life. Watershed analysis is seen by DEQ as the principal means of assessing water quality issues on federal lands. Monitoring temperature will be important to determine the natural range of temperature for streams in the watershed, and to show where riparian areas can best be managed to improve water quality.

Water quality is an important element in providing good aquatic habitat. Mining, recreation, timber harvest activities and road-related activities may be affecting water quality in Sharps Creek.

Key Question:

How has the present riparian condition affected stream temperature and which stream reaches could benefit most from improved riparian vegetation and structure?

What effect do human uses have on water quality and what are the trends?

Are there conflicts between mining, water quality and the management of sensitive species in the Sharps Creek watershed analysis area?

Issue #5: Vegetation, Soils and Disturbance by Fire

The key to implementing the ACS is designing land use activities to meet the overall goal of "maintaining the natural disturbance regime." (ROD, B-9). Although the natural disturbance regime may be difficult to define, attempts at the regional level (REAP) have led to a natural range of variability (NRV) estimation of the distribution

of vegetation stages at a watershed scale. In Sharps Creek a mixed ownership pattern and short-rotation timber production objectives on private land may develop a vegetation pattern that does not approximate either the extent or distribution of early seral vegetation characteristics of a natural disturbance regime.

Fire in historical times, and timber harvesting and fire suppression in the recent past, have created a mosaic of vegetation patterns in the watershed. The ecological role of fire in maintaining healthy vegetation conditions and the effects of 90 years of fire suppression are key issues in the watershed.

Key Questions:

What is the natural range of variability in Sharps Creek for late successional vegetation?

How have the vegetation conditions changed in Sharps Creek and what are the trends?

Are there associations between vegetation, soils, and other site variables that would be useful to reference, while prescribing for management activities?

How has the role of fire changed and what has been the effect on vegetation?

Are there management activities that can replicate the effects of natural fire on vegetation?

Issue #6: Threatened, Endangered (T&E) and Sensitive Plant and Animal Species

The Sharps Creek watershed is presumed to provide habitat for Federal and State-listed vertebrate species. Maintenance or recovery of viable populations of threatened, endangered and sensitive species while there is ongoing human uses such as timber harvest, recreation and mining will be a challenge for the next several decades. There is some evidence that mining activities may conflict with bat habitat.

Key Questions:

What role does the watershed play in providing conservation or recovery of wildlife and plant species?

Do mining activities conflict with bat habitat?

What is the status of unique habitats in the Sharps Creek watershed?

What are the effects and magnitude of non-native plants on the watershed?

Issue #7: Wildlife Habitat and Connectivity

Connectivity of late successional vegetation between LSR's provides genetic and population flows for animal and plant species. Low vagility, small body mammals in particular are dependent on connected patches of late successional vegetation that provide interior habitat. Fragmentation from harvest, road building and recreation sites, especially in riparian reserves, may prevent recovery or maintenance of habitat connectivity within the watershed.

Key Questions:

Is road density a concern in ODF & W Elk Emphasis Areas?

What is the habitat trend within Key Raptor Area # 138?

What is the availability of snag habitat and large woody debris habitat?

What is the connectivity of late successional forest between the LSR, riparian reserves and matrix lands. What are the trends? What are the effects on wildlife species?

Are there landscape patterns that would best meet wildlife ecological and resource objectives?

What is the condition of the connectivity/diversity blocks on BLM land?

Issue #8: Aquatic Habitat & Species

Stream density is high in the Sharps Creek watershed analysis area, averaging 6.7 miles per square mile; 60.4 miles of the streams are fish bearing. Management activities such as timber harvest, roading, mining and recreation have contributed to the loss of quality riparian vegetation and aquatic habitat. Aquatic species have been most affected by degradation of channel complexity. Additional concerns center on mining activities occurring in riparian reserves and areas of heavily roaded earthflow terrain that may increase fine sediment production.

Key Questions:

What are the aquatic areas of concern and what are the expected trends?

Where is the highly diverse aquatic habitat found and what are the expected trends?

Are recreation activities impacting aquatic habitat in Sharps Creek and if so, is there a conflict with existing management plans?

Have mining activities impacted aquatic species and habitat, and if so, is there a conflict with existing management plans?

How does different management (private and federal ownership) affect aquatic habitat?

Issue #9: Late Successional Reserves

There are 5,221 acres of late successional reserve on BLM land in the watershed; it is part of the South Cascade Late Successional Reserve (LSR 222), the main part of which lies to the south and east of Sharps Creek drainage, providing valuable connective habitat to the Coast Range. Not all of the BLM LSR is in late successional habitat so establishing priorities for restoration is a concern.

Key Questions:

What is the current condition of the LSR and how does it compare to the natural range of variability?

What are the priorities for restoration in the BLM portion of LSR 222?

Are there opportunities to decommission roads in the LSR?

What effect does the current road density have on meeting the objectives of the LSR?

Issue #10: Roadless Area

There are three roadless areas in the eastern portion of the watershed on Forest Service land. One is an extension of the Canton Creek Roadless Area to the south. The other two, Fairview and Puddin Rock, are large unfragmented forest and provides an opportunity for management of their value as natural, unroaded forest. They are within a Matrix allocation and approximately 3,000 of the 9,686 acres are available for harvest.

Key Questions:

What is the current condition of the roadless area and what are its values?

What role does the roadless area play in providing biodiversity within the watershed?

Are there opportunities to use landscape techniques to manage the roadless area?

Issue #11: Timber Management

Sharps Creek has moderate to poor site quality for producing timber products and with 13,800 acres of matrix lands, will continue to provide a steady flow of commodities to the community. There may be opportunities to provide timber products while improving and restoring riparian habitat through thinning activities. Partial harvests on unsuitable soils may also provide opportunities to increase harvest if regeneration can be assured. Some of the BLM matrix land is also key northern spotted owl habitat areas (Lick, South Lick and parts of Pony drainages).

Key Questions:

Can we provide timber and protect northern spotted owl habitat in the Lick Creek area?

Are there opportunities to provide timber products while restoring and managing habitat?

There are low productivity soil conditions in Sharps Creek. Are there specific prescriptions that should be developed for these soils as protection?

Where are the priority areas for harvest?

Issue #12: Roads

Road density in Sharps Creek ranges from zero to highly roaded. Roads in Sharps Creek provide access for timber, recreation, fire protection and mining activity. At the same time they impact riparian and aquatic species habitat, contribute to slides and debris flows and reduce the connectivity of terrestrial species habitat. While unmaintained roads increase the risk to water and habitat quality more than maintained roads, road maintenance budgets continue to decrease. Mixed ownership means roads are maintained at different levels and that identifying roads to be decommissioned, reconstructed or maintained is complicated by issues associated with rights-of-way, mining access and mining laws. There are historic mining roads in the watershed.

Key Questions:

What are the resource reasons to decommission roads?

What is the potential to decommission roads in high density, roaded areas?

Issue #13: Minerals Management

Placer mining and lode mining are historic activities within the watershed that continue at a relatively moderate level today. Activity may at times increase significantly based on a variety of factors including previous year's weather, number of claims, stream levels, etc. There are concerns about the effects of mining and the occupation of mining claims on riparian and aquatic species as well as on water quality. Mining is a traditional use of the watershed that needs to be accommodated while maintaining and restoring quality habitat.

The general public has an increasing awareness and interest in the historical and current mineral activity that occurs in the Sharps Creek watershed. Recreationists seeking to experience the history of the mining area and those seeking the remoteness of the recreational experience are visiting more often. Consequently, mining claimants are typically concerned for the security of their developments; and members of the general public are concerned that mining is creating harmful impacts to the environment.

Key Questions:

What is the potential for significant impacts from lode mining activities in the Sharps Creek watershed?

How can we "foster and encourage" mining without causing significant ecological effects?

Is there a conflict between recreation and current mining claims?

3. Current and Reference Conditions

This chapter combines current and reference conditions which derive from Steps 3 and 4 from the Federal Guide for Watershed Analysis. Under some topics, such as recreation or timber harvest under Human Uses, there is no information available for reference conditions. Instead there is a discussion of current conditions for each topic but a general description of pre-European settlement times for reference conditions.

Erosional Processes

Current Condition

The members of the Watershed Analysis team developed a process to aggregate the subwatersheds by common attributes. These are referred to as drainage groups for the remainder of the document. For the purpose of the discussion relative to the geologic conditions, these drainage groupings will be used.

There are 13 drainage groups that are identified in the Sharps Creek drainage, ranging in size from 1,571 acres to 6,855 acres. Figure 16 portrays the relative distribution of the geologic groups by drainage group.

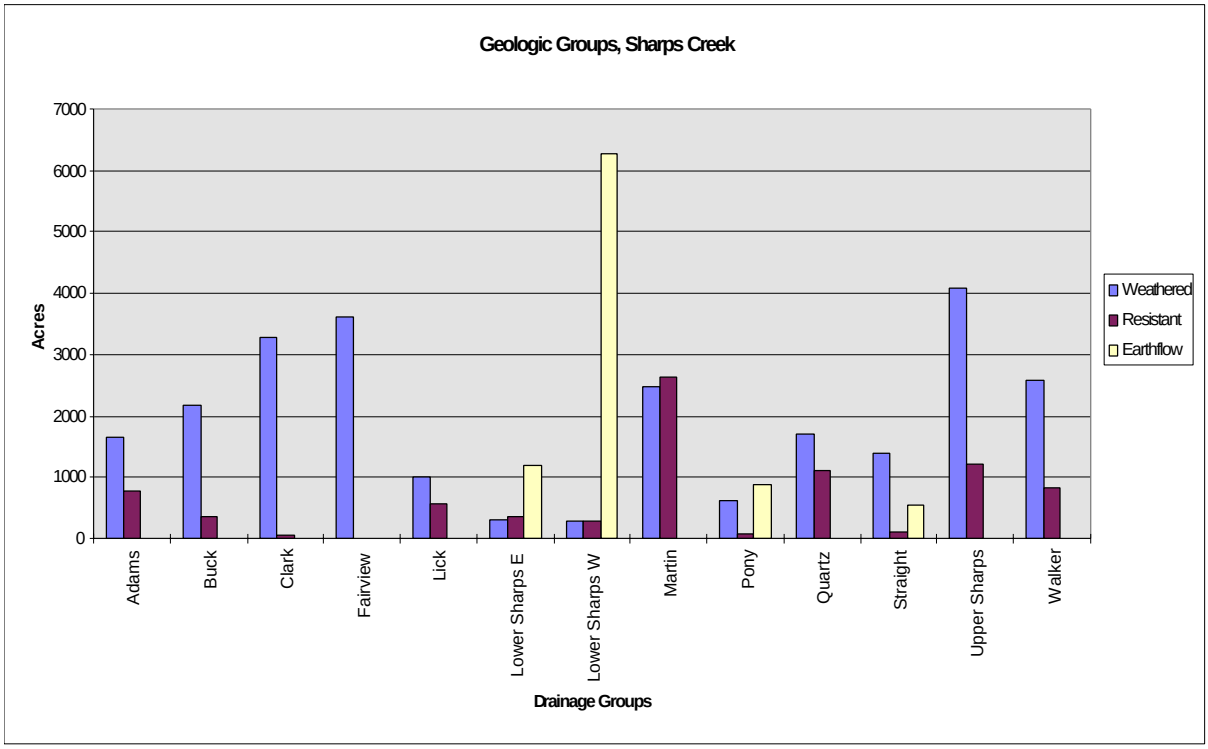


Figure 16. Geologic Groups

Geomorphic Processes

A succession of processes and events have shaped the character of the landforms and associated ecological conditions that currently exist in Sharps Creek watershed. While the landforms in the watershed have not changed significantly since management activities were initiated, a number of geomorphic processes have been dramatically affected.

Weathered/Altered Volcanic Rock Units

The largest portion of the landscape is characterized by highly weathered and/or altered volcanic rock units (60 percent). These rocks are typically associated with moderate to deep soil profiles and weather into cobbles, sands and silts. The amount of weathering as well as the chemical nature of the rock lends itself to high erosion rates when exposed to the elements.

While these weathered rocks occur in all of the drainage groups, they are extremely prevalent in the Upper Sharps Landscape Area, especially in Clark, Fairview, Upper Sharps and Walker drainage groups (over 75 percent) and occur in lesser amounts in all the subwatersheds.

Earthflow Terrain

Four of the drainage groups in the Lower West and Lower East Landscape areas have significant amounts of Earthflow terrain; these include Lower Sharps West, Lower Sharps East, Pony and Straight. As described in Chapter One, these earthflow features have distinct and significantly different erosional and channel development processes.

The earthflow terrain is characterized by gentle to moderate slopes with areas of hummocky topography and small impoundments or closed depressions (sag ponds). The larger features on the south side of Sharps Creek are associated with the regional dip of the underlying bedrock and have impinged on the main stem, which has resulted in the development of smaller and, typically, steeper earthflow features on the north side.

The earthflow complexes have controlled the development of channel systems in the lower tributaries of Sharps Creek. In particular, Boulder, Damewood and Table Creeks are located in, or on the margins of these earthflow features. There are also some smaller unnamed tributaries on the north side of lower Sharps Creek that are associated with earthflow terrain. Typically, these channels tend to be lower gradient, with a reliance on large woody material for structure and often have steep erosive banks due to the large amounts of highly weathered material.

As a result of extensive timber management since the 1950's, the erosional and hydrological processes on the earthflow landscapes have been dramatically modified. The relationship of the deep productive soils and abundant groundwater associated with earthflow offered opportunities to actively manage timber on most of this landscape and in some areas the second entry has occurred. Consequently, the

development of the road systems began in the 1940's and worked its way up the drainage. Due to the rolling nature of these landscapes, road development is among the most intensive in the watershed.

Road Development in Earthflow Terrain

The transportation discussion indicates that Lower Sharps West Drainage Group has the highest road density in the drainage (6.7 Miles/Square Mile) with the majority of the road system developed on a combination of BLM and private ownership. Based on aerial photo analysis, it appears that a large portion of the road system on earthflow terrain was constructed in the early part of the management era prior to the 1964 flood.

The road development that occurred on both federal and private holdings in the early period of management history duplicated a common pattern in the Cascades. The gentler slopes in the lower reaches of the watershed were developed early on, and the steeper, less productive slopes were entered in 1970's and 1980's. This was typically done with little understanding of the underlying geology and patterned after more urban transportation systems that utilized fixed grades and large cut and fill sections. As a result of widespread landslides and road failures in the 1964 flood, the land managers realized that roads could be developed with minimal disturbance in many areas and design criteria were established which has resulted in newer roads with substantially less disturbance on earthflow terrain.

Landslides

Under current conditions, mass wasting events, particularly debris slides and debris flows are the primary erosional process identifiable throughout most of the watershed. As described previously, the geomorphic groups identify strong relationships between landslide frequency and distribution in Sharps Creek.

As discussed in the Brice Creek Watershed Analysis (USFS, 1997), the air photo landslide inventory process displays the patterns of landslide frequency and distribution at a landscape level. This effort occurred in a watershed that has multiple ownerships, resulting in reliance on air photo coverage that existed for both Eugene BLM and the Umpqua National Forest. The scale of these photos is common, but in several cases the flight years vary 3-5 years. Although this issue does have the potential to skew the data set, a review of the coverage suggests that the objectives of evaluating the watershed under a variety of management scenarios was met.

The landslide data generated for Sharps Creek was analyzed to assess the relationship to disturbance and categorized by Natural (in undisturbed landscape), Timber (associated with or in a harvest area) and Road (within 100 feet of a road or landing). The other sorting mechanism is timing, with a review of 1946 and 1950 photos (very limited management activity), 1966 and 1969 photos (associated with disturbance from 1964 storm) and 1989 and 1990 photos (most recent).

Natural Landslides

Natural landslides can be viewed as those features that exist in a highly variable landscape that has a number of disturbance processes interacting upon it. These may include fire, floods, windstorms and biologic factors that affect vegetation. Figure 17 represents a graphic display of natural landslides normalized for a 70 year time period between 1920 to 1990.

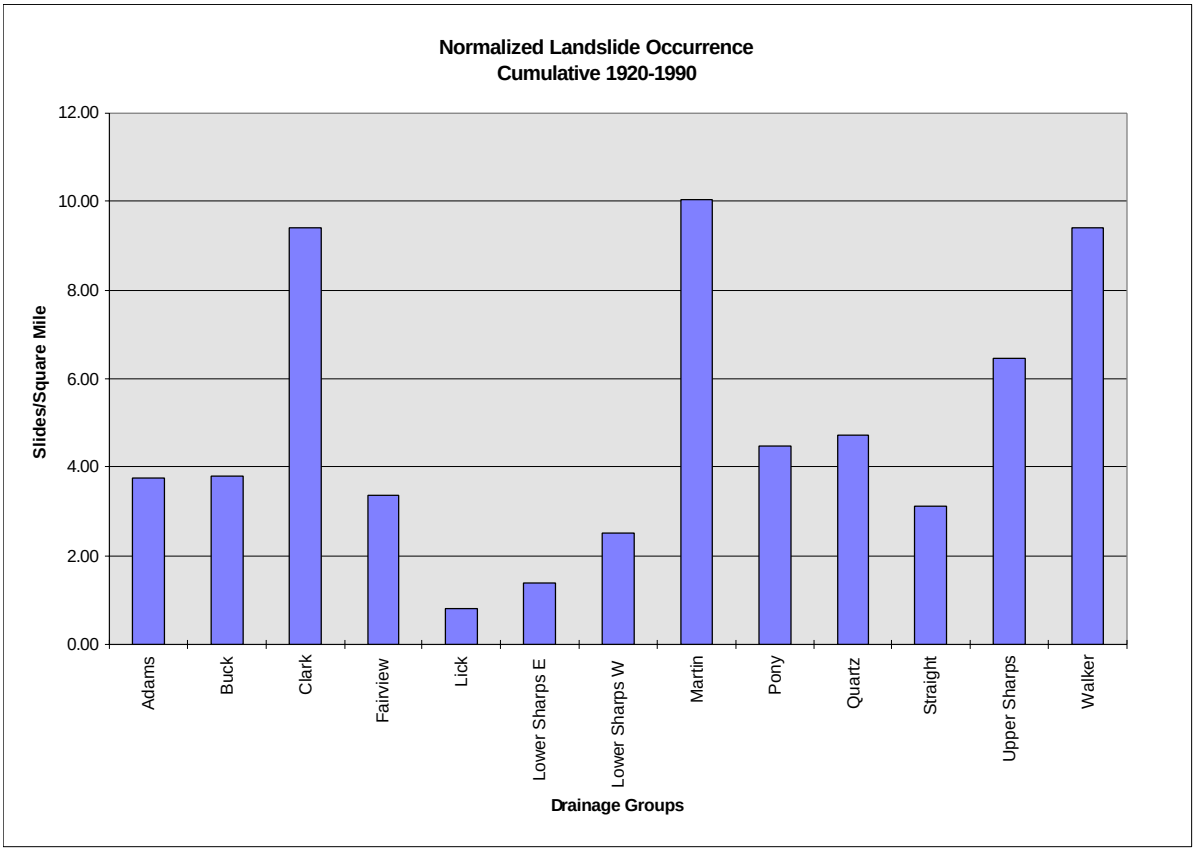


Figure 17. Natural Landslides

By selecting an approach that normalized landslides by square mile, it is apparent that several drainage groups have much higher natural landslide occurrence during the record period. In particular Martin, Clark and Walker have landslide rates above 9 slides/square mile over the past 70 years. These are much higher indices than those identified in the Brice Creek Watershed Analysis. The other drainage groups have occurrences that are comparable with other landslide studies on the forest, ranging from less than one/square mile on earthflow terrain to about four on the steeper weathered landforms (Weathered).

Cumulative Landslides

Attempts to compare normalized landslide occurrences associated with timber harvest and road activities proved difficult due to the lack of standardized data sets between agencies as well as large private holdings in the lower reaches of Sharps Creek. As an alternative Figure 18 represents the cumulative landslides for Natural, Timber and Road related activities.

An assessment of landslide signatures on the landscape suggest that natural landslides are much more prevalent on the weathered rock units than either earthflows or the harder rocks by a factor of two or three. Based on the premise that slopes fail under a set of parameters associated with structural integrity, this supports the predicted result.

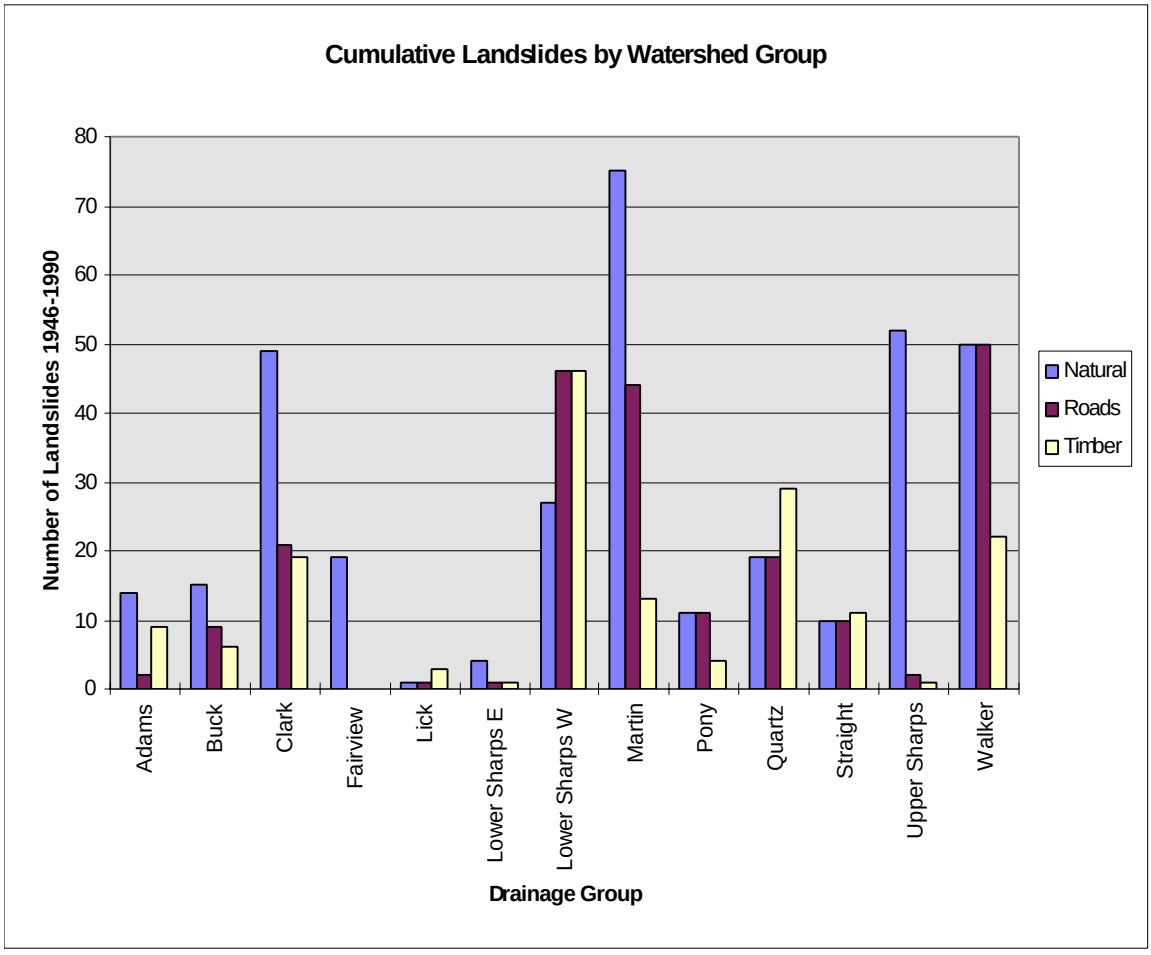


Figure 18. Landslides Associated with Natural, Timber, and Road Activities

Figure 19. Landslides and Debris Flows

Debris Flows and Disturbance Patterns

In a review of the Debris Flow GIS layer, developed from historical air photos, there appears to be some strong relationships between increases in disturbance patterns and debris flows (Figure 19).

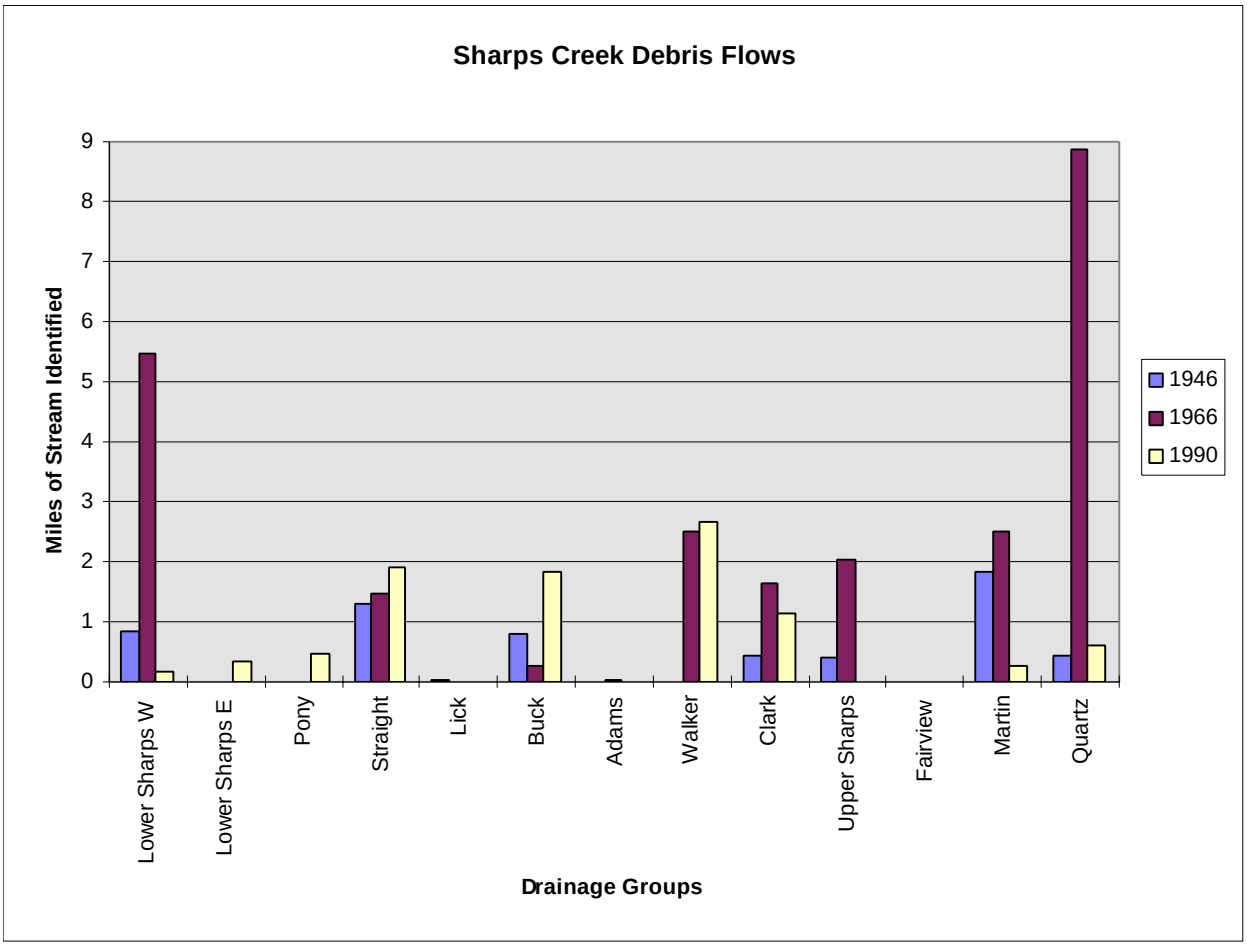


Figure 20. Debris Flows

In the 1946 coverage only seven of 13 drainage groups had visible debris flow tracks and about six miles of stream channel had been affected. In 1966 eleven of the drainage groups had experienced debris flow events, most likely in association with the 1964 floods. This pattern is disproportionate to the relative increase in landslide rates for the same time period. There was a five to ten percent variance in the number of landslides that were identified in the photo record. In contrast, there was a 45 percent increase in the miles of debris flow between 1946 and 1966, which included the 1955 and 1964 storms.

This discrepancy may be explained in a review of events that initiated debris flows as well as practices that were common in the watershed. There were observations made in the course of field review that a large percentage of channels impacted by debris flows in the later periods had been subjected to timber harvest and road construction activities.

In particular, three drainage groups appear to have significant increases in debris flow as a result of timber harvest and road construction activities. Lower Sharps West is by far the outlier in that it is predominantly earthflow terrain, where debris flows and debris slides are not a predominant process. Walker and Quartz drainage groups may be more characteristic of landscapes susceptible to debris flows.

The significance of the relatively large increases in debris flows may be viewed in terms of ecological function. In a watershed like Lower Sharps West, the primary structural component that controls channel morphology and flow regimes is large wood. Since these are not bedrock controlled systems, they have the ability to move and adjust through time. These channel types also have the ability to contribute large volumes of sediment into systems with relatively low channel gradients that may have difficulty transporting it.

Drainages such as Quartz and Walker are a sharp contrast to Lower Sharps in that they are predominantly steep gradient, confined channels with bedrock and boulder controls. While these channels are much less susceptible to debris flows under reference conditions, the additive factors of riparian timber harvest, stream clean-out practices and the affects of roads have substantially simplified large portions of some stream systems. This reduces the resiliency of the aquatic system to absorb impacts.

Hydrology

Current Condition

Sharps, Brice and Layng Creeks form the headwaters of the Row River upstream of the Dorena flood control reservoir and the Coast Fork Willamette River. Each of the tributary watersheds is about one-third of the area draining to the Row River. Sharps and Brice Creek drain more resistant landforms, with shallower soils than Layng Creek's deeper earthflow land. The result is little storage of winter rain, high winter flood peaks, and low summer flow on all three streams. Sharps Creek floods each year from November to May, then falls to a trickle all summer. Sediment transport exceeds supply, and there are few gravel bars in the wide, bedrock channel. For the first 10 miles up Sharps Creek, from the Row River to Martin Creek, most of the tall Douglas-fir shading the stream have been cut. Water temperature increases rapidly below Martin Creek, reaching 75 degrees Fahrenheit near the mouth of Sharp Creek on the warmest summer afternoons. Shallow summer flow, warm water, and little wood and gravel in the stream provide poor habitat for aquatic insects, amphibians, fish and the animals that depend on them.

Sharps Creek flow is greater in summer from the headwaters near Bohemia Mountain. Further downstream, and in Martin Creek, flow is lower and water temperatures are higher. The Row River, lower Sharps Creek and Martin Creek do not meet water quality criteria for temperature. Flow and water quality will improve in the next century if young riparian trees are allowed to grow tall enough to shade and fall into the stream, if trees and gravel can accumulate, and if the stream is left in its few meanders after big floods. In nearby watersheds, landowners and land managers have formed watershed councils to identify local initiatives for improving water quality within their watershed.

Floods

The biggest flood since 1964 occurred on the Row River and Sharps Creek on November 18, 1996. The Row River below Sharps Creek (USGS gage 14154500) peaked at 30,400 cubic feet

per second (cfs) overnight, a 100-year flood recurrence. Layng Creek probably produced a larger part of the peak (about 12,400 cfs), with ungaged Brice and Sharps Creeks probably rising to between a 25 and 50-year flood. Not as many hillsides slid or culverts plugged in Sharps Creek as in Layng Creek. Gravel and wood from Walker Creek, a mile below Martin, piled up in Sharps Creek, and some of Sharps Creek road fills eroded along the banks of the stream. Other large floods occurred in December 1955, January 1976, and December 1981, but none as big as 1964 and 1996.

Cumulative plots of Row River annual floods in the Layng Creek Watershed Analysis did not show a detectable increase in flood peaks since the gage was installed in 1935. Local effects of road ditches and forest canopy removal have probably increased peaks on smaller streams within the watershed, but it is not clear whether these effects have altered stream geometry or habitat (Jones and Grant, 1996).

Low Flows

Flow in September is among the lowest in the western Cascade Mountains, measured and estimated to be as low as 5 cfs at the mouth of Sharps Creek in 1996. Flow was only 1.5 cfs in Martin Creek, Sharps Creek's largest tributary (Figure 21). A tanker drawing water for fire or road watering can draw 0.5 cfs, enough to dry up a small stream at this time of year. Low flows in a wide stream heat up quickly from the sun, so water temperature is higher on the stream in July and August when the combination of low flow and high sun angle is greatest.

Sharps Creek above Martin Creek was about 3.4 cfs at its lowest in 1996, about three times other tributaries of equal size. Water here and in Fairview and Bohemia Creeks is deeper and cooler than tributaries of Martin and lower Sharps Creek. Measured and estimated streamflows throughout Sharps Creek for the lowest flow of 1996, a typical year, is shown in Appendix B.

Reference Condition

Floods and low flows before the 1800's were still extreme in Sharps Creek, but the ability of the stream to adjust to them was very different. A large flood then and now might exceed 10,000 cfs, but jams of trees and gravel bars would have forced the water out of the channel onto the terrace where the road is today. Low gradient reaches of the stream above Damewood Creek, above Lick and Buck Creeks, and below Walker Creek probably looked wider and full of wood. These would have been the best habitat for fish. The flood plain probably stored more water through the summer, and aquatic life could find cool pockets of water at bank seeps and the mouths of tributary streams. That might have raised summer flows, but lowest discharge was still likely less than 10 cfs.

Conditions upstream, especially in streams with terraces like Martin, Quartz, and Walker Creeks, were probably similar to Sharps Creek. Roads, timber harvest, and mining have altered these streambanks (the terraces made them easier to get to) and made them deeper and wider, with shallower water today. The higher landslide rates and stream power of Walker, Clark, Quartz and Martin Creeks formed the floodplains and terraces, and made them vulnerable to disturbance.

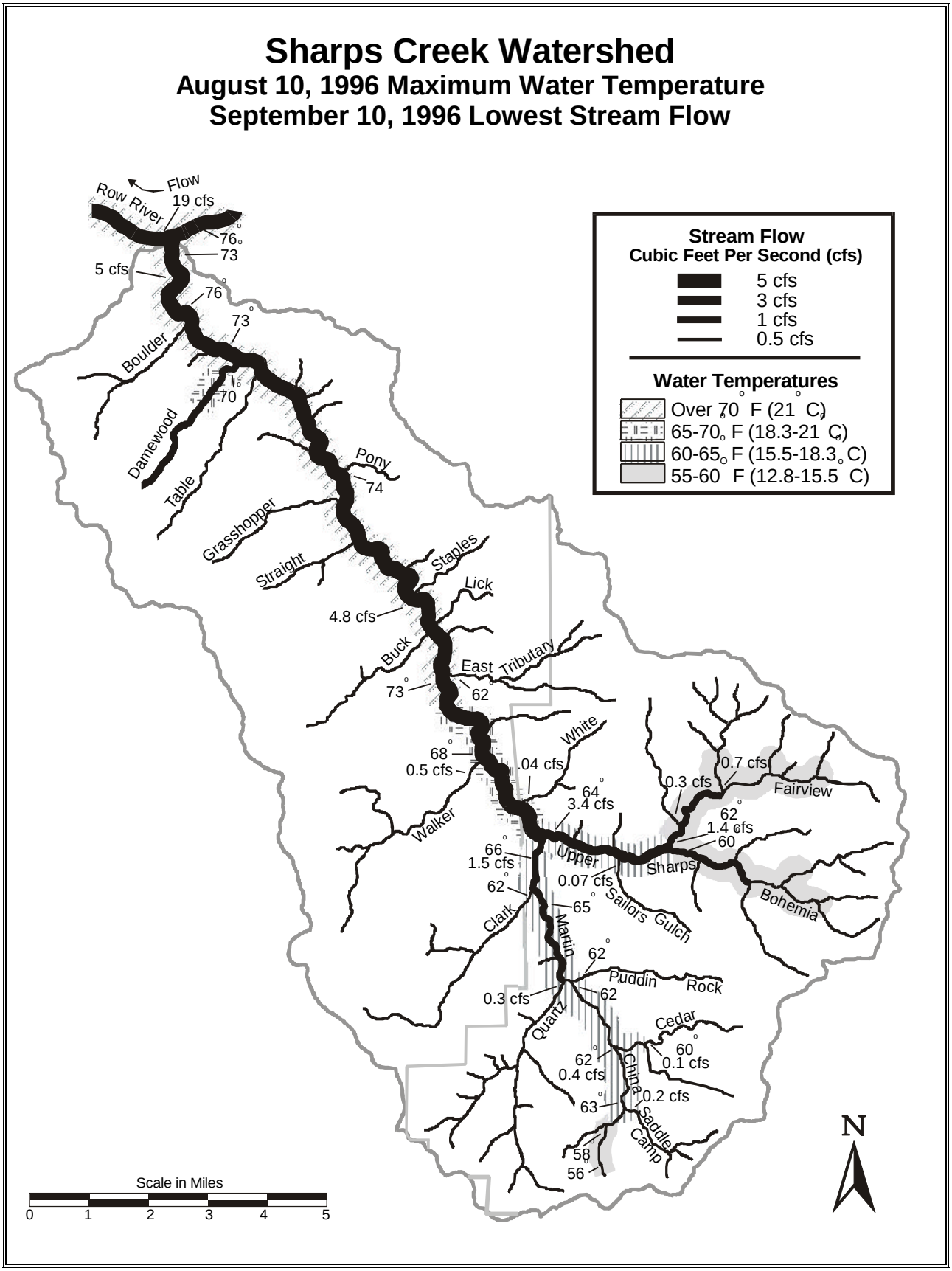


Figure 21. Water Flow and Temperature

Stream Channels and Riparian

Current Condition

Channel gradients can be used to classify stream function (Montgomery and Buffington, 1993). The high gradient (greater than 20 percent) streams tend to be the source reaches. These reaches supply substrate and woody material which is brought down the channel during mass wasting and debris flow processes. The moderate to high gradient (4-20 percent) channels function more as transport reaches; debris is stored here for a relatively short time before it moves downstream. The low gradient (4 percent) channels are depositional reaches. Material is stored here for a longer time before it is gradually transported downstream.

The majority of the channels in this watershed are considered transport reaches. The headwater tributaries with over 20 percent channel gradient are the source reaches. The Rosgen channel classification (Rosgen, 1996) is displayed in Figure 22. The depostional areas are represented by the few areas identified as C channel types in Figure 22 along with some of the lower gradient portions of the larger tributaries and the mainstem of Sharps Creek.

Sharps Creek and its tributaries are moderate to deeply entrenched channels. These classifications were estimated by using topographic maps, aerial photos and field observations. Some areas in the upper watershed were measured during stream inventories.

The current condition of the mainstem of Sharps Creek is believed to have been altered from the historic condition. This alteration may be due to mining activities, road building adjacent to the stream and the removal of riparian and instream large wood. Much of the wood was believed to have been salvaged after the 1964 flood event. The removal of this wood has resulted in a channel that does not efficiently capture woody debris and bedload as material moves downstream.

A source of future large woody debris is limited due to the road within the riparian zone and past timber management practices. The road adjacent to the channel has also limited channel movement. The mainstem of Sharps Creek appears to have downcut, becoming more entrenched, resulting in a loss of sinuosity. The channel is now more typical of an F channel type with some B channel characteristics. This channel type has increased the rate of material being transported by the creek, reducing depositional areas. Sharps Creek is now limited to one small depositional area just downstream from Walker Creek. The section is indicated on Rosgen Channel Classification map as a C channel type.

The stream inventories for White and Puddin Rock Creeks indicate what appeared to be a change in channel type due to mining activities. The upper banks have been altered creating more of a B channel type. This may be interfering with the efficiency of how material is transported through these steep channels, especially during high winter flows.

Damewood Creek is a tributary lower in the drainage which now flows through farm land. The lower part of the stream is a depositional C channel type.

Many of the tributary streams are classified as A or B channel types. However some are indicated to have characteristics of both and are on the map as B/A.

Figure 22. Rosgen Channel Classification

Reference Condition

Figure 22 also displays what was believed to be the historic channel type for the streams in this watershed. As mentioned above, the mainstem of Sharps Creek was believed to have functioned more as a B channel type. Most of the tributary streams are high gradient, moderate to deeply entrenched, A and B channel types.

Water Quality

Sharps Creek is warm, and probably has high pH and dissolved oxygen fluctuation in summer. The tall Douglas-fir riparian trees have been cut from the National Forest boundary above Walker Creek, to the Row River. Riparian trees are young along most of the tributaries except Table Creek near the mouth, lower Martin Creek, and Upper Sharps Creek and their forks.

Current Condition

Water temperature for Sharps and Martin Creeks are high. These streams are on the Final November 1998 Oregon DEQ's List of streams that do not meet water temperature standards. The reaches listed include Sharps to the confluence of Martin Creek, and from the mouth of Martin Creek up to the headwaters. The data in Appendix B shows that the mean of the warmest 7 days in 1997 was less than 64 degrees F (the criteria for salmonid rearing) above Martin on Sharps Creek, and 65 degrees F at the mouth of Martin Creek. The warmest single day of the year in 1966 Martin Creek was 65 degrees F above Clark Creek.

Both Sharps Creek above Martin and Martin Creek at the mouth were warmer than 55 degrees F (the salmonid spawning and emergence criterion) in June 1997, a year with typical water temperatures (Appendix B). Rainbow trout fry are emerging from gravels in June. Upper Sharps Creek riparian shade is good, and temperatures were probably always this high.

A plot of water temperatures on the warmest day of the 1996 summer shows that tributaries are cooler than Sharps Creek, and temperature increases rapidly from Martin Creek to mouth 11 miles downstream.

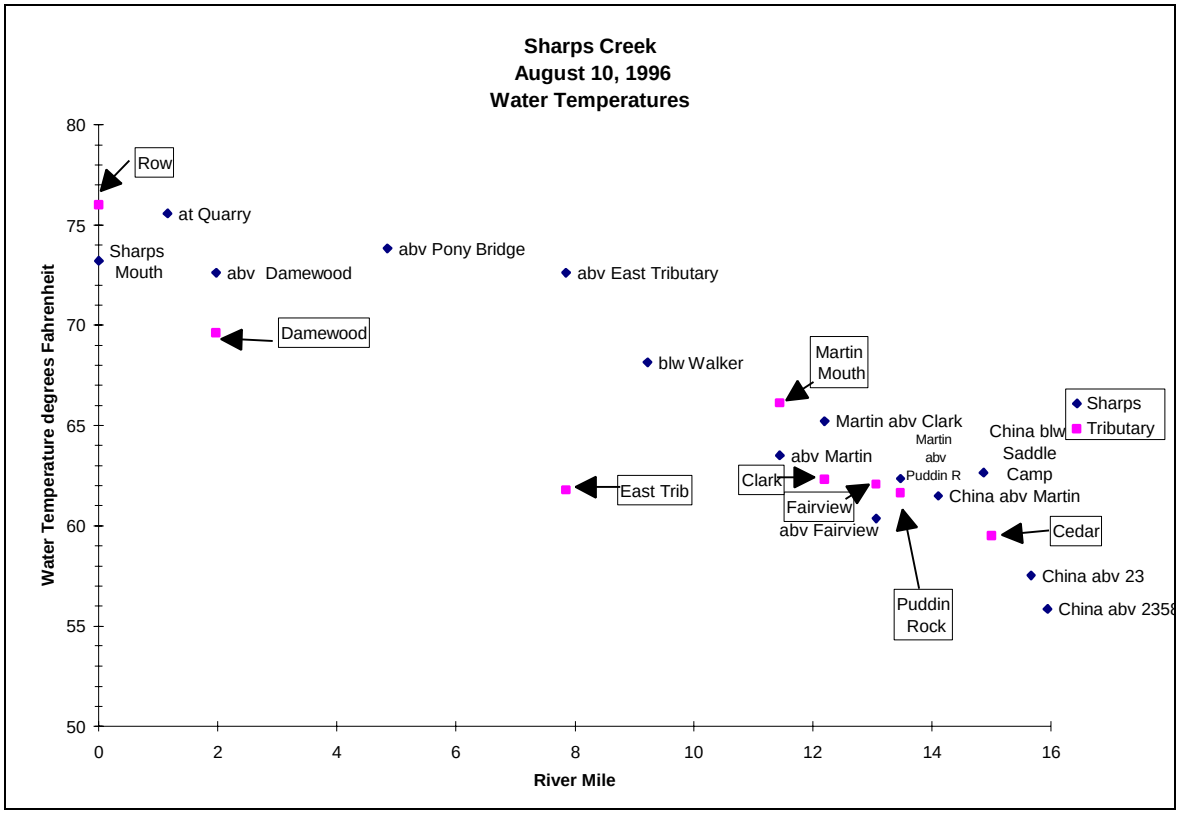


Figure 23. Water Temperatures August 10, 1996

Riparian conifers have been cut from both sides of Sharps Creek to the National Forest boundary below White Creek. Water temperature during the warmest week in 1997 increased from about 64 degrees F at Martin Creek to 75 degrees F near the mouth, or about 1 degree per mile. From Walker Creek to Staples Bridge (about 3 miles), the increase is greatest, from 67 to 75, or almost 3 degrees per mile. Sharps Creek road and riparian timber harvest have left little shade on this wide, bedrock stream.

Sharps Creek has low dissolved constituents (conductivity in September 1997 was 66 microsiemens/cm, a low value, see Appendix B). This indicates little ability to buffer changes in pH. Attached algae is common in summer; and can be found in Sharps Creek unshaded bedrock reaches. Since algae use carbon dioxide during the afternoon in photosynthesis, carbonic acid goes down and pH can go up. The opposite is true in the morning, when algae use up oxygen with respiration. The result is swings of pH from 7 in the morning to 8 or higher in the afternoon. Since flow is low, Sharps Creek can not entrain air (and carbon dioxide) to keep pH down. Inventories found supersaturation of dissolved oxygen in September 1997, indicating that algae were producing oxygen. Wide swings in daily pH and dissolved oxygen can affect aquatic life, which is reflected in the pH water quality criterion of 6.5-8.5 and dissolved oxygen of 8 and 11 mg/l (rearing and spawning periods). Measurements were not taken during extreme conditions in July and August. Since nearby streams in Steamboat Creek and downstream Willamette have exceeded these criteria, more investigation on Sharps Creek are warranted.

Reference Condition

Before tall conifers were cut along Sharps Creek and its tributaries, high summer water temperature was probably 3-5 degrees cooler at the mouth, but still higher than the water quality criterion for salmonid rearing (64 degrees F). Layng Creek and other streams on the Forest with similar drainage area and better riparian condition are near 70 degrees. Upper Sharps and Martin were probably about 64 degrees, as they are today (even the roadless City Creek to the south is smaller and warmer than they are). Cooler summer water, higher flows, and inter-gravel storage of water before the 1800's probably resulted in more stable daily pH and dissolved oxygen. The more complex habitat and better water quality was a more productive environment for aquatic life.

Vegetation, Soils and Disturbance

Vegetation

Current Condition

The vegetation in Sharps Creek is displayed in five seral stages: establishment (0-20 years), thinning (21-80 years old), mature (81-150 years), transitional (151-300 years) and old growth (301+ years). The age range applied to the stages serve as a proxy for structural stages. In Brice Creek and Sharps Creek watersheds, these ages are generally close to the stages they are associated with. In Sharps Creek, stands may stay in stages longer than the ages shown based on productivity of the site. Also, harvesting and fire suppression have changed the structure by changing the quantity of snags and down wood. The term *late successional vegetation* as used in this section includes mature, transitional and old growth.

All five seral stages are currently represented in the Sharps Creek watershed analysis area. The following table shows the percentage of vegetation by stage and ownership.

Table 31. Vegetation by Stage and Ownership

Vegetation Stage	Acres by Stage	total percent	BLM Acres	% by stage	FS Acres	% by stage	PVT Acres	% by stage
Establishment	12,181	29%	2,122	18%	1,634	13%	8,425	69%
Thinning	10,432	24%	1,866	18%	1,563	15%	7,003	67%
Mature	8,804	21%	1,418	16%	7,234	82%	152	2%
Transitional	5,882	14%	2,408	41%	3,450	59%	24	<1%
Old growth	4,706	11%	1,151	24%	3,552	76%	3	<1%
Non forest	504	1%	63	12%	320	63%	121	25%
Total	42,509	100%	9,028		17,753		15,728	

Approximately 48 percent of the watershed is currently greater than 80 years old (mature, transitional and old growth stages)and 27 percent is over 150 years in age (transitional and old growth). About 28 percent of the vegetation is younger than 20 years (establishment). The young vegetation is concentrated in the western, private portion of the watershed and the older, mature vegetation is on federal land in upper Sharps Creek. Because of the two roadless areas plus the areas designated as LSR on BLM land, upper Sharps Creek's mature vegetation is relatively unfragmented. It is also on steeper, less productive land and generally less accessible than lower Sharps Creek.

In the last 70 years, timber harvest and, to a lesser extent, fire suppression have been the dominant influences determining vegetation stages in the subwatershed. Because of the lower productivity in Upper Sharps Creek (than the rest of the Row subbasin), vegetation has been more slow to recover from fire in areas that burned more than 80 years ago. This translates into less effect possibly, from fire suppression. Although there are areas that appear to have repeatedly burned, (Sailors Gulch drainage), the general effect would be to have ground fires and widely spaced vegetation. There are many two-storied stands in the upper Sharps Creek drainage; evidence of the effect of frequent, low intensity fire. The moderate fire regime makes for complicated effects, structure and conditions.

Figure 24. Current Vegetation

There are currently 21,000 acres, or 50 percent of the Watershed, that have never been harvested. To distinguish these acres from plantations, they are being called “natural stands” in this document. The following map shows the location and connectivity of the natural stands.

Species Composition

Species composition of timbered stands in the Sharps Creek watershed analysis area varies by plant series (potential vegetation). The hemlock series is the most common series in the watershed. The most common species throughout the watershed are Douglas-fir and hemlock. At higher elevations (above 4,000 feet) silver fir, white fir, mountain hemlock, noble fir and Shasta red fir are common. At lower elevations incense cedar, bigleaf maple and sugar pine are present. Knobcone pine is present in small quantities on the Calapooya Divide on the southern ridge of the drainage. The following table shows the average composition percentage by species for the western hemlock series and is derived from stand exams conducted mainly in lower elevation stands in Brice Creek; it is highly probable that Sharps Creek has similar percentages for the hemlock series.

Table 32. Species Composition

Species	Stand Average (%)	Range (%)
Douglas-fir	65.3	18 - 98
Western hemlock	18.8	1 - 53
Western redcedar	12.1	1 - 36
Sugar pine	4.4	1 -12
White pine	2.8	1 - 6
Noble fir	1.0	1 - 1
Pacific yew	3.8	1 - 11
Bigleaf maple	3.5	1 - 14
Chinquapin	8.1	1 - 24
Madrone	4.3	1 - 9

In most plantations that were precommercially thinned between 1970 and 1985, Douglas-fir was selected as the preferred species to leave to the effective exclusion of nearly all other tree species. Since that time, management practices have emphasized leaving a diversity of species. Also, ingrowth from surrounding stands has filled in many plantations with hemlock, western red cedar, incense cedar, white fir, several types of hardwood species and the occasional white and sugar pine. Pacific yew is often found to have survived harvest and broadcast burning in plantations, and can be found in most harvest units where it previously existed.

Insect and Disease

In the Sharps Creek Watershed, various insects and pathogens are causing scattered mortality of individual trees and groups of trees throughout the analysis area. Current watershed-wide mortality levels are generally low.

Insect and pathogen activity has probably increased since the turn of the century due to timber harvesting, the introduction of an exotic organism, and the exclusion of fire (Goheen 95). Vegetation density is higher in some areas than that which would have been maintained by fire. Single-species, even-aged plantations of Douglas-fir provide more uniform conditions for

introduction and spread of disease. Road building and maintenance and soil compaction have also increased tree stress.

Figure 25. Natural Stands

Reference Condition

Historically, lightning fires largely determined vegetation conditions and seral stages in Sharps Creek. The reference condition for vegetation stages are based on the year 1936 and were derived from historical maps. Maps and records were scarce for Sharps Creek. The maps used covered large areas and are limited by the fact that smaller patches of differing stages of vegetation are not often depicted accurately. Also, when fire burned through the understory, many large trees remained, often creating two-storied stands that were mapped as burned areas in 1936 but retained 40 to 50 large trees per acre. Below is a table and a map showing the historic vegetation stages (1936).

Table 33. Historic Vegetation Stages (1936)

Stage	Acres	Percentage
Deforested burn	1,360	3%
Early	6,543	15%
Mid	6,193	15%
Late	1,562	4%
Old growth	26,112	61%
Non forest	716	2%
Total	42,486	100%

LSR and Connectivity/Diversity Block Vegetation

Analysis of the portion of LSR 222 on BLM managed lands shows approximately 61 percent of the conifer vegetation is greater than 80 years in age. A discussion of the habitat conditions can be found in the Terrestrial and Aquatic Species section.

Approximately 47 percent of the stands in the Connectivity/Diversity Blocks (Matrix) are greater than 80 years old. The habitat condition of the Connectivity/Diversity Blocks is described in the Terrestrial and Aquatic Species section and Appendix E.

Table 34. Connectivity Matrix and Late Successional Reserve

Stage	Connectivity Matrix		Late Successional Reserve	
Establishment	1,055 acres	28%	1,072 acres	20%
Thinning	892 acres	24%	970 acres	19%
Mature	540 acres	14%	885 acres	17%
Transitional	919 acres	24%	1,458 acres	28%
Old Growth	348 acres	9%	826 acres	16%

Roadless Area Vegetation

The vegetation condition for the three Roadless Areas on Forest Service land in Sharps Creek are important because of their value as intact, connected forest. Currently there are areas of late seral, mature and thinning stages in these areas. The map in Figure 28 shows a comparison of the current and reference vegetation conditions.

Unlike most other watersheds in the Row subbasin, the roadless areas in Sharps Creek watershed analysis area currently maintain vegetation that is older than it was 60 or 100 years ago. This is a result of fire suppression in an area that once frequently burned. These roadless areas may not be

able to maintain suitable late successional habitat conditions because of susceptibility to lightning. This is an area that is at risk of catastrophic fire without some kind of active fuels management.

Figure 26. Vegetation Reference Condition, 1936

Figure 27. BLM Seral Conditions

Figure 28. Roadless Area Vegetation

Soils

The soils in Sharps Creek are varied. Deep soils in Lower Sharps West and East contrast with the rocky soils in Upper Sharps land area. More than a third (5,897 acres) of the soils on lands managed by the Forest Service are classified as unsuitable for timber harvest. The majority (90 percent) are classified as unplantable because of the high volume of gravel and cobbled-sized rock fragments (TRG) that forms a layer greater than six inches making planting impractical. Another 9 percent of the soils have a high volume of fine gravel that can be planted but creates excessive air voids (TRV) around the roots resulting in unacceptable mortality when planted. There are small pockets (less than 125 acres) of land debris avalanche (TLA) terrain and shallow (TRR) soils on Forest Service managed lands. The following map (Figure 29) illustrates the location of unsuitable soils on Forest Service managed lands.

Fire

There are five fire behavior (FBO) fuel models found in Sharps Creek watershed analysis area. These fuel models are representative of both current and reference times, though their distribution over the landscape has differed.

Table 35. Fuel Models

	Acres				Percent of
Fuel Model	BLM	Private	USFS	Total Acres	Watershed
1	28.55	114.27	15.85	158.67	0.90
2	0.00	29.38	2.18	31.56	0.10
5	2,142.71	7,095.59	1,333.64	10,571.94	25.00
8	4,144.50	7,236.36	1,643.08	13,023.94	30.00
10	2,699.44	1,251.78	14,752.22	18,703.44	44.00
Totals	9,015.20	15,727.38	17,746.97	42,489.55	100.00

Table 36. Reference Fuel Models

Fuel Model	Acres	Percent of Watershed
1	1,499.18	3.00
2	0.00	0.00
5	6,403.76	15.00
8	6,912.91	16.00
8/10	1,562.17	4.00
10	26,111.53	62.00
Totals	42,489.55	100.00

Figure 29. Soil Suitability

Fire Uses and Activities

Current Condition

Fuels Management Activities

Organized forest fire protection began soon after the disastrous fires of 1902. By 1904, evidence suggests that fuels reduction activities (esp. slash burning) occurred in areas where miners were exploring. Logging activity began in the lower (BLM and private) parts of the watershed in the late 1920's, and in the upper (FS) parts in the late 1940's. Slash burning has been a standard practice on harvested lands in the Sharps Creek watershed.

The fuels activity map and the table below display the acres treated by either broadcast burn or under burning on FS lands, and the percent of the FS land they represent. Similar data for BLM and private lands were not available for this report. Piling and burning was not evaluated because this treatment method does not usually consume enough fuels to change the fuel model or create a significant difference in fire behavior.

Table 37. Fuels Treatment Activity in Sharps Creek (USFS land only)

Time Period	Acres Treated	Percent of Watershed
1950 -1969	848.4	.05
1970-1989	467.9	.03
1990-1998	93.9	.01

Reference Condition

Native American Influence

According to historical records (circa 1826), Native Americans repeatedly burned prairie and forests for game hunting and brush clearance. This kept the forest from maturing fully, except near rivers and along some valley bottoms. The landscape was open grassland on the valley floor and light, open forests on most hills around the area. This use of fire had kept the valley's flora in a fire-maintained climax state for hundreds of years. These activities have modified landscapes in many subtle ways that have often been interpreted as "natural" by the early explorers, trappers, and settlers. The last known Indian burning in this area was prior to 1846.

An article from the Cottage Grove Sentinel (April 25, 1919), apparently based on reports related by Indians remaining in the area, refers to activities of the Kalpuyans. The articles states:

"before the white men came…they [the Indians] kept underbrush cleared from level lands and hills by controlled grass burning. This, they felt, produced better grass growth, better deer hunting, easier traveling, protection from fires in fall, and better visibility…the white man came and permitted undergrowth to take much of the land."

Figure 31. Current and Reference Fuel Models

Figure 32. Fuels Activity

Euro-American Settlers

According to local residents who inhabited the area around the turn of the century, large areas of forested land were cut down and burned; in some instances the timber wasn't logged, but left to be burned with the rest of the "trash". The land was then seeded for grasses upon which sheep would later graze. When asked in a 1975 interview what he remembers about the country around the Cottage Grove area, Frank Baker reported that it was much more open under the timber than it is now.

In the late 1850's, prospectors began exploring the present day Bohemia Mining District. Buildings, mills, roads and trails were built in the Sharps Creek watershed through the 1800's. Though there were isolated incidents of set fires, it is unlikely that miners regularly set uncontrolled fires to clear their lands. Instead, areas of trees were cut, and slash burned. In 1899 however, two men building the White Swan Trail started a fire that burned 240 acres.

In July 1904 Ranger Carl Henry Young noted in his journal that he "burned brush on cutting area[s]," most of which were probably on mining claims or associated with them. Young also wrote of the fires he had discovered adjacent to the Sharps Creek watershed, as well as to distant smoke columns he observed. These fires were probably related to land clearing activity.

Fire History, Occurrence, and Intensity Levels

Current Condition

Fire Occurrence

In this section, fire intensities and sizes classes are discussed. To better understand how these are defined, please refer to Table 14 in the Fire Intensity Levels section (following this one) for clarification.

Sixty-eight years of recent lightning and human caused fire occurrence (1930-1997) were analyzed to determine fire frequency, intensity, and extent. Data were gathered from Forest Service fire records, and do not include fires that may have occurred outside the Forest Service boundary. Overall fire occurrence, regardless of cause, is 0.6 fires per year in the Sharps Creek watershed. Lightning and human caused fires are discussed separately below.

Lightning-caused Fires

Over the last 68 years, 30 lightning fires have occurred on Lands managed by the Forest Service in the Sharps Creek Watershed. These fires represent 17 percent of all the lightning fires that have occurred on the Ranger District. The average lightning occurrence for the Watershed is 0.4 fires per year. Twenty six of these fires were size class A (1/4 acre in size or less), due to either the fuel conditions or suppression activities. Four lightning fires were size class B (1/4-9 acres).

In the 1930's two of the size class B fires burned on the southwest aspects of Cat Mountain, on the upper third of the slope. The third occurred in the 1950's east of Sailor's Gulch, mid-slope below Puddin Rock. The fourth occurred in the 1940's near present day Mineral Campground.

The size class B fires tend to be clustered in two areas. The first is the lower to middle third of the north facing slope between Mineral Campground and Puddin Rock (Sharps Creek drainage). On this north slope, the primary contribution to larger acreage fires would probably be fuels buildup over time due to infrequent fire, and the steep topography of the area. The second area is the southwest slope of Cat Mountain. Exposure to prevailing winds (SW), the southerly aspect, and drier fuels would account for the greater likelihood of larger fires occurring there.

The remaining small (class A) fires burned in isolated areas of heavier fuels, or crept around in surface fuels. These, too, tend to be clustered not only in the areas described above, but also on the south and westerly slopes in the vicinity of Glenwood Creek, within the Sailor's Gulch drainage, and along the length of the Calapooya Divide, Puddin Rock, and Adams Mountain-to-Cat Mountain ridge lines. Isolated fires occurred in the Fairview Roadless area, and in the White, Quartz and Clark Creek areas.

Human-caused Fires

Human-caused fire occurrence was analyzed for the same time period. Prior to 1930, there are few records of human caused fire in the Sharps Creek watershed. The exception is the 240 acre fire in 1899 along the White Swan trail in Glenwood drainage (T23S,R1E, Section 15).

In the last 68 years, there have been 11 human caused fires in the watershed, which accounts for 17 percent of all the District's human caused fires. A human caused fire occurs at a frequency of approximately one fire every 6 years in the watershed. Of these 11 fires, 4 were caused by debris burning; another 3 fires were abandoned campfires. One fire was smoker caused, while 2 were due to equipment use. One fire was due to a miscellaneous cause.

Six of the human caused fires were size class A fires; three were size class B fires. Two were size class C fires. All human caused fires, with one exception, occurred in the same general location as the majority of the lightning fires, which is between the Puddin Rock Creek and the Sharps Creek drainages, and along the Adams Mountain-to-Fairview Mountain ridge line.

The size class A fires are primarily scattered along the Sharps Creek drainage from the Glenwood area downstream to road 23. Of the larger fires, debris burning fires occurred in 1972 in the Star Mine area (4 acres, size class B); one in the Marten Creek area (7 acres, size class B); and one in the Puddin Rock Creek area (26 acres, size class C). A forty acre (size class C) fire occurred in 1985 due to equipment use. A one acre (size class B) fire occurred near Marten Spring in 1972 as a result of debris burning. The largest was the 240 acre (size class D) fire that occurred in 1899; this

fire was located on the west slopes of Bohemia Mountain, southeast of the Glenwood area.

Areas of High Susceptibility

Though fires were scattered throughout the watershed, the clusters that occurred: 1) between Puddin Rock Creek and Sharps Creek, 2) from the confluence of Bohemia and Glenwood Creeks to Bohemia Mountain and north to Fairview Mountain, and 3) in the Cat Mountain area, indicate these areas are more susceptible to ignition starts and fire spread. Exposure to weather, drier fuels or build up of fuels over time, and steep topography are all factors in these areas. Of these areas, the slopes between Puddin Rock Creek and Hardscrabble Road (from road 23 at the bottom to the Calapooya Divide at the top) are of particular concern.

Fire Intensity Levels

Fire intensity data was incomplete for 1930-1969; fire intensity levels (FIL) for 1970-1997 showed majority of fires to be FIL 3 or less. The exceptions are two fires (5 and 15 acres) in 1996 that burned at fire intensity level four. Fires in 1930-1969 are assumed to have displayed similar FIL's. Fire size classes of known FIL's were used to assign FIL's to the earlier fires.

Table 38. Fire Intensity Levels

Fire Intensity Level	Flame Length (feet)	Fire Report Designation	Assumed Fire Size Class	Size Class Acreage
Low	0 - 2	FIL 1	A/B	0-1/4
	2 - 4	FIL 2	B	1/4-9
Moderate	4 - 6	FIL 3	C	10-99
	6 - 8	FIL 4	D	100-299
High	9 - 12	FIL 5	E	300-999
	12+	FIL 6	F/G	1000+

We can assume the size class A fires displayed low fire intensity levels (0-2 foot flame lengths), with occasional exceptions when the fire burned in isolated pockets of heavier fuels or torched a snag. The size class B and C fires could be characterized as partial stand replacing fires, as they would have burned at moderate intensities and killed isolated trees or patches of trees. Fuels would have either built up over time or been dry enough to contribute to higher intensity fire in the areas where these larger fires are clustered. The 240 acre fire in 1899 most likely exhibited fire intensity levels of 4 or 5; this was a higher intensity, stand replacing fire.

Reference Condition

Fire Occurrence

Fire history data were collected on Forest Service lands within the Sharps Creek watershed, but due to a series of stand replacing fires in the 1800’s, much of the fire

scar evidence in the area was destroyed. The BLM and private portions of the watershed are not well represented due to lack of data. Tree origin data and adjacent watershed analyses were used to develop a picture of the fire history in the Forest Service portion of the watershed. Aerial photos were used to aid in determining historical occurrence in the roadless areas.

Findings of Fire History Study

Adams Mountain/White Creek area

These areas are multi-aged stands with remnant old growth from the late 1400's to mid 1500's. A majority of these stands have origins in the mid to late 1700's, with understory from both the early and late 1800's.

Puddin Rock area

The stand sampled indicates this is more of a single-aged stand with very scattered old growth from the mid 1500's to the early 1600's. A small portion of the stand originates in the early 1800's, with the majority originating in the late 1800's.

Quartz Creek area

This is more of a single aged stand with very scattered old growth from the early 1600's and early 1700's. The majority of the stand originated in the late 1800's.

Saddle Camp area

In samples taken in this stand, no remnant old growth were found. This is a young stand, with trees originating in the early and late 1800's.

Clark Creek area

This is a multi-aged stand with trees from the early 1600's and early 1700's, with an understory stand from the early and late 1800's.

Fire Intensities

According to the data, it appears high intensity fires passed through the area in the late 1500's, the late 1600's, and the early 1800's. These fires burned in a lower intensity in the northern portion of the watershed, leaving multi-aged stands, and in a higher intensity in the southern portion, leaving remnant old growth in the riparian areas and on northern aspects. It is estimated that stand replacement events would have occurred approximately every 100-150 years in which a significant portion of the Sharps Creek watershed would experience fire so severe that it would set the forested stands back to an early successional stage. Low to moderate intensity fires occurred between the major fire episodes in the southern portion as well, but the effects aren't as obvious as those that occurred in the northern portion. Because adequate fire scar evidence was not available, the natural fire rotation could not be calculated for the watershed.

Air Quality

Current Condition

The Diamond Peak Wilderness, and the Crater Lake National Park (south of the Umpqua National Forest) are Class I areas, as defined by the Clean Air Act. The remaining areas, including the other wildernesses within the Forest, are Class II areas. The Forest Service and BLM are required to comply with the provisions of this act, as well as standards set by the Environmental Protection Agency and the Oregon State Smoke Management Plan. These policies are designed to improve air quality. One objective is to prevent smoke from being carried to or accumulating in designated areas or other areas sensitive to smoke. The northern boundary of the Sharps Creek Watershed is approximately 11 miles southeast of the southern-most edge of the Willamette Valley Designated Area (DA).

The Willamette DA includes the town of Cottage Grove and the Dorena Reservoir area. Several miles to the northeast is the Oakridge Special Protection Zone (SPZ). This zone requires BLM and the Forest Service to adhere to possible additional restrictions to prescribed burning between November 15th and February 15th of each year.

Within the Oregon State Implementation Plan for Visibility Protection (SIP), a general prohibition on prescribed burning applies to Lane County from July 1st to September 15th of each year. The goal of this strategy is to reduce substantially impaired visibility within select Class I lands. The Class I areas nearest the watershed are 17 or more miles away and include the Diamond Peak Wilderness to the southeast, and the Three Sisters Wilderness to the northeast.

Particulate matter (PM-10) has been identified as an air pollutant. Particulate matter emissions are produced from activities such as prescribed fire and events such as wildfire. The PM-10 health standard established by the EPA is aimed at respirable sized particulate matter that penetrates deep into the lungs. This particulate matter is 10 micrometers and smaller in size.

Residual smoke from prescribed fire is a related concern, as larger volumes of this smoke may drift downwind and into communities within the designated areas. Generally, prescribed fire residual smoke has not been an issue to down canyon communities. In most cases winds are from a northwesterly direction during the day carrying smoke to the southeast; at night down canyon winds are normally light, and smoke settles in the adjacent valleys.

Reference Condition

Prior to Euro-American settlement, it is evident that fire was a common occurrence, regardless of ignition source. With the combination of Indian and settler burning in the Willamette Valley and Calapooya Mountain foothills in the spring and fall months, the lightning fires in the summer months, and with possible human-ignited fires in select areas of the watershed for grazing, game, or gathering purposes at various times of the year, we can assume that smoke was present at varying densities throughout much of

the year. Air quality ranged from a light haze from distant fires to a dense layer over areas in which fires were large, intense and of extended duration. Smoldering fuels probably contributed much of the emissions, given the nature of the fires that occurred in the watershed.

Residual smoke from fires within the watershed can be assumed to have drifted into the Oakridge and Umpqua Valley areas with the prevailing northwesterly winds. Localized drainages would have accumulated smoke during the evenings and early mornings, and been lofted somewhat with the lifting of the inversions typical at certain times of year. East wind conditions would have carried smoke into the Disston valley and possibly down into the Cottage Grove area (the southern end of the Willamette Valley). Smoke in this area may have accumulated during evening hours and occasionally during daytime, as it tends to be prone to inversion conditions.

Fuel Conditions

Current Condition

The primary role of fire since the early 1900's has been that of a management tool to reduce the fuels hazard and associated risk of fire starts. The fuel conditions under which the burns were carried out were unnatural (extensive clearcutting), but the resulting human created mosaic of various burn intensities may in some way mimic the overall effects of fires that occurred in reference times. Since the late 1800's, the role of natural fire has been minimal in the watershed. Regardless of ignition source, stand or partial stand replacement fires have been a rare occurrence in the watershed since 1899. The fires since 1900 have burned only small concentrations of fuels, individual snags or trees, and occasional patches of timbered stands. The largest on Forest Service land were 26 and 40 acres in 1972 and 1985, respectively. One fire occurred in the northern portion of the watershed in the 1970's that was fairly extensive, but information on cause, fire intensity, and total acres is not available.

Reference Condition

In reference times, repeated fires appear to have sustained much of the lower (northern) and riparian areas of the watershed in a mid-successional to old growth condition. The exceptions are the eastern portion of the Sharps Creek drainage, and other higher elevation areas. These sites appear to have been maintained in non-forest or early successional states, only occasionally reaching some semblance of maturity before being set back by fire.

It has been approximately 100 years (within the estimated fire return interval of 100-150 years for stand replacement events) since a partial to stand replacement fire has occurred. Many isolated, lower intensity fires have burned through the older stands, reducing litter, smaller understory, and pockets of concentrated fuels. Minimal partial stand replacement and torching events have occurred since the last major fire in the late 1800's. It is likely that some of the fires that have been suppressed over the last 100 years had the potential for sustained crown fire, or at least partial stand replacement, given past weather extremes and fuels conditions.

The types of fuel models in reference times were similar to what we see today. The difference is in the distribution and amount of each fuel over the landscape. Rather than the patchy distribution seen today due primarily to logging activities in the roaded areas, fuel models in reference times were maintained over larger, contiguous areas. Fire was a random event in terms of location, intensity and extent, and created and maintained a mosaic that is not evident today. The exceptions are the riparian areas of the major tributaries to Sharps Creek, which are probably similar today to what was seen in reference times.

Fire was probably used within the watershed for hunting, at gathering sites for berries and other plants, in high elevation meadows for game or grazing, and to some extent for clearing brush and slash in and around mining claims. The roles fire played would be to set back or kill brush that impeded big game movement or reduced visibility and ease of travel, to maintain gathering and grazing sites and, later in the 1800's, to dispose of slash. Fires set for these reasons would have been mostly low intensity (2-4 feet flame lengths), and with few exceptions would have been ground fires. If Native Americans maintained selected areas, as has been suggested in various writings, fire was probably set every year to five years, depending on site needs. The miners' use of fire created isolated, low to moderate intensity fires, with very little overall effects on the area as a whole.

Effects of Fire/Fuels Activities on Vegetation

Current Condition

Slash burning has been the most obvious effect of fire on the watershed since 1936. At least 1410 acres have been broadcast or under burned on Forest Service lands, representing 9 percent of that portion of the watershed. Of the 24,725 acres of non-Forest Service lands, we estimate that 75 percent (10,632 acres) of it has been previously harvested and burned during contemporary times, which would raise the total percent of the watershed burned to 52 percent (43 percent + 9 percent). Early slash burns were done at various times of the year, and had a wide variety of effects. Burns occasionally exceeded cutting unit boundaries, stressing or killing nearby live trees. For the most part this occurred within a limited distance from the edges of harvest areas.

In some parts of the Watershed the earlier slash burns combined with timber harvest had more impact than fire would have created in reference fire conditions. Effects on soils often ranged between moderate and severe. Residual snags and coarse woody debris were minimal to non-existent after harvest and slash burning in areas that would have historically continued to provide these materials.

In the last 15 years or so, burns on federal lands have been carried out under spring burning conditions. Effects on stands and fuels have, for the most part, more closely resembled the moderate to lighter intensities typical of past ground fires in this watershed.

As discussed above, none of the fires since 1936 have produced significant partial stand replacement effects. Effects of these smaller, low to moderate intensity fires

were not significant to the watershed's structure or processes, but did have localized effects on soils and overstory survival. Had these fires not been suppressed, they may have continued to grow in size and intensity to some extent.

Reference Condition

Fire played a major role in determining structure and process in the forested landscape of reference times. The type and amount of vegetative species were influenced by the extent, intensities, and recurrence of past fires. As previously discussed, fire created and maintained a mosaic landscape pattern which changed through the centuries. The fire episodes indicate repeated and large areas of stand replacement, as well as significant areas of partial stand replacement. Very little of the watershed had been left unburned for more than a 150 year period, at least since the 1400's.

In those areas that experienced recurrent, stand replacement events, fires would have initially burned at intensities that consumed coarse woody debris (material greater than one inch in diameter) as well as some larger down logs in various stages of decay. Fire would have burned within riparian areas with relative ease, especially those higher in elevation and somewhat exposed to prevailing winds. After these fires, fuels would slowly accumulate as fire killed trees and brush fell to the forest floor; trees and brush eventually re-establishing themselves. After an extended period of time, another stand replacing fire would sweep through the area, and the process would repeat itself. Effects of subsequent fires would depend on the length of time between fires, and the rates at which vegetation could re-establish and fuel loads could build up.

Areas of partial stand replacement fire were dispersed throughout the watershed. Within these areas, isolated incidents of stand replacement occurred as fire encountered concentrations of heavy fuels, or where weather and topographical features intensified fire behavior. Partial stand replacement fires would have burned through the undergrowth and ground fuels at lower intensities, occasionally burning into the overstory and torching individual and clumps of trees. This kind of fire creates a diverse mosaic, leaving not only openings in the canopy, but unburned patches of ground throughout the burn area. This kind of fire is less likely to burn intensely in riparian or other moist areas. Subsequent fires moving through these areas would burn the previously unburned fuels, and some of the fuels that had accumulated since the earlier burn.

It is impossible to assess the impact human set fires may have had on the watershed. With the knowledge that local Indians may have used the area for hunting and gathering purposes, and that both local and out-of-area Indians used the major ridges as travel/trade routes, we can assume that they used fire for clearing some of the areas they used. Depending on the time of year they would have done this, fire effects would have ranged from negligible to a major low-moderate intensity fire. It is possible that some of the fire episodes discussed in this paper were human caused; however, as Indian use of fire is considered a natural part of the process in reference times, the effects of human influence in reference times is not an issue.

Terrestrial Species and Habitat

Threatened, Endangered and Sensitive Species (T&ES)

The following section is an assessment of habitat conditions for a wide variety of terrestrial T&ES species, organized by current and reference conditions.

It is assumed that the loss of late-successional structural components from past management activities during the harvest of clear-cut units in and adjacent to terrestrial habitat will have an impact on the following species for many decades.

Northern spotted owl (*Strix occidentalis caurina*) Status: Threatened

Current Condition

There are eighteen known owl sites within the Sharps Creek watershed, ten on lands administered by the Forest Service and eight on BLM. The Fish & Wildlife Service considers owl sites at risk when the amount of suitable habitat drops below 40 percent within a pair's home range. In Sharps Creek the home range radius is 1.2 miles and 40 percent of that home range equates to 1,182 acres.

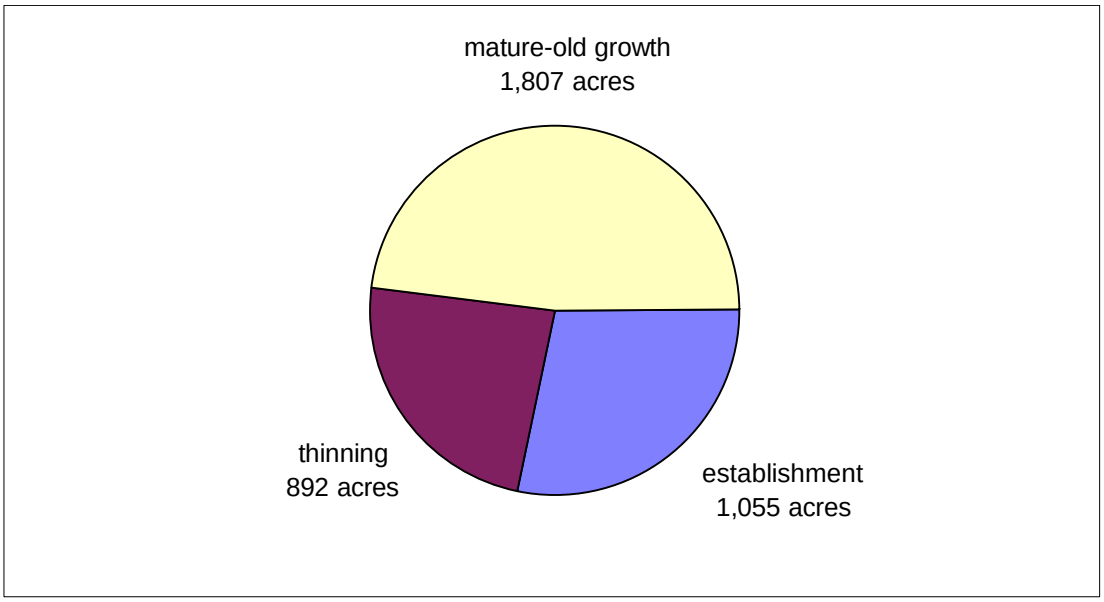
Five of the eight sites on land administered by BLM are within the LSR and currently meet the 40 percent requirement. However, the owl sites that are within the LSR are very close together, resulting in home ranges that overlap. This implies that foraging habitat is shared, causing a viability concern.

Of the thirteen owl sites that are within Matrix lands, eleven sites currently have 40 percent or more habitat remaining. The two owl sites that fall below the required habitat are within BLM Matrix administered lands. There is no information on reproductive success for owl pairs administered by the Forest Service. All of the eight known owl pairs on BLM lands have reproduced at least once since 1989, when monitoring began. The reproductive success of the eight owl pairs located on lands managed by BLM land are as follows:

BLM Matrix:
- One owl pair nested three times, in 1992, 1993, and1996
- Three owl pairs each nested once, one in 1992, two in 1994

BLM LSR:
- Four pairs last nested in 1992
- One pair last nested in 1989

Dispersal habitat objectives continue to be met within the watershed. The BLM portion of the matrix is identified as Connectivity/Diversity Blocks. Within Sharps Creek there are seven connectivity blocks (two of them have a small amount of acreage outside of the watershed). The blocks range in size from 310 acres to 795 acres. Those to the southeast consist mostly of late-seral forest stands; moving toward the northeast the blocks become more fragmented with younger stands. The most northern block does not contain any late-seral forest at all. As stated in the Northwest Forest Plan, 25-30 percent of each connectivity block must be retained as late-successional forest. Five of the blocks have enough or more late-successional forest to meet that requirement, one contains almost enough late-successional forest, and the final one contains no late-successional forest. The following chart shows the acreage by vegetation stage within the Connectivity/Diversity Blocks. See Appendix E for acreage by individual Blocks.



Only two connectivity blocks consist of one entire section. The other five consist of partial sections intermingled with private lands. Since the private lands are in either the establishment or thinning stage, the northern third of the watershed is highly fragmented. Mobile species, such as the spotted owl, will be able to disperse throughout the area but smaller, less mobile species will have a difficult time dispersing. The fragmentation and the loss of old-growth habitat resulted in the threatened status of this species. Recovery time for clear-cut units will take two or three times longer than areas affected by stand replacement fires under reference conditions because late-successional components such as snags and down wood have been removed.

Critical Habitat Units

In June of 1990, the Northern Spotted Owl was listed as a threatened species. The Endangered Species Act calls for the preparation of recovery plans for listed species that are likely to benefit from the effort. This act also directs the agencies to propose critical habitat "to the maximum extent prudent and determinable." Critical Habitats Units (CHU) are a network of designated conservation areas on federal forest lands to protect sufficient habitat for spotted owls. There are portions of three CHUs within Sharps Creek watershed: OR-22 , OR-25 and OR-26. They are located on the north end of the watershed. The Sharps Creek portion of CHU OR-25 includes 7,509 acres of BLM administered lands (4,667 acres in LSR-222 and 2,842 in Connectivity/Diversity Blocks) and the remaining 7,600 acres are in private ownership.

Table 39. Critical Habitat Units

CHU	Acres within Sharps Creek WA	Acres in Late Seral
OR 22	1,115 acres	10 acres
OR 25	15,109 acres	4,126 acres
OR 26	3,894 acres	3,160 acres

Critical Habitat Unit OR-22 was established as a "stepping stone" of future suitable habitat within the South Willamette-North Umpqua area of concern. The area of concern provides a "bridge" for spotted owl dispersal between the Cascades and Coast Range provinces. Currently, the CHU is not providing suitable habitat (nesting, roosting and foraging); only 10 acres of late-successional forest are within the Sharps Creek Watershed. It is however, providing dispersal habitat.

Critical Habitat Unit OR-25 has been identified as the foundation of the eastern end of the South Willamette-North Umpqua area of concern according to the U.S. Fish and Wildlife Service (Josh Millman, USFW Biologist, personal communication). The critical habitat unit was designated for two reasons: to help ensure that the inter-provincial linkage is maintained and improved, and to provide nesting, roosting and foraging habitat. OR-25 is 102,633 acres in size: 43 percent is private, 55 percent is managed by the BLM and 2 percent is managed by the Forest Service. Approximately 33 percent of the CHU is in late successional forest.

The OR-25 overlaps LSR 222 except for 2,842 acres in the Lick Creek and Pony Creek drainages which are designated by BLM as Connectivity/Diversity Blocks (matrix). This is 3 percent of the CHU but contains 5 percent of the late-successional forest within the CHU. Within the Sharps Creek watershed, OR-25 has 15,109 acres and 19 percent is designated as Connectivity/Diversity Blocks. There are 4,126 acres (27 percent) in late-successional forest and 41 percent of the late-successional forest is in the Connectivity/Diversity Block sections. These sections contain a large portion of the late-successional forest within the CHU. The CHU would more likely perform the function for which it was designated if existing late successional forest remains uncut until younger stands within OR-25 in Sharps Creek Watershed grow up.

Critical habitat unit OR-26 provides essential nesting, roosting, foraging and dispersal habitat. The location minimizes the distances between units OR-19, OR-20, OR-25 and OR-28 assisting with dispersal between them.

Figure 33. Critical Habitat Units

Reference Condition

Based on the 1936 reference map, the historic condition of the landscape was characterized by large blocks of connected suitable habitat (34,500 acres) or fragmented blocks of unsuitable habitat. When the forest progressed through the stem exclusion stages, habitat was again occupied by spotted owls. The recovery time could have been as short as fifty years, because of the large amount of coarse woody debris habitat and residual old-growth trees that remained.

The arrangement of suitable habitat was somewhat inverted when compared to current habitat conditions. The northern portion of the watershed was historically refuge habitat. Based on known fire history data, moderate and low intensity fires burned through this low elevation habitat consisting of deep soils and moderate slopes with north to east aspects. In Upper Sharps Creek, where there are higher elevations and more south and west facing slopes (mostly under Forest Service management), fires burned at higher intensities resulting in a fragmented habitat or loss of suitable habitat conditions. Overall, the population of spotted owls was likely at greater densities than under current conditions; Lower Sharps West and East served as areas of historic refuge and protected the viability of this species within the watershed.

Bald eagle *(Haliaeetus leucocephalus*) Status: Threatened

Current Condition

A Recovery Plan has been developed (Pacific States Bald Eagle Recovery Plan 1986). The goals of the recovery plan are nearly achieved within the state. There are no known breeding sites in the watershed. However, based on inventories and historic records it is known to be used for foraging and roosting sites by wintering, migrating and breeding eagles. Large snags are used as roost sites and old-growth fir trees are used as nest sites. There is a resident pair down stream from Sharps Creek, at Dorena Lake. Improved water quality from the watershed will contribute to the success of this pair.

Reference Condition

Historically, eagles were more abundant over their range. Greater opportunities existed for foraging on winter kill and fish. There was more potential for preferred roosting sites (large old-growth trees) and less human disturbance. (USDI Department of Fish and Wildlife, 1986)

Northern goshawk (*Accipiter gentilis*)…Status: State Sensitive, Bureau Sensitive

Current Condition

Northern goshawks are found in a wide variety of forest types within their range. Nest sites in western Oregon are usually found in mature or old-growth forests (37 percent of the watershed remains in this habitat type), with a preference for moist areas on north slopes, often near water. Nest trees are usually the largest in the stand and a limb is used as a platform for nest construction. Foraging areas are below the forest canopy. Goshawks hunt from either perches or by flying through the open understory. The Goshawk is the largest accipiter in the region and takes larger prey, generally consisting of birds and some mammals such as tree squirrels, ground squirrels and rabbits. Goshawks have been observed in Sharps Creek watershed exhibiting territorial nesting behavior and are expected to breed and forage in the watershed. One goshawk

nest has been found in a 50-year old stand surrounded on three sides by clearcuts. The population density is not known, nor is there information on their reproduction success. Three major threats have been identified (Reynolds, 1989): loss of breeding habitat and wintering habitat primarily due to timber harvest practices, reduced nesting success, and reproductive failure from pesticides and human disturbance.

Reference Condition

Historically, the watershed was comprised of about 80 percent late-seral forest. This forest had an open understory, providing large blocks of habitat and abundant prey species. There would have been enough habitat for at least seven pairs of goshawks within the watershed.

American peregrine falcon (*Falco pereginus anatum*)…Status: Endangered

Current Condition

A recovery plan was developed in 1976 (Pacific States Peregrine Falcon Recovery Plan). The population goals of the recovery plan are close to being achieved within the state. There are no known breeding pairs in the watershed. Peregrine forage mostly on other bird species particularly neotropical migrants. Neotropical migrants continue to have high pesticides residuals which contributes to reproductive failure. Reduced nesting success is another major problem, largely caused by human disturbance. Reduced snag densities within the watershed have an indirect effect on the peregrine, since snags are a critical habitat component for many bird species on which peregrine prey. It is estimated that at least 70 percent of snag habitat has been heavily impacted within the watershed. All of these problems are major contributors to the listing of this species.

Reference Conditions

There is a known historical nest site on Bohemia Mountain. Mining and recreational activities have impacted this historical nesting site. Peregrine populations were known to be at a greater density in the 1900s (USDI Department of Fish and Wildlife, 1976). Also, overall bird densities were likely higher, enhancing the opportunity for available prey.

Pileated woodpecker (*Dryocopus pileatus*) Status: State Sensitive-Vulnerable, Bureau Sensitive

Current Condition

This species is known to breed and forage in the watershed. The population density is not known, nor is there information on their reproductive success. The loss of mature and old-growth forest structural components for both foraging and nesting and wintering habitat is the major threat to this species. Approximately 50 percent of this habitat has been impacted from regeneration timber harvest and an unknown amount from salvage harvest.

Reference Condition

There was little or no timber harvest activities occurring in reference times. Mature and old-growth forest structural components were available over the landscape for both foraging, nesting and wintering habitat. Current population densities in the Sharps Creek watershed analysis area are probably 30 percent lower than historic densities because of the concentration of unsuitable

habitat on the northern end of the watershed and the overall reduction of snag habitat from fire suppression and harvest activities. Historically the landscape provided more nesting and foraging habitat and probably resulted in greater reproductive success.

Western Blue bird (*Sialia mexicana*) Status: State Sensitive-Vulnerable

Current Condition

Western blue bird is a neotropical migrant species that breeds and forages in the Sharps Creek watershed analysis area. The decline in available tree cavities combined with the use of pesticides threatened this species throughout its range. The reduction of pesticide use in North America and an aggressive bird box program seems to have stabilized the population decline over much of its range, but there still are concerns about this species in Oregon. Approximately 50 percent of the Sharps Creek watershed has been harvested with a corresponding reduction in proportional cavity habitat.

Reference Condition

Western Blue bird populations were likely stable, with abundant natural cavities throughout their range in Pacific Northwest forests. Pesticides were not a factor, but loss of habitat was occurring on private lands and throughout the Midwest and Eastern United States as lands were cleared of trees for agricultural uses.

Purple Martin (*Progne subis)* Status: Bureau Sensitive

Current Condition

The Purple Martin commonly nests in cavities in snags located in clear cuts or other openings. They may nest communally. Regeneration harvests in which snags are left provide habitat for this species. They have been found in other parts of BLM's South Valley Resource Area and could occur in Sharps Creek watershed.

Reference Condition

Fires within the forest which left open areas with remnant trees and snags would have provided habitat for this species. More habitat would have been available than during the years of clear cutting, snag removal, fire suppression and salvage.

Northern Pygmy-owl (*Glaucidium gnoma*) Status: State Sensitive-Vulnerable

Current Condition

This species is known to breed and forage in the Sharps Creek watershed analysis area. The population density is not known, nor is there information on their reproductive success. The Northern Pygmy-owl depends upon woodpeckers to create nesting cavities. The loss of large decaying trees, conversion of mixed age forest stands to plantations, and salvage activities, is detrimental to the species. Approximately 50 percent of this habitat has been impacted from timber harvest and road building activities.

Reference Condition

There is no information on Northern Pygmy-owl population densities, it is presumed that population densities were optimal. Opportunities for nesting cavities probably existed throughout the watershed.

Bat Species Status: Variable

Current Condition

The bat species listed below are known to forage in the watershed. Population densities are not known, nor is there information on their reproductive success. Roost sites are a critical resource for bats and their availability may play a major role in determining population size (Kunz, 1982).

Roosts are important to maximize their energy resources. In general, old-growth forest provides higher quality roost and maternity sites, with large, thick bark trees and large snags with cracks, peeling bark, and hollow cavities. The dependence upon undisturbed caves, mines and large cavities as hibernaculum and nursery are critical. Bats can not tolerate people at these sites. Disturbances and reduction of adequate roost sites (stress) can lead to reduced body fitness and/or death, resulting in a lack of reproductive success. The loss of structural forest diversity, especially within the riparian habitat have resulted in fewer species at lower numbers. There has been a reduction in structural diversity on approximately 60 percent of the riparian and 50 percent of the upland habitat from timber harvest and road building activities.

Bat Species	**Status**
Townsend's big-eared bat (*Plecotus*	State Sensitive, Bureau Sensitive
Long-eared myotis (*Myotis evotis*)	State Sensitive
Fringed myotis (*Myotis thysanodes*)	State Sensitive, Bureau Sensitive
Long-legged myotis (*Myotis volans*)	State Sensitive
Yuma myotis (*Myotis yumanensis*)	State Sensitive
Silver-hair Bat (*Lasionycteris noctivagans*)	State Sensitive

Reference Condition

Little information exists on past or present life history and/or requirements for these bat species. However, it is known that most bats require high density of snags (Perkins, 1996), reproduce in low number, have few natural predators, are long lived and are dependent upon undisturbed caves, mines and large cavities as hibernaculum and nursery. Snags and down wood were abundant throughout the watershed and human disturbance was an insignificant factor in determining the success of these species under reference conditions. Consequently, population densities of these bat species were almost certainly at optimal levels.

Marten (*Martes americana*) Status: State Sensitive-Critical

Current Condition

Marten are known to forage in the watershed. The population density is not known, nor is there information on their reproductive success. The Marten is an indicator species for old-growth on National Forests in the western Cascades of Oregon. The species is rare in the northern Cascades and badly depleted in the Coast Range, where viable numbers may no longer occur (ODFW

Sensitive Vertebrates 1992). Martens inhabit mature and old-growth forests that contain large quantities of standing and downed coarse woody material, often near streams. Martens select against brush and other open areas, and are sensitive to human disturbance. Forest fragmentation, the loss of large woody debris and increased road access have had detrimental effects on this species. The roadless area on USFS managed lands provides the best current habitat for this species. There is less likelihood that martens are utilizing the BLM portion of the watershed. If they are, their use would likely occur in the LSR.

Reference Condition

Anecdotal information from trappers indicate that marten population densities were much higher under reference conditions. The species was known throughout the Northwestern Cascades and Coast Range. Mature and old-growth forest that contain large quantities of standing and downed coarse woody material occupied the watershed. Once early-seral forest habitat recovered with a closed canopy it became suitable because of the late-seral structural components. The northern portion of the watershed has been identified as the area of refugia for late-successional species which provided ideal habitat for this species.

Red tree vole (*Phenacomy longicaudus*) Status: State Sensitive, Endemic

Current Condition

The red tree vole is expected to be found in the Sharps Creek watershed analysis area It has been found in resident spotted owl pellets This species is dependent on the large structural components of old-growth Douglas-fir trees. The complexity of large trees provide cover, forage, winter and summer habitat. Red tree voles reproduce in low numbers and display a high degree of site fidelity. Previous management plans allowed for little connection between old-growth forests, resulting in population fragmentation and threatening the genetic diversity of this species. Connection appears to remain throughout the southern portion of the watershed with approximately 85 percent of the forest habitat having a mature closed canopy, while the northern portion only has 30 percent mature closed canopy.

Reference condition

A moderate fire regime would probably retain a well distributed population throughout the northern portion of the watershed. Larger, old-growth Douglas-fir trees were often retained after low intensity fires. These large Douglas-fir trees provided cover, forage, winter and summer habitat and allowed connection within the forest matrix. It is expected that the southern portion of the watershed burned at higher intensities, resulting in large areas of stand replacement, which would suggest lower population densities would result.

White-footed vole (*Phenacomys albipes*) Status: State Sensitive, Endemic, Bureau Sensitive

Current Condition

Presence of white-footed vole has not been confirmed, but was suspected in northern spotted owl pellets found in the watershed. The white-footed vole is associated with mature riparian stands with large amount of large woody debris. Fragmentation and the loss of down wood in riparian habitat is assumed to be detrimental to the species. It is estimated that 90 percent of its habitat has been impacted by roads or timber harvest and agriculture activities.

Reference Condition

Available habitat along flood plans of Sharps Creek provided abundant amounts of large woody debris. There were no impacts from roads or timber harvest activities that removed down woody debris. Populations were probably at optimal levels.

Oregon Slender salamander (*Batrachoseps wrighti*) Status: State Sensitive, Endemic, Bureau Sensitive

Current Condition

It is highly probable that the Oregon Slender salamander can be found in the Sharps Creek watershed analysis area, because of available habitat, but no occurrence has been documented. This species is associated with decaying downed woody material. They are not found in clearcuts (Storm, R.M., 1986) and the loss of down wood habitat and forest fragmentation is expected to be detrimental to the Oregon Slender salamander. It is estimated that about 6,520 acres (50 percent) of the watershed is not suitable habitat because of the utilization of large woody debris during clear-cut harvest activities. The recovery of down wood habitat may take more than 150 years.

Reference Condition

The Oregon Slender salamander was expected to be at 100 percent population potential and recovery of early-seral habitat to suitable forested habitat would take 20 to 30 years. Large wood that would have been retained on site and the recovery of the micro-climate after canopy closure would restore suitable habitat.

Clouded salamander (*Aneides ferreus*) Status: State Sensitive, Endemic

Current Condition

Clouded salamanders are known to forage in the watershed. The population density is not known, nor is there information on their reproductive success. This species is associated with decaying down woody material, standing snags, talus rocks, and forest litter. The loss of down wood, snags and forest fragmentation is expected to be detrimental to this species. This species is known to avoid riparian areas. It is estimated that about 6,520 acres (50 percent) of the watershed is not suitable habitat because of the removal of large woody debris during clear-cut harvest activities.

Reference Condition

The Clouded salamander is associated with decaying downed woody material, standing snags, talus rocks, and forest litter. The retention of late-seral successional components over the landscape provided suitable habitat throughout the watershed.

Sharp-tailed snake (*Contia tenuis*) Status: State Sensitive, Endemic

Current Condition

It is possible that the sharp-tailed snake can be found in the Sharps Creek watershed analysis area. Applegarth (1994) noted that Sharp-tailed snake habitat includes moist rotting logs in oak woodlands. They emerge from burrows only during warm damp periods in the spring and fall. Loss of oak woodlands on low elevation private land is expected to have an impact on this species in the future. Currently 80 percent of its habitat has been impacted by harvest activities.

Reference Condition

Sharp-tailed snakes were found at lower elevations within the watershed in moist rotting logs or moist talus in oak woodlands. Large snags and down wood were retained throughout the watershed, providing habitat and connectivity between succession stages of forest habitat.

Great gray owl (*Strix nebulosa*) Status: State Sensitive - Vulnerable

Current Condition

Great gray owl have been documented in adjacent watersheds, and have been seen foraging in habitat created from past harvest clear-cut units. There are natural meadows that occur within the watershed which also provide forage habitat. Mature forest with large broken snags for nesting platforms are necessary for Great gray owls. The effect of fire suppression has been offset to some extent by clear-cut harvest activities, providing for foraging habitat in the short term. However, the loss of large structural components in clear-cut units will have a impact in the future because of a corresponding reduction in nesting habitat.

Reference Condition

Great gray owls require mature forest with large broken snags for nesting platforms. They hunt in open, deep soil meadows for their prey. This habitat was limited to the meadow complex along the top of the Calapooya Divide and lower elevation prairies. Wildfire created early succession habitat within the forest matrix with large numbers of snags, down wood and residual trees. Wildfire may have extended their foraging habitat until brush and tree species began to recover.

Species Historically on the District

The following large carnivores no longer inhabit the watershed because of forest fragmentation and human disturbance:

Gray wolf (*Canis lupus*)	Status: Endangered
Grizzly bear (*Ursus arctos*)	Status: Threatened
California wolverine (*Gulo luteus*)	Status: State Sensitive
Pacific Fisher (*Martes pennanti pacifica*)	Status: State Sensitive

Riparian Dependent Sensitive Species

The following section is an assessment of habitat conditions for a wide variety of riparian T&ES species, organized by comparing current and reference conditions.

It is assumed that the loss of late-successional structural components, loss of stream complexity and past management activities during the harvest of clear-cut units in and adjacent to riparian habitat will have an impact on the following species for many decades.

Willow Flycatcher (*Empidonax trailii*) Status: State Sensitive

Current Condition

The Willow Flycatcher is known to exist within the watershed. There is no information on population density or reproductive success. Past harvest of riparian habitat and roads adjacent to streams have resulted in the lost of about 15 percent of the available suitable habitat.

Reference Condition

Habitat loss occurred throughout the riparian system, however recovery occurred through succession processes. Under current conditions, constructed roads obviate such processes.

Harlequin duck (*Histrionicus histrionicus*) Status: State Sensitive

Current Condition

The Harlequin duck has been documented in the Sharps Creek watershed analysis area, with an estimated 60 miles of available stream habitat. However, there are 48 miles of road, several camp sites and associated mineral activities associated with the 60 miles of stream habitat. The human disturbance associated with these improvements probably precludes the use by Harlequin ducks.

Reference Condition

The available stream habitat was much the same as today except for the presence of human disturbance and roads.

Ringtail (*Bassariscus astutus*) Status: State Sensitive - undetermined

Current Condition

Ringtail forages in the Sharps Creek watershed analysis area. The population density is not known, nor is there information on their reproductive success. They are associated with rocky riparian habitat. Management activities such as road construction that resulted in the loss of 463 acres of riparian habitat would have the greatest impact on this species. This would be about 2 percent of the total available riparian reserve habitat.

Reference Condition

The lower reaches of the Sharps watershed provided rock crevices and talus slopes along their stream channels. This natural state allowed additional opportunities for dens and prey within the riparian system.

Tailed frog (*Ascaphus truei*) Status: State Sensitive, Endemic, Bureau Sensitive

Current Condition

Tailed frogs are known to forage in the watershed. Drainages in the watershed support remnant population of surviving adults. Tailed frogs are found in cold fast-flowing permanent streams in forested areas. They have the lowest known temperature requirements, and one of the narrowest temperature tolerances (11 to 14 degrees Celsius)of any of the world's frogs (Brown, H.A. 1975). This species is also unusual because it requires the longest development period known for any frogs, taking 12 years to reach reproductive maturity (Welsh, H.H. Jr. 1990). They display a high degree of site fidelity. These characteristics make recovery after habitat alteration much slower than occurs with other species. Increases in water temperature and loss of riparian habitat have devastating effects on this species. There is approximately 268 miles of stream habitat in the Sharps Creek watershed analysis area that could be available as suitable habitat for tailed frogs. However 38 percent of that available habitat is no longer suitable because of the changes that have occurred in the riparian habitat after timber harvest and road construction. Approximately 22 percent of the stream habitat will never be suitable because of road location.

Reference Condition

Tailed frog populations were probably well distributed throughout the watershed. Riparian habitats most likely remained relatively cool after fire disturbance because residual trees, snags and down wood were retained on site. Sediment delivery to class III and IV channels were not influenced by timber harvest activities that yarded logs through or built roads in or along stream channels, which appear to have had the greates impact to tailed frog habitat.

Foothill yellow-legged frog (*Rana boylii*) Status: State Sensitive, Endemic, Bureau Sensitive

Current Condition

The Foothill yellow-legged frog has been documented in the Row River below the confluence of Sharps Creek, and is suspected to occur because of available habitat on the lower reaches of Sharps Creek. Approximately 11 miles of habitat exist down stream from Clarks Creek. Most of the historic habitat would be found in the Row River system. Water quality and the loss of stream side riparian vegetation from residential, agriculture, timber harvest, and mining activities has had the greatest impact on this species. The lower reaches of the Sharps Creek has been heavily impacted by all of these activities.

Reference Condition

Stream habitat on the lower reaches of Sharps Creek has changed. Removal of large down wood has reduced the available pools and depth ratios. Flows were probably higher, from water being retained longer in refuge of check dams created by down wood throughout the system. Sharps Creek would periodically change it’s channel within it's flood plain, creating additional habitat.

Cascade frog (*Rana cascadae*) Status: State Sensitive, Endemic, Bureau Sensitive

Current Condition

Cascade frogs are suspected to forage and breed within the watershed. The population density is not known, nor is there information on their reproductive success. This species is located in ponds, wet meadows and stream habitat above 2,500 feet elevation, along a narrow strip in the Cascade Range. It is unlikely they occur on lands managed by the BLM in Sharps Creek watershed (Applegarth 1994). Management activities that change the hydrology or surrounding vegetation cover can be detrimental to this species. There are four known breeding sites within the boundaries of the Cottage Grove Ranger District These sites occur from Holland point south along the Calapooya divide to Noonday Ridge. There are no known sites west of Noonday Ridge, north of Holland Meadows or elsewhere on the Cottage Grove Ranger District. However, there are other opportunities for breeding habitat within the watershed and Ranger District. It is hard to determine if the reduction in beaver population or the removal of down wood in the steam system have reduced the opportunity for connection to other available breeding habitat. No known surveys have been conducted for this species in the watershed.

Reference Condition

It is probable that wet meadows in the Sharps Creek watershed analysis area were used historically as breeding sites. Ponds are often developed from earth flows or slumps. Then succession processes begin to reduce the surface area and turn the ponds into wet meadows.

There was probably additional habitat that occurred within the stream habitat from ponds that occurred behind down wood and beaver activity. However, these opportunities were few because of the steep slope, narrow riparian zones, heavy canopy closure and increased flows that occur in winter months.

Red legged frog (*Rana aurora*) Status: State Sensitive, Endemic, Bureau Sensitive

Current Condition

Red legged frogs have been documented in Brice Creek watershed and are suspected in the Sharps Creek watershed analysis area because of available habitat along the lower reaches of Sharps Creek. The population density is not known, nor is there information on their reproductive success. This species is located in ponds, wet meadows and stream habitat below 2,700 feet elevation west of the Cascade Range. Management activities that change the hydrology or surrounding vegetation cover can have negative effects on this species. Stream channeling and agricultural activities have had the greatest impact on this species within the watershed. Red-legged frogs appear to be absent from Jackson and Josephine counties, but a few sites remain in Douglas County and the Willamette Valley, where this species was once extremely abundant.

Reference Condition

This species was abundant throughout its range and was probably found along the lower reaches of Sharps Creek. Breeding habitat would have been found in flood plains, debris slides, beaver ponds or wherever back water or slow moving flows would occur. Red-legged frogs forage in the terrestrial environment. Riparian vegetation and down wood are important as refuge, to protect individuals from dehydration.

Southern Torrent Salamander (*Rhyacotriton variegatus*) Status: State Sensitive, Endemic, Bureau Sensitive

Current Condition

Southern Torrent salamanders are known to forage in the watershed. The population density is not known, nor is there information on their reproductive success. Cascade salamanders are sensitive to changes in water temperature (prefer 8 to 10 degrees Centigrade) and environmental moisture (they quickly die in a dry environment). This species is associated with small, gravely mountain streams and springs, and mature and old-growth forest below 4,000 ft elevation. Harvest management activities that cause on-site temperature increases, sedimentation and forest fragmentation, may lead to local extinction, which threatens the population due to restricted gene flow. It is estimated that 40 percent of potential stream habitat in the watershed has been impacted by previous harvest activities. Most of this impact has occurred in the northern portion of the watershed.

Reference Condition

Riparian habitats were cooler after fire disturbance because of the retention of residual trees, snags and down wood on the site. Sediment delivery to class III and IV channels were not influenced by timber harvest activities such as yarding logs or building roads through, or along stream channels. Retained residual trees, and woody debris reduced the effect of erosion and sediment delivery to stream channels. Fragmentation occurred, but suitable habitat conditions often recovered sooner, and were not displaced by roads.

Western pond turtle (*Clemmys marmorata*) Status: State Sensitive, Endemic, Bureau Sensitive

Current Condition

The Western pond turtle has been documented in the watershed. Most of the available habitat is in the lower reaches of Sharps Creek. This species inhabits streams and ponds in the spring and summer months and uses adjoining forest habitat to over winter. Loss of nesting habitat and pool habitat from residential and agriculture activities and human disturbance has been detrimental to this species. Also, the loss of large carnivores who keep many of the nest predators in check, contributes to low reproductive success, which threatens the existence of this species.

Reference Condition

The first eleven miles of the lower end of Sharps creek provided habitat for pond turtles. In-stream habitat conditions were better, with more pools and flood plans habitat available. There was little disturbance associated with human activities. Old growth forest lined the creek which provided wintering habitat.

Sensitive Invertebrates that may Occur in Sharps Creek Subwatershed

The following species are described in Appendix E.

Invertebrate Species	Survey & Manage	Status
Oregon Giant earthworm (*Driloleirus macelfreshi)*	X	Bureau sensitive
Evening fieldslug (*Deroceras hesperium*	X	Bureau sensitive
Papillose tail-dropper (slug) (*Prophysaaon dubium)*	X	Bureau sensitive
Blue-gray tail-dropper (slug) (*Prophysaon coeruleum)*	X	Bureau sensitive
Beer's false water penny beetle (*Aceneus beeri)*		Bureau sensitive
Tombstone Prairie Oligophlebodes Caddisfly (*Oligophlebodes mostbento*)		Bureau sensitive
Siskiyou Caddisfly (*Tinodes siskiyou)*		Bureau sensitive
Vertrees' Ochrotrichian Micro-caddisfly (*Ochrotrichia vertreesi*)		Bureau sensitive
Fort Dick Linmephilus Caddisfly (*Farula reapiri)*		Bureau sensitive
Tombstone Priarie Farulan Caddisfly (*Farula reapiri*)		Bureau sensitive
Cascade Apatanian Caddisfly (*Apatania tavala)*		Bureau sensitive
Vertrees' Ceraclean Caddisfly (*Ceraclea vertreesi)*		Bureau sensitive
Siskiyou Chloealtis Grasshoppen (*Chloealtis aspasma)*		Bureau sensitive
Californai scutellaid (bug) (*Vanduzeeina borealis californica)*		Bureau Assessment Spp.
Jumping Slugs (*Hemphillia malonei and Hemphillia glandulosa)*		
Oregon megomphix (*Megomphix hemphillii)*		Bureau Assessment Spp.
Potentilla root-borer beetle (*Chrysobothris potentillae*)		Tracking species

Connectivity of Late-Seral Habitat

Current Condition

Connectivity is a measure of the extent to which the landscape pattern of the late-successional and old-growth ecosystem provides for the biological and ecological flows that sustain late-successional and old-growth associated animal and plant species across the landscape (FSEIS, 1994). The "Viability Assessment and Management Consideration for Species Associated with Late-Successional and Old-Growth of the Pacific Northwest" (USDA Forest Service, March 1993) identified 150 vertebrate species that are represented within the Sharps Creek watershed. Of these 150 species, there are 20 endemic species and 33 are State or Federally listed.

- Amphibian species 10 are endemic
- Reptile species (9) 2 are endemic
- Bird species 3 are endemic
- Mammal species 5 are endemic

Connectivity of late-seral habitat appears to be good within the southern portion of Sharps Creek watershed. There are five patches of late-seral habitat remaining, dispersed throughout the southern half of the watershed for a total of 10,644 acres. However, the northern portion of the watershed has only 2,910 acres of interior habitat remaining. Patch sizes are:

South Sharps Creek	North Sharps Creek
• 676 acres	• 309 acres
• 128 acres	• 42 acres
• 162 acres	• 2,449 acres
• 9,180 acres	

This northern portion of the watershed is predominately private ownership and little late-seral forest or late-successional components remain, except in the Lick and Pony creek drainages. Unfortunately the northwestern portion of the watershed is the area of historic refugium (See Figure 34). This situation clearly creates a concern for the viability of populations of late-seral species within the watershed.

Clear cut units generally increase the contrast between adjacent habitat types, producing sharp boundaries (edge) and a more linear environment, and leave little, if any, remaining old growth structural characteristics. Timber harvest activities have substantially reduced the amount, quality, and the connectivity of remaining late-successional habitat. The current condition of the watershed in single storied stands is approximately 21,000 acres, or 50 percent of the watershed. The accumulative loss of late-successional components in clear-cut units will prolong the recovery to a functional forested habitat for both early- and late-seral species for several decades. Protecting the remaining forests, which are rich in biodiversity would sustain long-term site productivity. Managing for late-successional habitat in Lick, Pony and Revier drainages may assist in maintaining a legacy of that richness in biodiversity in the northern portion of the watershed.

Listed below are other species which reside in the watershed and are endemic to Northwest forests that require connective habitat. Though not listed as Sensitive, population trends of these species within the watershed are a matter of some concern.

Riparian-dependent Species

- Pacific giant salamander (*Dicamptodon tenebrosus*)
- Dunn's salamander (*Plethodon dunni*)
- Western red-backed salamander (*Plethodon vehiculum*)
- Northwestern salamander (*Ambystoma gracile*)

Upland-associated Species

- Ensatina (*Ensatina eschscholtizii*)
- Dusky-footed wood rat (*Neotoma fuscip*es)
- Bushy-tailed wood rat (*Neotoma cinerea*)
- Townsend's chipmunk (*Eutamias townsendii*)
- Forest deer mouse (*Peromyscus oreas*)
- Western red-backed vole (*Clethrionomys occidentalis*)

Neotropical Birds

Neotropical migrant birds are a group of species which migrate to warmer climates for the winter and typically have high nest site tenacity. Nest predation and parasitism due to fragmentation and edge in particular, is thought to be largely responsible for the decline of many species (Wilcox, 1985). This group includes; Sharp-shinned hawk, northern goshawk, dark-eyed junco, solitary vireo, Vaux's swift, Rufous hummingbird, and many more.

Figure 34. Interior Habitat

Late Seral Habitat

Reference Condition

Historically under reference conditions documented in our 1936 map, the forest matrix was an aggregate of 55 percent mature and late-seral forest and 45 percent early and mid-seral forest habitat (with late seral components). A large (23,400 acres) block of interior habitat was located in the northern and western portion of the watershed. The northwestern portion of the watershed had fires that were primarily low and moderate severity. Under this regime, the forested stands became older and more complex, retaining late successional habitat and providing stability for those associated species within the watershed. Well connected patches of interior, late-successional habitat were distributed across the landscape.

Generally the southern to the southeast portion of the watershed burned at higher intensities as slope and elevation increased. These areas experienced high to moderately intense wildfires on a average of 100 to 150 years, resulting in larger areas of stand replacement. Connectivity was usually retained within and around the periphery of fire area. Adjacent to the fire area were reservoirs of quality habitat and a source of late-successional species for colonization. Fire areas usually recovered quickly because of the remaining legacies of late-seral characteristics, that included large snags and down wood habitat.

Snags and Large Down Wood Habitat

Current Condition

Past management and logging operations resulted in the loss of many of these critical structural components over the landscape within the Sharps Creek watershed. Between 1930 and 1965, approximately 9 percent of the watershed was harvested. At that time, larger amounts of down wood were left in the forest during logging operations because market conditions would only support the extraction of higher quality, clear-grain Douglas-fir and western red cedar. Large quantities of lower grade Douglas-fir pieces and other tree species were left in the woods. All snags were felled to reduce the risk of fire ignition from lighting strikes.

Between 1960 and 1970, an increased demand for wood fiber and more efficient processing procedures led to greater utilization of all available timber volume. The snag falling policy was expanded to mitigate pre-suppression and safety concerns. Snags were now being felled inside the cutting unit boundaries and several hundred feet outside the unit boundaries, into the interior of adjacent natural stands.

Between 1970 and 1990, emphasis on wood fiber utilization continued to increase. Additionally, policies requiring YUM (yard unutilized material, greater than 8" in diameter & 10' in length) and the removal of added wood residue from streams channels were implemented. It is estimated that another 39 percent of the watershed was harvested in this time period, further reducing the amount of available woody debris on the landscape.

Since the early part of the century, wildfire suppression activities and suppression management policies further reduced the availability of current and future snag and down wood habitat. In the last 68 years, 30 lightning fires were recorded on the Cottage Grove Ranger District; no fire

exceeded 9 acres, due to fire suppression and fuel conditions. There were an additional 11 human caused fires, only two of which exceeded 9 acres and these ranged from 10 to 99 acres in size before suppression. Given the mean acreage of all the fire size classes (Fire and Fuel Management Analysis, Appendix C), there was an estimated 131 acres that burned on the 18,600 acres of Forest Service administered land within the Watershed in the last 68 years.

Reference Condition

Snags and down wood habitat is generated by processes that kill trees: wind, pathogens, insects, plant competition and the major agent, fire. Before the adoption of a strict fire suppression policy, fire was the dominant disturbance process that affected succession of forest habitat. Most of the watershed is in a moderate severity fire regime, This regime is characterized by the mean fire return interval at 7-25 years (Fire and Fuel Management Analysis Report). This results in a significant portion of the watershed experiencing fire activities of various intensities. The overall effect is a landscape with a high recruitment (7 to 25 years) of fire kill trees (snags), at different densities, creating a patch work of snag and down wood habitat throughout the watershed.

Analyzing fire data from the Brice Creek watershed (Brice Creek Watershed Analysis, 1997), which has a similar fire history to Sharps Creek watershed, as well as information from *Fire History and Pattern in a Cascade Range Landscape* (PNW-GTR-254, 5/90),an estimate can be made that on average, there would be 17 Class I or II snags per acre created from fire on a 65 year interval in the Sharps Creek WA.

Late-Successional Reserve Habitat

Current Condition

Late Successional Reserve 222 covers a large area of 508,000 acres, with Sharps Creek watershed containing a rather small portion of the LSR: 5,223 acres or 1 percent of the total area. Forty-three percent of LSR 222 is in late-seral forest and 33 percent is in mid-seral forest. Sixty-one percent of the portion within Sharps Creek is in late-seral forest (3,169 acres of mature and older) and 19 percent mid-seral (970 acres of thinning age). According to the South Cascades LSR Assessment (February, 1998), the functional range is between 45-75 percent late-seral conditions. The portion within Sharps Creek watershed on BLM administered land appears to be within this range but is intermingled with private land, resulting in a fragmented landscape and a loss of late-successional structural components. This fragmented spatial arrangement will have an impact on species for many decades. Late-successional species are found here; this portion of the LSR contains five spotted owl sites and red tree voles.

Reference Condition

Historically, the LSR contained similar proportions of vegetation classes as the current condition. However, under reference conditions, the classes were represented in large blocks that feathered into the adjacent forest vegetation. Areas of early-seral forest were created by wildfire that retained remnant late-successional components, as opposed to clear cut units which increases the contrast between adjacent habitat types, producing sharp boundaries (edge) and a more linear environment, and leaves little, if any, remaining old growth structural characteristics. Late successional habitat recovered many decades earlier because of the quality of the remaining residual late-seral component and the connectivity of late-successional habitat.

Key Raptor Area #138

Current Condition

Key raptor areas were identified Bureau-wide (BLM) in an attempt to identify important regional raptor reproduction and habitat areas; each area was chosen for specific species. Key Area designation does not imply any legal or management status to areas. Rather, the intent was to illustrate the extent and diversity of BLM habitats and to provide some indication of where future planning and management efforts should be focused (Raptor Research Reports 8:1-80, 1989). Key area #138 has a total of 55,000 acres of which BLM manages 28,000; 14,900 acres of the total are located in the Sharps Creek watershed.

The target raptor species inhabiting the key area are northern spotted owls, golden eagles, goshawks, northern pygmy owls, red-tailed hawks, great horned owls, saw-whet owls, Coopers hawks, screech owls, and kestrels. The population density is not known, nor is there information on their reproductive success. Loss of breeding habitat and wintering habitat due primarily to timber harvest practices, has had a direct and indirect effect on all of these species. Reduced snag densities within the watershed has an indirect effect on the Coopers hawks, kestrels and goshawk, since snags are a critical habitat component for many bird species on which they prey. Many of the falcons and accipiters forage mostly on other bird species, particularly neotropical migrants. Neotropical migrants continue to have high pesticides residuals which contributes to reduced nesting success and reproductive failure. This is another major problem that contributes to the concern for viability for these species.

The loss of snag habitat has a direct effect on all the owl species because of the shortage of nesting sites and cover during winter months. Old-growth trees and large snags provide roosting and nesting platforms for the owl's heavy nests. It is estimated that at least 65 percent of snag habitat and old-growth habitat has been heavily impacted within the watershed.

Reference Condition

Mature and old-growth forest structural components remained over the landscape for both foraging, nesting and wintering habitat. Population densities in the Sharps Creek watershed analysis area were probably 40 percent greater than current densities. Currently, the large concentration of unsuitable habitat on the northern end of the watershed provides little resources for many of these species. This lack of late successional habitat, combined with the general reduction of snag habitat from fire suppression and harvest activities contributes to a lower population density. Pesticides were not being used and bird populations would have been expected to be near 100 percent viability, providing an increase in availability of forage which probably resulted in greater reproductive success.

Figure 35. Key Raptor Areas

Elk Emphasis Area

Current Condition

Sharps Creek contains part of an elk emphasis area within the Indigo/West Fork Rock Management Unit; 17,650 acres within Sharps Creek. In the early 1990s, BLM and ODFW delineated several elk emphasis areas on the District to address low cow/calf ratios and low bull/cow ratios and to address the high public interest in producing a harvestable surplus of elk. Elk are an important game species for ODFW and generate $19.8 million per year to Oregon's economy (Elk Management Plan, ODFW, 1992). The EIS for the BLM's Eugene District's Resource Management Plan (RMP) contains an analysis of the elk emphasis areas using an adaptation of the Wisdom model (which measures elk habitat effectiveness). This elk emphasis area has marginal habitat conditions for road density and forage. The road density was 5.04 road miles per square mile; well above ODFW's benchmark of 1.5 road miles per square mile. The area has viable population parameters for cover. Current habitat ratios are: forage at 16 percent, hiding cover at 45 percent and thermal cover 39 percent. The elk population within the unit has been steadily increasing and is now considered to meet management objectives for population size and bull/cow ratios. ODFW plans to hold the population at the present level by increasing the amount of hunting allowed, including increasing antler-less hunts.

Reference Condition

Historically, elk roamed the valley floors and foothills of western Oregon. As summer weather dried the grass and forbs, elk would migrate into the forest following the green forage, and increasing in elevation throughout the summer months. Frequent low intensity fires, ignited by Native Americans or lightning, maintained quality forage. The forested stands appeared open with forbs, grasses and brush dominating much of the understory. Fire enhanced browse by pruning and providing nutrients, as well as reducing competition by destroying or thinning small shade tolerant species. Native Americans hunted elk to provide food and other resources, but not with sophisticated modern weaponry.

Figure 36. Elk Emphasis Areas

Unique Habitats

Current Conditions

Special or unique habitats are forested or non-forested features, conditions, plant and animal communities which contribute significantly to species diversity and to a variety of habitat values in the landscape. Generally, matrix vegetation consists of *Pseudotsuga menziesii* (Douglas-fir), *Tsuga heterophylla* (western hemlock) forests, within which are special habitats, including, but not limited to wet or dry meadows, unique or rare plant communities, rock outcrops, caves, talus slopes, shrub lands, ponds, wetlands and riparian areas. These areas are sensitive in response to changes in environmental factors such as wind, humidity, light, temperature, soil structure and human disturbance.

Special habitats within the Umpqua National Forest, BLM Eugene District and private lands represent significantly fewer areas but probably contain greater vascular plant species richness than adjacent forested lands. Because of their limited land base within the general forested environment, sites where habitat conditions preclude the development of conifer cover are of great importance to floristic diversity (Chambers 1988). Limited botanical inventories have been conducted to quantify the floristic diversity of these areas. Special habitat relationships are tied to physiographic and geologic provinces rather than hydrologic provincial boundaries. The value of these unique habitats in Sharps Creek watershed on a provincial scale is in genetic, plant and animal diversity, and to conserve rare or declining plant populations.

The most common habitats in Sharps Creek watershed are listed below. Following this list are some identified unique areas found in the Sharps Creek watershed analysis areas that illustrate the variety and diversity of habitats.

- ***Moist shrub land***
- ***Dry shrub land***
- ***Moist meadows***
- ***Dry meadows***
- ***Rock outcrops***
- ***Wet forb lands***
- ***Rocky lands with minimum vegetation potential***
- ***Land form failure, i.e: slumps***
- ***Talus land with minimum vegetation potential***
- ***Alder dominant woodland***
- ***Lakes, ponds, non-moving water***
- ***Beargrass, true fir community***

- ***Oak patch and meadow complex***

Calapooya Divide is an area where some of the northern most patches of *Pinus attenuata* (Knobcone Pine) occur. This is a short-lived species dependent on fire for regeneration.

Lower Sharps Creek has an occurrence of *Quercus chrysolepis* (canyon live oak) at the northern limits of its range. It is in T22S, R1W, Section 21.

White Creek area contains 70-80 percent pure stand of *Festuca idahoensis* (Idaho fescue), 5-10 percent *Bromus tectorum* (cheatgrass), and introduced European species *Aira elegans* (Elegant hairgrass). Overall, the area is in good native condition. Oak patches are present in this area.

Adams Mountain area is nearly all native with a few introduced species, including 95 percent pure *Festuca idahoensis* (Idaho fescue). This area could potentially be a seed collection site for erosion and restoration purposes; includes bluffs, talus slopes and dry openings.

Shane's Saddle includes a moist meadow, talus slopes and some wet shrublands. It contains 80 percent pure stand of *Festuca idahoensis* (Idaho fescue), with some amount of introduced grass species. The native plant community present in the area is abundant in variety and overall in good condition.

Other unique areas of interest for native condition and seed collection purposes include the Fairview Creek trail, Days Creek, Twin Rocks and Puddin Rock. Several areas need to be revisited during field season to survey for *Romanzoffia thompsonii* presence as well as be monitored for introduced species encroachment.

Of the 42,523 acres in Sharps Creek watershed, 17,752 acres are managed by the Forest Service, 9,208 acres are managed by the BLM, the remaining acres are privately owned. On Forest Service administered land, 1,677 acres (9 percent of the total land base) comprises what is known as unique habitats, contributing a very significant proportion of the biological diversity (approximately 90 percent). There are 140 unique habitats sites throughout the Forest Service lands in Sharps Creek, with 52 sites, totaling 889 acres, that are within 300 feet of a road or harvest area (approximately 5 percent) on Forest Service land.

Observations of these unique habitats suggest a high degree of native plant diversity, although on the Cottage Grove District few botanical inventories have been conducted to further our understanding of maintaining and enhancing these areas.

On the Cottage Grove District, survey findings of upland grasslands from a 1993 preliminary inventory and further inventories in the 1997 field season determined the quality and quantity of native grasses in these areas as well as the number of introduced species. Several areas were identified, first by aerial photo interpretation, then followed with field checks of sites with potential for native seed collection for future restoration projects.

Observations of unique habitats on aerial photos dating back to 1948 suggests encroachment of adjacent coniferous forests and a reduction of habitat acreage. Recurring fire once maintained dry open meadows and prevented coniferous encroachment.

Threatened, Endangered Or Sensitive Plant Species (TES)

Current Condition

The following information about TES species in the Sharps Creek watershed was gathered mainly from Forest Service lands. See Appendix E for a short list of sensitive species found BLM managed lands.

Of the 1,830 Threatened, Endangered and Sensitive species on National Forest administered lands, there are 14 TES plant species that are suspected to occur on the Cottage Grove Ranger District. Documentation exists for 12 populations of *Romanzoffia thompsonii*, a sensitive species, five of which occur in the Brice Creek watershed, four are found in Layng Creek watershed and two in Sharps Creek watershed. This species is an annual mist maiden, the only known annual *Romanzoffia*, found in seasonally and abundantly wet, shallow soiled rock outcrops associated with seeps. It blooms while spring water flows, typically April through June on the Cottage Grove District at 1,200 - 5,500 foot elevations. Its range includes Douglas, Jackson, Lane, Linn and Marion counties in Oregon. With minimal soil development, it is usually composed of gravel or scree with soil in small areas of the rocky crevices. *Romanzoffia thompsonii* survives on a moss mat, typically associated with *Bryum miniatum*, *Mimulus guttatus* (yellow monkey flower), *Montia siberica* (candy flower), *Mitella breweri* (Brewer's mitella), *Sedum nuttallii* (stonecrop), and *Delphinium menziesii* (Menzie's larkspur).

There are 246 fungi, 71 lichens, 23 bryophytes and 17 vascular plant Survey and Manage species identified with late-successional forest habitat according to the FSEIS/Record of Decision (ROD, Table C-3). These nonvascular plants and fungi have only recently been considered in botanical protocol. As compared to vascular plants, little information is available for nonvascular plants. At least six Survey and Manage species listed in the ROD are found in Sharps Creek watershed. There are six known populations of *Allotropa virgata* (candystick) in Brice Creek watershed, five in Sharps Creek watershed, and one in Layng Creek watershed. Nearly all sites were discovered while conducting proposed timber sale surveys. *Allotropa virgata* is a mycotrophic plant, producing no chlorophyll, and requires association with another plant for its existence. This species occurs primarily in the Hemlock-Douglas-fir series forests, and although not restricted to old growth conditions, the largest populations grow there.

The other Survey and Manage species known to occur in Brice Creek and Layng Creek watersheds, and suspected to occur in Sharps Creek watershed, include A*raispora, R. botrytis, Cantharellus cibarius, C. subalbidus, Sparassis crispa, Gomphus floccosus, G. clavatus, Polyozellus multiplex*, fungal species *Clavariadelphus ligula* and *C. truncatus*. Fungi are important in forest succession and ecosystem processes. Mycorrhizal fungi form a symbiotic association with live hosts such as conifers and hardwoods. Host species are dependent upon the fungi for nutrient and water uptake.

Other Survey and Manage fungal groups are saprophytic; forest decomposers living on organic materials from dead plant and animals, and parasitic; requiring living hosts for nutrients. Additionally, Survey and Manage bryophyte species *Antitrichia curtipendula* and *Buxbaumia viridis*, have been found in the other two watersheds and are suspected to occur in Sharps Creek watershed.

Lichens occur as either epiphytes growing on trees or growing on exposed rock and/or soil (Nash and Gries 1991). These species have important ecological roles (Slack and Seaward 1988) as

interceptors of wet and dry nitrogen fixers in ecosystems where they are abundant, in the weathering of rocks and the retention of soil in dry areas (Nash and Gries 1991). Lichens absorb all their nutrients from the air and therefore are very susceptible to air pollution, especially sulfur dioxide (Richardson 1988). They provide important forage material for several species of mammals (Sharnoff 1992), and many bird species use lichens as nesting material (Richardson and Young 1977). Table C-3 in the ROD lists eighty-one lichen species and potential habitat exists for forty-seven on the district as well as within the Sharps Creek watershed.

A forest with an abundant moss, lichen and liverwort flora maintains more water availability after rainfall, increasing the time that vascular plants can absorb the rain water (Dorris 1994). This humid environment decreases stress on the vegetation decreasing their susceptibility to disease, insects and fire (Dorris 1994). Vascular plants, lichens, bryophytes and fungi are valued as indicators of biodiversity, stability and forest health. These and other Species of Concern have not been the focus of any surveys and little is known about their existence in Sharps Creek watershed. Information about their biological importance is generally incomplete.

Sensitive plant populations known to the Cottage Grove District are mapped in the Geographic Information System (GIS) in the District office. To date, this and other sensitive species have been surveyed for in relation to proposed activities such as road building or timber harvest.

Noxious Weeds

Current Conditions

Noxious weeds are alien species that have been officially designated as such by federal or state law. The Oregon Department of Agriculture (ODA) defines these plants as "injurious to public health, agriculture, recreation, wildlife or any public or private property" (ODA 1994). The ODA determines which species will be legally considered 'noxious' in the state of Oregon, each of which carries an eradication plan which may be on the local, county or state level.

Cytisus scoparius (scotch broom, also known as Scot's broom), was introduced as an ornamental shrub and erosion control agent in the 1920's, (Miller, 1995) and can now be found abundantly in any disturbed site, mainly associated with clearcuts, landings and roadsides. It is a predominant competitor to young coniferous plantations and it is highly flammable, resulting in high risk for fueling uncontrolled fire. *Hypericum perforatum* (Klamath weed or St. Johnswort), which invades and is common in meadow habitats, was also found in a 1996 Sharps Creek watershed noxious weed inventory, along with *Cirsium arvense* (Canada thistle), a persistent perrenial, common to moist woods, roadsides and edges of wetlands, *Cirsium vulgare* (bull thistle) a biennial that invades disturbed areas, particularly clearcuts immediately after disturbance, and *Senecio jacobaea* (tansy ragwort), known to be toxic to wildlife and livestock. The foliage of *S..jacobaea* contains pyrolizidine alkaloids resulting in liver damage in cattle and horses in particular (Helliwell 1997).

Timber harvest and road building activities are known to be contributing factors in the establishment of noxious weeds, since road building and maintenance acts as a constant disturbance agent disallowing succession and maintaining early seral conditions conducive to invasive weedy species.

A 1991 inventory was conducted by ODA noxious weed coordinator Glenn Miller and the resulting information mapped and species identified confirming earlier reports of the same noxious weeds and invasive alien species' existence throughout the Cottage Grove Ranger District. A

1996 roadside inventory conducted cooperatively with the Eugene BLM in Sharps Creek watershed resulted in the same findings. The documented populations of noxious weeds known to occur in the watershed are classified by ODA as 'B' rated referring to being aggressive, non-native species too widely distributed on the Forest to be effectively treated by current available intensive control methods such as manual removal. These species are subject primarily to biological controls, although small isolated infestations may be subject to intensive control methods where feasible, such as manual removal or prescribed burn.

Senecio jacobaea has had past treatments on the Cottage Grove Ranger District with biological control agent *Longitarius jacobaea* (tansy flea beetle) in 1991 and in 1980 with both the tansy flea beetles and *Tyria jacobaea* (cinnabar moth larvae) with success. Biological control involves the use of insects which naturally feed on the plant or its seeds, eventually causing an equilibrium in population numbers.

Reference Condition

Old journals, historic inventories and botanical references have documented the loss of habitat for many plant species of concern that resulted from human disturbance or modification. Human management activities such as road surfacing, rock pit developments, debris disposal sites, management of forest as crops, the removal of coarse woody debris, and fire suppression, resulted in changes of soil pH, porosity, hydrology and substrate which render conditions that preclude the recovery to suitable habitat.

Historically, the main disturbance process was wildfire, which often was beneficial to many of these now sensitive species. Fires can reduce species competition, release seed banks, increase available nutrients, change substrate that benefits germination, promote seed production, reduce pathogens, and manage encroachment. The effects of wildfire were not lasting and plant successional process occurred naturally without human intervention. Mechanisms that transported exotics and non-native plant species were few. If establishment did occur, the remoteness between populations and natural successional processes curtailed the expansion of these invaders.

Aquatic Species and Habitat

Aquatic Species

Current Condition

Since 1949 Dorena Dam has blocked all passage to anadromous fish. Rainbow trout (*Oncorhynchus mykiss*), coastal cutthroat trout (*Oncorhynchus clarki clarki*), speckled dace (*Rhinichthys osculus*), and/or longnose dace (*Rhinichthys cataractae*), largescale sucker (*Catostomus macrocheilus*) and a few species of sculpin (*Cottus sp.*) have been the only fish species observed in Sharps Creek. Wildwood Falls blocks migration of resident fish to Brice and Layng Creeks. Sharps Creek enters the Row River downstream from the falls, making it possible for resident native and non-native fish from within the Row River and Dorena Reservoir to migrate up Sharps Creek. No fish sampling has occurred in Lower Sharps Creek to confirm the presence of non-native species. The Oregon Department of Fish and Wildlife has stocked Sharps Creek with rainbow trout. To better utilize these hatchery fish, this stocking effort was terminated in 1997. These fish are now stocked in the Coast Fork Willamette River in downtown Cottage Grove.

Reference Condition

Spring chinook were native to the Coast Fork Willamette Sub Basin. A small run entered the Row River and probably migrated up Sharps Creek. Construction of Dorena Dam blocked passage to this area.

Aquatic Habitat

Current Condition

The aquatic habitat for the Sharps Creek Watershed was analyzed by Drainage Groups. Table 16 displays many of the characteristics of each drainage and the average for each Drainage Group.

Inventories were conducted on streams adjacent to land administered by the Forest Service. Streams were not inventoried on land administered by the BLM or in private ownership. Data for these areas are limited to riparian seral condition and road densities from GIS (see Figure 37 and Table 16).

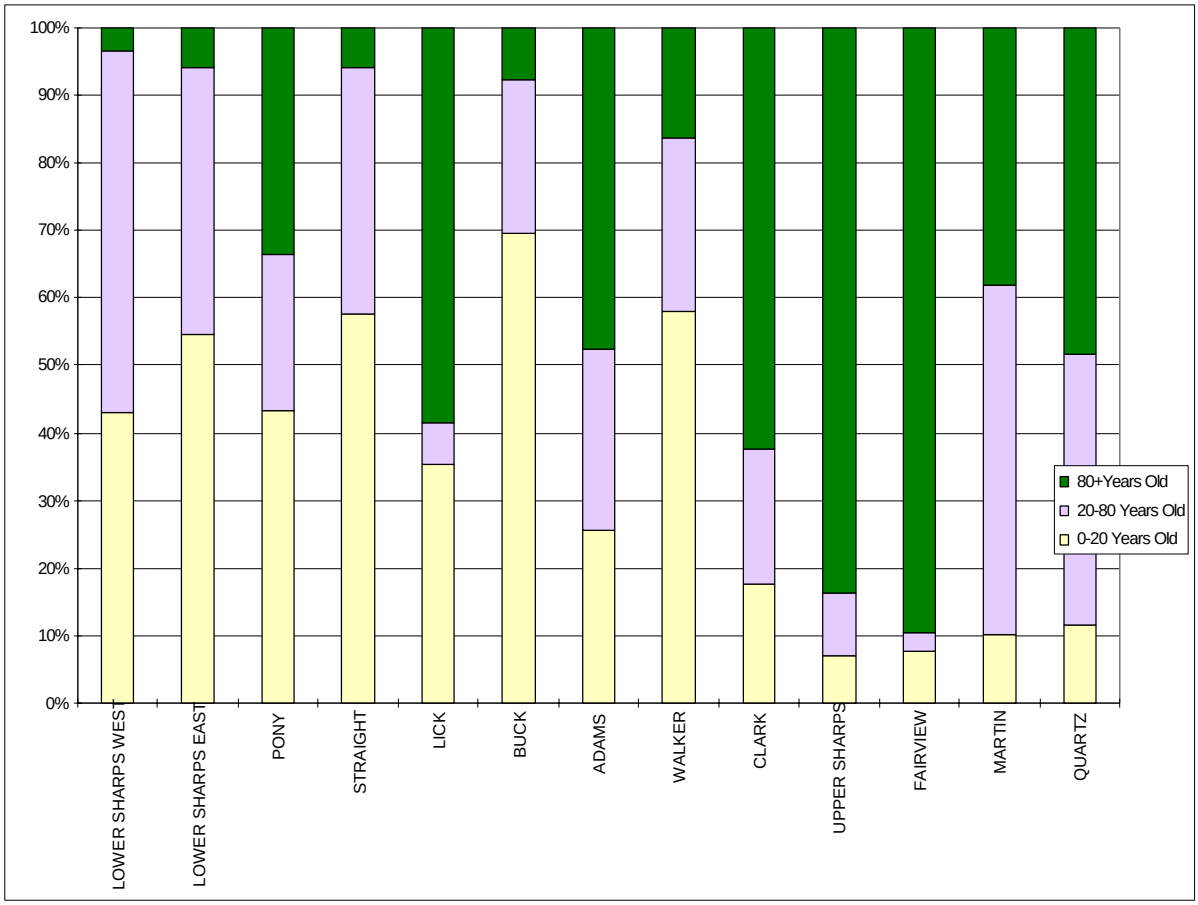


Figure 37. Riparian Seral Condition

Table 40. Drainage Characteristics

Drainage Name	#	Acres	Miles/ Sq Mile	Fish Streams Mi	Non-Fish Stream Mi	Class III	Class IV	Stream Density	Road Density	Road Density in RR	Riparian > 80 Yrs Old
BOULDER		2140.6	3.3	4.2	22.3			7.9	7.5	6.1	0.2 percent
DAMEWOOD		1337.0	2.1	3.5	9.9			6.4	7.4	7.0	0.9%
TABLE		1431.7	2.2	2.7	14.4			7.6	6.8	6.5	0.0%
GRASSHOPPER		1949.7	3.0	4.5	14.8			6.3	5.4	5.2	8.1%
Totals for LOWER SHARPS WEST		**6859.0**	**10.7**	**14.9**	**61.4**			**7.1**	**6.7**	**6.1**	**3.5%**
SHARPS		724.4	1.1	0.8	5.0			5.1	4.0	3.9	0.7%
REVIER		1144.3	1.8	2.4	9.0			6.4	5.8	4.1	9.1%
Totals for LOWER SHARPS EAST		**1868.7**	**2.9**	**3.2**	**14.0**			**5.9**	**5.1**	**4.1**	**6.0%**
PONY		**1575.7**	**2.5**	**2.2**	**9.8**			**4.9**	**5.2**	**5.9**	**33.5%**
STRAIGHT		**2041.3**	**3.2**	**3.0**	**18.8**			**6.8**	**6.7**	**5.1**	**5.8%**
LICK	**31.0**	**1572.6**	**2.5**	**3.0**	**11.6**			**5.9**	**3.7**	**3.6**	**58.5%**
BUCK		**2515.8**	**3.9**	**2.8**	**24.9**			**7.0**	**6.4**	**6.5**	**7.7%**
ADAMS	**03A**	**2422.9**	**3.8**	**4.2**	**21.6**			**6.8**	**3.2**	**3.1**	**47.5%**
WALKER	**03V**	**3402.2**	**5.3**	**5.5**	**34.6**			**7.5**	**4.6**	**3.8**	**16.4%**
CLARK	**03W**	**3340.5**	**5.2**	**5.8**	**27.4**			**6.4**	**2.5**	**2.9**	**62.5%**
WHITE	03B	789.8	1.2	0.6	8.0	1.4	6.6	7.0	2.2	1.4	80.6%
LOWER SHARPS	03G	914.2	1.4	2.2	7.5	0.8	6.7	6.8	1.7	2.8	96.9%
MID SHARPS	03J	895.7	1.4	1.3	7.8	2.0	5.8	6.5	1.7	1.6	84.4%
SAILOR'S GULCH	03I	431.2	0.7	0.2	4.2	1.4	2.8	6.5	1.8	0.3	78.3%
UPPER SHARPS	03L	819.1	1.3	0.0	6.6	1.7	4.9	5.2	1.0	0.6	82.5%
GLENWOOD	03K	1470.0	2.3	0.4	10.3	4.7	5.6	4.7	3.0	1.6	75.3%
Totals for UPPER SHARPS		**5320.0**	**8.3**	**4.7**	**44.4**	**12.0**	**32.4**	**5.9**	**2.0**	**1.6**	**83.7%**
LOWER FAIRVIEW	03F	339.8	0.5	1.2	2.2	0.0	2.2	6.4	0.2	0.3	100.0%
WALTON	03C	779.7	1.2	0.5	6.6	1.5	5.1	5.8	0.7	0.4	93.3%
CINGE	03D	1045.1	1.6	0.6	11.2	3.2	8.0	7.2	0.0	0	85.2%
UPPER FAIRVIEW	03E	1451.7	2.3	0.6	12.5	3.6	8.9	5.8	1.6	1.0	88.3%
Totals for FAIRVIEW		**3616.3**	**5.7**	**2.9**	**32.5**	**8.3**	**24.2**	**6.3**	**0.8**	**0.4**	**89.6%**
LOWER MARTIN	03H	556.0	0.9	0.7	3.8	0.0	3.8	5.2	3.6	4.7	78.6%
PUDDIN ROCK	03M	932.8	1.5	0.4	9.9	1.7	8.2	7.1	3.3	3.5	29.7%
MID MARTIN	03O	539.6	0.8	1.2	5.2	0.0	5.2	7.6	2.7	3.2	53.3%
CEDAR	03P	858.0	1.3	0.3	7.9	1.4	6.5	6.1	0.0	0	17.0%
UPPER MARTIN	03Q	681.7	1.1	0.7	4.8	1.2	3.6	5.2	0.5	0	75.7%
CHINA	03S	806.9	1.3	1.3	8.2	1.4	6.8	7.5	3.6	3.6	22.8%
SADDLE CAMP	03R	764.9	1.2	0.3	7.7	2.0	5.7	6.7	2.9	1.9	20.3%
Totals for MARTIN		**5139.9**	**8.0**	**4.9**	**47.5**	**7.7**	**39.8**	**6.5**	**2.3**	**2.4**	**38.1%**
LOWER QUARTZ	03N	773.0	1.2	1.3	9.0	1.3	7.7	8.5	3.1	2.8	47.2%
WEST FORK QUARTZ	03U	922.5	1.4	0.7	13.5	2.2	11.3	9.9	3.1	2.6	63.8%
UPPER QUARTZ	03T	1153.4	1.8	1.3	15.6	2.1	13.5	9.4	2.7	1.7	35.8%
Totals for QUARTZ		**2848.9**	**4.5**	**3.3**	**38.1**	**5.6**	**32.5**	**9.3**	**2.9**	**2.3**	**48.2%**

Figure 38 displays the riparian condition for the drainage groups where the majority of the ownership is either private or public, managed by the BLM. The top graph portrays the current seral condition. The seral stages are grouped by 0-20 years old, 20-80 years old and greater than 80 years old. The middle graph displays the percent of ownership for each drainage Group and the last graph shows what percent seral condition is present by ownership. The Clark and Lick Drainages have the highest percent of BLM management. These drainages also have the largest percent of riparian trees greater than 80 years old. The drainages with the poorest riparian condition are Lower Sharps West, Lower Sharps East, Straight, Buck and Walker. These drainages also have the lowest amount of BLM ownership. In conjunction with a poor riparian seral condition, these drainages tend to have the highest road densities. Many of these roads are also within the riparian reserves.

The first 10 miles of the mainstem of Sharps Creek is primarily within BLM-managed or private land. The riparian tends to be of poor condition with a narrow strip of trees. The road is also adjacent to the stream for these reaches impacting riparian potential and channel movement. Large woody material is extremely low for most of these 10 miles. This has all resulted in poor aquatic habitat which in turn limits aquatic life.

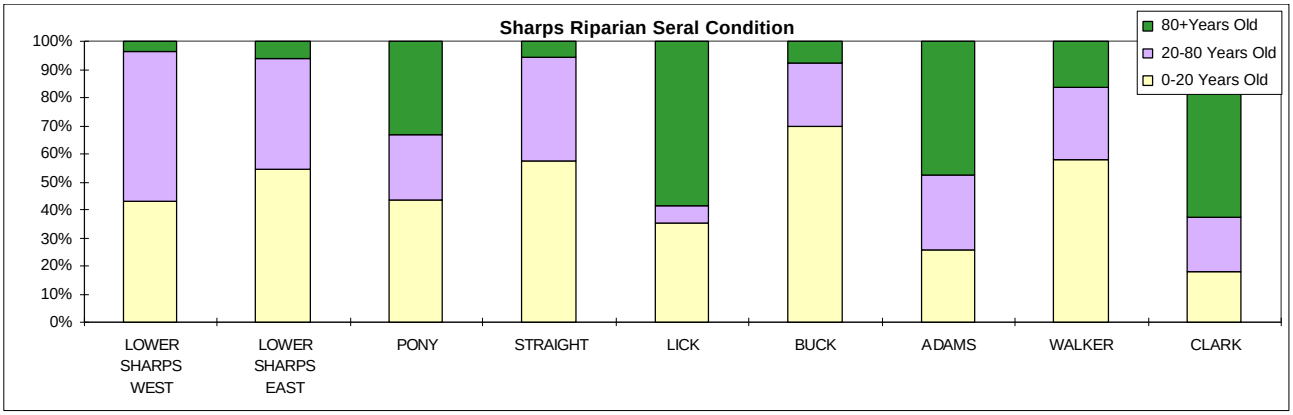
Macroinvertebrate sampling was collected within the first half mile of Sharps Creek in 1995 to 1997. This Lower Sharps Creek site scored poorly in all categories (Erosional, Margin and Detritus). The Erosional habitat did show a slightly improved score in 1996; however, this score was then back down in 1997. Species collected suggested water temperatures are warm and there is a high amount of fine sedimentation and cobble embeddedness (there are no groceries in the stream). Data in 1997 was also collected in Middle Sharps Creek (approximately 1 mile downstream of FS boundary), Upper Sharps (near Mineral Campground) and Puddin Rock Creek (within the first 0.5 miles). Middle Sharps had only slightly improved scores over Lower Sharps. Puddin Rock Creek samples indicated the stream temperatures to be warm, the habitat complexity to be moderate and a high amount of embeddedness and silt. The Upper Sharps Creek site had much higher scores than all other sites, indicating good habitat. Continual sampling of these sites will eventually indicate aquatic habitat trends.

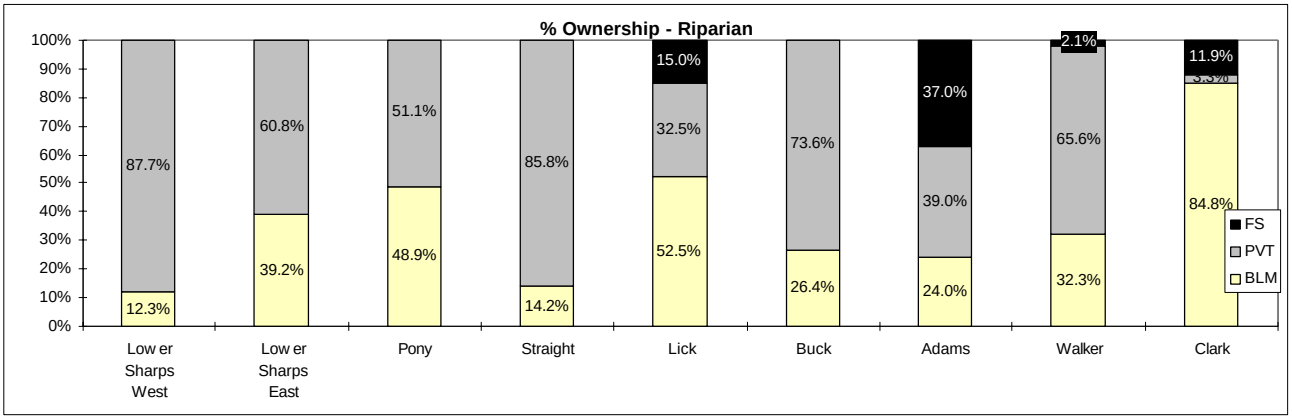
A summary of stream inventory and GIS data is discussed below for each drainage group (see Figure 3, Drainage Groups) within Forest Service administered lands.

Upper Sharps Drainage Group

The stream density for the Upper Sharps Drainage Group averages 5.9 miles of stream per square mile. This drainage group includes several drainages. The road density averages 2.0 miles of road per square mile, however this value varies by drainage. Roads are adjacent to the main streams in Lower and Mid Sharps and White Creek Drainages. A break down by road density is below:

Drainages	Miles of Road per Square Mile
Glenwood	3.0
White	2.2
Lower Sharps, Mid Sharps, Sailors Gulch	$\leq$ 1.8
Upper Sharps	1.0





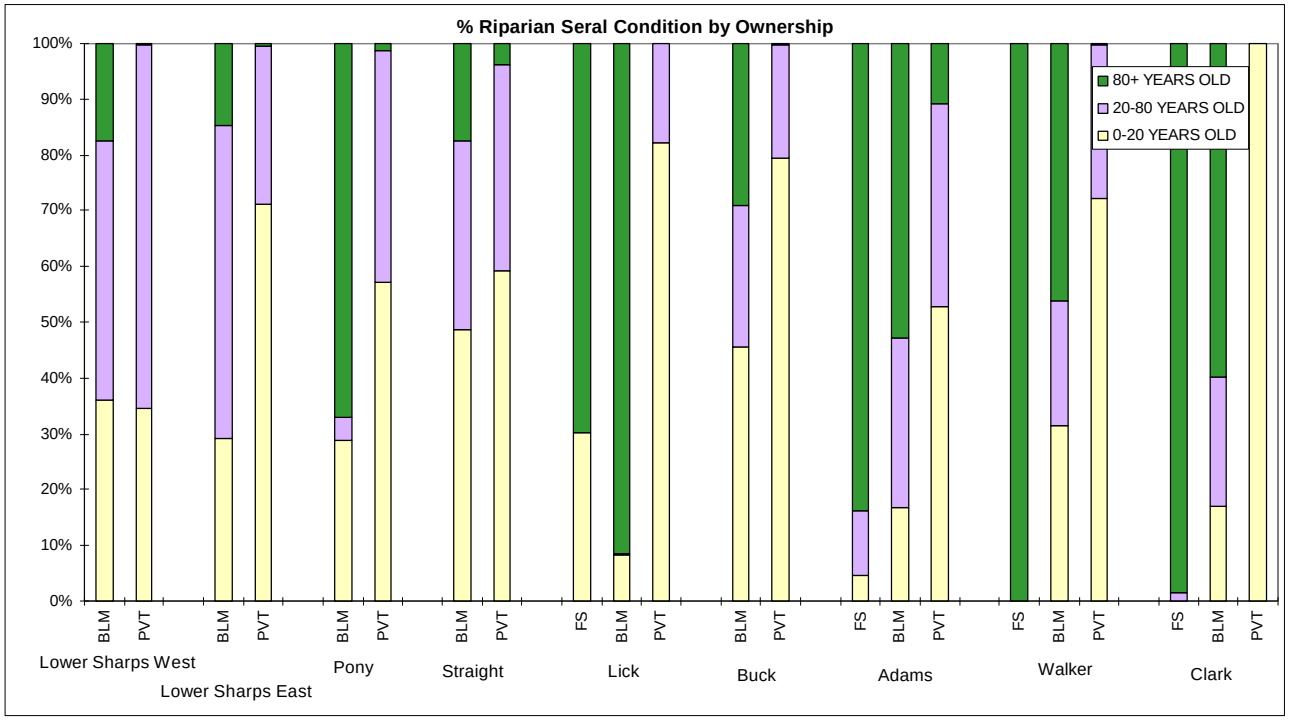


Figure 38. BLM and Private Riparian Condition

Approximately 4.7 miles of streams are fish bearing.

Mining is active in White Creek, Sharps Creek, Bohemia Creek, Glenwood Creek and Sailors Gulch.

Riparian seral condition varied by drainage (Table 16 and/or Figure 37), but the average indicated that 85 percent of the fish bearing streams have riparian trees greater than 80 years old; and 83 percent of the riparian trees on non-fish bearing stream are greater than 80 years old.

Several of the creeks within this drainage group were surveyed (see Figure 39 and Figure 40). Below is a summary from each of these surveys.

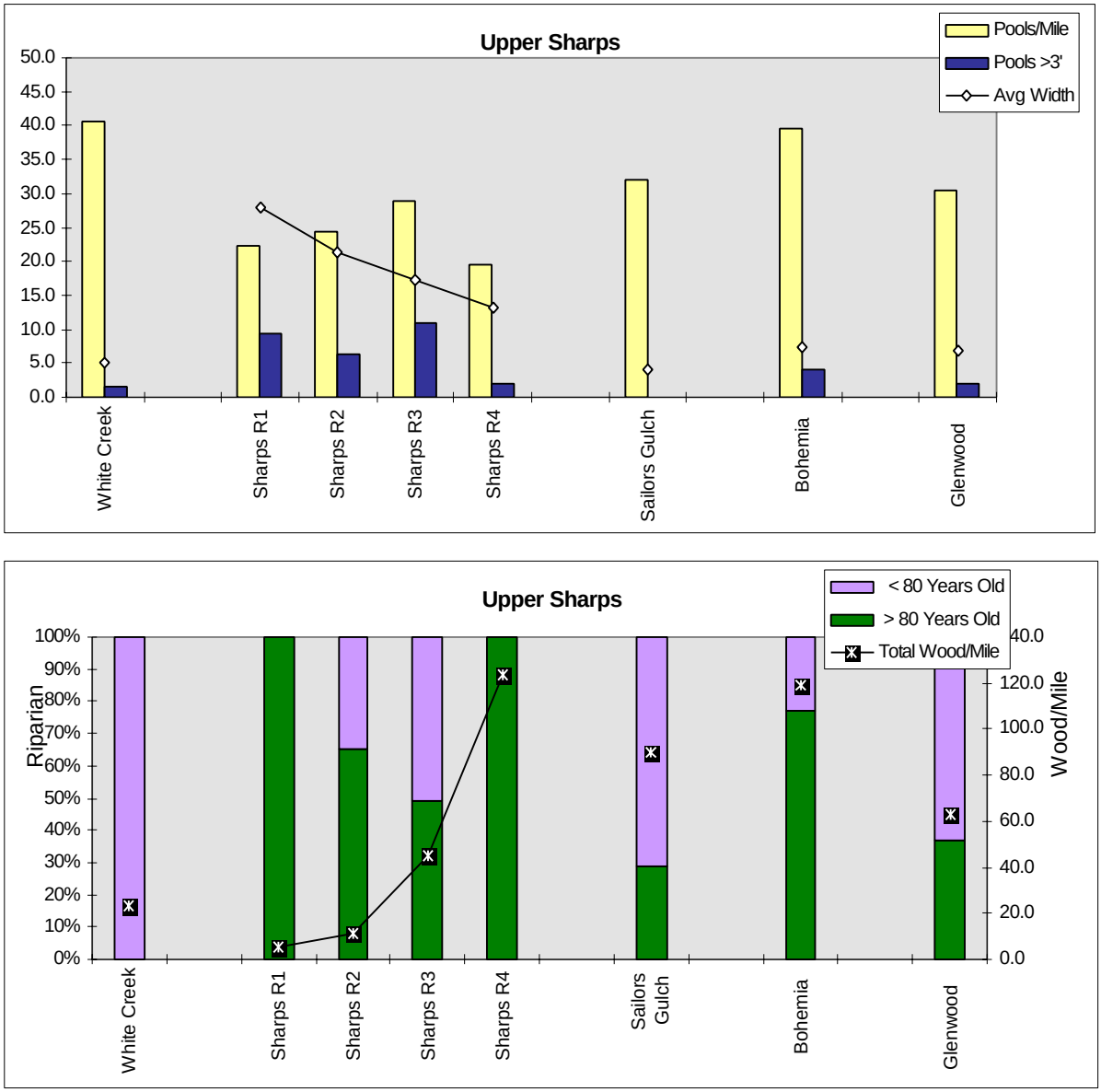


Figure 39. Pools and Wood, Upper Sharps

Figure 40. Streams Surveyed

Sharps Creek

The stream survey started at the FS boundary at River Mile 10. Rainbow and cutthroat trout were present for 3.5 miles above the FS boundary and sculpin for approximately 2.5 miles. Sharps Creek was regularly stocked to the confluence of Martin Creek by ODFW until 1996; stocking has been discontinued.

The 2460 road is parallel to the stream channel.

Reach 1 (FS boundary to Martin Creek) has poor pool and riffle habitat and an overall lack of channel complexity. Mining activity is high, and many of the pools having been dredged. The riparian seral condition is good because of the many large conifers, but the road is close to the channel and affects the riparian area. The amount of LWD is very low. The channel is wide with a high amount of solar exposure. The channel is also scoured to bedrock in many places, which does reduce stability concerns. Mining, the road and the limited amount of LWD seems to have affected the channel so that it is now wider and shallow. One long braided part of the channel demonstrates how the stream may be out of dynamic equilibrium in places. All fish observed were shorter than 6 inches. Fishing pressure, perhaps associated with mining activity, appears to be high from the miners.

Reach 2 (Martin Creek to Fairview Creek) has pools that tend to be deep, and the habitat, in general, is fair. Miners have created pools by dredging and there are bedrock scour pools. Mining is active but to a lesser extent than reach 1. The amount of LWD is still low. The riparian condition is fair, with some small trees; the 2460 road is near the stream channel.

The channel is wide with high solar exposure. Some braided channels are present indicating the stream is probably wider and more shallow than if woody debris was present and the road was not affecting the sinuosity. Like reach 1 the stream has been scoured to bedrock in places and this aids in channel stability. Trout numbers were higher in this reach, although all fish observed were less than 6 inches long. There are several small falls, chutes and high gradient riffles.

Reach 3 (Fairview to Bohemia) is where habitat improves. Mining activity is only at the beginning of the reach, and the road is no longer near the stream. The stream is smaller, but there are more pools per mile greater than 3 feet deep. Higher gradient riffles are in this reach. The amount of LWD increases but numbers are not high and the wood that is in the stream does not appear to be functioning as well as it could be. The lower reach may have been salvaged. The stream channel looks like it was disturbed in the lower reach; probably through mining activities. The channel is wide and has a wide hardwood riparian stand of trees. This hardwood riparian area may be from a past debris flow and/or from the past instream salvage especially around the Mineral Mining Camp. There is a possible past debris flow from T-6 (NSO 167). The riparian seral condition is fair with about half in small trees and the other half in large conifers. Rainbow and cutthroat trout were both observed, with cutthroat more dominant; most fish were 3 inches or less. Numbers of fish are low in the middle of the reach, probably due to the small, low water barriers.

Reach 4 (Bohemia to a 10 foot falls) is a high gradient stairstep riffles with limited channel width pools. LWD is abundant, and excellent riparian conditions include 100 percent stocking of large conifers. No roads are in or near the riparian reserve. Bedrock, LWD and riparian vegetation all

contribute to stability. Several migration barriers were identified throughout the reach. No fish were observed.

White Creek

Cutthroat and rainbow trout were observed for the first 0.7 miles, although most of the fish are within the first 500 feet of the stream. Riffles were the dominant habitat type; they tended to be wide and shallow, with small pocket pools. Pool habitat was fair in numbers per mile, however some of these may have been dredged during mining activities. Pools tended to have a good depth given the size of the stream. The amount of LWD was very low; although it increases upstream most is in the small category. Some wood may have been salvaged during mining activities. The riparian condition is very poor, with all small trees and saplings. This will delay future recruitment of LWD.

It appears that mining may have altered the channel. Some of the stream had downcut so that the channel is now wider and shallower. Some channel braiding, cobble embeddedness and dry channels were also observed. Instability was recorded for 20 percent of the reach length.

The culvert near the mouth is probably not a barrier with less than 1 foot jump. However water appeared to be flowing below the culvert.

Sailors Gulch

This stream is only fish bearing for 0.2 miles. Rainbow and cutthroat trout were the only fish species observed. There are no roads within the riparian reserve. Habitat is mostly riffles. Mining affected at least 50 percent of the surveyed area. Pools are fair in complexity and not very deep. Overall, LWD is good, with more wood in the upper reach. The riparian zone is in better condition than the 71 percent small trees indicated by the stream survey. Mostly intact riparian; an old fire went through the area and has now recovered. There is one clearcut in the upper reach with just a thin riparian buffer.

The channel has been altered at the beginning of the reach where the stream is wide and shallow with multiple channels. This is uncharacteristic for this type of high gradient channel. An old channel was also observed that is now well vegetated. Perhaps miners diverted the flow to form a new channel. The bedrock and LWD are aiding in stability. Cobble embeddedness appears to be a concern.

Bohemia Creek

This stream is fish bearing for 0.4 miles. Only a few trout were observed. Many low water barriers were in the surveyed reach. Habitat appears to be good with complex pool and riffle habitat. The channel gradient increases above the Glenwood Creek confluence, and so does the channel complexity. The amount of LWD is very good. Riparian condition is also good. Temperatures were very low indicating this stream to possibly be a cold water source. Road density is high for the Bohemia/Glenwood drainage at 3.0 miles per square mile. However no roads cross or are along Bohemia Creek. This high density is from the patented mining land in the headwaters.

A mining cabin is located below the Glenwood confluence and was recently occupied. The channel does not appear to be impacted from mining activities. The patented land in the headwaters may have active mining. Fine sediment does not appear to be a concern.

Glenwood Creek

No fish were found in Glenwood Creek. The stream was surveyed 0.5 miles up to a 50 foot water falls. The reach consisted of steep high gradient riffles with many waterfalls and chutes. Little fish habitat was present. Large woody debris was fair to good, however the riparian was poor with 63 percent in a small tree seral stage. Past harvest and mining exploration has resulted in a poor riparian condition for upper Glenwood Creek. Much of the patented land in the headwaters has also been harvested. The bedrock and boulder substrate help aid in channel stability.

Fairview Drainage Group

The stream density for the Fairview Drainage Group averages out to be 6.3 miles of stream per square mile. This drainage group includes several drainages. The road density averages out to be only 0.8 miles of road per square mile, however this value varies by drainage. Roads are primarily up on the ridges and on the patented land in the headwaters. Much of the drainage is roadless. A break down by road density is below:

Drainages	Miles of Road per Square Mile
Lower Fairview	0.2
Walton	0.7
Cinge	0
Upper Fairview	1.6

Approximately 2.9 miles of streams are fish bearing.

Mining is active within the patented land and past mining activities were observed near the mouth of Fairview Creek.

Riparian seral condition varied by drainage (Table 16 and Figure 37), but the average indicated that 100 percent of the fish bearing streams have riparian vegetation greater than 80 years old and 87.7 percent of the non-fish bearing riparian is greater than 80 years old.

Several of the creeks within this drainage group were surveyed (see Figure 40 and Figure 41). Below is a summary from each of these surveys.

Fairview Creek

Cutthroat and rainbow trout were observed for the first 2.2 miles to a 9-foot waterfall. A past debris flow may have occurred as indicated by the sometimes wide hardwood riparian area on the aerial photos. Perhaps this happened after the last large stand replacement fire that went through the drainage.

Reach 1 (Mouth to Walton Creek) has good channel complexity, although there is evidence of past mining for the first 0.5 miles. The habitat is mostly a stairstep riffle morphology, so there are not many channel width pools. The amount of woody debris is good, however it is mostly in the small category since only recently have large trees been in the riparian zone. The riparian condition is very good.

Reach 2 (Walton Creek to Cinge Creek) has good channel complexity with an adequate amount of woody debris, good riparian conditions and deep pools. The valley narrows in this reach. The channel is very stable due to the bedrock and boulder control, a high amount of woody debris and an intact riparian. Less fish were observed in this reach than reach 1. No mining was observed.

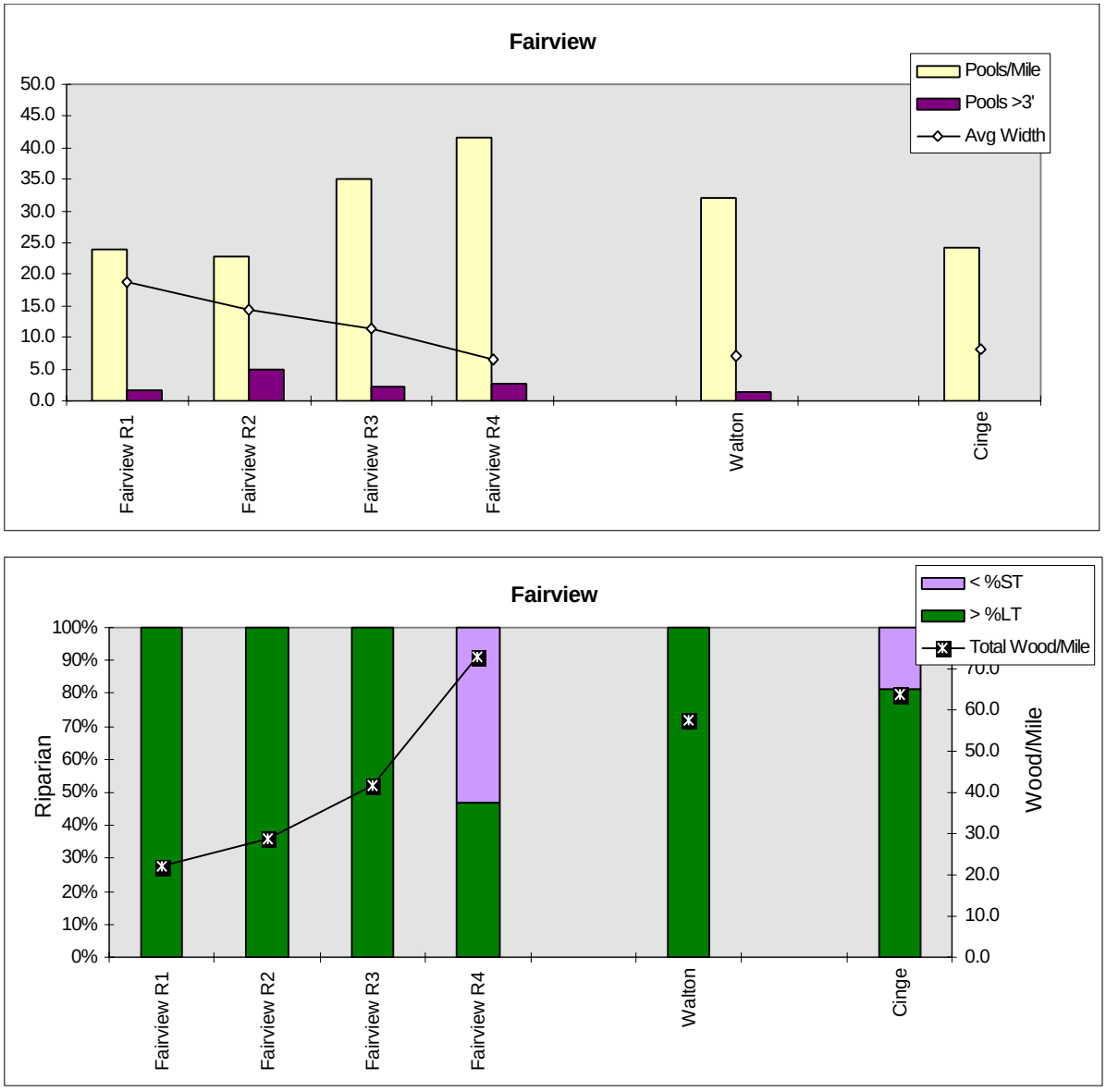


Figure 41. Pools and Wood, Fairview

Reach 3 (Cinge Creek to tributary 3) has good pool habitat. The pool habitat was very deep for this small stream. There is plenty of woody debris that is creating complex habitat and trapping spawning gravels. The channel is very stable. The end of fish use was in this reach. The fish observed were mostly cutthroat trout.

Reach 4 (tributary 3 to a debris dam around 0.5 miles above the end of fish use) is a high gradient stairstep riffle channel interspersed with fairly deep pools for such a small stream. Woody debris is abundant but in the small category. The riparian was recorded to be 47 percent small trees, however this natural stand is intact and in good condition. Many of the trees are close to 80 years old. The channel is stable. There were no mining activities and no fish observed.

Walton Creek

This stream is fish bearing with cutthroat trout for 0.5 miles up to a 12-foot waterfall. The channel is a stairstep morphology so there are not many full channel-width pools. The high amount of woody debris, even though in the small category provides complex habitat. The down wood is

large, not surprisingly given the fire history of the area. The riparian vegetation is 100 percent large trees. The channel is also stable. No signs of recent mining were observed, but an old sluice box was near the mouth. The channel near the mouth also appeared to be altered from mining. No roads cross Walton Creek; the few roads within the drainage are all on the ridge tops and timber harvest is very limited. Crayfish were abundant.

Cinge Creek

This stream is similar to Walton Creek in habitat. It is fish bearing for 0.5 miles with cutthroat trout. Several fish were observed during the survey. The channel tends to have a stairstep channel morphology, however there is also some low gradient habitat. These areas have large pools (50-70 feet long and 2 feet deep); though no pools are greater than 3 feet deep. A high amount of woody debris has created complex habitat. The riparian is intact and in good condition. There is also a high amount of coarse bedload being trapped by the down woody debris. The material may also be filling in some pool habitat which is why the pool depth is limited. The channel is stable in this pristine drainage. No roads are within the drainage and very little timber harvest has occurred. There was no evidence of mining.

Martin Drainage Group

The stream density for the Martin Drainage Group averages 6.5 miles of stream per square mile. This drainage group includes several drainages. The road density averages 2.3 miles of road per square mile, however this value varies by drainage. Roads are adjacent to the main streams in China, Lower and Mid Martin, and Puddin Rock Drainages. A break down by road density is below:

Drainages	Miles of Road per Square Mile
China, Lower Martin, Puddin Rock	>3.3
Saddle Camp, Mid Martin	>2.7
Upper Martin and Cedar	0.5 and 0

Approximately 4.9 miles of streams are fish bearing.

Mining is active in this drainage in Martin Creek, Puddin Rock Creek and China Creek.

Riparian seral condition varies by drainage; (see Table 16 or Figure 37). However, on average, 61 percent of the fish bearing streams have a riparian seral stage greater than 80 years old and only 33 percent of the non-fish bearing stream riparian trees are greater than 80 years old. However, much of this seral condition is close to 80 years old.

Several of the creeks within this drainage group were surveyed (see Figure 39 and Figure 40. Below is a summary from each of these surveys.

Martin Creek

Martin Creek has a road density of 2.3 miles per square mile. The 23 road is a valley bottom road adjacent to Martin Creek for reach 1 and 2. Cutthroat trout and rainbow trout were present for 4.4 miles. Sculpin were observed for the first 2.6 miles and dace for approximately the first 1.5 miles.

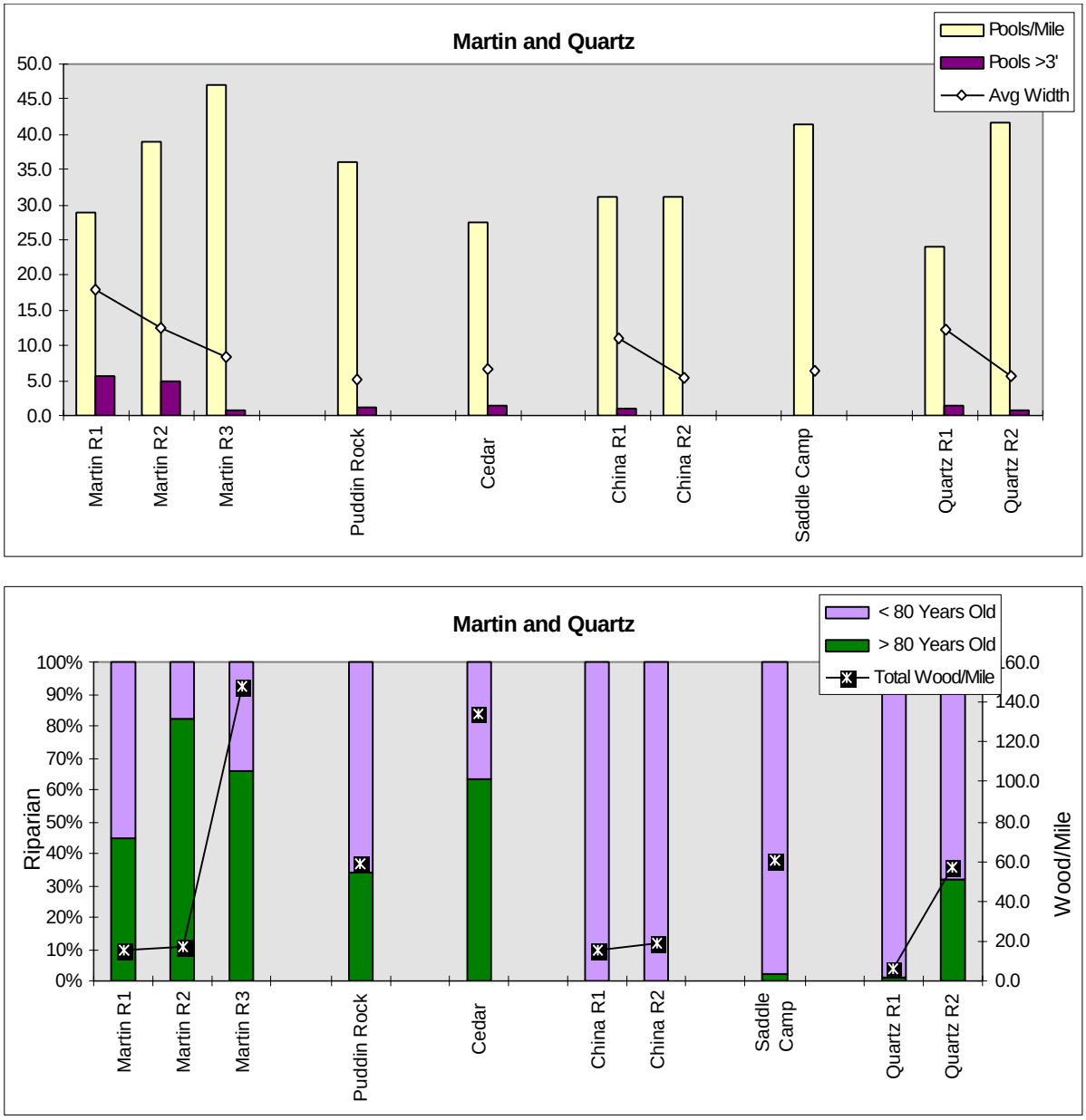


Figure 42. Pools and Wood, Martin and Quartz

Mining is common and active. High turbidity was observed during the survey for 425 feet downstream from mining activity in reach 1. Cobble embeddedness may be from mining activities.

Reach 1 (mouth to Quartz Creek) has fair pool habitat that is deep in the lower reach. Pools are mostly bedrock scour or recently dredged from mining activities. Riffles have little complexity. There is very little LWD within the reach. The riparian has some recruitment (50 percent LT), but road and possibly mining activity limits down wood. The channel is somewhat unstable, with a high width to depth ratio. Mining activities, the road adjacent to the channel and the lack of wood all contribute to poor stability. A very high concentration of juga snails were found throughout the reach. This snail is tolerant of fine sediment, warm water and low oxygen. High numbers of these snails indicate poor habitat and limited water quality conditions (Resources Northwest, Inc. and Aquatic Biology Associates, 1995).

Reach 2 (Quartz Creek to China Creek) pools are better quality than reach 1. The depth and cover are good, however some of these pools were created from dredging. Overall channel complexity decreases upstream. Riffles become the dominant habitat type in reach 2. They tend to be poor quality with little wood and small pocket pools. Subsurface flows were observed in places. LWD is very low; the lack of wood does not allow the bedload to be captured creating a channel that may be out of dynamic equilibrium.. The riparian area has a wide inner hardwood component and the road is within the riparian reserve. Past harvest has also left a narrow buffer strip (20 feet in some places). Active mining may have contributed to the fine sediment within the reach. The reach is more stable than reach 1 due to the larger substrate; although the bottom channel appears to be unstable from the dredging. Trout less than 6 inches long were often seen in the dredged pools.

Reach 3 (China Creek to a 5-foot falls where the stream is small and steep) has no road adjacent to the stream channel and very little harvest has occurred in the riparian zone. An old fire came through the area so that many of the trees are less than 80 years old; however larger trees grow along the creek.. Habitat is very good; the channel is steeper and has a stairstep morphology, so there are not as many channel width pools. There is a high amount of LWD. Mining was only active at the beginning of the reach. Fine sediment is not a concern. The channel is stable and there are no valley bottom roads. There is a good riparian and lots of LWD. A few trout were observed in this upper reach, all were less than 3 inches.

China Creek

The drainage is heavily roaded with 3.6 miles of road per square mile. It is fish bearing for 1.3 miles; populated mostly by cutthroat trout, with some rainbow trout near the mouth.

Placer dredging and panning is active from near road 23 and downstream to the confluence with Martin Creek.

Reach 1 (mouth to Saddle Camp Creek) is mostly very long riffles and the pool habitat is fair. The amount of LWD is very low. There is also a poor riparian area with lots of hardwoods; the inner hardwood zone is 55 feet wide. The road and a clearcut also affect riparian conditions. The riparian seral vegetation is 100 percent small trees, which limits future recruitment of LWD. The stream channel is fairly stable with just a few areas of active erosion. The road is 20 to 40 feet from channel in places, limiting riparian function and channelizing the stream. This may affect the channel from reaching dynamic equilibrium. Braided channels are common. There is a squash pipe culvert where the road crosses the stream that has a small drop on the downstream end (2.3 feet). This is possible low flow barrier to the resident trout.

Reach 2 (Saddle Camp to 23 road upper crossing) has a spring located around 640 feet above the Saddle Camp confluence which supplies approximately 90 percent of the flow. This spring indicates that China Creek was probably a cold water source in the watershed. China Creek then flows through reach 1 which has poor riparian conditions and water temperatures that may increase easily in this small stream before entering Martin Creek.

Pool habitat in reach 2 was fair. Subsurface flows are common with 25 percent of the habitat as a dry channel. This was even after heavy rains occurred for 3 days previous to the stream survey. The LWD is still low. Riparian condition improves from reach 1 with only a 15 feet inner hardwood zone. However the outer riparian is still small conifers. Trees were harvested from both banks in the 1950's. Recruitment has been poor on the right bank which is a south facing dry slope. The stream channel was probably also salvaged during the time the timber was harvested.

Puddin Rock Creek

The drainage is heavily roaded with 3.3 miles of road per square mile. This small stream is fish bearing for 0.5 miles; mostly all cutthroat trout, with some rainbow trout.

Approximately 80 percent of the stream (1.5 miles) that was surveyed has been modified from mining. Miner lives on site and uses heavy equipment within the stream channel.

The 23-127 road is adjacent to the stream channel and within the riparian reserve.

Pools numbers are high, but several were made from mining activities. They are unstable and expected to fill in. Riffles have also been altered. The stream has changed channels in places and this is also believed to be from mining. Large wood is fair (58 total pieces per mile); most is in the small size category and found in the upper part of the reach. The channel is unstable from mining and heavy equipment use, especially in the lower reach. The upper reach is scoured to bedrock; or mining activity may have removed much of the substrate. Wood is helping to stabilize and captures bedload. The riparian vegetation is poor with only 29.7 percent less than 80 years old.

NSO 70 (half way up reach) has a sluice box where the boulders are cemented together to keep it there.

The 23 road culvert has a 4 foot drop. There is a need to determine if it is passable at high flows.

Saddle Camp Creek

This small stream has a road density of 2.9 miles of road per square mile. Small cutthroat trout, less than 3 inches, were the only fish observed. It is fish bearing for 0.25 miles to a 28' falls, located 330' above the 23 road culvert. This culvert has a 2-1/2 foot jump and has downcut below. The 23 road parallels both banks in the fish bearing portion of the stream. The riparian condition, the pool habitat and the amount of LWD is poor in the fish bearing section; habitat does improve further upstream.

Cedar Creek

This small stream has no roads within the drainage area. Rainbow trout and cutthroat trout are found within the first 0.5 miles. Little to no timber harvest has occurred. The habitat is pristine with lots of wood, good pool and riffle habitat (very complex) and good riparian. Fire went through the area so there are fingers of smaller trees. Seral condition data suggests that the majority of trees are less than 80 years old, but older trees tend to line the creek and most of the trees are very close to 80 years old.

Quartz Creek Drainage Group

The Quartz Creek drainage group, has a very high stream density of 9.3 miles of stream per square mile. This density corresponds with the weathered bedrock geomorphic group as described in the erosional processes section. The road density is high at 2.9 miles of road per square mile, which is the highest road density for those drainages in this WAA that contain mostly Forest Service administered land . The 23-721 road parallels Quartz Creek for a mile causing channel confinement, bank instability and impacts to riparian habitat. The floodplain near the mouth of the stream was used as a disposal site in 1974 to place waste debris from the construction of the Puddin Rock Road; this fill channelized the stream.

Quartz Creek is fish bearing for 3.3 miles, with cutthroat trout, rainbow trout and sculpin the only fish observed. Sculpin are present to just below the private section boundary. Cutthroat are the most common fish and there is some question as to whether the snorkeler could identify the rainbow trout correctly. Few fish were greater than 6 inches long.

There were no migration barriers except for possible LWD jams with heavy debris loads causing changes to the streambed elevation. This correlates with the weathered rock morphology (see Figure 4). Heavy bedload came down Quartz Creek. Two LWD jams have captured bedload and there is an 8 and 9 foot change in stream height at these jams. Subsurface flows were also observed in the stream channel during summer low flow conditions.

Riparian conditions are poor in Quartz Creek. Only 21 percent of the fish bearing portion for the entire drainage group is greater than 80 years old, while 54 percent of the non-fish bearing streams have riparian stands greater than 80 years old. See Table 16 or Figure 37. There is a very wide hardwood riparian zone for the majority of streams that averaged about 50 feet in Reach 1, and 25 feet in Reach 2 (Figure 40). This is believed to be caused by past debris flows, along with mining, timber harvest and road construction activities. Approximately 9 miles of stream in this drainage group had debris flows from the 1964 flood.

Placer mining is active in Quartz Creek; with one miner residing on his claim. Isolated pools with stranded trout in between dry channel beds were observed during the stream survey.

Quartz Creek was surveyed (see Figure 40 and Figure 42). Below is a summary from the survey.

Reach 1 in Quartz Creek has poor pool habitat. The pools tend to be shallow and low in numbers. Riffles are wide and shallow. The riparian area was poor with a wide hardwood zone (50 feet) and small conifer trees beyond. Large woody debris was very low in pieces per mile and it was all small wood. Bank instability is common, especially NSO 12-20. The lack of LWD and the road confining the channel may be the reason for bank instability. There may also be a fine sediment problem within lower Quartz Creek.

Pool habitat in Reach 2 is still poor but improves upstream. Some pools are isolated with stranded 3-6 inch trout between areas where the channel is dry; dry habitat making up 18 percent of the reach. There was less riffle habitat than Reach 1, although the riffles were still shallow and wide. The subsurface flows may be from heavy bedload and mining activities. The riparian area improves with a narrower hardwood riparian zone (25 feet). Some spots on private land were open to solar exposure and had Scotch broom growing in these areas. The amount of LWD increases with 11 medium pieces per mile and 46 small pieces per mile. Additional wood was too small to be counted or above bank-full depth. Several pieces have cut ends, indicating they were from past harvest activities. The channel has downcut with overhanging banks above the bank-full depth in places. There is no armor/structural support for stream banks. Bank cutting and instability are common. There may be a fine sediment problem.

Aquatic Habitat

Reference Condition

Prior to land management activities such as timber harvest, road building and agriculture, Westside Cascade streams tended to have intact riparian areas with large conifers. As these trees fell over and provided down woody material, they enhanced channel stability and stream complexity (Sedell et al., 1988); both are important factors for providing a healthy aquatic habitat. This down wood helps form stream channels, scours out pools, dissipates flow, retains nutrients,

traps substrate (such as spawning gravels and cobbles where macroinvertebrates live), and provides cover habitat. Large wood deposited on floodplains and in off-channel areas is also important, providing protective cover for juvenile fish during winter high flows (Everest et al., 1987). Large wood is an essential component of the stream system, particularly in the western Cascades.

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Human Uses

The current conditions for timber production, roads, minerals and recreation (including visuals) are described in the first part of this section. Following recreation and visual current conditions, is a general reference condition for Human Uses.

Current Conditions

Timber Production

Timber harvest began in the 1940's in the western portion of the watershed. An average of 375 acres per year have been harvested.

In the past 25 years, highlead and other cable systems have been the most common harvest system used in the Sharps Creek watershed analysis area. However, a significant proportion of the harvested areas, especially on private land, has been tractor logged. Compaction is a concern in these areas.

Typically, harvest during the 1940's and 1950's left large amounts of cull logs. Harvest from the 1960's until the present left varying amounts of down logs. PUM (piling unmerchantable material), burning and removal of logs from streams often left these units deficit in large wood. Salvaging of snags also left units without suitable snag habitat.

Harvest on private lands has occurred since the 1940’s. Many stands that are currently in an early vegetation stage are entering their second rotation.

Figure 43. Harvest History

Roads

Currently, road use activities in the Sharps Creek Watershed include timber harvest, recreation, mining access and administrative access. Sixty-one (61 percent) of the existing 259 road miles in Sharps Creek Watershed are on private land. There is a remaining 20 percent in Forest Service jurisdiction and 19 percent in BLM jurisdiction.

With an overall road density of 3.9 mi./sq.mi., road density in Sharps Creek Watershed varies by drainage and by jurisdiction. Road densities range from zero (0 mi./sq.mi) in Cedar and Cinge drainages to 7.5 mi./sq.mi. in Boulder drainage. Road density on private land is 6.5 mi./sq.mi and on BLM land is 3.3 mi./sq.mi. Road density in the Forest Service jurisdiction is 1.9 mi./sq.mi, based on 54 miles of road and 17,752 acres of land. (This differs substantially from road densities in Layng Creek of 3.7 mi./sq.mi., and Brice Creek of 3.2 mi./sq.mi.) The lower road density might suggest less impact to riparian and aquatic species habitat.

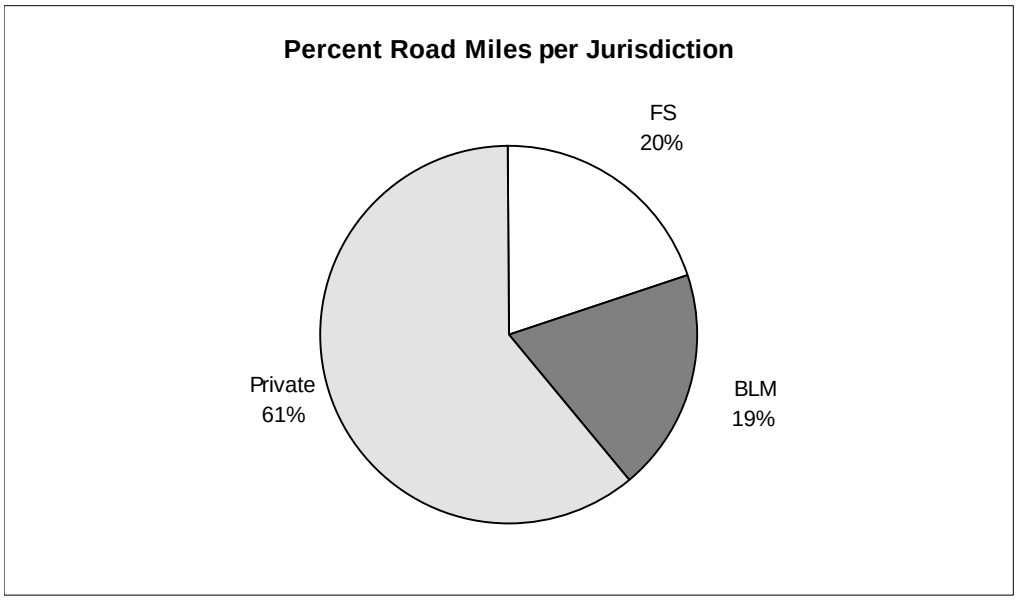

Figure 44. Percent of Road Miles Per Jurisdiction

Forest Service Jurisdiction

For roads under Forest Service jurisdiction, maintenance levels (ML) are assigned. These are levels 1 through 5 and reflect required maintenance standards necessary to meet documented management objectives for each road or road segment. Categorizing roads within the watershed by maintenance level is one way to develop an understanding of the character, function and use of the transportation system.

Ninety-one percent (91 percent) of the FS roads in Sharps Creek Watershed are maintained as open for public use, and designated as maintenance level 2 or 3. Maintenance Level 2 roads are maintained to a standard for use by high-clearance vehicles only and are typically dead-end roads or short side routes between larger road systems, built to access timber harvest units and provide shortened haul routes. Roads maintained at maintenance level 3 are maintained for public travel and passenger car use is encouraged or accepted. These roads are maintained to meet Federal Highway Safety Standards. The remaining 9 percent of the roads are maintenance level 1,

physically closed to traffic year-round. These closed roads are typically less than one mile in length and without rock surfacing.

Through an Access and Travel management update process in January 1996, roads on the Umpqua National Forest (inclusive of Sharps Creek Watershed area), were identified (draft list) as Primary, Secondary, or "Other" roads. Primary and secondary roads make up 54 percent of the Forest Service road miles in the Sharps Creek Watershed. Primary roads are roads which provide major access into and through the Forest and connect with high-use entry points or population centers. These roads link with state and county roads and are often designated as scenic routes or auto tour routes. Primary roads are intended to be maintained for passenger car use. Road 2300 and road 2358 in Sharps Creek are both primary roads. Secondary roads are roads that provide the best access to management areas outside the proximity of the primary road network. These roads extend primary Forest roads, as well as state and county roads. Secondary roads are intended to be maintained for high clearance use. Road 2301 and Road 2328 in Sharps Creek are secondary roads. Roads which are not included in the primary and secondary roads system are categorized as "other" roads. "Other" roads include all remaining open roads (Maintenance Level 2) and all system roads which are currently closed (Maintenance Level 1). Sharps Creek has 24 miles of "other" roads.

In the Forest Service jurisdiction of Sharps Creek Watershed, extensive roading is not anticipated in the future, due to resource concerns and maintenance expense. Road building needs may be limited to short spurs to access to Matrix land.

A culvert risk assessment has been completed on most of the class 2 and 3 stream crossings. Only one culvert located at M.P. 5.35 on road 2300 was dramatically undersized. None of the inventoried culvert crossings caused problems during the high water in the storms of 1996 and 1997.

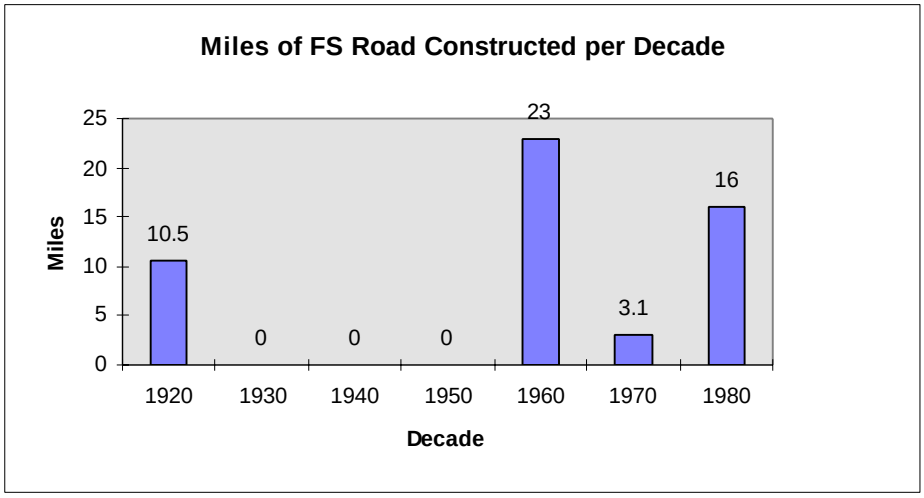

Figure 45. Miles of FS Road Constructed per Decade

Bureau of Land Management (BLM) Jurisdiction

On BLM jurisdiction, the Road Maintenance Operating Plan directs maintenance of 17 miles of paved road and 15 miles of crushed rock surface course road. Maintenance consist of annual surface maintenance and brushing as needed. There is no maintenance of natural (dirt) surface roads.

There are two O&C Logging Road right-of-way Agreements (RWA's) on BLM land in this watershed, that cover about 85 percent of the BLM land base. The most inclusive is with Weyerhaeuser; a smaller RWA is with Giustina Resources. The last permanent road built on BLM by BLM was in 1994; however, because of the RWA's, private timber companies continue to build roads on BLM. These actions are non-discretionary. BLM cannot deny the company the right to build roads, except where construction of the road will cause excessive erosion, another access route is available or the new road would interfere with existing facilities.

Weyerhaeuser Jurisdiction (private)

For roads under Weyerhaeuser jurisdiction (private Land), roads are classified by road type and maintenance level. There are four road types; Primary (M/L), Secondary (Truck road), Tertiary (Unit Spurs), and Temporary. Primary roads are the main truck roads, including paved roads and all designated tie roads. Secondary roads are haul roads that access more than one unit. Tertiary roads are the planned dead-end roads within a harvest unit that are expected to be used for forestry or future harvest activity. Temporary roads are spurs that will only be used for one unit and will be planted after use.

The maintenance levels assigned to these roads range from 1-4. Level 1 maintenance allows unrestricted access for logging activities at any time of the year, road type and snow permitting. Level 2 maintenance allows access for Forestry activities at any time of the year, road type and snow permitting. Level 3 maintenance preserves the basic structure of the roadway but does not guarantee access over the rotation. The road is semi-permanently blocked at the beginning with the expectation that it will be used at the next rotation. Level 4 maintenance roads are roads that are not expected to be used at the next rotation and have been identified for removal. These include new roads that are purposely built for a specific logging situation or piece of equipment and will not be needed again, old roads still remaining from prior logging that will not or should not be used, and roads that were built which were never utilized and determined to be unneeded.

Minerals Management

Mineral exploration is one of the predominant uses in the watershed. There are approximately 21 patented lode claims that occupy 278.56 acres of the Sharps Creek subwatershed. These patented claims are private land with limited activity and are located along the upper ridge of the subwatershed between Fairview Peak and Bohemia Mountain. Lode mining is mostly an underground activity and has limited impact on the surface resources. Other private lands in the lower part of the watershed control the opportunity for mining. Weyerhaeuser, a large landowner within the watershed, permits recreational gold panning along their lands bordering Sharps Creek. However vehicular access to these Weyerhaeuser lands is limited due to road closures. These closures were often the result of resource damage resulting from long term dispersed camping and dumping. Most of the public lands along the streams which are accessible by vehicle have placer mining claims located. These claims are dynamic and change hands frequently; however, the level of activity remains recreational in nature. Recreational mining is defined as gold panning and small dredges (intakes 4" or less) within the active stream channel. According to the most recent Bureau of Land Management state record of mining claims there are approximately 75 active placer claims and 100 lode claims within the Sharps Creek watershed.

The level of activity on mining claims vary depending on the type of claim and the time of year. Activity on hard rock or lode mining claims is minimal since development of the mineral resource is generally underground. Above ground impacts are generally limited to utilization of existing roads or, on occasion, construction of roads to access claims. Other surface impacts include

tailing disposal areas, occupation by temporary structures, equipment and/or on occasion by personnel. There are two consistently active lode claims in the subwatershed. These are the Star Mine along Puddin Rock Creek and the Birds Nest claim along Puddin Rock ridge. Both of these claims occupy the claim with extensive mining improvements including above and below ground structures or improvements. On-site personnel occupation is approved at the Star Mine for the purpose of full time and generally year round mining and site security. Activity on the other lode claims is generally limited to occasional exploration and/or extraction of mineral ore which may include underground blasting and manual excavation of ore.

Placer mining includes mineral-related activities within and along streams. All streams that originate from the Bohemia mineralized area have the potential to support placer mining activity. Claims are located on most public lands along Sharps, Martin, Quartz, China, and Puddin Rock Creeks. Density of placer claims are mostly along portions of these streams that have either adjacent vehicular access or are within reasonable walking distance. Placer mining is typically small dredges (4" or less intakes) operating in the active stream channel.

The level of recreational mining activity increases significantly during the drier summer months however the more active and productive claims are usually worked year round or when stream flows are high enough to allow adequate pool depth to float the dredges. There are typically less than 5 placer claims that are consistently active year round; the Climax Placer claims along lower Puddin Rock Creek being the most active. This claim also utilizes large mechanized equipment controlled within the scope of the Operating Plan and reclamation bond. Placer activity on the private lands is minimal.

Summer placer mining activity typically involves 20-25 placer claims worked on an intermittent basis throughout the season. Placer activity generally increases on weekends, holidays or during a claimant's summer vacation. The lower summer flows generally limit the dredging activity to the deeper pools and lower elevation stream channels. Surface resource impacts of placer mining is from high banking or excavating and extracting ore from stream-side terraces and dispersed camping on the claim. Long term dispersed camping or occupancy on a mining claim may be approved by the landowner based on need and level of mining activity.

Recreation

The recreation resource base within the Sharps Creek watershed is limited because most areas usable for dispersed recreation (e.g., camping) are occupied by mining claims. The current developed recreation program in this watershed consists of BLM's Sharps Creek Campground, a 10-unit camping and day use area, and the Forest Service's Mineral Camp, a semi-developed campground with two camp/picnic sites. There are numerous dispersed camp areas predominantly located along the lower portions of Sharps Creek, and tributaries of Martin and Clark Creeks. Many of these dispersed sites are also locations of placer mining claims located along these accessible stream-side locations. Fairview Peak Lookout and Bohemia Saddle County Park are frequently used recreation areas with minimal development.

Developed trails are all located on Forest Service lands and most are improved historical mining routes. Trails that are maintained for public use include the following: Bohemia Mountain (0.8 mile), Fairview Creek (3 miles), Knott (4.5 miles), and Bohemia National Recreation Trail (6.5 miles). All but Fairview Creek Trail are located along the main ridges of the Sharps Creek watershed. Sharps Creek Road is one of the earliest routes into the Bohemia Mining District, dating back to 1895. The road is popular as a recreational driving opportunity, and was once featured as an interpretive auto tour known as the Tour of the Golden Past, but is no longer

promoted. There is also one designated Old-Growth Grove along Fairview Creek. Locations of developed and dispersed recreation sites and trails are indicated on the Recreation Sites Map.

The primary human recreational use activities in the Sharps subwatershed include hiking, biking, camping, nature study, picnicking, sightseeing, driving, hunting, fishing, and swimming. Other uses include off road vehicles, gathering forest products (includes berry, mushroom picking, etc.), and some winter play. Besides the scenery, the key recreation attraction of the Sharps Creek watershed is the historic and active mining that occurs within the Bohemia Mining District and along the streams originating from this area. This is a popular recreation activity however conflicts between recreationists searching for recreational mining and camping areas have potential to conflict with the activities of the mining claimants. Sharps Creek Campground offers the only recreational mining area for people to mine who do not have claims filed elsewhere.

Visual Quality Objectives

All land management practices are expected to result in a certain level of scenic quality, known as Visual Quality Objectives (VQO's). VQO's are designed to develop measurable standards or objectives for the visual management of forest lands. The Sharps Creek subwatershed is classified into three primary VQO'S ranging from partial retention to maximum modification. A Partial Retention objective is applied to the foreground areas adjacent to Sharps Creek and Champion Creek roads and within the Fairview and Bohemia areas. The surrounding areas are inventoried as modification and maximum modification.

Reference Conditions for Human Uses

Changes in the Sharps Creek watershed have occurred from the historical uses of the corridor. These changes are primarily due to the resource utilization that occurred. Prehistoric peoples used the resources that the landscape offered. Seasonally, they hunted, fished, and gathered products in the upland areas of Row River and Sharps Creek and they typically burned the landscape to improve these resources. Historical use of the area was not significant until Euro-Americans came into the area. Homesteaders relied heavily on what the landscape offered in that their lives were typically isolated and they survived on a subsistent lifestyle. Discovery of gold in the Sharps Creek and Bohemia Mountain areas during the 1850's brought in Euro-Americans to the Sharps Creek Watershed. Mineral development and subsequent timber resource utilization became a significant factor in leaving its mark on the Sharps Creek landscape.

Early human use of the Sharps subwatershed was limited to seasonal use by the local Kalapuyan Native Americans which inhabited the lowland valleys of the Willamette and its tributaries. The gentler slopes of the lower Sharps Creek watershed and the ridges along the perimeter of the watershed offer the best locations of Native American occupation. These lands of BLM and private ownership include about 11 known sites and 7 isolates. The upland areas in Sharps Creek, which is predominantly Forest Service ownership, have only 2 known sites and a few isolates reported. This upland area was primarily utilized for seasonal hunting and gathering trips to supplement their diet and winter stores of food as well as travel routes to facilitate trading with neighboring tribes. Of the known cultural sites in the Sharps Creek watershed, they are typically lithic scatters , rock features, and isolated tools all of which indicate seasonal short-term occupation. The lowland sites may have had more year round occupation. Epidemic diseases and social dislocation following the arrival of fur trappers, explorers, miners, and settlers between 1790 and 1840 resulted in the near extinction of local tribes.

Fur trading expeditions during the early 1810 to 1840's were the first to travel into and around the Willamette Valley. There is little evidence that fur trappers frequented the streams east of the valley floor as they concentrated their travels through the Willamette Valley and river valleys west to the coast. Therefore with the exception of an occasional fur trapper exploring the dense forested canyons of the western Cascades, the earliest Euro-American settlers came into the neighboring Row River Valley as the result of the Donation Land Act in 1850. Slowly settlement spread along the stream corridors and into the Row River valley between 1853 and 1860. As land claims populated the lowland areas, settlers moved further upstream and eventually onto the lower flat terraces along Sharps Creek.

The discovery of placer gold in Sharps Creek in 1858 and lode gold in Bohemia in 1863 brought in an influx of activity to the Sharps Creek area. As the mineral resource of the Fairview area was developed in the late 1800's access routes, roads and trails brought more people into the area. Meanwhile, interest in forest products began during the 1850's. With the construction of the O&C railroad came the technology of shipping lumber to regional and world markets and by the turn of the century the lumber market in the Willamette Valley was booming. By the 1910's a railroad came close to Sharps Creek traveling into the Layng Creek drainage to the north. Logging started in the Sharps Creek drainage soon after that. Forest Reserves were also developed near the turn of the century and rangers began patrolling and managing the forest lands of this area with emphasis on fire management and timber harvest. Trails and roads were constructed to facilitate the use and development of the area.

4. Synthesis and Interpretation

This chapter is organized by core topic, and by key questions from Chapter Two. The intent is to synthesize and interpret the information from the first three chapters and to provide a basis for recommendations in Chapter 5.

Erosional Processes

Management activities such as harvest and road building have affected erosional processes in Sharps Creek by increasing landslides, sedimentation and channel erosion. While road building practices have improved since the 1960's and harvest activities, especially slash disposal practices, cause less surface erosion than in the past, there are still concerns about maintaining the road system, activities on earthflow terrain and the potential for increased landslides and debris torrents.

Key Question: What are the important erosional processes in the landscape?

The important erosional processes operating within the watershed are mass wasting (landslides, debris slides and deep-seated earthflows), and stream channel erosion, including bed and bank erosion and surficial erosion typically as sheet, rill and gully. Of these erosional processes, the mass wasting component is the primary erosion process that has affected landscape development.

Key Question: How do disturbances affect erosional processes?

The effects of disturbance on erosional processes can be separated into natural disturbances and those associated with land management activities. Natural disturbances are primarily those that affect vegetation such as fire and disease, with landslides as the predominant physical effect of flood events. The combination of vegetation removal and saturated soil conditions is the primary contributor to landslide activity.

Surficial erosion is associated with disturbances that remove the effective ground cover such as fire and windthrow, and is a secondary factor in landslides. The erosion associated with landslides is surficial where the deposit and / or scarp are unvegetated and subject to the elements.

Under a natural disturbance regime, channel erosion is typically associated with channel changing events such as infrequent floods and debris flows that periodically affect the channel morphology. In most of the basin, the bedload transport of the channel exceeds the supply and there is little evidence of a fine sediment in-filling the substrate.

Management Related Disturbances

Analysis identified three management-related activities that affect erosional processes in Sharps Creek. At the landscape level, road construction and timber harvest have been the dominant disturbances that affected erosional processes. In particular, the erosion associated with mass wasting is the main component identified in the Sharps Creek watershed analysis area. Another factor that affects stream channel erosion in particular is mining activity, however there is little known about this process.

In a comparison based on cumulative data, several watershed groups were identified that have extremely high management-related landslide rates relative to those identified as natural in the inventory process. Lower Sharps West drainage group has the highest number of landslides identified in the entire analysis area. This finding is significant in that the landscape is predominantly earthflow terrain, where a high number of debris slides are relatively uncommon on the gentle to moderate slopes under natural conditions. Landslides identified as management-related appear to manifest a causal relationship with interruption of hydrologic flow paths and removal of vegetation on isolated steeper slopes.

The Quartz drainage group also appears to have a relatively high number of management related landslides, relative to the natural patterns. This area, unlike Lower Sharps West, is predominantly steep bedrock controlled slopes with a tendency for landslide activity to occur. Quartz drainage group has about 100 percent increase in landslides over natural occurrences identified in the photo record. A large proportion of these are presumed to be associated with timber harvest activities.

Martin and Walker drainage groups also had relatively high landslide rates associated with management activities in addition to some of the highest natural landslide rates identified in the Umpqua National Forest Landslide Layer.

In contrast, several of the drainage groups had very low numbers of management related landslides, relative to the natural levels. Upper Sharps and Fairview appear to be unaffected by management related landslides. The likely explanation would be the low amount of harvest activity and road construction in these areas. Another factor may be the strong geologic control of the slopes and limited soil development that are necessary for debris slides to occur.

As discussed in Chapter Three, the most dramatic effect of management activities on erosional processes has been the large increase in the amount of stream channel affected by debris flows and dam break floods. While it is recognized that debris flows are part of the channel development process in some geomorphic terrains, a number of low gradient stream channels, including Sharps Creek have been uncharacteristically subjected to these events with observable effects on riparian vegetation as well as channel morphology for a number of years.

Figure 46. Management Related Landslides

Key Question: Are the erosional processes outside the natural range?

As discussed in the previous section, several of the drainage groups appear to be outside the natural range, at least over the period of the photo record. In particular, both the magnitude and frequency of landslides and debris flows have been affected. A consequence of these findings is that there has been a modification of geomorphic processes that include wood, water and sediment. In conjunction with other impacts to aquatic and riparian habitat such as riparian harvest and valley bottom roads, the resiliency of the system has been reduced considerably.

Hydrology

Key Question: What are the local peak flow effects on stream channels and erosional processes?

An analysis of Row River peak flows measured below Sharps Creek, Brice Creek and Layng Creek from 1936 to 1992 determined that "there is no obvious evidence that the Row River peak flows …at the gauging station are increasing over the 56 year period of record. However, it is also apparent that management activities such as timber harvest and road construction can affect the timing and quantity of storm runoff in a local area…(and)…are…very significant in terms of their effect on the watershed." (Layng Creek Watershed Analysis, Appendix B-Peak Flows Assessment, 1995). The analysis shows that roads concentrate runoff on hillslopes and streams, and timber harvest can increase local peak flows in small drainage basins (especially in the rain-on-snow zone from 2,000 to 4,000 feet elevation). Even if these flows do not accumulate downstream, they can affect aquatic life, increase landslides and scour channels locally.

Road construction and the removal of large wood and standing trees in riparian areas adjacent to Sharps Creek and its tributaries, has had far-reaching effects on channels in the analysis area. Even existing peak flows are more damaging without the accumulations of fallen trees and floodplains to absorb streamflow energy (see Chapter 3 Aquatic Habitat). In Sharps Creek most of the stream and riparian area has been altered for 10 miles up to the confluence of Upper Sharps and Martin Creek. The channel is wide and shallow, with few refuges for fish and aquatic life. A deposit of gravel and trees in Sharps below the mouth of Walker Creek has one of the few low-gradient areas where flood energy is dispersed. Above Fairview Creek, Upper Sharps and its tributaries have better riparian vegetation and channel condition. Here, the effects of peak flows are less damaging. Roads (including mining roads) encroach on floodplains in Martin Creek and tributaries such as Clark, Quartz and China Creeks, and expose channels to more damage than would occur if the roads were not present.

Key Question: What is the hydrologic response to earthflow, weathered bedrock and resistant bedrock?

Low flows differ greatly in the three geologic landforms common to Sharps Creek watershed. Earthflow and weathered bedrock yield about 0.1 cubic feet per second

(cfs) per square mile. This means that in late summer, the 66 square-mile Sharps Creek watershed flows about 6.6 cfs, a stream perhaps 6 feet wide and a foot deep.

These low summer flows are typical of the weathered bedrock in Martin Creek drainage group (Quartz, China and Clark Creeks) and Walker Creek as well. Flow from the earthflows downstream of Martin Creek are similar. Upper Sharps Creek has more resistant bedrock, and flows are more than double those from lower Sharps and Martin. Upper Sharps Creek watershed (Fairview and Bohemia Creeks) flow 0.2 to 0.4 cfs/mi^2. Resistant bedrock may include fractured bedrock, which stores more winter soil water for summer flow. The result is higher, deeper flows and cooler water for aquatic life in Upper Sharps Creek and its tributaries. In September 1996 Upper Sharps Creek flowed 3.4 cfs, while the larger watershed of Martin Creek flowed only 1.5 cfs.

The geologic differences in hydrologic response during floods is less clear. The flood of November 18, 1996 may have been smaller on Sharps Creek than on Layng Creek and the Row River. Few culverts overtopped, and far fewer landslides occurred in Sharps Creek than in Layng Creek. The streamflow record for Layng Creek shows that much of the Row River flood came from that watershed. In a bigger flood, all geologic landforms in Sharps Creek may experience more landslides and channel scour.

No flow measurements are available for floods in Sharps Creek. Work elsewhere on the Umpqua and Willamette National forest shows that roads increase the effective length of streams most in earthflow lands (Umpqua National Forest, 1994). Gentler earthflows like those downstream and northwest of Walker Creek have fewer stream miles and more roads than steeper, dissected bedrock. Road ditches often function like streams when connected and can add as much as 60 percent to stream miles (Wemple Jones and Grant, 1996). This increases local peak flow and channel erosion, especially in soft earthflow soils. However, only 12 percent of the road network within the Sharps Creek watershed was found to have channel access.

The increase in stream length is less likely in weathered and resistant bedrock of Martin and Upper Sharps Creeks. In large floods small streams may overtop culverts (or plug them with rock and debris) from the additional flow from road ditches. In all landforms Jones and Grant (1996) showed that all floods in western Oregon of all sizes seem to increase when more than 25 percent of watersheds were cut, and more than 6 percent of their areas were occupied by roads. However, other researchers disagree with Jones and Grant's conclusions. For example, Thomas and Megahan, (1998) found no statistical downstream effect of clearcutting (> 25 percent) and roads (>6 percent) in large basins. While the effect of harvest and roads on big floods is hard to detect downstream, removal of road ditches (or interrupting them before they reach streams) and avoiding harvest upslope of roads can help reduce peak flow effects on headwater streams.

Stream Channels

Key Question: How have management activities affected the function of the stream channels in the mainstem of Sharps Creek and tributaries?

Figure 22 displays how the mainstem of Sharps Creek has been altered. Instream salvage of woody debris, removal of riparian trees, mining activities and road construction adjacent to the channel have cumulatively contributed to changes within the channel. The majority of the channel was a B Rosgen channel classification. Streams of this size and gradient would usually meander more with scour pools and depositional areas. However, the channel is now characteristic of an F channel type where there are long straight riffles. This has changed the channel function so that the stream now transports material quicker. This has resulted in limited pool habitat and less gravel deposition for spawning and macroinvertebrate habitat.

Few tributary streams appear to have been altered in regards to channel function, although surveys are lacking for tributaries on private and BLM land. Stream inventories for Puddin Rock Creek and White Creek have both indicated that mining activities have altered the upper banks so that the channels appear more like B channel types than A channels. The boulders were probably moved out of the bottom of the channel onto the upper banks.

Walker Creek experienced a large debris flow which has scoured the stream to bedrock. The stairstep morphology is gone from this high gradient stream and it is now scoured to bedrock in many places. Much of the material was deposited downstream in Sharps Creek.

Water Quality

Key Question: How has the present riparian condition affected stream temperature and which stream reaches could benefit most from improved riparian vegetation and structure?

Stream temperatures in Sharps Creek and its large tributaries (Martin and Upper Sharps) range between 64 and 76 degrees Fahrenheit in summer. This exceeds Oregon water temperature criteria and is too warm for good aquatic life habitat. Upper Martin and Upper Sharps were probably never much cooler, but Sharps Creek from Martin to the mouth has much less riparian shade and wood in the stream than it did before the road was built. Sharps Creek is probably 3-5 degrees warmer than it was under reference conditions.

The greatest heating occurs below the Martin-Upper Sharps confluence from White Creek at the Umpqua National Forest boundary to Staples Creek (see Appendix B). From there down to the mouth of Row River, stream temperatures Sharps Creek exceed 70 degrees during low flows, but some small tributary streams do provide cool refuges for fish, amphibians and aquatic insects near their mouths. Restoring tall riparian trees and stream structure to this reach of Sharps Creek and protecting riparian vegetation along tributaries below Martin creek, could be accomplished through a partnership of landowners and agencies within the basin. Stream temperatures were

not measured on many of these tributaries, but of those that were measured, Damewood Creek was the warmest (70 degrees), and could benefit from riparian planting or other restoration near its mouth. Riparian vegetation and channel condition should be protected throughout the watershed to maintain and restore water quality.

Key Question: What effect do human uses have on water quality, and what are the trends?

The same reaches of Sharps Creek and Martin Creek that have high water temperature are probably experiencing higher pH and lower dissolved oxygen than previously (see Chapter 3 -Current Condition-Water Quality). More riparian shade trees and large down woody material in the stream will likely help all water quality characteristics. It is likely that even small amounts of nitrogen that leach into streams after clearcut timber harvest may increase algae in the stream and affect water quality (see Appendix B). Deferring harvest or partial cutting may lessen this effect where much of a watershed has been recently cut (Umpqua National Forest, 1994).

The greatest human impacts to Sharps Creek water quality have probably already occurred. Conditions will improve slowly over the next century as riparian vegetation grows back and large trees cover more of Sharps and Martin Creek tributaries and as riparian protection is provided during future timber harvest. Riparian protection is expected on federal land under the Northwest Forest Plan. If riparian vegetation is not further protected on private land under the State Forest Practices Act, those streams will not improve. Road restoration, riparian planting, and protecting trees that fall into streams (especially Sharps Creek below Martin) would all accelerate recovery.

Sharps and Martin Creeks are Water Quality Limited Stream on Oregon DEQ's November 1998 list of streams which don't meet water quality standards. One way to improve water quality and remove these streams from the list is for landowners to cooperate on a Water Quality Management Plan through a voluntary watershed council (large and small private holdings, and public agencies like BLM and the Forest Service). Oregon DEQ and the U.S. Department of Agriculture have helped facilitate such groups where landowners support such a solution. A Water Quality Management Plan would set a goal for water temperature, for example, and council members would develop practices to achieve this goal. Information on water temperature and riparian condition in the watershed analysis can be helpful (ODEQ, 1997).

Mercury associated with mining may also be affecting water quality. Past mining methods involved using mercury to help leach out the gold. It is also possible that mercury naturally occurs within the watershed. When found, the miners extract mercury from the stream channel. Oregon Department of Environmental Quality is interested in mercury levels within the watershed. Preliminary data collected in the Row River indicated a higher than expected level within the fatty tissue of fish. More testing is needed.

Key Question: Are there conflicts between mining, water quality and the management of sensitive species in the Sharps Creek watershed analysis area?

In addition to the general effects of mercury on water quality from mining, there is some evidence that mining activities within streams and along riparian areas are having adverse effects on aquatic and terrestrial amphibians. The level of the impact has not been assessed because of the lack of information on the extent and the location of the mining activities.

Several terrestrial species that may be at risk of continued inhabitation throughout the watershed at viable numbers because of mineral and forest management activities include: White-footed vole, Townsend's big-eared bat, Long-eared myotis, Fringed myotis, Long-legged myotis, Yuma myotis, Silver-hair Bat, Oregon Slender salamander, Tailed frog, Red-legged frog, Clouded salamander, Torrent salamander, Sharp-tailed snake, Western pond turtle, Harlequin duck, Ringtail cat and Marten.

Vegetation, Soils and Fire

Vegetation

Key Question: What is the natural range of variability in Sharps Creek for late successional vegetation?

The natural range of variability for late successional vegetation in the Coast Fork Willamette is 45 to 75 percent late seral vegetation (>80 years) based on the Regional Ecosystem Assessment Project (REAP USDA, 1993). Currently, 48 percent of the vegetation in Sharps Creek watershed analysis area is greater than 80 years old. If only the riparian reserves and LSR remained in a late seral state, this percentage would drop to 40 percent. If the vegetation growing on unsuitable soils, within the small LSR's, and within the connectivity blocks stays intact, it is likely that the percentage will eventually range between 50 and 60 percent.

Structural Stage Distribution

Key Question: How have the vegetation conditions changed in Sharps Creek and what are the trends?

The distribution of current and reference vegetation in Sharps Creek is tabulated below in three succession stages; early-, mid- and late succession. The early succession stage used in this table includes all stages less than 80 years old and includes both establishment and thinning vegetation stages. Similarly, the mid-succession stage includes mature stands between the ages of 80 to 150 years. The late succession stage includes both transitional and old growth vegetation stages that are generally greater than 150 years in age.

By comparing current and reference vegetation stages in the following table, one can see how management and time have altered the distribution of structure stages. The early succession stages have increased in all Landscape Areas as a result of timber

harvest, with early-seral vegetation increasing most dramatically in the Lower Sharps Landscape Areas. Timber harvest has also reduced the extent of mid-succession vegetation in both West Lower Sharps and, to a lesser extent, in East Lower Sharps and West Upper Sharps. Some of the mid-succession reference-condition stands have become late succession stage under the current condition in East Lower Sharps. The current distribution of structure stages has changed the least from the reference condition in Upper Sharps Creek Landscape Areas.

Table 41. Distribution of Historic and Current Vegetation Stages in Landscape Areas

Landscape Area	Vegetation Stages (percent of area)					
	Early-		**Mid-**		**Late-**	
	Reference[a]	Current	Reference	Current	Reference	Current
Lower Sharps West	16	96	68	1	16	3
Lower Sharps East	7	58	86	11	7	31
Upper Sharps West	NA	51	NA	11	NA	38
Upper Sharps East	NA	15	NA	49	NA	36
Upper Sharps (East & West)	7	31	44	34	49	34

[a] The distribution of Reference Vegetation Stages in this table is derived from Brice Creek 1850 Reference Vegetation in comparable Landscape Areas of Brice Creek. The geomorphology and climate of Brice and Sharps Creeks are very similar; and as a result, the two watersheds probably had comparable vegetation patterns over time. Also, the mapping of Reference Vegetation in Brice Creek was done at a scale that is comparable to current vegetation mapping in Sharps Creek.

By comparing the distribution of current and reference vegetation stages *by landunit*, one can see the effect of management on the distribution of structure stages on different types of lands and vegetation in Sharps Creek.

Table 42. Sharps Creek Current and Reference Vegetation by Landunit

Landunit	Vegetation Stages (percent of area)					
	Early-		Mid-		Late-	
	reference	current	reference	current	reference	current
Warm/Dry Gentle	13	49	61	24	26	28
Warm/Dry /Steep	14	31	48	34	38	36
Warm/Moist/Gentle	17	91	60	2	23	7
Warm/Moist/Steep	15	59	47	9	38	32
Cool/Dry/Steep	17	30	26	50	56	21
Cool	25	42	32	36	43	22

By comparing current and reference amounts of early succession vegetation, it appears that timber harvest has most changed the current distribution of vegetation stages in the more productive warm/moist landunits. At the same time, harvest-related changes have

affected the less productive warm/dry landunits the least compared to reference conditions, as the current distribution of early succession stages shows. At high elevation, in cool landunits, timber harvest has reduced the amount of late-succession vegetation stages compared to reference conditions.

Structural Stage Development by Landunit

In unmanaged stands the process of succession is characterized by different structural stages that, in a simple way, represent age classes. The rate that vegetation progresses through structure stages is affected by a site's moisture and temperature regimes, by competition among species and by other site factors that affect the occupation and growth of different species following disturbance. For even age stands, the rate of structural stage development can be characterized by landunits. For example, the early succession stage generally has been characterized as stands less than 80 years of age, but this early succession stage occupies a warm/moist site for as little as 60 years, a cool site for 75 years and a warm/dry site for as long as 110 years. Differences in the growth rates and ages of vegetation structural stages by landunit reflects stand exam data for young, mature and old growth forests in the Little River drainage, North Umpqua River basin and the Western Cascades geologic province. (USDA & USDI, 1995, Appendix C-7).

Table 43. Structure Stage Development by Landunit

Landunit	Height. Growth	**Age Range**	Growth	**Age Range**	Growth	**Age Range**	Growth	**Age Range**	Growth	**Age Range**	**Age**
Cool	4.5'	**0-15**	40/20	**15-25**	35/20	**25-45**	27/20	**45-75**	15/20	**75-141**	**141+**
Warm / Moist	4.5'	**1-10**	40/20	**10-20**	46/20	**20-35**	32/20	**35-60**	19/20	**60-112**	**112+**
Warm/ Dry	4.5'	**0-12**	31/20	**12-25**	26/20	**25-52**	13/20	**52-112**	17/20	**112-172**	**172+**
DBH range	0-1"		1-5"		5-12"		12-20"		20-30"		30"+
Brown's stage	Grass-forb		Shrub		Open Pole		Closed Pole		Mature		Old Growth
Succession Stage	Early								Mid-		Late

Snags and Large Woody Material by Landunit

The presence and abundance of snags and logs is a product of succession and disturbance. Differences in amounts of large wood is thus related to vegetation structure stage. In the development of even-age stands in the absence of fire disturbance, snags and large wood are most abundant in the early stage, least abundant in the mature stage, and intermediate in abundance in late succession stage (Spies et al, 1988). The effect of fire disturbance on the large wood resource is highly variable and depends upon both the frequency and the severity of the disturbance regime under which a forest develops. For example, in Upper Sharps Creek, the lowest levels of snags and logs exist in Dry/Steep landunits where fire frequency and severity are relatively high. Frequent and severe fire effects combine to reduce the ability of a site

to produce and sustain large wood structure. Table 20 summarizes differences in snags and logs by landunit in mature and old growth forests in upper Sharps Creek, and reflects differences in timber stand exam data from that vicinity (data for the warm/moist/gentle landunit is from Brice Creek exam data).

Differences between mean lengths of snags + logs in the warm/moist/steep and warm/dry/steep landunits appears to be statistically significant. The comparison of means in warm/dry/steep and cool/dry/steep also appears to be significant. However, comparison of means with such large differences in sample variances is awkward, and forces one to ask the question, "Are these differences relevant to this analysis?" In fact, amounts of debris and numbers and size of debris pieces generally increase with site moisture, probably as a result of higher productivity, lower fire frequency and lower decay rates on moist sites (Spies & Franklin, 1991.

Table 44. Sharps Creek Snags and Large Wood Data Summary

Landunit	Snag /Log	Plots (N)	SUM Snag/ Log (feet)	MEAN Hgt./Lgth. (lin.ft. per ½ acre)	Standard Deviation (feet)	Mean Snags/Plot (½ acre)
Warm/Moist/Gentle	SNAGS + LOGS	71	na	415	376	na
Warm/Moist/Steep	SNAGS	22/45	2724	60.5	119.3	2.32
Warm/Moist/ Steep	LOGS	44/45	18147	403.3	267.9	
Warm/Moist/ Steep	SNAGS + LOGS	45	20,871	463.8	266.2	
Warm/Dry/Gentle	SNAGS	38/65	3990	61.4	91.7	2.13
Warm/Dry/Gentle	LOGS	54/65	13,300	204.6	246.0	
Warm/Dry/Gentle	SNAGS + LOGS	65	17,290	266.0	208.7	
Warm/Dry/Steep	SNAGS	53/92	3706	40.3	59.6	1.49
Warm/Dry/Steep	LOGS	84/92	19,259	209.3	198.6	
Warm/Dry/Steep	SNAGS + LOGS	92	22,965	249.6	177.4	
Cool	SNAGS	16/37	1197	32.4	61.4	1.63
Cool	LOGS	34/37	5258	139.4	151.6	
Cool	SNAGS + LOGS	37	6355	171.4	134.0	
Cool/Dry/Steep	SNAGS	11/18	527	29.3	50.3	1.36
Cool/Dry/Steep	LOGS	15/18	1573	87.4	65.6	
Cool/Dry/Steep	SNAGS + LOGS	18	2100	116.7	65.2	

Key Question: Are there associations between vegetation, soils, and other site variables that would be useful to reference, while prescribing for management activities?

Two landscape stratifications were developed to describe associations between site variables in Sharps Creek watershed. While both stratifications are useful for prescribing management activities, Landscape Areas may be most useful for landscape analysis and soil resiliency units most useful as a site specific management tool.

Landscape Areas

The three Landscape Areas in Sharps Creek reflect differences in landunit patterns, reference vegetation patterns, dominant erosion processes and differences in past management practices associated with the pattern of land ownership (a similar set of Landscape Areas based on landunit patterns were defined for Brice Creek watershed (USFS, 1997).The three most important disturbance processes that affect vegetation in Sharps Creek analysis area are fire, erosion and human use. These three processes can be used to broadly characterize the pattern of vegetation in the Sharps Creek landscape.

The objective for landscape areas is to define areas that represent broad-scale differences in vegetation pattern, stream characteristics and human use patterns.[1] These Landscape Areas can be the basis for developing a desired landscape pattern that reflects;

- *range and variability of historic vegetation patterns of different Landscape Areas,*
- *riparian and stream channel morphology, and*
- *human use patterns, including effects of land ownership and management history.*

Table 45. Distribution of Landunits in Sharps Creek Landscape Areas

Sharps Creek Landscape Areas	Landunits (percent of area)					
	Warm/Dry / Gentle	**Warm/Dry/ Steep**	**Warm/Moist/ Gentle**	**Warm/Moist/ Steep**	**Cool**	**Cool/Dry/ Steep**
Lower Sharps West	13	5	30	42	10	-
Lower Sharps East	83	10	4	3	-	-
Upper Sharps West	19	19	3	43	3	-
Upper Sharps East	26	23	1	21	24	5
Upper Sharps East/ West	23	21	2	30	21	3

[1] USDA Forest Service, 1993. *Integrating Landscape and Watershed Planning for Ecosystem Management: The Augusta Project*. Cascade Center for Ecosystem Management. Willamette National Forest, Blue River, Oregon, 97413.

In moderate fire regimes the pattern and patch sizes of vegetation stages over time is quite variable (Agee, 1990). The product of a moderate severity fire regime is a complex mosaic of vegetation that is initiated by a mix of fire effects and fire return intervals over the landscape. Differences in the effects of any one fire event reflect the variability in topography, site productivity and fire season climate on a landscape scale. The pattern of vegetation that burns also affects fire behavior producing a vegetation "neighborhood" effect (Witherspoon and Skinner, 1995). Landscape Areas define landscape-scale differences in these variables and their effect on fire disturbance.

Different patterns of landunits define the three Landscape Areas in Sharps Creek. The following table is a discussion of vegetation disturbance patterns by Landscape Area. Upper Sharps East and West are combined into one landscape area called Upper Sharps.

Table 46. Disturbance Attributes by Landscape Area

Landscape Area	Fire	Erosion	Human Uses
Lower Sharps West	The historic vegetation pattern is assumed to be a mature forest matrix with a complex pattern of early- and late-seral patches similar to the comparable area in lower Brice Creek. This pattern was the result of the moderating effect of gentle slopes on fire behavior combined with fuel buildup associated with productive warm/moist environments. The gently-sloping terrain and moist environment has the effect of lengthening the return-interval for stand replacement fire event. Longer fire-return intervals and low intensity fire effects that are characteristic of the warm/moist environments generate multi-aged stands. In contrast, heavy fuel build-up and layered forest canopies promote stand replacement fire effects under extreme fire conditions. Remnant old growth patches are most likely maintained in riparian areas and on gently-sloping northerly aspects.	Outside the Buck creek drainage, the dominant geomorphic feature in Lower Sharps Landscape Area is earthflow terrain. The predominance of gentle slopes characteristic of earthflow terrain is reflected in a relatively low natural landslide rate, except along steep, incised channel sideslopes. In a warm environment, high site productivity and relatively large inputs of wood to stream channels provides structure and resilience to channel erosion. Relatively low channel gradients and oblique tributary junction angles are not conducive to debris flow process and associated channel scouring.	The gently-sloping la areas were roaded an these areas have the h on stream channels in extensions. Furtherm ownership in the **Lov** simplification of the v uniform and younger compared to the refer
Lower Sharps East	The reference vegetation for this landscape area is dominated by a matrix of mature, even-age forest with relatively few patches of early and late-seral forest compared to Lower Sharps West. The spread of fire on steeper slopes and southerly aspects (warm/dry/gentle & warm/dry/steep landunits) has the effect of shortening the fire-return interval for moderate severity fire effects. Between stand replacement fire events, fuel buildup is relatively low compared to Lower Sharps West due to increased frequency and extent of low intensity fire effects, a process that consumes ground fuels. Remnant patches of late-seral western red cedar and western hemlock forests are maintained in riparian zones.	Outside the Lick and Adams creek drainages, the dominant geomorphic feature in Lower Sharps Landscape Area is earthflow terrain. The predominance of gentle and moderate slopes characteristic of earthflow terrain is reflected in a relatively low natural landslide rate, except along steep, incised channel sideslopes. In a warm environment, high site productivity and relatively large inputs of wood to stream channels provides structure and resilience to channel erosion. Relatively low channel gradients and oblique tributary junction angles are not conducive to debris flow process and associated channel scouring.	By comparison, **Low** ownerships and slope pattern of vegetation, today
Upper Sharps	The historic vegetation pattern in Upper Sharps landscape area is more complex than Lower Sharps areas. Steep slopes, alternating north/south aspects and warm/cool temperature environments effects a complex pattern of vegetation disturbance made by fire. The dominance of the Douglas -fir forest suggests frequent fires comparable to Lower Sharps East. Under severe fire conditions, the spread of fire on steep slopes that predominate in the area would create a mosaic of fire effects aligned with the landunit pattern. The high intensity fire effects of the 19th century fires has restricted remnant late-succession patches today to the lower slopes and narrow riparian zones. However, the reference percentage of late-seral is the highest of the three Landscape Areas because of the complex physiography.	This landscape area as well as the Buck , Lick and Adams drainages have higher natural landslide rates than Lower Sharps areas, a reflection of the prevalence of steep slopes and weathered bedrock. Steep channel gradients combined with higher natural landslide rates produce more frequent debris flows and disturbance to riparian forests that are confined to narrow stream corridors confined by steep terrain .	Later road building a Upper Sharps has res fragmented vegetatio Aside form the Walke almost entirely in fede

Soil Resiliency

Soil resiliency is defined as the ability of a soil to readily recover from disturbance impacts, both human-caused and natural. In other words, resilient soils can maintain nutrients and structure while resisting erosion, fire and timber harvest effects, or other soil disturbance impacts. On the other hand, even the most resilient soils can be *sensitive* to disturbance due to soil properties that make them *susceptible* to erosion and loss of nutrients and structure as a result of disturbance processes. For example, clayey soils on gentle land surfaces have high resilience, yet they are "susceptible" to loss of structure as a result of compaction from equipment operation. The *sensitivity* of soil to disturbance is the product of the resiliency of that soil and susceptibility to that disturbance process. With this definition of soil sensitivity, the most sensitive soils in a landscape are those with low resiliency and high sensitivity. In Sharps Creek the most sensitive soils to disturbance, including effects of fire and timber harvest, are the rocky soils on steep slopes in upper Sharps Creek that have low resilience.

Soil properties that affect resiliency include properties important to plant growth including soil moisture, organic matter, temperature, structure, rooting depth, etc. For example, where soil moisture limits plant growth, soil properties that affect water retention (soil depth, texture, structure, rock content and organic matter) are used to determine resiliency.

In upper Sharps Creek most soils are on steep to very steep (>60 percent) slopes. Most soils are also very rocky (35 to 60 percent rock) to extremely rocky (>60 percent) rock fragments. On steep slopes shallow rocky soils have low resiliency and they are susceptible to erosion from both mass-wasting and surface erosion process.

Soil temperature also affects resiliency. In upper Sharps Creek, elevation and aspect were used to define warm and cold temperature regimes. Cold, rocky soils in upper Sharps Creek that are shallow and moderately-deep have low resilience. Cold, deep soils have moderate resilience. The following two tables show resiliency properties at high and low elevations.

Table 47. Resiliency Properties of High Elevation Soils in Sharps Creek

Resilience	Soil Depth	Rock Fragments	Aspect (Elevation)	BLM Soil Resiliency Code
Low	Shallow (0-20")and Moderately Deep (20-40")	All	North (> 3200')and South (>4600')	4
Moderate	Deep (40")	All	North (> 3200')and South (>4600'	7

Figure 47. Soil Resiliency

At low elevations on warm sites, soils depth, aspect and rock fragments content were used to determine resiliency. These are the soil properties that most affect soil moisture retention as well as resiliency.

Table 48. Resiliency Properties of Low Elevation Soils in Sharps Creek

Resilience	Soil Depth	Rock Fragments	Aspect (elevation)	BLM Soil Resiliency Code
Low	Shallow	All	North (<3200') South (>4600')	3
	Moderately Deep	> 60%	North (<3200') South (>4600')	3
Moderate	Moderately Deep	35-60% or >40% cobbles	North (<3200') South (>4600')	6
	Deep	>60%	South (>4600')	3
High	Deep	All	North (<3200')	9

Landscape Area Soil Quality

Soil quality is an overall measure of soil's condition in a given disturbance regime, including both natural and man-caused disturbances. Soil quality represents the sum of the effects of disturbance on the productive capacity of a soil. Simply put, the highest quality soils support and sustain the most productive ecosystems. The sensitivity of soil to changes in quality, or productive capacity, is a product of a soil's resiliency and its susceptibility to disturbance-related productivity losses.

Lower Sharps West is dominated by soils of high to moderate resiliency. High resiliency, clayey soils in this area such as the Honeygrove soil series are susceptible to surface erosion when bare because of the series' low permeability sub-soils. These same soils, when wet and subject to repeated passes by heavy equipment, are susceptible to compaction because of fine-texture soil surfaces and because they exist on gently sloping lands that are easily accessible to machinery.

Lower Sharps East is dominated by soils of moderate resiliency . Soils are generally shallower on steep slopes and southerly aspects characteristic of this area. Soil organic matter, a soil property important to soil resiliency is lower as a result of higher decomposition rates and fire return intervals on south aspects.

Upper Sharps is dominated by soils of low resiliency. Most high elevation soils, except the deepest ones , have low resiliency because they are cold. At lower elevations, shallow or extremely rocky soils have low resiliency because of low moisture and nutrient storage. Deeper soils at lower elevation have moderate resiliency. These low to moderate resiliency soils are susceptible to surface erosion on steep slopes when bare and are susceptible to mass erosion processes along drainage - ways.

Fire

Key Question: How has the role of fire changed and what has been the effect on vegetation?

Changes in Fuel Model Distribution

Where there was once approximately 6,400 acres of brush/establishment, mostly in the upper elevations of the watershed, today those areas are primarily timbered. The older, denser stands in these areas include both transitional and old growth. As they continue to age, fuels will build and the areas will become more susceptible to intense fire behavior. The current condition of these stands, and the heavier fuel conditions that will eventually prevail, may be typical of the area as it reaches the stand replacement stage of the fire cycle.

Conversely, in the lower elevations 10,600 acres of land that was once mature or old growth timber are now in various stages of brush, establishment, or young timber. Where these stands were more contiguous in reference times between stand replacement events, and in some areas maintained through intermediate lower intensity fires, we now find a patchy distribution of a greater variety of fuel types. Past and current harvest practices, as well as fire suppression, play the primary role in the makeup and distribution of the fuel models today. In the areas of mixed ownership, the noncontiguous and dynamic nature of the fuel models will likely continue.

In reference times there were approximately 1,500 acres of open, grassy areas; today there are only 190 acres of meadow, about 10 percent of what was there historically.

Changes in Fire Intensity Levels - Impact of Settlement, Fire Suppression Policy, and Management Activities

Fire was a common occurrence and played a major role in the watershed in reference times. Early settlers did not have a significant influence on the fire history of the watershed in the last half of the 1800's. The establishment of the forest reserves, and subsequent protection measures in the early 1900's, played a more significant role.

Fire suppression policies were developed to protect the forest reserves after the devastating fires of 1902 when severe fires occurred in almost every county west of the Cascades. With the implementation of these policies, fires located in the watershed were extinguished, often before they attained substantial size or intensity. With few exceptions, most lightning and human caused fires were extinguished at less than one acre. Today, full suppression (control) is still the primary action taken; occasionally limited suppression (contain) is used; rarely is nothing more than monitoring a low risk fire (confine) done. A full suppression fire policy has had a significant effect on the role fire plays in maintaining fuel types and their distribution in some portions of the watershed, where in other areas the effects of fire suppression are secondary to the effects of harvest practices.

Slash burning has also had an effect on the watershed. Since 1951, over 1,410 acres of lands managed by the Forest Service in Sharps Creek watershed has been either broadcast or underburned. If data for private and BLM slash burning were available,

this acreage figure would be much higher. Past harvest/burn/replant practices have created a patchwork mosaic of land. In many places these burns were possibly more severe than the area had been subject to previously, while in other places the opposite was probably true, particularly on mixed ownership lands where no burning was done after harvesting. Prior to the mid-80's, slash burns often took place in the summer and fall months when fuels were at their driest. These burns were generally more intense, and had greater negative effects in regards to soils and coarse woody debris. Since the more contemporary practice of Spring burning has become prevalent, overall intensities and negative effects have diminished .

Currently, fires are smaller in size, regardless of ignition source, due to both suppression activities and past fire episodes in the watershed. Larger fires tend to occur between Puddin Rock and Sharps Creek and in the upper Sharps Creek drainage where the topography is bowl shaped. Fuels on the north slopes of Sharps Creek build up due to the moist plant associations on the north facing, steep topography. Given certain weather conditions and dry fuels, fires in this area have the potential to burn to larger sizes. The fuels on the south and westerly slopes are generally drier, and are more exposed to prevailing winds. Fires starting in these areas are more intense and have potential to grow because of these factors.

In contrast, with the exception of the two areas mentioned above, fire intensities were widely distributed in reference times. Areas of low to moderate intensity were intermixed with areas of moderate to high intensity. Due to the fire history of the watershed, a more open forest was maintained in most areas. The last major moderate to high intensity fires occurred in the 1890's. In terms of intensity, we are approaching the stand replacement fire return interval of 100-150 years for the watershed.

Figure 48. Fire Risk

Changes in Fire Regime and Range of Variability

The optimal conditions for interpreting natural disturbance regimes are a long, pre-European settlement record with a high frequency, low severity disturbance regime, which permits sampling numerous events per site with dendrochronologic methods. Some areas of the watershed met this criteria; exceptions were areas that are roadless or experienced repetitive stand replacement fire events.

In pre European settlement times, fires were a frequent occurrence in the watershed and the overall fire regime was maintained. A wide range of fire intensities occurred, resulting in a complex, dynamic mosaic of forest composition and stand age structure. The mosaic burns of the past appear to have affected vegetative types, distribution, and sustained old growth..

In the mid to late 1800s, influence from mining on the watershed was negligible; pioneer miners rarely set large areas on fire, and mainly used fire in a "cut and burn" style.

Since the turn of the century, fires have been a frequent occurrence within the watershed, with a broad range of sizes and intensity. When the fires grew in size, overall intensities tended to be moderate. Had suppression policies not been in place, it is very likely many of the smaller fires would have become larger, with higher intensities. Fire suppression, however, has minimized the role of natural fire, particularly those of low to moderate intensity.

Changes in Air Quality

In the past air quality was often poor. Regardless of ignition source, fires would have burned longer and more intensely, resulting in increased consumption and resulting emissions. Down canyon and down wind effects would have varied, depending on weather conditions. Smoke in the Willamette Valley and Willamette River drainages would have been a common occurrence in the summer months, and inversions would have contributed to prolonged poor air quality in the valleys. Wood burning for heat in the winter months would also have contributed to poor air quality; inversions are most common in the area at this time of year and sole reliance of wood for heat resulted in high emissions on a daily basis for several months of the year.

In the early to mid-1900's through the 1950's, air quality began to improve somewhat. Indian ignited fires were no longer a regular occurrence, and settler fires slowly decreased as land was cleared for homes and pasture land. Logging was starting to pick up in the forest, however, and slash burning smoke filled the air, mostly in the summer and fall months. It was during this time period that fire suppression policies were fully implemented , and most fires of other origins were suppressed before significant emissions could be produced. Wood burning in the winter months was still a major contributor to poor air quality, though that was beginning to change with the development of other sources of heat.

In the 1960's and 1970's logging activities increased with a corresponding increase in slash burning emissions. In the 1980's logging decreased somewhat, but slash burning was still the accepted and preferred disposal method. Most of these burns were still carried out in summer and fall, but a trend toward spring burning had begun. Until the mid-60's there was little concern about air quality and residual smoke impacts to people.

With the passage of the Clean Air Act in 1967 and amendments in the 1970's, regulations were put into effect which restricted activities that contributed to air quality degradation. By the mid 1980's prescribed burning techniques were being implemented which further reduced negative impacts to air quality. Restrictions were in place which also reduced winter wood burning impacts.

In the 1990's we have only burned within the spring burning period. None of these burns impacted air quality outside the immediate vicinity of the burn. Through the techniques we employ and the regulations we adhere to we have minimized air quality impacts to downwind areas, and have not had a smoke intrusion due to prescribed burn activities for several years. Since presettlement times air quality has gradually improved. Technology has advanced to the point that most smoke management and air quality concerns can be mitigated. An exception is the uncontrolled wildfire, which would impact air quality much more than prescribed burning does, even if management ignited prescribed fire (MIPF) were implemented.

Changes in the Role of Fire on the Fuel Condition

Natural fires once created, modified, and maintained fuels conditions within the watershed. Low intensity, partial stand replacement, and stand replacement fires served to keep the forest floor relatively clear of large build-ups of fuels. These fires also maintained a dynamic mosaic of fuel models over large areas of the landscape. Stand replacement fires burned periodically, consuming most of the fuels that would have built up in the area over time due to disease, insects, weather events, or past fires.

The use of fire by humans once involved maintaining conditions for hunting, gathering, traveling, and grazing. Most of the time these fires would be of lower intensities, usually to clear out brush or burn off grasses. Exceptions probably occurred when higher intensity fires resulted, but for the most part human-set fires maintained fuels conditions previously established.

In this century fire has been used as a management activity for fuels hazard reduction. Clearcuts and other harvest areas have been burned primarily to reduce wildfire risk, an objective that goes back to 1902. A secondary role has been to use fire as a silvicultural tool to clear slash for replanting. In terms of fuel levels, the outcome of slash burning in the watershed is similar to the effect of fires in reference times, except that the distribution of fuels and mosaic effect on vegetation has not been maintained. Fire has not been allowed to burn after natural ignitions (prescribed natural fire), nor has it been reintroduced to the watershed purposefully (management ignited prescribed fire). Management activities and fire suppression have encouraged fuels to build up in areas that have historically had low loadings, and have allowed burning in areas which

had not experienced the moderate to intense slash burns that were characteristic of the 1940-1970's. Prescribed natural fires would have left snags and down logs. The combination of harvest and slash burning has reduced this habitat.

The overall role of fire in the watershed has been minimal since the early 1900's. As a companion to silvicultural practices, and for hazard reduction purposes, it has played a major role in preparing sites for planting and mitigating wildfire risk. While we have been mostly successful in preventing large fires from occurring, we have at the same time prevented many of the areas within the watershed from benefiting from the many effects of fire that may contribute to a healthier forest.

Effects of Fire Exclusion on Vegetation Structure and Watershed Processes

The effect of continued exclusion of fire will be forests with stands that are older on-the-average than historically, and which will function much differently ecologically. Due to both forest density and to the kinds of tree and other plant species that will emerge to replace the existing forest overstory, they will be forests which are more unstable than the ones they are replacing, i.e. , more susceptible to catastrophic fire. There will be denser understory in previously open stands of trees, a higher potential for mortality from insect and disease epidemics, potential loss of seral tree, shrub, and herbaceous species important for natural diversity and wildlife habitat; and heavy fuel build-up. These changed conditions will lead to larger, more severe wildfires that can be expected to result in more significant impacts to water, soil, and air resources than would have been typical in pre-European forests.

Though fire played a major role in maintaining or modifying the watershed condition in reference times, continued exclusion and suppression decreases the effectiveness of fire as a tool in maintaining and modifying structure and processes, and sets the stage for major, destructive fire events in the future. The watershed is still within its natural range of variability, and is due for a moderate intensity, partial stand or stand replacement fire to occur.

While slash burning plays a part in reducing hazard within discrete areas, it does not benefit surrounding areas; i.e. , the landscape in the drainage or sub-watershed around it doesn't receive the treatment it may require to effectively mitigate the hazard over the total potential burn area. A clear-cut burned within an area susceptible to stand replacement fire, for example, may not be an effective control point to slow or stop a fire's spread.

Key Question: Are there management activities that can replicate the effects of natural fire on vegetation?

Potential Restorative and Enhancement Opportunities

Some of the timbered stands in the watershed have become denser in terms of fuel loading. The primary causes have been fire suppression, lack of landscape prescribed fire, and severe weather events. The overall fuels condition will continue to deteriorate, and stands will become more susceptible to fire. The role of fire as a maintenance

function will change significantly throughout the watershed as fires continue to be fully suppressed.

If we maintain the status quo, continuing full fire suppression and doing little prescribed burning other than for silvicultural or hazard reduction purposes within timber sales, fuels will continue to build; the high fuel loadings will be maintained; eventually intense, stand replacing event s will occur.

Flame lengths in excess of eight feet are generally not affected by control technologies. Control is more successful when flame lengths are below eight feet. Factors that contribute to success include increased moisture, loss of fuel continuity, drop in wind velocity, and change in slope. As fuels continue to build in the forests, wildfires continue to become larger and more severe. When controlling the size of wildfires is mentioned, it is intended for wildfires burning within the limits of control technology. In addition, most large wildfires incur significant spotting. It can be very difficult or impossible for aerial retardant to be effectively delivered on the spot fires due to the smoke, intense heat, and strong turbulence. Fuel breaks and roads are usually ineffective in stopping or slowing the spread of a spotting wildfire.

Potential Effects of Future Prescribed Fire Activities

If prescribed fire continues to be used as it has in the past, to meet silvicultural and fuels management objectives, the watershed will continue to experience limited prescribed fire in isolated pockets, to the neglect of the area as a whole. Eventually a large, stand replacing fire will occur which will probably have some level of severe effects on the watershed and on air quality.

Instituting management ignited prescribed fire may not immediately or effectively mitigate the risk of high intensity stand replacement fire, but over time may decrease the risk significantly. Application of fire to select areas may have the added benefit of restoring fire's maintenance role to portions of the watershed.

Natural fuels planning on the District, particularly in the Sharps Creek watershed, may bring to light areas that would benefit from recurrent management ignited prescribed fire. The recommendations in chapter six will address this potential in more detail.

A portion of Late Successional Reserve (LSR) 222 is situated within the watershed area managed by BLM. Fuels in these stands have been increasing, and there is concern that potential effects of a wildfire occurring within the LSR may be severe. The general discussion of LSR's in the Record of Decision mentions fire as a natural process in retaining the forests in a natural condition. Further, it states that small scale disturbances by wildfire and other agents will be allowed to continue, and that use of prescribed fire in the LSR is allowed. In the discussion on management of disturbance risks, it states that reintroduction of fire may be necessary, and discusses under -burning over a large area. Since there is a moderate risk to the LSR, options to mitigate the risk will be discussed in the recommendations section.

Summary

The Augusta Creek Project at the H.J. Andrews Forest (Willamette National Forest) yielded some general lessons about historic vegetation patterns that appear to be relevant to the Sharps Creek watershed as well. Both areas have a similar fire return interval and fire regime. Three main points were made in the Augusta Project summary.

1. Fire has been a significant and persistent component of the ecosystem, resetting stand conditions and influencing stand development.
2. The resulting vegetative patterns have been highly variable in time, space, and structure.
3. Fire and vegetation patterns appear to be correlated with topographic features.

Though complex, there are opportunities to manage the landscape more closely along the patterns of natural disturbance, which might be used as a template for forest management. Ultimately, a focus on maintaining the ecosystem under a regime which resembles reference conditions will require evaluating wildfire suppression methods and the potential use of prescribed fire, as well as addressing air quality concerns.

Terrestrial Species and Habitat

Threatened, Endangered and Sensitive Animal and Plant Species

Key Question: What role does the watershed play in providing conservation or recovery of wildlife and plant species?

Spotted Owl

Twenty owl pairs were analyzed in Sharps Creek watershed; fifteen pairs will never reach the "take" threshold which is when suitable habitat within their home range drops below 40 percent. In 100 years, habitat will have recovered and sixteen pairs will retain suitable habitat through the life of current Standard and Guidelines. The Sharps Creek watershed contains portions of three critical habitat units (CHU's), part of which is overlapped by a Late Successional Reserve, that provide suitable nesting-roosting-foraging habitat. See Appendix E for more detail on this subject.

Bald eagle (*Haliaeetus leucocephalus*) Status: Threatened

This species will probably continue to recover throughout its range. Habitat conditions will improve within the watershed, providing additional roost and nest sites.

Northern goshawk (*Accipiter gentilis*) Status: State Sensitive

This species will continue to experience net loss of mature forest on Matrix land of about 6,000 acres over the next fifty years, a reduction of about 11 percent from current conditions. This will reduce suitable habitat conditions to 50 percent, still within the range of natural variability. After 80 years approximately 70 percent of the

watershed will become suitable habitat. It is probable that these species will maintain viable population within the watershed.

American peregrine falcon (*Falco pereginus anatum*) Status: Endangered

Protocol surveys need to be conducted in the Bohemia and Adams Mt. area to avoid disturbance from management activities. If breeding pairs are located, management activities will be modified to neutralize impact on this species. It is expected that this species will continue to increase throughout its range in the Northwest.

Pileated woodpecker (*Dryocopus pileatus*) Status: State Sensitive-Vulnerable

Loss of habitat will continue to occur on Matrix land from timber harvest operations. Mitigation efforts to retain existing snags, snag creation, and the retention of down wood and old growth residuals in harvest units and reserve allocations should assure a viable population of pileated woodpeckers on Forest Service and BLM lands. Short rotations combined with low percentage of old growth and snags retained on private ownership will result in reduced populations of Pileated woodpecker on the north end of the watershed.

Western Blue bird (*Sialia mexicana*) Status: State Sensitive-Vulnerable

Blue birds prefer open to open forest habitat. Mitigation efforts to retain existing snags, snag creation, and providing bird boxes should allow suitable nesting habitat within the watershed. The trend is for increased natural nesting habitat and reduction of open forest habitat, because of fire suppression and the reduced timber harvest program on Federal lands.

Northern Pygmy-owl (*Glaucidium gnoma*) Status: State Sensitive-Vulnerable

Snag habitat for Northern pygmy owls should continue to improve from mitigation efforts to retain and enhance cavity habitat on Matrix land. Also, the retention of snags in Riparian Reserves and LSR's after wildfire and other natural decaying processes will assure a viable population of snags within the watershed.

Marten (Martes *americana*) Status: State Sensitive-Critical

The recovery of late successional habitat and possible reductions in road densities within the LSR will be favorable for the marten. However, continued fragmentation within the Matrix and the roadless area may have short term and long term negative effects depending on the rate of fragmentation of the roadless area and adjacent suitable habitat. Connectivity of suitable habitat to the northern portion of the watershed will be of concern because of the current land use patterns.

Red tree vole (*Phenacomy longicaudus*) Status: Survey & Manage Endemic

Implementation of good survey protocols and habitat management are key to recovery and retention of the red tree vole. In the southern portion of the watershed, the LSR, Riparian Reserves and Roadless Areas currently provide suitable habitat. There will be continued improvement as the young and mature vegetation in the LSR and Riparian Reserves grows older

In the north end of the watershed , the potential for reduction of connectivity of late seral vegetation may lead to isolat ion of populations. Retention of late seral vegetation in Lick and Pony drainages offers the most potential for providing connectivity of habitat and protection for this species.

White-footed vole (*Phenacomys albipes*) Status: State Sensitive, Undetermined, Endemic.

The valley bottom location of Sharps Creek Road, current harvest practices on private lands and the loss of large woody debris may threaten the retention of populations within the watershed.

Oregon Slender salamander (*Batrachoseps wrighti*) Status: State Sensitive, Undetermined, Endemic

The loss of large wood from previous harvest activities and harvest of Matrix land will continue to result in loss of suitable habitat. Large decaying wood and infrequent disturbance seem to be critical for this species. Life requirements are not fully understood, but large wood increases in importance as refugium where disturbance is likely to occur more frequently. Areas of historic refugium may be critical as population sinks for this species. The northwest portion of the watershed was identified as an area of refugium on reference vegetation maps. Continued short rotations and loss of large coarse wood may be detrimental to this species in this area. Inventory work is needed to determine populations within the watershed. Until additional information on life requirements and habitat is acquired, current information indicates there will be further decline of this species

Clouded salamander (*Aneides ferreus*) Status: State Sensitive, Undetermined, Endemic

Decaying down wood and snags are a critical components for this species. Retention of large woody debris and residual old growth over the Matrix lands is expected to provide suitable habitat in the future. Fragmentation will continue to occur from harvest activities on Matrix land; recovery should occur after the microclimate recovers. Inventories would help define suitable habitat within the watershed. There are concerns for the viability of this species on private lands because of the loss potential large coarse wood habitat.

Sharp-tailed snake (*Contia tenuis*) Status: State Sensitive, Vulnerable Endemic

Current short harvest rotations on private land, which result in curtailment of the development of large decaying woody debris habitat , will probably result in the loss of viable populations within the watershed. Most of the potential habitat is within private ownership.

Great gray owl (*Strix nebulosa*) Status: State Sensitive - Vulnerable

Natural meadow complexes along the Calapooya Divide will continue to function as habitat. Early-successional habitat will continue to be created from harvest activities on

Matrix land. Consequently, it can be expected that habitat conditions will remain within the natural range of variability.

Species Historically on the District

All of these large carnivores no longer reside in the watershed and it is unlikely that this condition will change in the foreseeable future.

- *Gray wolf (*Canis lupus*) Status: Endangered*
- *Grizzly bear (*Ursus arctos*) Status: Threatened*
- *California wolverine (*Gulo luteus*) Status: State Sensitive*
- *Pacific Fisher (*Martes pennanti pacifica *) Status: State Sensitive*

Riparian Dependent Sensitive Species

The loss of late-successional structural components and stream complexity in riparian habitat, road construction, and siltation from management activities will have impacts on these species for many decades. The current trend of improving habitat should continue if current Riparian Reserve standard s and guidelines remain in effect. Impact to non-fish bearing streams from valley bottom roads within private ownership will result in viability concerns for some riparian dependent species within the watershed. The following vertebrate species (and the riparian invertebrates listed in Appendix E) are of concern.

Harlequin duck (*Histrionicus histrionicus*) Status: State Sensitive, Undetermined

Human activity associated with the Sharps Creek road, dispersed camp sites and in-stream mineral activities along lower reaches of Sharps Creek will continue to cause levels of disturbance that will probably preclude this species from inhabiting the watershed.

Ringtail (*Bassariscus astutus*) Status: State Sensitive - undetermined

Again, human activity associated with the Sharps Creek road along lower reaches of Sharps Creek, and the fact that the watershed is in the northern range of this species may result in low numbers or no viable population within the watershed.

Tailed frog (*Ascaphus truei*) Status: State Sensitive, Vulnerable Endemic.

It appears that management activities that have resulted in the loss of riparian vegetation, reduction in stream complexity, or increased siltation, have limited the recovery of this species within the Sharps Creek watershed analysis area. Road locations along perennial and intermittent stream channels that result in on-site increases in stream temperature or loss of habitat will continue to be detrimental to this species. At this time, there is only one known remnant adult population within the Sharps Creek watershed analysis area, and it appears that there is limited suitable connected habitat for this population. It is difficult to determine future trends for this species; little is known about tailed frog life requirements or the long term impacts of

management activities such as mining and timber harvest. Connectivity and riparian habitat should improve under current standards and guidelines, as mandated by the Northwest Forest Plan. The State Forest Practices Act likely will not provide suitable mitigation to maintain habitat for this species along non-fish bearing perennial and intermittent stream channels.

Foothill yellow-legged frog (*Rana boylii*) Status: State Sensitive, Vulnerable Endemic

Habitat condition will continue to improve along the lower reaches of Sharps Creek on both public and private land.

Cascade frog (*Rana cascadae*) Status: State Sensitive, Vulnerable Endemic

On Federal lands habitat improvement should occur under Riparian Reserve standards and guidelines when combined with specific habitat enhancement projects, thus indicating a favorable trend for Cascade frogs in Sharps Creek watershed.

Red legged frog (*Rana aurora*) Status: State Sensitive, Undetermined, Endemic

It is not expected that habitat conditions will continue to improve within the Sharps Creek watershed analysis area under current conditions. The lower reaches of Sharps Creek have few opportunities for the development of pool habitat created from large coarse wood, beaver activity or from new channels created in flood plains.

Southern Torrent salamander (*Rhyacotriton variegatus*) Status: State Sensitive, Vulnerable, Endemic

Habitat conditions and connectivity will improve along non-fish bearing perennial and intermittent stream channels because of Riparian Reserve standard and guidelines on Forest Service and BLM ownership. The Northern portion of the watershed will continue to result in viability concerns under current management practices.

Western pond turtle (*Clemmys marmorata*) Status: State Sensitive, Critical, Endemic

Degradation from road building, the loss of pool habitat, predation, destruction of nesting habitat and the destruction of over-wintering sites from timber harvest activities will probably preclude the maintenance of a viable population within the Sharps Creek watershed analysis area.

Key Question: Do mining activities conflict with bat habitat?

Bat Species Status: State Sensitive

Bats are sensitive to disturbance during daily torpor periods and during hibernation, gestation and maternal periods; disturbance may result in the loss of hundreds of adult and juvenile bats. It is expected that these incidents will only intensify in the future as human activities increase in mine adits and caves. Habitat will continue to be lost from

harvest activities on Matrix land. Riparian Reserves and LSR's should not experience further reduction of habitat. However, it will take 100 to 150 years before structural characteristics such as large thick-bark trees, snags with cracked or peeling bark and large hollow cavities begin to develop on cut-over lands . Little is known about the life requirements of these species, although high densities of snags are considered to be critical. The ROD provides additional standard and guidelines to protect roost sites of bats, including fringed myotis, silver-haired bats, long-eared myotis, long-legged myotis, and pallid bats.

- **Townsend's big-eared bat (*Plecotus townsendii*)** Status: State Sensitive, Critical, Forest Sensitive
- **Long-eared myotis** (*Myotis evotis*) Status: State Sensitive, Undetermined, Protection buffer species
- **Fringed myotis** (*Myotis thysanodes*) Status: State Sensitive Vulnerable, Protection buffer species
- **Long-legged myotis** (*Myotis volans*) Status: State Sensitive, Undetermined, Protection buffer species
- **Yuma myotis** (*Myotis yumanensis*) Status: State Sensitive, Undetermined, Protection buffer species
- **Silver-hair bat** *(Lasionycteris noctivagans*) Status: State Sensitive, Undetermined , Protection buffer species
- **Western Small-footed Myotis** *(Myotis ciliolabrum*) Status: State Sensitive, Undetermined, Protection buffer species

Late-successional components have been virtually eliminated from approximately 50 percent of the watershed. Anticipated harvest on Matrix lands will continue to result in loss of habitat for the next 50 years, effectively reducing available habitat to 36 percent of the watershed. Human disturbance will continue to affect habitat availability within the watershed. The trend suggests that there will be no net increase in population density for at least the next 150 years.

Key Question: What is the status of unique habitats in the Sharps Creek watershed?

Little is known about the status of unique habitats in Sharps Creek. There is a need to address unique habitats more extensively in Sharps Creek and adjacent watersheds to determine the effect of past, present and future management activities, and to further understand the diversity, function and status of these potentially sensitive areas. For example, in the rock outcrop /wet meadow habitats alteration of the moisture and light regimes greatly affects *Romanzoffia thompsonii* populations, as does the encroachment of conifers and nonnative invasive species.

Special habitats within the Umpqua National Forest and within the BLM Eugene District represent significantly less acreage than the general forested areas but probably contain greater vascular plant species richness than adjacent forested lands. Because of

their limited land base within the general forest environment, sites where habitat conditions preclude the development of conifer cover are of great importance to floristic diversity (Chambers , 1988). Studies done by Hickman (1968) , which were conducted on the west and east side of the Cascade Range , indicated that 85 percent of the plant diversity occurred on 5 percent of the land within special habitats.

Field visits to these potentially sensitive areas are needed to determine the habitat composition and the effects of management activities. The opportunity to include prescriptions for any necessary restoration projects exists at project-level planning and analysis. Harvest or road building within a 300 -foot buffer area potentially reduces shade for species intolerant of full sunlight. These activities may create a general microclimate change and potential changes in hydrology upon which plant species distribution and composition depend.

Excluding fire from wet or dry meadow complexes throughout the forest matrix has changed what was once a low contrast meadow /forest interface into a high contrast one. Additionally, exclusion of fire is probably responsible for the introduced plant species, including noxious weeds, into meadow landscapes.

Key Question: What are the effects and magnitude ofnonnative plants on the watershed?

Noxious weeds have the potential to displace native species in unique habitats and in disturbed areas. Noxious weeds within the watershed have existed since the early 1900's when settlement began. These species are generally associated with adjacent disturbance such as road building or logging. Since vehicles appear to be the primary vector for long distance movement of most of these species (Trunckle & Fay , 1991), the majority of noxious weed infestations in Sharps Creek watershed occupy road shoulders. In general, the more heavily used roads have the highest numbers and diversity of noxious weed species. Soil substrate and the existing plant community will influence seed germination and plant growth. Once established, noxious weeds tend to move from road shoulders to adjacent meadows, riparian areas and forest openings, producing abundant seeds which generally are long lived within the soil seed bank. As nonnative species, they often have an advantage over native plant species due to the lack of local pathogens and predators.

Some noxious weeds, particularly the tap -rooted annuals and biennials, may accelerate erosion or streambank failure due to their inferior soil binding root systems (Lacey, Marlow and Lane 1988). They also tend to spread rapidly (typically by wind pollination) and are difficult to eradicate causing competition with native species and their habitats. Some of these species have the ability to dominate areas permanently, precluding the development of native species in natural seral progression, effectively causing permanent loss of habitat for native plants. It is likely that the exclusion of fire is responsible for noxious weeds encroachment into meadows(Wolf , 1997).

Wildlife Habitat and Connectivity

Key Question: Is road density a concern in ODF&W Elk Emphasis Areas?

Within the Sharps Creek watershed is 17,650 acres of the Indigo/West Fork Rock Management Unit. Based on road density and forage criteria, habitat conditions in this elk emphasis area are considered marginal. The road density is 5.04 road miles per square mile, far above ODF&W's benchmark of 1.5 road miles per square mile.

The area does has viable population parameters for cover: 16 percent forage, 45 percent hiding cover, and 39 percent thermal cover. Current trends indicate that a minimum of 40 percent of the area will be in thermal cover at all times, while forage habitat continues to decrease. Eventually, there will be concerns about the management of quality foraging sites for elk because of ownership patterns and land allocations. Approximately 40 percent of the area will be managed as late-seral forest (thermal cover) in LSR or Riparian Reserves in the northern and eastern portion of the elk emphasis area.

About 56 percent of the area is private land, mainly within the southern and western portion of the elk emphasis area. Typically, private ownership results in large areas of early seral forest (foraging habitat and hiding cover) and relatively high road densities. Optimal forage conditions would be small areas (20 acres) of foraging and hiding cover intermingled within a matrix of thermal cover with little or no roads. There may be opportunities to reduce road densities within the LSR.

Key Question: What is the habitat trend within the Key Raptor Area # 138?

Key Raptor Area #138 totals 55,000 acres; 28,000 acres are managed by BLM. Within the Sharps Creek watershed there are 14,918 acres, of which 6,316 are managed by the BLM. Approximately 50 percent of this acreage will be managed as late-successional habitat with retention of late-successional components throughout all successional stages. The other 47 percent of the area within the watershed will be managed according to Connectivity/Diversity Block Standards and Guidelines. The fragmentation of ownership and loss of functional habitat characteristic within some of the 47 percent of the area not in reserves will reduce the carrying capacity and number of species within the Key Raptor area # 138.

Snag and Large Woody Debris Habitat

Key Question: What is the availability of snag habitat and large woody debris habitat?

Past human influences have been so pervasive that natural conditions are difficult to define. Forest management practices such as timber harvest and fire suppression have resulted in drastic contrasts between managed and natural forest large coarse wood habitat. These management practices have modified coarse wood habitat rates of input, the size and distribution of coarse wood and patterns of decomposition. The consequences of forest management practices that alter coarse wood habitat are substantial because of the numerous functions of coarse wood. This critical structural

component introduces complexity to the forest ecosystem, and when it is eliminated, the forest ecosystem is simplified; organisms, structures, pathways, and functions are reduced. This simplified forest may lead to decreases in the populations of many plant and animal organisms in both terrestrial and aquatic environments. The human impacts have occurred for so long that few appreciate the magnitude and implication of the loss of coarse wood habitat both in and out of the Sharps Creek watershed.

Snag and down wood habitat is generated by processes that kill trees, such as wind, pathogens, insects, tree competition and the major agent, fire. Fire was the dominant disturbance process that affected succession of forest habitat within the watershed. Fire kills trees directly by scorching, girdling and burning of the root systems. In addition, fire indirectly contributes to other causes of mortality causing wounds and allowing decay organisms to weaken the trees. In pre-European settlement times an unmanaged Douglas-fir forest was never without an abundance of snags, even when converted to early-seral forest, the old forest retained a legacy of snags providing a continuous supply to the succeeding forest. Larger snags greater than 50 inches dbh may last more than 125 years, generally smaller diameter snags may only be sustained between 50 to 100 years (Cline, 1980).

The watershed is in a moderate severity fire regime which is characterized by a mean fire return interval of 20 years and a natural fire rotation of 45 years (Fire and Fuel Management Analysis Report , Appendix C). This results in a significant portion of the watershed experiencing fire activities of various intensities. The overall effect is a landscape with a recruitment rate of 20 years of fire-killed trees (snags) at different densities, creating a patchwork of snag and down wood habitat throughout the watershed. The watershed provided fewer larger live trees per acre (approximately 90 tpa) and higher densities of snags than in today 's environment. The short interval between fires often killed smaller trees, which are less resistant to fire, creating a thinning effect or setting forest succession back. Frequent fires probably maintained lower fuel loading , which may have contributed to lower intensity fires killing fewer larger trees over the landscape, creating a more complex forested landscape. Currently, most natural forested stands within the watershed contain 100 to 120 trees per acre greater than 15 inches in diameter. Most stands appear uniform in structure with a mean snag density for all five decay class of snags ranging between 2.5 and 4.5 snags per acre (Analysis of stand exam information within Sharps Creek Landunits) .

It is estimated that there is currently only one hard snag per four acres within the unmanaged natural forested stands within the watershed, this can be partially contributed to fire suppression and stand age (approximately 50 percent of the watershed). The other 50 percent (21,000 acres) of the watershed has been harvested under intensive management with little or no snags retained ; 28 percent of this area currently has no potential for snags greater than 15 inches in diameter because they are young clear-cut plantations with no larger residual trees remaining. The remaining portion has been thinned regularly, eliminating natural snag production from trees that would have been suppressed, or trees that exhibit decay, diseased or infested with insects. This suggests that there is only one hard snag per eight acres within the watershed.

By analyzing fire dat a from the Brice Creek watershed analysis , which is also representative of a moderate fire regime (Fire and Fuel Management Analysis Report), and information from Fire History and Pattern in a Cascade Range Landscape (PNW-GTR-254, May 1990), it was estimated during reference conditions the average number of snags for the watershed would be 39 hard snags greater than 15-inches dbh per acre created from fire on a natural fire rotation of moderate to high intensity fires (Appendix E). The fire intensity and return interval may vary in forested stands within the watershed depending on slope, aspect and elevation , creating varying densities of snags throughout the watershed. Additionally, snags are created by other processes such as disease, insect infestation and suppression mortality; representation of snag densities from these processes can best be gained from studies that did not include mortality from recent fire disturbance. Refer to the chart, Class I, II and III Snags within Western Hemlock Associations in Appendix E. Data from the chart suggests that areas within the watershed that were excluded from fire disturbance for long intervals (200 years or more) would have snag densities ranging from 6 to 18 snags per acre.

In areas strongly influenced by fire, snag densities may range from 9 to 90 snags per acre or 10 to 100 percent of the trees within the stand. This estimate is based on the Brice Creek Watershed Analysis fire data and calculations from Fire History and Pattern in a Cascade Range Landscape (1990 Morrison, Swanson). For further details see Appendix E.

The key point is that historically there were much higher snag densities within the watershed and therefore more habitat for those dependent species.

Snag Dependent Species

Even though late-successional habitat is expected to remain within the natural range of variability, harvest activities on Matrix land and fire suppression activities will continue to cause a loss of forest habitat (snag habitat) for dependent species . Developing sufficient large woody debris prescriptions for these species may be critical. Terrestrial invertebrates also depend on coarse woody debris and the presence of hardwoods. All these species are indigenous to Northwest forests and have small home ranges, which make them subject to population isolation. Though not all are listed as Sensitive, population trends of these species within the watershed are a matter of some concern.

- Pacific giant salamander (*Dicamptodon tenebrosus)*
- Dunn's salamander (*Plethodon dunni*)
- Western red-backed salamander (*Plethodon vehiculum*)
- Northwestern salamander (*Ambystoma gracile*)
- Ensatina (*Ensatina eschscholtizii)*
- Oregon Slender salamander (*Batrachoseps wrighti*)
- Clouded salamander (*Aneides ferreus*)

- Cascade salamander (*Rhyacotriton cascadae*)
- Sharp-tailed snake (*Contia tenuis*)
- Dusky-footed woodcut (*Neotoma fuscipes)*
- Bushy-tailed woodcut (*Neotoma cinerea*)
- Townsend's chipmunk (*Eutamias townsendii*)
- Forest deer mouse (*Peromyscus oreas*)
- Western red-backed vole (*Clethrionomys occidentalis*),
- Red tree vole (*Phenacomy longicaudus*)
- White-footed vole (*Phenacomys albipes*)
- Blue-gray tail-dropper (slug) (*Prophysaon coeruleum)*
- Papillose tail-dropper (slug) (*Prophysaon dubium)*
- Oregon Megomphix (*Megomphix hemphilli)*

With current ROD standard and guidelines, sufficient coarse woody debris prescriptions and the management of corridors, it is expected that the trend will improve for species that require late-successional components such as connective habitat on federally-owned lands. The trend is not expected to improve on privately owned lands.

Key Question: What is the connectivity of late successional forest between the LSR, riparian reserves and matrix lands? What are the trends? What are the effects on wildlife species?

North Sharps Creek

The arrangement of current late-successional habitat appears inverted when compared to historical habitat conditions. The northern half of the watershed was historically refuge habitat, (Reference Figure 34) characterized by large blocks of interior habitat. The northwestern portion of the watershed had fires that were primarily low and moderate severity. As the forested stands became older and more complex, late successional habitat provided stability for those associated species within the watershed. Well connected patches of interior late-successional habitat were distributed across the landscape. Areas of refuge maintained the viability of species within the watershed.

Currently, there is little remaining interior habitat in this portion of the watershed, which is predominantly private land. Few late-seral forest or late-successional components remain, except in the Lick and Pony creek drainages. The northern portion of the watershed provides few opportunities under current ownership patterns. This approach to forest management simplifies forest biology, reducing biodiversity. Clear

cut units generally leave little, if any, remaining old growth structural characteristics. Timber harvest activities have substantially reduced the amount, quality, and the connectivity of remaining late-successional habitat. The cumulative loss of late-successional components in clear-cut units will prolong the recovery to a functional forested habitat for both early and late-seral species in this area, creating a concern for the viability of populations of late-seral species within the watershed. The management of the late-successional habitat in Lick, Pony and Rev ier drainages may assist in maintaining some of that richness in late-successional diversity in the northern portion of the watershed.

South Sharps Creek

Generally, the southern to the southeast portion of the watershed burned at higher intensities with increases in slope and elevation. These areas experienced high to moderate inten sity wildfires on a n average of 100 to 150 years, resulting in larger areas of stand replacement. However, fire areas usually recovered quickly because of the remaining legacies of late-seral characteristics that included large snags and down wood habitat. Connectivity of late-seral habitat within the southern portion of Sharps Creek watershed appears to be good (See Current Interior Habitat Map , Figure 34). Remaining are large patches of late-seral habitat dispersed throughout the southern half of the watershed. The Fairview Roadless area and the LSR provides a large block (11,000 acres) of interior habitat.

Under current standards and guidelines, approximately 40 percent of the watershed would not be in the Matrix land allocation (Potential Interior Habitat Map). Of the 17,350 acres in reserve allocations, a bout 85 percent falls into the southern half of

Figure 49. Potential Interior Habitat

the watershed. There is one large 4,600 acre block and 18 others blocks of interior habitat. Two blocks are 500 acres, five blocks are between 200 and 100 acres and the remaining blocks are between 100 and 400 acres in size. These blocks could be configured into a connective corridor which would assist in retaining a healthy ecosystem with structural and functional diversity across the southern portion of the watershed now and into the future. As stated in the vegetation and fire sections of this document, the concern is that the southeast portion of the watershed burned at higher intensities, and likely will again, reducing the availability of suitable habitat and distribution of interior species.

Over the next 50 years, late-successional habitat will continue to be converted to early seral habitat from harvest activities on Matrix land. This will reduce late-successional habitat to 45 percent within the watershed, which is within the range of natural variability for late-successional forest. As habitat is being lost on Matrix land, habitat will be recovering in Riparian Reserves and LSR's. The loss of snags and down wood habitat from previous management activities such as timber harvest and fire suppression will retard the full recovery for many species in the watershed. Within the next 150 years, 40 percent of the watershed will be maintained in late-successional habitat with a natural distribution of coarse woody debris components.

Loss of habitat along the lower reaches of Sharps Creek from timber harvest and road location will continue to have a notable impact on connectivity for both aquatic and terrestrial species within the watershed. The current trend of functional connectivity between the LSR and Riparian Reserves and Matrix for all terrestrial and aquatic species should continue for the southern portion of the watershed. However, within the northern portion of the watershed, connectivity will not be functional for all species (only highly mobile species). There will be limited connectivity between LSR, Riparian Reserves, terrestrial habitat and between north and south portions of the watershed in the future. Road location and management activities along the lower reaches of Sharps Creek will continue to be a concern for maintaining viability and connectivity for terrestrial and aquatic species. Fragmentation of late-successional habitat will continue to be a concern until the LSR functionally recovers. Management activities that reduce large coarse wood habitat, such as timber harvest and fire suppression will continue to be a concern within the watershed. The continued conversion of late seral habitat to early-seral habitat in the northern portion of the watershed will causes viability concerns for some species within the watershed.

Key Question: Are there landscape patterns that would best meet wildlife ecological and resource objectives?

The inter relationships between wildlife and the landscape occur at different scales: between populations, within populations, and within the home range. The dispersal of individuals across the landscape results in demographic and genetic interactions within and among populations. In a forest ecology where the landscape is fragmented by clear cut harvests operations, those species with low dispersal ability, low fecundity or a high degree of habitat specialization for forested habitat are at the

Figure 50. Habitat Connectivity Corridor

greatest risk of extinction . All life requirements for these species need to be close enough together and well enough linked to provide functional and suitable habitat.

Suitable habitat conditions may not equate to optimal habitat conditions. Suitable habitat conditions are when the habitat has the arrangement of food, cover and water required to meet the biological needs of a species. Optimal conditions have an arrangement of the elements (food, cover and water) convenient enough for the species to utilize the existing resources and allows enough energy to maintain normal reproductive potential. This provides for healthy, strong and viable population levels that result, in part, from interacting with other forest-associated species over the long term.

In order to disperse and to be viable, these forest dependent populations need movement corridors of stable, good quality optimal habitat to allow travel within the watershed. Some species that use a wide range of habitat conditions have a lesser need for a continuum of connected late successional habitat conditions. Other species that move a short distance during a life span, such as some salamanders, mollusks, and voles have a greater need for a continuum of late -successional habitat condition to move across the landscape.

Reference condition s in the watershed reveal a landscape which was largely interconnected. The development of connective corridors to large patches of late-successional refuge would imitate this original state. These corridors w ould assist in genetic transfer of breeding individuals among otherwise isolated populations, thus reducing the risk of both demographic and genetic isolation of species. Connective corridors also provide links to facilitate colonization of new habitat.

Starting with an analysis of historic fire patterns and using remaining late successional habitat and current standards and guidelines, a connective corridor was designed to provide linkage between LSR's and watersheds. The LSR currently provides the best remaining refuge habitat for late-successional species. The Fairview Creek drainage provides a large block of interior habitat that connects the LSR to the Brice Creek drainage and the remaining late-seral habitat within the north end of the watershed (See Habitat Corridor Map). An average 5,000 foot wide corridor minimizes the effects of edge, allows an ecological balance between aquatic, terrestrial species, corridor-dependent species and other more mobile forested species who often interact as prey species on corridor dwellers. Providing a canopy connective corridor between LSR's and other watersheds may be critical for the successful management of Matrix land in the short term (50 to 70 years). This corridor design does not adequately address all species needs within the watershed. Current vegetation conditions and current ownership patterns precludes the opportunity to design a corridor that would link the historic refuge (Lower Sharps) and the lower reaches of Sharps Creek to the south end of the watershed.

Key Question: What is the condition of the connectivity/diversity blocks on BLM land?

Within Sharps Creek watershed there are seven connectivity blocks (two of them have a small amount of acreage in the adjacent watershed). The blocks range in size from

310 acres to 795 acres. Those to the southeast consist mostly of late-seral forest stands; moving toward the northeast , the blocks become more fragmented with younger stands. The most northern block does not contain any late-seral forest at all.

As stated in the Northwest Forest Plan, 25-30 percent of each connectivity block must be retained as late-successional forest and each block must be managed on a 150-year area control rotation. Five of the blocks have enough or more late-successional forest to meet that requirement, one contains almost enough late-successional forest, and the final one contains no late-successional forest. The total Connectivity block vegetation by stage is listed below.

Stage	Acres	Percent
Establishment	1,055	28
Thinning	892	24
Mature and older	1,807	48

Although the connectivity blocks themselves appear to be functional by definition, only two of them consist of one entire section. The other five consist of partial sections intermingled with private lands. Since the private lands are in either the establishment or thinning stage, the northern third of the watershed is highly fragmented. Mobile species will be able to disperse throughout the area , but smaller, less mobile species will have a difficult time dispersing. Over time, conditions within each block will likely improve as the effects of the 150 year area control rotations are realized.

Aquatic Species and Habitat

Key Question: What are the aquatic areas of concern and what are the expected trends?

Many of the streams within the Sharps Creek Watershed have become entrenched ; stream channels ha ve widened and the sinuosity has been reduced. Such impacts are due to several factors such as building roads within the riparian areas, stream channelization, removing riparian trees and removal of instream large woody material. Large wood normally adds stability (Dose and Roper, 1994), dissipat es channel energy, and allows the stream to interact with the floodplain efficiently.

Road ditches directly influence streams by increasing overland flows and depositing fine sediment into the channel. These ditches essentially act as intermittent streams. The higher flows can potentially increase bank cutting within the channel, creating erosion and fine sediment concerns. The fines fill in between cobbles and gravels embedding the stream channel which ruins spawning and macroinvertebrate habitat. A high concentration of fines within spawning gravels can result in the reduction of available habitat or suffocation of eggs. Trout feed on macroinvertebrates, therefore a decrease in available habitat results in limited food availability. As mentioned in current conditions, macroinvertebrate sampling in lower Sharps Creek confirms there is a fine sediment concern.

It is recognized that habitat conditions can vary throughout the watershed depending on channel morphology. Reference conditions for the number of pools and large woody material per mile have not been established. However, it is evident that impacts from management activities have created a current condition of considerably fewer pools and less pieces of large woody material than would be found in a pristine condition.

The aquatic condition was also analyzed by comparing riparian reserve seral conditions and the amount of roads within the riparian reserve for each drainage group. These data were from GIS and have not been ground verified. Figure 51 displays a relative rating for the road density within the riparian reserves and the percent of stands that are greater than 80 years old for each drainage group. As displayed in this figure, drainages such as Lower Sharps West, Buck and Straight are furthest from the desired condition of having few roads and a large percent of riparian seral condition greater than 80 years old. Most of the streams in these drainages are suspected to be not properly functioning, some may be considered functioning at-risk (see Figure 53). This downward trend is expected to continue on private land or where private land is adjacent to most of the streams. Figure 53 also displays the ownership adjacent to the stream channels which will help determine the expected trend.

Lower Sharps East, Walker and Pony are considered to be in a moderate to poor condition. These drainages consist mostly of private land. However 49 percent of the riparian area in Pony drainage is managed by the BLM (see Figure 3 8 in chapter 3). Approximately 68 percent of the BLM riparian is greater than 80 years old for the Pony drainage, indicating that much of the impact is from private ownership. These drainages are suspected to be not properly functioning or may be functioning at-risk in places. Trends are similar to those mentioned above.

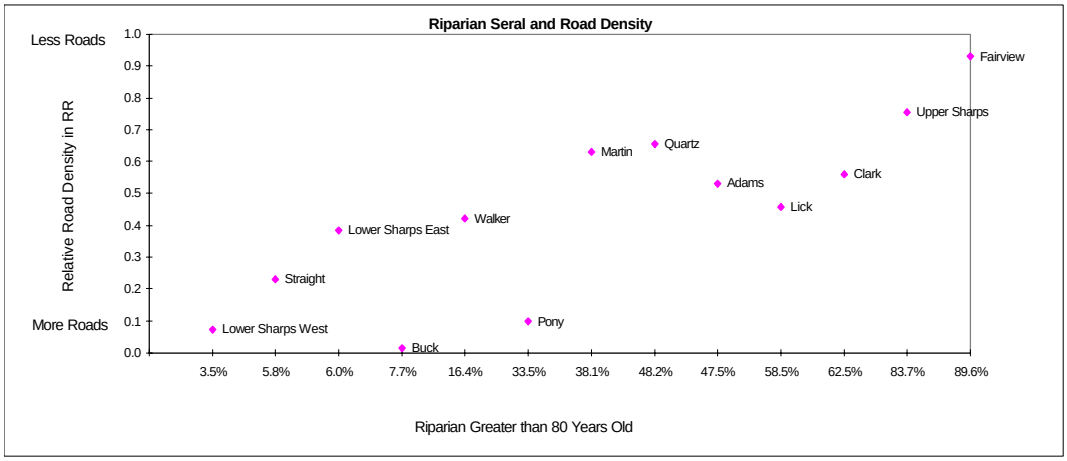

Figure 51. Riparian Seral and Roads

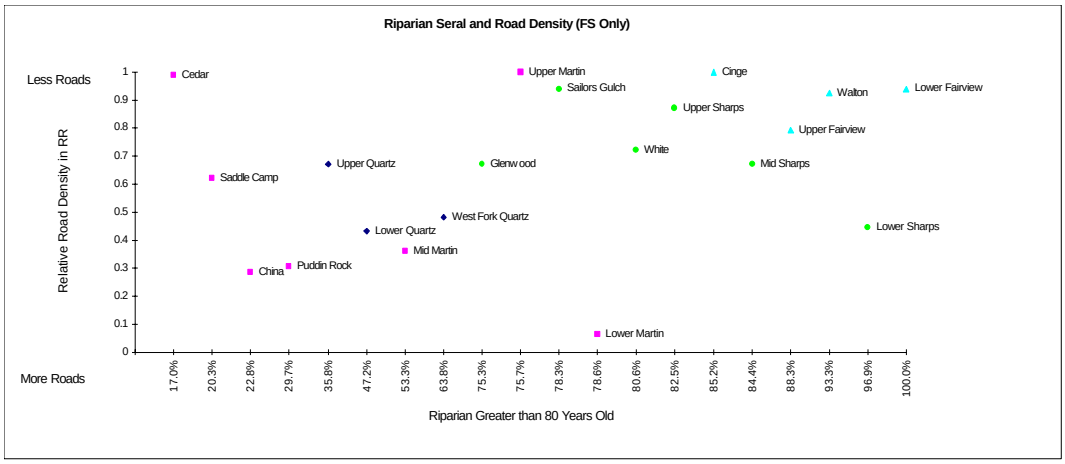

Figure 52. Forest Service Riparian Seral and Roads

Walker Creek is in the moderate to poor condition grouping. However, the drainage has experienced recent large debris flows and mass wasting events. This high impact has resulted in poor aquatic habitat which is not properly functioning. The trend is expected to continue to decline.

In addition to the riparian condition and roads, many of the streams are deficient in large woody debris and have little channel complexity. With the exception of the depositional area just downstream of Walker Creek, the mainstem of Sharps Creek is mostly devoid of large woody debris from the mouth up to the confluence of Fairview Creek. The lack of large woody debris has resulted in limited pool habitat and few areas of depositional substrate for spawning and macroinvertebrate habitat. The mainstem of Sharps Creek from the mouth to the depositional area below Walker Creek is considered to be not properly functioning. From the depositional area up to Fairview is considered functional/at-risk. The expected trend is continuing decline. This is primarily due to the road adjacent to the channel, the poor riparian management on private land and the continual mining within the stream channel.

Aquatic habitat conditions were analyzed in greater detail within the Forest Service administered land. Figure 52 displays each drainage. The drainages on the bottom left of this figure indicate where habitat conditions are furthest from the desired condition of having few roads and mostly older trees within the riparian reserves. China Creek, Puddin Rock Creek and Quartz Creek are of most concern and are considered not properly functioning. This data correlates well with the stream inventory reports which, as indicated in Chapter 3, show these streams to be low in large woody debris, low in available pool habitat, have a poor riparian condition and are affected by roads.

Quartz Creek is of particular concern. The riparian consists of a 50-foot strip of hardwoods, the road is parallel to the channel and appears to be affecting it. Heavy bedload is moving down Quartz Creek and the channel is not able to store and transport it properly, indicating the channel is not in dynamic equilibrium. Some trout were observed in isolated pools between dry channels. Mining is active in Quartz

Figure 53. Aquatic Habitat Condition

Creek and in-stream large woody debris is in low supply. The private section in Upper Quartz Creek has scotch broom growing adjacent to the stream channel and a high degree of solar exposure.

China Creek is low in large woody debris and a very limited channel complexity. The road is also close to the stream channel, only 20 to 40 feet distance in some places. The riparian area is in a poor condition.

The lower portions of Martin and Sharps Creeks within Forest Service managed land, are both actively mined and are low in large woody debris. They are also considered functional/at-risk.

The expected trend will be an improvement in aquatic habitat condition if the Aquatic Conservation Strategy is implemented correctly. However mining activities in Puddin Rock Creek and Quartz Creek may continue to degrade habitat. The roads adjacent to Lower Sharps, Lower Martin, Quartz and China Creeks may keep the trend in a steady, unchanging state.

Key Question: Where is the highly diverse aquatic habitat found and what are the expected trends?

Figure 51 displays Fairview and Upper Sharps drainages to be the best condition and already at the desired future condition. Given the current management under the Northwest Forest Plan and the Aquatic Conservation Strategy, the aquatic condition is expected to endure or possibly improve if restoration projects are implemented.

For the drainages with mixed ownership, Clark and Lick are in the best condition, with Adams as moderate. These streams are suspected to currently be functioning at risk. Clark is 85 percent BLM and is now within an LSR, however a road is adjacent to the stream and much of the wood has been salvaged from the channel. Given the LSR allocation, the trends for the Clark Drainage will continue to improve. Lick is 52.5 percent BLM and Adams is 61 percent federally administered. The trend for these drainages is expected to improve on federally administered lands and to decline on private land, however the cumulative trend may continue to decline if the majority of the streams within a drainage are adjacent to private land.

Figure 52 takes a closer look at the drainages within the Forest Service portion of the watershed. As described in the Brice Creek Watershed Analysis (1997), having a riparian seral condition of at least 80 percent greater than 80 years old is a desired condition. Using this guideline, along with having a low road density within the Riparian Reserve, Lower Fairview, Walton, Cinge and Upper Sharps are in the best condition when compared to the rest of the watershed. Upper Fairview has late seral riparian vegetation, however the roading is higher here because of the patented land in the upper drainage. It should also be noted that Upper Martin and Sailors Gulch are also in very good condition. The Cedar Creek drainage is misleading in this figure. A stand replacing fire affected this drainage and the seral condition is actually close to, if not at, 80 years old for most of the drainage. The stream inventory for Cedar Creek points out the pristine nature and complex habitat found there. The stream inventories

discussed in Chapter 3 indicate that Cedar Creek, Walton Creek, Cinge Creek, Upper Martin Creek, Upper Sharps Creek and Fairview Creek are all considered to have healthy aquatic habitat with a high amount of down woody debris, good pool habitat, large trees along the riparian and very low road densities. These streams are all properly functioning and in the desired condition (see Figure 53).

Key Question: Are recreation activities impacting aquatic habitat in Sharps Creek and if so, is there a conflict with existing management plans?

Recreation activities are concentrated within and along the stream channels. Dispersed camping, fishing, swimming and recreational mining are the most common activities. These activities may cause a loss of streambank vegetation which would result in erosion and deposit fine sediment into the stream channel. Access trails to the streams and low gradient stream terraces typically become compacted from recreation traffic and limits the growth of vegetation within the riparian. Down woody debris is utilized for fire wood which limits the amount of large woody debris within and adjacent to the stream channel and therefore reduces habitat complexity.

Current recreation use is considered moderate to high during peak summer season. The expected trend is that recreation use will continue to increase in this area. The Northwest Forest Plan (1994) goal is to limit impacts and to protect Riparian Reserves; the land use plans of the Umpqua National Forest and the Eugene District BLM direct the agencies to provide for outdoor recreation. A conflict exists between managing for recreation uses and demands while also maintaining and enhancing the Riparian Reserves.

Riparian Reserves adjacent to the larger streams within the Sharps Creek Watershed tend to be low gradient and are roaded. These are the areas prone to recreation use. The confluence of Saddle Camp and Quartz Creeks was once identified for potential recreation sites. There are also plans for eventual expansion at both existing developed sites at Mineral and Sharps Creek Campgrounds. Public demand and resource protection through site hardening are two motivating factors in determining the need for additional development. However, additional development and expansion of recreation sites would negatively affect the Riparian Reserve. In addition, The Umpqua National Forest Land and Resource Management Plan (1990) strategy is to de-emphasize use in Sharps Creek in an effort to minimize conflicts with active mining activities.

The riparian areas with the highest risk include Lower Sharps Creek, the mouth of Fairview Creek, Lower Martin Creek, Quartz Creek and Puddin Rock Creek.

Key Question: Have mining activities impacted aquatic species and habitat, and if so, is there a conflict with existing management plans?

Mining activities are common throughout the Sharps Creek Watershed. The majority of the public land is claimed and even though individual operations are small, placer mining occurs on a regular basis throughout the watershed. The impact to the aquatic resources include disturbance of spawning gravels and macroinvertebrate habitat, channel degradation, and an increase of turbidity and suspended sediment. There is

also a chance that contaminants such as gas and oil from the dredges may enter the stream channel. In addition, occupancy of the site and long-term dispersed camping may affect the riparian and aquatic habitat.

Mining is regulated differently on lands managed by BLM than on Forest Service managed lands. Determinations as to when a Notice of Intent (NOI) is sufficient over a Plan of Operations (PO) is not consistent between the two agencies. Other differences include occupancy approval, requirements of self contained toilets, restricted recreational mining dates for working in -stream, and reclamation bonding. In general, BLM has limited authority for bonding ; therefore they tend to be more restrictive in their NOI and PO requirements.

The 1872 mining law requires the federal government to allow for mining. However the impacts from mining conflicts with the Northwest Forest Plan (1994) and the Aquatic Conservation Strategy that directs federal land managers to maintain and enhance riparian and aquatic habitat.

Key Question: How does different management (private and federal ownership) affect aquatic habitat?

Timber harvest on private land is regulated by the Oregon Forest Practices Act Water Protection Rules (1994). Riparian protection varies by whether the stream is fish bearing, non-fish bearing or used for domestic purposes. The size of each stream is broken into large, medium and small categories. Most of the tributary streams that are non-fish bearing within this watershed would be in the small category. Therefore, these streams receive no riparian protection. Fish bearing streams have a no-cut width buffer of 20 feet and then the rest of the Riparian Management Area (RMA) is thinned to a certain basal area. The RMA is 100 feet for large streams, 70 feet for medium streams and 50 feet for small streams. There are no known domestic water sources within this watershed.

The federal administered land of the BLM and the FS have much higher restrictions for riparian protection. The Standards and Guidelines for management of the Riparian Reserves can be found in the Aquatic Conservation Strategy, which is part of the Northwest Forest Plan (1994). Riparian Reserves are land allocations that do not allow for timber harvest unless it can maintain and enhance aquatic and terrestrial habitat. These Riparian Reserves are the width of two site-potential trees for fish bearing streams and one site-potential tree for non-fish bearing streams. A site-potential trees is defined as the average height of what a 200 -year old tree would be growing at that site. A site-potential tree height on BLM land within this watershed is 200 feet and 180 feet along FS streams. The Aquatic Conservation Strategy also requires protection of unstable areas.

Riparian protection on private land is minimal and may not adequately protect stream courses. Figure 2 displays the varied ownership between federal and private land within the lower portion of the watershed. The streams in this area will subsequently have different levels of riparian management. Unstable areas within private land may not necessarily be protected. This may lead to mass wasting and failures. Much of the Walker drainage is privately owned and is also prone to landslides. The recent debris

slides within this drainage displays how management on private land can increase landslide frequency. Aquatic habitat trends are expected to improve on federal land, however drainages that have mixed ownership with private land may decline. This may vary if the stream courses tend to be more on federal land.

Human Uses

Late Successional Reserves

Key Question: What is the current condition of the LSR and how does it compare to the natural range of variability?

The South Cascades Late- Successional Reserve (LSR 222) encompasses a total area of 508,000 acres, with Sharps Creek watershed containing a small portion (1 percent or 5,233 acres) of LSR-222. Within the entire LSR, 43 percent is in late-seral forest and 33 percent is in mid-seral forest. The portion within Sharps Creek has 61 percent late-seral forest (3,169 acres of mature and older) and close to 19 percent mid-seral (970 acres of thinning age). According to the LSR Assessment (USDA , 1998), the functional range is between 45-75 percent late-seral conditions. BLM lands within the Sharps Creek watershed appear to be within this range but the intermingled relationship with private land effects a fragmented landscape and a loss of late-successional structural components which will have an impact on species for many decades. Historically, the LSR contained similar proportions of vegetation classes as those found in the current condition. However, the stages were represented in large blocks that feathered into the adjacent forest vegetation. Early-seral forest were created by wildfire that retained remnant late-successional components, as opposed to clear cut units which leave little, if any, remaining old growth structural characteristics. Habitat recovered many decades sooner because of the quality of the remaining residual late-seral components and the connectivity of late-successional habitat.

Key Question: What are the priorities for restoration in the BLM portion of LSR 222?

The priorities for restoration are:

1. To enhance and maintain large coarse wood habitat ; evaluate the effects of loss of habitat from management on a landscape scale .
2. Create high density of snags in mature seral forest habitat .
3. Reduce fragmentation from roads and harvest activities ; rip and plant unnecessary roads and create no new openings .
4. Precommercial thin to enhance late successional components (high er density of large snags and large trees) .
5. Commercial thin to enhance late successional components (high density of large snags and large trees).

Key Question: Are there opportunities to decommission roads in the LSR?

There are a few opportunities to close and decommission portions of roads in the LSR. The Cottage Grove District ATM process identified road 27.0 to be gated with restricted administered uses.

Opportunities are limited on lands managed by BLM because of the intermingling of private land and the need to provide access to these lands. However, the following roads are the highest priority for decommissioning to benefit aquatic and wildlife habitat. The portion of these roads that end on BLM managed land may be available to decommission or close.

T23S, R1W

Road Number	Section
23-1-1.1	1
23-1-2.1, 2.2,2.3	2
23-1-3, 3.2	3
23-1-9, 9.1, 9.4	9
23-1-27.1. 26.1	14, 11, 23
23-1—27,26.1	26
23-1-27.4, 27.5	27

Key Question: What effect does the current road density in the LSR have on meeting the objectives of the LSR?

The LSR objectives are to protect and enhance late-seral forest habitat, but roads often have adverse effects on meeting those objectives. Listed below are some of the effects that current road density has on meeting those objectives :

1. Results in a reduction of forest and riparian habitat.
2. Fragmentation of the forest canopy.
3. Creates edge and edge habitat in late-successional habitat.
4. Fragmentation of terrestrial habitat.
5. Increases predation on late-successional species.
6. Increases opportunities for human-caused fires.
7. Increases human disturbance of wildlife.
8. Interrupts natural water flows .
9. Fragment connectivity of aquatic species and habitat.

10. Provides connection for early successional species through late-successional habitat.
11. Provides connection and seed source for nonnative and noxious plant species.
12. Reduces the quantity and quality of late-successional interior habitat.
13. Constrains the recovery of aquatic habitat in streams adjacent to roads.

Roadless Area

Key Question: What is the current condition of the roadless area and what are it's values?

The two important roadless areas managed by the Forest Service are Fairview (4,929 acres) and Puddin Rock (4,535 acres). The Fairview Roadless area extends into Brice Creek watershed in a small strip surrounded by roads. Only the Sharps Creek portion appears to still provide "roadless area" values. Fairview and Puddin Rock are still relatively intact with only 327 acres harvested since the 1986 Umpqua Forest Plan update. Fairview is almost entirely intact and is separated from the Puddin Rock roadless area by a single road . The Puddin Rock roadless area is dissected by two roads and a few harvest areas. However, the two roadless areas still provide connectivity from Brice Creek to LSR 222 to the south and east of the watershed, as well as north into the Lick Creek area. See Figure 54 for a map of the roadless area.

The Umpqua Forest Plan (1990) recommended non-Roadless designation because Puddin Rock and Fairview did not meet the qualifications for roadless areas of 5,000 acres in size. Roadless areas are those in which the natural integrity of the ecosystem is intact and uninterrupted and offers opportunities for solitude and primitive experiences. The Umpqua Forest Plan did not analyze the roadless areas as connective habitat or how they function within the entire Sharps Creek watershed.

Figure 54. Roadless Areas

The following chart displays the current condition and associated values of the roadless areas for each of the resource areas described in this document.

Resource	Description/Current Condition	Values
Erosional Process	Mostly weathered/altered volcanic rock. Landslide rate average for steep weathered landforms-- 2 slides/square mile.	Close to natural condition; useful as comparison, especially as area with past, natural disturbance from fire (except for fuels loading).
Hydrology	High summer flow and cooler water in Fairview and Bohemia creeks. Natural extremes in flood and summer low flow; vulnerable to disturbance.	Source of high summer streamflow.
Stream Channel	Many areas are fully intact and pristine. Some are altered from mining activities	Stable channels. Serves as source and transport reaches for large woody debris and coarse substrate.
Water Quality	Good riparian shading and good water quality	As source of good water quality and cool summer flow. Likely stable ph and dissolved oxygen.
Vegetation, unique habitats	High percentage of late successional vegetation. Complex structure and intact riparian vegetation. Areas of low productivity vegetation, unsuitable soils.	Unfragmented late successional vegetation, unique habitats, meadows; knobcone pine found in Upper Sharps. Fire refugia in canyon bottoms
Fire	Complex fire regime. Areas of high risk for lightning fires. Areas where fire suppression has caused fuels to reach outside of natural variability.	Area with a high degree of influence from fire. Natural prescribed fire probably necessary to maintain within range of natural variability.
Terrestrial Species & Habitat	Late successional vegetation habitat provides for several species dependent on old growth. Connected habitat provides for low vagility, low mobility species espcially in riparian areas	Connected, intact interior habitat provides refuge and maintenance of late successional habitat that somewhat offsets the large areas of early successional habitat in Lower Sharps.
Aquatic Species & Habitat	Late successional riparian vegetation and down woody debris provides quality aquatic habitat. Mining activity has affected some habitat.	Complex habitat provides refuge. Is the best aquatic habitat within the watershed.
Human Use	Mining and recreation are the two human uses outside of roads and harvested areas.	Source of minerals and timber. Provides quality, remote undisturbed recreation experience.

As described in the Fire and Terrestrial sections of this document, Upper Sharps Creek has traditionally maintained a mosaic of vegetation conditions. With fire suppression, the vegetation will continue to mature and become more uniform. Fuel loading will increase and snag habitat will stay minimal unless insect and disease activity increases. One large-scale fire event could place the watershed outside the natural range of variability for late seral vegetation. Sharps Creek watershed is at much higher risk of a large-scale fire event than Layng Creek, Brice Creek or the Cottage Grove Lake /Big

River watersheds. The roadless area will need to be managed if it is to maintain the role of providing intact, connected interior habitat.

Key Question: What role does the roadless area play in providing biodiversity within the watershed?

The two roadless areas provide conservation of biodiversity through protection and maintenance of the processes and functions of intact ecosystems in the Sharps Creek watershed. Approximately 25 percent of the drainage is covered by the two roadless areas. A small portion of the Canton Creek Roadless Area (233 acres) extends from the south. When combined with the riparian reserves, the BLM portion of LSR 222 and other areas not expected to be harvested (local LSR's, unsuitable soils, unique habitats, etc.), almost 50 percent of the drainage will have late successional vegetation. This places the drainage within the range of natural variability (45 percent to 75 percent) for late successional vegetation. Of the 9,970 acres within the roadless areas, approximately 3,000 acres are suitable and available for harvest. The remainder is classified as riparian reserves, unique habitats or as unsuitable soils because of reforestation concerns.

The Council of Environmental Quality (1993) report *Incorporating Biodiversity Considerations into Environmental Impact Analysis Under the National Environmental Policy Act* listed 11 principles of biodiversity conservation:

Principles of Biodiversity Conservation (CEQ, 1993)

1. Take a "big picture" or ecosystem view.
2. Protect communities and ecosystems.
3. Minimize fragmentation; promote the natural pattern and connectivity of habitats.
4. Promote native species; avoid introducing nonnative species.
5. Protect rare and ecologically important species.
6. Protect unique or sensitive environments.
7. Maintain or mimic natural ecosystem processes.
8. Maintain or mimic naturally occurring structural diversity.
9. Protect genetic diversity.
10. Restore ecosystems, communities, and species.
11. Monitor for biodiversity impacts; acknowledge uncertainty; be flexible.

Based on the above listed principles, the opportunity is available for Fairview and Puddin Rock roadless areas to play the role of protecting biodiversity in Sharps Creek watershed analysis area. Delaying or foregoing harvest in this area as other areas under more protection (LSR and Riparian Reserves) recover is one such opportunity.

Protection or deferral of harvest in the roadless area would fulfill several objectives of the Aquatic Conservation Strategy --including protection of the best habitat in the watershed.

The protection of landscape features such as interior habitat is perhaps the most critical value offered by the roadless area. As described in the Terrestrial Species section, there is an opportunity to provide landscape connectivity for terrestrial species and habitats by connecting the roadless area and Lick/Pony Creek drainages with the habitat connectivity zones in Brice Creek and Layng Creek watersheds.

Key Question: Are there opportunities to use landscapeanalysis techniques to manage the roadless area?

There are several opportunities to use landscape analysis techniques in managing the roadless areas. These include :

1) Protection and connection of interior late successional habitat,

   Explanation: See the habitat connectivity discussion in this chapter. Not only is this an area of connected habitat , but it offers refuge stream habitat in "pristine" condition, unique habitats in good condition and a mosaic of stand conditions.

2) Identifying fuels management opportunities for areas at high risk of disturbance by fire,

   Explanation: See the Fire section for a discussion and map of high risk areas. Probably the two most important analyses for managing the roadless areas are the fire analysis and vegetation patterns analysis .

3) Identifying downstream restoration opportunities that extend the benefits of upstream protection ,

   Explanation: A watershed council could identify these opportunities and work with local land managers to implement projects.

4) Identification of road closures that would increase the effectiveness of maintaining the Fairview and Puddin Rock roadless areas.

   Explanation: See Roads discussion in Chapters 4 and 5 and Appendix J.

Timber Management

Key Question: Can we provide timber and protect northern spotted owl habitat in the Lick Creek area?

The reference condition reveals that the original landscape of the watershed area was largely interconnected. As the forested stands became older and more complex, late successional habitat provided stability for those associated species within the watershed. Well connected patches of interior late-successional habitat were

distributed across the landscape. These areas of refuge maintained the viability of this species within the watershed. Currently there is little remaining interior habitat in this area of the watershed; the remaining late seral habitat is intermingled with private lands and is highly fragmented. The remaining late-seral interior habitat is located in Lick and Pony creek drainages. The northern portion of the watershed provides few opportunities under current ownership patterns and timber harvest management objectives of short rotations to recover this loss habitat.

Intensive harvest management practices that maximize wood fiber production simplify forest biology, reducing biodiversity and substantially reducing the amount, quality, and the connectivity of remaining late-successional habitat.

Mobile species will be able to disperse throughout the area but smaller, less mobile species will have a difficult time dispersing. This creates a concern for the viability of populations of late-seral species within the northern portion of the watershed. The dispersal of individuals across the landscape results in demographic and genetic interactions within and among populations. In a forest where a fragmented landscape exists because of a history of clear cut harvest, those species with low dispersal ability, low fecundity or a high degree of habitat specialization for forested habitat, are at the greatest risk of extinction from fragmented clear cut forest. These species thrive in large patches of continuous connected interior late-seral habitat conditions. Minimizing the effects of edge allows an ecological balance between aquatic and terrestrial species. All life requirements for these species need to be close enough together and well enough linked to provide suitable habitat over the long term. This provides for healthy, strong and viable population levels that result, in part, from interacting with more mobile forested species (spotted owls) who often interact as prey species on interior habitat dwellers.

The retention of large patches of late-successional refuge within Lick Creek drainage will assist in reducing the risk of both demographic and genetic isolation of many species, provide links to facilitate colonization of new habitat, and may assist in maintaining some of that richness in late-successional diversity in the northern portion of the watershed. This strategy of retention may be critical for the success of managing options for Matrix lands.

Timber harvest activities that result in fragmentation or the loss of late-successional components such as snags and large coarse wood will be detrimental to this critical habitat within this portion of the watershed. Harvest or restoration activities that enhance late-successional interior habitat condition will encourage restoration of spotted owl habitat.

Key Question: Are there opportunities to provide timber products while restoring and managing habitat?

Land allocations for the Sharps Creek watershed include 3,320 acres of LSR and 9,639 acres of Riparian Reserves. There are 13,822 acres in the Matrix allocation; approximately 6,156 acres on lands managed by the Forest Service are suitable for timber harvest. With continued implementation of the NW Forest Plan, timber harvest quantities for the Cottage Grove Ranger District are expected to stabilize at less than

12MMBF with an annual probable sale quantity of 1.2 mmbf (47 acres) from Sharps Creek watershed. These timber sales may provide opportunities to improve the ecological function of the associated area and also to modify the road drainage system to assure that they function properly for an indefinite period of time.

The objectives for LSR and Riparian Reserve lead to an emphasis on late successional vegetation conditions. Thinning may accelerate the accomplishment of these objectives by providing larger trees. Reducing the risk of catastrophic fire may also involve removing some trees while implementing a prescribed burning program. Trees not needed to accomplish LSR and Riparian Reserve objectives may be available for commercial sales.

Other opportunities for increasing commercial timber harvest include the development of benchmark prescriptions in areas with soils unsuitable for regeneration harvest (5,772 acres on FS managed lands).

Key Question: There are low productivity soil conditions in Sharps Creek. Are there specific prescriptions that should be developed for these soils as protection?

In general, the most productive lands for growing timber in the watershed are in Lower Sharps Creek. Upper Sharps Creek has lower site productivity, steep ground, and areas of highly weathered rock and several south-facing drainages. Silviculture prescriptions for Upper Sharps land areas are generally not for intensive forest management practices . Suitability for timber harvest on Forest Service lands is much higher in Brice Creek watershed, Layng Creek watershed and the lower elevations within Sharps Creek watershed.

Prescriptions that maintain a low density, retain cover and use suitable species for the site should be favored.

Key Question: Where are the priority areas for harvest?

The Layng Creek Watershed Analysis (1995) developed a strategy for providing connectivity of late successional vegetation by prioritizing harvest areas across the subwatershed. A zone of the most connected habitat was recommended as the lowest priority for harvest. The highest priorities were areas with the least resource concerns and the least valuable wildlife habitat. Other areas recommended for a higher priority for harvest were areas where timber harvest had already taken place. The reason for recommending this strategy was the low level of late successional vegetation in the Layng Creek subwatershed (37 percent) and the expectation of further reductions (to 30 percent).

In the Brice Creek watershed analysis area there is more late successional vegetation in reserve areas than in the Layng Creek watershed analysis area . Consequently, Brice Creek watershed will not fall below the natural range of variability of 45 percent to 75 percent. Sharps Creek has approximately 48 percent late successional vegetation but the distribution is much different than Layng Creek watershed or Brice Creek watershed. There are opportunities to delineate priorities for harvest in Sharps Creek based on the configuration of late and early seral vegetation and ownership patterns.

The potential areas for the lower priority for harvest are the two roadless areas and a northern patch of connected habitat stretching into Lick Creek drainage on lands managed by the BLM. First priority areas are outside the habitat connectivity zone and the LSR. See Figure 50 for a map of the habitat connectivity corridor and the terrestrial habitat recommendations in Chapter 5 for additional description of the habitat connectivity zone and a map of the priority areas for harvest.

Roads

Key Question: Where are there resource reasons to decommission roads?

Construction of roads has mainly been correlated with timber harvest and mining activity. Roads within the Sharps Creek watershed are used for timber harvesting, mining access, fire management, recreation, and access to administrative facilities. Approximately 80 percent of the Forest Service road miles in this area were built in the 1960's or later. During the series of storm events which occurred between November 1996 and January 1997, no failures occurred in the Sharps Creek watershed area. It is supposed that contemporary, improved construction practices (in place since the 1960's) minimized storm damage.

Forest Service

On lands managed by the Forest Service, an access and travel management process was used to determine where there are resource reasons to decommission roads. A copy can be found in Appendix J. The process evaluates the degree of conflict between human uses and resource impacts by numerically rating the importance of the road for human uses and, in separate tables, the degree to which the road is a concern for aquatic and terrestrial resources. This process also identifies road maintenance priorities and restoration opportunities. A final rating results in categories that specify maintenance levels, decommissioning, restoration opportunities and areas needing further study.

The results of these comparisons can be used as a framework for decision making on whether to maintain, stormproof or decommission roads.

Road Analysis Categories

Seven distinct road analysis categories were developed in response to the road segment ratings: Maintain A (MA), Maintain B (MB), Maintain C (MC), Decommission (Decom), No Action (NA), Fix problems close road (FCR), and Quandary. They are defined below.

Figure 55. Access and Travel Management Recommendations

Maintain (MA, MB, MC)

Three different "maintenance" categories were developed. The definition of "maintenance" used here means the road would be maintained for the long term as functional in the transportation network.

"Maintain A" candidates have low aquatic risks where little storm-proofing is expected to be necessary. "Maintain B" candidates may have low, moderate or high aquatic risks but much storm-proofing is expected to be necessary. Road segments which provide the sole access to private lands were placed in the "Maintain B" category if they had a "high" or "moderate" aquatic rating. Those that had a "low" aquatic risk rating were placed in the "Maintain A" category. "Maintain C" candidates are segments that are maintained by Lane County, Bureau of Land Management (BLM), or are entirely on private land but spur off of Forest Service roads. It was assumed that these road segments will continue to be maintained over the long term. In some cases, the Interdisciplinary Team may have recommendations for road maintenance on these road segments which would be passed on to the county, BLM, or private land owners.

Approximately 51 percent of the total road system, 32 miles, were identified for continued maintenance in the transportation network (Table 5 of Appendix J).

No Action (NA)

This category was characterized by segments that had low maintenance needs or concerns, including maintenance level I roads, that also had low aquatic and wildlife risks. It includes a small number of segments that rated out as moderate aquatic risks and moderate human use but were judged by the ID team to be low maintenance priorities. In general, "No Action" candidates were usually short spur roads (<0.5 mile). Some "No Action" candidates might be high priority for decommissioning from a road maintenance program standpoint.

In a watershed restoration program, "No Action" roads would be inventoried, primarily to assess landing failure risks and potential drainage problems; but in general, they do not have stream crossings and would be expected to be of low aquatic concern and not worthy of the financial expenditure for full decommissioning to alleviate aquatic concerns.

Appendix J, Table 8 shows those road segments that fell into the No Action category.

Three miles of road (4.8 percent of the total road miles) were found to be low risk to aquatic and terrestrial habitat as well as low human use. These road miles were put into the "No Action" category.

Fix Problems/Leave Road (FLR)

This category was characterized by segments that were considered to be a low risk to aquatic and wildlife habitat but were in need of immediate maintenance to minimize future risk. Low risk roads with an oversteepened landing on them would fall into this category as would those road segments that need to be water-barred or have culverts removed. These roads may or may not be used again in the future but will no longer be maintained after having these problems fixed. Essentially, these roads will be allowed to close.

Appendix J, Table 7 shows those road segments that fell into the Fix Problems/Leave Road category.

There were 4.26 miles or 7 percent of the total road miles that were found to be a low risk to aquatic or terrestrial habitat and have low human use but are currently in need of some type of action to remove any future risk. These road segments will eventually be water -barred; culverts will be removed and oversteepened landings pulled back.

Decommission (DECOM)

The definition of decommissioning here is elimination of any contribution from the road to most major types of aquatic risk. While this would not necessarily preclude access by foot or ATV trails, it would usually lead to elimination of any use for automobile travel. It would include any combination of the following; pullback of fills and oversteepened sidecast areas, removal of culverts, installation of water bars, ripping road surfaces and revegetation. Each road segment proposed for decommissioning is evaluated separately and individual prescriptions for decommissioning will vary among road segments.

Segments with the following aquatic and human use ratings are usually targeted for decommissioning:

- *Segments with "high" aquatic impact ratings and "moderate" or "low" human use ratings,*
- *Segments with "moderate" aquatic impact ratings and "low" human use ratings.*

Appendix J, Table 6 shows those road segments which fell into the decommission category.

There were 5.3 miles (8.4 percent of the total road miles) of roads proposed for decommissioning. Although the ID team addressed decommissioning roads, it was difficult to determine the feasibility of decommissioning road segments that access mining claims.

Quandary

These were roads where clear management recommendations were more difficult. These roads had "high" or "moderate" ratings for both human uses and aquatic impacts. Final recommendations for quandary segments were made after more interdisciplinary discussions. If consensus could not be reached by the ID team, segments were left in the "Quandary" category so that they could be re examined by a project level ID team. Appendix J, Table 9 shows those road segments that received a Quandary rating.

Forest Service Quandary roads totaled 19.29 miles (31 percent of the total road miles). Two other road segments fell into the Quandary category, segments 2 and 10, but were not included in the total Quandary mileage since the final decision on these roads lies with the County and BLM. Segment 2 is a county road on Forest Service land and segment 10 is a BLM road that accesses Forest Service lands.

Private Lands

There are about 158 miles of road in private ownership covering 15,543 acres (37 percent) of Sharps Creek watershed. These roads were built mainly for timber harvest and have an average density of 6.5 miles/square mile . As discussed in Chapter 3, the drainages with the poorest riparian condition are areas with the highest percentage of private ownership and include Lower Sharps West, Lower Sharps East, Straight, Buck and Walker drainages. There is a high

percentage of roads adjacent to streams in these drainages and almost 100 percent of the riparian vegetation is less than 80 years old.

Bureau of Land Management

Road density on lands managed by BLM in Sharps Creek watershed averages 3.3 miles/square mile The BLM uses a process similar to the ATM process used by the Forest Service. Called Transportation Management Objectives (TMO), the process began with the development of District-wide road maintenance levels. This was done in 1996 by the Eugene District and establishes a maintenance level for every BLM-controlled road in the District. Unless otherwise recommended in watershed analysis and adopted, the 1996 maintenance level is the *status quo* objective for any particular road. See chapter 5 for specific road recommendations. A list of roads and their maintenance category is in Appendix I.

Key Question: What is the potential to decommission roads in high density, roaded areas?

The overall road density in Sharps Creek is 3.9 miles/square mile This is similar to Brice Creek at 3.2 and Layng Creek watershed at 3.7. However, the distribution is quite different because of ownership patterns. High density roaded areas predominate in Lower Sharps East and West, mainly in private ownership where the density is 6.5 miles/square mile . Because this is an area managed for timber production, the likelihood of decreasing road density through road decommissioning is low. In October 1998 Weyerhaeuser will begin a watershed analysis for the Sharps Creek watershed which may lead to identification of road decommissioning opportunities.

The density on BLM managed lands is 3.3 miles/square mile . Because of right-of-way agreements and the checkerboard ownership patterns, opportunities for decommissioning roads are limited. Roads in the Late Successional Reserve are the highest priority and most feasible candidates for road decommissioning. See Chapter five for specific recommendations.

Because of the steep, low productive character of the Upper Sharps Creek watershed, this Forest Service managed landscape has a very low road density of 1.9 miles/square mile . The three roadless areas, (Fairview, Puddin Rock and Canton Creek) are the main contributors to this low density. Moderately high road density does exist in Adams, Clark, Quartz and drainages and in portions of Martin drainage. The ATM process described in the previous question has identified several roads for decommissioning. Chapter 5 lists the actual roads recommended for decommissioning. Mining access is the limiting factor to decommissioning roads on Forest Service managed lands.

Minerals Management

Key Question: What is the potential for significant impacts from lode mining activities in Sharps Creek watershed?

The potential for significant impacts from lode mining activities exists, however reclamation and bonding requirements tend to limit that potential. Exploration and removal of mineral on a lode claim is primarily an underground operation. Impacts to the surface may result from providing or maintaining access; road locations possibly over riparian reserves and right of way timber removal for road construction; occupation of the land by structures, mining equipment; security gates and disposition of tailings. The number of lode claims (approximately 100) located within Sharps Creek watershed have remained relatively stable since the 1960's. Activity of these lode claims has also been relatively minimal due in part to the inaccessibility and the economic feasibility to

extract the ore profitably. Activity on these lode claims also occurs on an intermittent or part time schedule. Most work involves the required annual assessment of $100 of improvements which is typically road or trail maintenance and adit cleanout.

Within Sharps watershed there are two fairly active lode mining operations (Star and Birds Nest) both located in the Puddin Rock area. These claims have roads, trails, gates, structures, and tailings disposal areas. Most of the tailing sites are historical, existing since the early 1900's. Surface impacts from these operations are mitigated through approved Plans of Operations and bonding that requires minimal resource impacts and ensures reclamation of the site. Both these lode sites have or will have the ability to process ore at existing mill buildings located on the site. Today ore extraction is typically a mechanical process with further processing occurring off site. Historically mercury was utilized in the mining process; however, today there are no chemicals utilized. Due to resource mitigation, reclamation bonding and economics, the potential for many of the lode claims to become active on a large scale is limited.

On occasion a large mining company may approach mining claimants to lease their claims in order to propose extensive exploration in a relatively short time frame. This has happened in the Brice Creek watershed however there is no record of this occurring in the Sharps watershed for many years. Many of the lode claims are retained to work as a recreational activity with the potential of providing the claimant with an economic gain. Until the price of gold increases to a level that covers the costly extraction and processing expenses, the potential for mineral activity increasing beyond today's levels is limited.

Key Question: How can we "foster and encourage" mining without causing significant ecological effects?

The USDA Forest Service and the Bureau of Land Management administers mineral resources on public lands. Mining activities on private lands is under the discretion of the landowner; however, mining activities must be conducted according to state Department of Environmental Quality, Oregon Department of Fish and Wildlife, and other regulating bodies. The General Mining Law of 1872 allows for the extraction of minerals from most public lands unless the lands have been previously withdrawn from mineral location. Numerous subsequent laws and amendments also require that such mining activities be conducted so as to minimize adverse environmental impacts on the surface resources of public as well as private land. The Forest Service and the Bureau of Land Management administer their mineral programs under different yet similar Codes of Federal Regulations. Forest Service mineral administration is under 36 CFR, Part 228- Minerals. BLM is governed by 43 CFR Part 3800-Mining claims under the General Mining Laws. Extracting mineral resources while also protecting the surface resources requires circumvention whenever possible. When not possible, appropriate and reasonable mitigation, reclamation and restoration are required.

Sharps Creek watershed has historically supported locatable mining activities since gold was first discovered in Sailors Gulch Creek, a tributary of Sharps Creek during the mid 1800's. Since then the level of activity has ranged from intense to minimal, but has generally been fairly consistent throughout time. Administration of mining activities has changed according to the significance of the surface resources being impacted at the time. The level or significance of the impact of mining activities is dependent on the location, the season, the biological and geological composition of the stream and its riparian area, and the proposed mining activity. Because of the numerous variables involved, mineral administration remains to be on a case by case basis.

At the local level, BLM and Forest Service districts requires Mineral Operating Plans for all mineral activities that have the potential to cause significant surface disturbance. The determination of significance rests with the appropriate land management agency on a case by case basis due to the potential for a wide range of resource impacts. It is through approval of these Operating Plans that changes, modifications or special mitigation conditions can be required by the managing agency. A reclamation bond can also be utilized to ensure that ecological impacts are minimized, eliminated, or can be restored to a near natural condition. There are many unknowns and differing opinions in regards to the significance of the mining activities on ecological values, in part, because of the lack of funding for monitoring. Government agencies can minimize these impacts and find some agreement and understanding through monitoring, study, and exchange of new information between the mining community, scientific research community, the general public and land managers.

Key Question: Is there a conflict between recreation and current mining claims?

Recreation use in the Sharps Creek watershed is increasing each year and there are increasing conflicts between miners and the recreating public. Sharps Creek provides several attractions to the recreating public. These attractions include both isolated dispersed camping areas and trails as well as two developed campgrounds and picnic areas, all typically located along the stream channels of Sharps, Martin, Fairview, and Quartz creeks. People seeking more seclusion and remoteness seem to travel to Sharps Creek. The historical and active mining in this watershed is also a luring attraction to recreationists.

The remoteness available in Sharps Creek watershed is in part due to the recognized preference of the active mining claimants to limit the amount of recreational use and attraction to the area. Mining claimants are typically concerned with vandalism to mineral improvements, personal liability for the public entering their mining claims and illegal mineral removal. However, with the exception of patented lode claims in the upland areas around Fairview and Bohemia Mountain, all placer and unpatented lode claims are public land. The general public is free to utilize the area as long as their activity does not physically interfere with the miners right to extract mineral.

Many, if not all, of the dispersed camp sites located along Sharps Creek are also active mining claims. Claims are considered to be active and valid whenever there is a record of mineral location and annual assessment documentation filed at the county and state BLM offices as required by law. Mineral activity is moderate on these claims; and therefore, most areas can also support recreational use. However, due to the location of mining claims on most all of the prime recreational sites there are only two developed campgrounds (with a combined total of 12 individual camp sites) where the general public can recreate freely without fear of conflicting with the mining claimants activities. Because of these multiple uses in the watershed there is bound to be an increasing potential for conflicts to arise.

Historical use of the watershed by placer and lode miners is also a prime attraction to the general public. People looking for the opportunity to view or experience the illusive discovery of gold travel to and recreate along Sharps Creek. Recreational mining for people that do not have a mining claim located, are limited to areas within BLM's Sharps Creek Campground where recreational mining is permitted from June 1 to February 29. Recreational mining is limited to panning, sluicing, and suction dredges with intakes of 4 inches or less. The mineral withdrawal for the campground is present to protect the recreational values of the site.

Eugene District BLM Resource Management Plan addresses the possibility to withdraw approximately 700 acres of land along lower Sharps Creek. This would entail the acquisition of

abandoned mining claims and the purchase or exchange of land with willing private landowners. Providing areas for the increased demand for recreational mining may inadvertently reduce public trespassing on private lands and simplify management of the Sharps recreation area. It may also lessen the conflicts between recreationists and miners to some extent.

From a recreational perspective there are considerable advantages to this proposal. Recreational mining is one of the primary attractions to the Sharps Creek area; however, opportunities for this activity are currently limited to the immediate area around the BLM recreation site. All other public lands along Sharps Creek and several of its tributaries are actively claimed and worked by the claimant. The claimant has the sole right to mining on their claims which leaves little opportunity for the general pubic to participate in a recreational mining activity. Requests for recreational mining areas are common from the recreating public. Recreational mining activity observed at Sharps Creek Recreation Site and the nearby Brice Creek recreational mining areas is moderate and typically seasonal in nature. These moderate levels of activity may be partially regulated by people trying to avoid conflicts with other recreational activities around the recreation sites or the lack of physical area or mineral value to recreationally mine.

Mining in general can have a detrimental effect on meeting ACS objectives. The Recreational Mining proposal would add a significant number of public land acres where recreational mining could occur. The likelihood of additional dispersed recreation sites and increased human use is also a possibility which could have a direct effect on riparian and aquatic species and habitat.

Public lands not withdrawn from mineral location are mostly all claimed and generally worked on a recreational basis. While the current mineral value on these claimed lands may be limited, there remains the potential for large scale placer mining operations to occur. Mining claim activities and their potential effect on the resources are mitigated through a Mineral Plan of Operations and reclamation bonds. If additional public lands were acquired and withdrawn from Mineral Location, then claims could not be located and the BLM would have more control on how to administer the recreational mining operations. For example, the BLM could regulate the number of recreational mining permits issued, the types of equipment utilized, the season of use, etc. unlike what they can do with active mining claims .

5. Recommendations

This chapter focuses on recommendations based on the conditions and interpretations presented in Chapters 3 and 4 of this document. Recommendations and pertinent commentaries are grouped according to the core topics that have been discussed in the main body of this analysis.

Recommendations that address private land management and management by the USDI Bureau of Land Management and the USDA Forest Service are intermingled throughout the resource topics. Often it is evident because of specific locations which entity is responsible for managing that area. In other cases there are multiple parties responsible for a resource such as streams, erosional processes and unique habitats.

These recommendations are made based on an analysis of resource conditions, past and present and are not intended to be implemented without further analysis, consultation and cooperation. Differing resource objectives, time and resource constraints and priorities within the region all play a part in determining the applicability, feasibility and desirability of implementing these recommendations. They are not regulation, law or decisions; they are recommendations that are provided based on the opportunity to look at the resource conditions of the watershed in its entirety .

Because of time constraints, the difficulty of looking at multiple ownerships and resources available to work on this analysis, some areas were not addressed in depth. Completion of the following plans and analyses for the Sharps Creek watershed would contribute greatly to the work begun in this document.

- Watershed Restoration Plan
- Water Quality Management Plan
- Monitoring Plan
- Private Land Watershed Analysis (Weyerhaeuser, 1999)
- Watershed Council Analysis
- Habitat Conservation Plans
- Prescribed Fire Plan

Erosional Processes

Recommendations relating to erosional processes are concerned with allowing the watershed to recover from past management practices and restoring the natural resiliency of drainage networks . The analysis in Chapters 3 and 4 showed that several drainages were outside the natural range of variability. Although current road building and harvest practices appear to cause considerably less damage to resources than in

earlier decades, there is a need to evaluate high risk areas and use the skills of earth science specialists appropriately and where needed.

1. Utilize geomorphic and Landscape Unit Mapping to assist in developing proposed activities so that natural erosional processes are taken into consideration, both in timing and magnitude of activity. Use geomorphic maps to identify high risk areas and areas in need of further evaluation.

2. Use the available landslide history, the Access and Travel Management plan for Sharps Creek watershed (USFS) and the Transportation Management Objectives document (BLM) as information to prioritize road construction, reconstruction and decommissioning opportunities. In addition explore partnership opportunities with other land owners in watersheds such as Walker Creek to address continuing erosional and access issues.

3. Involve the appropriate level of earth science specialist at the initial planning stages to determine the need for specialized services relative to the issues.

4. As part of preliminary project proposals in the roadless area, conduct an assessment that addresses the amount and nature of unsuitable soils.

5. On earthflow terrain, consider the effects of roading, harvesting and yarding on hydrologic functions on a site specific basis as well as at the whole Sharps Creek subwatershed.

Water Quality

Recommendations for water quality involve changing management practices as well as developing cooperative projects among various land managers within the watershed. Monitoring and surveys are needed. Protection and restoration of riparian areas will improve water quality over time.

1. Except during emergencies, water should be pumped for fire suppression, road watering for dust abatement and other uses only from Sharps Creek below Martin. Low flows and sensitive aquatic habitat of tributaries can be severely affected by dewatering. Most streams flow less than 450 gallons per minute (one cubic foot per second), and pumps can easily dry up habitat in a sump pond or stream. Fish and amphibians spawn or rear year around, and water use is a real risk to aquatic life in small streams and wet habitats. Sharps Creek below Martin Creek flows five cfs or more in summer, and even a large pump would have less effect on fish and aquatic habitat there.

2. Establish a partnership with Oregon Department of Environmental Quality to isolate and/or determine the nature and extent of mercury within the Sharps Creek and upper Row Watershed.

3. Continue the stream temperature monitoring program to provide a database to assist with the development of a water quality management plan for Sharps Creek. This could be done as a cooperative effort with the other land owners in the watershed but as a minimum should include both BLM and USFS lands.

4. Participate with the Oregon Department of Environmental Quality, Lane County, and private landowners in a watershed council. Because federal land managers do not administer all the land in the Sharps Creek watershed, a local partnership of private and public land owners must join to improve water quality in the basin. ODEQ (Eugene office 541-686-7838) has guidelines for Water Quality Management Plans on streams (like Sharps Creek) that are listed on the 303(d) list and are not meeting water quality standards. Voluntary measures should be used to improve water temperature and the resulting aquatic habitat.

Vegetation and Fire

Vegetation

The following recommendations were developed in response to key questions concerning associations between site variables that would be useful to reference when prescribing management activities in the Sharps Creek watershed analysis area.

The context for the following recommendations may be found in the Landunit Map ; Table 17, Distribution of Historic and Current Vegetation Stages in Sharps Creek Landscape Areas; and Table 18 Sharps Creek Current and Reference Vegetation by Landunit.

1. Use Landscape Areas as a framework to establish a desired condition for vegetation. Combined with landscape analysis and a prescribed fire plan, the use of a desired condition within these Landscape Areas may integrate the development of desired conditions for Riparian Reserves, snags and large wood, the pattern of vegetation structural stages (patch sizes and frequencies), road densities and address other resource issues.

2. Utilize *The Augusta Project* analysis techniques and tools to conduct landscape analysis and to develop desired landscape patterns *as applicable*. (USDA Forest Service, 1993).

3. Project desired landscape vegetation patterns by using the relationships between vegetation (Plant Association Groups) and physiography as defined by Sharps Creek Landunits. This pattern would be defined by the distribution of vegetation structure stages *within* Plant Association Groups (Landunits).

4. Compare the current vegetation pattern of Landunits and Landscape Areas to the desired vegetation pattern to identify potential vegetation treatments. After analyzing current land uses, allocations, risks and opportunities, develop alternative treatment opportunities. For example:

    A) **West Lower Sharps**

        1) Use thinning to accelerate the development of early seral stands into mid and late seral stands, especially in riparian areas.

2) Recognize historic vegetation patterns and look for opportunities to move vegetation stages towards late seral conditions, possibly in the following areas, given the history and current land use:

- historic terrestrial vegetation refuge areas
- riparian buffers

3) Retain 25-30 percent of BLM Matrix/Connectivity Blocks in late seral vegetation.

B) **East Lower Sharps**

1) Use thinning to accelerate the development of early-seral to mid and late-seral stands.

2) Use partial harvest and fuel reduction treatments to balance the distribution of mid- and late-seral stages.

3) Protect unique habitats and key refuge areas.

C) **West Upper Sharps**

1) In stands in early vegetation stages, use treatments to promote and develop late successional characteristics.

2) Maintain and allow the development of late successional vegetation in the LSR.

3) Restore and maintain riparian buffers.

4) Protect unique habitats and key refuge areas.

D) **East Upper Sharps**

1) Evaluate vegetation patterns and fire risk.

2) Use vegetation treatments as necessary to maintain overall distribution of vegetation stages.

3) Reintroduce fire.

4) Protect unique habitats and key refuge areas.

The above examples do not specify site specific locations or the extent of the recommended type of treatment. This specificity would require an analysis of alternatives and a drainage scale analysis of the current condition of vegetation stages by Landunit within Landscape Areas. Also, an in-depth fire analysis integrated with the Landunit Analysis needs to be completed. These analysis products are beyond the scope of this iteration of the Sharps Creek Watershed Analysis.

Fire

Fire as a Replication of the Ecological Process

Fire is an appropriate process in the preservation of old-growth forests. Fire is responsible for their creation and maintenance, as well as their destruction. Because we cannot replace the effects of fire with only timber harvest or vegetation manipulations, fire must remain as an active function in the system. However, allowing fire to take its course isn't a feasible option under current fire suppression policies in these land allocations. Instead of natural fire events, we can take advantage of prescribed fire used under pre determined conditions and limitations.

Recommendations for Restoration or Enhancement of the Natural Fire Regime

1. Identify and evaluate opportunities for prescribed natural or management ignited fire in select areas to restore fire's role of maintenance. Priority areas would be:
    - Areas that have historically experienced moderate intensities, and recurrent partial stand replacing fires (See Figure 48, Fire Risk map);
    - Meadows and winter range habitat;
    - Planning areas for which an analysis shows prescribed fire would be beneficial, either inside cutting unit boundaries or adjacent to them;
    - Late Successional Reserve;
    - Areas where significant amounts of trees have fallen due to extreme weather events ;
    - High risk areas within the roadless areas.
2. Assess risk of using or excluding fire in these areas. Include:
    - Firefighter and public safety ;
    - Values at risk, to include mining structures ;
    - Potential fire behavior ;
    - Cost analysis;
    - Air quality concerns ;
    - Fire effects;
    - Road access or potential closures, especially in the LSR.
3. The South Cascade LSR Assessment (LSR 222) recommends a desired future condition that maintains 65 percent of the LSR in a low to moderate risk category, as determined by fire behavior, fuel loadings and fire occurrence.

- Prescribed fire planning for the Sharps Creek portion of the LSR should include a risk assessment to determine where it falls in relation to th e above 65 percent figure.

Management Strategies for Prescribed Fire

1. Identify opportunities for partnership projects, (partners may include the Bureau of Land Management, the Bohemia Mine Owner's Association, Weyerhaeuser, other private landowners, Oregon State Department of Forestry, and the U SFS North Umpqua and Cottage Grove Ranger Districts) .
2. Begin natural fuels planning effort , using an interdisciplinary approach to assess areas that would benefit from management ignited prescribed fire as described above.
3. Prepare management ignited prescribed fire plans for areas within the watershed that would be high priority for application of fire .
4. Identify opportunities for monitoring and evaluating prescribed fire applications and effects beyond what is currently required .
5. Develop fire behavior predictions for use in Fire Situation Analyses (FSA's) and fire planning .
6. Identify several prescription windows to maximize opportunities for a variety of landscape scale treatments .
7. Model potential smoke management emissions given proposed projects using plume trajectory modeling .
8. Delineate proposed wildlife corridors and areas of concern for larger fires on Hazard Reduction Standards Risk Map and identify protection priority. As the landscape surrounding the proposed corridors develops, consider opportunities for prescribed fire within the corridors .
9. Along the Sharps Creek , Martin Creek and Puddin Rock corridors, continue fire prevention efforts to mitigate risk of human caused fire due to recreational and mining activities .
10. Develop a map of predetermined risk (of significant spread) areas; identify and practice appropriate suppression response (confine, contain, control) based on mapped areas, weather, available fire management personnel, and fire behavior projections as available.

Areas Needing Further Study or Research

1. The Fairview and Puddin Rock roadless areas need to be evaluated more thoroughly. Fire management personnel should survey representative areas to gather data such as visible fire scars, tree age samples, fuels and stand characteristics as funding and opportunities become available. The information collected will be used to validate assumptions made in this study as to the fire risks of these areas.

2. Areas identified as possibilities for prescribed natural or management ignited prescribed fire may require pre-burn preparation. Those areas requiring reduction of understory fuels as a pre-burn preparation could be expensive. An economic evaluation of potential costs and losses associated with this type of preparatory work would be necessary.

Significant Issues or Areas of Concern

1. In order to implement management ignited and prescribed natural fire programs and to meet current management suppression policies, qualified personnel with prescribed fire training and experience are needed. Skills need to be emphasized in the following areas:
    - Fire and fuels planning for landscape scale projects ,
    - Knowledge of fire effects ,
    - Prescribed fire behavior analyst skills ,
    - Complex prescribed fire manager, burn boss, and specialist skills .
2. Implementation of a prescribed burning program will require t raining and upgrading of employee skills.
3. Air quality has been gradually improving since the early 1900's. This trend should continue, and any prescribed burning would be planned to meet air quality standards and restrictions. With any larger scale prescribed fire project, an assessment of the public's concerns relative to potential smoke emissions would need to be addressed.
4. Other public concerns that need to be addressed in any prescribed fire planning effort for the watershed would be , not only the issue of using prescribed fire , but also the risks and consequences of human use or lightning trigger ed wildfire. At a minimum, human use of the watershed, especially in fire season, and the potential use of chemicals (i.e. , retardant) during fire suppression activities need to be addressed.
5. There are strong public expectations for protection and fire suppression programs. Through educational opportunities, people can be taught the role of fire and its effects. They will better understand the historical role fire has played in the watershed prior to our management activities. An increased public awareness of fire management issues may lead to more tolerance for prescribed fire after understanding some of the trade-offs and risks associated with wildfire.

Terrestrial Habitats and Species

Covered in this section are TE&S animal and plant species, riparian habitats, noxious weeds, snags and down wood and the habitat connectivity zone. Retention of late -seral vegetation, protection of unique habitats, restoration of degraded sites and on-site

management are all needed to restore and maintain a functioning ecosystem for terrestrial habitats and species within Sharps Creek watershed.

Threatened, Endangered, and Sensitive Wildlife and Plant Species

Recommendations

The following specific recommendations are based on concerns about the viability of each of these species within the watershed. In some cases, more information is needed to assess critical habitat components of concern.

These recommendations are listed so that as opportunities arise measures can be taken to retain and restore habitat. They are not intended as regulation or decisions.

Spotted Owl

Within the Sharps Creek watershed, Critical Habitat Unit OR-25 has 15,109 acres with 19 percent of it designated as BLM Matrix/Connectivity (Lick Creek and Pony Creek drainages). OR-25 has 4,126 acres (27.3 percent) in late-successional forest; 41 percent of the late-successional forest is in the Connectivity sections. The Fish and Wildlife Service addressed the importance of ecologically significant old growth in the FY 1998 biological assessment for habitat modification projects in the Willamette Province. Under Section 7(a)(1) of the Endangered Species Act, the following conservation recommendation was provided: "*Minimize the rate of harvest of suitable spotted owl habitat within the matrix and critical habitat outside of LSR's*" Management conflicts exist in this area, however.

The Lick Creek and Pony Creek drainages exemplify the competing interests inherent in the Northwest Forest Plan. The NFP is designed to simultaneously assure the viability of the northern spotted owl by maintaining sufficient habitat across its range but also to allow timber harvest.

The NFP was written to assure long term viability of northern spotted owls. Large blocks of late-successional forest offer the best opportunity to maintain existing habitat for the owls. The Lick Creek and Pony Creek drainages contain relatively large blocks of relatively intact late-successional forest. Postponing regeneration harvest could promote retention of critical habitat.

The NFP also seeks to provide a continuous flow of logs to allow northwest forest industry the opportunity to remain viable. The NFP and the Eugene BLM District Resource Management Plan allocated the Lick Creek and Pony Creek drainages to Matrix. Matrix lands are available for timber harvests. Indeed, the Plan's predictions of probably sale quantity depend on logging within Lick Creek and Pony Creek.

It is recommended that specific analysis of management options be completed for the Lick Creek and Pony Creek drainages. Consider the following factors:

- The role the Lick Creek/Pony Creek area plays in providing suitable owl habitat in CHU OR-25 and in the South Willamette/North Umpqua Area of Concern;

- How timber harvest would affect the integrity of owl habitat and delivery of PSQ ;
- Whether the land use allocation should be changed to LSR and what the consequences are of that change;
- Whether an opportunity exists to swap LSR land use allocation elsewhere to maintain the mix of LSR and Matrix now embedded in the NFP and BLM RMP .
- Portions of BLM Roads 22-1-23 (23,T22s, R1W) and 22-1-14 (Sec. 24 and 25) are priority for closure as feasible.

White-footed vole

1. Enhance the riparian habitat along lower Sharps Creek by allowing large wood to accumulate.
2. As opportunities arise, restore riparian habitat that is currently occupied by roads below 2,500 feet elevation within the broad flood plain terraces of Sharps Creek.

Bats (See list in Chapter 4 for species)

1. To the extent compatible with site-specific objectives and land allocation objectives, manage for a high density of snags.
2. Protect roost sites.
3. Protect bats from human disturbance during hibernation, gestation and maternal periods.
4. Survey proposed project areas to locate potential maternity and hibernation sites for occupation by bats.
5. Develop management plans with private land owners and mining claimants that currently control critical habitat such as mine adits.

Oregon Slender and Clouded Salamander

1. Inventory proposed project areas to locate habitat.
2. Protect habitat from disturbance.
3. Maintain high quantities of large woody debris at elevations below 3,000 feet on north aspects and in riparian areas.

Tailed frog

1. Inventory and monitor habitat within proposed project areas .
2. As opportunities arise, r estore riparian habitat that is currently occupied by roads adjacent to non fish-bearing intermittent and peren nial stream channels.
3. As opportunities arise, protect and restore riparian vegetation along non fish-bearing, intermittent and perennial stream channels.

4. Work with miners to minimize damage from in-stream mineral activities (such as suction dredging) that destroy eggs, adults and juveniles .

Red-legged and Yellow-legged frog

1. Inventory and monitor habitat within proposed project areas .
2. As opportunities arise, restore riparian habitat that is currently occupied by roads below 3,000 feet elevation in ponds and along non fish-bearing, intermittent and perennial stream channels .
3. As opportunities arise, protect and restore riparian vegetation along stream channels below 3,000 feet elevation.
4. Work with miners to minimize damage from in stream mineral activities such as suction dredging that destroy eggs, adults and juveniles within the lower reaches of Sharp Creek. .

Sharp-tailed Snake

1. Allow large wood to accumulate on both private and Federal lands, below 2,500 feet elevation.
2. Assure a good distribution of large diameter wood in all decay classes over the landscape.
3. Protect oak meadow habitat.

Western Pond Turtle

1. As opportunities occur, restore riparian habitat that is currently occupied by roads along lower Sharps Creek.
2. Protect turtles from human disturbance along lower Sharps Creek . This may include relocating roads, dispersed camps and developed campgrounds outside of riparian habitat.
3. Locate possible hibernation and nest sites, then protect these sites.
4. Restore large wood for basking and pool development.

Harlequin Duck

1. As opportunities arise, restore riparian habitat that is currently occupied by roads along Sharps Creek.
2. To the extent feasible, protect ducks from human disturbance along lower Sharps Creek during spring and early summer months. This may include relocating roads, dispersed camps and developed campgrounds outside of riparian habitat.

Ringtail Cat

As opportunities arise, r estore riparian habitat adjacent to all perennial streams that is currently occupied by roads.

Marten

1. In general any reduction of human disturbance throughout the watershed will benefit marten.
2. As opportunities arise, reduce open road density throughout the watershed. Control access with gates or tank traps to allow no more than .5 miles of road with open access per square mile of road in suitable habitat.
3. Provide connective habitat throughout Matrix land and private lands .
4. To the extent feasible, provide large quantities of large woody debris, both within stream and in terrestrial habitat.
5. Reduce fragmentation of late-successional habitat.
6. Retain late-successional components as large coarse wood debris and residual old-growth trees throughout the landscape .

Riparian Habitat

Recommendations

1. Retain recommended Riparian Reserves standards from the Northwest Forest Plan for all stream classes including reserve widths. Reserve widths average 180 feet for non fish-bearing streams and 360 feet for fish-bearing streams on lands managed by the Forest Service. On lands managed by the BLM (because of higher site quality) the riparian widths are 200 feet for non fish-bearing streams and 400 feet for fish-bearing streams.
2. Priority should be given to enhancement of large coarse woody debris habitat within Riparian Reserves.
3. Manage Riparian Reserves to enhance late-successional conditions; consider the impacts to microclimate and associated riparian species prior to management.
4. As feasible, remove roads located within Riparian Reserves.
5. Maintain Riparian Reserves in a condition that reflects the natural range of successional vegetation and processes within the watershed.
6. Evaluate opportunities to manage for a high density of snags to mitigate loss of habitat on Matrix and private lands.
7. Minimize the impact of campgrounds and dispersed camp sites on riparian habitat.

Threatened, Endangered and Sensitive Plant Species and Unique Habitats

Recommendations

1. There is a lack of information about Survey and Manage species, including lichens, liverworts, mosses and fungi that are suspected to occur in the Sharps Creek watershed. Inventory, monitoring and further education of field personnel in identification of these species are needed to help determine changes in population, which species are impacted by management activities and reproductive success.

2. Several of the unique habitat areas have rock outcrops that need to be inventoried for *Romanzoffia thompsonii* presence and monitored for encroachment of introduced species.

3. In the White Creek meadow area, the center island of *Pseudotuga menziesii* (Douglas-fir) needs to be kept small to keep from merging with nearby forest structure. Also maintain the *Quercus garryana* (Oregon white oak) from encroachment from the forest edge. Monitoring of introduced and native grasses within this meadow is recommended.

4. The introduced plant species listed in Chapter 4 found on Shane's Saddle also needs to be monitored for encroachment on the meadow area.

5. *Pinus attenuata* (knobcone pine) in the Calapooya Divide area needs to be monitored and management plans developed. This is one of the northernmost occurrence of this species.

6. The following species on BLM managed land should continue to be surveyed and tracked: *Allotropa virgata, Epipactis gigantea, Montia diffusa, Orobanche pinorum and Pityopus californica.*

Noxious Weeds

Recommendations

1. As of March 1996 the Umpqua National Forest has a prevention strategy in place for the future control of noxious weeds, to be incorporated into the project planning process. BLM has a similar process. This includes, but is not limited to:

    - Controlling and then monitoring infestations where needed, to be continued for up to five years on a scheduled basis; and

    - The cleaning of equipment prior to moving onto forest land should be considered during project planning and design.

2. Disturbed ground would be revegetated as soon as possible after project completion where on-site assessment warrants planting or seeding. Low risk areas would be allowed to naturally revegetate.

3. The Forest Service, BLM, the Oregon Department of Agriculture and other land managers use a process known as Integrated Pest Management (IPM) to emphasize prevention as the strategy for controlling unwanted vegetation.

Snags and Down Wood

The Fire section and the discussion of snags and down wood in Chapter 4 under Terrestrial Habitats describe how the historical fire regime in Sharps Creek supported a large number of snags, down wood and a mosaic of vegetation structures and patch sizes. Standards and Guidelines for Matrix allocations on Federal land (ROD, page C-40) recommends developing models for computing expected numbers and sizes of logs by groups of plant associations and stand types to use as a baseline for landscape prescriptions.

The following recommendations are based on the computations for snags and down wood in Appendix E , with the goal of returning Sharps Creek watershed vegetation to a regime that is within the natural range of variability for snags and down wood. This would entail leaving a higher average number of snags and pieces of down wood across the landscape than is recommended as the minimum in the ROD.

Recommendations for Sharps Creek Watershed for Areas Suitable for Timber Harvest

1. By drainage, manage for a minimum of 9 snags per acre greater than 20" diameter in decay classes I and II. Priority within harvest units is to retain all existing snags. Snag objectives can be achieved through various means, including, but not limited to retaining additional green trees in regeneration harvest units, creating snags in reserves, restricting salvage activities in reserves and creating snags during thinning activity. This should be the minimum density of snags retained over time, allowing for some loss of this structure. (See Appendix E for analysis.)

2. Harvest activities should retain 12 down logs 20" x 20' at a density of 24 pieces per acre of decay classes I and II for a total of 24 pieces per acre. In addition, 12 down logs greater than 20" x 10' (larger the piece the better) should be retained to the extent consistent with silvicultural and project objectives. All existing large down woody debris should be retained and protected from disturbance to the greatest extent possible.

3. Minimize salvage of snags and down wood in LSR's and Riparian Reserves except for safety reasons and to meet ACS objectives.

Habitat Connectivity Zone

A 4,000-foot wide temporary "habitat connectivity zone" is recommended to allow time for Riparian Reserves and the LSR to recover (approximately 50-70 years). The corridor would run from the ridge down Fairview Creek drainage to Sharps Creek, then up the Clarks Creek drainage to the LSR . This corridor would be the lowest priority for harvest.

In Layng Creek and Brice Creek watershed analyses (USDA Forest Service, 1995 and 1997), a zone of vegetation was also recommended as the lowest priority for harvest to protect the highest quality late successional vegetation while Riparian Reserves and the Late Successional Reserves recovered from past harvest. The following recommendations are based on the analysis in Chapter Four under Terrestrial Species and Habitats and are designed to connect to the Brice Creek and by extension to the Layng Creek Habitat Connectivity Zones. (See map Upper Row Habitat Connectivity Zone in Appendix E) .

Application of the Connectivity/Diversity Block standards and guidelines in the BLM portion of Sharps Creek is designed to maintain dispersal conditions for the northern spotted owl in the South Willamette/North Umpqua Area of Concern. While the application of the standards and guidelines is designed for the northern spotted owl, application of the standards and guidelines as detailed in the Northwest Forest Plan will also benefit late-successional forest related species other than the northern spotted owl.

It is recommended that activities within the habitat connectivity corridor be managed according to the following guidelines .

Recommendations

1. A habitat connectivity zone should be created to allow time for Riparian Reserves and LSR to recover (50 to 70 years).
2. This 4,000-foot wide temporary corridor would be managed as a lower priority for harvest. The corridor would run from the ridge down Fairview Creek drainage to Sharps Creek then up the Clarks Creek drainage to the LSR. (See Figure 50)
3. Timber harvest in this corridor would either be deferred or managed to maintain connectivity for riparian and upslope late-successional dependent species. When harvest is required to meet other priorities such as restoration or silvicultural priorities, the harvest prescription should seek to maintain or enhance late-successional forested conditions.
4. Active fire suppression or management should occur to protect late-successional condition within the corridors.
5. Management activities that should be given high priority to restore habitat include creating or enhancing snag and large down woody debris, maintaining a diversity of tree species, layered canopies, and structural diversity.

Aquatic Species and Habitat

Watershed restoration is a key component of the Aquatic Conservation Strategy within the Northwest Forest Plan. This strategic approach calls for maintaining and enhancing the best habitat within the watershed first. It also recommends to restore other areas. Watershed restoration is divided into three categories:

- **Road Restoration**, which includes upgrading and improving drainage and sediment concerns to full decommissioning. All culverts that pose a risk need to

be upgraded to accommodate a hundred year flood event. An Access and Travel Management Plan was developed for the Forest Service portion of the watershed; this plan identifies many restoration opportunities. T he BLM uses their Transportation Management Objectives as guidance .

- **Riparian Silviculture** to enhance the growth of late successional vegetation within the Riparian Reserve to meet ACS objectives.(See ROD, page B-31.)
- **Instream Restoration** to improve the channel complexity and aquatic habitat.

Strategic Approach

1. In keeping with the strategic approach, Fairview, Walton, Cinge, Upper Sharps, Upper Martin, Sailors Gulch and Cedar Creeks have the best aquatic habitat within the watershed and should be further enhanced. These streams are within roadless areas. Keeping the roadless character of these drainages would maintain the pristine habitat currently present.
2. It is also recommended that these creeks be monitored to better understand aquatic habitat and species within healthy systems. Monitoring may include macroinvertebrate sampling, fish sampling, surveying for amphibians and continued habitat surveys over time. Some specific recommendation s that came from the stream inventories for these streams include:
    - Look into upgrading or decommissioning roads in Upper Fairview dra inage to reduce sedimentation and drainage concerns. Work with patented claim owners (private land) where feasible, and as opportunities occur.
    - Sharps Creek Reach 3 (Fairview Creek to Bohemia Creek), look into moving the down large woody debris in the stream so that it is more functional.
    - Sailors Gulch, determine if the clearcut unit in the upper reach could benefit from riparian silviculture.
    - Monitor to determine what effects mining has on aquatic resources.
3. Clark Creek and Lick Creek appear to have better habitat available within the lower portion of the watershed. The land within these drainages is primarily administered by BLM. Enhancing habitat within these drainages would be consistent with the Aquatic Conservation Strategy.
4. Lick Creek has few landslides (see Erosional Processes in Chapter 3). Therefore road restoration projects that reduce landslide potential are not a high priority for this drainage. Upgrading or decommissioning roads should be looked into with more of an emphasis on improving drainage concerns and reducing the increased stream network that ditches tend to cause. Other restoration opportunities should focus on instream projects and riparian silviculture.
5. Clark Creek is within an LSR. This drainage has a history of numerous landslides. Decommissioning roads or improving crossings to reduce landslide potential

should be considered highest priority for this drainage. The road along Clark Creek is also affecting the recovery of this channel to properly functioning condition. Opportunities need to be reviewed to determine if conditions can be improved. Riparian silviculture and instream restoration opportunities are also a priority for BLM within this drainage.

Other Restoration Opportunities

1. A Watershed Council is recommended so that the different agencies and private land owners can work together to restore degraded habitat within the watershed.

2. The road along Sharps Creek has essentially blocked or limited passage for aquatic species to many of the tributaries. Sediment routing has also been altered from all these stream crossings. An interagency and private corporation effort can inventory and assess this road within the riparian corridor. This information needs to precede other restoration efforts within the mainstem, or if other projects do develop they should proceed cautiously.

3. These other projects include instream restoration of the mainstem of Sharps Creek. The habitat is of poor quality from the mouth to Fairview Creek, with little channel complexity. The area of particularly concern is from the mouth to below Walker Creek (see map, Aquatic Habitat Condition, Figure 53). Instream structure, such as placement of large woody debris and boulders may improve aquatic habitat and channel complexity.

4. A Water Quality Management Plan needs to be developed by the U.S. Forest Service, BLM and the private owners to de-list Sharps and Martin Creeks from the Oregon DEQ water quality limited 303(d) list.

5. Earthflow terrain is located in the lower part of the watershed (see map Geomorphic Groups, Figure 4). The earthflow terrain is a source of fine sediment and appears to be affecting the quality of the substrate by filling in the cobbles and gravels needed for macroinvertebrate and spawning habitat. Most of these areas are under private ownership where the State Forest Practices Act is used for stream protection. This protection is minimal to non existent along many of the streams. In the earthflow terrain it is recommended that:

    - The State should consider developing guidelines for management activities on earthflow terrain to protect streams.
    - Riparian areas be thinned and managed for late successional seral conditions.
    - Roads should be inventoried and upgraded to improve drainage concerns, or else decommissioned.

Recommendations identified during stream inventories:

Quartz Creek

The riparian area is predominantly lined with hardwood stands. Riparian silviculture projects can convert the riparian to a more desired stand of conifers.

Reach 1 is lacking in instream large woody debris. Placing log and or boulder structures may improve habitat by increasing the channel complexity. This type of project would need to be coordinated with local miners.

The 23-721 road along Quartz Creek is affecting the channel. Develop opportunities to upgrade or decommission this road.

Monitor mining activities to help understand possible effects to the aquatic species and habitat.

Martin Creek

Coordinate with miners and determine if instream placement of LWD and/ or boulders would benefit reaches 1 and 2.

Determine if riparian silviculture techniques can reduce the hardwood component of the riparian vegetation in reach 2 in order to release and grow large conifers.

Monitor mining activities to help understand possible affects to the aquatic species and habitat.

Monitor macroinvertebrate to help determine if the stream channel has fine sediment or high temperature concerns. Evaluate what the high concentration of juga snails may indicate in reach 1.

Maintain roadless characteristic and complex habitat in Reach 3 of upper Martin Creek.

China Creek

Determine if riparian silviculture projects would benefit reach 1.

Determine if instream placement of large woody debris would benefit the stream channel.

Determine if the 23 road needs to be upgraded or if it can be moved away from the stream channel and riparian in places.

Continue monitoring stream temperature. Determine if China Creek Spring is functioning as an important cold water source.

Puddin Rock Creek

Monitor mining activities to help understand possible effects to the aquatic species and habitat.

Identify ways to minimize impacts to the aquatic resources from using heavy equipment during mining operations.

Restore the stream channel before continuing to other portions of the mining claims.

Remove the cemented sluice box if not in use.

Determine if the 23 road culvert can be improved for fish passage or should be replaced.

Determine if in-channel habitat can be restored.

Look into decommissioning or improving the 2328 roads.

Saddle Camp Creek

Determine if riparian silviculture and instream placement of large woody debris would benefit in the fish bearing portion.

Cedar Creek

To the extent possible, maintain roadless character of the drainage.

Monitor aquatic condition s (biological and physical) in this pristine refuge drainage; this information will provide a benchmark for monitoring and aid in the restoration of degraded habitat.

Sharps Creek

Work with miners to introduce instream large woody debris and/ or boulders to reach 1 and 2.

Monitor mining effects to the aquatic system.

Continue macroinvertebrate sampling and sample on FS land (especially in areas with high concentration of juga snails).

Look into moving the large woody debris within the floodplain in reach 3 so it is more functional in the stream channel.

White Creek

Monitor mining effects and reduce future impacts that may continue to alter the channel.

Determine if the culvert on the 2460 road has water flowing below it and replace or repair if necessary. (See ATM).

Monitor water temperature.

Determine if riparian silviculture restoration projects would benefit the aquatic system.

Sailors Gulch Creek

Currently no roads cross Sailors Gulch Creek. An opportunity exists to limit road construction that may impact the stream channel.

Monitor mining effects.

Determine if the clearcut unit in upper reach could benefit from a riparian silviculture restoration project.

Bohemia Creek

Determine extent of mining activity and effects to the aquatic system.

Keep the main channel of Bohemia Creek free from roads that may affect the stream channel.

Fairview Creek

Maintain this drainage as pristine, refuge habitat. To the extent feasible, maintain the roadless character.

Passively allow the streams to continue to restore themselves by maintaining riparian reserves. Do not enhance the pristine reaches.

Monitor the aquatic condition in this pristine drainage.

Cinge Creek

Limit management impacts.

An opportunity exists to study and research this drainage that has had no timber harvest or road construction.

Walton Creek

An opportunity exists to limit roads and harvest units within this drainage. This will maintain this already healthy stream system.

Human Uses

Human uses are pervasive throughout the watershed. Timber harvest, roads, mining and recreation are the most common activities. The cumulative impact of past practices, and the likelihood of their continuation in the future, has made watershed restoration a key component of recent Federal and State initiatives. Cooperation among landowners in the following key areas can ensure the long-term sustainability of the Sharps Creek watershed:

- Ensure viable populations of all species by providing functional habitat for wildlife and aquatic species, and
- Protect water quality through measures that will remove Sharps and Martin Creeks from the DEQ 303(d) list (temperature limited).

General Recommendations

To meet these objectives the formation of a watershed council with key landowners and users is one method that has been used successfully in neighboring watersheds. The State of Oregon charters watershed councils and they often provide the forum to successfully develop understanding and coordination among local landowners. Identification of opportunities, prioritization of restoration needs and cooperative projects have been the outcome of successful watershed council endeavors throughout the State. The following list of issues, opportunities, projects and key resource concerns are provided for the consideration of a watershed council or others who are interested in improving the ecosystem health of this watershed.

1. Look for opportunities to eliminate unnecessary roads, fix degraded roads and remove roads from sensitive areas, such as riparian zones.
2. Pursue cooperative road restoration and reduction of road density particularly in Walker Creek, Lower Sharps, Martin and Quartz creek drainages.
3. Support and encourage increased protection of riparian areas by private land managers.
4. Look for opportunities and encourage the retention of snags, large trees and down wood.
5. Pursue opportunities to protect unique habitats, including riparian habitat.
6. Develop partnerships for aquatic restoration— instream, riparian silviculture, roads, etc.
7. Develop partnerships with miners to close adits with "bat-friendly" gates.
8. Look for opportunities for land tenure adjustments to enhance connectivity and to protect the most valuable wildlife and aquatic habitat in the watershed.

Late Successional Reserve

Recommendations

1. Create a high density of snags in mature seral forest habitat.
2. Except to meet safety or LSR objectives, minimize salvage or harvest of large coarse woody debris.
3. Enhance and maintain large quantities of large woody debris in both terrestrial and aquatic habitats.
4. Thin to meet LSR objectives in young plantations and managed stands.
5. Reduce fragmentation from roads and harvest activities. The following list of roads may be available to close or have sections available to close.

T23S, R1W	
Road Number	Section
23-1-1.1	1
23-1-2.1, 2.2,2.3	2
23-1-3, 3.2	3
23-1-9, 9.1, 9.4	9
23-1-27.1. 26.1	14, 11, 23
23-1 -- 27, 26.1	26
23-1-27.4, 27.5	27

Roadless Area

On Forest Service managed land, the two large roadless areas, Fairview and Puddin Rock, provide wildlife refuge and aquatic habitat and provides balance, in terms of vegetation age classes, to the Lower Sharps Creek area. The Lower Sharps Creek area is primarily establishment and thinning stage vegetation with few late successional features. The roadless areas represent the aquatic and terrestrial habitat in the best condition in the Sharps Creek watershed analysis area and contains the majority of mature and late successional vegetation . The Northwest Forest Plan ROD states that to provide consistency with the Aquatic Conservation Strategy, *"Watersheds currently containing the best habitat or those with the greatest potential for recovery should receive increased protection and receive the highest priority for restoration programs."* (ROD, Page B-9).

Maintenance of late seral vegetation within the roadless areas may not be feasible in the long term (over 100 years). Because of the moderate fire regime, Upper Sharps Creek is historically a mosaic of vegetation classes and may not be sustainable as late successional vegetation.

There are also 3,357 acres of land suitable and available for harvest in the roadless areas.

The Canton Creek roadless area within Sharps Creek is a small portion (233 acres) that extends north from the Canton Creek watershed on the North Umpqua Ranger District (USFS).

Currently, there is controversy and some uncertainty about Federal policy regarding roadless areas. At a minimum the following considerations should be incorporated in to project alternatives:

- *Avoid arterial roads,*
- *Avoid regeneration harvest,*
- *Emphasize use of best management practices, and*
- *Delineate connectivity zone and recognize the importance of connectivity if timber harvest is to occur.*

Based on the analysis in Chapter 4 and the above considerations , the following recommendations were developed :

1. Within Sharps Creek watershed , the Fairview and Puddin Rock roadless areas should retain their roadless character. Minimize or preferably, no roads should be built in the Sharps Creek portion of the Fairview and Puddin Rock roadless areas.

2. Restrict timber harvest within the roadless areas to projects that would enhance habitat resource objectives.

3. The habitat connectivity zone within the Roadless Areas should be the lowest priority for projects that include timber harvest, unless the purpose is to enhance late successional habitat.

4. A prescribed fire plan in conjunction with a land unit analysis should define the desired future condition of the roadless area before any projects are implemented that include harvest.

5. During the next Forest Service land management plan revision , consider the following alternative allocations :

    - Reallocate the Sharps Creek watershed portion of the Fairview roadless area and portions of the Puddin Rock roadless area to MA-14, Undeveloped Intact Ecosystems (Umpqua Forest Plan, 1990, Management Area 1 4). Or,

    - Designate the Sharps Creek portion of Fairview and Puddin Rock roadless areas as Late Successional Reserve. In exchange, r eturn the Brice Creek LSR to Matrix allocation.

Timber Management

The Sharps Creek watershed analysis area will continue to provide timber resources for commodity production, especially on privately owned land. BLM and Forest Service managed lands both have Matrix allocations under the Northwest Forest Plan where most harvesting will occur .

General Recommendations

1. Provide late successional characteristics such as remnant large trees, down wood, snags and riparian buffers in all harvest units.

2. As opportunities occur, restore previously degraded sites. Maintain and enhance the best wildlife and fish habitat.

3. Assess thinning opportunities to meet Aquatic Conservation Strategy and other resource objectives (LSR, unique habitats) in young stands.

4. Encourage private land managers to increase protection of riparian areas on private land.

Planning and Analysis Recommendations

1. On Federally managed lands prioritize harvest based on retaining late successional, connected habitat. The habitat connectivity zone would be the lowest priority for harvest.

2. Further develop and complete Landunit Analysis combined with Fire Analysis to define suitable, sustainable harvest prescriptions.

3. On lands managed by the Forest Service, use fire analysis to refine harvest prescriptions as to patch size, density, structure, rotation and species composition.

4. On lands managed by the BLM, use standards and guidelines in the Eugene RMP Silvicultural Appendix to help develop harvest prescriptions.

Vegetation Management

1. On Federally managed land in Upper Sharps Matrix allocations, utilize primarily uneven aged management or partial harvest prescriptions, especially on harsh sites, south-facing slopes and rocky, steep slopes over 60 percent (marginal sites).

2. On productive sites in Matrix allocations, after meeting watershed analysis recommendations and ROD standards and guidelines, use intensive timber management techniques, such as pre-commercial thinning, pruning and hand fertilization to maximize timber production opportunities.

3. Develop benchmark silviculture prescriptions for Matrix sites with low productivity and for sites with soils unsuitable for regeneration harvest.

4. Maintain wide spacing of conifers and provide density management on Site Class IV and V sites in Matrix allocations.

Roads

Roads affect and facilitate the management of several resources. In aquatic and terrestrial habitats the impacts are largely negative, yet roads allow for timber and mineral access, fire protection and recreation management. Throughout this chapter there are recommendations for managing roads in the Aquatic, Terrestrial and LSR sections. Overall road density for the watershed is 3.9 mi./sq.mi.

Private Land

On privately managed lands, the road density is high (6.5 miles per square mile) and there appear to be opportunities to close roads in riparian areas and to reduce the potential for landslides.

BLM

On BLM managed lands, the Travel Management Objectives plan is the guiding document for maintenance of roads (see Appendix I). There are also specific

recommendations for roads in the LSR section and Habitat Connectivity section of this Chapter. Road density is 3.3 mi./sq.mi.

Forest Service

Road density in the Sharps Creek watershed on Forest Service lands is approximately 2.4 miles per square mile (63.0 miles of road inclusive of County, BLM and private roads within Forest boundaries).

On Forest Service managed land, an Access and Travel Management Plan was developed to evaluate each road segment for aquatic, wildlife and human use effects and needs. Categories were established to specify maintenance levels, restoration opportunities, decommissioning needs and areas needing further study. Chapter 4 and Appendix J describe the analysis categories in further detail.

The Access and Travel Management Plan is a list of recommendations. Actual decisions are made through a NEPA interdisciplinary team process where alternatives are developed and the effects are evaluated.

Because several of the road recommendations in the decommissioning and quandary categories are in areas where there are placer mining claims or involve access to patented claims (see below), it is recommended that claimants be involved early on in the NEPA process and that public involvement be extensive.

The following road analysis categories were developed in response to the following road segment ratings: Maintain A (MA), Maintain B (MB), Maintain C (MC), Decommission (Decom), No Action (NA), Fix problems close road (FCR), and Quandary.

Maintain (MA, MB, MC)

Approximately 51 percent of the total road system (32 miles), were identified for continued maintenance in the transportation network.

No Action (NA)

Three miles of road (4.8 percent of the total road miles) were found to be low risk to aquatic and terrestrial habitat as well as low human use. These road miles were put into the "No Action" category.

Fix Problems, Leave Road (FLR)

Besides those road segments in "No Action", 4.26 miles (7 percent of the total road miles) were also found to be a low risk to aquatic/terrestrial habitat and low human use but these roads are currently in need of some type of action to remove any future risk (FLR). These road segments will be waterbarred, culverts will be removed and oversteepened landings pulled back.

Decommission (DECOM)

There were 5.3 miles (8.4 percent of the total road miles) of roads proposed for decommissioning. Although the ID team addressed decommissioning roads, it was difficult to determine the feasibility of decommissioning road segments that access mining claims. Segments 20, 34, 35, 36, 37, and 48 were all proposed for decommissioning but also provide access to mining claims. It was proposed that segments 34, 35, 36, and 37 be further addressed during the Quartzback Timber Sale Environmental Analysis (EA) which will begin in the Fall of 1998. Segment 20 is located up Puddin Rock Creek and also provides access to an active mining claim. As with segments 33, 35, 37, segment 20 is a valley bottom road having a detrimental impact on the creek. The team proposed this segment for decommissioning but recommend that an Environmental Analysis be completed to address the biological and social aspects of decommissioning.

Quandary

Forest Service Quandary roads totaled 19.29 miles (31 percent of the total road miles). Two other road segments fell into the Quandary category, segments 2 and 10, but were not included in the total Quandary mileage since the final decision on these roads lies with the County and BLM. Segment 2 is a county road on Forest Service land and segment 10 is a BLM road that accesses Forest Service lands.

One road segment was not given a recommended road maintenance category, segment 45. The ID team thought further assessment of this segment was necessary before a recommendation could be made .

Below is a list of road segments, their impact and use rating and the recommended final analysis determination.

Table 25. Final Road Analysis Category

Road Segment Number	FS Road Number	Segment Length (mi)	Wildlife Impact Rating	Aquatic Impact Rating	Human Use Rating	Final Road Analysis Category
1	2460	10.5	M	H	H	**MC**
2	2460	4.78	H	H	H	**Quandary**
3	2460	2.63	M	M	H	**MC**
4	2301	1.01	M	M	H	**MA**
5	2301	3.64	M	M	M	**MB**
6	2301-747	0.23	L	M	L	**Decom**
7	2301-746	0.26	L	M	L	**Decom**
8	2301-742	0.73	L	L	M	**MB**
9	2301-436	0.42	L	L	L	**NA**
10	BLM	6.3	H	H	H	**Quandary**
11	23	2.83	H	H	H	**Quandary**
12	23	1.64	M	H	H	**Quandary**
13	23	2.77	M	H	H	**Quandary**
14	23-767	0.59	L	L	M	**MA**
15	23-767	2.07	M	L	M	**MA**
16	Spur	0.22	L	L	L	**NA**
17	23-708	0.21	L	L	L	**NA**
18	23-805	0.75	L	L	M	**MA**
19	23-805	0.35	M	L	L	**NA**
20	23-127	0.6	M	H	L	**Decom**
21	2328	1.51	M	H	H	**Quandary**
22	Star Road	0.53	M	M	L	**MA**
23	2328	3.46	M	H	M	**Quandary**
24	2328-436	0.32	M	L	L	**NA**
25	2328-739	0.99	M	L	M	**NA**
26	2328-448	2.01	L	L	L	**NA**
27	2328	0.92	L	L	M	**MA**
28	2328-453	0.23	M	L	L	**NA**
29	2358	2.1	M	M	H	**MB**
30	2358	0.9	L	L	M	**MA**

Table 25. Final Road Analysis Category (continued)

Road Segment Number	FS Road Number	Segment Length (mi)	Wildlife Impact Rating	Aquatic Impact Rating	Human Use Rating	Final Road Analysis Category
31	2358	0.73	L	L	H	**MA**
32	2358	6.55	M	M	M	**MA**
33	23-721	0.89	M	H	M	**Quandary**
34	721	1.88	M	H	L	**Decom**
35	23-808	0.45	H	H	M	**Decom**
36	23-808	0.61	M	H	L	**Decom**
37	Spur	0.46	H	H	L	**Decom**
38	BLM-FS	2.74	M	L	M	**NA**
39	2531-760	2.01	L	L	H	**MA**
40	2531-760	0.22	L	L	L	**NA**
41	2531-720	0.2	L	L	L	**NA**
42	2531-809	0.1	L	L	L	**NA**
43	2531-750	0.16	L	L	L	**NA**
44	2460-766	2.34	M	M	M	**MB**
45	2460-165	0.85	M	L	L	**Assess**
46	2460-461	0.39	M	M	L	**MC**
47	2460-451	0.13	L	L	L	**NA**
48	2460-Spur	0.39	M	H	L	**Decom**
49	2358-411	0.11	L	L	L	**NA**
50	2358-447	0.22	L	L	L	**NA**
51	2460-508	0.41	L	L	M	**MC**
52	2460-773	0.35	L	L	H	**MA**
53	2241	0.84	M	L	M	**MA**
54	2241-841	1.41	M	M	H	**Quandary**
55	Spur-PVT	0.12	L	L	L	**MC**
56	Spur-PVT	0.36	L	L	L	**MC**
57	Spur-PVT	0.69	L	L	L	**NA**
58	3828-175	0.64	L	L	L	**NA**
59	2241-842	0.1	M	L	L	**NA**
60	2241-748	0.06	M	L	L	**NA**

Recreation

Recreation activities and development in the Sharps Creek watershed have historically received less emphasis than mineral resource development. Public recreation has generally been day use activities related to either the public 's interest in exploring (driving, hiking, ATV use) the historic and currently active mining claims or water based recreation (swimming, sunbathing, fishing) along the accessible portions of Sharps Creek and several of its tributaries. This is still evident; however , there has been a noticeable increase in overnight camping in both developed and dispersed sites during the past few years.

Long range plans have identified expansion of the recreation resource at both Mineral Camp and Sharps Creek Recreation sites. Recent increases in recreation traffic and more frequent conflicts between mining claimants and campers indicate a trend of increasing recreation pursuits and demand in the Sharps Creek watershed. The increasing number of dispersed sites and the growth in size of existing dispersed sites are additional indicators that use and frequency of use are increasing.

General Recommendations

1. Continue to operate and maintain existing developed sites at BLM Sharps Creek Recreation Site and FS Mineral Camp. Consider , evaluate and design expansion plans so as not to prevent, to the extent practicable, meeting ACS objectives. (See below for site specific recommendations for Sharps Creek and Mineral Camp.)

   Explanation: Although located within the Riparian Reserves, these developed recreation sites provide a public service in a controlled atmosphere. Without them, people would utilize the undeveloped flat terraces along the streams and development will occur with little control or resource protection measures.

2. Limit dispersed recreation use in Riparian Reserves. C onsider site specific harden ing of heavily used dispersed recreation sites and placer claims. Define access, use areas, and limit further expansion with natural traffic control barriers (rocks, vegetation). Implement temporary and/ or permanent closures of degraded sites to allow for restoration or rehabilitation.

   Explanation: People will recreate along water, particularly the lower elevation stream terraces of Sharps Creek and several of its tributaries. If access is not provided, people will develop their own order to access the water. Eliminating recreation use in popular and heavily used dispersed areas is often difficult. Hardening the site will lessen resource damage to the riparian reserves.

3. Continue to de emphasize recreation development to minimize resource impacts and conflicts with the mineral resource and ACS objectives. However , if public demands cause uncontrolled development, then recreation development or expansion needs to be considered (see item 2 above).

4. Pursue administrative ways to provide consistency between Forest Service and Bureau of Land Management camping policies. Determine the feasibility of the FS adopting BLM camping restriction of 14 days per season.

   Explanation: Current FS policy allows overnight camping for 14 days every 30 day period. This policy allows for the frequent return of campers and the enforcement problem of monitoring camping limitations on Forest Service lands. It is confusing to the public who typically does not differentiate between the two agencies and their boundaries. The BLM policy also reduces the occurrence of long term resident camping which reduces resource impacts on prime recreation sites.

5. Inform and educate recreationists and resource users about ACS Objectives to gain compliance. Develop simple but proactive signs to install at developed and popular dispersed sites. Provide information in recreation publications, in displays at local fairs and events, to the media, in presentations to local clubs and to service groups.

   Explanation: ACS objectives are relatively new to the forest visitor. Educating the visitor about the benefits and reasons for these objectives is a key step in gaining willing compliance and support for the agencies management practices.

Specific Recommendations

Minimize resource impacts at Mineral Camp

1. Replace leaking pit toilet at Mineral Camp.
2. Close off vehicular access into Mineral Camp (beyond existing parking area).
3. Provide trailhead parking at Fairview Creek trailhead and close undeveloped terrace along Fairview Creek to vehicles. Install trail signing to direct traffic to specific area(s).
4. Develop native vegetative screening for restoration as well as screening between use areas.
5. Monitor use and visitation to identify need for expansion. Consider expansion as public demand and use levels warrant ; this will help reduce use in nearby undeveloped areas.
6. Pending development and/or expansion of Mineral Camp (see General Recommendation 1), consider withdrawing the site from mineral location (subject to valid existing rights) to protect the recreational values of this recreation site.

Minimize resource impacts at Sharps Creek Recreation Site

1. Maintain separation of day use above creek from camp area across road.
2. Minimize further development of streamside day use area unless needed for resource protection and/ or demand.

3. Harden existing creek access. Maintain fence closures to minimize additional creek access points.

4. Monitor use and visitation to identify need for expansion. Consider expansion as public demand and use levels warrant; this will help reduce use in nearby undeveloped areas.

Recreation Roads and Trails

1. Manage Fairview Creek or other trails within riparian reserves for hiker use only. Avoid equestrian, mountain bike, or motorized use along riparian trails as there is greater erosion potential into nearby streams.

2. Minimize trail locations impacting riparian reserves. Avoid new locations close and consistently parallel to the stream. Most trail proposals are generally extensions or the reopening of historic trail routes which typically follow ridge or midslope locations.

3. Improve monitoring of recreation use levels on public lands by installing road counter at appropriate location (lower Sharps above private lands and/ or Clark Creek Road).

4. Minimize impacts to streams by replacing stream crossings with trailbridges or other fords to lessen erosion and siltation. Stream crossings should be perpendicular to the stream flow to minimize crossing widths whenever possible.

5. Sailors Gulch is a historical trail that is no longer promoted or maintained by the Forest Service. The mining claimants along this steep stream channel utilize this trail as access to their claim(s). Address trail maintenance through a Plan of Operations to minimize impacts.

6. Maintain existing non riparian trails (Knott, Bohemia Mountain, Bohemia NRT)

7. Define boundaries of the 80 acre Fairview Recreation Old Growth Grove. Maintain and manage for its recreation and interpretive values. Avoid development and maintain trail(s) as the primary access. Maintain roadless character as appropriate with current policy.

8. Sharps Creek and Hardscrabble roads have recreational and visual resource values for their scenery, historical and mining interpretive interest, and access to Bohemia Mining District and Fairview Peak. Maintain current Forest Service partial retention visual inventory and BLM Visual Management v isual resource Class inventor ies along viewed foreground lands along route.

9. Strive to keep public lands open for public use by keeping security gates to a minimum. When security gates are appropriate, ensure agency access at all times for administrative use.

Potential Recreation Sites -- BLM Eugene District RMP Proposals

1. Red Bridge (BLM) -- potential 10 acre recreation site near the confluence of Sharps and Row River Creeks (T.21S., R.1W.,Sec.05). Historic development included vegetation clearing and gravel surfacing for logging and mill parking area. Consider improving or restoring the area for its riparian and recreational values.

2. BLM Calapooya Back Country Byway -- a proposed recreation travel route along Sharps Creek and over Calapooya Divide. Formulate an interagency interdisciplinary team under BLM's lead to inventory route, address public interest and demand, and determine feasibility to pursue proposal implementation.

3. Proposed BLM Recreation Mining Area/Mineral Withdrawal Area Discussion :

   In accordance with BLM priorities, pursue mineral withdrawal for a recreational mining area as directed in the RMP. Scope and develop alternatives to best implement the project , including the no action alternative .

Mineral Recommendations

The USDA Forest Service and the Bureau of Land Management administer mineral resources on public lands. Mining activities on private lands are under the discretion of the landowner; however, mining activities must be conducted according to state Department of Environmental Quality, Oregon Department of Fish and Wildlife, and other regulating bodies. The Sharps Creek watershed has historically supported locatable mining activities since gold was first discovered in Sailors Gulch Creek, a tributary of Sharps Creek during the mid 1800's.

General Recommendations

1. Pursue consistency of minerals administration and interpretation of regulations and policies by BLM and FS to the extent allowed under current policies.

   Explanation: Mining claimants are required to communicate with several government agencies depending on the level of their activity. Seeking more common ground between adjacent federal agencies and their interpretation of mining regulations would create better understanding and support for mineral administration.

2. Encourage two-way communication and education between public agencies and mining customers. Provide information through publications and presentations regarding mining rights and operations and ACS objectives to agency staff and the mining public. Support periodic and consistent patrols of mining operations to monitor operations compliance and improve communication. Invite and involve the mining community in the formation of a watershed council .

   Explanation: ACS objectives and Threatened, Endangered, and Sensitive species protection has raised the level of significance of many mining activities,

particularly placer mining. Understanding how mining activities may affect streams and surrounding ecosystems and how these activities can occur while also ensuring that current laws and regulations are being followed may help gain compliance and support.

3. Promote responsible placer mining to protect river ecosystems. Utilize publication, *Suction Dredging in the National Forests, Dredging Responsibility to Protect River Ecosystems*, USDA, September 1997 for information, education, and rationale for succeeding recommendations. Showcase exemplary mineral development.

4. Provide the above publication or current educational publication on "responsible mining" to claimants upon request, or during issuance of a Notice of Intent (NOI) or Plan of Operations.

5. Work with Bohemia Mine Owners Association (BMOA) to identify inactive, unclaimed adits, evaluate value of retaining the adits (interpretive, future claim potential, bat habitat, etc.), and pursue closure of adits with liability issues . Continue efforts to ensure public safety on unclaimed adits on public lands.

6. Restrict instream dredging to the period between July 1 and October 15, based on ODFW recommendations to protect aquatic habitat .

7. When providing public timber for approved mining purposes, select timber outside riparian reserves whenever possible. Downed wood should be left in place whenever possible. If removal is necessary , consider replacement as part of reclamation plan. Firewood collection for use in conjunction with mining operations is allowed through the appropriate permitting process.

8. Whenever possible encourage operators to avoid streamside disturbance particularly during the wet, rainy season when streambanks are vulnerable.

9. Monitor mining activities and impacts with periodic and frequent field checks and inspections. Weekend visits or patrols are recommended based on level of activity and number of claimants working.

10. Develop cooperative monitoring projects to provide information about the effects on aquatic resources by mining activities .

11. Potential for oil and gas leases in Sharps is limited ; however, if they should be requested, do not permit surface occupancy.

Specific Agency Recommendations

Forest Service

1. To meet resource protection objectives, e ncourage temporary occupancy (14 day/30 day dispersed camping) rather than extended occupancy.

2. Discourage new or additional pit toilets within the riparian reserves. Either require self-contained systems which can be dumped at approved dump stations or

acquisition of County sanitation permits for other types of sanitation facilities. In other cases, follow DEQ Water Quality Program recommendations (#340-71-330 , Table 8) for minimum separation distances (100 feet) for non-water carried waste disposal facilities and privies.

3. Develop and include specific Locatable and Salable Mineral Surface Management standards to be included in future Umpqua National Forest Land Management Plan revisions. Utilize Eugene District BLM's RMP, Appendix HH, format for consistency and "one stop shopping format" for mining claimants as well as recreational miners.

4. Recreational Mining in Mineral Withdrawal Areas – when applicable, adopt seasonal restrictions consistent with ODF &W recommendations (July 1 to October 15).

5. Develop and provide for distribution packets of current and informative material regarding basic facts on minerals location, administration, regulations and responsible mining practices.

Locatable Minerals on Forest Service Lands

Miners staking claims on lands administered by federal agencies in Sharps Creek, as on other lands, will be encouraged to file a Notice of Intent to conduct mining operations. Activities on Forest Service managed lands that appear to pose significant risks to natural resources will require a Plan of Operations and a Reclamation Plan and Bond.

Basic Administrative Steps

Mining Activities which may occur without Notice of Intent (NOI)

When mining activities are observed on a claim or a claimant inquires into mineral activities, inspect or inquire into the activity and make the determination of appropriateness of a NOI. Encourage discussions with the claimant to facilitate communication between the mining claimant and the landowner. A NOI will be requested, however it is not legally required for the following activities:

- A Plan of Operations already exists,
- Existing roads are utilized for access,
- Marking and/ or monumenting a claim,
- Manual removal of small samples and specimens, and
- No significant surface disturbance is occurring , and
- Instream placer activities limited to panning.

Mining Activities which may occur under Notice of Intent

Each mining operation will be reviewed on a site by site basis to determine if a Notice of Intent is acceptable or if a Plan of Operations is required. Below is a list of conditions or activities that would allow mining activities to continue under a Notice of Intent and most likely not require a Plan of Operations:

1. Obtaining and following conditions and limitations of Oregon Department of Environmental Quality General Permit 0700-J (expiration date 3-31-2002).

2. Mining activities not in or near streams with listed or "at-risk" aquatic species.

   Explanation: No species currently exist in the Sharps Creek Watershed.

3. Placer mining in low gradient, depositional areas within the stream (see map (LOW GRADIENT REACHES)).

   Explanation: There is a concern for channel stability in the higher gradient streams. Once the substrate is removed the channel looses the stairstep morphology that is common in these high gradient reaches. These "stairsteps" are what provide stability to these channels. Winter high flows will redistribute the displaced substrate in the lower gradient areas. However, the higher gradient areas tend to be transport reaches which move material downstream. Following channel disturbance, little if any material is expected to be deposited in these high gradient areas once the stable stairstep morphology is removed.

4. Instream dredging from July 1 to October 15, unless written permission to work outside this season is obtained from ODFW.

   Explanation: The resident trout within the Sharps Creek Watershed spawn during the winter months. This seasonal restriction will allow cobbles and gravels to redistribute during high flows and become stable prior to the spawning season. Salmonids have been observed to spawn in gravels from mining operations, however these areas tend to be less stable and may be redistributed during the next high flow event (Harvey and Lisle, 1998). This may result in a high percent of mortality. Justification for starting the season July 1 is because the young fish emerge from the gravel in the spring and are limited in movement and more vulnerable to suction dredging until they are larger.

5. Dredging with suction hose and intake diameters of 4 inches or smaller and less than 40 horsepower. No other power equipment (other than suction dredge) is used.

   Explanation: This is currently the maximum size of a dredge permitted for instream work under the issuance of "General Permit 0700-J" from the Department of Environmental Quality. Larger dredges and intake sizes have greater potential to cause significant alteration of the stream channel and therefore require additional permit information, fees, and registration of the dredge with the DEQ.

Figure 56. Low Gradient Reaches

6. No other placer activity is occurring concurrently within ¼ mile up or downstream. If this occurs a Plan of Operation may be required from each operator.

   Explanation: This is to assure that the cumulative effects from multiple mining operations will be addressed for each stream.

7. No mining in fine-textured soils within the stream banks or within high gradient channels. No alteration of the stream channel by moving large boulders. No undermining of stream banks by removing protruding boulders and woody debris.

   Explanation: The majority of fine sediments along a stream are in the streambanks. Avoiding the streambanks will reduce concerns for channel and bank stability. A large boulder is defined by being too large to be moved by hand or approximately 1.5' x 1.5' or larger.

8. No cutting or removal of live trees (greater than 1" saplings) or down woody debris (greater than 12" diameter x 10' long) within the stream channel or the Riparian Reserve.

   Explanation: Large woody debris provides channel complexity, channel stability and habitat for fish and other aquatic organisms. Live trees provide shade, are future sources of down woody debris and provide bank stability.

9. Distributing cobbles or tailings as broadly as possible in the channel. No stacking or depositing cobbles or tailings on or near the bank.

   Explanation: Large piles can deflect high water against stream banks which may result in bank erosion or alteration to the streambed.

10. Avoid causing isolation of pools during low flow periods. When dredging in shallow areas, return the dredged area to the original grade by filling in pits with the dredging spoils to avoid entrapment of fish or highwater bedload movement.

    Explanation: This minimizes indirect effects on fish by not creating man-made pools that attract fish and subsequently entrap them as flows decline.

11. Mining activities limited to less than 14 consecutive days and less than 40 hours a week per season or less than 2 days a week per season.

    Explanation: The amount of resource disturbance is associated with the amount of time spent mining. Chronic water quality effects may harm aquatic resources. This guideline allows for miners to intensely explore areas before determining if they want to further their activities under a Plan of Operations. In addition, weekend miners can continue their activities under a Notice of Intent.

12. Prevent hazardous spills into water by limiting petroleum products to 5 gallons of gasoline for dredges at any one time. Place absorbent spill pads around gas tank when refueling. Outfit suction dredge with an oil pan. No chemicals used or stored on site. Fuel must not be left on site unattended.

13. Underground hand excavation of lode mining adits. Minimal deposition of tailings on existing stable tailing piles.

Activities which may require a Plan of Operations

Mining activities that will likely cause significant disturbance of surface resources will require a Plan of Operations. Each claim and level of activity will be looked at to determine the level of significance and if a Plan of Operations is needed. If disturbance to the surface resources cannot be avoided or mitigated then a Reclamation Bond will be required. An environmental analysis may also be written to determine the effects and the required mitigation and reclamation. During the analysis of a Plan of Operations, District and other specialists will be consulted as needed to scope issues and concerns and to develop applicable mitigation and reclamation plans to protect or restore riparian resources.

Below is a list of activities that <u>will</u> require a Plan of Operations:

1. Stream channel or banks altered by mining activity.

2. Moving or removing more than 50 cubic yards of material annually.

   Explanation: Moving material in excess of 50 cubic yards annually requires approval from, and permit fees to, the Division of State Lands.

3. Not following the hazardous spill precautions mentioned above and/ or using more than 5 gallons of gas or any other chemicals or petroleum products at one time.

4. Cutting or removal of live vegetation (greater than 1" saplings)or down woody debris (greater than 12” diameter x 10’ long) within riparian reserve .

5. Occupancy over the 14-day dispersed camping regulation. Occupancy is defined as full or part-time residence by persons as well as surface occupation by temporary and permanent structures, equipment, and supplies.

6. Dredging in Sharps Creek from the mouth upstream to Fairview Creek.

   Explanation: The draft 1998 Oregon Department of Environmental Quality 303(d) list for water quality limited streams has listed Sharps and Martin Creek for being temperature limited . Sharps Creek is listed from the mouth up to the confluence of Martin Creek, and Martin Creek is listed from the mouth up to the headwaters. Under the DEQ General Permit 0700-J it states that "no suction dredging shall be allowed in streams designated by the Department as water quality limited for temperature if the activity would result to a measurable increase in temperature."

7. Maintenance of existing roads and trails. Removal of live or standing trees and the use of earth moving mechanized equipment will require a Plan of Operations.

8. Dredging activity in the properly functioning streams as identified in the Sharps Creek Watershed Analysis (Figure 53). This is in keeping with the Aquatic Conservation Strategy by protecting the best habitat in the watershed.

Bureau of Land Management

The Eugene District RMP (June 1995) contains specific direction regarding management of mining claims (Appendix H). No watershed-specific recommendations are provided beyond those already in the RMP.

Specific Area Recommendations -- Forest Service

See Appendix H for a full list of claims.

1. **Lower Puddin Rock Creek -- Climax Placer Claims:** This section of Puddin Rock Creek has had extensive placer mining activity since the 1950's. Recent placer activity has significantly increased, consisting of extended occupancy of the site by equipment and structures. Heavy equipment has been utilized for road work and earth moving operations. The claim is under a Plan of Operations and reclamation bond. It is recommended to foster the development of the claim in a manner to isolate disturbance within a ½ acre area and reclaim as needed before moving into another section of the claim. Further environmental analysis may also be necessary.

2. **Upper Puddin Rock Creek -- Golden Star Placer Claims:** This section of Puddin Rock Creek is a high gradient stream (see map , Figure 46). It has had minimal placer activity until recently. Large boulders and downed woody debris are being removed from the stream channel and channel stability has become an issue. Some boulders have been moved back to the channel, however, the channel has lost its structure and ability for capturing bedload and may stay scoured to bedrock. Material is expected to move downstream during winter and spring high flows. Because of the steep channel gradient and the level of disturbance, a Plan of Operations has been required. Additional environmental analysis, a Plan of Operations and a reclamation plan bond may also be needed. Development of the claim should isolate disturbance to a 1/4 mile of the stream which should be reclaimed as needed before moving into another section of the claim.

3. **Upper Quartz Creek -- Silverado Placer Claims:** This section of Quartz Creek has had continual and reoccurring placer mining since the early 1990's. The most significant impacts are from year-round occupancy within the riparian area. Other observed concerns are the concentration of high fines, sedimentation, and seasonal low flows which have the tendency to create subsurface flows and isolated pools. Mining activity has been limited to hand excavation and panning within the stream channel. Recently the claimant has begun utilizing a dredge to move material. The claimant is under a Plan of Operations and reclamation bond specifically for occupancy. It is recommended to maintain access for miners equipment and to update the Plan of Operations, reclamation plan and the bond to minimize the impacts listed above.

4. **Upper Puddin Rock Creek -- Golden Star Lode Claims:** These claims have extensive occupancy from numerous structures (some of which are considered historic), equipment, and year-round residency justified for security. Lode mining is occurring in existing adits. Tailing disposal is within existing tailing piles as

well. A minimum service road provides access to these claims. The operation is under a Plan of Operations and has a reclamation plan and bond. Lode mining is intermittent due to limited time of claimants. Impacts to riparian area, which include road/trail crossings, tailings and piles, are limited. The Plan of Operation is consistent with operation however the reclamation plan and bond is not sufficient to cover cost of total reclamation. The structures and the site need to be evaluated to determine if there is historical significance. Continue regular and frequent monitoring checks to observe compliance with the Plan of Operations, to improve communications with claimants and to monitor potential impacts to the Riparian Reserves.

5. **Puddin Rock -- Birds Nest Lode Claims**: Development consists of existing adits, tailings piles, access road and gate, mill building (under construction), storage/temporary shelter structure, and historic remnants of the claim (cabin, woodshed, outhouse, smokehouse). The claim is under a Plan of Operations with a reclamation plan and bond. Impacts to riparian areas are minimal, limited to road crossings across intermittent streams. Historical significance of the original structure needs to be evaluated in order to develop site recommendations. The Birds Nest Site is one of a few sites that retain historical structures under Forest Service ownership ; however, the condition of the structures is rapidly deteriorating. The cabin roof needs re-shingling to deter further deterioration.

6. **White and Sharps Creek -- Christo-Contessa, Eagle 1 Claims:** Continue cleanup and reclamation work at White and Sharps Creek confluence and Eagle 1 Placer Claim on Clark Creek above confluence with Martin Creek. Long term occupancy has created areas of compaction, denuded vegetation, and unsurfaced access spurs within the riparian area. The claimant is responsible for cleanup ; however, further reclamation may be necessary. Consider access control, possibly spur closure, and revegetation work in these dispersed camping areas.

7. Alluvial terraces along streams and stream confluence s which are accessible, or nearly accessible, by vehicles are generally the areas which pose the highest risk to riparian areas and the watershed from mineral operations. These areas not only have the highest potential for placer operations but they also offer convenient places for dispersed camping associated with placer activities. Impacts to these areas can be mitigated or minimized by discouraging year-round occupancy, limiting access, and limiting mining impacts to in-stream activities. If mining operations are proposed outside the active stream channel (above the permanent line of vegetation) then environmental analysis, appropriate and reasonable mitigation and reclamation, needs to be addressed. Operations in these areas which propose disturbance in excess of 1 acre of surface or 5,000 cubic yards annually require a permit, reclamation plan and bond, and permit fees from the state Department of Geology and Mineral Industries . Federal and State agencies need to confer to ensure adequate reclamation but not duplicate permitting and bonding.