Blowout Watershed Analysis

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USDA Forest Service, Pacific Northwest Region
Detroit Ranger District, Willamette National Forest

Blowout Watershed Analysis
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I. INTRODUCTION

A. The Document: *What is the purpose of the document, how is it organized and how will it be used?*

The purpose of this watershed analysis is to provide a general understanding of ecological conditions and processes within the Blowout drainage. This information will serve as a basis for future project level analysis and decision-making for a wide range of potential management activities there. The analysis helps to ensure that those activities are consistent with ecosystem management objectives as described in the *Willamette National Forest Land and Resource Management Plans* (Forest Plan) as amended by the *Record of Decision for Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl*.

This document is divided into five major sections: 1) an introductory section describing some general watershed information, 2) a physical domain section: characterizing geologic and hydrologic processes and conditions, 3) a biological domain section: describing the pattern and habitat character of plants and animals and the processes that influenced these 4) a social domain section: describing human uses and interactions within the watershed and 5) a management implications section: describing the interrelationship of various ecosystem processes and identifying opportunities for management and restoration.

All chapters within the document are written in a question and answer format. Each subject area is like a mini-story giving: 1) a resource overview; 2) a discussion of values that humans place on the resource and issues that result from differences in human values; 3) a description of the past and current condition of the resource, as it relates to the issues; and 4) a comparison of the differences between past and current conditions along with a discussion of the causes of those differences. Finally, the last chapter of the document discusses the influences and relationships between the various ecosystem processes and proposes management recommendations for dealing with identified issues.

The *Federal Guide for Ecosystem Analysis at the Watershed Scale* (version 2.2) provided guidance for the watershed analysis process. Decisions have not been made about implementing recommendations contained in this document. The recommendations must be further analyzed in the NEPA process.

B. Location: *Where is the Blowout watershed?*

The Blowout watershed lies in the North Santiam river basin on the western slope of the Cascade mountain range, near Mt. Jefferson. The 34,000+ acre watershed is located in Linn County in Oregon (*see vicinity map #1*).

Blowout WA
Vicinity Map

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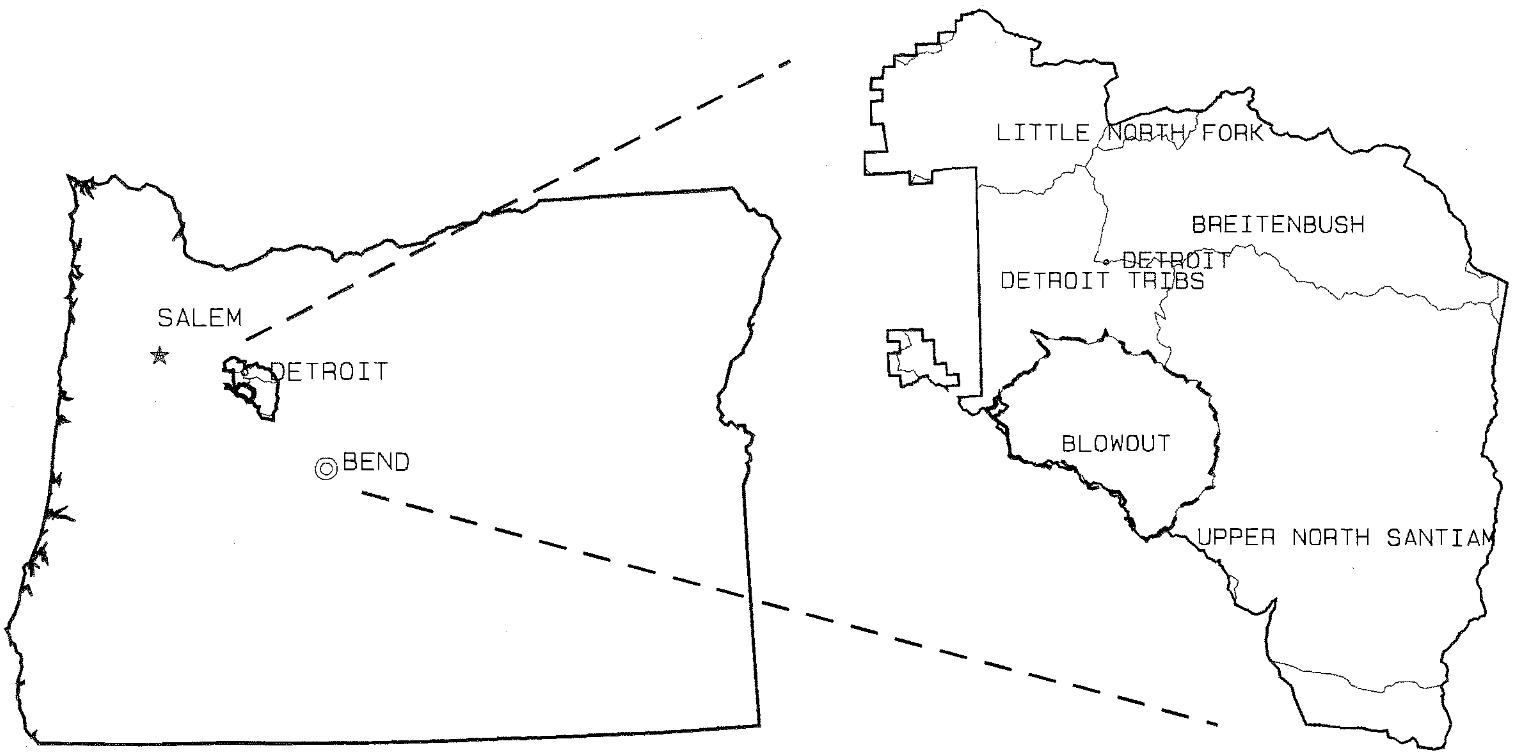

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Map #1

Blowout Creek flows in a northeasterly direction and drains the eastern portion of the analysis area. Box Canyon Creek flows in a northerly direction and drains the western portion of the analysis area. Both creeks empty into Detroit Lake, on the North Santiam River near the town of Detroit, Oregon. The dam that contains this lake was constructed in the 1950's to control flooding and produce hydroelectric power. From here, the North Santiam River flows into the Santiam, the Willamette and Columbia rivers before emptying into the Pacific Ocean.

C. ***Distinguishing Features of the Watershed:*** *What are the physical, biological and social features that make this watershed unique?*

Physical

- Pinnacle Peak Special Interest Area contains unique geologic features.
- Blowout Cliffs is an impressive watershed feature resulting from a massive natural landslide that once backed up Blowout Creek to form a lake.
- Box Canyon drainage exhibits a distinctive parallel drainage pattern.
- Although it accounts for only about 5 percent of the total Blowout watershed area, this watershed contains some of the most unstable, and potentially highly unstable, areas on the ranger district and the Cascades range.
- Coffin Mountain, an interesting landscape feature on the eastern watershed boundary, is a long, flat-topped butte that resembles the shape of a coffin, thus it's name.
- Blowout slide is a large, natural landslide in the watershed.

Biological

- Blowout contains some of the most productive growing sites on the Ranger District.
- Hawkins Creek area supports fairly large stands of natural, fire-regenerated second growth as a result of the fire history of the area and the frequent fire-return interval.
- Blowout Creek supports three species of salmonid fish: rainbow trout, cutthroat trout and kokanee salmon.
- Bald eagles and peregrine falcons use the watershed but neither species is known to nest in the watershed.

Social

- In the past, the Blowout watershed provided a large portion of the timber harvest produced by the Detroit Ranger District.
- Blowout watershed lacks the distinctive features that draw abundant recreational use to other areas of the district. There are no developed campgrounds or other major facilities in the watershed. Most recreational use that occurs in the Blowout is dispersed in nature, such as hunting or fishing.
- The Suspension bridge, which crosses Blowout Arm of Detroit Lake, is a focal point of some of the water-related recreational use in the watershed.
- The fire lookout on Coffin Mountain, along the eastern watershed boundary, is the only staffed lookout in regular use on the ranger district today.
- The watershed contains a portion of Quartzville Back Country Scenic Byway.

D. Management Areas and Management Direction: How are lands allocated and what is the basis for management of the watershed?

The *Willamette National Forest Land and Resource Management Plan* (1990), as amended in 1994, establishes guidance for all natural resource management activities on the Forest. It divides the forest into various management areas and describes the desired future condition of each of those areas. It also establishes standards and guidelines that direct management activities forest wide, as well as for each individual management area. The following table summarizes management areas within the Blowout watershed.

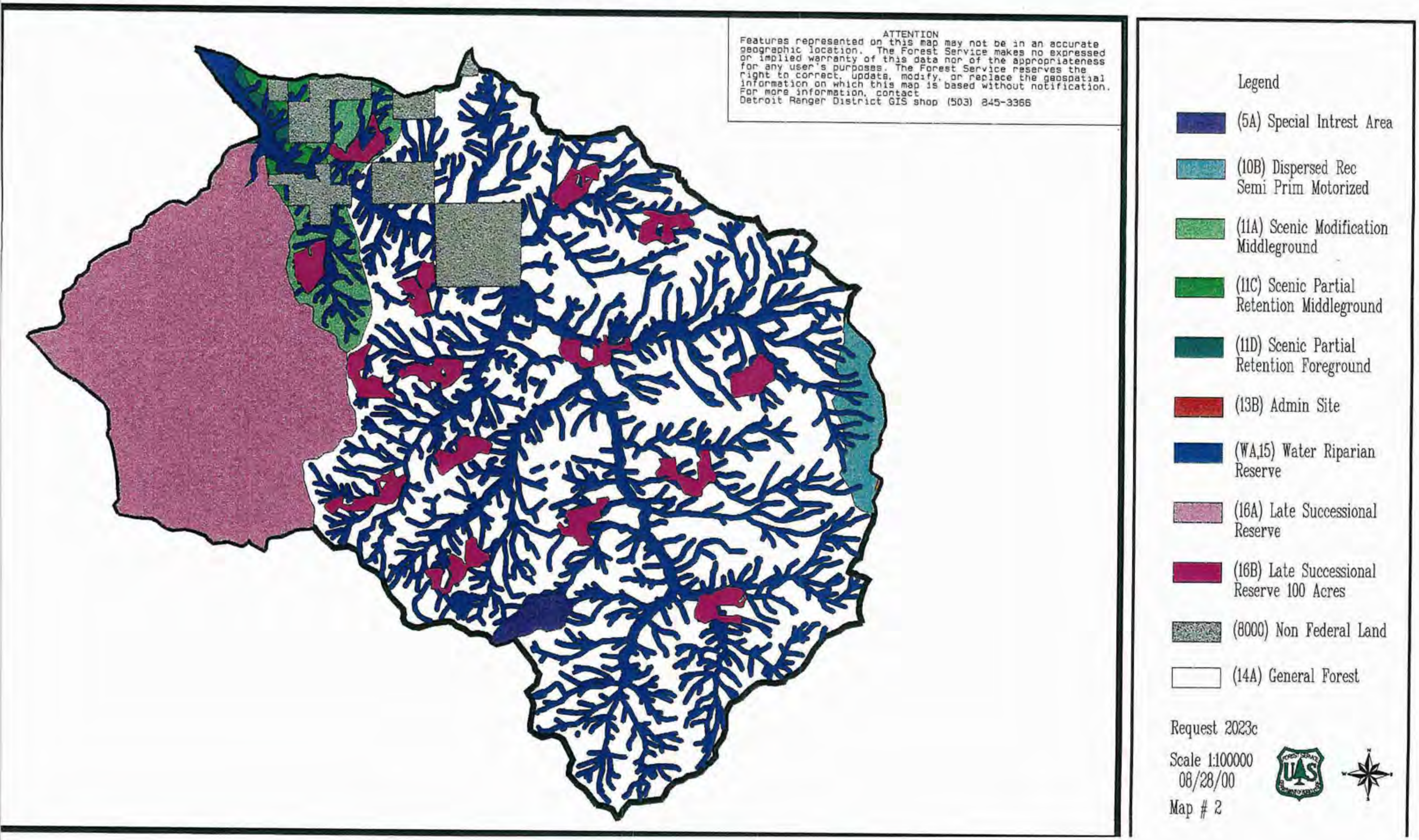
Management Area Name	Management Area Number	Acres
Special Interest Area	5A	211.3
Dispersed Recreation Semi-primitive motorized	10B	431.2
Scenic Modification Middleground	11A	579.7
Scenic Partial Retention Middleground	11C	123.7
Scenic Partial Retention Foreground	11D	62.2
FS Administrative Use Area	13B	2.7
General Forest Intensive timber management	14A	12,379.8
Riparian Reserves (That overlap general forest, scenic, and dispersed recreation areas only)	15	10,223.1*
Late Successional Reserves	16A	6,829.9
100 acre Managed Late Successional Reserves	16B	1,563.2
Private Land	NA	1,558.4
Water	NA	189.1
Total		34,154.3

* This acreage may increase as unmapped streams are field verified in future reconnaissance.

(*See also, management allocation map #2*)

Blowout WA

Management Allocations



Other Management Considerations

In addition to existing management plans, the following agreements have been made with other parties that would be applicable in this watershed:

- *Memorandum of Understanding (MOU) with the City of Salem, Oregon and the USDA Forest Service, Willamette National Forest, 1996.*

  The purpose of this document is to determine if and how the water quality of the North Santiam River is changing over time, allowing for natural and seasonal variations.

- *North Santiam River Watershed Joint Water Quality Monitoring Plan between the City of Salem, Oregon and the Willamette National Forest, Detroit Ranger District*

  Since most of the Detroit Ranger District is within the municipal watershed for the City of Salem, the Detroit Ranger District and the City of Salem have entered into a joint water quality monitoring plan to address the City's concerns about the effect of Detroit District management practices on the quality of the City's water supply. The plan addresses monitoring strategies and parameters to evaluate water quality in the North Santiam sub-basin.

- An agreement was made with Oregon Department of Fish and Wildlife (ODFW) to manage all winter range as high Management Emphasis Areas (MEA) for big game.

Management Plans within the watershed

The management of this watershed is directed by the *Willamette National Forest Land and Resource Management Plan* (1990) which was amended by the *Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related species Within the Range of the Northern Spotted Owl* (1994).

The land and resource management plan requires site specific direction for management of certain areas. The following existing and proposed plans are applicable to all or part of the Blowout watershed.

- Implementation Guide for the Coffin-Bachelor Mountain Dispersed Recreation Semi-primitive Motorized Area
- Late Successional Reserve (LSR) Assessment
- Bald Eagle Management Plan
- Federal Wildland Fire Management Policy and Program
- Access and Travel Management Guide*
- Winter Sports Management Plan
- Detroit Lake Composite Area Management Guide

* = Proposed plan

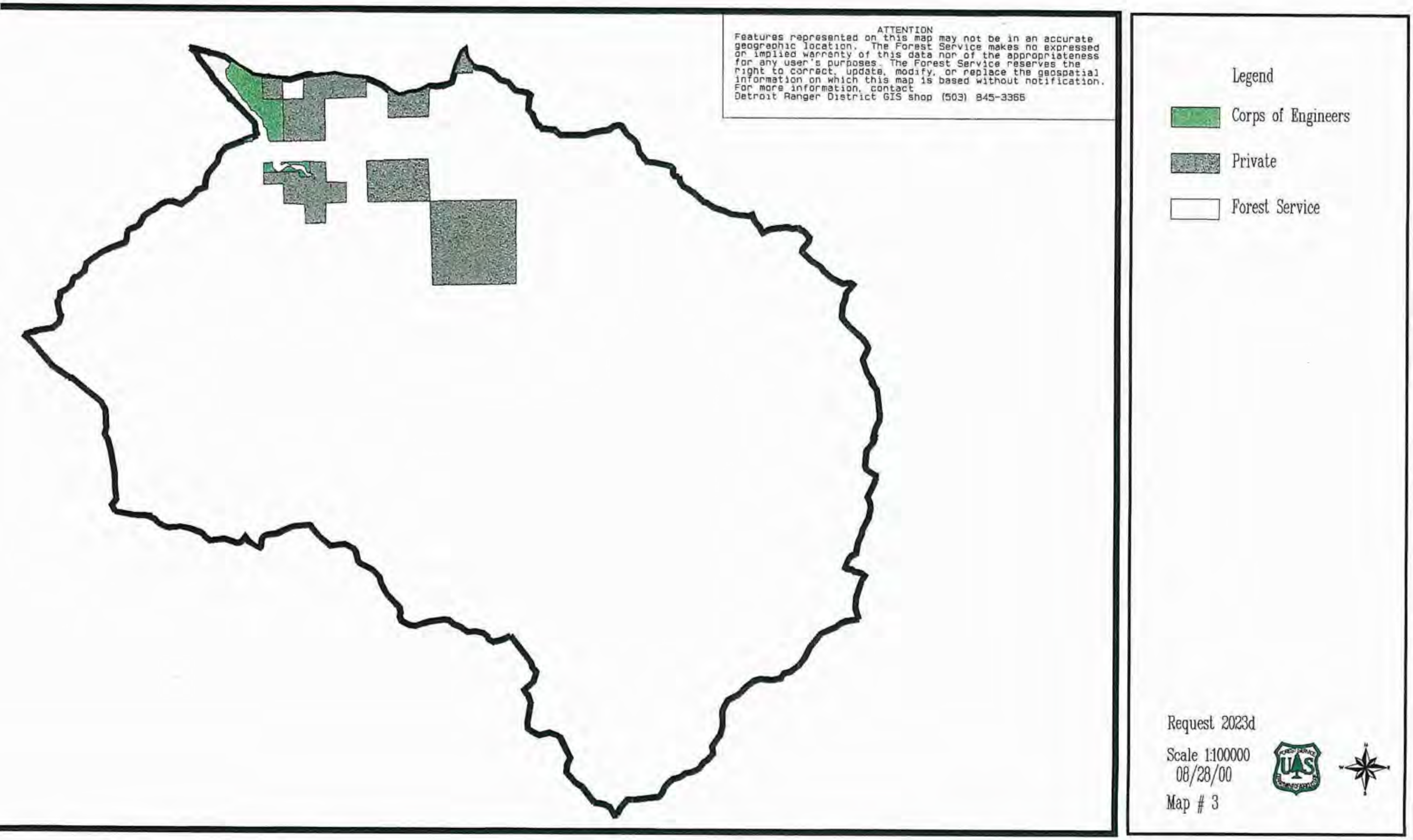
E. ***Ownership:*** *What is the ownership of the watershed?*

- 95% National Forest System land (*see ownership map #3*)
- 5% Private land and other ownership

F. *What makes the watershed important to people?*

- Economics - timber harvest and other commodity production, etc.
- Dispersed recreation use (fishing, hunting, firewood gathering, sightseeing, etc.)
- Generation of clean water for downstream beneficial users.

Blowout WA
Ownership



II. PHYSICAL DOMAIN

A. Geology

1. Characterization

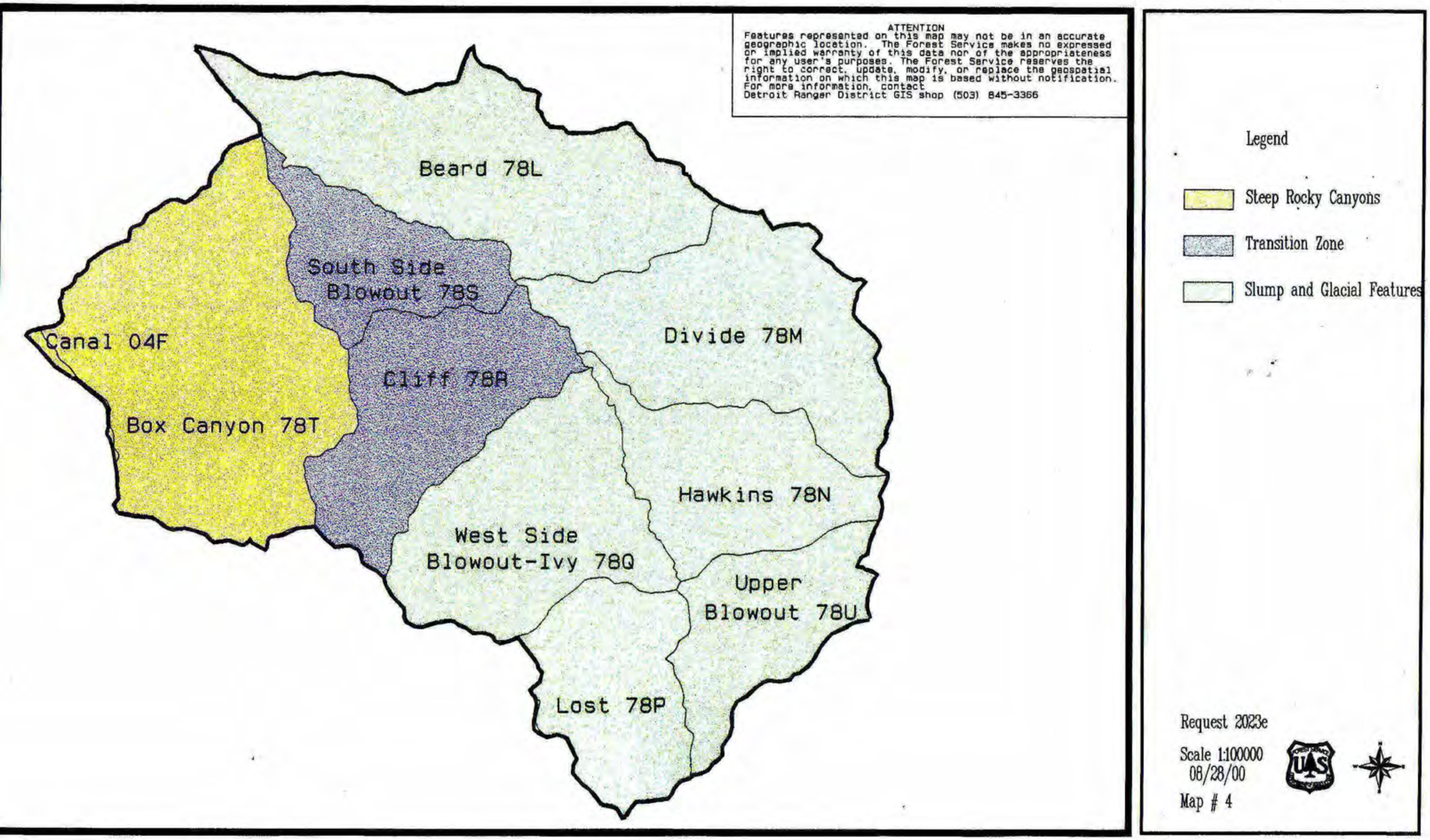
The 34,154 acre Blowout analysis area is a geomorphically complex terrain with a diverse topographic expression. Landforms range from highly glaciated upland benches and flats at the headwaters of Ivy Creek; to steep rocky canyons and crags of lower Box Canyon; to the large scale stabilized slump/earthflow complexes and associated glacial deposits of Hawkins and Divide Creeks; to the flat stable river terraces at the confluence of Blowout and Ivy Creeks.

The Blowout is located entirely within the Western Cascades physiographic region, and is composed of older Tertiary lava flows, tuffs, and breccias around 17 to 32 million years old. Most of this strata was previously assigned to the Little Butte Sequence. Overlying these rocks and capping the ridges at the south end of the study area are andesites and basalts of 10 million to 17 million years of age. These rocks have previously been designated as the Sardine Formation by some authors (Walker and Duncan, 1989). The surface expression of these rock formations has been extensively changed by stream erosion, glacial activity and slope instability.

In the last several hundred thousand years to a million or more years ago, several glacial periods have extensively altered the landscape and created a variety of new features, such as cirque basins and morainal deposits. Since then, many of these features have been eroded by stream action and slope instability. Locally, the materials of the Little Butte Series weather to form deep colluvial and residual soils that give rise to a variety of unstable landtypes. Stabilized slump/landflow features, such as sag ponds, bench and scarp topography, and disrupted drainages, are common in Cliff Creek, Hawkins Creek and Divide Creek. In localized areas of most drainages, actively unstable remnants of these larger landflows can still be found scattered within the stabilized terrain.

Based on topographic expression and geomorphic history, the Blowout analysis area can be stratified into three relatively distinct landform blocks: 1) Areas that principally contain steep rocky canyons - 6,858 acres; 2) Sub-drainages that principally display topography formed by slope instability and/or fluvial/glacial action - 21,686 acres; and 3) A transition area that contains elements common to both the steep canyons and the slump/glacial topography - 5,603 acres. The following is a general description of each landform block, starting with the western most block and moving to the east (*see landform map #4*).

Blowout WA
Landforms



Steep Rocky Canyons

This area is defined by the Box Canyon drainage. Aptly named for its distinctive rectangular drainage pattern and steep side walls, the elevation ranges from 1560 feet to 4930 feet. Notably, much of this nearly 3500 feet of relief can be found on sustained steep sideslopes that extend from very small, intermittent, alluvial terraces along Box Canyon Creek to the plateau like, upland benches above. Except in the headwaters, the area is generally highly dissected, with steep, shallow rocky soils and numerous rock outcrops. The headwaters display limited areas of benches and more gently rolling terrain that resulted from cirque activity associated with glaciations, long past (probably mid to early Pleistocene). Soils are primarily residual or colluvial in origin, with some glacially derived soils located in the more gently sloping terrain in the upland areas.

Transition Area

As the name implies, this landform block is geomorphically a transitional area between the steep, shallow, rocky, colluvial soils that predominate in Box Canyon and the relatively gently sloping, deep and often glaciated soils common to much of the Blowout. The transition area has characteristics of both the steep rocky canyons to the west and the glacial/slump topography to the east. Distinctive in appearance, the area includes Southside Blowout (78s) and Cliff Creek (78r) where elevations range from 1560 to 4580 feet and 1840 to 4970 feet respectively. Not surprisingly, this landform block is perhaps the most geomorphically diverse and complex area within the Blowout study area. It contains landforms that range from highly glaciated upland benches and headwalls at the higher elevations, to large-scale stabilized slump/earthflow complexes, to localized areas of actively unstable landflows, to steep, shallow soiled, highly dissected headlands with rock scarps and bluffs, to relatively flat stream terraces in the lowlands near the confluence with Blowout Creek. The complex highly dissected topography is evident with stable upland benches that formed from glacial activity (probably mid to early Pleistocene) separated by precipitous precipices. Extensive, very steep, shallow rocky sideslopes encompass the crags and extend to the valley bottoms. Soils are primarily residual and colluvial in nature on the steeper slopes, with glacial soils on the benches, and alluvial deposits in the valley bottoms. Some mixing of soils has occurred with the large to small scale slope instability that is common to many areas.

Slump and Glacial Terrain Area

The slump/glacial landform block is dominated by fluvioglacial deposits and/or older stabilized earthflow terrain. Included within this block are the Beard (78l), Divide (78m), Hawkins (78n), Westside Blowout-Ivy (78q), Lost (78p) and Upper Blowout (78u) subwatersheds. Elevation ranges from 1560 feet to 5770 feet. This landform block also displays a complex highly dissected topography of rolling benches and flats with occasional near vertical scarps and cliffs. Rock scarps are generally headwalls that have developed large slump/earthflow activity. West Side Blowout, Lost, and Upper Blowout form, respectively, the west, central, and east sides of a large cirque basin (probably from the mid Pleistocene) that created an extensive valley glacier in most of the Blowout drainage. Soils vary in origin, but are often glacial or fluvial in many areas, and the more residual types often slumped into place. Soil mixing is quite common with various soil types juxtaposed in the landscape because of the extensive slope instability.

2. What Do Humans Value That Is Associated With Geology?

a) Landform has aesthetic, spiritual and functional value (i.e. vistas, vision quests, recreation settings, travelways for humans and animals, etc.)

b) Geologic resources have utilitarian and economic value (i.e. crushed rock to surface roads and decorative stones for landscaping or building).

c) Natural geologic processes and their influences on the ecosystem are valued.

3. What are the highest priority issues or resource concerns associated with geology?

a) Whether current erosion processes that are dominant in the Blowout watershed are within the natural range of variability or whether they have been influenced to such an extent by human activities that they are now outside that range.

b) A more specific subset of the above issue is whether management activities such as timber harvest and road construction were major contributors to the landslides that occurred in the Blowout watershed during the 1996 flood event and whether the number and types of landslides were outside the range of natural conditions that might be expected in such a storm event.

c) Collectively the Blowout study area has some of the best growing sites on the Ranger District. In addition, some of the best fertilization response has been on soils in the Blowout. But, about 5 percent of the watershed contains areas that are among the most unstable on the entire Detroit Ranger District. Because of the inherent instability of portions of the Blowout watershed, there is a concern about whether these sensitive soil areas can be identified and avoided when planning and implementing management activities in the watershed.

d) Old tractor logged units have compaction levels that exceed Forest Plan standards and guidelines.

e) Soils in the Blowout cover a wide range of types and particle sizes. Some of the weathered Western Cascade volcanic parent materials produce clay size particles. The fine clays, commonly called Smectites, are a major cause of turbidity that affects downstream water quality.

4. What and where are the management direction/activities, human uses, or natural processes that affect the dominant erosion processes?

a) **Current/Reference Conditions:** *What erosion processes are currently/ historically dominant within the watershed? What are the current/historic conditions and trends of the dominant erosion processes prevalent in the watershed? Where have they occurred or are they likely to occur?*

Steep Rocky Canyons (see Map 4)

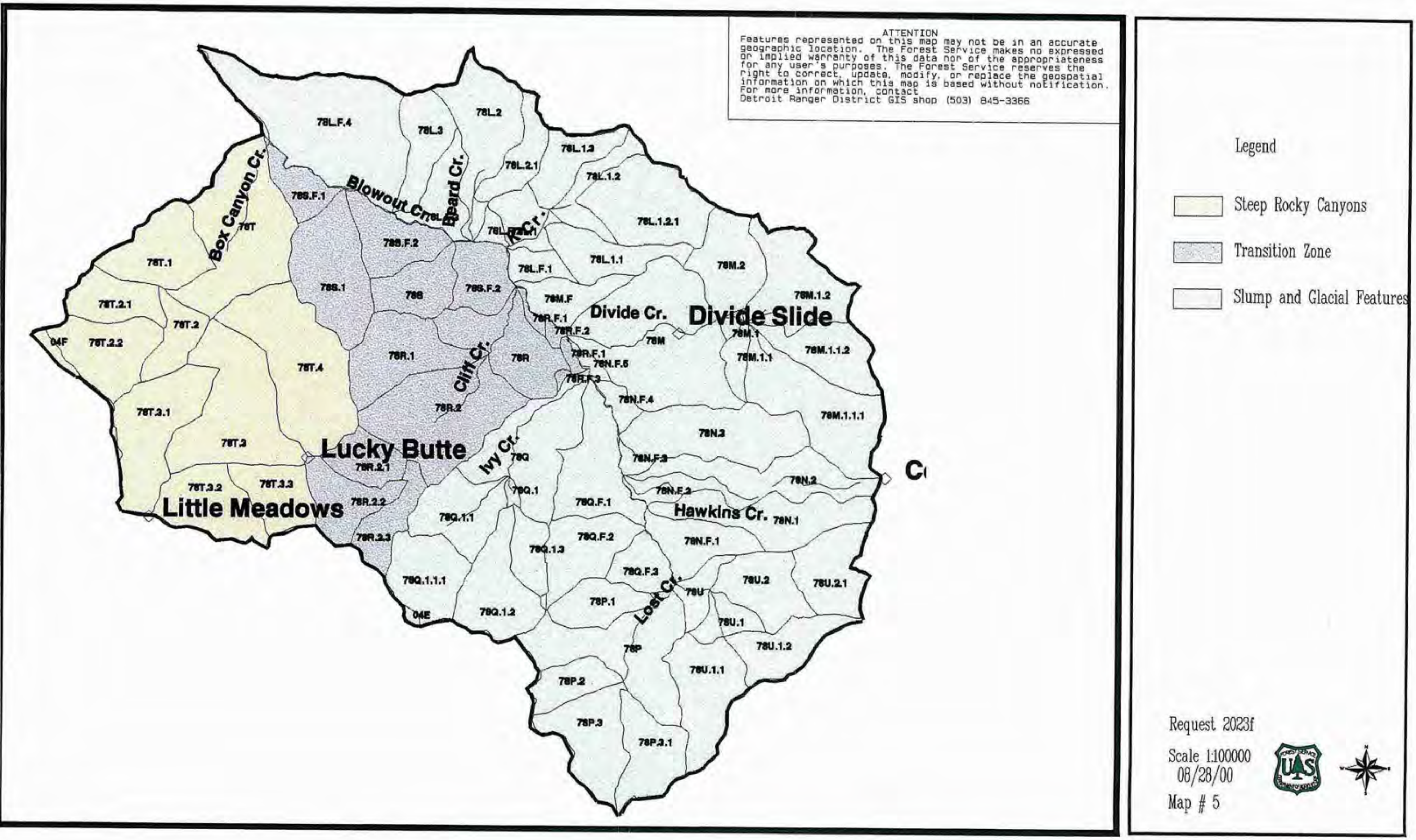
Slope Forming Processes: Stream downcutting of the volcanic formations that comprise the Western Cascades has been the principal process in this drainage for several million years. Older (probably mid to early Pleistocene) glaciation(s) created a upland bench system with occasional remnant glacial deposits in the southern portion of this landform block. Stabilized slump/landflow activity has reshaped some of these more gently sloping, deeper soil areas in the head waters, with some small actively unstable areas still present. Some slumping of the weathered Cascade volcanics is also present.

Sediment Delivery Mechanisms: The principal sediment delivery system in operation is downslope movement of the soil mantel by creep or colluvial process. This process is accelerated during large scale fire events, which occurred in much of the basin approximately 500 years ago and again 150-200 years ago. Some localized areas of instability are present with debris chutes in the lower canyon (especially 78t.1 and 78t.2, see map #5) and earth flows in the upper canyon. The two largest active slumps occur just west of Lucky Butte (along the south boundary of 78t.3) and north of Little Meadows (78t.3.1); their effected areas are about 80 and 60 acres respectively. The unstable areas, although not extensive in nature in this large basin, probably provide a nearly continuous supply of sediment to the main stream channel, as well as side channels, that probably equals the outputs from colluvial processes over the fire cycle period.

Transitional Area (See Map 4)

Slope Forming Processes: In the long term of several millions of years, slopes have resulted primarily as a result of steam downcutting by Blowout Creek and its many tributaries. This activity was accelerated in the last million years or so with extensive glacial activity in the early to mid Pleistocene era. In the nearer term of several hundred to several thousand years, slumps, earthflows and debris chutes have played and continue to shape the landforms and streams of this basin. Massive landflows from the Blowout

Subdivisions of Sixth Field Watershed (PDIVs)



Cliffs area, for example, pushed Blowout Creek to the south, and this resulted in the steep canyons and rock cliffs that dominate the opposite stream banks contained in this landform block.

Because of the considerable amount of sediment input to the system, stream erosion and deposition have shaped the lower portion of this drainage. In the confluence area of the Blowout and Ivy Creeks, channel changes are evident where the Blowout has shifted locations from west to east several times over a distance of almost one half mile. Evidence of this stream relocation continues downstream. As the confluence of Blowout and Cliff Creek approach, extensive stream terrace deposits have formed with some as high as 400 feet in elevation above the current valley floor.

Sediment Delivery Mechanisms: As was discussed previously, slope instability by both translational (debris chute) and rotational (slump/earthflow) failures are the dominate sediment delivery methods in this basin. Two active rotational failures of about 12 and about 30 acres toe at principal creeks. Over a dozen, highly debris chute prone hillsides ranging from 3 to as much as 15 acres currently display features which indicate that considerable instability has occurred in the last 50 years, and more is to follow. These slide zones will continue to supply the streams with sediment for decades, and possibly for centuries to come. Finally, creep and colluvial deposition certainly play some role in sediment delivery, especially in the more stable areas. Large woody debris often controls the size and extent of the debris flows.

Slump and Glacial Terrain

Slope Forming Processes: Major slope forming processes have been stream incision into highly weathered volcanic strata, glaciation, and slope instability. Direct glacial deposition (moraines or tills) or slump/earth flows of glacially derived material have been the dominate process in this drainage. Indeed, almost all areas show some influence from glaciation, slumping, or stream downcutting of this material. In some higher elevation areas, benches comprised of residual soil and saprolite show the effects of glacial scour in the distant past. Blowout Creek itself has been significantly manipulated by large earthflows that moved to the south from the highlands. It is difficult to date these events, but it appears to be several thousand years old although that is only a guess at this point. The extensive low gradient reaches of the Blowout main stem with their broad meandering channels have resulted from the base level controls that the large landflows established.

Sediment Delivery Mechanisms: The major sediment delivery systems at work today range from slow, but steady, creep to the rapid forces of slope instability. One significant sediment mover is creep and the associated down slope colluvial processes that are constantly at work and accelerate during periods of large scale fire events. The Beard area for example, has an extensive fire history in the last 500 years with much of the area burning and reburning.

Most areas show an extensive history of slump related soil movement that continues to the present day. The Divide Creek Slide of 150 to 200 acres, located between Cooper's Ridge and Divide Creek (on the boundary between 78m and 78m.2), has blocked Divide Creek on numerous occasions and shifted the channel several hundred feet in the process. Extensive stream terraces from about 40 to over 200 feet in elevation above Divide Creek and extending to the confluence with the Blowout, testify to the extensive sediment input in the past. Field evidence indicates that this slope instability will continue to supply a significant amount of sediment and woody debris to lower Divide Creek and the Blowout for decades to come. On the other hand, for the upper part of Divide Creek, creep and colluvial processes are predominant and certainly accelerate during periods of large scale fire events. Divide also has an extensive fire history in the last 500 years with much of the area burning and reburning in the last 140 years or so.

Another distinctive active landflow somewhat over 100 acres is located (on the boundary between 78n.1 and 78n.2) west of Coffin Mountain and includes about 3000 feet of the Hawkins Creek channel. This land flow appears to move intermittently in surges with previous movements at 65 and perhaps 130 years to 300 years ago, as well as a major movement over 500 to 600 years ago. These have obviously had a considerable effect on the Hawkins Creek channel from the extensive sediment input and stream relocation. For example, some field evidence indicates that Hawkins Creek and the long parallel channel to the south flowed into each other and formed one channel. Whatever the case, this unstable site has been and will continue to supply a significant amount of sediment and woody debris to Hawkins Creek for decades to come. For many of the streams in this drainage however, creep and colluvial processes are now the predominant sediment generator, and these processes certainly accelerate during periods of large scale fire events. Similar to Divide Creek, Hawkins Creek has an extensive fire history in the last 500 years with much of the area burning and reburning.

At this point in time, much of the Blowout main stem geometry is controlled by slope instability. As one would suspect, this is the primary sediment delivery method to the stream. One example is the Blowout Slide. Currently at over 70 acres, this slide toes directly into the river and has now buried a small waterfall that was present only a few years earlier. Another example involves an actively unstable area at the northwest corner of Upper Blowout (78u) and the southwest corner of Hawkins (78n.F.1) that also toes directly into the Blowout. Again, this earthflow has moved the main stem of the stream to the west approximately 200 to 300 feet in the last couple of hundred years or so. These unstable areas, as well as many others not mentioned, have supplied and will continue to supply the upper Blowout with an enormous amount of sediment for centuries to come.

b) **Comparison of Current and Reference Conditions**: *What are the natural and human causes of change between historical and current erosion processes in the watershed?*

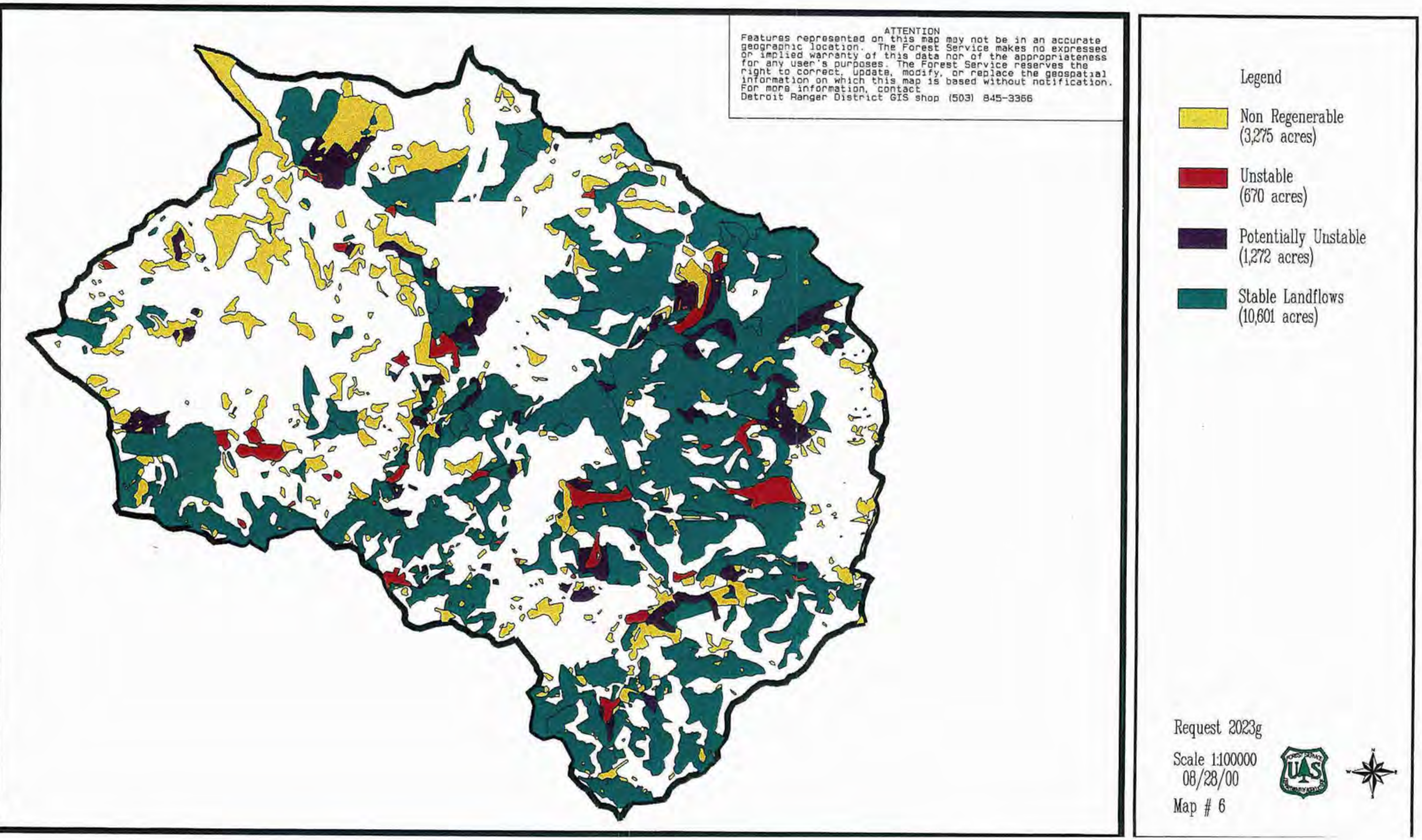
Fire is a natural ecological component of the west Cascades ecosystem. Fire recurrence intervals estimated at about 200-400 years seem to occur in the natural system, with shorter intervals recorded in some critical high lightning areas. From a soil productivity standpoint, most naturally occurring wildfires were not kind to the soil resource. Most duff and down woody debris were consumed, along with extensive amounts of above-ground, living organic matter. Timber management and the concomitant slash treatment in the 1970's and early 1980's tended to duplicate severe fires, or worse, with tractor piling. Since about 1985, with the initiation of duff retention standards, the retention of down woody debris, the use of non-fire treatments such as grapple piling and the elimination of dozer piling, the prospects for long term soil productivity have improved considerably. Aggressive fire fighting standards and techniques have lessened the severity of fires or reduced the acreage affected.

However, fire is a very natural part of the ecosystem development of the west Cascades. Disturbances are necessary and will occur. They can be controlled and manipulated or unrestrained and rampant. From a short term nutrient cycling standpoint, timber harvest with little or no slash treatment on manageable lands or protection of reserve areas is preferred in order to allow for additional buildup of organic matter and duff. Unfortunately, from a long term productivity standpoint, this desire has to be balanced with the potential for extensive, unrestrained wildfire. Uncontrolled fire at high fuel loadings and low fuel moisture will increase fire severity and cause soil damage and nutrient loss. This situation does not change significantly whether the area is untreated slash after logging, a late successional reserve, or wilderness. No specific recommendations are forthcoming as to the appropriate level of risk that should be assumed. However, control of fuel loading, either by fire or through some other mechanical or manual method, is much preferred over most wildfire scenarios. It remains to be seen if the reduction in the effective transportation system, because of funding cuts in recent years, will have an adverse effect on wildfire management because of a growing loss of access capability.

Slope instability has been and continues to be a very natural part of the Blowout landscape. Timber management with its harvest component and associated road construction can effect the rates of slope instability, either positively or negatively. To assist in the evaluation of potential effects, these critical slope instability areas have been delineated in the field and mapped by defining various land types (see map #6). They are defined geomorphically as areas that a) display evidence of periodic movement or catastrophic failure over the last 300 years or so, usually within the last 130 to 140 years, and especially within the last 30 to 50 years; b) usually include additional potentially unstable deposits or material; and c) exhibit slope or soil characteristics that indicate future catastrophic failure is likely in the foreseeable future (generally considered a major storm event such as the 50 or 100 year return interval).

Landtypes considered unsuited because harvest will result in irreversible resource damage (about 670 acres) are primarily those that are actively unstable or potentially highly unstable slump/earth flows (FW-105, BMP T-6). Some of these landtypes have actively unstable areas very closely associated, and generally in direct contact, with stream riparian areas or stream courses. These areas all commonly display slump type topography and include such features as tension cracks, bare soil scarps, leaning and fallen trees, sags and depressions, seeps, and disrupted drainages. Failure depths are such that root strength probably has little affect. However, the instability problem might be aggravated by timber harvest or catastrophic fire, as removing the trees tends to raise

Blowout WA
Unsuited/Unstable Soils



ground water levels due to the loss of evapotranspiration. This in turn might reduce the soil strength and can cause increased or renewed instability.

Potentially highly unstable, not unsuited landtypes (about 1270 acres) range from the shallow, translational debris chute to the more massive, rotational, slump earth flows. Actively unstable and associated, potentially highly unstable lands, have already been excluded from consideration as unsuited lands. Potentially, moderately to highly unstable, not unsuited lands also exist in the form of marginally stabilized earthflows and highly prone debris chute areas. These landtypes are such that these areas would not meet the definitions of "unsuited" as outlined previously, but should be considered potentially unstable (FW-107). In that regard, most of these areas are associated with Class IV stream channels or the headwaters of such channels (FW-103). Probable changes in evapotranspiration and infiltration rates, as well as ground water regimes and water tables, could occur with some management activities and exacerbate the potential instability problems further, either locally or as a cumulative effects condition. These landtypes and most complexes of these landtypes have been excluded from management considerations, unless a site specific evaluation concludes otherwise.

At this point it needs to be **highlighted** that 1) the Blowout is the most unstable drainage within the North Santiam system on Federal land; 2) the area of instability is mapped and occupies about 1900 acres; and 3) the Blowout analysis area contains over 34,000 acres of land. The actively or potentially highly unstable terrain makes up only about 5% of the landscape. In other words, almost 95% of the area is available for management from a stability standpoint. This does not take into account the 3275 acres of unsuited unregenerable terrain, as well as extensive areas set aside for wildlife habit and stream protection. It is worth restating, that the actively unstable areas within the Blowout profoundly affect stream morphology and sediment delivery, but occupy only a small part of the current landscape. Stabilized landflow terrain, on the other hand, is a dominant feature of this analysis area and occupies about 10,610 acres or almost one third of the total landscape.

Soil compaction fortunately, is not duplicated well in nature, except on grander scales, such as glacial and sediment loading. Consequently, man's activities can play a significant, cumulative, and detrimental role in this arena. The major source of most compaction (and also much disturbance) is ground based skidding equipment used during periods of higher soil moisture. Fortunately, unrestricted tractor yarding and tractor piling have not been considered options on those landtypes where sideslopes are gentle enough to support tractor usage for almost a decade. The silty nature of the fine grained soils, and evidence that significant soil moisture is available most of the year indicate that any type of unrestricted tractor yarding and piling (even low ground pressure during the summer months) could lead to unacceptable soil compaction and/or disturbance.

Restricted tractor yarding from predesignated skid roads or shovel yarding while operating on slash have been the primary methods of operation within the standard operating season (June 1 to October 31). Reducing the effective weight of the tractors, reducing the number of trips over a piece of ground, or confining equipment to rocked roads, are all means to reduce the risk of soil compaction and displacement. Yarding over frozen ground, or over a deep, solid snow pack (24 inches of dense snow, or the equivalent) works well and has reduced soil disturbance and compaction. In addition, as a minimum mitigating measure, at the completion of harvest activities, tractor skid roads (existing or created) that are not part of the designated transportation system are generally subsoiled with a "Forest cultivator" or an equivalent winged ripper in order to return the site to near original productivity.

Considering that most sideslopes located within Blowout and Box Canyon are too steep for ground based equipment, that much of the harvest in the last decade was accomplished with cable systems instead of ground based operations, that many of the older tractor logged units are now beginning to actively loosen the soil through a variety of natural mechanisms, the effects from tractor usage in this basin are not cumulatively critical.

Roads provide access for a variety of management and recreational activities. The Blowout, typical of many West Cascades drainages, is relatively well roaded. Surprisingly, from a sediment generation and movement standpoint, roads have not had a significant effect on stream generated sediment and sediment budgets. Approximately 200 miles of system roads, spur roads and landings are present in the Blowout analysis area. A considerable majority of the road system is located on stable benches and flats, and many of the full bench sections were not severely sidecast. Assuming an average 40% sideslope and standard construction procedures, about two cubic yards of material is relocated for each foot of road distance constructed. This amounts to about 3,200,000 cubic yards of relocated material that has been moved in the last 40 years or so. As a comparison, the "Blowout Slide" is about 70 acres in size and about 45 acres are actively unstable and moving at the rate of 1 to 3 feet per year into the Blowout main stem. At an average depth of 45 feet (and the slide may actually average twice that depth), this same amount of yardage is being relocated at least annually. This becomes even more significant when you consider that hundreds of acres of actively unstable or potentially highly unstable terrain exist in this analysis area.

Floods as well as fires are catastrophic events that periodically impact the system. Evidence of large floods in 1861 and 1964 are relatively common along both the streams and associated upland areas. The recent 1996 storm is no exception, and both flood deposits and slope failure events are evident from this storm. However, in comparison to the other storms of record, the 1996 storm was generally much less significant than previous deluges, when considered from a slope stability and sediment generation standpoint. Perhaps one to two dozen failures (not all have been mapped) occurred from the 1996 event. Some were road related; some were unit related; and many were located within unmanaged old growth or naturally fire regenerated stands. Most were relatively small in size. Extensive field evidence is available to show that both the 1861 storm and the 1964 event caused major slope failures within the Blowout area, relocated channels, and changed stream terraces.

Flood events, as was previously discussed, transport or relocate large quantities of sediment from the uplands through the tributary and main channel system. Western Cascade volcanics weather and decomposed to a variety of different materials, depending on the chemical composition, grain size, and durability of the parent material. One component of that weathering is a variety of silt and clay size material. The smallest of these clays, called smectites, are commonly found in soils that display slump/earthflow features. Consequently, the Blowout has a higher percentage of this fine clay component than other watersheds within the North Santiam. It should be noted that this very fine fraction makes up only a very, very small part of the total sediment supply to the system, on the order of a few tenths of one percent at most. Smectite clays are primarily responsible for the persistent turbidity noted downstream in the reservoir. Whether you consider gravel, sand, silt or clay, the Blowout has been, currently is, and will continue well into the future to be a major source of sediment of all sizes for the North Santiam system.

c) Table: Comparison of Current and Reference Conditions: *What are the natural and human causes of change between historical and current erosion processes in the watershed?*

Geologic Characteristic	What Was it Like Historically	What Changed?	Natural Cause of Change	Human Cause of Change
Slope forming processes	In last several hundred thousand to million+ years ago, several glacial periods altered landscape in this watershed	Glaciation is not a dominant factor in erosion processes in the Blowout watershed today	Climatic changes have reduced area affected by glaciation	Global warming, which is influenced by human pollution, can reduce area affected by glaciation
	Since glaciation, slopes have formed and/or been re-shaped as a result of stream downcutting. Eroded material from this downcutting has been deposited in other locations thus changing the landscape	The rate of stream downcutting has increased in some areas	Removal of vegetation by fires increases peak flows which in turn can increase the rate of stream downcutting and the amount of erosion.	Removal of vegetation through timber harvest can increase peak flows, stream down cutting and erosion rates in a similar way to fires. Removal of down woody material on hillslopes and large woody material in stream channels can affect erosion and depositional processes
		The rate of stream downcutting has decreased in some areas	Natural re-growth and maturation of vegetation can reduce peak flows that result in less stream downcutting and erosion	Fire suppression has allowed vegetation to persist in places that previously had been subject to large scale fires. Tree planting can decrease the time needed to re-vegetate a site, which can in turn reduce peak flows and stream down cutting. Silvicultural treatment method, duff retention standards, large woody debris retention, and non-fire fuel treatment methods such as grapple piling can affect peak flows and stream downcutting

Geologic Characteristic	What Was it Like Historically	What Changed?	Natural Cause of Change	Human Cause of Change
Slope forming processes ***(continued)***	More recently slope instability in the form of: • slumps • earthflows • debris chutes has re-shaped landforms within this basin	Increase rate of slope instability	Fires aggravate instability by removing trees thus decreasing evapotranspiration rates which in turn increase water tables. This decreases soil strength and increases soil instability	Removal of vegetation through timber harvest in unstable areas. Sidecast of material from road construction Salvage and stream cleanout
		Minimize rate of slope instability	Vegetative growth increases evapotranspiration which reduces soil moisture and increases soil strength. In addition, root strength provided by vegetation helps minimize slope instability	Avoidance of unstable areas during timber harvest and road construction Geotechnical analysis of road location. End hauling road waste material. Retention of large woody material on hillslopes and in streams. Fire suppression which allows vegetation to persist on the landscape and help stabilize hillslopes.

Geologic Characteristic	What Was it Like Historically	What Changed?	Natural Cause of Change	Human Cause of Change
Sediment delivery	Downslope movement of soil mantel by creep or colluvial process, primarily under the influence of gravity, plays a role in sediment delivery	Rate of downslope movement has accelerated in some areas	Rate of movement is accelerated by large scale fire events that remove vegetation and down woody material from hillsides	Rate of movement is accelerated by timber harvest that removes vegetative cover and down woody material
		Rate of downslope movement has decreased in some areas	Vegetative growth and down woody material build up. Large wood material that has fallen on hillslopes or in stream channels can trap sediments	Fire suppression lessens the severity and area affected by wildfires, reducing erosion potential Management practices that include retention of down woody material reduce erosion. Reintroduction of structure to stream channels.
	Slope instability through: • slumps • earthflows • debris chutes are major sediment delivery systems in the watershed	Increases in soil instability in some areas	Fires accelerate instability by removing vegetation, thus decreasing evapotranspiration. This increases the water table, which in turn decreases soil strength and results in increased soil instability Peak flows/floods transport or relocate large quantities of sediment from the uplands through the stream systems. Natural slope instability	Timber harvest can aggravate instability in similar ways to fire. Sidecast of material during road construction contributes to slope instability Lack of road maintenance can result in plugged culverts that back up water which can wash out road segments.

Geologic Characteristic	What Was it Like Historically	What Changed?	Natural Cause of Change	Human Cause of Change
Sediment delivery (continued)	Slope instability through: • slumps • earthflows • debris chutes are major sediment delivery systems in the watershed *(Continued)*	Decreases in soil instability	Re-growth of vegetation, improves root strength and increases evapo-transpiration which can reduce soil instability. Large woody debris often controls size and extent of debris flows	Fire suppression has resulted in less acres being affected Implementation of management standards and guidelines to retain duff layer, retain down woody material, grapple piling, etc. Fuel loading control can reduce the intensity of fire effects on erosion and sedimentation

Geologic Characteristic	What Was it Like Historically	What Changed?	Natural Cause of Change	Human Cause of Change
Long-term soil productivity	Organic material contributes to soil nutrients	Loss of soil nutrients	Extensive unrestrained wildfire at high fuel loadings and low fuel moistures increases fire severity and consumes duff, down woody material and other organic matter. These fires cause soil damage and nutrient loss.	Slash burning done during periods of low soil/fuel moisture and/or with high fuel concentrations can consume duff, down woody material and other organic matter, resulting in soil nutrient loss
		Reduction in loss of soil nutrients	Natural build up of duff, woody material and other organic matter contribute to soil nutrients	Timber harvest with little or no slash treatment. Elimination of harvest in reserve areas allowing build up of duff, woody material and other organic matter. Changes in management practices that include duff retention standards, retention of down woody debris, and use of non-fire slash treatments like grapple piling Aggressive fire suppression efforts have lessened fire severity or reduced acreage burned Control of fuel loading by fire or through mechanical or manual method to reduce severity of wildfires

Geologic Characteristic	What Was it Like Historically	What Changed?	Natural Cause of Change	Human Cause of Change
Long-term soil productivity ***continued)***	This watershed has historically had fairly productive soils	Increased soil compaction reduces long-term soil productivity	Except for compaction as a result of glaciation, there are few natural process in which soil compaction occurs	Ground-based skidding equipment used during periods of high soil moisture causes soil compaction and affects long-term soil productivity
		Minimize soil compaction		Restrict use of ground-based yarding systems, log suspension requirements, seasonal operating restrictions, all can help reduce soil compaction and maintain soil productivity

II. PHYSICAL DOMAIN

B. Hydrology

1. Characterization: *What are the dominant hydrological characteristics (e.g. total discharge, peak flows, minimum flows) and other notable hydrological features and processes in the watershed (e.g. cold water seeps, ground water recharge areas)?*

The dominant hydrologic characteristics for the Blowout watershed are similar to other documented watersheds in the Western Cascades. Rainfall for the area, averages 80-120 inches per year, with intensities as much as 9 inches in 24 hours. These intensities can be expected one percent of the time each year *(National Weather Service 100 year, 24 hour rainfall intensity maps)*. Intense precipitation is episodic in nature, and often generates peak flows, which are a major disturbance mechanism for stream channels and associated riparian areas.

The hydrology of the Blowout watershed is rain-on-snow dominated, as is much of the rest of the western Cascades. In the Cascade Range, ***peak flows*** generally occur during rain-on-snow events in the transient snow zone. For most of the rest of the Detroit Ranger District, the transient snow zone is estimated to occur between 1,500 and 4,000 feet elevation (Christner and Harr, 1982). The elevation range of the transient snow zone in the Blowout is 1,200 to 4,900 feet, differing slightly from Christner and Harr's figures, due to the orientation of the watershed to the dominant winter storm patterns. This makes the entire Blowout watershed subject to rain-on-snow events. As storm fronts pass through the North Santiam Canyon they are slowed by Coopers Ridge and Coffin, Bachelor, and Buck Mountains, resulting in precipitation in the Blowout watershed. Snow pack, melted by warm rain, delivers large volumes of water to stream channels and considerably increases stream flows. Depending on the extent of the air mass, isolated areas or regional areas can be affected, causing variation in increased peak flows around the watershed.

Minimum flows, in the Blowout, are regulated by water storage features which allow flow to persist during drought periods. Much of the summer time flow comes from water stored in the broad alluvial flood plain along the main channel of Blowout Creek and the glacial and colluvial soils found throughout the drainage. The alluvial material found along the Blowout is also a heat sink for solar radiation and so contributes to water temperature increases in the summer months as well. Other storage features include numerous ponds and wet areas scattered throughout the watershed.

Discharge: There have been no stream gauges on the Blowout in the past, so discharge rates have not been measured. A stream gauging station was installed in 1998 and will be operated by the U.S. Geological Survey. In the future, discharge rates will become available.

Cold Water Seeps: Earthflow activity in the watershed has resulted in numerous wetlands well distributed across the landscape. These wetlands are typically in the form of sag ponds and shallow ground water surface interfaces, and are either an extension of the riverine system or are isolated occurrences associated with geologic features.

Ground Water Recharge Areas occur in alluvial deposits, ponds, unstable areas containing sag ponds, and deep soils within the watershed.

2. *What do humans value that is associated with hydrology?*

Water storage and regulation systems; the amount and timing of water flow; and sediment budgets have ecological, economic and social value.

3. *What are the highest priority issues or resource concerns associated with hydrology?*

The highest priority hydrologic issue in the watershed is flow of water, especially peak flow and low flows.

4. *What and where are the management direction/activities, human uses, or natural processes that affect the hydrology?*

a. Current Conditions: *What are the current conditions and trends of the dominant hydrological characteristics prevalent in the watershed?*

Peak flows: Rain-on-snow dominated landscapes are dependent upon regional and global weather patterns and their interaction with local topography. Due to the effect of east/west and north/south dominated ridge systems found in the Blowout, cold fronts passing over the area release precipitation, often in the form of snow. Later, when a warm front passes over the area, it can remove this accumulation of snow, rapidly generating peak flows. It is expected that this trend would continue in the future.

The first series of storms that come into the area, don't change the stream flow much, because of abundant water storage capacity in the basin. With later storms, once water storage areas are filled, or if intensities exceed infiltration rates, the system becomes more flashy (Ziemer, 1998).

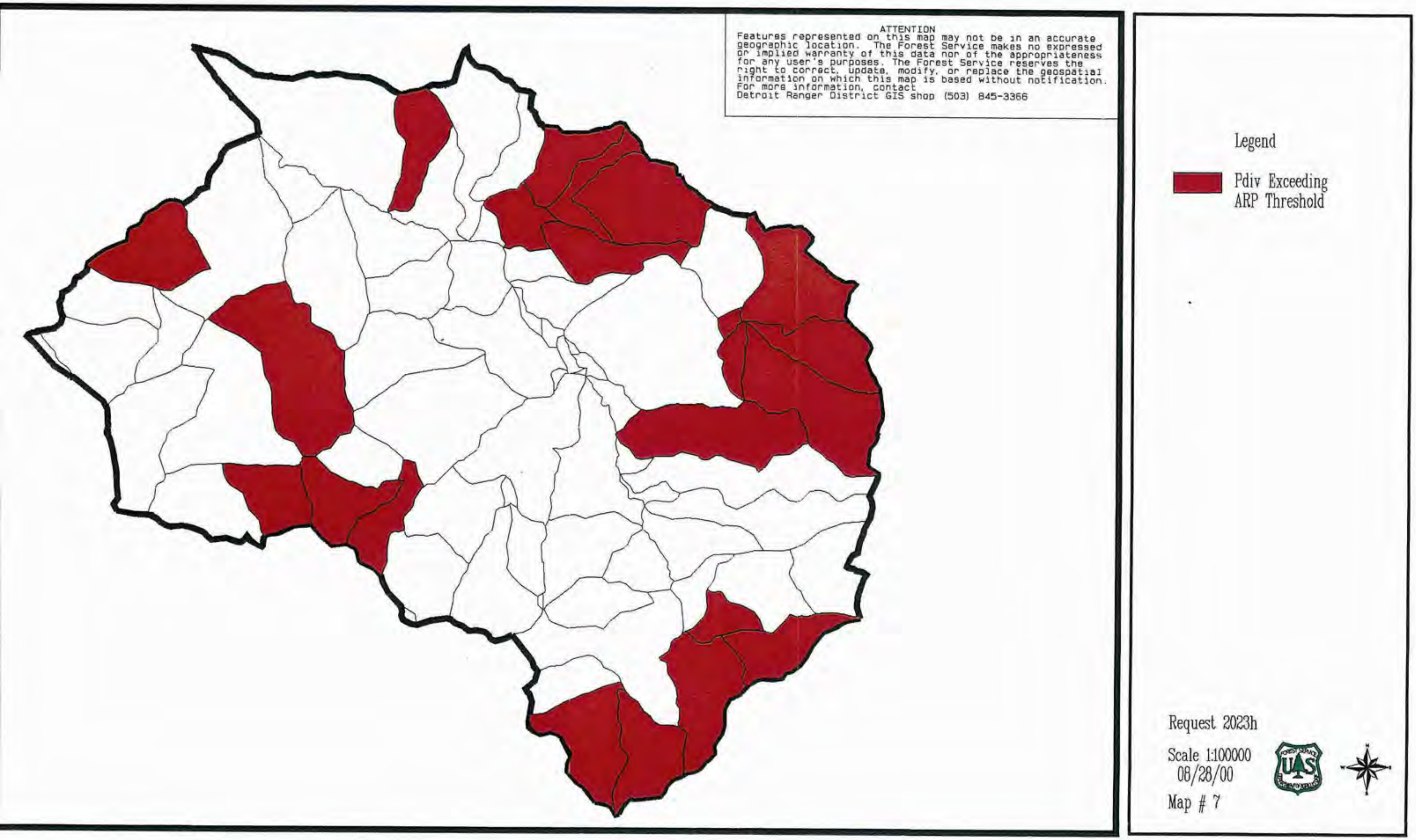
There is adequate upland water storage to provide year round flows in all named tributary streams, as well as, a lot of first and second order streams. Slump topography in some upland areas results in numerous ponds, seeps, wetlands, and high water tables in those areas. In fact, a unique feature of this watershed is the amount and distribution of wet areas.

Hydrologic Recovery is used to estimate the capability of timber stands to intercept snow, rain and wind and to assess the potential risk of adverse effects to stream channels and water quality from increases in peak flows during rain-on-snow events. For the Willamette National Forest, hydrologic recovery is calculated using the Aggregate Recovery Percent (ARP) method. Recommended midpoint ARP values have been assigned in the Forest Plan.

For each "Watershed Condition Type" defined in appendix E-10 to E-18 in the Forest Plan, there are adjustments to hydrologic recovery recommendations for ARP. The watershed condition types for surveyed channels in the Blowout tend toward types 5, 6, 7 and 8. For channel types 5 and 6, ARP is recommended to be, at or above, midpoint values in order to minimize streambank and streambed erosion. For channel types 7 & 8, ARP is recommended to be at least 5 percent above midpoint values, in order to minimize the risk of increases in peak flows and the associated risk of increases in stream channel scouring.

All planning subdrainages *(map #7)* within the analysis area are within 10 points of the Forest Plan threshold midpoints, some above the midpoint values and some below. When those planning subdrainages are broken into smaller units, for finer resolution and to better isolate problem areas, 21 of the 46 watershed areas are within ten points of ARP threshold midpoints in 1998. Because ARP values change over time and/or when harvest activities are implemented, these values will need to be periodically updated. Numerous channels within the area have shown or are currently showing signs of cumulative watershed effects including: Lost, Cliff, Blowout, Divide, and Ivy Creeks.

Planning Subdrainages That Do Not Meet ARP Recommendations



The following subdivisions do not meet the hydrologic recovery (ARP) recommendations:

Planning Subdrainage	Division of Subdrainage	Recommended ARP	Actual ARP	Comments
78L Beard		75		Type 7 & 8
	78L.1	75	72	
	78L.1.1	75	72	
	78L.1.2.1	75	73	
	78L.1.3	75	62	
	78L.3	75	66	
	78L.1.2	80	78	
78M Divide		70		Type 7 & 8
	78M.1	70	66	
	78M.1.2	75	72	
78N Hawkins		70		
	78n.3	70	60	
78P Lost		70		Type 7 & 8
	78P.1	75	72	
	78P.3	70	51	
	78P.3.1	70	48	
78R Cliff		70		
	78R.2	75	75	
	78R.2.2	70	69	
	78R.2.3	70	50	
78T Box Canyon		70		
	78T.1	70	65	
	78T.3.3	70	57	
	78T.4	70	67	
78U Upper Blowout		70		
	78U.1	70	56	
	78U.1.1	70	61	
	78U.1.2	70	54	

**These were the most accurate ARP values available at the time of this writing. These ARP values will need to be updated periodically as watershed conditions change over time.*

As shown above, several areas do not meet the Forest Plan recommendations pertaining to hydrologic recovery (FW -093)(BMP-W-5). Both subdrainages and divisions of subdrainages that do not meet these recommendations, will be closed to additional roading and harvest activity, which disturbs canopy closure, until sufficient recovery occurs to reduce risk of increased peak flows and channel bank/bed erosion.

b. ***Reference Conditions:*** *What are the historical hydrological characteristics (e.g., total discharge, peak flows, minimum flows) and features (e.g., cold water seeps, ground water recharge areas) in the watershed?*

Historical peak flows, occurred much as they do now, during rain-on-snow events in the transient snow zone.

Evidence suggests that peak flows in this area were historically high in stage and frequency. High drainage densities reflect the historic abundance of runoff within the area.

The following table shows the top ten floods on record, within the Willamette system. Please note the 1996 February storm is not mentioned in this table. The flows recorded during 1996 were 85 percent of the flows recorded in 1964 and 83 percent of the flows recorded in 1921. This allows the reader to interpret the magnitude of the 1996 flood in relation to other historical flows.

Willamette System Floods

Chronology	Years Before Present	Interval
1964	30	30
1920	74	44
1901	93	19
1890	104	11
1881	113	9
1861	133	20
1849	145	12
1844	150	5
1843	151	1
1813	181	30

**Note these are the ten greatest flows on record. Other flows have occurred through time that have shaped the channels and valley floors.*

It is apparent from field investigations, that flows of smaller magnitude, shape and change the valley floor annually. The key to the amount of disturbance the flows have within the watershed, is the amount of large wood present, and the attachment of the stream channel to its floodplain.

In the past, large scale fires burned vast areas of the watershed stripping them of their vegetation. The removal of this vegetation, in combination with rain-on-snow events, resulted in increased volumes of water coming off the hillsides and entering stream systems. Because of the increased water volumes, high energy streams scoured steep v-shaped valleys. Their floodplains were minimal due to the incised nature of the valley floors and wet areas in depressions were scattered throughout the landscape. The Hawkins Creek area has a frequent fire return interval, so this area had more flashy flows, historically, than the rest of the watershed.

c. ***Table: Comparison of Current and Reference Conditions***: *What are the natural and human causes of change between historical and current hydrological conditions?*

Hydrological Characteristic	What was it like historically	What changed?	Natural Cause of Change	Human Cause of Change
Peak flows	Peak flows were higher in areas denuded by large scale fires. Lack of vegetation and increased snow accumulation allowed flashier runoff during rain-on-snow events in these areas.	Peak flows, as a result of large scale, stand replacing fires have been reduced.	Regrowth of vegetation in areas denuded by fires. Vegetation intercepts water and affects the amount delivered to streams during high flows.	Fire suppression limited the size of fires and allowed more vegetation to persists on the landscape.
		Peak flows show slight increases throughout the watershed rather than large increases in concentrated areas of high fire activity.	Areas of disturbance are distributed throughout the watershed. Natural recovery is constant and can be aided by silvicultural practices designed to speed up recovery.	Timber harvest units are smaller and more scattered across the landscape than large scale, stand replacing fires were. Acreage harvested is comparable to that burned.
		Increase in size of the smallest peaks occurring during the driest antecedent conditions, this effect declines as storm size and watershed wetness increase.	Weather patterns for the region cycle through a 17 year cycle of wet period and dry periods.	Timber harvest has removed vegetation on the same scale as historic fires but openings are smaller and distributed more evenly across the landscape than historic openings created by fires
	Regional weather patterns and topography influence peak flows which have been associated with rain-on-snow events in transient snow zone.	Increase in peak flows in localized areas	Fires and the resultant loss of vegetative cover/canopies can locally affect peak flows.	Timber harvest can affect snow intercept by removing tree canopies, thus accumulating more snow on the ground and impacting localized peak flows.
	Peak flows high in stage and frequency	Similar to historic times		

Hydrological Characteristic	What was it like historically	What changed?	Natural Cause of Change	Human Cause of Change
Flood plain water storage	Storage occurred in large flood plains associated with the main stem of Blowout Creek.	Water storage in floodplain has been reduced in Blowout Creek.	Increased stream energies caused streams to downcut into alluvium, lowering the water table and reducing storage potential.	The location of Blowout Road has disconnected Blowout Creek with its floodplain thus affecting water storage capacities. Removal of large wood from the stream system resulted in increased energy to scour channel down through flood plain thereby reducing water storage.

II. PHYSICAL DOMAIN

C. Stream Channels

1. Characterization: *What are the basic morphological characteristics of stream valleys or segments and the general sediment transport and deposition processes in the watershed (e.g., stratification using accepted classification systems)?*

There are two distinct drainage systems in the area, streams that are tributary to Box Canyon Creek in the west, and streams that are tributary to Blowout Creek in the east. Both Box Canyon and Blowout Creeks drain directly into Detroit Reservoir, on the North Santiam River. Named streams within the area include Blowout Creek, Beard Creek, K Creek, Divide Creek, Hawkins Creek, Lunch Creek, Ivy Creek, Lost Creek, and Box Canyon Creek (*map #8*).

The analysis area is relatively steep and well drained as evidenced by stream densities of approximately 5.25 miles/sq. mile. Stream substrate material varies from bedrock to gravel and is dominated by boulder/cobble material in the lower valley reaches.

The following discussion will be stratified by landform block, as described in the Geology section of this watershed analysis.

Steep Canyon Area Landform Block (See Map 4)

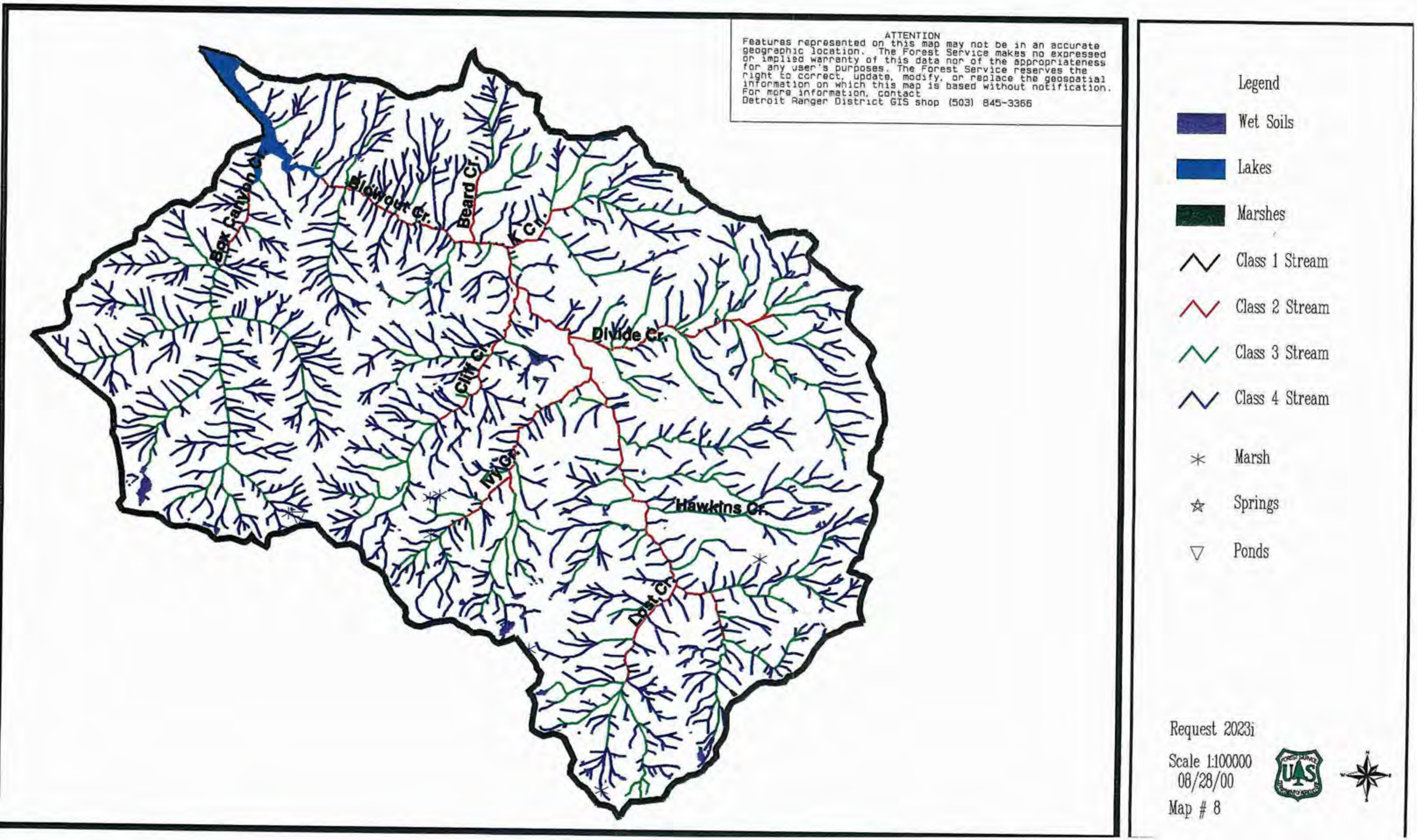
Box Canyon: Deeply incised parallel streams are found in Box Canyon, as evidenced by first to third order stream channels. This pattern of parallel streams is the result of high gradient channels draining glacially-formed slopes, that have been altered by erosion. The high gradient stream channels are associated with valley walls greater than 65 percent slope and contain channel bottom materials which are dominated by bedrock and boulders. These high energy stream channels exhibit very little sinuosity. The parallel streams join to form a dendridic pattern lower down in the drainage.

The fourth and fifth order streams make up the named streams in the watershed. Rosgen channel types for streams in this area range from Aa+ to B type channels *(see description of Rosgen channel types, chart #1)*. The diversity of the channels is the result of lack of valley development.

Headwater channels have some sediment storage capacity in pools and backwater areas because of channel structure such as logs and boulders, but this structure is minimal here. Sediment storage capacity decreases as streams transition into the valley wall regions, where high energy streams transport sediment through to Box Canyon Creek and Detroit Reservoir.

Debris torrents have and continue to play an important role in the first and second order stream channels in this area. Failed material, from debris torrents, builds up

Blowout WA
Streams, Lakes, Ponds and Wet Soils



Rosgen's Channel Typing

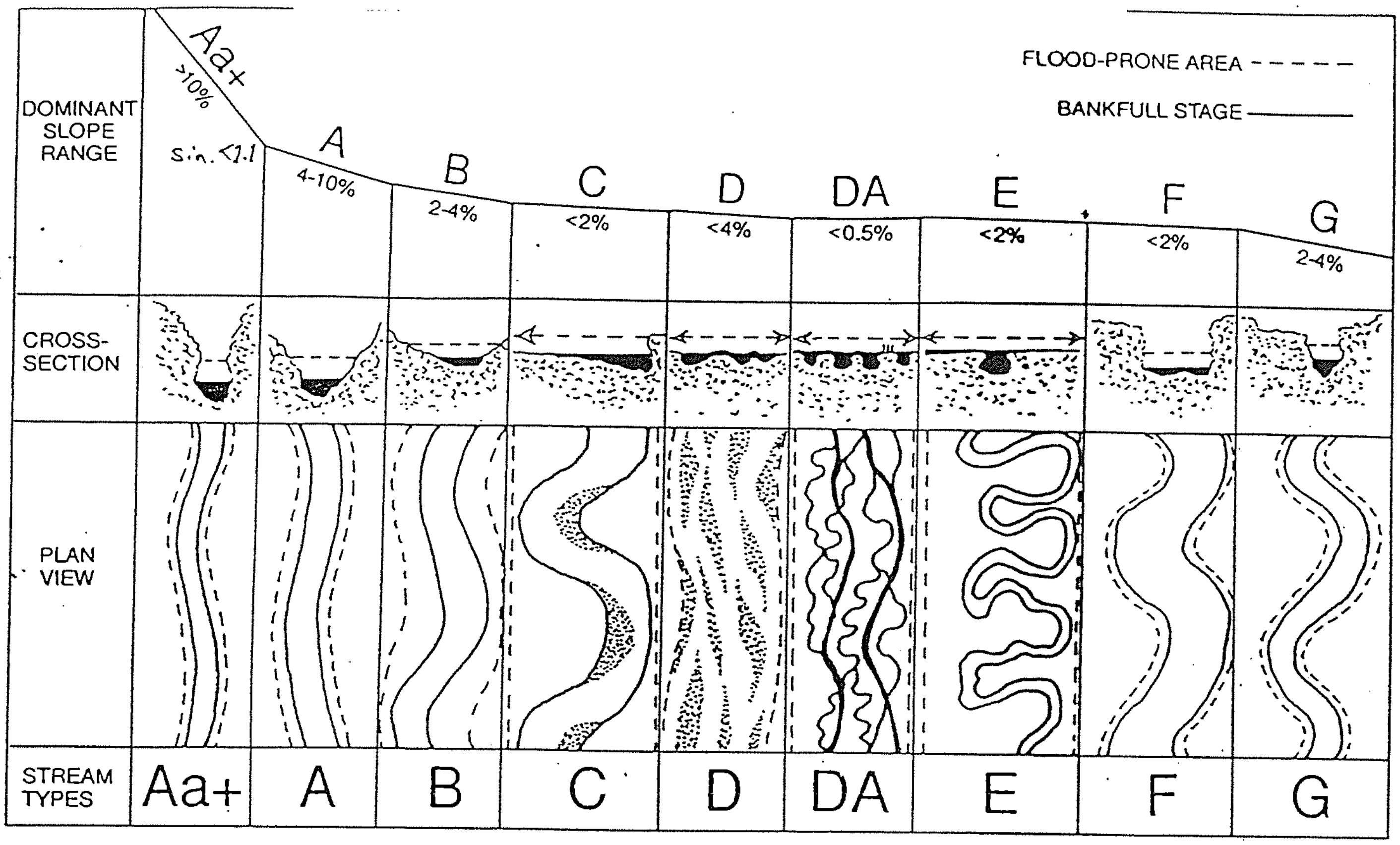
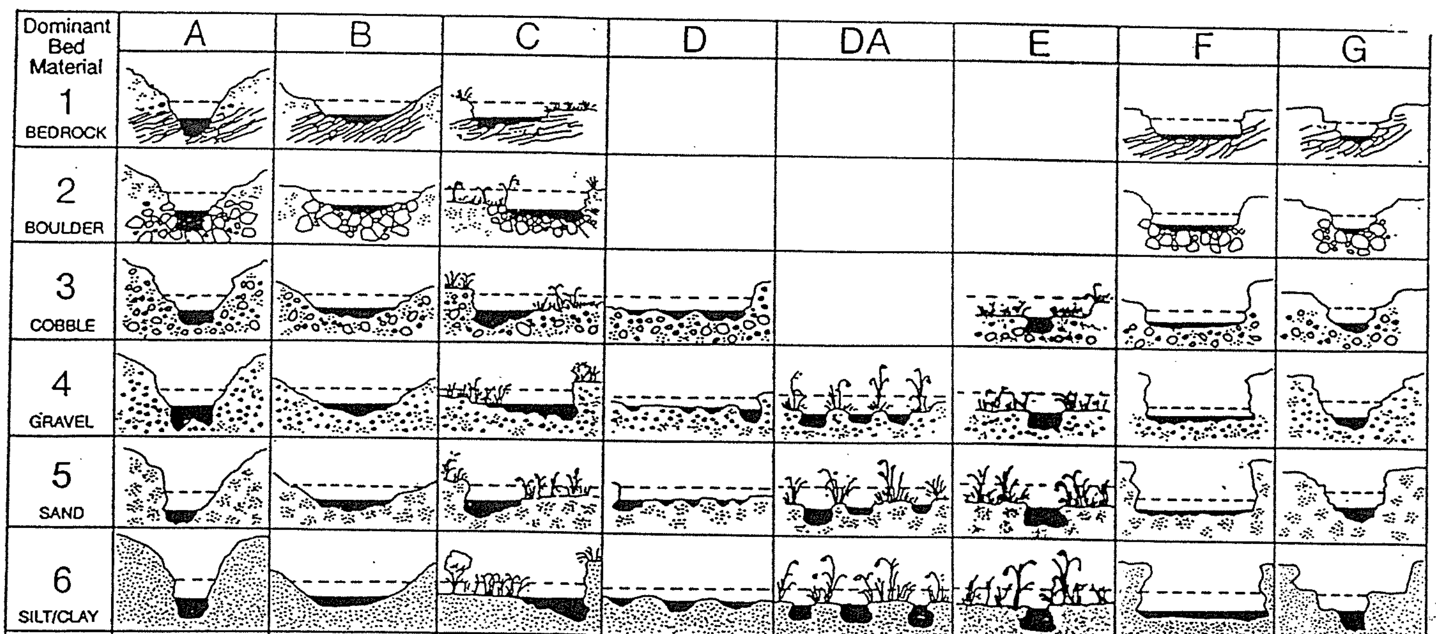


Figure 2. – Stream types: gradient, cross-section, plan view (adapted from Rosgen 1994). Original drawings by Lee Silvey. Courtesy of Catena Verlag.



	A	B	C	D	DA	E	F	G
ENTRH.	<1.4	1.4-2.2	>2.2	N/A	>2.2	>2.2	<1.4	<1.4
SIN.	<1.2	>1.2	>1.4	<1.1	1.1-1.6	>1.5	>1.4	>1.2
W/D	<12	>12	>12	>40	<40	<12	<12	<12
SLOPE	.04-.099	.02-.039	<.02	<.04	<.005	<.02	<.02	.02-.039

Figure 3. – Cross-section view of stream types (adapted from Rosgen 1994). Original drawings by Lee Silvey. Courtesy of Catena Verlag.

Chart #1

Rosgen's Channel Typing - Classifications

Stream Type	General Description	Entrenchment Ratio	W/D Ratio	Sinuosity	Slope	Landform/Soils/Features
Aa+	Very steep, deeply entrenched ,debris transport streams.	<1.4	<12	1.0 to 1.1	>.10	Very high relief. Erosional, bedrock or depositional features; debris flow potential. Deeply entrenched streams. Vertical steps with/deep scour pools; waterfalls.
A	Steep, entrenched, cascading, step/pool streams. High energy/debris transport associated with depositional soils. Very stable if bedrock or boulder dominated channel.	<1.4	<12	1.0 to 1.2	.04 to .10	High relief. Erosional or depositional and bedrock forms. Entrenched and confined streams with cascading reaches. Frequently spaced, deep pools in associated step-pool bed morphology.
B	Moderately entrenched, moderate gradient, riffle dominated channel, with infrequently spaced pools. Very stable plan and profile. Stable banks.	1.4 to 2.2	>12	>1.2	.02 to .039	Moderate relief, colluvial deposition and/or residual soils. Moderate entrenchment and W/D ratio. Narrow, gently sloping valleys. Rapids predominate w/occasional pools.
C	Low gradient, meandering, point-bar, riffle/pool, alluvial channels with broad,well defined floodplains	>2.2	>12	<1.4	<.02	Broad valleys w/terraces, in association with floodplains, alluvial soils. Slightly entrenched with well-defined meandering channel. Riffle-pool bed morphology.
D	Braided channel with longitudinal and transverse bars. Very wide channel with eroding banks.	n/a	>40	n/a	<.04	Broad valleys with alluvial and colluvial fans. Glacial debris and depositional features. Active lateral adjustment, w/abundance of sediment supply.
DA	Anastomosing (multiple channels) narrow and deep with expansive well vegetated floodplain and associated wetlands. Very gentle relief with highly variable sinuosities. stable streambanks.	>4.0	<40	variable	<.005	Broad, low-gradient valleys with fine alluvium and/or lacustrine soils. Anastomosed (multiple channel) geologic control creating fine deposition w/well-vegetated bars that are laterally stable with broad wetland floodplains.
E	Low gradient, meandering riffle/pool stream with low width/depth ratio and little deposition. Very efficient and stable. High meander width ratio.	>2.2	<12	>1.5	<.02	Broad valley/meadows. Alluvial materials with floodplain. Highly sinuous with stable, well vegetated banks. Riffle-pool morphology with very low width/depth ratio.
F	Entrenched meandering riffle/pool channel on low gradients with high width/depth ratio.	<1.4	<12	>1.4	<.02	Entrenched in highly weathered material. Gentle gradients, with a high W/D ratio. Meandering, laterally unstable with high bank-erosion rates. Riffle-pool morphology.
G	Entrenched "gulley" step/pool and low width/depth ratio on moderate gradients.	<1.4	<12	>1.2	.02 to .039	Gulley, step-pool morphology w/moderate slopes and low W/D ratio. Narrow valleys, or deeply incised in alluvial or colluvial materials; i.e., fans or deltas. Unstable, with grade control problems and high bank erosion rates.

Chart #2

small terraces within the third and fourth order stream channels. These terraces are then occupied during peak flows, which alter their shape and create riparian areas.

Transitional Area Landform Block and Slump and Glacial Landform Block

The Transitional Landform Block and the Slump and Glacial Landform Block exhibit geological differences, so they have been separated into two discussions in the geology section of this document; however, stream channels in both landform blocks are similar so they will be discussed together here.

Stream channels in these landform blocks exhibit a dendridic pattern and tend to be incised due to convex slopes.

Channel morphology, in this area, has been greatly influenced by earthflow activity. High energy first and second order streams have little sediment storage capacity and tend to have bedrock-boulder channel bottoms. A long history of fires, especially in the Divide and Hawkins Creek areas, coupled with timber harvest, have removed vegetation, leaving streams without an adequate supply of large woody material to provide structure and store sediments. These areas generate increased peak flows and a landscape that is more susceptible to debris torrents. This fire-peak flow- debris torrent scenario greatly influenced channel development in this area, in part by its lack of large wood to hold sediments. These stream channels tend to act like pipes and pump sediments through to higher order stream channels.

Third and fourth order streams in these landform blocks are more typical of those of other western Cascades watersheds. These stream channels transport sediment down narrow valley bottoms that are occasionally interrupted or confined by earthflows. At the toes of the earthflows, channel roughness and gradient increase forming a stepped channel, as evidenced in longitudinal profiles of these streams.

The types of sediment and depositional processes prevalent in these landform blocks are closely associated with channel types. Sediments are ***transported*** through Rosgen type G headwater channels (*very steep gully like features*) and continue to be transported through Aa+ channels(*steep gradients, narrow channels with little sinuosity*) and B channels (*moderate gradients, channel widths and sinuosity*). Sediments are then ***deposited*** when they reach Rosgen type C channels, with their lower gradients and wider more sinuous channels. The main stem of Blowout Creek is a type C channel for limited segments, below the Beard Creek confluence.

These stream channel bottoms historically contained a high percentage of exposed bedrock and large boulders. Debris torrent activity in headwater areas and earthflow activity have historically kept Cliff, Blowout, Lost, Ivy, and Divide Creeks loaded with structure. Most of the fine sediments are being transported out of the system. Small discontinuous terraces are present in channel backwater areas, and confluences.

Past management activities have mimicked the effect of fires on sedimentation in Blowout streams, but on a somewhat smaller scale. This management-induced sedimentation was the result of: clearcut and shelterwood harvests where vegetation was not retained along stream courses; roads that were sidecast; broadcast burning practices that included late summer and early fall burns; and removal of large woody material from hillsides and stream courses as a result of yarding of unmerchable material (YUM) yarding and stream cleanout. Many of these activities are no longer practiced, but the effects are still evident.

Morphological characteristics of stream valleys: Historically, sediment transport and depositional processes were the result of peak flows and erosion. After fires burned an area, erosion-generated sediments loaded stream channels. These sediment-loaded channels were later flushed out during peak flows. Though episodic in nature the effects of peak flows on stream channels were long lasting.

The amount of large woody material, that acted as sediment traps, in stream channels fluctuated with fire intensities. High intensity fires consumed large woody material, while low intensity fires recruited woody material into stream channels. The amount of wood also varied with the topography. Steeper, V-shaped valleys, such as those in the Hawkins Creek, retained less wood than wider valleys. These V-shaped valleys acted as chimneys, drawing fire through them, and consuming the woody material in the stream channels.

Channels formed under peak flows became very resistant to change as high energy streams scoured out fine sediments, and left large boulder and bedrock dominated channel bottoms. These substrate allow for sediments to move through the system rather than be deposited.

Depositional areas are mainly associated with larger order streams that are generally lower gradient and lower energy. They also are associated with the amount of large woody material in the stream channels. The streams in depositional areas, generally had wide valley bottoms and lots of downed wood to trap sediments.

2. *What values do humans place on stream channels?*

Stream channels and their associated flood plains are an important part of the ecosystem and also have aesthetic value to humans.

3. *What are the highest priority issues or resource concerns associated with stream channels?*

Channel bank stability and protection of headwall areas are high priority issues in this watershed.

Channel bank erosion and associated sediments, as a result of peak flows, are a concern in this area.

In some parts of the watershed, there is a concern about stream channels being disconnected with their floodplains.

Monotypic, diversity-poor stream channels, resulting from the 1964 flood and past management activities are of concern in this watershed.

The effects of the 1996 storm on channel conditions, and whether upland forest management influences were outside the natural range of conditions is also a concern.

4. *What and where are the management direction/activities, human uses, or natural processes that affect the stream channels?*

a. *Current Conditions:* *What are the current conditions and trends of stream channel types and sediment and deposition processes prevalent in the watershed?*

The current morphological characteristics of stream valleys in the Blowout watershed are similar to historic conditions. The basic stream patterns and channel gradients are largely influenced by geology, so have not changed a great deal since the reference time frames, 100 years ago.

One of the greatest impacts on stream sediment and depositional processes, is a century of fire suppression that has reduced debris torrent frequencies, as well as, the amount of surface erosion. This in turn, has reduced the amount of sediment introduced into the stream channels.

Both sediment and large woody material are necessary components for proper stream channel and floodplain interactions. Surface erosion upslope from stream channels is generally less today than in historic times because fire suppression has allowed vegetation to persist on hillslopes, thus minimizing erosion. There have been management activities, in the past, that generated sediment on par with some fires, such as harvest where no riparian vegetation was left, roads that were sidecast, and removal of large wood, but these activities are no longer practiced.

Generally speaking, timber harvest, over the decades, has removed vegetation on a similar order of magnitude to fires, but because of several factors such as: *selectively placing harvest units out of erosion-prone areas; harvest units generally being smaller in size than stand-replacing fires; harvest units being dispersed throughout the watershed rather than being concentrated in one part of the watershed like a fire; and more recently the retention of vegetation adjacent to stream channels,* harvest has not generally resulted in surface erosion to the same extent that large scale fires once did. Reduction in erosion rates have reduced the sediment available to stream channels to rebuild floodplains.

In many areas, there is an increase in the buildup of down woody material as a result of years of fire suppression. In addition, channel vegetation is increasing in areas where fires have been excluded. In larger streams, however, the converse is true, woody material has been removed as a result of timber harvest.

In all subdrainages and all channel types, large woody material plays an important role in the metering of sediment through stream channels. In the absence of wood, sediment is transported uninterrupted through the system. When large wood is present, sediment is pulsed from wood accumulation to wood accumulation, thus increasing the time sediment remains in the stream channel.

Currently streams exhibit high energy levels, just as they did historically. Today; however, in some streams where large wood has been removed through timber harvest, sediments move more quickly through the system than they once did. Here, the reintroduction of large wood can help store more sediments, so the streams can function as they once did.

Another observation regarding stream channels, is that vegetation allowed to persist on upland slopes because of fire suppression, has tended to reduce the intensities of peak flows over historic conditions.

***b. Reference Conditions**: What were the historical morphological characteristics of stream valleys and general sediment transport and deposition processes in the watershed?*

Historically, sediment transport and deposition processes were a result of peak flows and erosion. After a fire burned an area, erosion-generated sediments loaded stream channels. These sediment-loaded channels were later flushed out during peak flows. Sediments pulsed through the system, from one accumulation of large wood to another, over a relatively long period of time. Though episodic in nature, the effects of peak flows on stream channels were long lasting.

Fire: Fires created substantial disturbances in this landscape dotted with unstable areas, resulting in many hill slope failures. These hill slope failures introduced large amounts of sediment into streams. In turn, these sediment-rich stream systems either widened their valley floors, creating additional hill slope instability, or incised their valley floors, creating channel bank instability, depending on the dominant weather patterns at the time.

Riparian vegetation then invaded the valley floors, hill slopes, or channel bank areas, and through time, helped stabilize the areas. Those areas not stabilized provided diversity of plant species within the riparian zone.

Fire intervals are estimated to be 80 to 275 years (REAP, 1993) in the Blowout study area. This allowed ample time, between fire episodes, for trees to grow to sufficient size to provide a source of large woody material for riparian areas. In addition, fires in riparian zones tended to burn less intensively than upslope fires because of increased moisture in these areas. The result was an abundance of large woody material in riparian areas, which was important to stream systems for energy dissipation and sediment storage. This energy dissipation, reduced the transport ability of the water, so sediment and organic debris were retained in the system. It also resulted in the creation of abundant pool habitat within the stream system and numerous back water areas. Old side channels are still visible within certain valley floor segments in the watershed.

Typically streams would have had diverse channels with multiple side channels, storage areas with abundant pools, and intergravel flows behind large accumulations of large woody material. In headwall areas and at the toes of earthflows, stream energies would have been high, but they would have been less outside of these areas. Large woody material would have been abundant, with adequate size and mass to span smaller valley floors.

Earthflows: Earthflows affected stream channels in several ways. If the earthflow contained sufficient large woody material, the roughness of the woody material tended to slow the migration of the flow, so its distribution downstream was minimal. Earthflow flats were established upstream of accumulations of woody material and the stream channel occupied either intergravel space or meandered on the flats. Energy increases in the stream channel occurred as a result of the change in gradient at the toe of the earthflow. These increased energies often resulted in the removal of finer materials and the creation of higher gradient channels. Sometimes earthflows resulted in the development of a waterfall, after which the stream channel would lose its energy as it passed through the falls. If the material was alluvial in nature, as opposed to colluvial, intergravel flows could develop and the stream channel, at low flow periods, would run subsurface.

Earthflows sometimes scoured stream channels to bedrock, depending on their speed and viscosity. These bedrock reaches, for a short time, contained over-steepened upper channel banks. Woody material was recruited into the stream channel, from these over-steepened channel banks, and colluvium was collected. This process rebuilt the diversity within the channel.

Earthflows also created smaller channels along their margins or on their flow faces. Wetland areas were created, as sag ponds associated with these flows, or as a result of the flows on the landscape.

Floods: Large flood events in 1964 and 1965 moved tremendous amount of large woody debris into Detroit Reservoir and set up log jams in the Blowout stream system. Several years before and after these flood events, the Forest Service removed log jams, and virtually all other large woody debris from streams, through the use of tractors. These projects cleaned out the Blowout stream channel from the private boundary near the Road 10 bridge, up to a series of waterfalls just below Hawkins Creek. This work was intended to reduce the damage to downstream roads and bridges during high flow events.

In a large part, because of these stream cleanout projects, the 1964-65 flooding eroded large amounts of stream bank and side slope materials. Short sections of Road 10 were almost completely washed away and large riprap was not able to prevent the damage. Recent surveys have shown flood terraces, with dominant stands of red alder dating back to 1965-70, in all major stream systems in the basin.

In 1996 a smaller magnitude storm (30-50 year return interval) occurred. Recruitment of channel bank material allowed aggregation to occur throughout most of the watershed. Large pulses of sediment, sometimes referred to as sediment waves, moved through the 4th and 5th order channels. Earlier efforts to reintroduce wood into Blowout, Ivy and Divide Creek decreased the stream energy enough to reconnect portions of the channel with its historic flood plain. Stream channel elevation was raised from these pulses generating upper channel bank slope failures. These failures provided additional sediment to the channel.

Management: Prior to management, there was generally an abundant supply of down woody material within the riparian areas in the Blowout analysis area.

When logging first began in the drainage, harvest units were generally clearcut from stream bottom to ridgetop, but only the highest quality logs were utilized. Timber was abundant, so rotten or partially rotten trees were left on the ground. In addition, shattered pieces and chunks from trees that broke when they were cut down, were left on the ground so large woody material was still abundant across the landscape.

In later years as philosophies changed, utilization and slash treatment methods resulted in less down woody material being made available in riparian areas. Fire was used to reduce logging slash, so that trees could be planted more easily. More uses were found for wood, and the value of the wood increased, so utilization standards changed. Low quality logs, that used to be left on the site, became useable as chip material. Woody material was cleaned out of streams. Salvage operations started keying in on riparian areas due to higher quality and larger size trees. This was most evident after the 1964 flood, in which an entire timber sale was developed to remove down woody material from riparian areas.

There is evidence that numerous intermittent, non fish bearing streams, were used early on as skid roads. Interception of flow by these skid trails resulted in the development of new intermittent streams.

Stream channels responded to the lack of large woody material, by slowly incising valley floors and removing finer material from their substrate, thereby creating long riffle reaches of cobble. Rapid downcutting did not occur because of the shear volume of sediment being transported. Streams within the lower valley reaches of the watershed became disconnected from their flood plains and back water and nutrient rich areas were lost. Stream complexity and diversity diminished and riparian vegetation became dominantly hardwoods.

During peak flows, flood plains absorbed most of the stream energy. The lack of large wood in the floodplains caused the energy to be released against the standing vegetation and the adjacent hill slopes. This release of energy generated additional hillslope and channel bank failures, increasing the sediment loads.

Road locations, reduced floodplain areas by channelizing flows and disconnecting streams with their flood plains. This resulted in increased channel energies and led to channel bank instability.

Summary: The watershed has experienced numerous earthflows because of inherent instability. Fire and management activities have altered the landscape and have created a condition for increased peak flows that has resulted in hillslope failures and channelbank instability. Historically, the stream systems would have been somewhat buffered by the large woody material present within the stream system. Management; however, has reduced this buffering effect and has created high sediment, high energy stream systems that are currently incising their valley floors and recruiting sediment from channel banks.

The riparian areas have historically been impacted by fire, and in recent times by management. Management activities have resulted in removal of large woody debris, a critical component of the hydrologic system. Numerous channels are still adjusting to this removal. In addition, the size of trees in the riparian areas is currently relatively small, so replacement of large instream wood is not expected to occur in the near future. Augmentation through the use of silvicultural tools would aid the vegetative growth within the riparian reserves to provide bigger trees for large woody debris recruitment of instream structure within 50 years.

c. Table: Comparison of Current and Reference Conditions: *What are the natural and human causes of change between historical and current channel conditions?*

Stream Channel Characteristic	What was it like historically	What changed?	Natural Cause of Change	Human Cause of Change
Morphological Characteristics	Basic stream patterns and channel gradients are largely influenced by geology	Similar to historic conditions with minor influences from roads	Gravity causes water to flow downhill.	Road systems intercept surface water and route it differently than natural hillslopes.
Sediment and depositional processes	Sediment and depositional processes were the result of peak flows and erosion that generally occurred during rain-on-snow events.	Similar to historic conditions with minor influences due to created openings.		Roading and timber harvest have created openings that can locally influence peak flows and therefore sediment and depositional processes in the localized area.
	Historically abundant sediment reached stream channels, especially after large scale fires	Less sediment reaches stream channels now than did historically.	Re-growth of vegetation results in reduced erosion	Fire suppression has allowed vegetation to persist on the landscape. This reduces erosion. Timber harvest removes vegetation, but generally in smaller areas and more scattered about the watershed than historic fires did.
	Sediments that reached stream channels were flushed out during peak flows over a relatively long period of time	Sediments flush out of the system more quickly now than they did historically	Without large woody material in the channel to deflect the water, both stream energies and water velocities have changed.	Stream cleanout, past removal of large woody material from streams, removed structure that held sediments. Salvage and harvest adjacent to stream channels, that removed trees that might have fallen into streams to replenish large woody material there.

Stream Channel Characteristic	What was it like historically	What changed?	Natural Cause of Change	Human Cause of Change
Floodplain/ stream channel interactions	Historically there was abundant sediment and large woody material in stream channels	Surface erosion is currently less than in historic times, so there is less sediment available to streams to rebuild their floodplains.	Re-growth of vegetation has reduced surface erosion.	Fire suppression allows vegetation to persist on hillslopes, so there is less erosion to contribute sediment to stream channels. Harvest practice changes such as leaving down woody material, retaining riparian vegetation, etc. reduce erosion generated sediments reaching stream channels. Selective placement of harvest units outside erosion-prone areas. Harvest units smaller than fires and more distributed across landscape thereby minimizing erosion-generation sediments reaching stream channels.
	Sediment and large woody material created very complex stream channels and floodplains. Stream flows occupied their floodplains on a regular basis.	Reduction in floodpain area due to decrease in sediment and large woody material	Vegetative cover and the associated root systems helped to stabilize hillslopes and as a result reduced surface level soil failures.	Road locations in historic floodplains have caused channelization of stream flows. This channelization has increased stream energies and caused downcutting. Without sediment to build floodplains, streams became disconnected with floodplains.

Stream Channel Characteristic	What was it like historically	What changed?	Natural Cause of Change	Human Cause of Change
Sediment metering through stream channels	Historically sediment was pulsed through the stream system from large woody accumulation to accumulation. The sediment remained in the system for relatively long periods of time. There was abundant sediment storage	In some areas there has been a reduction in the amount of large woody material in stream channels, so sediments are transported more quickly through the stream systems than they were historically. Sediment storage is also reduced	Large scale fires can remove large woody material that helps meter sediments.	Removal of large woody material from stream channels through stream cleanout programs Timber harvest and salvage adjacent to stream channels, thus removing future large wood supply.
		Increase in large woody material in some areas	Re-growth of vegetation along stream channels.	Fire suppression has allowed vegetation to persist on landscape in areas that might have been more prone to fires historically .

Stream Channel Characteristic	What was it like historically	What changed?	Natural Cause of Change	Human Cause of Change
Stream energies	High stream energies	Similar to historic conditions		
	During peak flows floodplains allowed water to spread out and helped to absorb stream energies	Floodplains disconnected from stream channels so they don't absorb stream energies like they once did.	Increased stream velocities promote stream channel downcutting.	Roads adjacent to streams channelized streams and reduced floodplain areas.
	Abundant large woody material in streams for energy dissipation and sediment storage Energy dissipation reduces transport ability of streams Sediments remained in system longer.	Less large woody material to dissipate stream energies	Root strength of hillslope vegetation helps to minimize slope failures that deposit large wood in stream channels.	Stream cleanout Salvage of trees adjacent to stream channels that might have contributed to large wood instream channels. Without wood, there is less channel roughness and less to dissipate stream energies.
Stream Channel Diversity	Abundant pool habitat and backwater areas. Diverse channels, multiple side channels and large woody material accumulations	Fewer pools and side channels due to disconnection of stream channel with floodplain. Less sediment and large woody material recruitment from slope failures.	Increased stream velocities create monotypic streams. Vegetation has helped to stabilize slopes that might have failed in the past and deposited large woody material in stream channels.	Removal of large wood from stream channels and stream channelization.
	Log jam development	Reduced upslope failures	Less woody material in stream channel results in less chance of a log jam forming	Salvage along stream courses and removal of large wood from stream channels.
	Overall diversity	Streambank and hillslope erosion	Revegetation of hillslopes results in greater stability.	Stream cleanout and log jam removal

II. PHYSICAL DOMAIN

D. Water Quality

1. Characterization: *What aquatic-dependent beneficial uses occur in the watershed?*

Beneficial uses dependent on aquatic resources in this watershed are: domestic water; resident and anadromous fisheries; downstream fisheries; aquatic non-fish species; riparian dependent species; water-related recreation; hydroelectric power, agriculture and water-related fire suppression and road maintenance needs.

- Water, from both Blowout and Box Canyon Creeks, flows directly into Detroit Reservoir on the North Santiam River, which serves as a **domestic water** supply for several downstream municipalities including Salem, Stayton, Aumsville, Sublimity, Lyons, Mehema, Mill City, and Gates.

- **Fisheries** are found in much of the Blowout and Box Canyon stream systems.

- Streams downstream of Detroit and Big Cliff Dams support an **anadromous fishery** resource, however due to the dams only resident fish are currently in the Blowout watershed.

- **Aquatic non-fish species** can be found in all waters within the basin.

- **Riparian-dependent species** occur along the edges of water bodies in the watershed.

- A high percentage of the **recreation use** in the Blowout watershed is related to water and riparian areas. Dispersed recreation sites are generally located within riparian areas and near water sources in this watershed. In addition, the Blowout arm of Detroit reservoir extends into the watershed and receives quite a bit of boating use because it is relatively sheltered from wind.

- Periodically water from the Blowout watershed is used for **fire suppression and road maintenance**. Small access roads have been built to selected streams, and pump chances have been developed at these sites, to provide water when needed for fire suppression and road maintenance.

What water quality parameters are critical to these beneficial uses?

Water quality parameters critical to beneficial users are temperature and type and timing of sediment input.

Temperature: As is typical in the western Cascades, water temperature controls the type and distribution of aquatic species in the watershed. The primary influence on water temperatures in this watershed is solar radiation. This influence can be modified to a large degree by vegetative canopies shading stream courses. The degree to which shading occurs has a significant influence on stream temperatures.

Sediment: Sediment movement through the watershed is critical for various aquatic, domestic, and recreation resources. The timing, type and amount of sediment have varied effects on beneficial users, including the following:

- Mixing of sediment with water causes it to become turbid, thus affecting the cost of treatment for domestic water supplies. In order to meet State drinking water standards, turbidity must not exceed 10% above the background level for the watershed. The City of Salem uses a slow sand filtration water purification system which cannot effectively filter water in excess of 10 NTU's. If there is too much turbidity in the water at their intake point near Stayton, in the past, the City had to shut down their water system and use alternative water sources until the turbidity level dropped. Now they must pre-treat their water and remove sediment prior to running it through the sand filtration beds. This costs them extra money, but allows the system to remain operational during periods of high turbidity.

- Measuring 10% above background levels assumes records of adequate length and sampling frequency have been collected throughout the range of the hydrograph. This is not the case for the Blowout streams. In October of 1998 a United States Geological Service (U.S.G.S) gauge was established on Blowout Creek. This gauge will provide flow and turbidity data. Once a record is established, the background restriction will be considered. Currently Best Management Practices (BMP's) are implemented to meet this requirement as agreed to by Department of Environmental Quality, Environmental Protection Agency, and the Forest Service in 1988.

- The timing of fine sediment input can influence reproduction success of certain aquatic species if it occurs during critical times, such as egg incubation.

- Coarse bedload deposition can result in plugged culverts and damage to transportation systems.

- Deposition of appropriate-sized sediment can create spawning habitat for various aquatic species.

- Fine grain deposition from streams, creates beaches for recreation, and rich farmland for agriculture.

- Deposition of sediment can contribute to floodplain creation and development of habitat for riparian dependent species.

As illustrated above, sediment can have both positive and negative impacts on various resources. Thus supporting the critical nature of sediment movement, and its properties; (e.g. turbidity; bedload, mode of movement, suspended) as a water quality parameter.

2. *What do humans value that is associated with water quality?*

Water and water quality have life-sustaining and economic, aesthetic, and recreational value.

3. *What are the highest priority issues or resource concerns associated with water quality?*

The highest priority water quality issues are **water temperature, type and timing of sediment input** into streams, turbidity and domestic water use.

Lack of large woody debris in stream channels, from past management and fires, has reduced stream channel storage capacity for sediment. Because of this, more sediment is transported through the stream system today, during a hydrologic event, than in historic times. This may impact downstream users and eventually the storage capacity of Detroit Dam.

Stream temperatures within Blowout Creek and some tributaries exceed State Water Quality standards for about three months out of the year. Blowout Creek is currently listed as a State Water Quality limited stream; 303d listed.

4. *What and where are the management direction/activities, human uses, or natural processes that affect water quality?*

a. **Current Conditions**: *What are the current conditions and trends of beneficial uses and associated water quality parameters?*

Water for domestic use is generally of moderate quality in the Blowout watershed. Under normal conditions turbidity in the Blowout averages less than 5 NTU's. During episodic storms, especially those that increase peak flows like rain-on-snow events, hillslope and channel bank failures increase sediment input into streams, temporarily reducing water quality, by increasing turbidity in the range of 25 to 85 NTU's. (***Note;*** *these turbidity levels are taken from grab samples taken during storm events.*)

Large native earthflows, that occupy portions of the Blowout landscape, can affect the quality of waters produced. Streams encountering these earthflows mobilize material, increasing water turbidity and reducing water quality. Episodic in nature, the temporary reduction in water quality rises along with rising waters. Once this sediment is flushed out of the watershed, water quality returns to previous conditions, under normal flows. Domestic water users downstream of Detroit and Big Cliff dams, have not historically been affected by these pulses of sediment because of the metering of these sediments by the dams.

During the 1996 water year, a flood event flushed a lot of new sediment into Detroit Reservoir, and stirred up existing sediment, resulting in turbid waters flowing out of Detroit and Big Cliff dams for several months. This condition, coupled with tighter requirements adopted by the State of Oregon and reduced the acceptable level for turbidity in raw drinking water (*the condition of water before being placed in distribution lines and treated*), heightened concerns of several downstream communities when turbid waters flowed past their water intake systems and they had to rely on alternate water sources for domestic use. Prior to the installation of a pre-treatment facility, the sand filtration system used by the City of Salem could become clogged with sediment during periods of high turbidity, so City officials were particularly concerned with the source(s) of the persistent turbidity. A study of reservoir sediments (*North Santiam River Turbidity Study, 1996-1997*) showed the major culprit in the persistent turbidity to be ultra fine clays, or colloidal materials, called smectite clays. In the Blowout area, sources of these clays are failure zones of earthflows, weathering, and geologic erosion of weak volcanic ash deposits. These types of soils are found scattered throughout Blowout watershed.

The Willamette National Forest has entered into a Memorandum of Understanding with the City of Salem, Army Corp of Engineers and the Bureau of Land Management and is working closely with the City of Salem to address water quality concerns.

Temperature: Since 1980 steam temperature data has been collected on Blowout Creek and its tributaries. During this time, temperatures in excess of Oregon State Water Quality Standards of 58° F degrees, have been recorded on Blowout, Ivy, Divide, Cliff, and Hawkins Creeks. Stream temperatures have reached as high as 72° degrees F and are commonly within the 68° to 70° F degree range throughout the summer.

Surveys of main stem, named streams using Level II protocol have shown that the canopy closure over stream reaches averages 24 percent. This cover provides minimal shade to the streams and is of critical importance in contributing to high stream temperatures. Without shade, solar radiation reaches alluvial deposits along stream courses, which act as heat sinks during the summer months, transferring solar energy to the water and increasing stream temperatures.

An example of stream temperatures increasing as a result of lack of shade, can be seen in Lost Creek. Here the water runs over a section of bedrock, where there is relatively little shade, and stream temperatures rise several degrees as the water flows over this reach of stream. The biggest influences on stream shade, and therefore stream temperatures, are fires and timber harvest. Both of which, remove vegetation and can therefore affect the amount of shade along stream courses.

Sediment / Turbidity The analysis area contains areas of highly unstable ground which produce earthflows that contribute large volumes of sediment to stream channels. In addition, past management practices and fires have resulted in far less woody material in some streams channels than was present historically. This lack of woody material reduces the sediment storage capacity of these stream channels, resulting in more sediments being transported through the system more quickly, during hydrologic events today, than in historic times. Furthermore, less woody material decreases channel roughness and increases stream energies. This generates greater mobilization of sediments and contributes to larger alluvial deposits.

Roads also have the potential to influence stream sediment. Depending on other disturbance mechanisms and slope stability, roads can influence the size and frequency of debris slides or other sediment input delivery mechanisms into stream channels. One important example in the Blowout watershed is road 1012 820, where material that was excess to the road construction was "sidecast" over the edge of the road. This "sidecast" material is uncompacted and tends to fail on a regular basis, sending sediment down slope into stream systems.

Road densities give an indication of the potential risk of various road-related sediment input delivery mechanisms. The following chart shows road densities by planning subdrainage. The higher the density the higher the risk.

There are several other examples of roads in the Blowout being constructed across unstable sections of ground. These unstable areas have naturally resulted in debris slides and sediment in the stream channels, but the roads often exacerbate the problem.

Additionally, roads that are used during wet weather, as many in the Blowout have been, tend to produce additional sediment to the streams.

For these reasons, a measure of road densities will give an indication of the potential risk of debris slides and increase sediment rates to stream channels in the study area. The following chart shows road densities by planning subdrainage.

Road Densities by Planning Sub-Drainage		
Planning Subdrainage	**Miles of Road**	**Road Density Miles per Square Mile**
78L Beard	30.5	3.63
78M Divide	29.25	4.18
78N Hawkins	18.62	4.14
78P Lost	17.88	4.54
78Q West Side Ivy	22.18	3.58
78R Cliff	20.18	3.75
78S Southside Blowout	6.86	2.04
78T Box Canyon	28.19	2.73
78U Upper Blowout	16.31	4.55
Other Misc.	0.15	2.87
Totals	190.12	Ave.= 3.58

What and where are the "303d" water quality limited water bodies within the watershed?

Currently Blowout Creek is listed as a 303d water quality limited stream in the Blowout watershed. The District is currently writing a Water Quality Management Plan to establish total maximum daily loads (TDML) for the basin. Temperature is the primary parameter for which the TDML is created.

b. Reference Conditions: *What were the historical water quality characteristics of the watershed?*

Riparian and aquatic resources were the major beneficial uses in historic times. Turbidity and stream temperatures were the water quality characteristics that had the greatest influence on these resources.

Historic water quality characteristics are difficult to determine quantitatively due to the lack of sufficient data. Even with the data available, characterizing the watershed can only be done on how the system is operating today. Upon reviewing the records one needs to remember climatic changes that have occurred since this period of record, as well.

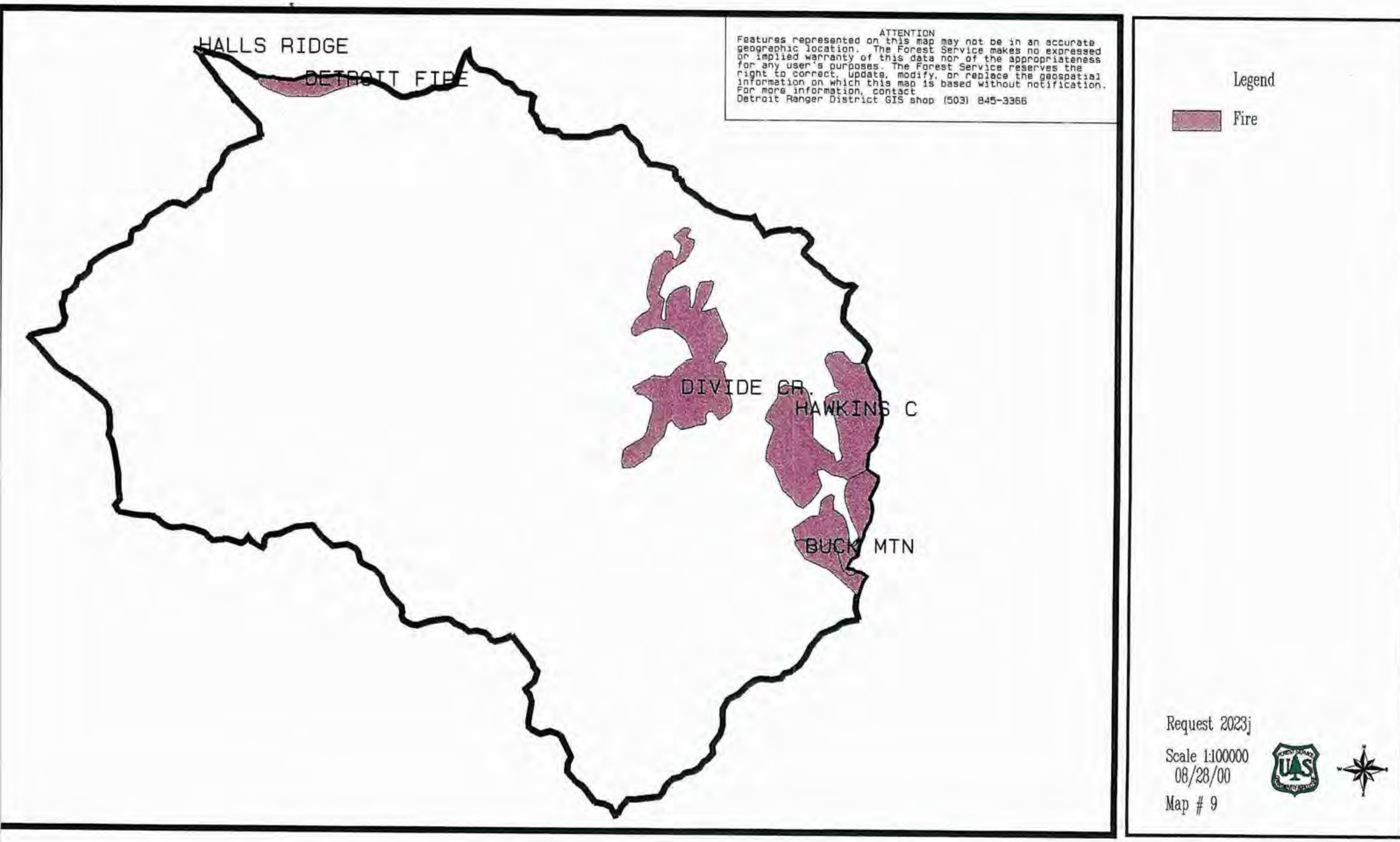
Temperature: It is likely that historic water temperatures for Blowout Creek were somewhere near the 58° F standard, currently used by the State. This assumption is based on anecdotal evidence of people who worked in the area many years ago, as well as, evidence of temperature moderation as vegetation grows back and begins shading stream channels that were previously unshaded as a result of vegetation removal. This temperature assumption, however, recognizes that immediately following flood events a recovery period would occur until such time that vegetation could reoccupy stream sides.

In the past, fires were the major influence on the amount of vegetation on the landscape, especially on south and west aspects, which were most prone to fires. The amount of vegetation influenced stream shade and affected stream temperatures.

Turbidity: Turbid waters are caused by sedimentation, resulting from disturbances on the landscape. One major historic disturbance mechanism was fires. Map #9 shows the extent of disturbances caused by fires in the watershed. After a fire, sediments moved through stream systems in pulses, creating short term impacts. Sediment particle size depended upon the sediment source and location. First through fourth order streams contained boulder to clay size particles that were mobilized during storm events and fifth and greater order streams moved cobble to clay size particles. The difference between the two, related to the amount of woody material present to increase channel roughness and reduce stream energies.

Historically, sediment was temporarily trapped by large woody debris in the stream channels and was later transported through the stream and valley systems during major hydrologic events.

Blowout WA
Fire History



***C. Table: Comparison of Current and Reference Conditions**: What are the natural and human causes of change between historical and current water quality characteristics of the watershed?*

Water Quality Parameter	What was it like historically	What Changed	Natural Cause of Change	Human Cause of Change
Beneficial Uses	Historically beneficial uses included fish, aquatic non-fish, and riparian dependent species	Additional beneficial uses have been added such as domestic water use, water-related recreation, hydro-electric power generation, agricultural and industrial water uses, fire suppression and road maintenance. These additional uses have affected water quality requirements.	Growth of human population	Demographic changes have affected water use/needs. Blowout streams now contribute to beneficial uses that were not of concern historically.
Stream Temperatures	Historically stream temperatures increased in areas following large scale fire disturbances and flood flows.	Blowout, Ivy, Divide, Cliffs and Hawkins Creeks stream temperatures are significantly above Oregon State Water Quality Standards of 58 for about three months in the summer	Solar radiation reaching surface water and alluvial deposits warms water.	Timber harvest, road construction and human ignited fires have removed vegetative shading near stream channels allowing more solar radiation to reach water and warm it.
	Both cooling and heating potential of surface water is a result of solar radiation but has been moderated historically by shade from vegetative canopy adjacent to stream channels.	Vegetation that provides shade adjacent to stream channels has been removed in some areas, thereby allowing stream to warm.	Lightning-caused, stand replacing fires, removed vegetative shading adjacent to stream channels allowing more solar radiations to reach water and warm it.	Same as above

Water Quality Parameter	What was it like historically	What Changed	Natural Cause of Change	Human Cause of Change
Stream temperatures (continued)	Both cooling and heating potential of surface water occur is a result of solar radiation but has been moderated historically by shade from vegetative canopy adjacent to stream channels. (Continued)	Vegetation that provides shade adjacent to stream channels has grown back in some areas, resulting in cooler stream temperatures than when large scale fires removed vegetation in these areas historically	Vegetative regrowth	Fire suppression resulted in smaller fires and retention of more vegetation. More shade for streams, allowed less solar radiation to reach the water and has moderated stream temperatures. Retention of riparian reserves has helped to moderate stream temperatures.
Turbidity	Turbidity has historically been caused by disturbances on the landscape. Peak flows have eroded toes of earthflows and fire has resulted in increased surface erosion.	Reduction in the acreage of large scale fires has reduced surface erosion potential; removal of large woody material from stream channels increased stream velocities and resulted in erosion of the toes of earthflows.	Fire disturbances contribute to surface erosional.	Fire suppression has reduced that acreage of large scale fires and has minimized surface erosion that resulted from these disturbances. Stream cleanout reduced sediment storage capacity in streams and increased stream velocities. Timber management and road construction have caused erosion that has resulted in turbid waters in streams.
	Turbidity increases during episodic events, especially those that increase peak flows like rain-on-snow events.	Lack of stream diversity increased stream energies.	Weather patterns, earthflows, soil instability and stream energies.	Timber harvest and road construction generated sediments can contribute to turbidity increases during peak flows.

Water Quality Parameter	What was it like historically	What Changed	Natural Cause of Change	Human Cause of Change
Turbidity (continued)	Historically turbidity rose quickly and then subsided relatively quickly	Turbidity rises quickly and subsides in stream channels, but when the waters reach Detroit Reservoir turbidity can persist for relatively long time intervals during some storm events (i.e. Floods of 1996 and 1964)	Very small particle size clay called smectites are generated from some soil formations in this watershed when streams downcut through those soil types. These particles do not settle out of suspension readily and cause turbidity increases.	Detroit dam held suspended smectite clays from peak flow events which did not settle out readily in the reservoir. This in combination with the intake point at the dam, resulted in persistent turbidity in the North Santiam River following the 1996 flood event.

III. BIOLOGICAL DOMAIN

A. Vegetation

1. Characterization: *What is the array and landscape pattern of plant associations and seral (structural) stages in the watershed (riparian and non-riparian)? What processes caused these patterns (e.g., fire, wind, mass wasting)?*

Blowout drainage is one of the most productive areas on the Detroit District in terms of biomass growth potential. The deep, fertile soils and favorable climate combine to produce lush coniferous forests.

Trees: Douglas-fir is the most abundant tree species in the area, followed by western hemlock and western redcedar. As elevations increase over 3000 feet, Pacific silver fir and noble fir become more commonplace and at the highest elevations, mountain hemlock becomes a stand component. Other associated tree species include: Pacific yew, western white pine, grand fir, sugar pine and incense cedar.

Many stream channels and wet areas support pure hardwood stands or include a hardwood component in the timber stands. Red alder, big leaf maple and black cottonwood are common in these areas. In upland areas, big leaf maple and golden chinquapin are also important.

Second Growth of Natural Origin: A common assumption is that prior to timber management, all timber stands were old growth. In Divide and Hawkins Creek drainages there are examples of naturally occurring stands of second growth timber. There are a few thousand acres of 70 to 80 year-old stands that were naturally regenerated by fire. These stands tend to be in the lower to mid-elevation ranges and are commonly very dense, single-storied stands dominated by Douglas-fir. Overall in the drainage, about 6000 acres have been naturally regenerated by fire within the last 100 years.

In these stands, generally few trees exceed 12 inches in diameter and understory vegetation is sparse. Some of the stands have remnant Douglas-fir, western redcedar or western hemlock and the western hemlock almost always have severe dwarf mistletoe infestations.

One characteristic of these stands is that self-thinning is minimal. Few trees have much competitive advantage and are competing more or less equally for growing space.

Shrubs: A comprehensive inventory of the shrub and herb layers has not been completed. Common shrub species in the Blowout include: rhododendron, Oregon grape, vine maple, salal, and bear grass, etc.

Plant Associations: Plant communities are useful indicators of environmental factors. In reality these communities and the environmental factors grade more or less continuously across the landscape, but for the sake of practical application they have been artificially grouped into plant associations. Each plant association is a relatively discrete group of plant species, which maintain stable populations over long periods of time and recur across the landscape where the environment is suitable. Normally each *plant association* is named by the major climax species and dominant shrub and herb layers. The *plant association series* is named by the major climax species without mention of shrub and herb layers.

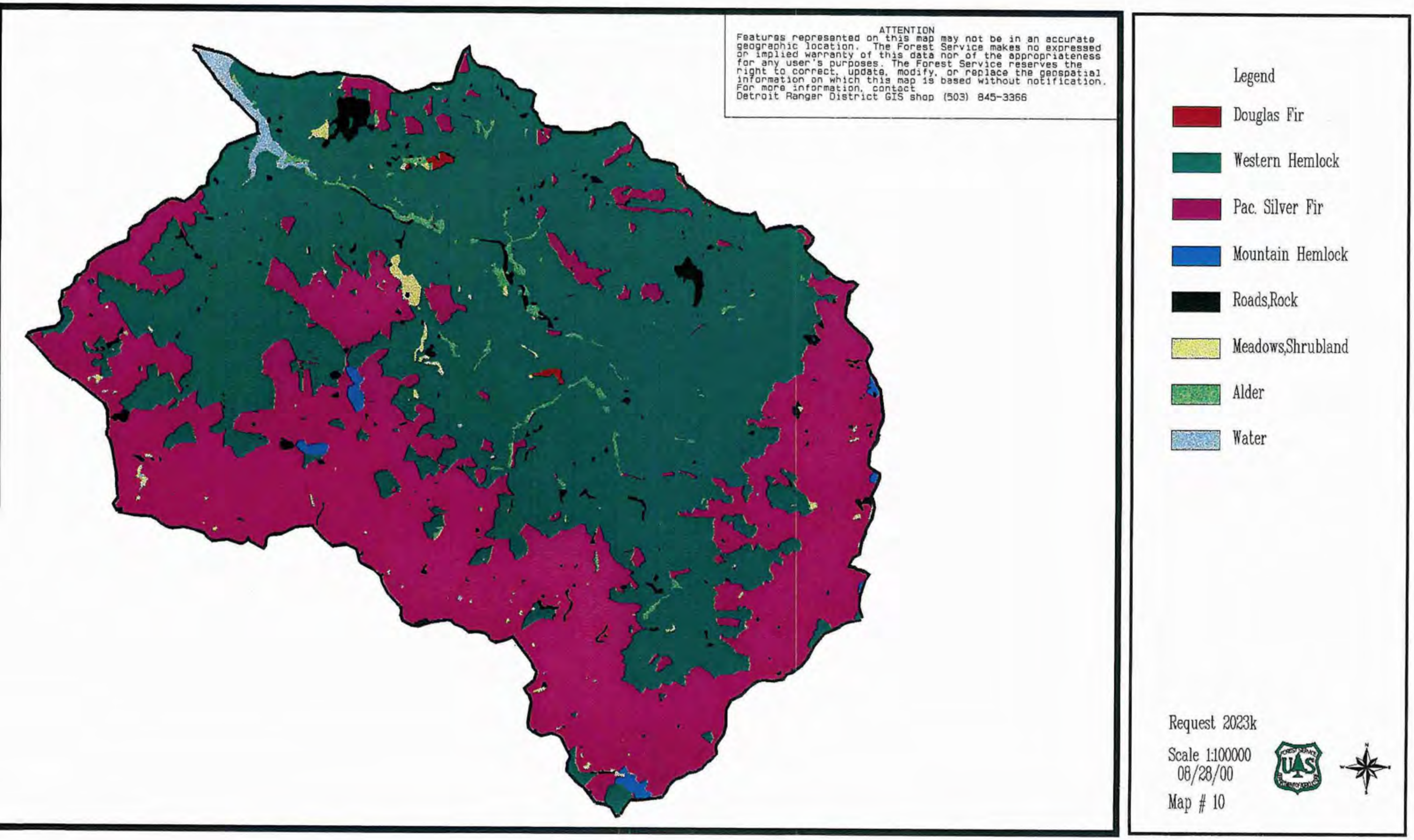
Not all areas of the Blowout have been inventoried for plant associations, so we really only have a good picture of the climax species and not the associated shrub and herb layers. The plant association series represented in this watershed include: Douglas-fir, western hemlock, Pacific silver fir and mountain hemlock. The two maps (# 10 and # 11) that follow depict the major plant association series for the entire Blowout watershed, as well as, major plant association series for the riparian reserves within the watershed. Overwhelmingly, western hemlock and Pacific silver fir associations dominate the landscape. Douglas-fir associations are found in isolated patches at the lower elevations and mountain hemlock associations are confined to a few ridgetop locations.

As seen the chart below, the warmest, low elevation sites tend to support Douglas-fir associations, while the coldest, high elevation sites tend to support mountain hemlock associations. The area in between, which is where most of the Blowout watershed falls, is either western hemlock or Pacific silver fir. The chart also shows that tree growth potential is highest in the lower elevation, warmer sites and decreases as elevation increases and site temperature decreases.

Plant Association Series	Percent of forested portion of watershed	Site Temperature	Elevation	Tree Growth Potential
Douglas-fir	<1%	warm | V cold	low | V high	high | V low
western hemlock	44%			
Pacific silver fir	55%			
mountain hemlock	<1%			

This pattern of plant associations was caused by a variety of physical and biological factors such as soils, climate and microclimate, topographic influences, the distribution and abundance of various plant or animal species, and disturbance history, both natural and human caused.

Blowout WA
Plant Association Series



Blowout WA
Plant Association Series in Riparian Reserves

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Legend

- Douglas Fir
- Western Hemlock
- Pac. Silver Fir
- Mountain Hemlock
- Roads,Rock
- Meadows,Shrubland
- Alder
- Water

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Scale 1:100000
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Map # 11

Differences in plant associations between riparian and non-riparian areas may vary in degree locally, depending on stream class, topographic features, water availability, air drainage, soils, and other factors. Differences in vegetation from riparian areas and upslope sites may be significant enough to classify adjacent sites in entirely different plant association series or there may be no difference at all. In general, riparian plant associations tend to be wetter and cooler than adjacent upslope sites, but these differences decrease or may disappear completely with intermittent streams. For clarification, Riparian Reserves widths may or may not represent the actual zone of influence that streams have on vegetation. In general, differences in vegetation from the upslope disappear in a shorter distance than that defined by Riparian Reserve widths.

Structural Stages: The structural stages represented in the Blowout watershed today are generally the result of either timber harvest or past fires. There are four structural stages represented in this watershed: stand initiation, stem exclusion, understory re-initiation, and old growth. The following is a brief description of each structural stage:

Stand Initiation Stage - In this stage, stand ages range from 1 to 20 years old depending on site conditions and degree to which the stand has been managed. Most stands in this stage were the result of timber harvest and almost all were planted. Harvest units were planted at a density of about 400 to 600 trees per acre with one or more tree species, generally Douglas-fir, noble fir, and western white pine, depending on site conditions. Commonly, additional tree species seeded into these plantations naturally. At the lower elevations, shade-tolerant species such as western hemlock, western redcedar and Pacific silver fir seeded in, while at the higher elevations mountain hemlock and Pacific silver fir seeded in.

Many of the plantations have been precommercially thinned, leaving the largest, most damage free trees, as well as seedlings under one foot tall, free to grow in the plantations.

Non-tree vegetation is also present in this structural stage, although species and numbers are highly variable. On most sites, species such as rhododendron and vine maple re-sprout after timber harvest and broadcast burning. At higher elevations, beargrass also survives timber harvest and burning and may cause severe competition for planted trees. Invasion of harvested sites by non-sprouting plants is highest at lower elevations, < 3000 feet, and on southerly and westerly aspects. Snowbrush invasion occurs on some sites, especially those with frequent fire return intervals.

The degree of plant species diversity declines with increasing elevation and coldness of site. Many of the sites in the mountain hemlock series undergo very little change in the composition of plant species following fire or logging.

Photo shows Stand initiation at about age 20

Until about 1990 most of these plantations had very few snags, green trees, or significant levels of course woody debris. Almost all were broadcast burned. All harvest units sold after 1990, that are in this structural stage, have met the Willamette National Forest standards and guidelines for snags and down woody material.

Stem Exclusion Stage - This structural stage includes a very large range of stand conditions and includes trees that range in age from about 20 to 150 years, with diameters from 5" to 20.9", depending on site conditions and degree of management. These stands have dense crowns which block out light to the forest floor, and limit additional tree regeneration in the understory. Typically, shade tolerant understory trees that are present, persist but grow very slowly. Intermediate or suppressed trees that do not tolerate shade well, suffer from competition and have a high mortality rate. Shade intolerant shrubs and forbs frequently disappear during this stage.

In natural stands, this stage is typically dominated by one or two tree species. Pre-commercial thinnings, which normally precede this stage, may reduce competition and mortality by favoring the best growers. Commercial thinnings further reduce competition and increase average stand diameter. Shade tolerant understory trees and other plants may benefit from increased light and respond with vigorous growth..

Photo shows stem exclusion in a natural second growth stand

Understory Reinitiation Stage - This stage is characterized by stands as young as 80 years to stands as old as 250 years, depending on site conditions. The vast majority of these stands have not been managed. In this stage, the dominant tree layer begins to break up due to mortality and a second, pole sized, canopy layer generally develops underneath. Although this may simply happen naturally, given enough time. In the, past underburning has created these stands in some areas, by killing sufficient overstory trees to stimulate regeneration underneath. This underburning was more prevalent in the past than has been generally recognized, partially because it was not of intense interest until recently and also because it is difficult to distinguish through querying of databases.

In this watershed, management-induced understory reinitiation has resulted from old salvage logging and more recently, commercial thinnings. These practices have resulted in release of tolerant understory trees that are developing a second canopy layer at a much earlier age than would have developed under natural conditions, especially with fire suppression and a lack of natural underburning.

Photo shows understory reinitiation in a 90 year old commercially thinned stand

Old Growth - These stands are the largest and oldest found in the watershed. They may range from over 200 to over 600 years old in this watershed. While a complete record of stand ages is not available, it is believed that over 90% of the stands, in this stage, date back to the 1600's.

Photo shows old growth - A 375 year old stand in the western hemlock series.

Most of these stands still have a high component of Douglas-fir or other fire regenerated species in the upper canopy layers. Second and third canopy layers are usually well developed with shade tolerant species. Other vegetation, primarily shrubs, may reach high levels because of more open canopies. Diseases such as dwarf mistletoe in hemlocks or true firs, and heart rots and root rots contribute to mortality and bole defects. In the oldest stands, especially those in the upper elevations, mortality and rots may occur at high levels. Heavy competition from rhododendron, other shrubs or beargrass may reduce replacement of mortality, leaving stands more open.

The table below depicts the percentage of area occupied by each structural stage in the various plant association series **for the entire watershed.**

Current Structural Stages By Plant Association Series For Both Riparian And Non-Riparian Areas (entire watershed)		
	Percent of Area Occupied by Plant Association Series	
Structural Stage	***Western Hemlock***	***Pacific Silver Fir***
Stand Initiation	*11*	*17*
Stem Exclusion	*19*	*8*
Understory Re-initiation / Old Growth	*22*	*18*
Non-Forest	*2*	*1*
Totals	*54*	*44*

Map #12, that follows, depicts the spatial distribution of these structural stages across the landscape.

The following table depicts the percentage of area occupied by each structural stage in the various plant association series for **riparian reserves** only.

Current Structural Stages by Plant Associations *in Riparian Reserves* (on Federal Land only)		
	Percent of Area Occupied by Plant Association Series	
Structural Stage	***Western Hemlock***	***Pacific Silver Fir***
Stand Initiation	*11*	*15*
Stem Exclusion	*19*	*6*
Understory Re-initiation / Old Growth	*26*	*18*
Non Forest	*3*	*1*
Totals	***59***	***39***

Blowout WA
Structural Stages

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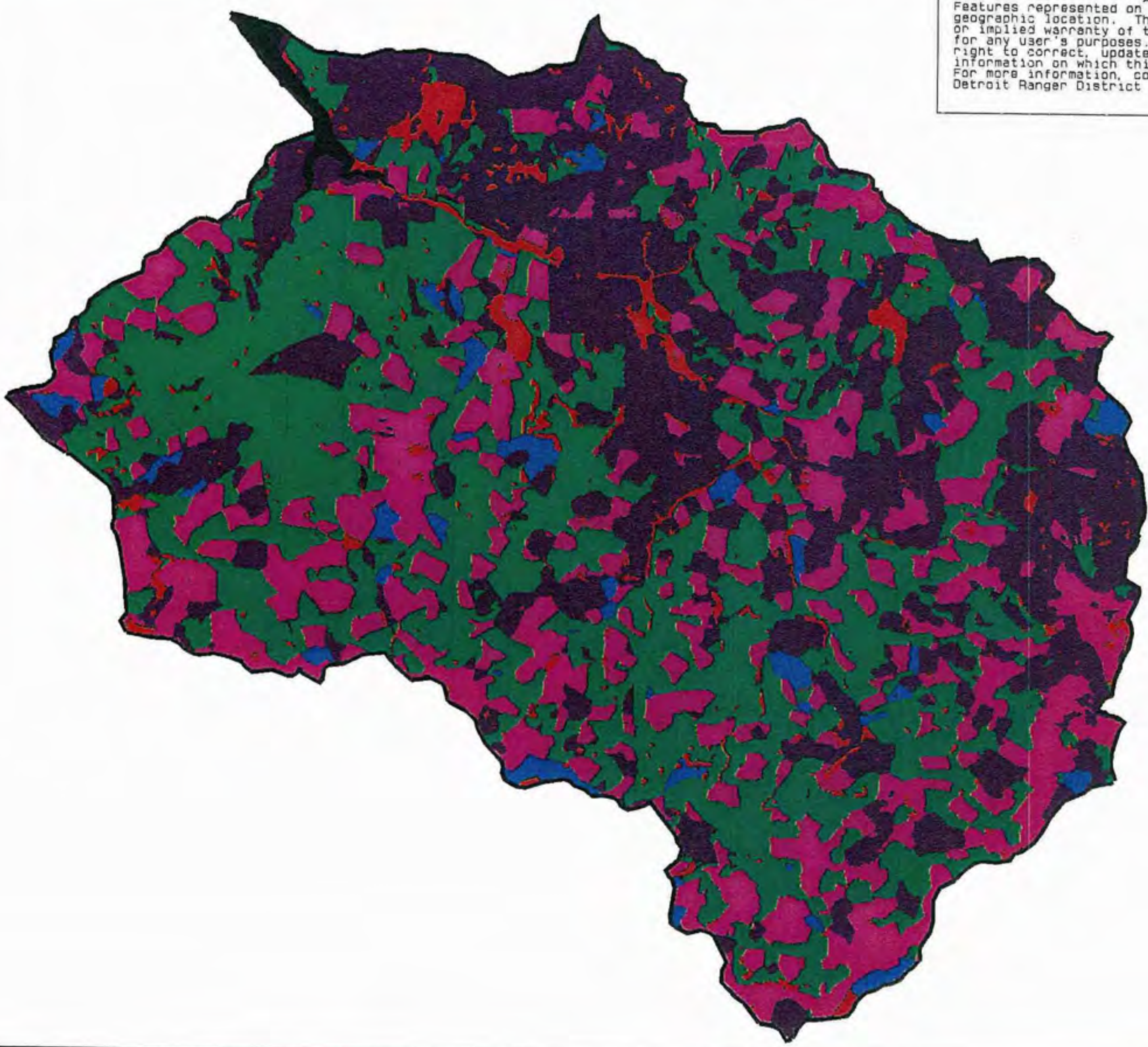

Legend

- Initiation
- Exclusion
- Reinitiation
- Old Growth
- Non Forest
- Detroit Lake

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Scale 1:100000
08/28/00

Map # 12

The table below depicts the percentage of area occupied by each structural stage in the various plant association series **for the area outside of riparian reserves only**.

Current Structural Stages *Outside of Riparian Reserves* (on Federal Land only)		
Structural Stage	***Percent of Area Occupied by Plant Association Series***	
	Western Hemlock	***Pacific Silver Fir***
Stand Initiation	*11*	*18*
Stem Exclusion	*19*	*10*
Understory Re-initiation / Old Growth	*20*	*19*
Non Forest	*3*	*1*
Totals	***52***	***48***

From the charts above, it appears that structural stages in the riparian reserves are similar to non-riparian areas although there is slightly more understory re-initiation and slightly less stand initiation and stem exclusion in riparian areas than non-riparian areas.

The map (map #13) that follows shows the landscape distribution of stand structural stages within riparian reserves.

Structural stage differences between riparian and non-riparian sites may vary and are influenced both by management activities and by similar factors that influence plant association distribution. Major disturbances such as fire and logging have had a differing level of influence on structural stage development which varies greatly by stream class. Except for early railroad logging in the lower elevations, larger streams were excluded from regeneration harvests. Salvage logging was practiced in these streams but this would not usually be significant enough to alter stand structural stage. Intermittent streams were generally not buffered from logging until the 1970's and many not at all, but may have received some differential yarding techniques.

Past fires tended to burn in intermittent stream valleys as they did in upslope areas and may have burned with even greater intensity where heavy fuel accumulations were present. On larger streams, there was more of a tendency for fires to burn less intensely or to go out entirely. These fires were more likely to leave remnant trees or unburned islands of vegetation. Re-invasion of burned areas may have varied greatly or very little from upslope areas due to factors previously discussed.

Floods and debris torrents may have created significantly different vegetation in localized riparian areas, but overall these differences are probably not significant in the watershed.

Blowout WA
Structural Stages in Riparian Reserves

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Legend

- Initiation
- Exclusion
- Reinitiation
- Old Growth
- Non Forest
- Detroit Lake

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Scale 1:100000
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Map # 13

Diversity: Vegetative diversity can be characterized as moderate in the Blowout analysis area with respect to special habitats (SHABs). The number and types of special habitats reflect the unstable nature of Blowout slopes. Rock outcrops, cliffs, talus slopes, and slumps, and the special habitats derived from these land types, predominate in the drainage.

What Is Unique About The Vegetation In The Blowout Watershed?

The special (non-forested) habitats found in the Blowout watershed are mainly represented by rock type habitats including outcrops, vine maple/talus, and scree slopes (e.g., dry rock gardens). Plant diversity within these rock dominated SHAB types is generally low. In contrast, special habitats such as ponds, wet meadows, and moist meadows are relatively well represented in the Blowout watershed, especially in headwater areas, and plant diversity in these types is high.

There is only one known ***sensitive plant species*** within the Blowout watershed, Thompson's mistmaiden (*Romanzoffia thompsonii*). Other Willamette National Forest plant ***species of concern*** found in the Blowout include Virginia grape-fern (*Botrychium virginianum*), large-flowered brickellia (*Brickellia grandiflora*), cliff paintbrush (*Castilleja rupicola*), and the fringed pinesap (*Pleurocospora fimbriolata*).

A few ***survey and manage species*** from Table C-3 of the *Record of Decision (ROD) for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl* have been documented as occurring in the Blowout. These species are mostly associated with late-successional and old-growth forest and have been identified as needing information gathered on status, monitoring, protection, or all three.

The Blowout watershed provides habitat for several ***noxious weed species***. St. John's-wort and Scotch broom present the largest problem, followed by Canadian thistle, tansy ragwort, and bull thistle. Spotted knapweed and diffuse knapweed are currently at very low densities in this watershed.

2. *What Values Are Associated With Vegetation?*

a. Vegetation has economic, life-sustaining, aesthetic recreational and spiritual value (trees and other vegetation provide commodities, many plants provide food/shelter to humans, fish and animals, old growth provides aesthetic and spiritual value, and huckleberries and cedar trees are important to Native American cultures for tribal ceremonies and basket making).

b. Natural species richness and diversity has ecological value. Plants are the oxygen providers and the base of the food chain that allows all other forms of life to exist. A variety of plant species supports a variety of other life forms. Plant/animal interactions can range from a simple indirect association as in the case of carnivores, to very complex interdependencies where neither the plant species nor the animal species can exist without each other (co-evolution). Animals can use vegetation for food, shelter, camouflage, poisons, and tools.

Without this diversity living systems are simpler, and are more prone to reduction or extinction during stochastic events such as environmental disturbance or disease outbreaks.

3. What Are The Highest Priority Issues Or Resource Concerns Associated With Vegetation?

a. For a variety of reasons, **old growth** is a highly valued component of the ecosystem, so many people do not want to see any more of it harvested. Therefore, management activities that involve harvest of old growth timber, and for that matter, timber harvest of any kind have become very controversial.

b. Fire suppression has been a management goal for many decades, now the issue is whether fire suppression has significantly altered **plant community and structural stage distribution and timber stand conditions** within the watershed.

c. **Land allocations and management goals** are often based on compromise rather than science, so they are not always compatible with historic ecosystem conditions or **dynamic natural systems**. Management goals for land allocations such as late successional reserves, riparian reserves, scenic areas, etc. require that vegetation be managed in ways that may be in conflict with historic ecosystem conditions within the watershed.

d. Recent wind storms, heavy wet snows and floods have resulted in **localized areas of downed timber** in the watershed. This may result in increased bark beetle populations that eventually kill adjacent live trees. Furthermore, accumulations of downed and dead trees increase risk of stand replacing wildfire.

e. **Noxious weeds**, such as scotch broom, and invasive non-native plants are a threat to native plant diversity in the watershed. These species are able to thrive in a new environment because they arrive without the complement of predators, disease, and other ecosystem components found in their native region of the world. Most of these species take advantage of disturbance gaps such as logged units, roads, rock quarries, burned areas, the areas surrounding human structures, and trails. Once established, these populations can serve as a seed source for further dispersal, generally along road and trail corridors.

f. There is a concern about maintaining natural **biodiversity** within the watershed. The occurrence of special habitats (non-forested communities) and their distribution across the landscape is important for biodiversity of plant and animal species. Diversity within this watershed is low, so this increases the importance of these special habitats.

Preserving biodiversity has ecological value, as noted above, but it also has secondary societal value as well. Only a small percentage of plant species have been screened for compounds that may have medicinal, nutritional, or other commercial applications. Plants can be indicators of environmental quality, as in the case of certain lichens that are sensitive to air pollutants. In order to preserve the potential uses of plants, we must protect biodiversity at all three levels: genetic, within plant community, and between plant communities.

Forest Service strategies for preserving and promoting biodiversity at all three levels includes reforestation and revegetation programs that emphasize genetic diversity in plant materials used, protection of within plant community diversity by precluding disturbance of species rich habitats, and maintaining representation of all plant community types across the landscape. The challenge is to find the most effective way to identify the species and areas on which to apply these strategies within the overall framework of forest management.

4. *What Are The Management Direction/Activities, Human Uses, Or Natural Processes That Affect Vegetation?*

a. ***Current Condition***: *What were the disturbance factors that led to the current vegetative conditions in the watershed described in the characterization?*

Fire: Fire has played a very important ecological role in Pacific Northwest Forests. The western Cascades have a high severity fire regime that is characterized by large stand replacement fires which have established a complex, interlocking mosaic of timber stands. The age and shape of these stands have historically been determined by infrequent and severe crown and surface fires that often resulted in total mortality. These large fires have often occurred in drought years, ignited by lightning and driven by east winds.

Accurate fire return intervals have never been calculated in these forests since intervals between fires have been long and may not be cyclic (Agee and Flewelling 1983). Although, it has been determined that higher elevation sites generally have a longer interval between stand replacement fires.

Large fires in *Douglas-fir/western hemlock* plant communities usually result in almost complete tree mortality with the large Douglas-fir being most resistant to fire and becoming the most common remnant species. After a fire, western hemlock seedlings may outnumber Douglas-fir, however, Douglas-fir is usually more robust. Douglas-fir is less shade tolerant so it's early post-fire establishment is critical if it is to later be the dominant species. The understory vegetation is usually similar to a pre-burn old growth forest containing huckleberries, vine maple, sword fern, rhododendron, salal and Oregon grape.

Twenty years after a fire much of the new character of the forest has been defined. Re-sprouting and invading vegetation may inhibit tree regeneration beyond what was already established during the first few years. Plant and animal diversity is very high as the successional forest continues to develop. The canopy closes and natural thinning processes accelerate due to the lack of light. This reduces the shrub and herb populations, thus lowers plant and animal diversity.

The shaded understory which results from the canopy closure favors the regeneration of western hemlock over Douglas-fir. Douglas-fir mortality begins to occur at about 250 years. Douglas-fir mortality continues to increase until the western hemlock would completely dominate the stands. However, a fire usually occurs in the heavy accumulations of fuel before Douglas-fir disappears completely from the stand.

Pacific silver fir/Douglas-fir plant communities occur at higher elevations where temperatures are cooler, growing seasons are shorter, and snow pack is more persistent than western hemlock/Douglas-fir plant communities. Pacific silver fir is the successional species instead of western hemlock. The characteristics of these stands are similar to western hemlock plant associations with the shade tolerant species dominating over time.

Historically fires in the lower fire zones have sometimes extinguished naturally upon entering these higher elevation stands. Throughout many of these stands, Douglas-fir shares early succession dominance with noble fir and western white pine. The ages of these trees has often been used as indicators of past fire disturbance.

Fire is the predominant natural disturbance process in the Blowout Analysis Area. Prior to 1850 and European settlement, fires were a result of lightning with a combination of other environmental factors, and may have been used by Native Americans to manage the land. Most of the current old growth stands in the drainage originated in the early 1600's. It is reasonable to conclude from current information that at least 80 percent of the Blowout Analysis Area burned during this period, and that most of these were stand replacement fires. Stands originating after these fires would not have been considered late-successional until the early 1800's.

Periodic underburning probably occurred in the drainage but insufficient stand information is available to understand the extent or frequency of these types of fires. Underburning tends to create stands dominated by an upper canopy of large fire resistant Douglas-fir, and without significant lower canopy levels for the first few hundred years. Stands in this condition do not currently exist in the drainage due to fire suppression efforts.

Fires since 1850 have occurred on about 6000 acres in the drainage. Almost all of these fires appear to have occurred between 1890 and 1900, primarily in the Hawkins Creek drainage (*see fire history map # 14*). As seen in other watersheds, this period accounts for a large proportion of fires within the past hundred years on the Detroit District. It is assumed that dry conditions and natural factors have contributed to these fires.

The effects of fire history in the area are significant. Large stand replacement fires have occurred in the past as represented in Box Canyon with the upper canyon containing stands that originated before 1800 or between 1850 and 1899. According to the 1901 land classification mapping of the Cascade Forest Reserve with verification based on current information, approximately 140,000 acres out of 318,000 acres, or 44 percent, of the Detroit District was mapped as burned or had less than 2000 board feet of timber per acre. Eighteen percent of Blowout was considered recently burned in 1901.

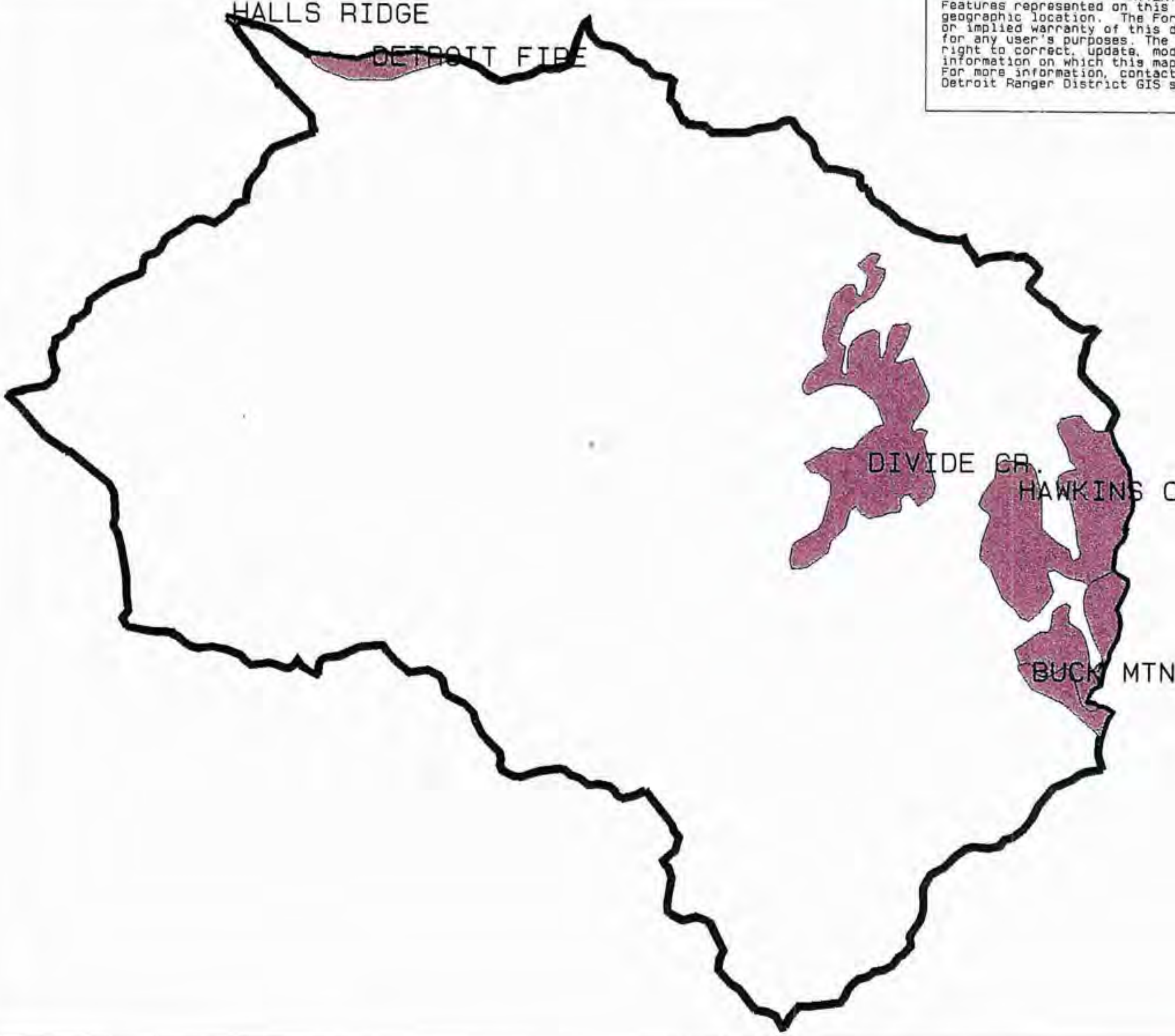
Since the early 1900's through 1966, there are no records of any significant fires in the Blowout drainage. This is probably a result of active fire suppression. The large stand replacement fires that have occurred during this century have been minimal. Fires occurrences in Blowout since 1960 include:

Fire Name	Year Burned	Acres Burned	Cause
Buck Mountain (Blowout portion)	1967	200	Lightning
Lucky Butte	1971	232	Escaped Slash Burn
Box	1979	120	Escaped Slash Burn

Lightning often ignites fires at the higher elevations. When conditions do not promote wide-spread surface fires, patch fires result commonly burning over 10 acres. A variety of small variable aged stands have originated due to these fires.

Special Habitats: The effect of fire on special habitats, non-forested plant communities, is by nature both temporally and spatially variable. Aside from the fact that special habitats in the western Cascades exist in an ecosystem where fire plays a dominant role, some habitat types and some plant species are differentially affected by fire. Dry and mesic meadows can experience tree encroachment without the presence of fire. Fire adapted species will generally drop out of the above ground composition of plant communities without fire but continue to be represented in the soil as seeds or vegetative propagules waiting for the next fire event. The competitive advantage of some species will dwindle if fire is precluded, and the structure, function and composition of plant communities will change through time. Fire can effect insect and disease cycles. Catastrophic fire has the potential to change hydrological patterns within a drainage, and thus change the species composition of those areas affected, at least temporarily.

Blowout WA
Fire History



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Legend

Fire

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Scale 1:100000
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Map # 14

The effect fire has on specific species depends on the degree of fire adaptation displayed by that species, and the predisposition of its habitat to fire. Other adaptations may also come into play. A wet meadow species of concern may be protected from small fire events surrounding the meadow until a catastrophic fire razes everything around it. The population's chance of surviving the event may depend on its ability to cope with the increased water levels and siltation that will be deposited in the meadow following surface runoff during the rainy season. *Noxious weed species* will also be differentially adapted to fire. Their habitat, generally continuously disturbed openings adjacent to roads or developments, is less likely to be exposed to fire due to the adjacent fire breaks and easy access for fire suppression crews.

Present forestry practices have probably had a dampening effect on the fire regime in the Blowout Analysis Area. The large number of roads and managed stands in this area have increased accessibility for fire suppression efforts, and have provided fire breaks throughout much of the area. The size of smaller patch fires has been kept artificially low, and the opportunity for these fires to become large stand-replacing fires under certain environmental conditions (high temperatures, east winds, etc.) has been greatly reduced. Conversely, management has increased the frequency of patch fires in specific areas due to escaped slash burns and increased access to the public which has resulted in human ignited fires. Furthermore, potential intensity of fires has increased due to accumulating fuel loads in areas of fire suppression, and drier and windier conditions expected along created stand edges. The overall effect is a decrease in the probability of large and low intensity fires, an increase in the probability of high intensity fires, and a divergence from the natural fire pattern which existed in this area prior to management. This decrease in the types of fire that occur leads to a decrease in the types of vegetation that respond differentially to fire. The resulting condition probably reflects an alteration in the distribution, composition and extent of plant communities that had adapted to the pre-management fire regime.

It is clear that fire, predominantly stand replacement fire, has been the major disturbance factor creating current natural stands. With the inception of forest fire protection measures, fire has become a decreasingly important disturbance factor in the watershed. Where natural underburning was prevalent, lack of fire generally has resulted in increasing stocking levels of understory trees and fuel loading.

Timber Management: Management activities affecting the landscape started with railroad logging in the early 1900's. Railroads were constructed up the main-stem of Blowout Creek to the confluence of K Creek. By the 1930's the lower watershed was logged from stream to ridgetop. This occurred on both private and public lands. Early lookout photos (1930) show some of the cutting activity. By the 1950's all of the private land was cut and public land cutting had extending up the drainage networks. These were areas of easy road construction.

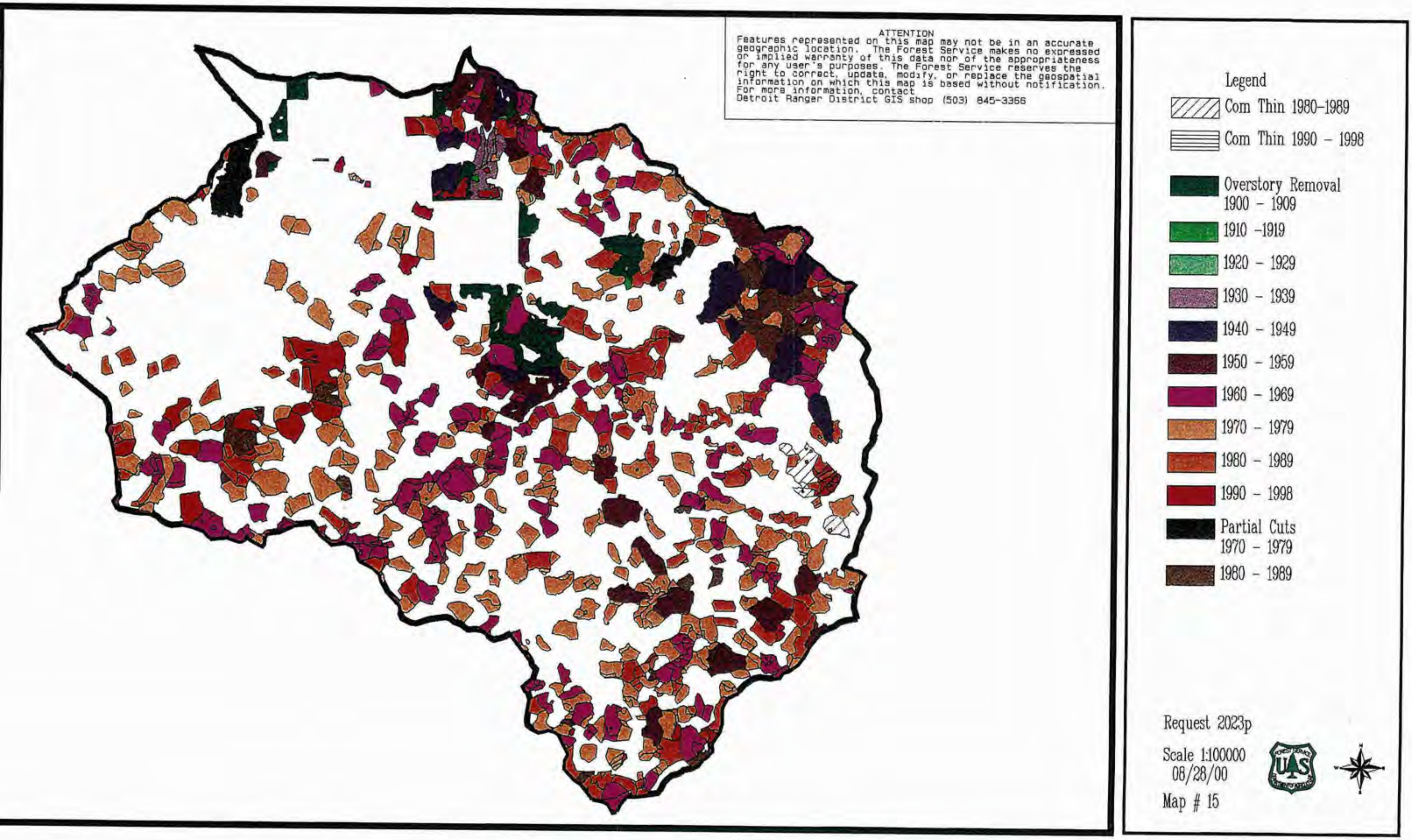
During the 50's and 60's the area was aggressively roaded. The main transportation system was completed by 1975. This includes the main collectors and arterials and locals. The area provided a large portion of the District target during 1940 to 1980. If volume was needed, the Blowout was looked to (*see Harvest by Decade map #15*).

Decade Harvest in the Blowout since 1900	
Years	**Acres Harvested**
1900-1909	669
1910-1919	12
1920-1929	4
1930-1939	125
1940-1949	768
1950-1959	1153
1960-1969	3051
1970-1979	4366
1980-1989	2442
1990-1994	782
Total	13,372

***Vegetation*:** The Blowout is one of the most intensely managed areas on the Detroit Ranger District. Even-aged management, primarily clearcutting, has been the most common harvest method to date. Broadcast burning was prescribed for most harvest units for fuel reduction and site preparation for planting. Plantations date back to the late 1940's. Low elevations and easy access are the chief reasons for the early activities. Fertilization and pre-commercial thinning have been practiced throughout the drainage.

Reforestation: Tree planting has been the primary reforestation method since the 1940's with natural seeding as either a planned or unplanned supplement to stocking. From the 1940's through the mid-1970's, Douglas-fir was almost exclusively planted on the lower to mid-elevation sites. Noble fir and Douglas-fir were commonly planted above 3000 feet elevation. From the late 1970's to the present, additional tree species were added including, Western white pine, Western redcedar, Western hemlock, Pacific silver fir, grand fir, lodgepole pine, sugar pine, Engelmann spruce, and mountain hemlock. A minimum of two species, usually three or four species, are currently planted in each harvest unit.

Blowout WA
Harvest By Decade



Natural regeneration in planted harvest units has been a significant factor in adding to the tree species diversity in most units. At lower elevations, Douglas-fir, Western redcedar and Western hemlock are commonly significant stand components due to fill-in seeding. At higher elevations, silver fir and Western hemlock tend to be the most common species. This seeding may occur soon after site preparation and may be added to after pre-commercial thinning opens up the stand.

As an example of how natural seeding has supplemented planted stock, the following was observed from data collected in 1990 from a stand in Divide Creek. The stand was planted in 1962 with pure Douglas-fir and pre-commercially thinned in 1980 to 300 trees per acre. By 1990 there were 1130 trees per acre, and five additional species present. Although Douglas-fir is generally the dominant tree, other species are major components of the upper canopy level of the stand.

The first known reforestation effort appears to be planting in the late 1930's and early 1940's of the railroad logged areas previously mentioned.

Following World War II timber harvest became more consistent and as a result, reforestation became a more sustained program. Both planting, and natural and artificial seeding were options used from the 1940's into the 60's. For example:

> ***Seeding:*** An extensive aerial seeding project was undertaken following the Sardine Fire, in the Detroit Tribs Watersheds to the north, in 1951.
>
> ***Planting:*** Douglas-fir was the preferred species at lower elevations but was not always successful at higher elevations, especially in frost prone areas. Noble fir was a preferred planting species above 3000 feet elevation. Engelmann spruce and ponderosa pine were used on some severe frost pockets where Douglas-fir planting was not successful.

In the 1970's planting became the sole reforestation method due to its reliability and requirements in the National Forest Management Act to assure reforestation within five years after harvest. The shelterwood regeneration method was also used on sites with high frost potential and on warm droughty sites. All seed collected during the 1980's was harvested from trees selected for superior growth. The 1980's saw the addition of most of the indigenous conifer species to the list of species planted. The most notable species was the addition of rust-resistant Western white pine which had been significantly reduced in the watershed due to blister rust. Western redcedar, western hemlock, grand fir, Pacific silver fir, sugar pine, mountain hemlock and lodgepole pine were also planted depending on local site conditions. The use of shade cards was introduced in the 1980's for seedling protection on warm droughty sites. The forest cultivator/subsoiler began operating during this period to help break up old compaction from prior tractor logging and to help reduce vegetative competition. Also The 1990's have added increased hardwood planting on some local areas, especially in root rot pockets. Increased use of containerized versus bareroot seedlings has resulted in significantly increased survival for certain tree species.

Site Preparation and Fuel Treatment: Throughout the period that timber management has taken place in the watershed, site preparation for planting and fuel treatment have been closely linked. Prior to the 1960's, the record of what fuel treatment was used is not particularly clear but it is generally recognized that the use of broadcast burning was much less than in recent decades and this coincided with less tree planting and therefore less need to prepare sites. Snags were felled for fire hazard reductions from the earliest harvest dates. Utilization standards for timber were relatively low during this period, so a great deal of large material was left following logging and if unburned additional material was left. On gentler slopes, tractor piling was also used with variable effects on soil productivity.

As tree planting became more or less standard practice, along with concern for minimizing fire hazard, broadcast burning became more prominent. During the 1960's most of this burning was done in the fall and was frequently associated with dry conditions, so burning often resulted in hot burns and excessive duff consumption. The 1970's saw the introduction of yarding of unmerchantable (YUM) material off of units. For a few years YUM yarding was used as a substitute for burning. This was a poor substitute for burning because it did not treat the small diameter slash, was less than adequate as site preparation, and didn't set back vegetative competition. Later YUM yarding was combined with broadcast burning to removed fuel to help reduce broadcast burn intensities. This combined with increasing timber utilization further reduced the amount of wood left on site. The broadcast burning season was extended to include late spring and fall and night burning was instituted to take advantage of higher fuel moisture conditions to reduce burning impacts.

In the early 1980's tractor piling of slash was ended due to unacceptable impacts on soil productivity. Broadcast burning was the preferred treatment on most sites. From the late 1980's to the present brought the need to leave green trees, snags and logs on harvest units. This coupled with increasing restrictions aimed at meeting air quality standards, created conditions which necessitated a reduction in the number of acres burned. Grapple piling was also used increasingly on gentler slopes since it provided more flexibility in the timing of burning while minimizing soil damage.

Timber Stand Improvement: Timber stand improvement began in the early 1950's, with pruning and precommercial thinning. Both activities remained at fairly low levels through the 1950's and 1960's and pruning was discontinued by the mid-1960's. Precommercial thinning accelerated during the 1970's and has continued at high levels into the 1990's at a rate of about 500 acres per year for the entire District (precise figures for the watershed alone were not analyzed).

Fertilization began in the late 1970's and has averaged about 500 acres per year to the present. Some stands have had multiple treatments. Pruning was reintroduced in 1989 and has averaged 300 to 400 acres per year on the District. Brush release has been a very minor treatment on the District, with snowbrush, Ceanothus velutinus, pulling being the most common method.

Early pre-commercial thinning tended to leave stocking levels higher than are currently regarded as optimum for acceptable growth. Starting in the early 1970's, fewer trees, generally about 300 per acre were left and this level has continued until the present. Prior to the 1980's Douglas-fir was generally the preferred crop tree at lower elevations while noble fir was favored at higher elevations. Other species were left during pre-commercial thinning if they were among the largest and most healthy trees in the stand. In most cases the other species had not been planted and as a result were smaller and therefore not left as crop trees. Beginning in the 1980's provisions were taken to leave representatives of all species present in the stand when thinning. In some cases this also resulted in additional trees being left after thinning. With the planting of a much wider selection of species, minor species also were in a better position to compete for growing space.

Insects and Diseases

Root diseases: Site specific information on the prevalence of insect infestation and pathogen disease centers is difficult to obtain. A discussion of the dynamics of these vectors, however, can shed light on the effect management has on their spread. In this discussion, the use of the word "pathogen" will focus on the effects of root diseases. It has been estimated that at least 18% of annual conifer mortality volume in the western United States is due to or associated with root disease (Hadfield et al 1986). The three most important fungi responsible for this mortality in the western Oregon Cascades are *Phellinus weirii* (laminated root rot), *Fomes annosus* (annosus root disease), and *Ceratocystis wagneri* (black stain root disease). Of these, *Phellinus* is by far the most prevalent in the Blowout Analysis Area and elsewhere, but the importance of *annosus* and black stain root diseases cannot be underestimated because they do increase in direct response to human activity (Hadfield et al 1986). Host species most susceptible to *Phellinus* damage are Douglas-fir, grand fir, white fir, and mountain hemlock. Since *Phellinus* can survive up to 50 years in stumps and roots and spreads via root contact, an argument could be made that spread is facilitated by crop rotation due to the increase in root contacts and the increased vulnerability of young trees 15-20 years old, as well as, older Douglas-fir plantations. Presumably then, rates of spread of *Phellinus*, and possibly *Fomes* and *Ceratocystis*, have increased from the period prior to intensive management in the Blowout.

Phellinus weirii is common throughout the Blowout. It is easiest to detect in plantations of small sawtimber size. Most infection centers found are 1/4 acre or less in size. Some stands have many small centers that are coalescing into larger infections. A couple of young plantations show mortality that is still standing because the trees are too small to be windthrown.

Commonly, insects and pathogens work in tandem to cause tree mortality. Environmental stress resulting from either physical factors or disease can leave trees vulnerable to insect infestation. Populations of insects can increase in root disease centers, leaving nearby healthy trees vulnerable (Hadfield et al 1986). Stress and mortality caused by physical factors such as drought and windthrow have been accentuated by increased edge effects resulting from previous management practices. Fire suppression allows disease infestation to persist and grow.

White pine blister rust is an introduced fungus that affects five-needled pines such as western white pine and sugar pine, found in this watershed. Blister rust has caused significant mortality plus top kill in all ages of both pines, and has greatly reduced their occurrence in the drainage. Replanting with rust-resistant white pine began in 1983 and has continued with white pine typically comprising from 10 to 30 per cent of most plantations. Resistant sugar pine is not yet available for planting. Some planting with non-resistant sugar pine has occurred in order to bolster the number of trees until resistant stock is available. Some natural resistance is expected.

Dwarf mistletoe is the other major disease found in the Blowout. The majority of mature western hemlock are infected. Pacific silver fir and to a lesser extent Noble fir are infected also. Dwarf mistletoe is more prevalent in mature stands with multiple canopy layers which facilitate spread from the overstory to the understory. Even-aged management has reduced the distribution of dwarf mistletoe, fire suppression promotes conditions for increased spread. Retention of infected green trees in harvest units promotes infection of same species regeneration.

Douglas-fir beetle mortality was seen in several locations, however, it is not considered significant. Beetle activity increased following a windstorm in 1990. *Mountain Beaver* are present but appear to be at low population levels, very little damage has been observed.

Localized populations of *pocket gophers* are found in the drainage but are generally not causing significant damage to plantations.

Special Habitats: The effect of disease (including herbivory) on special habitats takes two forms: if the surrounding forest stand is dying from disease, the loss of cover may expose the habitat to environmental extremes and result in a change in species composition and distribution. Disease can also target certain species within the special habitat, which might also alter the species composition, or at least relative densities. Forest mortality due to disease can create gaps, and local species composition will change if disease resistant species recruit in. Species of concern will have to be monitored for disease. The battle against noxious weeds often uses disease (herbivorous insects-biocontrol) to control populations.

Other Disturbances

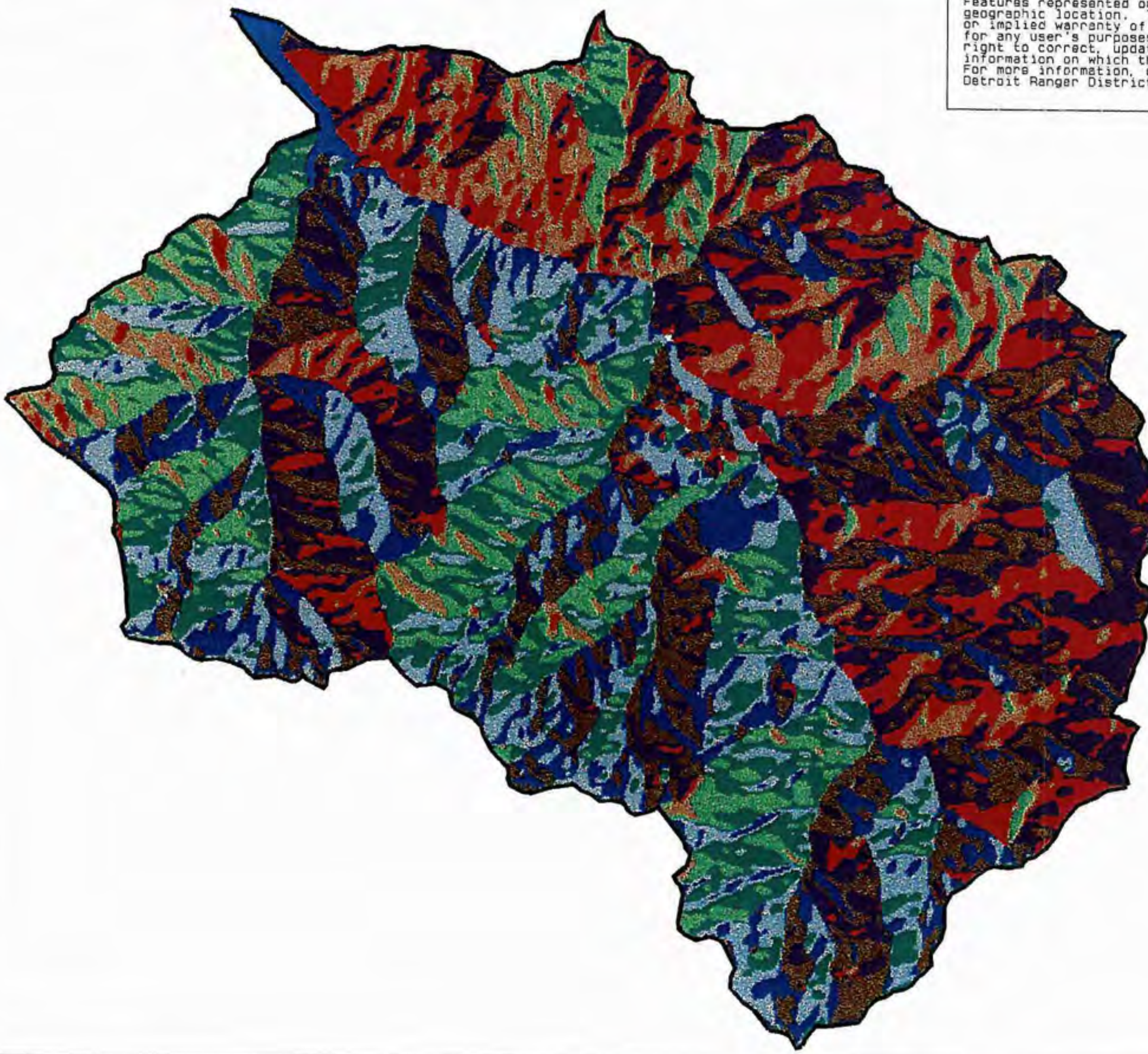
Wind and Snow: Blowdown of trees from windstorms has periodically affected portions of the watershed, especially those that are in wind exposed areas such as south and west aspects (see aspect map #16), and ridgetops. Areas of saturated soils and treelines along existing openings may also be vulnerable. In 1990 a significant portion of the watershed experienced blowdown although an exact estimate is not possible. Several salvage sales were sold as a result of this storm but additional areas were not salvaged due to resource and administrative constraints.

During the winters of 1996 and 1997 significant snow breakage occurred throughout the drainage as a result of wet, heavy snows. The extent of damage varies from light and scattered to locally heavy. The most significant damage is generally in dense pole to small sawlog sized stands and is characterized by broken tops as well as entire trees pushed to the ground. Riparian areas have experienced a disproportionate percentage of the damage.

Flood: Special habitats most likely to be effected by flood are those wetland types and riparian areas associated with floodplains. Floods have the potential to drastically alter habitat elements by removing and depositing structural, substrate, and plant propagule materials. Flood can change the course of a stream, which may disconnect a wetland from its water source. Likewise, it can introduce water to new areas, creating swamps, bogs, and marshes under certain conditions. The loss of habitat of a species of concern presents a special problem, however, since there is a lesser chance that even if the habitat is created elsewhere that a rare plant would be able to recruit in. For noxious weeds, the newly disturbed floodplain substrate resulting from flood can provide expansion room if a propagule source is nearby.

Assuming the Aggregate Recovery Percentage in the Blowout Analysis Area was higher before management than it is presently, it is fair to say that the area was less flood prone. In vegetation terms, this translates into the likelihood that more swamps, marshes, bogs, and stable riparian plant communities existed prior to large scale management in this area. It also means that we are now seeing more red alder dominated vegetation and other hydric disturbance associations than occurred in the past. The effect of flooding in the Blowout drainage is evidenced by the condition resulting from the 1964 flood. The floodplain and banks of Blowout Creek show little structure (also due to stream "clean-up") and are largely dominated by red alder stands. The effect of management has been to

Blowout WA
Aspects



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Legend

- North
- Northeast
- East
- Southeast
- South
- Southwest
- West
- Northwest
- Detroit Lake

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Map # 16

accentuate and bias natural processes, which has resulted in a disproportionate increase and concentration of disturbance vegetation at the expense of stable vegetation.

Earthflows: Unstable soils and slow, large scale land movements can create special habitat such as talus and cliff plant communities, alder chutes, rock gardens, and may be involved in aspects of meadow creation. They also have the potential to disrupt these communities, as well as forested plant habitats that occur on these substrates. The situation for plants of concern and noxious weeds is similar to that described in the flood section above.

The Blowout Analysis Area has historically had a lot of unstable soils and features (Blowout and Coopers Cliffs, many talus features and failed slopes), hence the high proportion of vine maple/talus plant communities, alder chutes, and early successional patches in the watershed. In addition to the cliff and talus, avalanche, and disturbance vegetation, land flows can result in an undulating topography with localized wet depressions and hummocky mounds that provide varied habitat for plant and animal species (such as at the base of Blowout and Coopers Cliffs, and elsewhere).

Much in the way that past management has accentuated the effect of flooding, it has also accentuated the effect of erosion and subsequently, land flow. The effect on vegetation is also similar. Disturbance vegetation thrives on recent slope failures. This is not necessarily a detrimental occurrence, since hardwoods may come in and provide varied habitat where only coniferous forest grew before, but again it is a question of degree. Pervasive slope failure or snow avalanches resulting from logging practices can dramatically increase the chances of altering features or vegetation types that we do want to retain, especially those same riparian types discussed in the flood section.

What Is The Current Condition Of Late Successional Habitat?

The oldest stands of trees, for which there is documented information in this watershed, are approximately 400 to 600 years old. There may be older stands than this, but they have not been intensively inventoried. The vast majority of the older stands, found in the watershed, date from the early 1600's when fires burned over most of the watershed. This is consistent with stand ages found throughout the rest of the Ranger District.

The harvest of late successional timber has slowed, in recent years as concerns over the dependence of various species have led to changes in land management allocations.

The Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Related Species requires that provisions be made for retention of old-growth fragments in watersheds where little remains. The standard and guideline is applied to fifth field watersheds (20 to 200 square miles) in which federal forest lands are currently comprised of 15 percent or less late-successional forest. Within such areas, all remaining late-successional stands are to be protected. Blowout study area contains portions of four fifth field watersheds. The following chart shows the percentage of late successional stands remaining in each fifth field watershed and in each smaller sixth field watershed.

Late Successional Stands By Fifth-Field Watershed				
Fifth Field Watershed	Federally owned Forested Acres in Watershed	Percent Late Successional Stands	Percent Late Successional in Matrix Allocations	Percent Late Successional in non-Matrix allocations
Entire 5th Field Watershed	83,039	34	32	68
Portion of 5th Field Watershed that is within Blowout Analysis Area	34,155	39	39	61

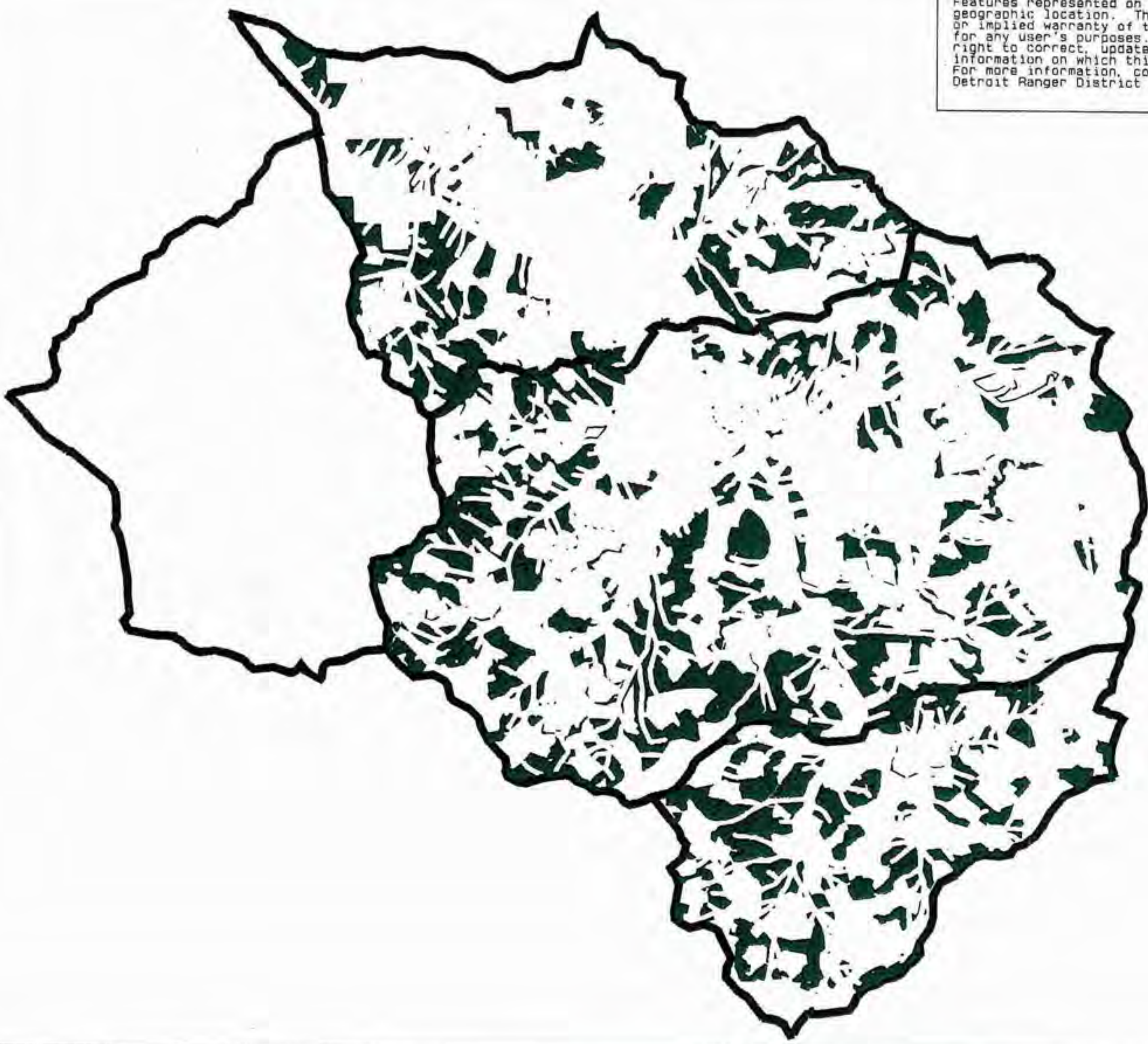
The following map #17 shows late successional stands within matrix allocations.

What is the status of non-native plant species in the watershed? Where are non-native plant populations located? What factors have contributed to their spread?

Most noxious weed and invasive non-native species migrate up from the Willamette Valley through the Canyon via Highway 22. Invasive non-native species that seem to be expanding include the Himalayan blackberry Rubus discolor and the white sweet-clover Melilotus alba - the latter is found in abundance on the Sweet Home Ranger District.

The table below lists some of the invasive non-native plants found in the Blowout analysis area. The occurrence column indicates which species are most predominant.

Blowout WA
Late Successional Stage in Matrix



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Legend

Late Successional

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Scale 1:100000
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Map # 17

Invasive Non-Native Plants Found In Blowout			
Common Name	**Scientific Name**	**Biological Control**	**Occurrence**
ox-eye daisy	*Chrysanthemum leucanthemum*	No	Widespread
chicory	*Cichorium intybus*	No	Isolated
wild carrot	*Daucus carota*	No	Widespread
foxglove	*Digitalis purpurea*	No	Patchy
spotted cat's ear	*Hypochaeris radicata*	No	Widespread
wall lettuce	*Lactuca muralis*	No	Widespread
white sweetclover	*Melilotus alba*	No	Patchy
reed canarygrass	*Phalaris arundinacea*	No	Patchy
self-heal	*Prunella vulgaris*	No	Patchy
Himalaya blackberry	*Rubus discolor*	No	Patchy
evergreen blackberry	*Rubus lacinatus*	No	Isolated
red sorrel	*Rumex acetocella*	No	Widespread
curly dock	*Rumex crispus*	No	Patchy
common mullein	*Verbascum blattaria*	No	Patchy

The table below lists seven established noxious weeds that are found in the Blowout analysis area.

Established noxious weeds found in Blowout			
Common Name	Scientific Name	Biological Control	Occurrence
Canada thistle	Cirsium arvense	Yes	Widespread
bull thistle	Cirsium vulgare	Yes	Widespread
Scotch broom	Cytisus scoparius	Yes	Widespread
spotted knapweed	Centaurea maculata	No	Isolated
diffuse knapweed	Centaurea diffusa	No	Isolated
St. John's-wort	Hypericum perforatum	Yes	Widespread
tansy ragwort	Senecio jacobaea	Yes	Widespread

An *Integrated Weed Management Environmental Assessment* for managing noxious weeds, signed by the Forest Supervisor in 1993, states that each infestation of weeds will be managed according to its classification; new invaders will be eradicated using all control methods available and will have highest priority. The best we can do with established infestations is keep their population numbers in check through biological and manual control methods.

Under the Willamette's integrated weed management program, spotted knapweed populations and other new noxious weed invaders are subject to spot herbicide spraying in order to prevent establishment. This program complies with and meets the intent of the *Region 6 Environmental Impact Statement for Managing Competing and Unwanted Vegetation* and the associated *Mediated Agreement.* Bio-control and manual control efforts focus on tansy ragwort and Scotch broom.

Tansy ragwort, a sunflower family member, releases massive amounts of seed into the wind similar to dandelion and can establish in most any disturbed area. Scotch broom has the tendency to dominate disturbed and semi-disturbed areas due to its size, large seed bank, and its ability to modify the surrounding environment.

Preliminary inventories of noxious weeds on the Detroit Ranger District were conducted in 1992. The inventory was manually recorded on maps and in a computer file. The infestations have been digitized and placed in the GIS data base. We will make comparisons using old and new maps to track the spread of weeds and rates of increase and to determine the effectiveness of control measures.

Presumably, continuous and increasing disturbance associated with road building and maintenance in the Blowout Analysis Area has led to population expansions of noxious weed species and invasive non-natives. Major collector roads host the majority of the infestations.

One threat to biodiversity in this analysis area is the predominance of disturbance vegetation and early successional vegetation (ruderals). This threat can be described by any or all of the following three concerns: 1) the disproportionate amount of area occupied by early successional and disturbance vegetation may effect animal-plant interactions and other ecosystem processes; 2) the particular type of disturbance represented by timber management may change conditions such that the type of natural succession following events like fire and disease is precluded; and 3) the vast road system and other continuously disturbed areas allow for easy establishment and long-term occurrence of noxious weeds and other undesirable ruderal species. The resultant effect of all three concerns is a reduction in the number and extent of various stable native plant communities represented in the landscape.

Without more data and analysis, the significance of concerns #1 and #2 is hard to evaluate. But the effects of concern #3 is evidenced by the results of a recent district road survey of noxious weeds. In the heavily roaded areas on the east side of the analysis area, populations of noxious weeds such as St. John's wort *Hypericum perforatum*, Scotch broom *Cytisus scoparius*, Canada thistle *Cirsium arvense*, and tansy ragwort *Senecio jacobaea* are abundant. It is apparent that these populations serve as propagule sources for further weed invasions of arterial roads. On the west side, where road densities are considerably less, population densities and distribution are much reduced and restricted to just the major road routes. Other noxious weed concerns in this analysis area include small but recent infestations of spotted knapweed *Centaurea maculata*.

What is our current knowledge of Table C-3 (ROD) and Appendix J2 (FEIS) plant species occurrence in the watershed, and what is the current status of survey protocols for survey and manage species (C-3)? What other species of concern are found in the watershed?

A large number of late successional forest plant, animal, and fungal species were identified as needing protection or monitoring in the ROD and standards and guidelines for the Northwest Forest Plan. These species fall under either the category of protection buffer or survey and manage.

The Regional Ecosystem Office (REO) is collecting location information and developing survey protocols. A survey and manage species database has been developed and is ready for field use in 1997. Survey protocols for bryophyte species are now ready for field testing, and all other survey protocols should be ready soon. Survey strategies include the following:

Survey strategy 1: manage known sites;
Survey strategy 2: survey prior to activities and manage sites;
Survey strategy 3: conduct extensive surveys;
Survey strategy 4: conduct general regional surveys.

Activities implemented in 1995 and later must include provisions for known sites if the species is under survey strategy 1. For species under survey strategy 2, activities implemented in 1999 or later must have completed surveys. Survey strategies 3 and 4 are more general and must be underway in 1996. Mitigation measures for these species can be found in Appendix J-2 of the FEIS (Holthausen et al. 1994). The following table lists species documented on the Detroit District.

ategory	pecies	ocation on the Willamette N.F.	urvey Strategy
Mosses	*Antitrichia curtipendula*	Forestwide	4
	Rhizomnium nudum	Hanks Lake-DE	PB-1,3
False truffle	*Rhizopogon albietis*	Breitenbush watershed	3
Rare false truffle	*Alpova alexsmithii*	Mt. Jefferson Wilderness	1, 3
	Gymnomyces abietis	Mt. Jefferson Wilderness	1, 3
	Hydnotrya inordinata	Mt. Jefferson Wilderness (Jefferson Park)	1,3
Chanterelles	*Cantharellus cibarius*	Forestwide	3,4
	Cantharellus subalbidus	Forestwide	3,4
	Cantharellus tubaeformis	Forestwide	3,4
	Gomphus clavatus	Forestwide	3
	Gomphus floccosus	Forestwide	3
Rare Chanterelles	*Polyozellus multiplex*	Battle Ax Cr-DE	1,3
Uncommon Gilled Mushrooms	*Catathelasma ventricosa*	Regionwide	3
Rare Cup Fungi	*Gelatinodiscus flavidus*	Park Ridge-DE	1,3
Tooth Fungi	*Hydnum repandum*	Forestwide	3
	Hydnum umbilicatum	Forestwide	3
Parasitic Fungi	*Sparassis crispa*	Forestwide	3
Nitrogen-fixing lichens	*Fuscopannaria leucostictoides* *	Detroit, Blue River Ranger Districts	4
	Lobaria oregana *	Forestwide	4
	Lobaria pulmonaria *	Forestwide	4
	Lobaria scrobiculata *	Forestwide	4
	Nephroma bellum *	Forestwide	4
	Nephroma helveticum *	Forestwide	4
	Nephroma parile *	Forestwide	4
CONTINUED…	*Nephroma resupinum*	Forestwide	4

Category	Species	Location on the Willamette N.F.	Survey Strategy
Nitrogen-fixing lichens (cont.)	*Peltigera collina*	Forestwide	4
	Pseudocyphellaria * *anomala*	Forestwide	4
	Pseudocyphellaria anthraspis	Forestwide	4
	Pseudocyphellaria * *crocata*	Forestwide	4
Rare Nitrogen-fixing lichens	Lobaria hallii	Forestwide	1,3
	Nephroma occultum	Forestwide	1,3
	Fuscopannaria rubiginosa	Detroit R.D.	1,3
	Pseudocyphellaria * rainierensis	Forestwide	1,2,3
Rare Rock lichens	Pilophorus nigricaulis	Detroit R.D.	1,3
Aquatic lichens	Hydrothyria venosa	Little North Santiam	1,3
	Leptogium rivale	Opal Creek	1,3
Rare Oceanic Influenced Lichens	Hypogymnia oceanica *	Forestwide	1,3
Vascular plants	Allotropa virgata *	Forestwide	1,2

The species locations that are documented on the Detroit District are from herbarium collections, the ecoplot data set, and incidental sightings. Most of the lichen locations come from regional air quality monitoring plots. Appendix J2 of the FSEIS (Holthausen et al. 1994) provides descriptions of the habitat and range of many of these species. Vascular plants that are on both the C-3 list and the Region 6 Sensitive Plant List suspected or documented to occur on the Willamette National Forest (*Botrychium_minganense* and *Botrychium montanum*) have been subject to survey during the normal course of field work. To this date, habitat descriptions for most C-3 plant and fungal species are not specific enough to determine probable locations with existing data.

Uncommon Plants: Uncommon plants have no special management status in Region 6. Their distributions are monitored on the Willamette National Forest because we want to prevent having to list species on the Regional Forester's List. One of the monitoring questions in the Willamette National Forest Land and Resource Management Plan (LRMP) has the Botany program responsible for a Forest Concern List--those species rare enough to track for purposes of maintaining biodiversity and for helping determine whether populations are increasing, decreasing or stable statewide. Four uncommon plants are found in the Blowout Analysis Area:

Uncommon Plants in Blowout Analysis Area		
Latin Name	Common Name	Occurrences
Botrychium virginianum	Virginia grape fern	1
Brickellia grandiflora	Large-flowered brickellia	1
Castilleja rupicola	Cliff paintbrush	1
Pleuricospora fimbriolata	Fringed pinesap	Many

Populations of uncommon plants are tracked by an informal database. Inventories have been developed opportunistically during sensitive plant survey. It should be noted that like sensitive plants, most of these uncommon plants are found in special habitats. The first three occurrences are protected by virtue of special habitat designation. Fringed pinesap occurs in coniferous forest, and has no such protection.

What Threatened, Endangered, or Sensitive (TES) plant species occur in the watershed, and what is the current condition of these populations?

Sensitive Plants: Plants on the Region 6 sensitive plant list are afforded protection by the Regional Forester by authority of Forest Service Manual (FSM) 2670. The purpose is to avoid having to list the plants as threatened or endangered due to losses incurred as a direct or indirect result of management activities. *Romanzoffia thompsonii*, Thompson's mistmaiden, is a Region 6 sensitive plan that is found at one location in the Blowout Analysis Area. The habitat for this plant is always rock gardens; sites where bedrock is close to the soil surface, where there is minor to no soil development, and where herbaceous species such as mosses and forbs predominate.

Sensitive Plants in the Blowout Analysis Area			
Latin Name	Common Name	Location	Occurrences
Romanzofia thompsonii	Thompson's mistmaiden	Beard Saddle	1

Past timber management has not had a discernible impact on this one population of *Romanzoffia thompsonii*, although its habitat is surrounded by a stand only 40 years old. A road does bisect this habitat, however, and the segment of the population below the road does appear to have been impacted by sidecast gravel from the road.

What types of special habitats (rock outcrops, seeps, bogs, meadows, talus slopes, etc.) occur in this watershed?

Special Habitats: The occurrence of special habitats and their distribution across the landscape is important for biodiversity of plant and animal species (*see Special Habitats map #18*). Forest Plan standard and guideline FW-211 directs us to protect these habitats and their ecotones. The Special Habitat Management Guide lists special habitats by plant associations and the wildlife that use them. The guide provides a methodology for inventory, mapping and databasing information as well as providing management prescriptions.

The largest number of non-forest plant communities (special habitats) in this analysis area are represented by dry rock gardens, wet meadows, and vine maple-talus patches. Dry rock gardens occur on the major peaks and ridges, including Coffin Mountain, Pinnacle Peak, Lucky Butte, Cub Point, and Blowout and Coopers Cliffs.

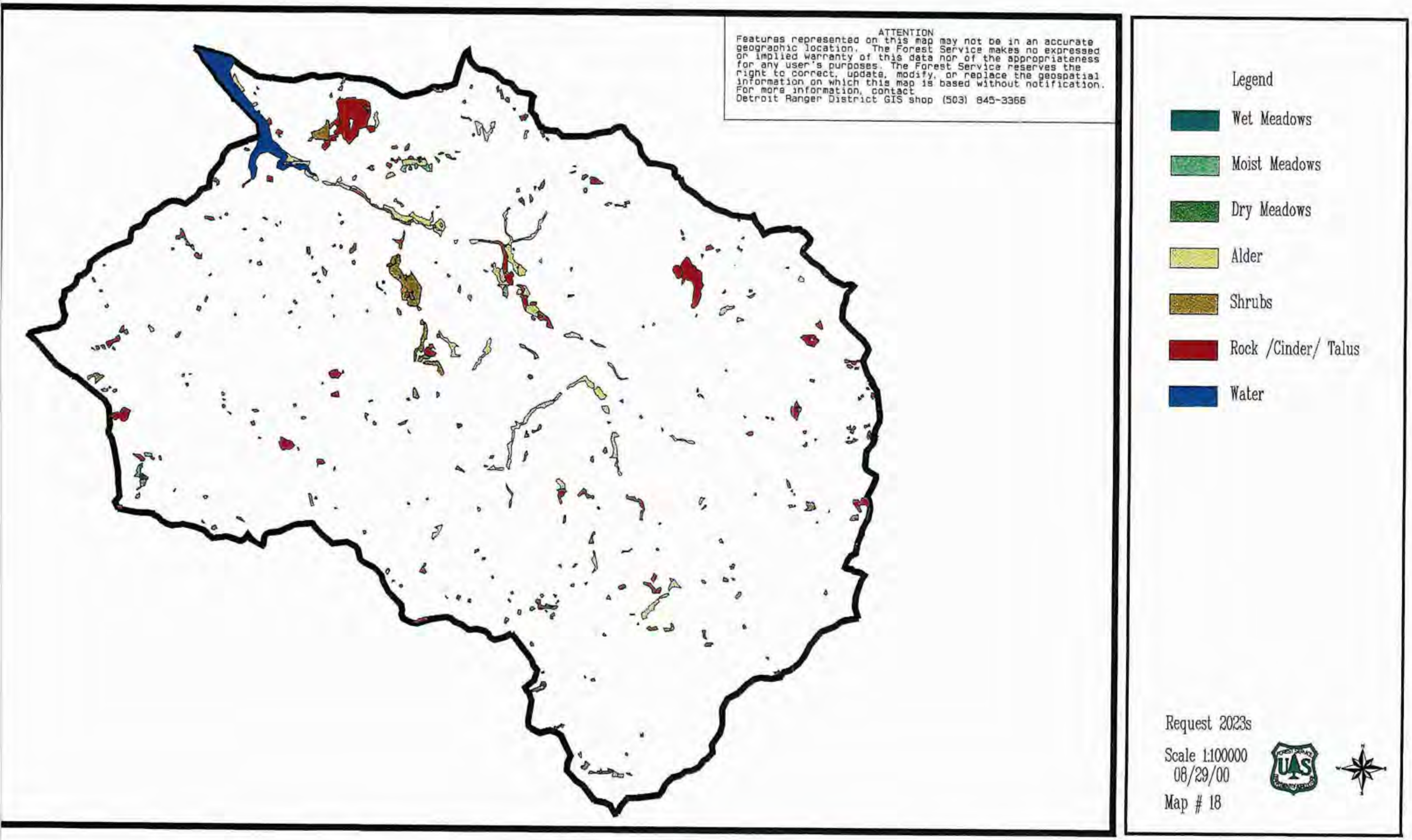
Various wet meadow/bog/pond special habitats occur at the headwaters of Blowout and Box Canyon Creeks and their tributaries. Many of these types are surrounded by recent harvest activities, some are not.

Vine maple-talus patches are distributed throughout the analysis area and attest to the predominance of unstable soils in both Blowout and Box Canyon watersheds. Wet and seepy tag alder patches with associated vegetation are distributed along the upper rims of these Analysis Areas. A notable wet rock garden is located on a slope near Beard Saddle, and a beautiful spring wildflower display that includes the sensitive *Romanzoffia thompsonii* (Thompson's mistmaiden) occurs there.

A few mesic meadow types can be found at mid-elevations in the Blowout area, but are nonexistent in the Box Canyon area.

Beaver ponds and sag ponds, sedge meadows and hardwood swamps predominate in the lower elevation second growth stands. The formation and/or current condition of many of these latter sites have probably been influenced by past harvest activities.

Blowout WA
Special Habitats



Special Habitats in the Blowout Analysis Area

Type of Special Habitat	Number of Habitats*	Condition of Special Habitats							
		Special Habitat is within/ or bordered by Harvested Unit,		Special Habitat is Bisected by Road		Special Habitat is Bordered by Road		Invasive weedy Plants found within special habitat**	
		Number	Percent	Number	Percent	Number	Percent	Number	Percent
Dry rock gardens	26	2	8			3	12	2	8
Vine maple - talus	22	2	9			2	9		
Wet mdws	19	13	68	1	5	10	53	2	11
Pond	12	5	42			5	42	2	17
Mesic mdws	10	2	20	1	10			2	20
Cliff	9					1	11		
Sitka Alder	9			1	11	1	11		
Swamp: hardwoods	8					1	13		
Sedge mdws	6	2	33			2	33	1	17
Talus	3			1	33				
Bog	3	1	33						
Vine maple - rocky soil	3	1	33						
Moist rock gardens	2	1	50	1	50			1	50
Dry mdws	1								

* (approx. number of habitat types out of 133 identified by photo or in field)
** (based on 54 habitats inventoried in 1994)

b. Reference Condition: What is the historical array and landscape pattern of plant communities and seral (structural) stages in the watershed (riparian and non-riparian)? What processes caused these patterns (e.g. fire, wind, mass wasting)?

The reference date is set at approximately 100 years ago because there was little human influence at that time and because of an active fire period at about that time period. Some of the discussion regarding reference conditions is interspersed in the current conditions section of this document.

Columns 2 and 3 of the following table are from a Sub-Regional Assessment done for the entire Willamette and Siuslaw National Forests. Its purpose was to estimate the range of natural conditions for each plant association series. It determined the percentages for each structural stage using information from fire studies on the Blue River Ranger District and in the Mount Jefferson Wilderness. The period analyzed was from 1600 to 1850. The values used in the tables below represent the mid-range given in this report. The Assessment figures given here are for the entire North Santiam subbasin.

Columns 4 and 5 of the following table shows the structural stages by plant association for the 1895 period. Figures were derived from a variety of sources, estimates and maps of historic burns, old photography, records of harvest activity, and on the ground knowledge of the area. A high degree of accuracy is not possible in this watershed without more extensive field examination.

Columns 6 and 7 represent current conditions, for comparison.

The distribution of plant associations throughout the watershed was previously discussed in the Characterization. The predominant factor affecting stand structure in pre-European settlement times was fire. Other disturbance factors such as wind or flooding may have had significant impacts in localized areas but not approaching the scale of large wildfires. Insects and diseases also effect stand development but knowledge of specific large scale impacts are not known for this watershed.

The table shows there are some significant changes in percentage of each structural stage between reference and current conditions.

Historical Compared to Current Structural Stages by Plant Association Series (on Federal lands)						
Structural Stage	Sub-Regional Assessment by Plant Association Series (**1600-1850**) for the **North Santiam Subbasin**		**1895 Structural Stages** by Plant Association Series for **Blowout Watershed**		Current Conditions	
	Western Hemlock	Pacific Silver Fir	Western Hemlock	Pacific Silver Fir	Western Hemlock	Pacific Silver Fir
	%	%	%	%	%	%
Stand Initiation	18	18	12	6	20	39
Stem Exclusion	22	27	-	-	35	18
Understory Reinitiation/ Old Growth	60	55	85	91	41	41
Non-Forest	-	-	3	3	4	2
Totals	100	100	100	100	100	100

What was the historical relative abundance and distribution of plant species of concern (ROD, TES, others) and the condition and distribution of their habitats and other special habitats in the watershed?

Although there is no data regarding the status of these species 100 years ago, inferences can be made based on habitat. Indications are that late-successional forest habitat was far more prevalent a century ago than today. Timber management and large scale fires have substantially reduced the current amount of these habitat types. Survey and manage species (Table C-3, ROD) associated with late-successional habitat should have had correspondingly larger population sizes and distributions.

Formation and development of special habitats (SHABs) is mostly a function of changing geomorphology, in which changes are measured in millennia. The more important comparison to make to a 100 year reference point is changes in SHAB structure, function, and species composition.

III. BIOLOGICAL DOMAIN

B. Animal Species and Habitats- Aquatic

1. Characterization: *What is the relative abundance and distribution of species of concern that are important in the watershed (e.g., threatened or endangered species, special status species, species emphasized in other plans)? What is the distribution and character of their habitats?*

The Blowout Creek drainage currently supports three species of salmonid fish: rainbow and cutthroat trout and kokanee salmon. Rainbow trout are very common in the drainage and are generally found in Blowout Creek and the lower reaches of many of it's tributaries. Cutthroat trout, another common species, are primarily found in the tributaries and upper reaches of Blowout Creek. Kokanee salmon are generally found in Detroit Reservoir but they ascend Blowout Creek in the fall to spawn. In fact, they were observed spawning in the lower section of Blowout Creek in 1999. Their numbers vary from year to year, depending on past spawning success and survival in the Reservoir.

Non-game fish found in the drainage include black-sided dace, long-nosed dace and sculpin. The dace are primarily found in the main stem of Blowout Creek while sculpin are found throughout the drainage.

Habitat for salmonid fish is fair to good within the drainage although currently habitat in the lower reaches of Blowout Creek may be better suited for dace than for salmonid fish. Past management activities and flood flows that have widened and shallowed the stream, have increased stream temperatures and reduced channel complexity. Detailed surveys and reports on habitat condition in the Blowout Creek Watershed are on file at the district.

Threatened and Endangered Species: At this time there are no known threatened or endangered fish or aquatic insects in the Blowout Creek drainage.

Sensitive Species: The Regional Forester's sensitive species list does not include any aquatic species that are known to exist in the Blowout watershed.

Survey and Manage Species: There are no fish or aquatic insects on the Survey and Manage list at this time.

2. *What Values Are Associated With Aquatic Species And Habitats?*

a. Species and habitats have aesthetic, economic, recreational, and spiritual value.

There is an inherent aesthetic value to viewing quality aquatic habitat whether it be a stream or a lake. The placement of a fish, especially a wild salmon or steelhead, within this context greatly increases that value.

There is recreational value to aquatic species and habitat as evidenced by the number of people who gravitate toward water to recreate and/or fish, although the actual monetary value is not always easy to quantify.

Prior to Euro-American settlement in Oregon, native Americans may have harvested fish within this watershed, probably near a waterfall that was located about two miles upstream from the mouth of the Blowout. Food gathering areas, such as this, had high spiritual value to the Native Americans.

b. Habitat components necessary to sustain the variety of species indigenous to the area has ecological significance.

c. The native wild gene pools that have developed over thousands of years are valuable in providing species with the resilience to survive a wide range of natural conditions and disturbance regimes.

3. *What Are The Highest Priority Issues Or Resource Concerns Associated With Aquatic Species And Habitats?*

a. Fish habitat quality has been reduced due to past fires, floods and management activities such as *road construction, cutting and yarding of trees, removal of down wood from streams and riparian zones, and slash treatment.* Habitat quality has been affected in the following ways:

- Large woody material was removed from the channel and the associated riparian zones.
- The lack of large wood in the channel reduced pool quality and numbers, reduced hiding cover, and widened and shallowed the channel.
- The lack of good stream-side cover and the widening and shallowing of the channel have increased stream temperatures to the point that State Water Quality standards for salmonid producing streams are being violated during summer low flows. The increased summer temperatures may be increasing competition between non-game species such as dace and cutthroat and

rainbow trout. In 1997, lower Blowout Creek had a seven day average temperatures in the high 60 degree range.

- The amount of roading in the Blowout is contributing sediment to stream channels and may be reducing pool volume and lowering spawning success of salmonids.

b. The placement of instream large wood, as part of restoration programs, may conflict with recreation use such as kayaking.

c. Native fish and wildlife play an important role in shaping the function of ecosystems they are a part of. For example, in a stream with historical runs of spring chinook salmon, large numbers of dying and decomposing fish would have released a significant amount of nutrients to aquatic and riparian habitats. When these fish no longer inhabit the stream, the loss of nutrients can affect the overall productivity of the stream. Lower Blowout and Box Canyon Creeks may have been affected this way.

4. What Are The Management Activities/Direction, Human Uses, Or Natural Processes That Affect Aquatic Species And Habitats?

a. **Current Conditions:** *What are the current habitat conditions and trends for species of concern identified above?*

The following information is from USFS Surveys 1990-1993, Pre-1996 Flood.

Pool quality is low throughout most of the Blowout watershed. The weighted average for all reaches is about 10 pools per mile.

Hiding cover for fish ranges from 5 to less than 20 percent. Boulder substrate was identified as the dominant type of hiding cover that fish were using during 1990-1993 survey. This was also the case in a 1982 survey by Oregon Department of Fish and Wildlife in which deep pools and boulders were found to be providing the majority of cover at that time as well.

Riffle habitats comprise a range of 51 to 86 percent of the surface area throughout the surveyed stream reaches.

Large woody material is shown, by research, to be an essential component of fish habitat. It provides hiding cover, nutrient and insect sources and hydraulic control for pools and micro-habitats as it dissipates stream flow energy. However, large wood greater than 24 inches in diameter was found at rate of less than 35 pieces per mile in most of Blowout Creek.

The ratio of bankfull width:depth is variable in the drainage. It's fairly high in much of Blowout Creek and moderately high in some other areas of the watershed.. This may indicate a loss of structure, mostly from a lack of large wood and large trees, to confine or narrow the active channel during flood events. Bankfull flows are relatively unrestricted, with high erosive energies, and are transporting large amounts of bedload.

Canopy and shade cover averages 24 percent and ranges from 0 to 60 percent on surveyed streams..

Water temperatures have been monitored on seven stations on the main stem and 13 stations on five tributaries since the summer of 1980. Eight years of data have shown temperatures in excess of 58° F in Blowout Creek, with many days exceeding 70° F. Divide and Ivy Creeks have also shown temperatures consistently exceeding 58° F but to a lesser degree. Analysis of monitoring and survey data and observations suggest broad riffles, with low cover on the main stems of these three streams may be the major reason for the increased temperatures.

Existing fish habitat condition has been influenced to a large degree by management activities along with at least two major flood events (1964 and 1996). Road building, timber harvest and stream cleanout increased sediment loading, reduced stream cover, increased temperature and removed large trees that would have contributed to aquatic habitat complexity. Past management activities probably exacerbated the flood affects by causing more scouring of channels and reducing complexity more than might have occurred without management activities.

Direct human use has probably changed current condition very little compared to management activities. Fishing, hunting and other recreation use has probably had minor effects on aquatic habitat when compared with past roading and timber management activities.

Threatened and Endangered Species: Spring chinook and winter steelhead, which are presently listed as threatened, were eradicated from the drainage in 1953 when Detroit and Big Cliff dams were completed. There was a recent proposal by Oregon Department of Fish and Wildlife to reintroduce spring chinook into Blowout Creek in the fall of 1998. They proposed to use surplus adults from the hatchery that were ready to spawn. The proposed re-introduction did not take place. Current habitat conditions for these species is less than optimal because of high temperatures, low habitat complexity and lack of pool habitat for hiding cover.

Sensitive Species: Trends for sensitive aquatic insect species in the Blowout are unknown. No detailed studies have been done to assess this information. It is likely that populations are increasing as habitat recovers from past activities and flooding. Adherence to the direction in the Northwest Forest Plan should maintain this upward trend.

Other Species*: *Rainbow trout: No detailed surveys have been done for many years. Dace may be competing with rainbow trout for space and food in the lower reaches of Blowout and Box Canyon Creeks, while cutthroat trout are likely competing with them in the tributaries.

Cutthroat Trout: Trends are generally unknown. No detailed surveys have been done for many years. Rainbow trout are likely competing with cutthroats for space and food in the lower reaches of tributaries and the upper reaches of Blowout Creek.

Dace: Trends are generally unknown. No detailed surveys have been done. A short section of Blowout Creek near the mouth of K Creek was sampled in 1998 and long nosed dace seemed to be abundant. Black sided dace were mentioned in older surveys but none were identified in the 1998 survey.

Sculpin: Trends are generally unknown. No detailed surveys have been done. Sculpin seem to be fairly common in all streams surveyed in 1998. Samples of sculpin were collected from several streams in the Blowout system in 1998.

Where are the year-round cold water sources areas for the streams in the Blowout watershed, and where can their contribution be identified as important to the maintenance of cool stream temperatures?

There are no known significant cold water sources within this watershed. Temperature moderation may be a function of stream morphology and stream side vegetative cover. Prior to logging in the tributaries, these shaded cooler streams may have been significant in maintaining cooler water temperatures in the lower reaches of Blowout Creek. The water temperature in lower Blowout Creek in mid July of 1938 with an air temperature of 84° F was 53° F. More recent temperatures have been in the high sixties, reaching up to as high as 70°F.

What is the condition of the riparian reserves in the watersheds and the distribution of those conditions with regard to fish habitat?

The condition of riparian reserves varies across the watershed. Presence or absence of large woody material or standing large trees is greatly dependent on past road building, timber harvest, salvage logging, fire history, and major storm events. Historical conditions have been altered in this watershed by management activities and major storm events. Detailed surveys are available at the Detroit Ranger District.

Where and how did recent flood events affect fish habitat in the watershed?

Major flow events that carry large amounts of bedload and large woody material can be detrimental to fish survival and spawning success. Kokanee salmon from Detroit Reservoir spawned in lower Blowout Creek in the fall of 1995. If these eggs or alevins were still in the gravel when the flood happened, it is likely they would not have survived the disturbance.

While from one stand point these events are tearing things down, on the other side they are providing the streams with the building blocks for new habitat. They provide new large wood to the channel from debris flows and from undercutting of trees along the channel. They also provide new substrate from channel changes and debris flows to recharge and form new spawning areas. The short term impacts of these events can be detrimental but long term they can be generally good. This is especially so in drainages with healthy intact riparian areas that have the replacement components a stream needs to maintain complexity and productiveness.

What and where are existing fish habitat improvements in the watershed?
Habitat improvement activities, in the form of log and boulder structures, have taken place in Blowout Creek and lower Ivy Creek. These structures were constructed prior to the 1996 flood event. Some faired well in the storm event and others were completely washed out by the high water. The structures in Ivy Creek held up the best. This was likely due to the smaller stream size. A specific review of 17 structures in Blowout Creek showed that over 60 percent of the wood and 45 percent of the boulders were moved from the structure sites by the flood.

b. Reference Conditions: *What was the historical relative abundance and distribution of species of concern and the condition and distribution of their habitats in the watershed?*

Blowout Creek was known as Volcano Creek in the 1890's. Maps from 1892 indicate an area called Volcano Lake starting at approximately river mile two on Blowout Creek. A survey in 1938 by the Bureau of Fisheries indicated that rainbow trout fingerlings were abundant in Blowout Creek below a falls about two miles upstream from the mouth (McIntosh 1993). It's likely these two sources are talking about the same barrier and also likely the fish seen in 1938 were rearing winter steelhead. There is no indication of a lake being present in 1938. This site is presently inundated when Detroit Reservoir is at full pool.

Cutthroat trout were not found during the 1938 survey, but may have been present in the upper parts of Blowout Creek and its tributaries as they are presently found throughout the drainage (Heller 1974, Skeesick 1988, USFS Surveys 1990-93, and 1998, Wetherby 1982).

The aquatic habitat probably contained complexes of large woody material, which stored large quantities of sediments and diversified riparian and aquatic habitats. Shade over the streams in the watershed was probably much more abundant in the past, prior to logging activities.

A survey by the Bureau of Fisheries in 1938 showed water temperature in Blowout Creek to be 53° F at a point approximately two miles up from the mouth. The temperature was taken on July 18th in mid afternoon with an air temperature of 82-84° F. Although this is only one temperature, at one time during the summer it still may be an indication that historically, prior to logging, salvage and stream clean-out, Blowout Creek was a much cooler stream. This also may be an indication that with recovery of vegetation, stream temperatures will lower significantly.

Threatened and Endangered Species: There is historic habitat for two fish species that are listed as threatened under the Endangered Species Act. These are spring chinook salmon and winter steelhead. The first 1.5 miles of Box Canyon Creek and the lower 2.0 miles of Blowout Creek may have historically supported these fish prior to the completion of Detroit and Big Cliff dams. Barriers present at these two points likely kept them from moving higher in the drainage.

Bull trout that are listed as threatened under the Endangered Species Act may also have used habitat in Blowout Creek but it is unlikely it would have been considered preferred habitat for bull trout.

No known aquatic insects listed under the Endangered Species Act historically lived in this drainage.

Sensitive Species: The same aquatic insect species present now were also most likely to be present historically. See writeup in current condition for information on abundance, distribution etc. Management activities may have changed habitats enough to slightly effect abundance and distribution of some species but not enough to remove them from their historical habitats.

Survey and Manage Species: None

Other Species: Rainbow and cutthroat trout, blacksided and long nosed dace and sculpin are now common in the drainage. Historically dace may not have been as abundant due to colder water conditions.

Historically, cutthroat trout may have dominated more of the drainage than they currently do. Rainbow trout may have been confined more to the areas below the barriers in Blowout and Box Canyon Creeks. This would have reduced competition between the two species and allowed cutthroat to be more widespread.

Habitat for salmonid fish was probably in good to excellent condition prior to the beginning of timber harvest and road building within the drainage. Habitat in the lower reaches of Blowout Creek was cooler and may not have been as well suited for dace allowing rainbow trout (likely winter steelhead) to better compete for space and food with any dace that may have been present.

c. **Table: Comparison of Current and Reference Conditions**: *What are the natural and human causes of change between historical and current species distribution and habitat quality for species of concern in the watershed?*

What is the change between historical and current species distribution?	**What was the natural or human cause of change?**	**What is the change between historical and current habitat quality?**	**What was the natural or human cause of change?**
Threatened and Endangered Species			
Bull trout, spring chinook salmon, winter steelhead - Listed as Threatened under the ESA - Historical range may have included the lower end of Blowout and Box Canyon Creeks but now with the dam in place the reservoir covers up the barriers and allows access to upper areas of the drainage	Building Detroit and Big Cliff dams.	Historical habitat was probably higher quality than at present. Management activities have added sediment to streams, removed wood from channels, removed canopy cover and increased water temperature.	Timber harvest, road building, and to a lesser extent, flood events.
Sensitive Species			
Aquatic Insects (See earlier list) -- Species distribution may have changed some from historical times. As habitat changed due to removal of wood from streams, reduction of canopy and increases in sediment then, organisms more tolerant to these changes may have become more dominant in areas with the greatest change.	Management Activities, including timber harvest, road building, the dams, and to a lesser extent major flood events.	Historical habitat was probably higher quality than at present. Management activities have added sediment to streams, removed wood from channels, removed canopy cover and increased water temperature.	Timber harvest, road building, Detroit Dam, and to a lesser extent, flood events.

Other Species (Game fish)			
What is the change between historical and current species distribution?	**What was the natural or human cause of change?**	**What is the change between historical and current habitat quality?**	**What was the natural or human cause of change?**
Rainbow trout -- Historically rainbow trout may have been restricted to the lower reaches of Blowout Creek and Box Canyon Creek due to waterfall barriers. At present, due to Detroit Dam , the reservoir backs water above the barriers at full pool and fish are able to pass above these points.	The change was due to the construction of Detroit Dam.	See aquatic insects above.	See aquatic insects above.
Cutthroat Trout - Historical and existing distribution are probably fairly similar. Competition with rainbow trout since the completion of Detroit dam may have reduced the present range slightly.	The construction of Detroit Dam.	See aquatic insects above.	See aquatic insects above.
Dace - Similar to discussion for rainbow trout above.	The construction of Detroit Dam.	Habitat for dace may have improved as management activities increased stream temperatures.	See aquatic insects above.
Sculpin - Not sure how distribution of sculpin may have changed in the last 100 years. The change in habitat from flowing water to a reservoir in lower Blowout and Box Canyon Creeks may have displaced a complete population of sculpin.	The construction of Detroit Dam.	See aquatic insects above.	See aquatic insects above

III. BIOLOGICAL DOMAIN

C. Animal Species and Habitats - Wildlife

1. Characterization: *What is the relative abundance and distribution of species of concern that are important in the watershed (e.g., threatened or endangered species, special status species, species emphasized in other plans)? What is the distribution and character of their habitats?*

Sensitive Species:

Peregrine Falcon (Falco peregrinus anatum): The peregrine falcon was recently removed from the endangered species list and is now considered on the Region 6 sensitive species list. There is one known peregrine falcon eyrie and 5 potential sites within the Blowout Watershed. There is an active eyrie adjacent to the watershed boundary. The falcons using this site probably utilize a portion of the Blowout watershed for foraging.

Several cliffs and rock outcrops exist in the Blowout. Falcons feed primarily on small birds above the forest canopy and in openings. Blowout's diverse landscape, consisting of a patchwork of forested areas interspersed with openings, provides the habitat for the birds that peregrines prey upon. This landscape also provides numerous foraging opportunities for falcons.

The goal for the Peregrine Falcon Management Unit, which includes this watershed, as well as, the rest of the Willamette National Forest, is two stable pairs of falcons. In 1998 there were 12 established peregrine falcon pairs on the Willamette National Forest and this number has been increasing yearly. This is well over the established goal of two stable pairs.

Threatened Species:

Northern Bald Eagle (Haliaetus leucocephalus): Bald eagles generally prefer stands of large trees, near substantial bodies of water, for nesting and foraging. Most of the larger streams in the Blowout watershed have sufficient amounts of this type of habitat, adjacent to them, to be useable by bald eagles. There have been sightings of bald eagles along Blowout Creek and scattered throughout the watershed, however, there are no known nesting sites in this watershed.

The Willamette Basin Bald Eagle Management Zone (Zone 12), which includes the Detroit Ranger District and Blowout Watershed, has a recovery population goal of 25 breeding pairs and a habitat management goal of 42 pairs. There are currently 12 occupied sites on the Willamette National Forest in this zone.

Two of the Forest's twelve bald eagle sites are located on the Detroit Ranger District, no nest sites are located in Blowout watershed, but approximately 600 acres of the Detroit Reservoir Bald Eagle Management Area lies within the watershed. (Map #19)

Northern Spotted Owl: There are 14 known pairs of spotted owls and five resident singles whose activity centers are located within the Blowout Watershed. An additional four pairs and one resident single on the Detroit R.D. have home ranges that overlap into the watershed. Of the pairs and resident singles whose activity centers are located entirely within or overlap into the watershed, 18 are considered in a "take" situation.

Generally suitable nesting, roosting and foraging habitat is highly fragmented within the eastern half of the watershed. In contrast, the western half of the watershed has a large, nearly contiguous areas of nesting, roosting and foraging habitat that is located in the Box Canyon subdrainage. (Map #20)

Box Canyon is part of a larger Late Successional Reserve #R0213 designated by the Record of Decision for the Northwest Forest Plan. A little more than half (56%) of this subdrainage is suitable nesting, roosting and foraging habitat.

Blowout WA
Bald Eagle Management Area

Legend

Bald Eagle Management Area

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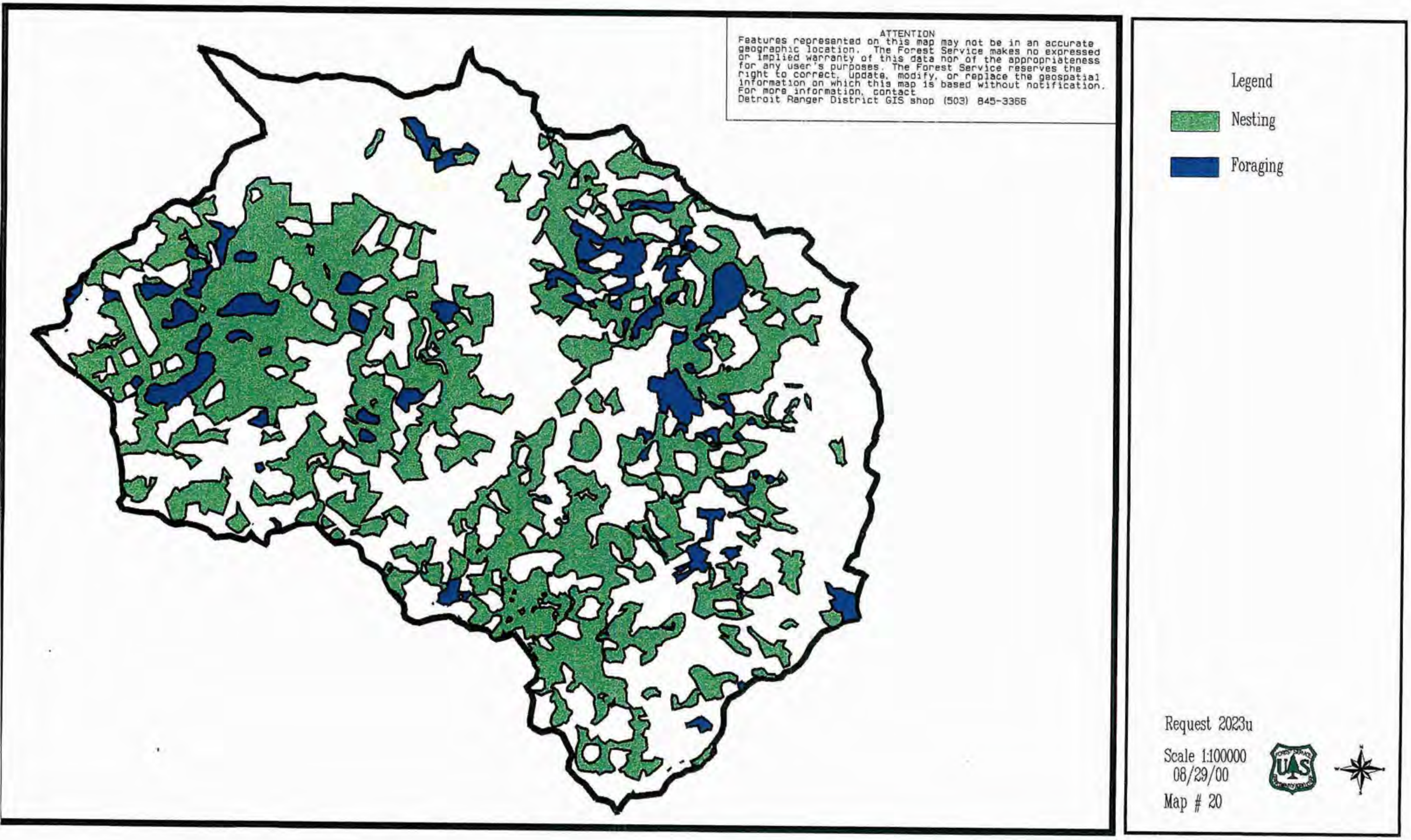
Map # 19

Blowout WA
Spotted Owl Habitat



Suitable Nesting, Roosting, and Foraging (NRF) Habitat			
Remaining within Home Range Pair Name	**Habitat acres within 0.7 miles**	**Habitat acres within 1.2 miles**	**Take Yes or No**
Box Canyon	698	1792	N
Low Blow	313	1008	Y
Lower Kay	344	993	Y
Blowout SOHA	531	1443	N
Bonk	457	1617	Y
Mustache	630	1504	N
Rainbow **	366	795	Y
Blowout Creek	359	980	Y
Pinhead	338	982	Y
Lucky	373	840	Y
Tomboy **	300	436	Y
Buck Mountain **	182	492	Y
Cub Point	435	930	Y
Lost Creek	287	869	Y
Bagel	743	1615	N
Cliff Creek	408	1257	Y
Kay Kapers	397	879	Y
Divide	287	739	Y
Sauer **	267	359	Y
Lucky Butte	504	1338	N
Heater	556	1554	N
Swinger *	446	1082	Y
Heater Creek * **	177	583	Y
Blowout Cliff *	37	330	Y

* New pair or resident single since 1994.
** Activity Center outside of watershed, Home Range overlaps into watershed.
Acres do not include privately owned lands.

The **Endangered Species Act (ESA)** directed the U.S. Fish and Wildlife Service to establish *Critical Habitat Units* (CHU) for the northern spotted owl. The Critical Habitat Units are areas where physical and biological features have been identified as essential to the conservation of the species and that may require special management considerations or protection. They were established to play a role in maintaining a stable and well-distributed population of northern spotted owls over their entire range.

A *critical habitat unit (CHU OR-14)* is located in the Blowout analysis area and was established along the western edge of the Western Cascade Province to provide essential nesting, roosting, foraging, and dispersal habitat for owls. The U.S. Fish and Wildlife Service needs to be consulted for all planned activities within the critical habitat unit.

Areas of Concern for management of the northern spotted owl were identified in the **Final Environmental Impact Statement on Management for the Northern Spotted Owl in the National Forests** (January 1992). These areas encompass portions of the northern spotted owl's range that pose a high risk of isolating owl populations, or that act as critical links or barriers between populations. A small portion of the *Santiam Pass Area of Concern* passes through the southern part of CHU OR-14 in the Blowout analysis area. This area was identified because of deficiency in habitat connectivity, poor distribution and quality of existing nesting, roosting, and foraging habitat and a high level of fragmentation. For these reasons, the importance of maintaining and improving owl nesting habitat in CHU OR-14 in this area is elevated.

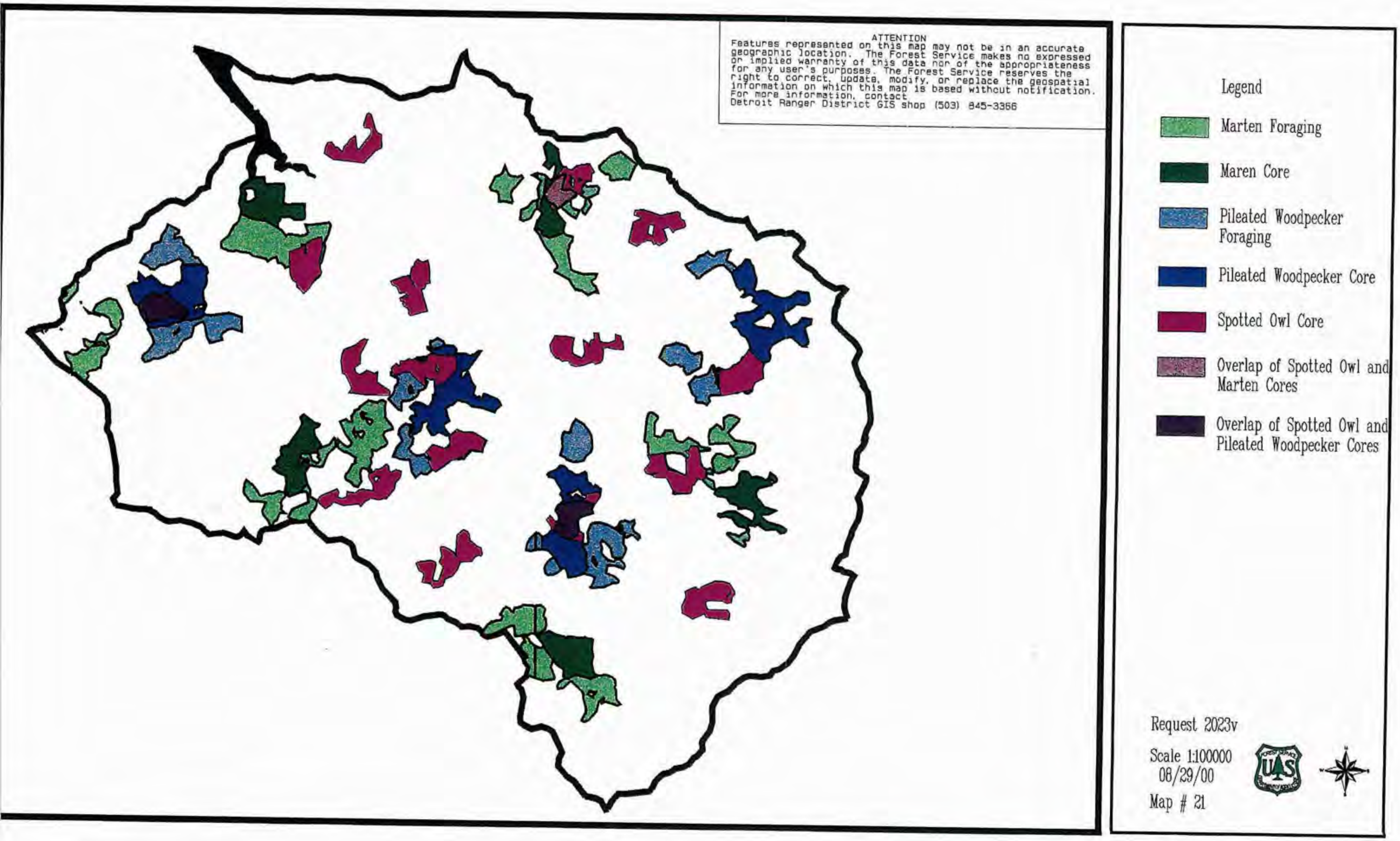
The **Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl** (1994) also included a *Riparian Reserve system* that was designed in part to benefit terrestrial species, including the northern spotted owl. The specific issue intended to be addressed in these areas for the spotted owl is the retention of adequate habitat conditions for dispersal.

When adequate dispersal habitat is not yet available in the riparian reserves, it could eventually be attained through riparian manipulation to develop desired dispersal characteristics. Until the desired characteristics are attained, however, some alternate dispersal habitat has to be made available. Areas that have been delineated, such as pileated and pine marten areas, can be retained for use as dispersal habitat in some areas while the 11-40 rule, which was established by the Interagency Scientific Committee's Conservation Strategy for the Northern Spotted Owl, can be implemented in other areas. (Map #21)

The 11-40 rule was established to assure that adequate dispersal habitat and options to apply adaptive management are available in the forest matrix land. The rule states in every quarter township, timber harvest shall be permitted only when 50% of the forest landscape consists of forest stands with a mean diameter breast height (dbh) of 11

Blowout WA

Pileated Woodpecker, Pine Marten and Spotted Owl Areas



inches and a canopy closure of 40 percent. All land-use allocations on forest lands within the quarter township count toward meeting this rule.

The Blowout watershed encompasses all or portions of 11 quarter townships. With the exception of two of these quarter townships that fall below the 50% threshold, the rest exceed the 50-11-40 rule.

Survey and Manage/Protection Buffer Species

Survey and manage measures apply within any land allocation within the range of the Northern Spotted Owl. The Northwest Forest Plan provides standards and guidelines that will provide benefits to amphibians, mammals, bryophytes, mollusks, vascular plants, fungi, lichens, and arthropods. The survey and manage provision for each species will be directed to the range of that species and the particular habitats that it is known to occupy. Standards and guideline are listed in Appendix C-5 of the Northwest Forest Plan and Table C-3 at the end of Appendix C shows the entire list of species covered by the standards and guides. As of the date of this Watershed Assessment, few surveys have been accomplished in the Blowout watershed because of the limited number of ground-disturbing projects implemented in the short time since the standards and guides were to have taken effect. As surveys are done for survey and manage species whose ranges overlap the Blowout Watershed, more information will be known about their occurrence and abundance in the watershed. A small amount of information is known about the red-tree vole as described below.

Red-tree Vole (Arborimus longicaudus) – Survey and Manage

The size of the population of the red tree vole in the Blowout watershed is unknown at this time. The vole is an important prey species for the spotted owl, as well as, other raptors, martens, and fishers. It tends to be more abundant in mature and old-growth stands, which provide optimum habitat. Fragmentation of old-growth is a concern for this species.

The red tree vole is a Table C-3, category 2 species, which directs the agency to survey prior to initiating habitat disturbing activities and manage sites. A forest-wide assessment was completed in October, 1996 and concluded that the fifth field watershed, which encompasses the Blowout analysis area, had suitable red tree vole habitat in 57% of the area. Because of the amount of habitat available, a decision was made at the Forest level that surveys for the red tree vole would not be required and no mandatory management requirements would exist.

Court interpretations now direct the agency to conduct surveys when suitable habitat will be affected.

Canada Lynx – Protection buffer and Scientific Analysis Team recommendations.

Habitat Components - Lynx were discovered to occur on the Willamette National Forest after sampling efforts during the summer of 1998. More extensive surveys in 1999 detected only bobcats in Oregon. Very little is known concerning their habitat use patterns in Oregon. Lynx are expected to occur above 3500' elevation and to be associated with snowshoe hare populations. Habitat modeling and survey techniques are currently being developed to learn more about the species. Surveys for 1998, 1999 & 2000 were designed to meet survey and manage requirements as defined by the Northwest forest plan.

Lynx Analysis units are being developed with the U.S. Fish and Wildlife Service at this time. These areas will be managed to provide habitat components used by Canada Lynx. The eastern and southeastern edges of the blowout watershed is within a proposed Lynx analysis unit.

Mollusks – Survey and Manage

Habitat Components - Four species of mollusks listed as survey and manage species are suspected to occur on the Detroit ranger district. Determining habitat preferences and ranges of these species is a component of survey and manage requirements. These species are expected to occur in conifer forests with hardwood components. Mosses, leaf litter especially near hardwood logs, ferns and areas under shrubs are key features used by these mollusks. Survey protocols have been developed for terrestrial and aquatic mollusk species. More detailed expected habitat requirements for these species are listed in the protocol.

Survey Requirements: Table C-3, Survey Strategy 2 - Survey prior to ground-disturbing activities. Extensive surveys have not been conducted in the Blowout watershed.

Great Gray Owl - Survey and Protection buffers

Habitat Components - Their main prey items in the western U.S. are primarily voles and pocket gophers. Great grays tend to forage in meadows and other openings, including human created openings which contain prey. Great grays nest in mature or old growth conifer forests or forests with remnant older trees or snags. Nest stands typically have >60% canopy cover with an open understory.

Survey Requirements: Survey suitable habitat within 1.2 miles from all potentially disturbing or habitat altering activities. Suitable habitat has 4 components for Northwest forest plan ROD requirements: 1) Within the range of the northern spotted owl. 2) At elevations above 3000 feet. 3) Within mature stands (80+ yrs) with greater than 60% canopy cover: and 4) Within 1,000 feet of a natural meadow larger than 10 acres.

Coffin mountain and the headwater area of Blowout and Straight Creeks are the only areas in the Blowout drainage with habitat as defined above.

Other Species (Game Species, etc.)

Big Game: Wisdom Model analysis was done for habitat conditions within the Blowout Watershed. The analysis was done individually for each Big Game Management Emphasis Areas in the watershed. The suitability of habitat for big game is affected not only by the vegetation that exists but also by the topography. The topography of the Blowout watershed varies greatly from flat to very steep slopes and cliffs. Steeper slopes are utilized less by big game. Topography is not taken into account by the Wisdom Model.

Current HE Values for Management Emphasis Areas Within the Blowout Watershed

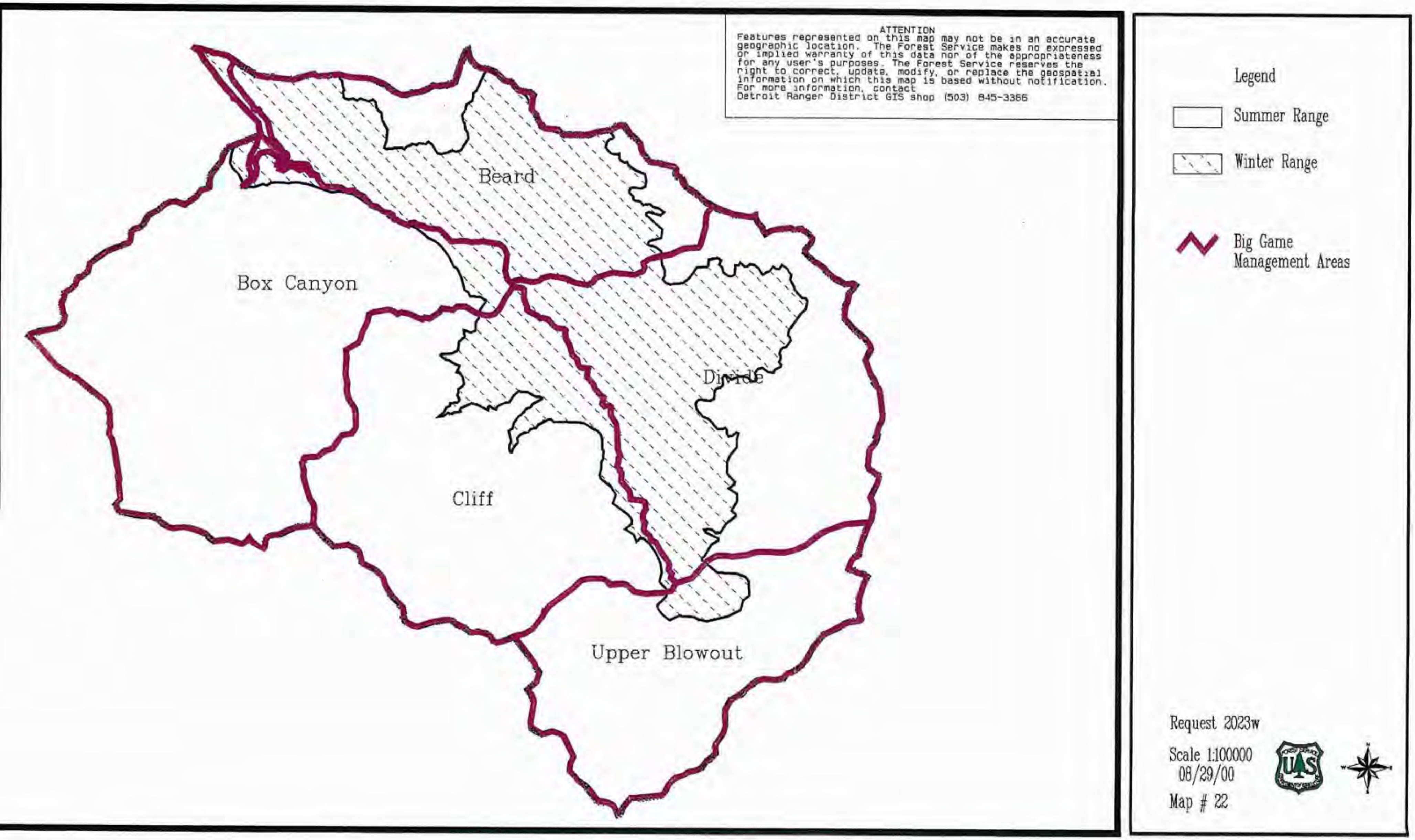
Management Emphasis Area		Objective HE Value	Current HE Values				
			HEs Size and Spacing	HEr Road Densities	HEc Cover	HEf Forage	HEI Overall
Beard	Winter Range	>0.6	0.95	0.28	0.35	0.34	0.42
	Entire Area	>0.6	0.95	0.25	0.34	0.36	0.41
Box Canyon	Winter Range	>0.6	0.66	0.45	0.29	0.05	0.26
	Entire Area	>0.4	0.90	0.44	0.49	0.31	0.50
Cliff	Winter Range	>0.6	0.84	0.26	0.25	0.42	0.39
	Entire Area	>0.4	0.94	0.34	0.41	0.35	0.46
Divide	Winter Range	>0.6	0.91	0.23	0.38	0.48	0.44
	Entire Area	>0.4	0.94	0.29	0.34	0.44	0.45
Upper Blowout	Winter Range	>0.6	0.97	0.46	0.52	0.18	0.46
	Entire Area	>0.6	0.96	0.26	0.34	0.36	0.42

1.0=Optimal, 0.6-0.9=Highly Viable, 0.4-0.5=Viable, 0.2-0.3=Marginal

The spatial arrangement of the various habitat types (foraging, hiding cover, and thermal cover) is important, juxtaposition and size of the habitat types affects the suitability of the habitat for use by big game. The physical arrangement of habitat types, in the various Management Emphasis Areas (MEA's), is excellent in all except winter range in Box Canyon and Cliff MEA's, although these are still above the objective values established in the Willamette National Forest Land Management Plan Standards and Guidelines. (Map #22)

Blowout WA

Elk Emphasis Areas with Summer and Winter Range



Road densities are high in all of the Management Emphasis Areas. Open roads are a source of disturbance for calving cows and does, and affect how big game utilize an area when feeding. Current road densities are above those recommended in the Forest Plan Standards and Guides. Open roads also increase the pressure on big game from hunters, because many areas more easily accessed.

The availability and proximity of cover affects how big game utilize an area. Cover comes in two types; hiding and thermal. Hiding cover is needed year round to minimize the effects of disturbance. Thermal cover is of particular importance during the winter to provide the animals protection from snow, wind and low temperatures. The analysis for cover does not differentiate between these two types in the model. With the exception of Cliff and Box Canyon MEA's, all areas are marginal with respect to the amount of cover they provide.

Forage tends to be a major limiting factor for big game. All areas, with the exception of Divide MEA, are significantly below standards. Notably, Box Canyon (Winter Range) and Upper Blowout (Winter Range) are below even the marginal range for forage.

The overall HEI values for these management areas tends to be below standards and guidelines with the exception of Cliff (Entire), Box Canyon(Entire), and Divide (Entire). Generally, the HEI values fall in the marginal range.

Others

The following is a list of species, not previously mentioned, that have potential habitat within the watershed. An * next to a species denotes species seen in the watershed through observations by District personnel.

Region 6 Sensitive Species which occur on the Willamette National Forest

Red-legged Frog*
Northwestern Pond Turtle
Harlequin Duck*
Greater Sandhill Crane
California Wolverine
Townsend's Big-eared Bat
White-footed Vole
Invertebrates
Spotted Frog
Peregrine Falcon*

Management Indicator Species

Northern spotted owl*
Pileated Woodpecker*
Pine Marten
Bald Eagle*
Peregrine Falcon*
Deer and Elk*
Cavity Excavators*

ODFW Sensitive Species List (December 1997)

-CRITICAL-

Oregon Spotted Frog	Western Pond Turtle
Northern Goshawk	Ferruginous Hawk
Flammulated Owl	Northern Pygmy Owl
Common Nighthawk	Lewis' Woodpecker
White-headed Woodpecker	Three-toed Woodpecker
Black-backed Woodpecker	Purple Martin
Yellow-breasted Chat	(Oregon) Vesper Sparrow
Sage Sparrow	Western Meadowlark
Townsend's Big-eared Bat	Fisher

-VULNERABLE-

Cascade Seep Salamander	Tailed Frog
Western Toad	Northern Red-legged Frog
Foothill Yellow-legged Frog	Cascades Frog
Western Rattlesnake	Greater Sandhill Crane
Great Gray Owl	Pileated Woodpecker
Olive-sided Flycatcher	Willow Flycatcher
Western Bluebird	Loggerhead Shrike
Fringed Myotis	Pallid Bat

-PERIPHERAL OR NATURALLY RARE-

Black Swift	Black Rosy Finch

-UNDERTERMINED STATUS-

Oregon Slender Salamander	Northern Red-legged Frog
Harlequin Duck	Barrow's Goldeneye
Bufflehead	Mountain Quail
Boreal Owl	Bank Swallow
Silver-haired Bat	Western Small-footed Myotis
Long-eared Myotis	Long-legged Myotis
Western Gray Squirrel	White-footed vole

Snags and Down Woody Debris

Snag densities vary by sub-basin in the Blowout Analysis Area. Variation occurs mainly because of past fire history, fire prevention strategies, timber harvest and windstorms. In the past, snags were felled because they were considered hazards because they were susceptible to lightning strikes. In addition managers left few or no snags in harvest units. Furthermore, Occupational Health and Safety Administration (OSHA) requirements to fall snags that pose a hazard to workers resulted in reduced snag levels in harvest units. Finally, the windstorm of 1990 caused catastrophic blowdown which decreased snag levels, but increased down woody debris levels.

Blowout WA
Snag Levels

Standard and Guideline FW-122 states that "habitat capability for primary cavity excavators shall be maintained to provide for at least 40% or greater potential populations". Using the Snag Model, it was determined that six out of nine sub-basins within the Blowout Analysis Area are below recommended levels of this standard and guideline.

Standards and Guidelines also specify down woody debris prescriptions for different plant associations. In the past there were no standards to maintain down wood in harvest units, so many older harvest units are devoid of down woody debris. Only logs that were classified as "cull" were retained. Recruitment of down woody debris within these units currently occurs around the harvest unit perimeter, in areas where there is timber of sufficient size and maturity (Map 24). In mature, natural timber stands, down woody debris recruitment occurs on an on-going basis so there is an almost continuous supply. Past heavy salvage has resulted in the local losses of the down woody debris habitat component in areas such as roadsides, older harvest units, and on easily accessible terrain. Roadside gathering of firewood may further reduce down woody debris where there is not currently excess down woody debris to meet standards and guidelines. .

2. What Values Are Associated With Wildlife Species And Their Habitats?

a. Species and habitats have aesthetic, economic, recreational, and spiritual value.

b. Native wild gene pools have ecological value.

c. Native species have value to ecosystem function.

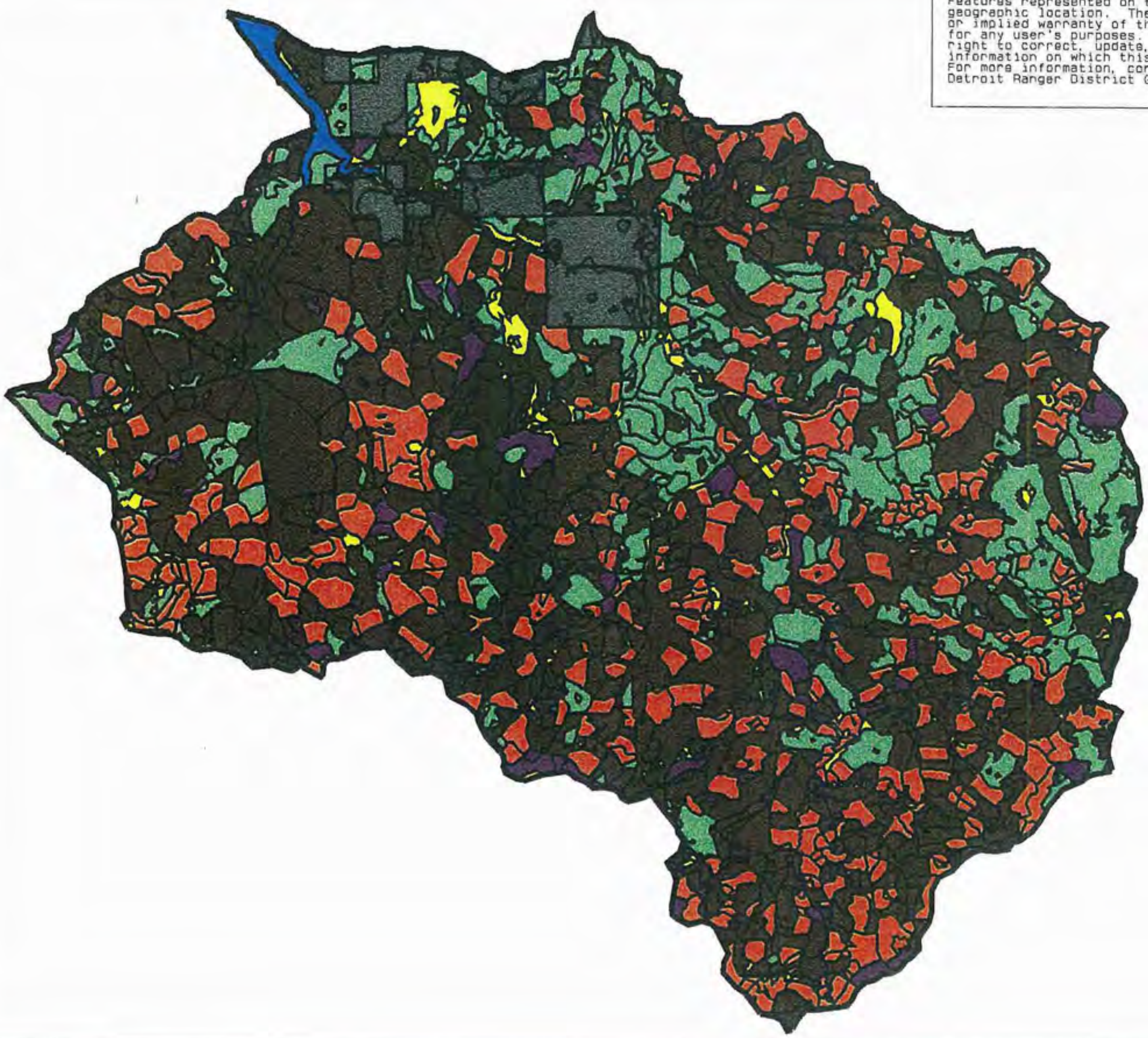
d. Habitat components necessary to sustain the variety of species indigenous to the area has ecological values (i.e. habitat distribution, connectivity, etc.)

3. What Are The Highest Priority Issues Or Resource Concerns Associated With Wildlife Species And Their Habitats?

a. Having habitat components necessary to sustain a variety of species native to the area.

b. Conflicting habitat needs for various species (i.e. big game and spotted owls).

Blowout WA
Down Wood Material Levels



ATTENTION

Features represented on this map may not be in an accurate geographic location. The Forest Service makes no expressed or implied warranty of this data nor of the appropriateness for any user's purposes. The Forest Service reserves the right to correct, update, modify, or replace the geospatial information on which this map is based without notification. For more information, contact Detroit Ranger District GIS shop (503) 845-3366

Legend

- High
- Medium High
- Low Medium
- Low
- Non Forest
- Private
- Detroit Lake

Request 2023y

Scale 1:100000
08/29/00

Map # 24

4. What are the management direction/activities, human uses, or natural processes that affect wildlife species and their habitats?

a. Current Conditions: *What are the current habitat conditions and trends for species of concern identified above?*

Threatened Species

Northern Spotted Owl: Currently, approximately 39% of the Blowout Watershed is in suitable nesting, roosting, or foraging habitat for the northern spotted owl. Past harvest practices have resulted in a fragmented landscape with stands of suitable owl habitat being isolated from each other in the eastern portion of the watershed, but habitat is more contiguous in the western portion of the watershed.

Population trends are uncertain, it appears that there is a decrease in the numbers of spotted owls in matrix lands over historic levels.

Northern Bald Eagle: Habitat for this species is adequate along Blowout Creek.

Past management activities, such as timber harvest, have reduced the amount of habitat available for this species. Construction of Detroit and Big Cliff dams has eliminated the anadromous fish runs that provided a larger prey base for this species. Removal of vegetation that shades the streams reducing their suitability as fish habitat may have also affected the available of prey base.

Flood events may have rearranged the coarse woody debris in the stream courses, thus impacting fish habitat. Flood events could also, in the short term, decrease the shading effect of streamside vegetation. In addition, fires can remove those stand structures used for nesting, roosting, and perching.

The population of bald eagles has been increasing and should continue to do so, although the prey base will be a limiting factor.

Sensitive Species

***Peregrine Falcons*:** Current habit conditions are good. Habitat is limited primarily by the number of cliffs and rock outcrops that have suitable nesting ledges. Habitat for prey species appears to be satisfactory.

Management activities have likely affected peregrine foraging opportunities. Openings from harvest units interspersed within patches of standing trees may have increased habitat conditions for prey species.

Other human use has had little effect on habitat condition.

Weathering affects the cliffs and rock outcrops that are used for nesting by creating or removing ledges. Fire and flood events could remove the habitat utilized by prey species.

This species has been showing an increase in it's population locally and throughout it's range. Currently it is being considered for de-listing.

Survey and Manage Species

Red Tree Vole: Currently there is more than an adequate amount of habitat available for this species in the watershed.

Management activities, such as timber harvest for commodity production, have reduced the amount of habitat available for this species, but not to a critical level. Management direction is to not further reduce the amount of available habitat.

Stand replacing fires can also reduce the amount of habitat. These types of fires seem to be limited in this watershed.

Trends for this species are currently unknown.

Habitat – Late Successional Reserve (LSR)

Approximately 20% of the Blowout watershed is comprised of the Quartzville Late Successional Reserve, identified as LSR-R0213 (see the Mid-Willamette Late Successional Reserve Assessment, August 1998).

Current Condition description: Current vegetation conditions within the Quartzville LRS are: 5% non-forest, 23% early seral, 15% early-mid seral, 5% mature, and 48% old growth. Late-successional forest, which includes the mature and old growth seral states represents 53% of the Quartzville LSR with 30% of the LSR considered to be interior forest habitat. There has been approximately a 32% decrease in late-successional forest in the area of the Quartzville LSR compared with conditions in the mid- 1900's. Currently, about 49% of the Quartzville LSR is considered to exhibit low fire risk, 49% moderate, and 1% high.

Objective: The objective is to maintain existing connectivity and interior forest. Aggregate treatments to promote large patches of developing late seral forest.

Treatment Recommendations: Any stand that appears to be on the right trajectory to reach potential late-successional forest habitat should not be treated. Priority for treatment would be in the early and early-mid seral stands to maintain existing dispersal habitat and connectivity within the block. A mix of treatment options should be used in this block. Multiple entries may be necessary to maintain canopy coverage in early to mid-seral stands. Treat no stands exceeding 80 years in age. Assess and protect mid-seral stands that are functioning as connectivity habitat. Buffer interior forest when doing commercial thinning treatments.

Other Species (Game, etc.)

Big Game: Current habitat conditions are below Forest Plan standards and guidelines.

Timber harvest, road construction and fire suppression have affected big game habitat. Tree harvest has resulted in the removal of thermal and optimal cover while increasing the amount of forage, in the short term. Over time, forage converts to hiding cover and given enough time, back to thermal cover. Many of the harvest units in the Blowout have grown out of the forage stage and back into hiding cover, so now forage is a limiting factor, as well as, thermal cover.

In addition, fire suppression has reduced the acreage burned over natural conditions, thus affecting the amount of available forage as well.

Road access to harvest units, has resulted in a transportation network that is beyond recommended road densities for big game. Traffic as a result of the roads, affects disturbance of big game. This is especially important during the critical winter months when the extra energy exerted by the disturbed animal cuts into its reserves for the winter ahead. In an attempt to reduce big game disturbance, many of these roads are closed to public access during winter months and some are closed year round.

Current conditions were likely not heavily influenced by natural processes.

Big game populations appear to be relatively stable now.

***b. Reference Conditions**: What was the historical relative abundance and distribution of species of concern and the condition and distribution of their habitats in the watershed?*

Sensitive Species:

***Peregrine Falcon**:* Most likely there was a larger population of peregrine falcons than currently exists. With more birds around, they probably occupied more of the potential habitat than is currently occupied. Because of the nature of nesting habitat required by peregrines, overhangs and rock ledges, the quantity of habitat has changed very little over time.

Threatened Species:

Northern Spotted Owl: There was probably a larger population of northern spotted owls in the past than currently exists and their distribution across the landscape was likely different because of fires and without the influence of timber management.

The character of spotted owl habitat was similar to current conditions, in that they utilized late successional stands with multi-layered canopies, but the distribution of the habitat was most likely in larger patches of suitable nesting, roosting and foraging habitat separated by large patches of unsuitable habitat that had been removed by fire events.

Northern Bald Eagle: The bald eagle was most likely more abundant and more widely distributed in the major watersheds in the past due to availability of prey species. Without dams to block fish migration, more anadromous fish were available as a food source. It could be that habitat conditions were a factor as well.

Survey & Manage Species:

Red Tree Vole: It is uncertain whether the relative abundance of red tree voles is different now than in the past. It is likely that there were more voles in the past than currently exist. The character of their habitat was probably similar to current habitat character, although it would have occurred in larger patches than it does now. Fires would have influenced habitat distribution.

Other Species (Game, Etc.)

Big Game: Historic abundance of big game is uncertain. Depending on who you talk to the populations of big game were either higher or lower than current levels. The character of habitat was probably different than currently exists. Unlike today's habitat character with many smaller openings, resulting from timber harvest, that are fairly evenly distributed across the landscape, there were probably fewer, larger fire-created openings occasionally interspersed with larger blocks of intact forest.

c. **Comparison of Current and Reference Conditions:** *What are the natural and human causes of change between historical and current species distribution and habitat quality for species of concern in the watershed?*

What is the change between historical and current *species distribution?*	What was the natural or human cause of change?	What is the change between historical and current *habitat quality?*	What was the natural or human cause of change?
Threatened Species			
Spotted Owl – likely decrease in populations and distribution of species from historic levels.	- loss and fragmentation of nesting, roosting and foraging habitat due to timber harvest.	- similar type of habitat used but distribution was different. Historically habitat patches were lager in size and were separated by patches of unsuitable habitat that had been removed by fire events.	- timber harvest increased fragmentation. - fire suppression affected size of patches between suitable habitat blocks.
Bald Eagle – decrease in distribution from historic levels.	- loss of prey species due to dam construction - reduction of habitat by timber harvest.	- loss of large trees adjacent to water. - fewer large fish, especially salmon and steelhead as food source.	- timber harvest - dam construction
Endangered Species			
Peregrine Falcon – Decreased in populations and species distribution from historic levels.	- chloro-florocarbon based pesticides	- habitat quality changed little. It is determined by cliffs and rock outcrops with suitable nesting ledges.	- weathering of cliffs and rock outcrops.
Survey & Manage Species			
Red Tree Vole – change unknown probably decrease in population levels.	- fragmentation and loss of habitat due to timber harvest practices.	- quality of habitat is similar.	
Other Species (Big Game)			
Big Game – change uncertain.	- increased human presence due to road construction. - distribution of harvest units or fire events across the landscape.	- little change in quality. - possible change in availability of forage.	- fire suppression - tree planting

IV. SOCIAL DOMAIN

A. Scenic Quality

1. Characterization

Compared to other areas on the district, the Blowout watershed is not valued as a highly scenic landscape. A few scenic features come to mind in the watershed including Blowout arm of Detroit Lake, Blowout Cliffs, Pinnacle Peak and Coffin Mountain, but overall the scenery is not spectacular. Much of the landscape lacks diversity and interesting topographic features found elsewhere on the district. Attesting to this, only about two percent of this watershed lies in scenic management allocations. The only scenic allocations in the watershed are located in the vicinity of Detroit Lake in the northwestern portion of the watershed. Also, Coffin and Pinnacle Peak Special Interest Areas are managed to meet higher quality scenic objectives.

The small scenic area near Detroit Lake is part of the larger North Santiam Viewshed, which covers a broad expanse of the district. The Forest Plan directs that the North Santiam Viewshed be managed for a high level of scenic quality. However, with the diverse land ownership within the viewshed, it makes achieving overall scenic quality more difficult.

2. *What Values Are Associated With Scenic Quality?*

a) Scenery has aesthetic, spiritual and economic value.

3. *What Are The Highest Priority Issues Or Resource Concerns Associated With Scenic Quality?*

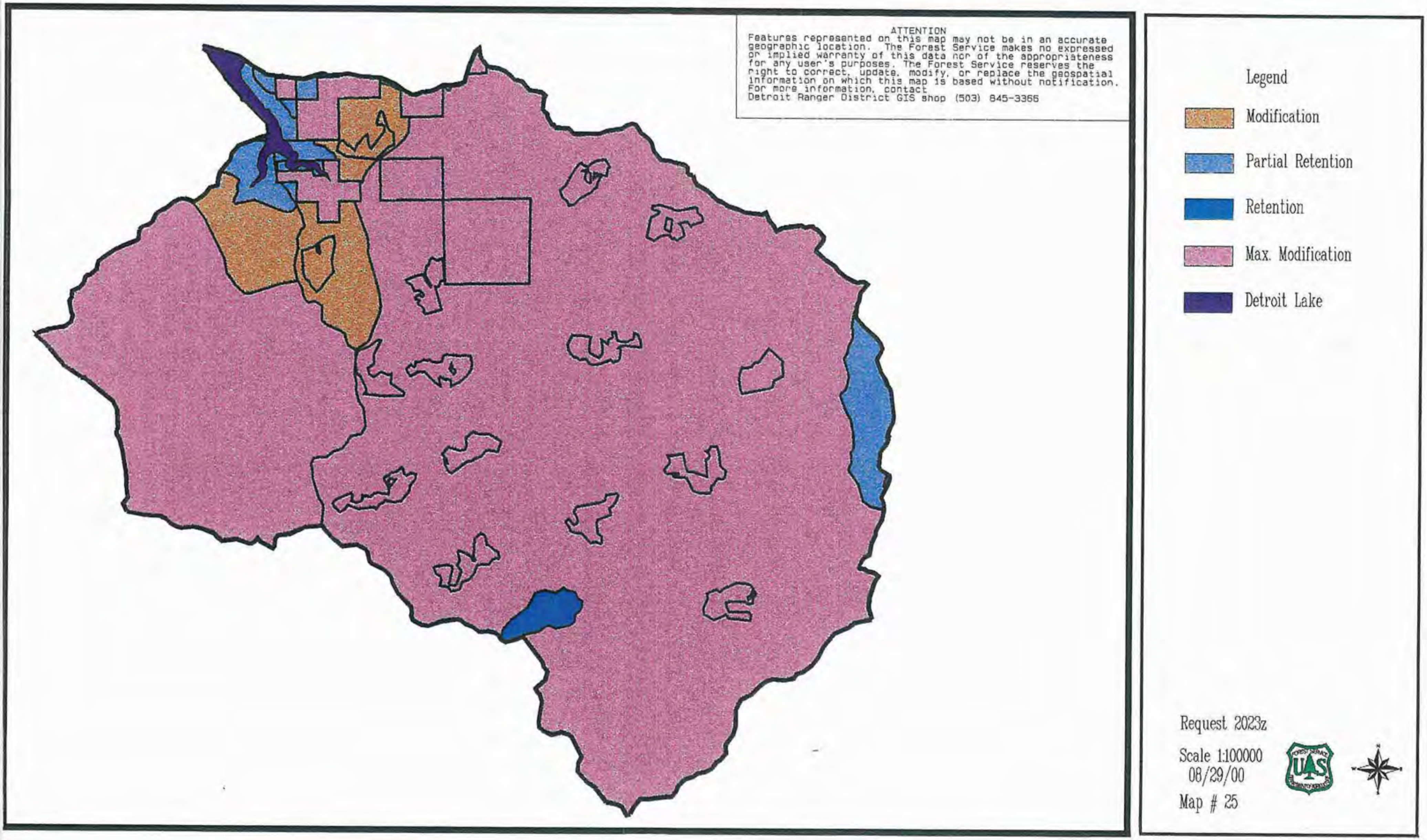
a. Management activities, primarily timber harvest and road construction have altered the landscape and changed the scenic quality of the watershed from pre-settlement conditions.

b. Given existing vegetation patterns and land allocations, an important issue is the management of the landscape to maintain and/or enhance the inherent beauty of the North Santiam Viewshed. In some places, current land allocations do not meet the intent of scenic resource management.

c. Some private lands in the watershed are managed intensively for timber production, without consideration of the scenic sensitivity of the surrounding area. People often confuse these lands as being federally owned.

d. An important issue to reservoir users is preservation of the scenic backdrop of Detroit Lake, an important aspect of Detroit's tourism and economic interest.

Blowout WA
Visual Quality Objectives



Detroit Lake is a prominent scenic attraction within a portion of this watershed. Approximately 198.5 acres of land surrounding Detroit Lake is owned by Army Corps of Engineers (COE) or are Forest Service lands withdrawn for COE purposes. The Forest Service administers these lands, however, no formal standards and guidelines have been developed for these areas within the Forest Plan. These lands are an important scenic resource and should be managed to maintain Visual Quality Objectives of retention to partial retention.

There are areas within the North Santiam Viewshed that are inconsistent with scenery management principles set forth by new handbook direction. For example, some middleground land visible from Detroit Lake currently has a modification visual quality objective and meets all the criteria for partial retention management. Detroit Lake is a visually sensitive area due to the amount and nature of use it receives, and expansive views from the lake surface. In some areas, land allocation designations were not applied from the perspective of the lake. On the other hand, there are also areas within the Viewshed that are not visually sensitive due to their juxtaposition within the landscape, and currently have a designated scenic allocation.

Existing Visual Condition Analysis by Management Area: At this time 20 percent of the analysis area is composed of stands in an early-seral stage with seedling and sapling size trees. About half of the watershed is in a mid-seral stage with pole and small size tree classes, primarily harvested in the 1960's and 1970's. Another 27 percent of the area contains a mix of medium to large size trees in a late seral stage. Four percent of land is non-forested such as lakes and meadows. With the high percentage of relatively young stands, the geometrical character along with the strong horizontal lines from cut and fill slopes, create a landscape that would appear Heavily Altered (*see table on page 4*).

The Late Successional Reserve (LSR) in Box Canyon Creek ranges from Slightly Altered to Heavily Altered. Harvest activities occurred in this portion of the Blowout Analysis Area over the last decade which contributed to an existing disturbed condition of 23 percent.

Blowout Visual Condition – Current

					Early Seral	MidSeral		Late Seral			
Mgmt. Area	**Harvest Rate Objective (%)**	**Current Decade Harvest Rate**	**Max. Disturbed Condition (%)**	**Existing Disturbed Condition (%)**	**Seedling Sapling (acres)**	**Poles (ac.)**	**Small Trees (ac.)**	**Med. Trees (ac.)**	**Old Growth /Large Trees (ac.)**	**Non-Forest (acres)**	**Total Acres**
5a	0		0	4	8	8	8	135	33	19	211
10b	7		14	2	10	72	411	8	1	28	530
11a	12	0	24	3	183	100	529	149	790	146	1,897
11c	103	0	20	3	19	12	212	23	106	14	386
13b	0		0	0	0	0	3	0	0	0	3
14a	13		26	22	6,507	5,255	8,544	3,787	4,065	875	29,038
Private	N/A		N/A	5	74	314	1,018	22	2	156	1,586
COE	12		24	0	0	8	145	1	0	15	169
Lake	N/A	N/A	N/A	N/A						188	188
LSR				23	1,604	668	2,280	770	1,390	165	6,877
Total					6,801	5,769	10,870	4,125	4,997	1,441	34,008
Percent					20%	17%	32%	12%	15%	4%	100%

Although harvest activities are currently consistent with Forest Plan standards, the sizes, arrangements, and geometric character of treatments over the past forty years has had a lasting effect on the scenic quality of the area. The visibility, distribution and concentration of various treatments in contrast with older uncut stands contributes significantly to the current quality of the scenic resources. The Existing Visual Condition of the landscape in Blowout can be described as Moderately to Heavily Altered.

North Santiam Viewshed Condition Analysis: The Forest Plan's goal for scenic management areas are to "maintain desired visual characteristics of the forest landscape through time and space." Achieving long-term visual quality goals in a forest environment works in direct proportion to how well time and space are managed. Time sequence over a landscape involves combinations of old growth and younger age classes. This provides visual variety but will shift in location as trees are harvested and new ones grow to take their place. Planning this dynamic situation through space and time is important to achieve an attractive sequence of views. To address the time and space component, maximum disturbance rates and harvest rate objectives for each allocation was assigned to each subdrainage to determine area available for harvest over the landscape *(see chart on following pages)*.

Overall existing disturbed condition for all Scenic allocations within the North Santiam Viewshed is consistent with Forest Plan Standards. Currently within the North Santiam Viewshed, MA-11f has met the maximum disturbed condition percentage, and no regeneration harvests can take place until this management area recovers. An analysis was completed looking at existing disturbed conditions within Blowout watershed by subdrainage to see how regeneration harvests were distributed. Only three Blowout subdrainages, 78i, 78s and 78t, lie within the North Santiam Viewshed, and all three are below maximum disturbed allowances. Most of 78t is now managed as a Late Successional Reserve, therefore no future regeneration harvests would be planned in the area. The most restrictive acreage between harvest rates and maximum disturbance allowances should be used as a guideline for planning future regeneration harvests in the Blowout in order to best distribute management activities (*see charts on following pages*).

Note: Those subdrainages that have existing disturbed condition and harvest rates shaded, have rates in excess of the standard within that allocation.

North Santiam Viewshed Condition Analysis

Mgmt Area/ Psub	HRO Harevest Rate Objective	EDC Existing Disturbed Condition (Forest Plan)	EDC Existing Disturbed Condition (NW Forest Plan)	MDC Maximum Disturbed Condition	Total Acres	Suited & Avail. (Forest Plan)	Suited & Avail. (NW Forest Plan)	Max Disturbed Allowed Acres (Forest Plan)	Max Disturbed Allowed Acres (NW Forest Plan)	Visually Disturb-ed Acres (Forest Plan)	Visually Disturb-ed Acres (NW Forest Plan)	MDC Avail. Harvest (Forest Plan)	MDC Avail. Harvest (NW Forest Plan)	HRO Acres Harvest Rate Objective Acres (Forest Plan)	HRO Acres Harvest Rate Objective Acres (NW Forest Plan)	Current Decade Harvest (Forest Plan)	Current Decade Harvest (NW Forest Plan)	HRO Avail. Harvest (Forest Plan)	HRO Avail. Harvest (NW Forest Plan)
11a	0.12	0.114	0.193	0.24	17810	12986	4894	3117	1175	1486	944	1631	231	1558	587	0	0	1558	587
03I	0.12	0.00	0.00	0.24	65	23	20	6	5	0	0	6	5	3	2	0	0	3	2
03J	0.12	0.10	0.11	0.24	1024	839	733	201	176	84	82	117	94	101	88	2	0	99	88
03K	0.12	0.00	0.00	0.24	241	218	192	52	46	0	0	52	46	26	23	0	0	26	23
03M	0.12	0.00	0.00	0.24	52	52	52	12	12	0	0	12	12	6	6	0	0	6	6
07U	0.12	0.47	0.40	0.24	1964	529	502	127	120	249	202	-122	-82	63	60	2	0	61	60
78B	0.12	0.00	0.00	0.24	877	489	348	117	84	0	0	117	84	59	42	0	0	59	42
78C	0.12	0.00	0.00	0.24	207	108	76	26	18	0	0	26	18	13	9	0	0	13	9
78D	0.12	0.26	0.61	0.24	1080	605	102	145	24	159	62	-14	-38	73	12	45	1	28	11
78E	0.12	1.83	0.00	0.24	140	35	0	8	0	64	0	-56	0	4	0	0	0	4	0
78F	0.12	0.04	0.06	0.24	1304	846	18	203	4	35	1	168	3	102	2	2	1	100	1
78G	0.12	0.15	0.18	0.24	703	434	301	104	72	66	55	38	17	52	36	1	1	51	35
78H	0.12	0.08	0.14	0.24	308	184	102	44	24	14	14	30	10	22	12	15	14	7	-2
*78I	0.12	0.03	0.04	0.24	816	611	429	147	103	16	16	131	87	73	51	0	0	73	51
78J	0.12	0.11	0.13	0.24	592	370	300	89	72	39	39	50	33	44	36	39	39	5	-3
78L	0.12	0.11	0.05	0.24	453	163	101	39	24	18	5	21	19	20	12	11	2	9	10

Mgmt Area/ Psub	HRO Harevest Rate Objective	EDC Existing Disturbed Condition (Forest Plan)	EDC Existing Disturbed Condition (NW Forest Plan)	MDC Maximum Disturbed Condition	Total Acres	Suited & Avail. (Forest Plan)	Suited & Avail. (NW Forest Plan)	Max Disturbed Allowed Acres (Forest Plan)	Max Disturbed Allowed Acres (NW Forest Plan)	Visually Disturbed Acres (Forest Plan)	Visually Disturbed Acres (NW Forest Plan)	MDC Avail. Harvest (Forest Plan)	MDC Avail. Harvest (NW Forest Plan)	HRO Acres Harvest Rate Objective Acres (Forest Plan)	HRO Acres Harvest Rate Objective Acres (NW Forest Plan)	Current Decade Harvest (Forest Plan)	Current Decade Harvest (NW Forest Plan)	HRO Avail. Harvest (Forest Plan)	HRO Avail. Harvest (NW Forest Plan)
*78S	0.12	0.00	0.01	0.24	764	614	399	147	96	3	3	144	93	74	48	0	0	74	48
*78T	0.12	0.02	0.00	0.24	679	380	2	91	0	6	0	85	0	46	0	0	0	46	0
78W	0.12	0.04	0.00	0.24	769	605	0	145	0	24	0	121	0	73	0	0	0	73	0
79A	0.12	0.00	0.00	0.24	457	367	0	88	0	0	0	88	0	44	0	0	0	44	0
79B	0.12	1.00	0.00	0.24	290	2	0	0	0	2	0	-2	0	0	0	0	0	0	0
79C	0.12	0.09	0.00	0.24	716	233	0	56	0	21	0	35	0	28	0	0	0	28	0
79D	0.12	0.00	0.00	0.24	91	0	0	0	0	0	0	0	0	0	0	0	0	0	0
79E	0.12	1.69	1.82	0.24	492	86	65	21	16	145	118	-124	-102	10	8	0	0	10	8
79F	0.12	0.63	0.58	0.24	1000	449	336	108	81	282	196	-174	-115	54	40	4	0	50	40
79G	0.12	0.30	0.40	0.24	319	210	127	50	30	62	51	-12	-21	25	15	0	0	25	15
79H	0.12	0.15	0.18	0.24	716	484	304	116	73	74	55	42	18	58	36	5	4	53	32
79I	0.12	0.03	0.04	0.24	451	336	266	81	64	10	10	71	54	40	32	0	0	40	32
79J	0.12	0.32	0.30	0.24	379	191	114	46	27	62	34	-16	-7	23	14	0	0	23	14
79K	0.12	0.09	0.25	0.24	855	583	4	140	1	51	1	89	0	70	0	7	0	63	0
92Q	0.12	0.00	0.00	0.24	5	2	1	0	0	0	0	0	0	0	0	0	0	0	0
11C	0.10	0.141	0.130	0.20	12984	7063	3509	1413	702	994	456	419	246	706	351	0	0	706	351
03A	0.10	0.00	0.00	0.20	47	40	40	8	8	0	0	8	8	4	4	0	0	4	4
03B	0.10	0.00	0.00	0.20	604	288	241	58	48	0	0	58	48	29	24	0	0	29	24

	HRO Harevest Rate Objective	EDC Existing Disturbed Condition (Forest Plan)	EDC Existing Disturbed Condition (NW Forest Plan)	MDC Maximum Disturbed Condition	Total Acres	Suited & Avail. (Forest Plan)	Suited & Avail. (NW Forest Plan)	Max Disturbed Allowed Acres (Forest Plan)	Max Disturbed Allowed Acres (NW Forest Plan)	Visually Disturbed Acres (Forest Plan)	Visually Disturbed Acres (NW Forest Plan)	MDC Avail. Harvest (Forest Plan)	MDC Avail. Harvest (NW Forest Plan)	HRO Acres Harvest Rate Objective Acres (Forest Plan)	HRO Acres Harvest Rate Objective Acres (NW Forest Plan)	Current Decade Harvest (Forest Plan)	Current Decade Harvest (NW Forest Plan)	HRO Avail. Harvest (Forest Plan)	HRO Avail. Harvest (NW Forest Plan)
03C	0.10	0.14	0.12	0.20	949	464	312	93	62	65	38	28	24	46	31	0	0	46	31
03D	0.10	0.08	0.13	0.20	897	534	339	107	68	43	43	64	25	53	34	23	23	30	11
03E	0.10	0.03	0.04	0.20	1555	652	437	130	87	17	17	113	70	65	44	5	5	60	39
03F	0.10	0.02	0.02	0.20	812	309	230	62	46	5	5	57	41	31	23	2	2	29	21
03I	0.10	0.00	0.00	0.20	79	33	14	7	3	0	0	7	3	3	1	0	0	3	1
03J	0.10	0.21	0.17	0.20	444	380	326	76	65	81	57	-5	8	38	33	4	0	34	33
03M	0.10	0.00	0.00	0.20	202	150	132	30	26	0	0	30	26	15	13	0	0	15	13
78A	0.10	0.00	0.00	0.20	305	231	167	46	33	0	0	46	33	23	17	0	0	23	17
78B	0.10	0.00	0.00	0.20	118	98	92	20	18	0	0	20	18	10	9	0	0	10	9
78D	0.10	0.28	0.18	0.20	1077	465	106	93	21	128	19	-35	2	47	11	72	19	-26	-8
78E	0.10	0.00	0.00	0.20	97	87	0	17	0	0	0	17	0	9	0	0	0	9	0
78J	0.10	0.00	0.00	0.20	104	102	81	20	16	0	0	20	16	10	8	0	0	10	8
78K	0.10	0.00	0.00	0.20	967	560	346	112	69	0	0	112	69	56	35	0	0	56	35
78L	0.10	0.00	0.00	0.20	115	50	28	10	6	0	0	10	6	5	3	0	0	5	3
*78S	0.10	0.00	0.00	0.20	27	12	8	2	2	0	0	2	2	1	1	0	0	1	1
*78T	0.10	0.03	0.00	0.20	245	166	1	33	0	5	0	28	0	17	0	0	0	17	0
78V	0.10	0.05	0.00	0.20	354	272	0	54	0	14	0	40	0	27	0	0	0	27	0
78W	0.10	0.14	0.00	0.20	489	257	0	51	0	35	0	16	0	26	0	0	0	26	0

Mgmt Area/ Psub	HRO Harevest Rate Objective	EDC Existing Disturbed Condition (Forest Plan)	EDC Existing Disturbed Condition (NW Forest Plan)	MDC Maximum Disturbed Condition	Total Acres	Suited & Avail. (Forest Plan)	Suited & Avail. (NW Forest Plan)	Max Disturbed Allowed Acres (Forest Plan)	Max Disturbed Allowed Acres (NW Forest Plan)	Visually Disturbed Acres (Forest Plan)	Visually Disturbed Acres (NW Forest Plan)	MDC Avail. Harvest (Forest Plan)	MDC Avail. Harvest (NW Forest Plan)	HRO Acres Harvest Rate Objective Acres (Forest Plan)	HRO Acres Harvest Rate Objective Acres (NW Forest Plan)	Current Decade Harvest (Forest Plan)	Current Decade Harvest (NW Forest Plan)	HRO Avail. Harvest (Forest Plan)	HRO Avail. Harvest (NW Forest Plan)
79A	0.10	0.05	0.00	0.20	542	442	0	88	0	22	0	66	0	44	0	1	0	43	0
79B	0.10	0.00	0.00	0.20	22	21	0	4	0	0	0	4	0	2	0	0	0	2	0
79C	0.10	0.58	0.00	0.20	567	133	0	27	0	77	0	-50	0	13	0	0	0	13	0
79D	0.10	0.36	0.61	0.20	195	115	59	23	12	41	36	-18	-24	12	6	0	0	12	6
79E	0.10	0.35	0.40	0.20	1379	777	491	155	98	269	196	-114	-98	78	49	0	0	78	49
79F	0.10	0.80	0.78	0.20	113	70	58	14	12	56	45	-42	-33	7	6	0	0	7	6
79K	0.10	0.38	0.00	0.20	678	354	0	71	0	136	0	-65	0	35	0	19	0	16	0
11F	0.05	0.096	0.149	0.10	6396	4498	1845	450	185	433	274	17	-90	225	92	0	0	225	92
03B	0.05	0.00	0.00	0.10	47	13	12	1	1	0	0	1	1	1	1	0	0	1	1
03C	0.05	0.00	0.00	0.10	27	1	1	0	0	0	0	0	0	0	0	0	0	0	0
03D	0.05	0.11	0.10	0.10	170	93	68	9	7	10	7	-1	0	5	3	10	7	-5	-4
03E	0.05	0.00	0.00	0.10	28	22	14	2	1	0	0	2	1	1	1	0	0	1	1
03F	0.05	0.00	0.00	0.10	159	78	47	8	5	0	0	8	5	4	2	0	0	4	2
03I	0.05	0.00	0.00	0.10	25	20	17	2	2	0	0	2	2	1	1	0	0	1	1
03J	0.05	0.00	0.00	0.10	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
03M	0.05	0.00	0.00	0.10	28	2	2	0	0	0	0	0	0	0	0	0	0	0	0
07U	0.05	0.38	0.32	0.10	390	348	311	35	31	131	101	-96	-70	17	16	2	0	15	16
78A	0.05	0.00	0.00	0.10	20	18	12	2	1	0	0	2	1	1	1	0	0	1	1

Mgmt Area/ Psub	HRO Harevest Rate Objective	EDC Existing Disturbed Condition (Forest Plan)	EDC Existing Disturbed Condition (NW Forest Plan)	MDC Maximum Disturbed Condition	Total Acres	Suited & Avail. (Forest Plan)	Suited & Avail. (NW Forest Plan)	Max Disturbed Allowed Acres (Forest Plan)	Max Disturbed Allowed Acres (NW Forest Plan)	Visually Disturbed Acres (Forest Plan)	Visually Disturbed Acres (NW Forest Plan)	MDC Avail. Harvest (Forest Plan)	MDC Avail. Harvest (NW Forest Plan)	HRO Acres Harvest Rate Objective Acres (Forest Plan)	HRO Acres Harvest Rate Objective Acres (NW Forest Plan)	Current Decade Harvest (Forest Plan)	Current Decade Harvest (NW Forest Plan)	HRO Avail. Harvest (Forest Plan)	HRO Avail. Harvest (NW Forest Plan)
78B	0.05	0.19	0.25	0.10	329	166	123	17	12	32	31	-15	-19	8	6	0	0	8	6
78C	0.05	11.00	0.00	0.10	12	1	1	0	0	11	0	-11	0	0	0	0	0	0	0
78D	0.05	0.19	0.18	0.10	702	356	100	36	10	67	18	-31	-8	18	5	24	0	-6	5
78E	0.05	0.00	0.00	0.10	101	37	0	4	0	0	0	4	0	2	0	0	0	2	0
78F	0.05	0.11	0.00	0.10	289	228	51	23	5	26	0	-3	5	11	3	0	0	11	3
78G	0.05	0.00	0.00	0.10	91	62	38	6	4	0	0	6	4	3	2	0	0	3	2
78H	0.05	0.00	0.00	0.10	11	8	3	1	0	0	0	1	0	0	0	0	0	0	0
78K	0.05	0.00	0.00	0.10	153	118	17	12	2	0	0	12	2	6	1	0	0	6	1
78V	0.05	0.02	0.00	0.10	447	335	0	34	0	7	0	27	0	17	0	0	0	17	0
78W	0.05	0.00	0.00	0.10	96	85	0	9	0	0	0	9	0	4	0	0	0	4	0
79A	0.05	0.06	0.00	0.10	205	141	0	14	0	8	0	6	0	7	0	0	0	7	0
79C	0.05	0.00	0.00	0.10	546	410	1	41	0	1	0	40	0	21	0	0	0	21	0
79D	0.05	0.03	0.04	0.10	90	75	28	8	3	2	1	6	2	4	1	0	0	4	1
79E	0.05	0.08	0.13	0.10	1564	1190	720	119	72	100	91	19	-19	60	36	0	0	60	36
79F	0.05	0.12	0.27	0.10	312	247	92	25	9	30	25	-5	-16	12	5	0	0	12	5
79G	0.05	0.00	0.00	0.10	33	32	8	3	1	0	0	3	1	2	0	0	0	2	0
79H	0.05	0.00	0.00	0.10	89	79	35	8	4	0	0	8	4	4	2	0	0	4	2
79I	0.05	0.00	0.00	0.10	70	55	26	6	3	0	0	6	3	3	1	0	0	3	1

79J	0.05	0.00	0.00	0.10	162	133	62	13	6	0	0	13	6	7	3	0	0	7	3
79K	0.05	0.11	0.00	0.10	119	72	1	7	0	8	0	-1	0	4	0	0	0	4	0

Mgmt Area/ Psub	HRO Harevest Rate Objective	EDC Existing Disturbed Condition (Forest Plan)	EDC Existing Disturbed Condition (NW Forest Plan)	MDC Maximum Disturbed Condition	Total Acres	Suited & Avail. (Forest Plan)	Suited & Avail. (NW Forest Plan)	Max Disturbed Allowed Acres (Forest Plan)	Max Disturbed Allowed Acres (NW Forest Plan)	Visually Disturbe d Acres (Forest Plan)	Visually Disturbe d Acres (NW Forest Plan)	MDC Avail. Harvest (Forest Plan)	MDC Avail. Harvest (NW Forest Plan)	HRO Acres Harvest Rate Objective Acres (Forest Plan)	HRO Acres Harvest Rate Objective Acres (NW Forest Plan)	Current Decade Harvest (Forest Plan)	Current Decade Harvest (NW Forest Plan)	HRO Avail. Harvest (Forest Plan)	HRO Avail. Harvest (NW Forest Plan)
92A	0.05	0.00	0.00	0.10	15	13	10	1	1	0	0	1	1	1	1	0	0	1	1
92Q	0.05	0.00	0.00	0.10	65	59	45	6	5	0	0	6	5	3	2	0	0	3	2

Desired Future Condition: Willamette National Forest Land and Resource Management Plan (Forest Plan) Standards and Guidelines state that management activities shall be designed and implemented to achieve or exceed the assigned Visual Quality Objective (VQO) for the management area (FW-058).

The goals for desired future condition for recreation and scenic resources of each management area allocation have been described in the Forest Plan, Chapter IV, Forest Management Direction.

Trends: The future Visual Condition of the watershed is expected to improve over current conditions when considering several developments and trends affecting forest management activities. As forest managers begin to focus more attention on balancing human use and product extraction with management of natural processes, over time, the appearance of Blowout is expected to approach a Visual Condition of Moderately Altered in managed areas to Slightly Altered in areas such as the LSR and scenic Management Areas.

With the development of a new Forest Plan and associated standards for management of scenic resources; including the control of harvest rates, unit sizes and shapes, treatment alternatives, and methods such as thinnings and individual tree selection; the design and distribution of activities within the watershed are expected to be less apparent to the casual viewer.

Implementation of the Northwest Forest Plan; which allocated Late Successional Reserves, increased the size of riparian reserves, reduced annual harvest rates, and established standards for management for a wide range of forest resources, is expected to have a beneficial effect on the quality of scenic resources in the future. However, the Visual Condition of the landscape within the LSR ranges from Slightly Altered to Heavily Altered which suggests that portions of the landscape will need be restored to meet and subsequently improve scenic objectives of creating and maintaining late-successional habitats.

This watershed contains many acres of second growth within scenic allocations. These stands will primarily have commercial thinning treatments prescribed which is less likely to impact the scenic resource than regeneration harvests.

b. Reference condition: ***What is the historical scenic condition in the watershed?***

Prior to development of road access within the Blowout watershed, the condition of the scenic resource was a natural appearing landscape shaped by a long history of natural processes including periodic flooding, landflows and wildfire. The basic landscape structure of steep slopes and long ridges covered by an older coniferous forest, accentuated with rock formations and meadow openings, and bisected by numerous streams tributary to the North Santiam River, formed the scenic resource of the watershed.

During the latter part of the 19th century, a significant portion of the Blowout drainage, 71 percent, was composed of medium, large and old growth trees. Less than one percent of the area contained stands of seedlings, saplings and poles. Wildfire occurrences during the mid to late 1800's are suggested by the evidence of the relatively young stands of small sized trees which represented 25 percent of the total area. Various non-forest habitats comprised four percent of the area. Natural in origin and random in composition, the Existing Visual Condition (EVC) of the watershed would be considered Natural Appearing.

Blowout Viewshed Condition - 1893							
	Seedlings and Saplings	**Poles**	**Small Trees**	**Medium Trees**	**Large/ Giant Trees**	**Non-Forest**	**Total**
Age (years)	1-20	21-40	41-150	151-200	200+		
Acres	61	5	8,648	4,235	19,801	1,253	34,003
Percent	0.002%	0.001%	25%	13%	58%	4%	100%

Starting in the 1930's, humans initiated disturbances within the drainage which included timber harvest activities and road construction. The 1950's marked the post-war boom, when there was a rush to open the forests for rapid development through increased timber sales and road construction. By 1952, the Detroit Dam and reservoir were completed and represented a significant alteration at the mouths of Box Canyon and Blowout Creeks. Most significant to this alteration included the exposed stumps and barren slopes that are revealed during draw down periods. From the 1950's through the 1980's, increasing harvest activities and road construction, predominately in the southern and eastern halves of the watershed, produced significant alterations of the Natural Appearing landscape, resulting in a mosaic of patch cuts in various stages of regeneration.

By 1950, five percent of the Blowout area was harvested and planted. Other than this slight decrease in large and old growth trees, stand composition remained much the same since 1893. This is likely the result of aggressive fire suppression efforts. The scenic condition ranged from Natural Appearing in the areas that had not been developed to Slightly Altered where harvest activities and road construction had occurred. Between 1950 and 1994, management activities created significant changes to the landscape over time ranging from a Slightly to a Heavily Altered Visual Condition.

Blowout Viewshed Condition - 1950

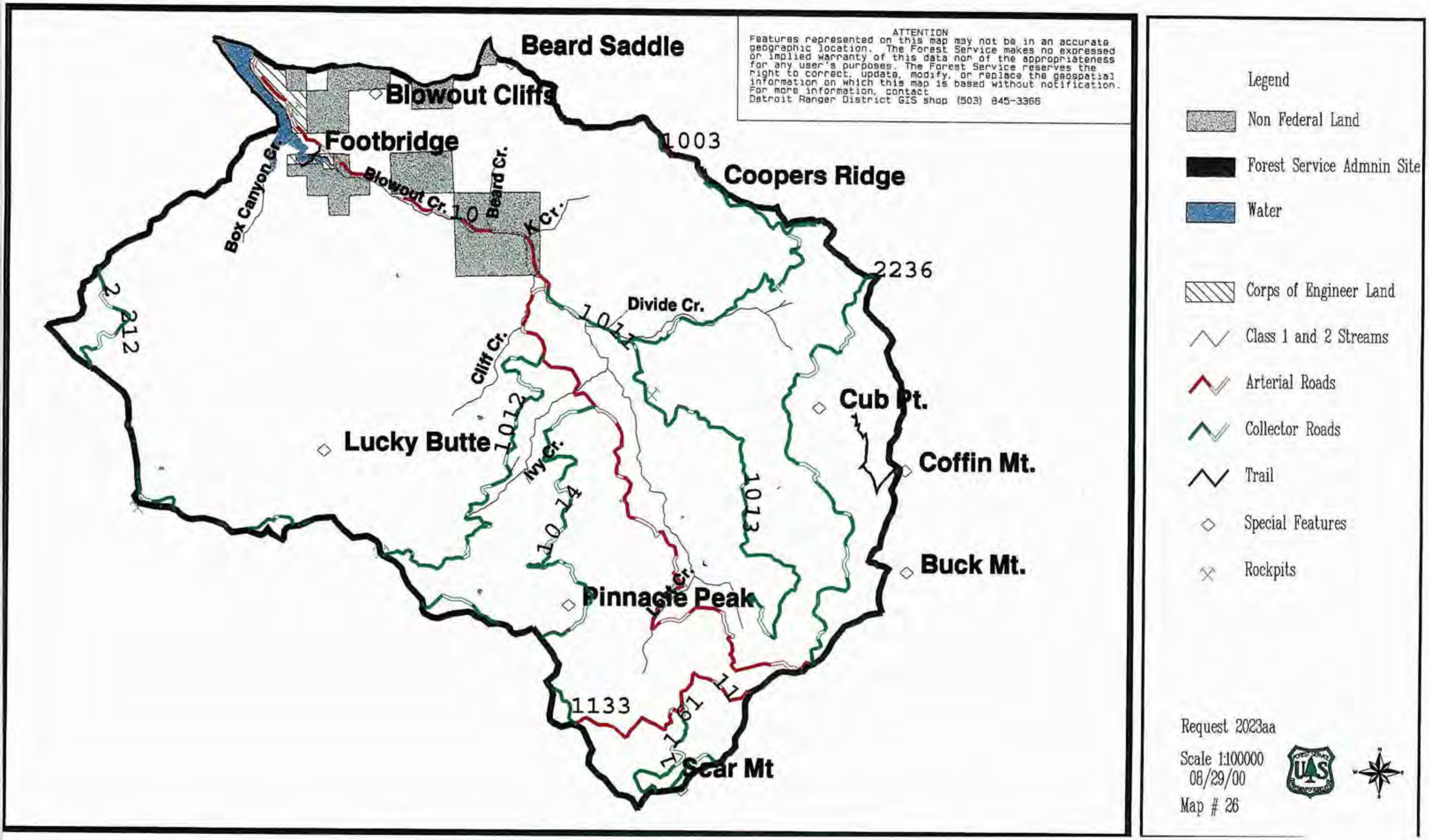
	Seedlings and Saplings	Poles	Small Trees	Medium Trees	Large/ Giant Trees	Non-Forest	Total
Age (years)	1-20	21-40	41-150	151-200	200+		
Acres	756	1,050	8,568	4,329	17,8590	1,441	34,003
Percent	2%	3%	25%	13%	53%	4%	100%

C: Table: Comparison of current and reference condition: *What are the natural and human causes of change between historical and current scenic conditions?*

Scenic quality has been affected by both resource management activities and natural events.

Scenic Characteristic	What was it like Historically?	What Changed?	Natural Causes of Change	Human Causes of Change
Scenic Quality	Natural appearing landscape shaped by a long history of natural processes including periodic flooding, landflows and wildfire. The basic landscape structure of steep slopes and long ridges covered by an older coniferous forest accentuated with rock formations and meadow openings, and bisected by numerous streams, formed the scenic resources of the watershed.	Alterations to the landscape changed the natural appearance and the scenic quality of the area.	Large Scale Fires	Management activities, primarily timber harvest and road construction have altered the landscape and changed the scenic quality of the watershed from pre-settlement conditions.
		Trends are that scenic quality is improving with time.	Re-growth of vegetation in areas denuded by timber harvest, road construction and fires.	With the development of a new Forest Plan and associated standards for management of scenic resources; including the control of harvest rates, unit sizes and shapes, treatment alternatives, and methods such as thinnings and individual tree selection; the design and distribution of activities within the watershed are expected to be less apparent to the casual viewer.
		Construction of Detroit Dam	Created scenic lake	During drawdown of the water levels in the winter, landscape alterations are visible such as stumps, barren slopes, etc.
				Implementation of the Northwest Forest Plan; which allocated Late Successional Reserves, increased the size of riparian reserves, reduced annual harvest rates, and established standards for management for a wide range of forest resources, is expected to have a beneficial effect on the quality of scenic resources in the future.

Blowout WA
Human Uses



IV. SOCIAL DOMAIN

B. Human Uses

1. Characterization: *What are the major human uses, including tribal uses and treaty rights? Where do they generally occur within the watershed?*

Human use of the Blowout area dates back to prehistoric times. A recently excavated site within the Blowout drainage yielded a hearth feature (prehistoric fire pit) containing charcoal which was radiocarbon dated at 2,690 B.P. (before present). Other relative dating methods (obsidian hydration) suggest the site was initially occupied around 5,000 B.P. (Draper et al, 1994). No botanical or faunal remains were recovered. Through site excavation archaeologists have discovered that humans have inhabited the western slopes of the Oregon Cascades for at least the past 10,000 years. Prehistoric human use within the Blowout watershed is seen mainly in the form of obsidian and crypto crystalline lithic scatters located along the ridge lines and near meadows. This suggests humans were using these ridge lines to access high elevation meadows, huckleberry fields and big game.

From prehistoric to historic times, human use of the area changed from travel and subsistence food gathering by native people to resource extraction of timber for use as construction materials by settlers.

Today human use of the area has become more varied. (See map #26) The local communities have been heavily dependent on federal land for their livelihoods. Saw timber and a variety of other special forest products provide employment opportunities while tourism associated with dispersed recreational activities such as hunting, camping, fishing, hiking, sightseeing, etc. generate economic benefits to local communities.

Humans utilize the Blowout watershed for a variety of resources, including: recreation, timber, special forest products, and personal use products such as firewood, plants and mushrooms.

Socio-Economic: The North Santiam Canyon is a rural area located at the base of the west side of the Cascade mountains. It extends for approximately 30 miles along the North Santiam River and includes five small communities: Lyons, Mill City, Gates, Detroit and Idanha and several unincorporated areas in two adjoining counties, Marion and Linn. The communities are clustered on either side of the North Santiam River and are between 25-50 miles from Salem, the nearest metropolitan area. The North Santiam Canyon serves as both a destination and a corridor for commerce. The total population of the region is about 6,617.

Forest products and tourism support the diversifying economies of many North Santiam Canyon communities. In 1996, 917 people were employed by private mills in the canyon. Until last year, the forest products industry and tourism generated from recreation in the Detroit Lake area and highway travel, provided the economic base for the Cities of Detroit and Idanha. This economic base was shaken recently when an Idanha mill, employing almost 100 people, closed down.

The region's forest resources are controlled by both public and private landowners. However, the vast majority of the land is managed by three public agencies, the USDI Bureau of Land Management, USDA Forest Service and Oregon State Forestry Department. The local communities affected by declining timber supplies have developed and are initiating economic development strategies to adjust to a different future.

Recreation: In comparison to other watersheds in the upper North Santiam Basin, Blowout has less recreational use and does not provide developed recreational opportunities such as campgrounds and picnic areas. The area offers an array of dispersed recreational opportunities. Activities typically associated with dispersed recreation in the watershed are camping, hiking, driving for pleasure, viewing scenery, hunting, fishing, swimming, huckleberry picking, biking, paragliding, and sail and motor boating. Peak use of dispersed sites is primarily during the summer months, May through September, with hunting activities occurring into the fall season. While dispersed camping use is concentrated in existing sites within the lower elevation riparian areas during the summer, it is broadly dispersed throughout the upland areas during the fall hunting season.

There are several areas within the Blowout analysis area where a concentration of recreation activity occurs. Detroit Lake encompasses a small portion of the analysis area, 188 acres, but contributes to a significant amount of use within this watershed. The Blowout Arm is popular area for fishing, swimming, picnicking, and shore/boat camping activities. The Suspension Bridge, an attraction located in the upper reaches of the Blowout Arm, is used as a jumping/diving platform by many young visitors. Concentrated dispersed camping occurs along Blowout Creek between the Suspension and Blowout Bridges. Many of these dispersed sites are located on private land.

Detroit Lake is primarily a summer destination due to the favorable climate. One of the primary influences of when use occurs within the watershed is tied with the fluctuation of the reservoir level for flood control. Full pool is reached early May and drawn down begins after Labor Day. At the beginning of fishing season, normally in late April, all boat ramps, campgrounds and marinas are usually operating.

Prevailing winds also affect the lake's recreation patterns during the summer. Generally, the wind comes up the canyon in the early afternoon and continues through late afternoon, causing people to move to sheltered areas of the lake, particularly to the east or at any of the arms like Blowout.

Finally, recreation use is weather dependant. Weather is too cold during the fall through spring for most water sports, except for fishing. Use peaks on those weekends and holidays that have favorable sunny, hot weather, and even during the week in the heat of summer. A summer with poor weather results in dramatic decreases in use when compared with more fair-weathered years.

The Blowout drainage is very accessible with two major arterial roads, Blowout and Straight Creek Roads, bisecting the watershed along with other system collector and local access roads. This area is composed of 185 miles of road access. These roads offer loop driving opportunities for pleasure auto drives and destination access. Visitors can access many areas outside of the drainage such as the Detroit Dam, many developed campgrounds, Highway 22, and Highway 20 at Sweet Home by way of the Quartzville Back Country Byway that follows Quartzville Creek, a Wild and Scenic River and Recreational Mining Corridor. The analysis area contains two system trails, Coffin Mountain and Coffin Lookout Trails, that lead to the District fire lookout structure.

2. *What values are associated with human uses?*

Heritage: People value the character of our communities and our cultural roots, as expressed in historic properties.

Socio-economic Uses (e.g., sustainable communities, tourism, etc.): Quality of life; preserving the environment and its natural beauty; availability of natural resources for sustained commodity production and year round recreational opportunities for economic benefits; are valued by many people, especially those who derive their livelihood from natural resources.

Recreational Uses: Recreational use of National Forest lands is valued for the experiences associated with the activity, such as the enjoyment, challenge, solitude or relaxation that it gives people. It refreshes people mentally, physically and emotionally. The Blowout Analysis Area is valued for its dispersed recreation opportunities, such as hunting, fishing, hiking, camping, sightseeing, etc.

3. *What are the highest priority issues or resource concerns associated with human uses?*

Heritage Resources: There is a concern about conserving the historic and/or scientific values of heritage sites and historic properties. These sites can give us invaluable insights into the past. Both natural and human processes have adversely impacted a high percentage of heritage sites. Many sites have incurred varying degrees of site degradation through root production of plants and trees, trampling by game animals, burrowing by small mammals, erosion, freeze-thaw cycles and wind thrown trees. In addition, sites have been unknowingly and knowingly disturbed by humans. Prior to 1978 very few sites were formally inventoried, recorded or protected. This coupled with the difficulty of finding undisturbed sites because of limited visibility due to dense vegetative cover and thick duff layers has resulted in heritage site degradation. In addition, artifact seekers have knowingly removed historic properties from sites. Very few heritage sites have been tested to determine the extent of disturbances to the sites or their eligibility to the Nation Register of Historic Places.

People are interested in learning about historic properties but very little has been accomplished toward interpreting past human activities.

Socio-economic Uses: The forest products industry, and tourism generated from recreation in the Detroit Lake area and highway travel, support the diversifying economies of North Santiam Canyon communities.

Species and watershed protection measures and changing public sentiment about selling forest resources (like old growth) as commodities, combined with a changing political climate, have resulted in a sharp reduction in the timber supply from National Forests and other public lands, to operate local mills. This reduction has threatened the economic sustainability of historically forest-dependent communities in the North Santiam Canyon, and have prompted them to develop economic strategies to adjust to a different future.

Decreasing firewood supplies are not able to keep up with the demand for fuel wood by people in the region.

Recreational Uses: There is more demand for recreational opportunities than supply available. In addition, available facilities and infrastructure associated with these opportunities are inadequate to meet demand. Growing recreational demand has resulted in impacts to resources; scenic quality, user experiences such as social crowding and user conflicts, increased fire risk and visitor safety.

Recreational access within the watershed is also an issue given road closures that have been implemented for a variety of resource reasons, coupled with road failures that occurred during the 1996 flood.

There is a demand for a diverse set of recreation opportunities (settings and activities) ranging from Primitive to Roaded Natural settings. As the physical environment is changed through various resource management practices so may the desired proportion of settings available to the public. The demand for Semi-primitive settings are not met in the Region, and future demand on the Forest will exceed the supply. Maintaining a diverse set of opportunities is also important to enhance tourism in the area and benefits to the local economy.

4. *What are the management direction/activities, human uses or natural processes that affect human uses?*

a. *Current Condition: What are the current conditions and trends of the relevant human uses in the watershed?*

Heritage Resources: A total of 5520 acres out of 34,154 acres have been surveyed for the occurrence of heritage resources within the Blowout Watershed. The surveys resulted in the location of more than a hundred sites and isolated finds which demonstrates human use in the Blowout drainage.

According to the district's Heritage Resource database, 70 historic properties (prehistoric/historic sites) have been recorded within the Blowout watershed. Nearly 95 percent of the recorded sites have already been impacted. Three factors have influenced the high percentage of site degradation: 1) prior to 1978 very few sites were formally inventoried, recorded or protected; 2) visibility within the Western Cascade forest environment is generally not conducive to finding undisturbed sites, and 3) natural environmental influences and animal activity.

The types of prehistoric sites recorded in the area include mainly "Open Air" lithic scatters of obsidian and crypto crystalline silica. Seventy-one percent of the total sites in this watershed are located on the top slope of a major ridge line (saddles, knolls, crest) and 23 percent are located on mid-slope benches mainly of ridge lines and 6 percent are located on stream terraces or flood plains. Eighty-four percent of the sites are located on slopes less than 10 percent.

Sites predominantly occupy areas within the Pacific Silver Fir Plant Association Series (Detroit Geographic Information systems database). Bear grass, rhododendron, and huckleberry were located at a majority of the sites. Other plants common to the sites in Blowout include blackberry,. strawberry, bunchberry, and Oregon grape.

Thirty-two percent of the sites are located near or adjacent to a Class IV stream, 30 percent are located near or adjacent a Class III stream, 5 percent are located near a Class II stream, 27 percent are located near a marsh or spring and 6 percent are located near a lake or pond. Distance to water does not appear to be a factor. Water distance from the sites ranges from 1 to 800 meters with a majority of sites located within 100 to 300 meters.

Six prehistoric sites within the Blowout watershed have been excavated to evaluate their scientific and historic values and determine their eligibility to the National Register of Historic Places (NRHP). Three of the sites (lithic scatters) were found to be eligible to the National Register of Historic Places but none of these sites have actually been placed on the NRHP.

One historic site (Coffin trail shelter) has been evaluated to determine it's eligibility to the NRHP. The trail shelter was considered to be not eligible for listing to the NRHP based on significant losses of integrity to the surrounding environment. The area around the trail shelter was clearcut sometime in the late 1970's.

Socio-economic Uses: The timber industry is still an important component of the North Santiam Canyon economy, however, timber related employment is not expected to reach past levels. Canyon communities realize they can no longer depend on the wood products industry as their sole economic provider. The North Santiam Canyon communities are working together to develop cooperative strategic plans for diversifying their economies. Several locally-based organization, such as the North Santiam Economic Development Corporation, have been formed to help these communities plan for their future. Common objectives of the communities include increasing the number of family wage jobs (through new business and business expansion), improving infrastructure, improving education and workforce job skills, maintaining and improving quality of life, and improving human resources services.

Community strategic and action plans where developed by residents, businesses and industry interests in the community and with assistance from various local agencies, including the Forest Service. The Forest Service is a partner with community economic and tourism organizations since many community goals, objectives and projects affect or depend upon National Forest lands.

Federal programs such as President Clinton's Northwest Economic Adjustment Initiative, made money available to local communities to begin seeking ways to diversify their economies. One of the first things the communities began to do was look into ways of developing infrastructure so they could attract new businesses to the canyon. One of the major challenges smaller communities face is infrastructure requirements for major manufacturing. As part of a federal effort to aid these timber dependent communities, special funding has been provided through various agencies as grants and low interest loans. This money has helped to fund such projects as the construction of the Canyon Life Museum, the development of a special forest products inventory modeling system, infrastructure feasibility studies (water systems, sewage treatment), industrial and business recruitment plans, etc. Until needed infrastructure upgrades can be completed, some of these communities are exploring the feasibility of retrofitting old timber mills and sites for other manufacturing activities or as recreational facilities (proposed North Santiam RV Park in Idanha), tourism/retail businesses, value-added wood manufacturing, cottage industries and telecommuting.

The Canyon communities began exploring ways of attracting more tourism dollars. Having Highway 22, the main link between Salem and Bend, running alongside the North Santiam River and up through the middle of the canyon offers tremendous potential. The highway carries campers and water enthusiasts to Detroit Reservoir, skiers to the Santiam Pass and central Oregon, and others wanting to take advantage of the natural beauty of the canyon. Along with the tourist traveler, it also carries enormous business and commercial traffic which has become an important component of the North Santiam Canyon economy. Detroit and Idanha City Comprehensive Plans recognize the importance of recreation and encourage future economic growth relating to the tourism industry. Both plans recommend pathways connecting communities, and adjacent campgrounds and day use areas. There is local interest in developing a loop trail around Detroit Lake and is identified as a Forest trail project in the Forest Plan. Tourism plans also incorporate this project and others including, expanding seasons at campgrounds, and developing a brochure on recreational opportunities in the Canyon and surrounding National Forest.

The North Santiam Canyon has also looked into economic diversification through secondary wood products manufacturing or through new markets in nontraditional forest products. The community received a grant to study market opportunities and developed methodology for companies and government agencies to evaluate available sustainable supplies of these products. A potential list of products could include: boughs, Christmas trees, bear grass, sword ferns, salal, prince's pine, mosses, Oregon grape, huckleberries, mushrooms, tree cones, post and poles, shakes and firewood.

Firewood is a forest commodity used by local communities which has been provided historically from the Blowout area. Even though public demand for firewood remains high, ability to fulfill the need has diminished steadily since 1992 with the reduction of timber harvest and land management changes to protect habitat for species dependent on down woody material. Firewood will only be available where current and future needs for large woody material are met in the area.

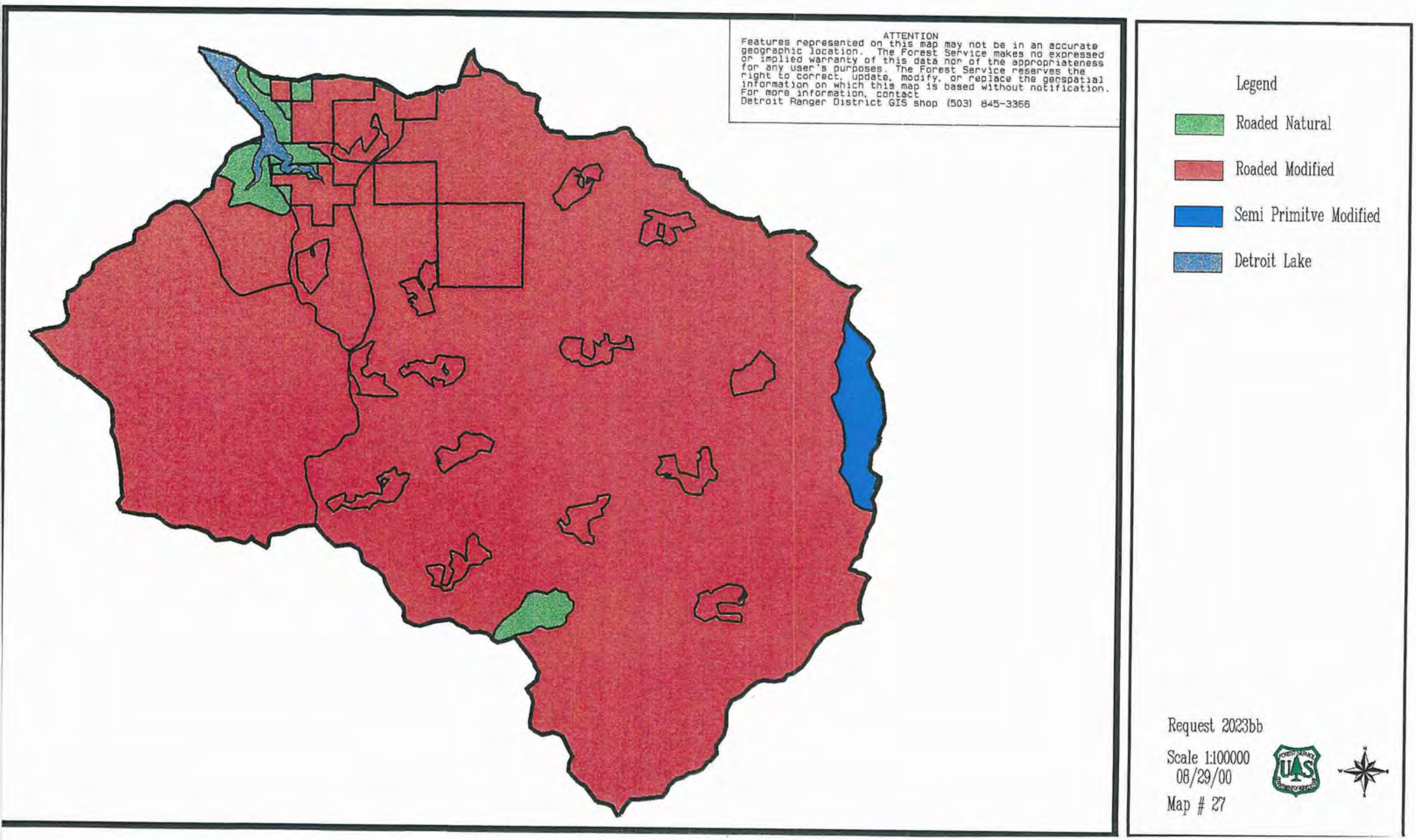
Visitation: The key attraction in the Blowout watershed is Detroit Lake. Detroit Lake ranks the third highest use lake in the state, and overall sixth among all water bodies in Oregon, just behind the Pacific Ocean (*1999 Boating in Oregon – Results of the 1999 Triennial Survey, Oregon State Marine Board*). Detroit Lake is one of the most popular recreation areas in the western Cascades, and is the highest recreation use area on the Detroit Ranger District, attracting well over 500,000 people a year. The Blowout is within a two hour drive of nearly 80 percent of Oregon's population. Because highway improvements over the years have made it more accessible, the Detroit Lake area has come to serve as a "backyard" destination for many Willamette Valley residents who once found it remote. A market study found that 46 percent of Detroit Lake area visitors originate from the Portland metropolitan area and 43 percent from the Mid-Willamette valley. Population growth in the Mid-Willamette Valley and Portland Metro area averages 1.9 percent during 1986-1990. This will likely lead to increasing numbers of visitors to the Detroit Lake recreation area in the future.

There is currently no data to support estimates of recreation visitation specifically for the Blowout analysis area. Field observations indicates that visitation ranges from light to moderate in the upper portion of the drainage, and high near Blowout Creek and Detroit Lake on the Blowout arm.

Recreation Opportunity Spectrum: The Willamette National Forest Land Management Plan (LMP) identified three land classifications of recreation experience in the Blowout Analysis Area. These classifications are based on the Recreation Opportunity Spectrum (ROS), a recreation planning and management framework which recognizes the continuum of recreation opportunities based on the activities, setting and experiences visitors desire. (See map #27) The basic assumption underlying the Recreation Opportunity Spectrum is that quality recreational experiences are best assured by providing a diverse set of recreation opportunities (Clark and Stankey 1979).

For the purpose of the analysis, it is assumed that private land will be managed and classified as Roaded Modified; and Army Corps of Engineer land will meet Roaded Natural characteristics. The predominant ROS class, Roaded Modified (RM), comprises 95 percent of the Blowout Analysis Area or 30,930 acres. This setting is characterized by a substantially modified natural environment. Resource activities and structures may be strongly dominant from most any point in the setting. Historically, Blowout has been intensively managed as general forest which has created a significantly altered landscape. Resource management activities, primarily timber production and high road densities, are prevalent throughout the analysis area classified RM.

Blowout WA
Recreation Opportunity Spectrum



Three percent, 789 acres, of the analysis area is classified as Roaded Natural (RN) which encompasses the Pinnacle Peak Special Interest Area (SIA) and areas along Detroit Lake. Roaded Natural is characterized by predominantly natural appearing environments with moderate evidences of the sights and sounds of humans. Interaction between users may be low to moderate but with evidence of other users prevalent.

Finally, two percent of the watershed, 530 acres, has been classified Semi-primitive Motorized (SPM). Semi-primitive Motorized is characterized by predominantly natural or natural appearing environment of moderate to large size. User interaction is low but there is often evidence of other users. This SPM classification encompasses a 3498 acre area north and east of Coffin Mountain, most of which is to the east of Blowout analysis area.

Twenty percent, 6877 acres, of Blowout lies within a portion of a Late-Successional Reserve (LSR). Currently, there is no ROS classification for these areas under the new allocation. The LSR encompasses the Box Canyon drainage which had a predominately Roaded Modified classification under the Forest Plan. Box Canyon consists of 1,749 contiguous acres of unroaded area, and could be considered a Roaded Natural experience by visitors. With a newly designated allocation and it's objective of restoring late-successional habitats, ROS settings will likely change in the future.

ROS Demand and Supply: The information on recreation demand that is reported in the Oregon State Comprehensive Outdoor Recreation Plan indicates a high and increasing demand for recreation settings featuring low levels of development and management activity, with relatively low levels of use, and where motorized access is not permitted (SCORP 1988). The 1994 SCORP goes on to state that there is a pronounced preference by the public for more semi-primitive and primitive settings, and that this issue requires greater examination and direction of efforts statewide to meet this demand. Thus, it is clear that settings catering to these recreational standards are especially valuable to the public. However, the Blowout watershed offers limited potential for providing semi-primitive or primitive settings. Box Canyon is the largest unroaded parcel of land in the analysis area, although access by a trail would be difficult due to steep terrain.

Recreational use of the Coffin-Bachelor Mountain Semi-primitive Area will likely increase with population growth, and increasing demands for semi-primitive settings and experiences (SCORP 1988, 1994). According to the Forest Plan, even if existing inventories of semi-primitive opportunities were maintained, future demand is expected to exceed capacity by the year 2010. In addition, between the year 2010 and 2030, use within all Wilderness Resource Spectrum (WRS) classes will exceed inventory capacity. It is likely with future demands at Mt. Jefferson Wilderness, strategies for managing use will be required. This may have implications on semi-primitive areas outside of Wilderness, potentially displacing users to limited existing non-Wilderness semi-primitive areas such as

Coffin-Bachelor Mountain. "Promotion" of Coffin-Bachelor Mountain area trails on the Forest Service Website (Internet), and depicting these trails on the Quartzville Byway kiosk map and brochure, will likely encourage use of this area.

Visitor use of this area is relatively low and primarily day use in nature. Since user interaction is very low, the area meets the social setting defined within the semi-primitive motorized classification of the Recreation Opportunity Spectrum (ROS). However, the activities and experiences associated within the area are non-motorized in nature due to lack of facilities available for motorize types of activities.

Recreation Access- (Roads) The Blowout drainage is very accessible with two major arterial roads, Blowout and Straight Creek Roads, bisecting the watershed along with other system collector and local access roads. This area is composed of 185 miles of road of which 52 miles of road are closed or proposed to be closed to public access. These roads offer loop driving opportunities for pleasure auto drives and destination access.

Visitors can access many areas outside of the drainage such as the Detroit Dam, developed campgrounds, Highway 22, Highway 20 at Sweet Home, and the Quartzville Corridor which contains Quartzville Creek, a Wild and Scenic River and a Recreational Mining Corridor. Straight Creek Road which bisects the upper portion of the watershed has been designated a "Backcountry Byway" tour route by the Bureau of Land Management with cooperation from the Forest Service and Linn County.

The road system provides for a broad range of recreational opportunities in a variety of settings. The absence or presence of roads is one of the most critical aspects of a setting that affects people's recreation experience. Currently, there are more than enough roaded opportunities to support the current and future demand. The key is to provide a variety of opportunities which encompass all ranges of roaded and unroaded settings, that is consistent with use patterns, public demand and resource objectives. Currently, access is provided to both trails within Blowout. However, the condition of roads reaching Coffin Mountain Trailhead are not meeting established standards. Dispersed recreational opportunities have been reduced in areas behind roads closed by flood damage, and gates that prohibit motorized travel due to wildlife or other resource concerns.

Conditions of roads play a factor in whether or not a visitor has a satisfactory experience. Visitors driving for pleasure in a standard automobile or RV would require a well-maintained route while off road vehicles would prefer a more rugged experience. Driving for pleasure is a growing and popular activity within the watershed. Safety of roads is a concern within the roaded recreation settings. Currently, lack of maintenance and flood related damage is resulting in many roads becoming unsafe, requiring extra caution or are closed to access.

With the recent Flood of '96, several roads have been closed due to hazardous conditions and concern for public safety. The road closures have been an issue with the public who still want to drive those roads. Often signs and closure barriers and gates are ignored and vandalized. Public safety is a Forest Service priority, however, administration of road closures has been difficult and costly.

Increasingly roads will be closed for a variety of reasons or will naturally close themselves due to the absence of maintenance. With declining road maintenance budgets, and concerns related to watershed quality and wildlife habitat effectiveness, road decommissioning and obliteration will be common in the future. Closed access will remove some roaded dispersed opportunities that presently exist. As roads are closed, more pressure may be placed on roaded areas outside of closures, and former roaded dispersed areas will probably not receive the use that previously existed. "Established" users of an area may be displaced to other areas that remain accessible. Roads with the highest use will result with the most significant impact on users.

In contrast these closed roads have increased opportunities to bike and hike free from interference with motorized vehicles. "Roads to trails" opportunities could arise for mountain biking, horseback riding or lowering standards for maintenance could provide opportunities for off-road vehicles use such as trail bikes or all-terrain vehicles.

Access to private land is adequate at this time. With the decreased ability to maintain roads there is a need to renegotiate cooperative agreements to help meet the needs and management objectives of all parties.

Recreation Access- (Trails): The analysis area contains two maintained trail systems, Coffin Mountain and Coffin Lookout Trails, that lead to the District Lookout site. Coffin Mountain Lookout is still operated today and offers visitors an awesome panoramic view of prominent peaks of the Western Cascades. Coffin Mountain has recently gained attention by paragliders and is being considered and evaluated for feasibility by local paragliding clubs.

Coffin Mountain Lookout: Coffin Mountain Lookout Trail receives the highest visitor use among trails in the area. Use in 1998 was estimated at 225 visitors. Coffin Mountain contains an administrative site with a lookout structure that is seasonally staffed for detection of forest fires. The lookout staff expressed difficulties in keeping an "eagle eye" for fire detection when distracted by visitors on the lookout deck. There have been occasions during the evening hours when the lookout has been confronted with drunk and verbally abusive visitors that make the lookouts personal safety a concern. Other lack of considerations on behalf of visitors has made lookout operation disruptive or inconvenient. Visitors often want to use the lookout's water supply or pit toilet which are intended for lookout use only. In addition, camping adjacent the lookout has been disruptive or inconsiderate to the privacy of the lookout. Recently, signs have been posted at the trailhead explaining courtesy and considerations while visiting the lookout.

Special Management Areas: MA-5A The Pinnacle Peak Special Interest Area contains exceptional geologic and biological characteristics. Management goals of these unique and special designated areas focus on protection and scientific study; and where appropriate, foster public use and enjoyment. Currently, there are no developed sites such as trails, interpretive signing or facilities. The area is accessible by roads, and contains dispersed camping sites, primarily used by big game hunters. The Forest Plan requires an Implementation Guide be complete for this area, however, a plan has not been done at this time.

MA-10b The Forest Plan designated the area surrounding Coffin Mountain as a Dispersed Recreation Area managed to provide Semi-primitive Motorized settings and experiences. An Implementation Guide was completed in April 1998 which provides management direction and project implementation guidance (*see Appendix A*).

Developed Recreation: No developed recreational sites such as campgrounds, boat ramps or picnic sites are located within the Blowout Analysis Area.

Interpretation: There are no interpretive opportunities provided within the Blowout watershed, although there are several potential opportunities. In a larger context, there has been minimal interpretation of natural and heritage resources within the North Santiam River Basin. There is a demand for these activities and are needed to promote resource protection and appreciation.

Suspension Bridge: The Blowout Creek Suspension Bridge has been closed for public safety due to corroding support braces and cables. However, regardless of posting closure notices it is still used as a jumping/diving platform by many young visitors which poses a safety concern.

Dispersed Camping: Based on observed conditions at thirty-two inventoried dispersed campsites within the Blowout drainage, it is apparent that visitors like to camp near water. Approximately 75 percent of the campsites found within the watershed are located near streams, particularly Blowout Creek at just over 50 percent. These areas receive the most frequent use and subsequently, the most impact to resources ranging from moderate to heavy damage site ratings with one site rating at extreme.

Although many dispersed campsites within the Blowout are associated with riparian reserves, the total disturbed riparian area attributable to these campsites is less than one percent. Access roads to some sites are not system roads and are not currently mapped.

Generally, there is a direct correlation between frequency of use and impact from that use. Those campsites that receive the most frequent use, subsequently, receive the most impact to resources ranging from moderate to extreme damage. Conditions of the most heavily impacted dispersed camping sites within the Blowout watershed include: soil compaction and large barren core areas, erosion, vegetation loss and tree damage. Many hazard trees are created as a result of recreational related damage. Vehicular access to sites is not limited which attributes to some of the degradation of these sites. Another contributing factor to the condition they exhibit is the amount of use individual sites receive each season due to their popularity or proximity to specific areas of interest such as Blowout Creek and Detroit Lake.

Dispersed campsites located away from riparian areas do not get the intensity of use or impact. These are generally located in the upper portions of the watershed, and are used by big game hunters during the fall. Often, these sites are located where existing developments have occurred such as a rock pit, landing, turnout or end of a spur road. Frequency of use is infrequent to moderate while impact is light to moderate. Lightly impacted sites are indicated by a fire ring or scar, and no other impacts from use by campers.

All the campsites inventoried had a least one fire ring. Almost all of the dispersed sites inventoried had no firewood available on the site.

Dispersed campsite conditions suggests that scenic quality and user experiences at many sites are being affected by use patterns and behaviors that shape the size and condition of sites.

Popular locations often lead to concentrated campsites within a confined area which leads to campsites located within sight and sound of each other. At these popular dispersed sites, sanitation, litter, and conflicts between campers is a common occurrence. Generally, campsites occupied by large groups tend to have more resource impacts to the site than small groups which have been apparent at some of the sites.

Dispersed site conditions within the watershed exhibit other characteristics that are a function of visitor behavior. It is common to find human waste proximal to dispersed sites. In addition, often waste associated with the camping experience; product containers, cigarette butts, discarded hygiene products, retired camping equipment and furniture, and other assorted goods, are left behind at the site. Garbage from home is discarded periodically in areas within the watershed.

This residue left by dispersed users is a concern in terms of public health and safety, particularly during periods of peak concentrated use. During this period the presence of human waste and other debris around dispersed camp areas may pose a threat to the health and safety of the users present. While visitation is of relative short duration and seasonal nature, effects to water quality are unknown.

The presence of human waste and debris, tree damage and loss, denuded and compacted camp areas, suggests that both the scenic quality and the intended recreation experience opportunity have been diminished for a significant number of sites within the watershed.

The Detroit Lake Composite Area Management Guide (1992) recommends phasing out of dispersed camping around the lake, and accommodating people in developed campgrounds as the highest management priority. Not all dispersed camp users will camp in a fee campground, and prefer a more primitive camping experience.

Dispersed Recreation Trend: The primary recreation emphasis on the Forest is on the management of dispersed recreation opportunities.

With projections of increased population growth for the mid-Willamette Valley and Portland Metropolitan areas, increased recreation use of the Blowout watershed can be expected for a wide range of dispersed recreation activities. For the period of 1980-1989, the Forest experienced an average 2.7 percent yearly increase in all forms of dispersed recreation use. With projections of increased use of 1.7-4.9 percent for all the different forms of dispersed recreation found in the Blowout, an increased demand for dispersed activities is anticipated. Based on these factors and the general trends of past use, it seems appropriate to assume that future participation in dispersed activities in the Blowout will increase as long as opportunities are provided.

According to the Detroit Lake Composite Area Management Guide summary of market demand analysis, demand for recreation use at Detroit Lake is expected to increase. Current demand for camping exceeds the number of developed campsites available. Furthermore, as the demand for developed recreation sites increase, so does the demand for dispersed recreation sites. Visitors who cannot be accommodated in campgrounds may seek out other previously "established" areas to camp. The number of dispersed sites, frequency of use, and impacts by use is expected to increase within the Blowout watershed. Additional camping areas will need to be developed to accommodate the demand.

The watershed will continue to receive a high intensity of dispersed use within accessible riparian reserves resulting in further needed management actions to resolve resource and social impacts. The demand will place additional pressure on the resources of the Blowout watershed and amplify the need for intensive management of recreational use within the watershed. A response to future use may require new strategies for responding to situations where human use exceeds ROS standards for extended periods of the normal use season or if resource degradation becomes a concern. This may possibly include: a change to a management area with standards more closely aligned with the type of use taking place or altering kinds of use based on resource driven issues; or hardening or development of the area to better accommodate the type and level of use.

Demand for winter sports opportunities is very high on the Forest with annual growth rates for cross-country skiing at 16.3 percent, and snowmobiling, snowshoeing and snow play at 4.9 percent. A Winter Sports Management Plan was developed for the District to establish the direction and management of winter recreation opportunities. Winter recreation suitability for most of the Blowout Road area rates very low and no formal development is planned here. The Five-Way Junction area located on the south Blowout boundary has a higher suitability rating. It may be developed as a winter recreation site to meet the demands of winter recreation in the future.

Data Gap: Dispersed campsite inventories were conducted in 1988. In order to more accurately monitor campsite conditions, a need exists to re-inventory the sites for more current information. It would also benefit to include other sites such as non-system access roads and social trails.

In addition, dispersed use data is insufficient to give an accurate picture of the kind of use patterns that occur on a watershed scale. Sampling dispersed use information within each opportunity class by watershed would enable managers to track the conditions and use patterns/trends in order to make better management decisions.

Water quality studies need to be conducted and monitored especially in areas such as lakes that receive intensive use.

b. Reference Condition: *What are the major historical human uses in the watershed, including tribal and other cultural uses?*

Heritage: Historically, the Molalla are reported to have inhabited the western slopes of the Oregon Cascade Range (Nilsson 1989,; Snyder 1987). The Molalla were comprised of three subgroups: the Northern Molalla, Southern Molalla, and Upper Santiam Molalla. The Blowout Watershed lies within the tribal area of the Upper Santiam Molalla (Nilsson 1989).

Ethnographic evidence indicates that aboriginal groups, possibly Kalapuya, Mollala, and Warm Springs have used the Blowout Watershed for seasonal hunting, fishing, huckleberry picking and gathering of other wild plants. Information on the use of the general area can also be inferred from the oral history of the Warm Springs Confederation as told by the elder women. They relate stories of their grandparents utilizing and maintaining the huckleberry grounds through fire near Scar Mountain Area (Felicia Beardsley 1990; personal communication).

The site distribution pattern within the Blowout watershed conforms with the above information and suggests the aboriginal groups were traveling along the ridge lines to access high elevation meadows, huckleberry fields and big game. Other plants that may have been consumed include Oregon grape, trailing blackberry, and strawberry.

The Scar Mountain trail is a major east-west travel route along the major ridge that divides the North and Middle Santiam drainages. The Scar Mountain trail connects with the Buck Mountain, Coffin Mountain, and Bachelor Mountain trail systems located north and east. The Scar Mountain trail also intersects with the Volcano trail, a route which leads from the Little Meadows area to the North Santiam River. Many archaeological sites are located along these routes, indicating early use of the trail system to access key resources. These routes later became incorporated into the Forest Service trail system.

Socio-Economic/Recreation: Surrounded by forests, it was timber that drew the first white settlers to the North Santiam Canyon in the early 1800's. While timber has been the backbone of the region's economy, it has been a fickle one. As early as 1893, the community had to adjust to mill closures, then boom periods of little or no unemployment.

Historically, the Blowout Drainage was not considered a recreational resource for various reasons. Access was extremely limiting up until recent decades, and the drainage did not provide opportunities that were unique compared to other parts of the District that were already developed eg. Breitenbush Hot Springs, Mt. Jefferson Primitive Area.

During the 1890's, railroad tracks were laid along the North Santiam River to historic Detroit. The railroad provided a link between the communities when roads were impassable, making it possible to take logs and lumber down to the Willamette Valley, and bring goods and passengers back up the canyon. The earliest timber harvest occurred in this watershed during the first decade of the 1900's (see figure below). Watershed occupants relied on timber harvesting for their livelihoods and the forests - wood, fish and game - for their sustenance. In 1926, a road was constructed between Niagra and Detroit. Access to the watershed was primitive and in places, very difficult to negotiate. Scenic quality was heavily altered early due to timber harvesting and history of large wildfires which is still evident today.

From the early 1910's through the late 1950's, the Blowout drainage was covered by an extensive trail network connecting trail shelters, guard stations and fire lookout stations. The primary use for the trail network and structures were for fire detection and control purposes. Trails were used by trail maintenance and fire lookout personnel. Some of these trails are part of the recreational trail network that hikers enjoy today.

Historic use and management of the Blowout drainage appears in the form of land claims and early Forest Service administrative and communications networks including lookout stations, trail shelters, and guard stations. These networks were maintained by Forest Service personnel primarily through an extensive trail network (often adapting to pre-existing trails) connecting trail shelters and lookouts. The primary use of the stations was for forest fire control. The trails are recognized from numerous historical maps of the district (1913, 1920, 1931, 1937, 1948, 1950, and

1951). The trails were often confined to ridges and ridge slopes. A few of the more important administrative trails bear mentioning:

The Scar Mountain trail first appears on the 1931 Santiam National Forest Map. The trail had an associated telephone line that connected Scar Mountain Lookout with the Hula Shelter. The trail also connected the Volcano trail with the Coffin Mountain trail. The 1947 trail log notes thirteen springs and 10 meadows along the route.

The Coffin Mountain trail served as a main arterial for access to and from the Coffin Mountain lookout. The lookout and trail first appear on an historical map from 1913 depicting the Santiam National Forest lands; the two continue to appear on maps of the Santiam National Forest (1920, 1931), Willamette National Forest (1937, 1950), and the Detroit Ranger District (1948). According to these maps, the Hula Shelter, Coffin Mountain Lookout and Fish Lake Ranger Station were all connected by this trail, which also supported a telephone line for communication. The trail log from 1936 charts the course of the trail from the North Santiam near the location of Idanha to the Scar Mountain Trail.

The Volcano Trail is an arterial trail that served as an integral part of the Forest Service communication and administrative network. It connected the basin of the North Santiam River with the Box Canyon Shelter, the Volcano/Kinney Creek Shelter, and the Slate Rock Lookout on the divide between the North and Middle Santiam Rivers.

The General Land Office Survey of 1893 recognized the present Blowout Creek as Volcano Creek which was fed by Volcano Lake located in Section 26. The 1913 Santiam National Forest displays the creek as Blowout.

Most of the watershed was timbered from Box Canyon sub-basin on the west to Hawkins sub-basin to the east, and south to Lost sub-basin. This area was considered "primitive" by those who lived and worked in the area. Recreational activity frequency occurring within the drainage was very occasional.

During the late 1930's, some timber harvest activity occurred on private land in the north portion of the watershed. The Beard Saddle Road, and a segment of which is now identified as Blowout Road, provided the only access to the watershed at this time. In the 1940's, Divide Creek Road was constructed in conjunction with timber harvest activities. Some big game hunting by people from the local communities occurred on these roaded portions of the drainage during this time.

From the 1940's, the timber industry expanded, bringing more work and more residents to the canyon community. The local economy within the canyon has gone through boom and bust cycles since the 1940's and is very closely tied to a timber economy. Dependence on timber fueled, if not caused the boom and bust cycles of the economy, and consequently the local economy has been sensitive to changes in forest policy.

Decade Harvest in the Blowout since 1900	
Years	**Acres Harvested**
1900-1909	669
1910-1919	12
1920-1929	4
1930-1939	125
1940-1949	768
1950-1959	1153
1960-1969	3051
1970-1979	4366
1980-1989	2442
1990-1994	782
Total	**13,372 acres**

Prior to completion of the Dam, the Army Corps of Engineers built two suspension bridges over Box Canyon and Blowout Creeks in order to tie the existing Volcano trail together since a portion would have been inundated with water when the reservoir was full.

It wasn't until after completion of the new North Santiam Highway during 1948 and construction of Detroit and Big Cliff Dams in 1953, that created a significant change in recreation use in this watershed. In the first decade of the reservoir's existence, fishing from boats was the primary activity that occurred on the lake. In the late 1950's, the Forest Service began responding to the recreation need along the reservoir by developing Hoover and Southshore Campgrounds, and making Stahlman summer home tracts available to lease by the public. These facilities are located on Blowout Road just outside of the watershed. During the 1960's, visitors, typically family groups from the Santiam Canyon and mid-Willamette Valley, began to come to the lake for camping, water skiing and swimming activities. Recreation use of the lake has steadily increased over the decades and changed with new equipment technology, and facilities upgraded to accommodate use

In the 1950's, road construction and timber harvest activities started to take place in the southern portion of the District. From the early 1960's throughout the 1970's, many of the other sub-basins opened up through road construction and timber administration followed by fire management. This enhanced and created an abundance of forage which facilitated the growth in deer and elk populations. Subsequently, it increased the big game hunting activity within the drainage. Other dispersed recreational activities, camping, huckleberry picking near Scar Mountain, driving for pleasure, sightseeing, and fishing became more common in the 1970's. Dispersed recreation use of the Blowout has increased ever since.

Beginning in the 1960's, increasing conflicts arose as land policy changed. In the 1980's the combination of high-tech mills requiring fewer workers, and a decrease in the timber harvest caused by environmental concerns over spotted owl habitat, significantly cut employment opportunities in the timber industry. The region was left with few employers that offered wages which could support families and unemployment began to rise. Communities began to realize the recreational potential of the area and have relied increasingly on tourism for their economic diversity and sustainability.

c. Comparison of current and reference condition: *What are the causes of change between historical and current human uses.*

Socio-Economic: The percentage of high-wage forest product industry jobs has decreased over time.

Local communities are starting to diversify their economies more than they have in the past. Many new businesses are associated with tourism but additional diversification is being investigated and recruitment of new commercial businesses and industry is being sought.

Timber from public lands is being offered in much smaller quantities than in the past.

Special forest products offered from this watershed are on the increase and will likely continue to increase in the near future.

Recreation use of the watershed has increased significantly, especially with the construction of the reservoir. The tourism economy associated with recreation has increased and is likely to continue to increase over time.

Recreation: Dispersed recreation areas and scenic quality have been affected by other resource management activities and natural events.

Recreation Use Patterns: Essentially we use the same corridors today that native Americans used for thousands of years, although we have changed their character greatly. People have always been drawn to areas along water, meadows, unique topographical features and vista points, whether for recreation, sustenance or cultural values. Future use patterns will likely follow the same corridors as long as access is provided and management direction allows use to continue.

Facility Construction: Prior to the 1950's, Blowout watershed was considered remote to a majority of the population, including Mill City. The transportation network to the watershed was primitive and slow. The construction and improvements of the highway and other roads in combination with economical transportation (modern automobiles), made access much easier and has resulted in more people recreating on National Forest lands than in historical times. In addition, construction of Detroit Dam created a highly demanded water-based recreational resource that did not previously exist.

Promotion of Recreation Opportunities/Increasing Use: In the 1920's-1950's, early national and regional efforts promoted National Forests for people to come and enjoy. Intensive use was not an issue as it is today. Conditions affecting leisure time and its use have changed quickly during the last 40 years. People began to have more leisure time, and better mobility through improved access and economical transportation. Considered Willamette Valley's "back yard," the watershed is receiving increase use. Local communities, with the decline of the timber industry, are trying to build strong, diversified rural economies by promoting tourism and recreational opportunities in the area. Areas in the watershed have reached or nearing capacity levels. The information highway is paving the way for promoting recreation opportunities on the Internet. Promoting and encouraging use can have adverse affects on the resources or create social issues within the watershed.

Changing Demographics and Recreational Demand: Changing demographics reflects on changing and increasing recreational use and demands. In 1910, the U.S. operated on a rural economy that had 90 percent of its population living in rural areas. The population had not achieved the mobility or the freedom from sustenance requirements that would give the time and means for recreation. After World War II, society became more affluent, urban growth started to boom, transportation systems improved and industrialization has been replaced by the information society, resulting in more leisure time. Rapid population growth has had the most dynamic influence on recreational use.

Many societal changes have occurred in the last few decades. Our society is becoming increasingly older, better educated and ethnically diverse. Americans are becoming increasingly concerned with environmental quality, quality of life, and the responsiveness of government to meet public needs. There is heightened concern with fitness and health. Americans are more urban and mobile, many wanting higher levels of services, developments, and conveniences. Changing lifestyles include smaller families, two-income family households, single-parent households, and non-family households. With new legislation and accessibility developments, people with disabilities are more "mobile" and able to visit the National Forest.

New Technology and Recreational Demand: Prior to World War II, recreation uses were traditional, eg. hunting and gathering, fishing and camping. Post World War II was marked by major changes in American recreational habits. The interest in various types of recreation has varied as the population's way of living has varied. Accelerating technological advances, including the development of equipment, transportation, and sports, necessitated more space, and the need to set aside specialized areas for activities such as jet skis and water sports, cross-country skiing, snowmobiling, paragliding and hang-gliding, trail/mountain bikes, off-road vehicles, hi-tech backpacking/mountain climbing, whitewater boating, RV camping, and stream and lake fishing. This meant a need to develop more facilities for recreational groups enjoying the forest. Although difficult to predict, new uses will emerge in the future, but historical uses will continue. People have strong ties to traditional, long-standing activities and places they enjoy.

Funding Levels: Funding levels are decreasing and demand for recreation opportunities are increasing. In order to fulfill this demand, federal agencies are looking at new ways to provide recreational opportunities such as user fees and "privatization" of operation of facilities.

Management Activities: The Blowout Analysis area has been intensively managed for timber since the 1930's. Road construction opened up many sub-basins for access by humans and recreation opportunities began to emerge as a result (See discussion of past and existing conditions). Prior to development of road access within the Blowout watershed, the condition of the scenic resource was a natural appearing landscape shaped by a long history of natural processes. Significant alterations to the landscape by harvest patch and lineal road cuts changed the natural appearance and the scenic quality of the area.

Some management activities such as wildlife habitat and riparian zone management generally have no adverse effect on recreation settings. In fact, these activities can provide long term beneficial effects to the recreation resource such as improved fishing, and wildlife viewing opportunities. Other activities such as timber harvest, road construction or fire management may have differing effects on recreational settings depending on the visitor. It may not be desirable setting for someone seeking a Semi-primitive experience, however, for a big game hunter it would be a very desirable setting. With intensive management over the years, recreation settings have shifted towards the Roaded settings. A balance of recreational settings should be maintained to meet the expectations and demands of the public.

Natural processes and occurrences: Natural occurrences, fire, wind, floods, land flows, insects and disease, and old growth affect recreation opportunities in different ways: 1) They create various plant and wildlife habitats which provide opportunities for nature study, and plant and wildlife viewing. 2) These processes have significant interpretive potential that would allow visitors to experience and gain an understanding of the important natural aspects of the forest. 3) Natural processes can detract from a desired experience that a setting previously provided or may completely eliminate and opportunity. 4) Some of the processes can threaten visitor safety, especially in dispersed settings. 5) Scenic qualities may be enhanced or diminished. Natural events are often compounded by previous management activities that frequently leave large scale impacts which may result in a less visually appealing landscape.

Fire: Fire patterns take on different shapes from a patchy mosaic to vast areas of burned over areas. The resulting habitat from a fire can enhance varying wildlife species. Fire can be a beneficial affect by re-establishing or perpetuating plant and animal diversity which would enhance wild flower, plant and wildlife viewing opportunities. Habitats created by fire that enhance big game populations and usage may provide a desirable opportunity for hunting.

With past and present fire suppression efforts there is an increased probability of high intensity fires. Such an occurrence could burn significant acreage within a recreational setting. Large tracts of burned land may diminish the scenic quality of the experience in any setting. Semi-primitive settings are affected to the greatest extent by landscape altering activities. If a fire burned an area classified and managed as Semi-primitive, it may no longer achieve the visitor's desired experience for that setting for a period of time. Especially if there was significant suppression activities such as snag falling, and dozer and standard hand fireline development. However, mitigation and rehabilitation measures can speed up the recovery to attain the desirable setting.

Not all fires of today are wildfires. Unnecessary human ignited fires may be caused during their recreational experience as a result of leaving campfires unattended. Public education and fire prevention programs will always be a continuing need.

Fire has also been used as a tool by humans. Native Americans ignited fires to perpetuate huckleberry fields near Scar Mountain. Over time and with fire suppression efforts, many of these sites have been slowly reforesting and berry production has been declining with tree encroachment and increasing crown cover.

Insects and Disease: Insects and disease can cause tree and stand mortality which creates a hazardous situation to recreation users on trails and at campsites. On the other hand, snags create habitat for various species which provides opportunities for wildlife viewing. Vast areas of unhealthy forests will diminish the visual quality and recreational experience desired by visitors.

Flood: Since a significant portion of dispersed recreation occurs along streams and lakes, floods may have an impact on recreational opportunities. Flood events have varying impacts on fish habitats and populations depending on the existing condition of the stream. Streams in Blowout which have been affected by the removal of streamside vegetation and large woody material from past management activities have a greater chance for impact to fish habitat and fish, if they can't find refuge, during a flood. With a flood event the implications involve the removal and redistribution of spawning gravels and food sources; increased quantities of sediment due to erosion; destruction of eggs; potential barriers from large jams can block passage, and increased stream temperatures from the additional removal of streamside vegetation. In the long run, desirable fish habitats may be created with the placement of large debris. Over time fishing opportunities and experiences may be enhanced due to an abundance of fish that the habitat can support.

Dispersed campsites and user trails are often located next to streams. Heavy use within riparian areas may contribute to the instability of a stream, especially during a heavy rain or flood event. De-vegetation and soil compaction resulting from dispersed sites and user trails may lead to surface erosion of stream banks and releasing sediment into streams. If flood line reaches over stream bank, it may affect existing recreational dispersed sites by clearing out vegetation or depositing material.

***Landflows*:** Land flows create elevated areas with localized wet depressions that provide varied habitat for plant and animal species. This may provide opportunities for wildlife and plant viewing. Massive land flow features within Blowout such as Blowout and Coopers Cliffs, can provide an interesting interpretive opportunity. Land flows have created several slumps on Blowout Road, a main arterial, which has made passage difficult with a standard pickup truck and impossible for automobiles and RV's.

IV. SOCIAL DOMAIN

C. Facilities

1. Characterization

The major facilities in the Blowout watershed include: a transportation system (roads, bridges, drainage structures, trails, etc.), a fire lookout, signs and gates.

The ***transportation system*** in the Blowout watershed provides access to approximately 34,000 acres of forest lands. The Forest Service maintains 185 miles of forest roads accessing public and private land in this area. Included in these are 17 miles of major forest arterials, 39 miles of forest collector roads and 129 miles of local timber access roads. Road densities average 3.58 miles per square mile over the study area.

Most of the roads in the Blowout were originally constructed to provide access for timber harvest. These roads were maintained by a fee collected from timber purchasers for every thousand board feet of logs they hauled down the roads. Once the roads were constructed, they provided access for other uses such as recreation, fire suppression, administrative use, etc.

Road 10, Blowout Road, is the major travel route used for all activities within the watershed. It accesses several developed campgrounds, permittee sites, private land holdings, and provides access to numerous dispersed recreation sites within and outside the watershed.

Road 11, Straight Creek Road, ties to the recently reconstructed Quartzville Road. This route provides a paved road between Sweet Home and Detroit Ranger Districts and opens up access to the historic Quartzville mining area. Three miles of the road pass through the Blowout analysis area.

The remaining system of collector and local roads provides access to federal, and private land for public use and resource management and protection.

With the recent Flood of 1996, several roads have been closed due to hazardous conditions and concern for public safety. The road closures have been an issue with the public who still want to drive those roads. Often signs, closure barriers and gates are ignored and vandalized. Public safety is a Forest Service priority, however, administration of road closures has been difficult and costly.

Trails: The watershed contains two maintained trail systems, Coffin Mountain and Coffin Lookout Trails.

Coffin Mountain Lookout is currently the only regularly staffed lookout on the Ranger District. It is staffed during fire season as a fixed point fire detection site.

Signs/gates: There are many regulatory, warning and informational signs located throughout the watershed. In addition, gates and barricades control access to selected portions of the transportation system. Frequently, vandalism of gates on closed roads may be found throughout the watershed, allowing access to areas that require resource protection. Administration of road closures have been difficult and costly. Many signs and closure devices are destroyed or removed.

2. *What values are associated with facilities?*

Commercial, administrative, private and public access to National Forest lands is valued for the opportunities it provides for recreation, commercial, and administrative operations, etc.

3. *What are the highest priority issues or resource concerns associated with facilities?*

a. One of the basic issues regarding facilities focuses around the question of what kind of transportation network is necessary and desired in the watershed and what resource tradeoffs are we willing to make to have that transportation network?

The following discussion addresses some of the elements of this issue:

Access and Travel Management: Transportation system management is a balancing act that requires consideration of resource protection needs while also providing for a variety of recreational experiences and management opportunities. Road Management Objectives need to determine purpose and use of each road, regulate traffic use during wet weather to prevent damage to riparian resources, and establish maintenance levels that reflect our ability to schedule and perform maintenance activities. Below are listed and described the broad range of users who desire access to the Blowout analysis area. This list is not meant to be all inclusive, but only broad descriptive categories.

Recreation: Recreationists desired access to a broad range of recreational opportunities in a variety of settings. The absence or presence of roads is one of the most critical aspects of a setting that affects people's recreation experience. For visitors seeking a roaded natural experience, it is important to maintain these settings. Conditions of roads plays a factor in whether or not a visitor has a satisfactory experience. Visitors driving for pleasure in a standard automobile or RV desire a well maintained route while four wheel drive units and off road vehicles (ORV's) prefer a more rugged experience. Safety of roads is a concern within the roaded recreation settings. For visitors who would like a more Semiprimitive experience, roads are a major detractor. Driving for pleasure is a popular activity within Blowout. Key access routes are desired by these users to continue this opportunity, and allow visitors to access recreation destinations within the Roaded settings.

Fire: There is a desire to address motor patrol needs for fire detection and allow for reasonable response time for initial attack of forest fires.

Commercial Operations and Permittees: Managers desire access to provide opportunities for timber harvest activities, Special Forest Products, mineral uses and personal use permits.

Ownership: Landowners desire to maintain access to private land and negotiate cooperative agreements to help meet the needs and management objectives of all parties.

Administrative: Managers desire access to provide access to meet resource management needs and management allocation requirements.

Road densities. Road densities are high in this watershed at 3.58 miles of road be square mile of land. The density of roads is an issue because it can affect the following:

Water routing efficiency: Roads can disrupt the natural hydrologic flow paths, including diversion of stream flow and interception of surface and subsurface flow.

Economics: The capacity of the Forest Service to maintain roads has declined greatly as funds for maintenance and timber purchaser conducted maintenance have been drastically reduced. Road closures and decommissioning could decrease future maintenance costs and reduce potential for storm damage, but will cause conflicts with other access needs. Deteriorating roads can also affect public safety.

Habitat Effectiveness Index for Big Game: Much of the watershed lies within High-Elk Emphasis areas and winter range. Road densities are substantially above recommended levels in all areas of the Blowout, adversely affecting the Habitat Effectiveness Index Models.

Sediment Production: Roads modify natural hill slope drainage networks and can accelerate erosion processes. Road related landsliding, surface erosion and stream channel diversions can deliver large quantities of sediments to streams, both chronically and catastrophically during large storm events. For major components that contribute to the discussion of sediment production from road systems are listed below:

Slope Stability: Slope stability addresses the geomorphology of a specific road location and its suitability to road construction. Most of the roads in this watershed have been constructed on stable benches and flats and do not have a significant effect of stream sedimentation. There are localized road locations in unsuited land types that pose high hydrologic risks.

Road Surfacing: Unsurfaced roads, especially those open to use during wet weather, result in sedimentation from surface erosion and the failure of designed drainage configurations. Roads with adequate surfacing protect drainage design and armor against surface erosion.

Road Structure and Stability: Problems with road structure stability exist primarily in sites where roads have been constructed through areas of unstable and unsuited land types. Standard design dimensions are not adequate and result in failures of cut and fill slopes. Permanent solution to these failures can be expensive and lack of funding results in quick inadequate fixes that produce chronic sediment production and ongoing maintenance requirements.

Drainage Structure Condition: Corrugated metal pipe has been the preferred design component for drainage on the majority of the roads constructed in the analysis area. Only in the most recent years have alternative drainage structures been used that reduce maintenance needs. Many of these metal pipes installed over the past 40 years are nearing or exceeding their design life. Failures are occurring.

Economics: In the past road construction and reconstruction were funded primarily from timber harvest activities. Annual funding for existing road maintenance was at a level that enabled the Forest Service to keep the entire road system open for safe public use and in good working condition. In recent years the capacity to maintain roads has declined dramatically. This is resulting in progressive degradation of road drainage and causing erosion rates and potentials to increase.

As timber harvest activities have decreased so have the traffic generated funds for maintenance and timber purchaser conducted maintenance.

In conjunction with timber revenues decreases, appropriated dollars from Congress are also decreasing.

Cooperative agreements with private land owners in the area have lapsed or ownership changes have voided previous agreements. New negotiations need to be made to meet the needs of all parties.

Road closure and decommissioning is an avenue that can help decrease the load on limited maintenance dollars through reducing miles of road requiring annual maintenance. Additional funding is needed to perform this work.

4. *What are the management direction/activities, human uses or natural processes that affect facilities?*

a) ***Current condition***: *What is the existing condition and trends of the facilities within the watershed? (Transportation facilities, road management, signs/gates, trails, etc.)*

Transportation Facilities: The existing condition of the 185 mile road system in Blowout covers a wide range of variables. A high percentage of the roads are built on stable benches and flats, and many of the roads that were built on full bench ground were not severely sidecast. There are also several cases of roads constructed through actively moving slide areas. Road 10 at M.P. 8.8 is the most obvious example of this. This road segment failed during the 1996 flood, thus closing the major access road into this drainage.

Many small local roads, built for timber harvest were designed for dry weather use and have little or no rock on them. Use of these roads in wet weather can cause serious impact to the drainage system and the road structure. Many of these roads in the Blowout have been closed by gates or barricades, not only to protect the road resource, but also to protect other resource values. Vandalism of the closure devices is high and enforcement of closures, due to the condition of closure devices, lack of adequate signing and the tendency for closures to be left open for long periods of time, is difficult. In addition, roads behind closures have not been put in a storage condition to reduce maintenance needs.

Recent social and economic trends have also impacted the transportation system in the Blowout. Deterioration has resulted due to the reduced levels of timber harvest revenue and other funding that financed annual maintenance activities. Reductions have resulted in the inability to maintain all roads at a level that provides adequate resource protection. Roads are becoming impassable due to lack of maintenance. If funding continues to be inadequate, more and more roads will be closing themselves through road prism and drainage failures.

Recreation: Dispersed recreational opportunities have been reduced in areas behind roads closed by flood damage, as well as, gates that exclude motorized travel due to wildlife or various other resource concerns.

Flood-related road closures have created friction between the Forest Service and some of the public. There has been a high vandalism rate to the closure devises and signs. Maintenance and repairs to these closures have been difficult to keep up with. Public safety is a major concern due to the difficulty of keeping the public out of unsafe situations.

Fire: Access for motor patrol needs for fire detection have been hampered in this watershed area. Road failures during the 1996 flood have made some areas impassable to vehicular traffic. Response time for initial attack for fires will likely be longer in some areas.

Commercial Operations and Permittees: The 1996 flood also reduced access opportunities to commercial operations; timber harvest activities, Special Forest Product harvest, mineral uses and personal use permits.

Ownership: Access to private land has been impacted by flood related road failures. With the decreased ability to maintain roads there is a need to renegotiate cooperative agreements to help meet the needs and management objectives of all parties.

Administrative: Access opportunities to meet resource management needs and management allocation requirements were reduced by the 96 flood. Preparation for commodities harvest; silvicultural and fuels treatments of managed stands; wildlife species and stream condition surveys; habitat enhancement, mitigation and restoration projects are just examples of management activities that are impacted. There will be an increase in cost in performing almost all aspects of resource management activities. This was a trend already being felt. The flood has accelerated the impacts.

Road Maintenance Funding: As stated above, declining road maintenance dollars are resulting in reduced access for all users in many areas of the watershed. Few of the local system roads receive annual maintenance. Overall, less surface, drainage and roadside maintenance is being done. At present roads are closing themselves through cut or fill slope failures, stream crossing failure and brush encroachment.

These "closures through neglect" do not provide protection against resource damage or protection of the large capital investment made when these roads were constructed.

Increasingly roads will be closed for a variety of reasons or will naturally close themselves due to the absence of maintenance. With declining road maintenance budgets, and concerns related to watershed quality and wildlife habitat effectiveness, road decommissioning and obliteration will be common in the future. As roads are closed, more pressure may be placed on roaded areas outside of closure, and former roaded dispersed areas will probably not receive the use that previously existed. "Established" users of an area may be displaced to other areas that remain accessible. Roads with the highest use will result with the most significant impact on users. The public perception of access is that they have grown accustomed to the current access and expect the same level of service.

In contrast these closed roads have increased opportunities to bike and hike free from interference with motorized vehicles.

Bridges: There are several bridges in the watershed. These bridges are in currently in good shaped with the exception of a log stringer bridge over Cliff Creek that was damaged during the 1996 flood. This bridge can no longer support heavy loads and is in need of replacement.

Culverts: A critical issue in looking at the condition of the roads in this watershed is the deterioration of the drainage system. Common design practices in the past did not call for consideration of the 100-year storm event as is called for in the current ROD. In order to meet the requirements of the ROD, numerous culvert replacements will be necessary.

b. Reference condition*:* *What were the major historical facilities in the watershed?*

Development of access in the Blowout watershed: Prior to the mid- 1940's this area was accessible only through a large trail system developed from Native American travelways and expanded on to meet the administrative needs of early forest managers. By the mid-1960's routes had been built into the major drainages. From the mid-1960's and through the 1970's the majority of the roads were built. Accessing tracts of timber for harvest was the primary driver for location of road systems. Long term transportation planning and integrated resource analysis were not normally used during this period of time. The result was a piecemeal system built for a single use without thought of long-term consequences.

Construction methods up until the mid seventies generally consisted of the side casting of fill material with no compaction requirements. Drainage structures were built to meet the minimum drainage requirements. Roads were often built landing to landing with little thought to long term needs. In 1973 new standards were implemented to improve the quality of Forest Service road construction to provide for a higher level of resource protection. By this time however, most of the major transportation routes had been constructed using the construction practices of the day.

Road Maintenance: Past emphasis on timber management has resulted in a large road system to gain access to timber and other Forest commodities. Timber sale revenue paid for the majority of road construction, reconstruction and maintenance.

Coffin Mountain Lookout: See the description of historic human uses for Coffin Mountain lookout and other facilities in the Human Uses Chapter (Chapter IV-B).

c) Comparison of current and reference condition

Road Management: Management of the road system is changing due to current and projected federal road maintenance budget declines and to the multiple resource objective needs described in the amended Forest Plan.

Economics: Decreases in annual maintenance budgets are down 70% from the late 1980's. Few of the remaining local roads receive annual maintenance. As a result, roads are closing themselves through cut or fill slope failures, stream crossing failures and brush encroachment.

Some of the damage that occurred in the 1996 storm event can be linked to the lack adequate maintenance.

Forest Plan as amended by the ROD: The Willamette National Forest Land Resource Management Plan established a goal for "the transportation system to provide visually pleasing and efficient access for the movement of people and material involved in the use, protection and management of forest lands". Two ROD designations introduce Standards and Guidelines substantially different from the earlier Forest Plan. These are Late-Successional Reserves and Riparian Reserves.

Late-Successional Reserves: 15,719 acres, 23% of this watershed lie in this designation. Road construction in Late-Successional Reserves is not recommended unless potential benefits exceed the cost to habitat impairment. Roads will be kept to a minimum and be routed through non-late-successional habitat where possible. Alternative access methods should be considered to provide access for activities in reserves.

Road maintenance may include felling hazard trees along rights-of-way. Leaving material on site should be considered if available coarse woody debris is inadequate. Topping trees should be considered as an alternative to felling.

With the exclusion of most timber harvest activities within this allocation, it may be hard to rationalize maintaining a large road system that was built to access land for timber harvest.
Limiting access will make enhancement and restoration projects more difficult and expensive to implement.

Risk to Late-Succession old growth habitat from catastrophic fire events will increase as access to large blocks of land is decreased.

Riparian Reserves: Standards and guidelines prohibit programmed timber harvests, and management of roads, grazing, mining and recreation to achieve objectives of Aquatic Conservation Strategy. See revised Forest Plan standards and guidelines for specific road management information.

Current standards in road design and construction practices and existing Road Management systems and programs go a long way in meeting the Aquatic Conservation Strategy objectives. Decreases in work force make it difficult to maintain existing systems and programs.

There is as estimated 58 miles of road located in riparian reserves. In addition, roads cross Class 1,2 and 3 streams approximately 182 times in this watershed.

Inventory and risk analysis to riparian conditions in a 100 year storm event have not been done. Analysis processes have been established but shortages of personnel available to do the work has delayed its completion. Probabilities that upgrading of stream crossings to accommodate the 100 year flood would occur are slim due to limited dollars and the high cost of such construction. Available restoration dollars should be spent on higher return projects such as stream restoration and road decommissioning and storage.

Roads will be storm proofed, decommissioned or obliterated as the localized sites are identified and analyzed.

***Other Facilities*:**

Facility condition is affected by age, natural elements, and human use; including "wear and tear" and vandalism.

Declining maintenance funding for publicly owned facilities are resulting in the degradation of facilities.

Flood events and erosional processes have a severe impacts on facilities such as campgrounds, water systems, structures including summer homes and footbridges, and trails.

Demand for accessibility, regulations, resource protection, and change in user needs creates a need for upgrading and improvement of facilities

Blowdown and snow damages or destroys facilities.

V. Management Implications

Geology

Synthesis: *What are the influences and relationships between erosion processes and other ecosystem processes in the watershed?*

Issue: Erosion and Sediment Delivery

How do other physical, biological and social ecosystem processes influence this issue?	Amount of Influence High, Medium, Low	How likely to change by management actions? High, Medium, Low, No
Physical: A history of large scale, stand replacing fires as well as underburning has shaped this watershed. But fire, especially intense, severe stand replacing fire, has also been a primary physical influence on erosion processes in this watershed.	High	Medium
Physical: Gravity (topography) in combination with climate (water and wind) influence the amount of erosion on hillsides.	Medium	No
Physical: Types of soils (natural instability) also influence the amount of hillside erosion	Medium	No
Biological: Rate of vegetative re-establishment following disturbance influences erosion rates.	Medium	High
Biological: Vegetative material, especially large woody material and intact root systems, help to stabilize slopes from erosion.	Medium	Medium-High
Biological: Leaf litter and organic matter, help to shield soils from raindrop impact and erosion. When disturbance removes these elements and their shielding effects, erosion rates increase for a time.	Medium	Medium-High
Social: Fire suppression has increased the fuel loading on the landscape. In the absence of fire, fuel loadings gradually build up over time. With more fuel, wildfires will burn with greater intensity than under natural conditions. More intense fires increase erosion potential.	High	Medium-High
Social: With fire suppression, vegetation persists on the landscape to hold the soil in place and erosion rates may decrease well below some long term rates.	High	Medium-High

V. Management Implications

Geology

Recommendations: *What and where are the opportunities for management, restoration or improvement within the watershed?*

Issue: Erosion and Sediment Delivery

Objective of Management Action	Potential Treatments	Priority
• Moderate some of the negative impacts of fire on erosion processes by decreasing hazard and risk of intense, stand replacing fires	• Reduce fuel loading by a variety of techniques including prescribed fire, handpiling, etc. in high hazard areas to control intensity of wildfire.	
None	None	N/A
None	None	N/A
• Restore erosion prone areas	• Promptly re-vegetate erosion-prone, denuded areas using native vegetation. • Promptly re-vegetate following harvest activities.	
• Minimize erosion potential from management activities	• Retain large woody material according to standards defined in the Forest Plan • Promptly re-vegetate disturbed areas • Retain vegetation contributing to slope stability in erosion prone areas	
• Retain duff layer	• Suspend logs during yarding as appropriate to maintain duff layer • Time slash treatment operations to coincide with higher fuel moistures so duff layer not consumed during burning	
• Minimize fire hazard and risk of large scale, intense stand replacing fires	• Reduce fuel loading in high hazard areas, by low-intensity prescribed fire or other method such as handpiling, etc. • In some instances instead of suppressing fires, use prescribed natural fire to achieve ecosystem goals.	
• Minimize vegetative losses to large scale fires	• Implement fire suppression strategies	

Issue: Erosion and Sediment Delivery (Continued))		
How do other physical, biological and social ecosystem processes influence this issue?	Amount of Influence High, Medium, Low	How likely to change by management actions? High, Medium, Low, No
Social: Land management activities (timber harvest, road construction, etc.) influence erosion processes. The type of logging systems, suspension requirements, road construction techniques, and silvicultural prescriptions. can all affect erosion rates, soil compaction, displacement, and productivity.	Medium	High

Issue: Erosion and Sediment Delivery (Continued)		
Objective of Management Action	Potential Treatments	Priority
• Minimize erosion potential from management activities	• Identify areas of active slope instability or areas that are potentially highly unstable (not necessarily unsuited) and avoid management activities such as timber harvest on these areas. • Retain green trees on critical sites (stream headwalls, sites with land movement). • Evaluate the re-introduction of large woody material into deficient stream channel reaches. • Implement geotech. review of future roading options to reduce or eliminate potential erosion problems. • Locate and design roads to minimize soil and water resource impacts. • Prevent, limit and mitigate erosion, sedimentation and resulting water quality degradation with construction and maintenance activities through timely implementation of erosion control practices and traffic control during wet periods. • Minimize erosion by conducting operations during minimal runoff periods. • Minimize erosion by road cuts, fill slopes, and the travelways by various soil stabilization measures (seeding, mulching, straw bales, erosion netting, etc.) • Minimize erosive effects of concentrated water and the degradation of water quality by the proper design and construction of road drainage systems and drainage control structures. • Insure that debris generated during road construction is kept out of streams and to prevent slash and debris from subsequently obstructing channels (unless stream channel objectives are being achieved). • Maintain all roads in a manner which provides for soil and water resource protection by minimizing rutting, sidecasting, and blockage of drainage facilities.	High
• Monitoring management activities	• As the proposed project is initiated, it will be monitored to evaluate implementation efficiency, prescription adequacy, and to update sale area rehabilitation needs or protection. Specific monitoring questions in Chapter V of the Land and Resource Management Plan that will be addressed include V-M22 through V-M34.	

Issue: Erosion and Sediment Delivery (Continued)		
How do other physical, biological and social ecosystem processes influence this issue?	Amount of Influence High, Medium, Low	How likely to change by management actions? High, Medium, Low, No
Social: Erosion is generated from wave action on Detroit Reservoir shoreline caused by boaters and wind, as well as, from fluctuations of reservoir levels.	Medium	Yes/No (reservoir levels are controlled by Corps of Engineers)
Issue: Long-term Soil Productivity		
Physical: Severe wildfires consume duff and other organic matter and can cause soil damage and nutrient loss	High in areas affected by severe fires	Medium-High
Biological: Creation of duff and organic layer by natural processes increases long-term soil productivity	High	No
Social: Slash burning during periods of low soil/fuel moisture and/or with high fuel concentrations can consume duff and organic matter, cause soil damage and nutrient loss.	High in areas affected by this type of burning	High
Social: Ground-based skidding equipment used for harvest during periods of high soil moisture can cause soil compaction and can affect long-term soil productivity.	High in areas affected	High

Issue: Erosion and Sediment Delivery (Continued)		
Objective of Management Action	Potential Treatments	Priority
• Restore erosion prone areas	• Develop a road and traffic management plan which includes priorities for road decommissioning and storm proofing • Aggressively decommission and storm proof high risk local roads, to reduce risk of catastrophic failure during storm events. • Sidecast pullback of unstable road fills on steep hillsides. The major focus initially will be on Cliff Creek (78r) on Forest Road 1012-820 and its tributaries where the worst problems occur. • Promptly re-vegetate erosion-prone, denuded areas using native vegetation	High
• Reduce shoreline erosion from wave action and fluctuations in reservoir levels	• Plant willow and other vegetation. Also, use other techniques to stabilize shoreline	
Issue: Long-term Soil Productivity		
• Maintain long-term soil productivity	• Fire suppression • Control fuel loading to reduce fire severity	
None	None	
• Maintain long-term soil productivity	• Time slash treatment operations to coincide with higher fuel moistures so duff layer and large woody material is not consumed during burning • Consider use of non-fire/ fuel treatment methods to treat slash where risk of soil damage is high.	
• Minimize soil compaction and displacement	• Minimize use of ground-based yarding systems. When used, confine to pre-designated skid trails. • Implement appropriate log suspension requirements and yarding system to minimize compaction and displacement. • Repair unstable roadfills • Repair cutbank problems • Suspend logs during yarding as appropriate to maintain duff layer	

Hydrology

Synthesis: *What are the influences and relationships between hydrology and other ecosystem processes in the watershed?*

Issue: Flows, especially peak flows and low flows

How do other physical, biological and social ecosystem processes influence this issues?	Amount of Influence High, Medium, Low	How likely to change by management actions? High, Medium, Low, No
Physical: Fire removes vegetative cover, which can influence snow accumulation, etc. During a rain-on-snow event, areas denuded by fires can contribute to increased peak flows. Damage from these flows can have social ramifications.	High	High
Physical: Soil type influences water holding capacity.	Low – Medium	No
Physical: Regional weather patterns and topography can influence rain-on-snow events in the transient snow zone, which are associated with peak flows. Precipitation type and intensity influences the amount of water entering the system that contribute to peak and low flows.	High	No
Biological: Vegetative re-growth and plant/tree cover types influence the amount of water that contributes to peak flows. Expanding root systems extract water from the system, tree canopies and canopy closure influence snow accumulation and the timing of water reaching stream courses.	High	Medium-High
Biological: The spatial distribution of vegetation across the landscape, topography, and the amount of large woody material influence how much water reaches stream channels.	Medium-High	Medium
Biological: Rate of tree growth influences the length of hydrologic recovery.	High	Medium-High
Social: Management activities such as regeneration harvest, road construction, etc. decrease vegetative cover in the short term, resulting in less precipitation intercept and may result in increased peak flows.	Medium	Medium

Hydrology

Recommendations: *What and where are the opportunities for management, restoration or improvement within the watershed?*

Issue: Flows, especially peak flows and low flows

Objective of Management Action	Potential Treatments	Priority
• Minimize effects of peak flows by managing fire and vegetation	• Fire prevention and fuel treatment to minimize risk of stand replacing fires and resultant fire impacts on soil infiltration rates, etc. that contribute to peak flows • Fire suppression to limit size of fires and allow vegetation to persist on the landscape.	High
	None	None
	None	None
• Maintain 7th field watershed in a recovered state greater than or equal to 70% canopy closure (70% of area) depending on threshold.	• Encourage rapid regrowth of vegetation, following site disturbances such as fires. • Replant quickly following harvest activities. • Use appropriate harvest prescriptions to maintain desired canopy cover.	High
	• Spatially distribute timber harvest across the landscape. • Retain large woody material as per standards and guidelines in Forest Plan.	High
	• Encourage tree growth through various silvicultural techniques. • Meet ARP requirements, as specified in Forest Plan, to provide adequate watershed recovery.	High
• Manage stands to maintain 70% canopy closure where possible. Where regeneration is necessary, keep the disturbed area below threshold percentage. For example 70% threshold = 30% threshold percentage.	• Within other resource constraints, encourage development of at least 70% canopy closure within managed stands to intercept snow, etc. thereby regulating the amount of precipitation reaching stream channels (highest priorities are in drainages below ARP levels) • Reduce drainage network through actively decommissioning and storm proofing roads • Optimize tree growth in plantations and fire regenerated young stands to reduce effects of peak flows. Activities such as pre-commercial thinning and commercial thinning are tools to accomplish this goal. These activities will also optimize tree growth within riparian reserves that are in the same seral stage as other plantations and fire regenerated young stands.	High

Issue: Flows, especially peak flows and low flows (Continued)		
How do other physical, biological and social ecosystem processes influence this issues?	Amount of Influence High, Medium, Low	How likely to change by management actions? High, Medium, Low, No
Physical: Flood events removed large woody material from stream channels, causing floodplain erosion and reduction of water storage areas.	High	Low
Social: Road construction disconnected some streams with their floodplains, thus affecting water storage capacities	Medium	Low-Medium
Social: Stream cleanout removed large woody material from stream channels causing floodplain erosion and reduction of water storage areas, thereby affecting minimum flows.	Medium	Medium

Issue: Flows, especially peak flows and low flows (Continued)		
Objective of Management Action	Potential Treatments	Priority
• Maintain desired level of minimum flows	• Create additional water storage areas in the floodplains by reconnecting stream channels to their floodplains. • Ensure adequate large woody material availability for stream channels.	High
	• Locate new roads in a manner that minimized floodplain impacts, whenever possible. • Capitalize on opportunities to re-connect streams with their floodplains as roads are decommissioned or obliterated, etc.	Medium
• Reestablish large woody material within streams to a natural level.	• In specific stream reaches and with interdisciplinary and public input, add structure to stream channels in the watershed. • Stabilize areas with large woody material to reduce stream energies so sediments are deposited. This will reduce downcutting and the channels will begin to build up to the level of the floodplains.	Medium

Stream Channels

Synthesis: *What are the influences and relationships between stream channels and other ecosystem processes in the watershed?*

How do other physical, biological and social ecosystem processes influence this issue?	Amount of Influence High, Medium, Low	How likely to change by management actions? High, Medium, Low, No
Issue: Channelbank stability and headwall protection as they relate to erosion and sedimentation		
Physical: Rain on snow events which generate peak flows have a profound influence on channel bank stability and de-stabilization of headwater portions of streams	High	No
Physical: Fires can either consume wood and make it unavailable to stream channels or it can create downed wood for stream channel structure. The amount of available structure in the channel influences channelbank stability	High	Medium
Biological: Natural tree mortality, insects or diseases, or other damaging agents that kill large trees can provide structure for stream channels and help to stabilize channel banks	Medium	Medium
Biological: Vegetation and root strength can increase channel bank stability and headwater stability	High	High
Biological: Canopy closure affects snow interception during rain on snow events which can generate peak flows. Peak flows have a profound influence on channel bank stability and de-stabilization of headwater areas.	High	High
Social: Water and the associated riparian areas attract recreational use. This recreation use leads to multiple access trails to the water bodies, removal of down woody material for use as firewood, soil compaction which can affect infiltration rates, etc. which in turn can impact channel bank stability.	Low	High
Social: Regeneration timber harvest, road construction and other management activities that decrease vegetative cover and can decrease channel bank stability	Medium	High
Issue: Floodplain and stream channel interactions		
Social: Past stream cleanout practices contributed to higher stream energies, stream down cutting, and less sediment storage capabilities this resulted in streams becoming disconnected to their floodplains.	High	No
Social: Some road locations have caused channelization of streams. This has increased stream energies and caused downcutting. Without sediment to build floodplains, streams can become disconnected with floodplains	Medium	Medium - Low
Issue: Diversity poor stream channels		
Physical: Floods and fires have either directly or indirectly had an impact on stream channel diversity.	High	Medium

Stream Channels

Recommendations: *What and where are the opportunities for management, restoration or improvement within the watershed?*

Objective of Management Action	Potential Treatments	Priority
Issue: Channelbank Stability and headwall protection as they relate to erosion and sedimentation		
None	None	
• Minimize adverse effects of erosion and sedimentation by promoting channelbank and headwall stability	• Minimize impacts of large, scale stand replacing fires through fire suppression and control fuel loading to reduce fire severity.	Low
	• Retain vegetation in riparian areas along stream courses • Encourage stand conditions that contribute to development large trees that could eventually contribute to stream channel structure. • Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands.	High
	• Retain vegetation along riparian zones as prescribed in the Forest Plan as amended by NW Forest Plan.	High
	• Within other resource constraints, encourage development of at least 70% canopy closure within managed stands to intercept snow, etc. thereby regulating the amount of precipitation reaching stream channels (highest priorities are in drainages below ARP levels) • Meet ACS objectives in riparian reserves.	High
	• Educate the public about recreational impacts to riparian areas and their influence on channel bank stability. • Encourage use of established developed recreational sites rather than use of dispersed sites, where possible. • Discourage dispersed recreational use in sites with channel bank stability problems.	Medium
	• Retain riparian reserves along stream courses.	High
Issue: Floodplain and stream channel interactions		
• Maintain stream channel/floodplain interactions.	• Retain current stream channel structure and encourage development of stand conditions that ensure that future structure is available to stream channels.	Medium
	• Locate new roads in a manner that minimized floodplain impacts, whenever possible. • Capitalize on opportunities to re-connect streams with their floodplains as roads are decommissioned or obliterated, etc.	Low
Issue: Diversity poor stream channels		
• Create diversity	• Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands.	Medium

Water Quality

Synthesis: *What are the influences and relationships between water quality and other ecosystem processes in the watershed?*

How do other physical, biological and social ecosystem processes influence this issue?	Amount of Influence High, Medium, Low	How likely to change by management actions? High, Medium, Low, No
Issue: Water Temperature		
Physical: Solar radiation increases stream temperatures	Medium	No
Biological: Vegetation distribution and development influences stream shade which can affect the amount of solar radiation reaching streams, so can affect stream temperatures	High	Medium
Social: Recreation and timber management, and road construction can affect shade and therefore stream temperatures.	Medium	High
Social: Management guidelines for retention of riparian reserves can provide thermal regulation to streams.	Medium/High	Meduim
Issue: Type and timing of sediment input into streams		
Social: Road densities are high within the watershed. Road related sediment sources are fill failure, shotgun culverts, drainage patterns being interrupted, and surface erosion	Low – Medium (This is due to the high natural background in watersheds with roads. Less of an influence than other watersheds.)	Medium
Issue: Turbidity and domestic water use		
Physical: Fire, as a mechanism, removes vegetative cover. When combined with weather patterns, this loss of vegetation permits accelerated erosion from which sediment increases can generate an increased level of turbidity.	High	Low
Physical: Type of soil (i.e. size of material- clay, etc) can influence the amount of turbidity, those prone to deep seated earth flows introduce more sediments affecting turbidity than those that are not so prone.	High	Low
Physical: Type and intensity of precipitation can influence erosion rates and thus turbidity.	Low	No
Biological: Lack of large wood in stream channels can decrease sediment storage and can result in an increase in turbidity	Low	No
Biological: Large wood in stream stores sediments which decreases turbidity.	Low	No
Biological: Vegetation distribution and development influences erosion processes which can affect turbidity.	Medium	Medium
Social: Recreation, fire, and timber management, road construction potentially affects erosion causing sediments which can affect turbidity	Medium	Medium

Water Quality

Recommendations: *What and where are the opportunities for management, restoration or improvement within the watershed?*

Objective of Management Action	Potential Treatments	Priority
Issue: Water Temperature		
None	None	
• Maintain water temperature within State Water Quality guidelines	• Retain riparian reserves along stream courses • Retain at least 70% canopy closure adjacent to stream channels	High
Issue: Type and timing of sediment input into streams		
• Sediment control	• Road maintenance • Rehabilitation of identified erosion sites • Sidecast pullback and road stabilization • Riparian planting • Re-vegetation of riparian areas • Road objectives • Remove drainage structures on temporary roads	Medium – High
Issue: Turbidity and domestic water use		
• Manage vegetation to ensure low erosion potential from site.	• Prescribe burn to reduce fuel loadings • Burn within prescription to maintain duff layer	
• Avoid accelerating earthflows by maintaining vegetative cover.	• Utilize silvicultural methods to increase vegetative growth on earthflows.	
• None	• None	
• Maintain diversity within stream channels	• Survey wood loading and prescribe additional input if not at expected environmental levels.	
• Maintain vegetation on the landscape that will minimize erosion potential	• Revegetate disturbed sites or utilize erosion control measures.	
• Sediment control.	• Utilize Best Management Practices to control the loss of sediments from project sites.	

Vegetation

Synthesis: *What are the influences and relationships between erosion processes and other ecosystem processes in the watershed?*

Issue: Old Growth		
How do other physical, biological and social ecosystem processes influence this issue?	Amount of Influence High, Medium, Low	How likely to change by management actions? High, Medium, Low, No
Physical: Fire occurrence is one of the largest physical influences on old growth distribution in the watershed.	High	Medium
Physical: Wind, climate	High	No
Biological: Fuel loads, insects and diseases can set the stage for catastrophic fires, thus influencing amount and distribution of *old growth.*	High	Medium
Social: Management activities and road construction, as well as, human-caused fires influence the amount and distribution of *old growth.*	High	High
Issue: Plant Association and Seral Stage Distribution/ Management goals compatible with natural systems		
Physical: Fire, soil, slope, aspect, microclimate, precipitation, wind, etc.	Medium	No
Biological: Insects and diseases can have localized effects on stand seral stages (e.g. root rot)	Medium	Low
Social: Management activities such as timber harvest affect seral stage distribution across the landscape	High	High
Riparian Reserves: Commercial thinning can develop desired stand structure within riparian reserves with emphasis on growing large trees and logs and other late successional characteristics.	High	High

Vegetation

Recommendations: *What and where are the opportunities for management, restoration or improvement within the watershed?*

Issue: Old Growth		
Objective of Management Action	Potential Treatments	Priority
• Minimize risk of stand replacing fires	• Fuel reduction, fire suppression, stocking level control, underburning.	Priority is dependent on management allocation
None	None	
• Re-introduce role of fire in the ecosystem	• Identify stands with history of short-term return intervals. Reintroduce fire as applicable.	Medium. Higher where hazards exist
• Meet Forest Plan standards and guidelines for old growth protection	• Implement standards and guidelines to protect late-successional characteristics in LSRS (owl activity centers), riparian reserves and in required acres within Matrix and appropriate land allocations.	High
• Meet Forest Plant standards and guidelines for old growth harvest.	• Implement Forest Plan objectives in Matrix land	Medium
Issue: Plant Association and Seral Stage Distribution/ Management goals compatible with natural systems		
• Reintroduce the role of fire into the ecosystem	• Treat stands that have a shorter fire return interval and evidence of underburning.	High
• Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands	• Salvage when present and future coarse woody debris needs are met and other Aquatic Conservation Strategy objectives are not adversely affected.	
• Maintain and restore habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian dependent species.	• Apply Silvicultural practices for Riparian Reserves to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy objectives. Examples would be commercial thinning, precommercial thinning.	High
• Develop late successional components in Riparian Reserves by developing desired stand structure with emphasis on growing large trees and logs and other late successional characteristics	• Commercial Thinning (Maximum potential acres): • Commercial thin in riparian reserves when: • Riparian reserves are intact but not do not have late successional structure. • In places where fire exclusion created more stems, and the development of late successional characteristics may delayed.	High

Issue: Insects and Diseases		
How do other physical, biological and social ecosystem processes influence this issue?	Amount of Influence High, Medium, Low	How likely to change by management actions? High, Medium, Low, No
Physical: Climate, especially drought, windstorms and the blowdown they bring, floods and the down wood resulting, have a significant physical influence on *insect and diseases* severity.	Medium	No
Biological: Vegetative competition, including inter-tree competition, can affect *insect and diseases* by increasing demands for nutrients, moisture and light	Medium	High
Biological: The spread of dwarf mistletoe is influenced by stand structure and species competition. Root rots may be more severe in single species stands.	Medium	Medium - High
Biological: The amount of dead material can increase the severity of insects and diseases and contribute to their spread.	High	Medium
Social: Management activities can increase root rots.	High	Medium
Issue: Noxious Weeds		
Physical: Wind distributes seeds so has a large influence on the spread of *noxious weed*	Medium	High
Biological: Lack of competition from native plants, spread of seeds by animals, and lack of natural predators and diseases influence the rate of spread of *noxious weeds*.	Medium	Medium
Social: Human movement, and travel corridors can spread seeds of noxious weeds from one place to another.	Medium	Medium
Social: Activities that create bare soil especially adjacent to roads and trails	Low-Medium	Medium

Issue: Insects and Diseases		
Objective of Management Action	Potential Treatments	Priority
• Design timber harvest units to minimize blowdown. Improve stand vigor attained through stocking control while maintaining species diversity.	• Locate and prescribe timber sale units considering local wind patterns. • Thin stands to reduce mortality from competition to increase resistance to insects and disease.	High
• Minimize spread of insects and diseases (such as dwarf mistletoe, root rots, beetles, etc.)	• Stand replacement harvest and replanting with non-host species can reduce dwarf mistletoe and root rot infected stands.	Medium
• Reduce the severity of insects and diseases by removal of dead material.	• Salvage harvest in areas with a buildup of dead material in excess of forest plan standards and guidelines for snags and down woody material	Medium
Issue: Noxious Weeds		
• Minimize spread of noxious weeds	• Target for removal large seed producing noxious weed populations where wind patterns may deposit seeds in uninfected areas.	Medium
	• Plant competitive species in areas where there is a risk of noxious weed spread	Low
	• Road closures, education, vehicle cleaning C-clauses, etc.	
	• Re-establish vegetation in disturbed areas. • Along highways and roads are good places to concentrate manual, biological, and minimal chemical control on knapweeds, scotch broom, tansy ragwort, and sweet clover	Medium

Issue: Biodiversity		
How do other physical, biological and social ecosystem processes influence this issue?	Amount of Influence High, Medium, Low	How likely to change by management actions? High, Medium, Low, No
Physical: Fire, climate, wind, and topography influence landscape level *biodiversity*.	High	Low-Medium
Biological: Insects and diseases, and vegetative competition influence *biodiversity*	Medium	High
Social: Management activities (most ground disturbing activities) can change, remove, or add vegetation, which influences biodiversity.	High	High
Prevention of large scale stand replacing fires may reduce plant diversity.	Low	Medium
Matrix Allocations		

Issue: Biodiversity		
Objective of Management Action	Potential Treatments	Priority
• Preserve and promote biodiversity at the following levels: genetic, within the plant communities, and between the plant communities	• Implement reforestation and revegetation programs that emphasize genetic diversity in plant materials used(e.g. use of native plant species, multiple species tree planting). • Protect of within plant community diversity by precluding disturbance of species rich habitats. (maintain special habitat buffers) • Maintain representation of all plant community types across the landscape. • Increase ecological diversity by providing early successional habitat.	High
• Increase ecological diversity by providing early successional habitat	• Create big game forage by regeneration harvest, seeding in winter range . Converting stands in the stem exclusion stage to stand initiation stage.	
• Reintroduce role of fire in the ecosystem, while preventing large scale fires. • Production of commercial yields of wood (Commercial timber)	• Understory removals and underburning. Field identification of areas of the watershed may identify areas that have historically underburned. • Timber Harvest: regeneration, partial, salvage, and commercial thinning harvests	Medium-High High
• Retention of moderate levels of ecologically valuable old-growth components such as snags, logs, and relatively large green trees	Regeneration Harvest: • Stands which have reached 95% of culmination of mean annual increment • Stands too old or stagnated to respond to release from thinning. • Stands where regeneration harvest will address insects, diseases and wind throw • Stands where creating openings meet other resource objectives (wildlife, recreation, etc) • Late successional stands, if in excess of 15% of specific 5th field watersheds.	Medium
• Improve Stand Vigor	Commercial Thinning: • In matrix, stands in these size classes will be considered for thinning if they need stocking control to achieve recommended stocking levels for optimum growth or to maintain stands for longer periods.	
	• Post harvest activities: reforestation, pre-commercial thinning, fertilization, pruning, vegetation control, and animal control.	
	•	

Issue: Biodiversity (Continued)		
How do other physical, biological and social ecosystem processes influence this issue?	Amount of Influence High, Medium, Low	How likely to change by management actions? High, Medium, Low, No

Issue: Biodiversity (Continued)		
Objective of Management Action	Potential Treatments	Priority
Special Forest Products: • Stocking control of trees, thinning and post and pole harvest, which may increase tree growth, reduce canopy closure and stimulate understory vegetation. • Pruning which may reduce canopy closure and stimulate understory vegetation, increase future wood quality, reduce blister rust frequency on white pine and sugar pine • Clipping of plants may increase new shoot growth which may either reduce competition to other plants or provide available forage for animals. • Provides employment, economic diversity, and revenue to the Government. • Allows for harvest for personal use.	• Special forest products represent a wide variety of commercially valuable products that may have a variety of effects on vegetation depending on the nature of the activity or the level of harvest. In some cases, harvesting is used to meet Silvicultural objectives and uses similar techniques such as thinning or pruning to generate products. In these cases, the previous discussions applying to these Silvicultural treatments would follow for special forest product harvesting. • A potential list of products includes: Boughs, Christmas trees, beargrass, sword ferns, salal, princess's pine, mosses, Oregon grape, clippings of various shrub species, huckleberries, mushrooms, tree cones, and posts and poles. • Harvest is acceptable where compatible with Forest Plan Standards and Guides and with objectives for Riparian Reserves and LSR's.	Medium-High

Aquatic

Synthesis: *What are the influences and relationships between aquatic species and their habitats and other ecosystem processes in the watershed?*

Issue: Having habitat components (food, water, shelter, etc.) necessary to sustain a variety of species native to the area.

How do other physical, biological and social ecosystem processes influence this issue?	How much influence do these processes have? High, Medium, Low	How likely to change by management actions? High, Medium, Low, No
Physical: Solar radiation can reduce the quality of aquatic habitat through increasing water temperature.	Medium	Medium
Physical: Fire can remove shade and large wood from streams and riparian areas.	Medium	Medium
Physical: Erosion and the resulting deposition of sediment in the stream can impact survival and reproductive success.	Medium	Medium
Physical: The complexity of a stream channel(pools, riffles and structure) can affect the carrying capacity of aquatic habitat.	High	High
Biological: Vegetation such as trees and shrubs can provide: channel structure that can affect stream bank stability and fish carrying capacity; shade that can moderate stream temperature; and organic input that can affect productivity.	High	High
Biological: Salmon that die after spawning provide nutrient enrichment to streams and riparian vegetation.	Medium	High
Social: road construction, timber harvest, and various human uses can affect stream shade and sediment input to stream courses and may affect fish and aquatic insect survival and productivity	Medium	High
Social: Recreation activities near stream and lakes can affect riparian habitat through compaction and the removal of streamside vegetation.	Low-Medium	Low

Aquatic

Recommendations: *What and where are the opportunities for management, restoration or improvement within the watershed?*

Issue: Having habitat components (food, water, shelter, etc.) necessary to sustain a variety of species native to the area.

Objective of Management Action	Potential Treatments	Priority
• Maintain stream temperatures within State water quality standards.	• Manage riparian reserves on perennial streams to provide adequate shade to maintain water temperatures appropriate for aquatic insects and spawning and rearing native fish species.	Medium
• Maintain streamside downed and standing large woody material	• Prevent large scale fires by decreasing fire hazard and risk	Medium
• Manage amount and timing of sediment input as a result of management activities	• Follow recommendations for timing of instream work issued by the Oregon Department of Fish and Wildlife (1997) • Minimize erosion from Management Activities through implementation of BMP's and Forest Plan standards and guidelines	High
• Maintain or restore stream habitat complexity	• Evaluate current habitat conditions and determine appropriate restoration projects, such as large woody material placement, to develop adequate habitat complexity in areas were it is lacking. • Manage vegetation along streams for future large woody input • Retain riparian reserves along stream courses. • Meet objectives of Aquatic Conservation strategy in riparian reserves.	High High
• Supply nutrients to the stream ecosystem	• Distribute salmon carcasses from the hatchery throughout the stream system • Introduce live fish to the system to spawn and die and provide nutrients.	Low – Medium
• Maintain or restore stream habitat complexity	• Evaluate current habitat conditions and determine appropriate restoration projects, such as large woody material placement, to develop adequate habitat complexity in areas were it is lacking. • Manage vegetation along streams for future large woody input • Retain riparian reserves along stream courses. • Meet objectives of Aquatic Conservation strategy in riparian reserves.	High
• Manage amount and timing of sediment as a result of management activities	• Keep sediment producing activities that are in or near streams to those times when fish spawning and incubation of eggs is not taking place.	High
• Decrease resource impacts and improve aesthetics at recreational areas	• Decrease resource impacts at dispersed and developed recreation sites	Low- Medium

Issue: Re-introduction of Native Aquatic Species		
How do other physical, biological and social ecosystem processes influence this issue?	How much influence do these processes have? High, Medium, Low	How likely to change by management actions? High, Medium, Low, No
Biological: Introduced fish species may out compete native fish populations	High	High
Lack of retention of organic matter due to the lack of complexity can reduce the overall carrying capacity of a stream	High	Medium
Social: Construction of Detroit and Big Cliff Dams blocked the migration of fish up the North Santiam River and eliminated salmon and steelhead from this watershed and also blocked movements of bull trout and cutthroat trout.	High	Low
Social Influences: Forest management activities such as stream cleanout, some timber harvest, and some road construction have reduced the potential carrying capacity of existing habitat	Medium – High	Medium
Recreational fishing pressure can affect native fish populations	Medium	High
Stocking of Non-native fish species for angler use can affect native fish populations	Medium – High	High

Issue: Re-introduction of Native Aquatic Species		
Objective of Management Action	Potential Treatments	Priority
• Reduce competition between native and non-native species	• Increase stream shade complexity and reduce temperature to favor native species.	Medium
• Provide adequate habitat to sustain populations of migratory fish when access around migration barriers (dams) have been resolved	• Increase stream habitat complexity by increasing the amount of large woody material in the stream with restoration projects.	Medium
• Provide access for salmon and steelhead to the area above Detroit Dam.	• Remove dams • Trap and truck adults above the dams.	High
• Maintain riparian management areas around streams.	• Keep ground disturbing activities outside riparian areas.	High
• Maintain viable native fish populations.	• Work together with ODOT to get regulations to maintain populations • Maintain, restore and enhance aquatic habitat through projects and improved management.	High
• Minimize conflicts between native and non-native fish.	• Work closely with fish management agencies to make sure that non-native fish are not introduced into areas that may impact native species.	High

Wildlife

Synthesis: *What are the influences and relationships between wildlife species and their habitats and other ecosystem processes in the watershed?*

Issue: Having habitat components (food, water, shelter, etc.) necessary to sustain a variety of species native to the area.

How do other physical, biological and social ecosystem processes influence this issue?	How much influence do these processes have? High, Medium, Low	How likely to change by management actions? High, Medium, Low, No
Physical: Climate, topography (elevation, aspect, etc.) and soils can influence the composition and distribution of vegetative communities across the landscape. This can affect the type of food, water and shelter available to animal species.	High	No
Physical: Fire affects vegetative seral stage distribution and the habitat of species dependent on them. Fires often burn in mosaic patterns that can affect the landscape with varying intensities. In some areas stands are completely replaced by fires and in others fires only underburn the stands and most trees are preserved. Fires have both short and long-term impacts on habitat components necessary to sustain a variety of wildlife species.	High	Medium
Physical: Climate (wind storms, snow storms, etc.) can cause trees to blowdown etc. and can influence fragmentation of interior habitat and development of edge habitat, but can also create habitat for species dependent on down woody material.	High	Low-Medium
Physical: Climatic patterns and topography can influence amount, type distribution and storage of precipitation which influences the availability of life-sustaining water for animal species and plant life they depend on for survival.	High	Low
Biological: Vegetative species composition and seral stage affects both food and shelter availability for animal species.	High	High
Biological: Species adaptation to certain habitat types can influence what species are present in given habitats.	Medium-High	Low
Biological: Insects and diseases can affect vegetative conditions which can affect habitat quality for various species.	Low	Medium
Social: Management activities such as timber harvest and road construction can influence habitat effectiveness and connectivity	High	High
Social: Management activities can influence biodiversity	Medium-High	High
Social: Human uses can influence habitat disturbance and degradation, reproductive success, habitat removal, harassment, predation, etc.	Medium	High

Wildlife

Recommendations: *What and where are the opportunities for management, restoration or improvement within the watershed?*

Issue: Having habitat components (food, water, shelter, etc.) necessary to sustain a variety of species native to the area.

Objective of Management Action	Potential Treatments	Priority
None	None	None
• Simulate beneficial ecological effects of fire on the landscape. • Prevent large scale stand replacing fires by decreasing fire hazard and risk.	• Using a combination of underburning and various prescriptions for timber harvest to simulate habitat needs of various species. • Fuel treatments, fire prevention and suppression	Priority varies by area.
• As prescribed, minimize blowdown along the edge of harvest units.	• Unit design, location and harvest prescription	Medium
None	None	None
• Maintain habitat components for native terrestrial wildlife species	• Harvest prescription, unit sizes, landscape patterns, etc. • Management Plant Standards and Guidelines	High
• Determine which species of concern exist in the watershed • Determine habitat needs of species of concern in the watershed.	• Conduct surveys for species of concern within the watershed • Harvest prescription, units size, unit shape, location, landscape patterns, etc.	High High
• Maintain habitat effectiveness and connectivity	• Develop harvest proposals that address the habitat needs of various species. • Consider harvest prescriptions, unit locations, unit sizes, past harvest, etc.	High
• Maintain biodiversity	• Timber harvest with varying harvest prescriptions including varying tree densities, and replanting with multiple species. • Expand meadows by removing encroaching trees, burning meadows (T11S, R5E, Sections 8, 15, and 17) • Create openings in large contiguous stands -harvest 3 to 5 acre patches in large contiguous stands in Box Canyon	High High Medium
• Increase of awareness of wildlife needs and habitat characteristics	• Education programs	Medium

Issue: Conflicting habitat needs for various species (big game and spotted owls)		
How do other physical, biological and social ecosystem processes influence this issue?	How much influence do these processes have? High, Medium, Low	How likely to change by management actions? High, Medium, Low, No
Physical: Fires, especially stand replacing fires can modify habitat to favor one species over another. Managing and/or suppressing fires may favor one species over another.	High	Low
Biological: Species natural adaptations to various niches in the ecosystem	High	No
Social: Management plans affect species habitat, protection of one species can be detrimental to another with differing habitat needs.	High	High
Social: Fire suppression may favor one species over another.		

Issue: Conflicting habitat needs for various species (big game and spotted owls)		
Objective of Management Action	Potential Treatments	Priority
None	None	None
• Maintain viable populations of all indigenous species	• Develop effective management plans that address habitat needs of the various species native to the watershed. Regional, basin and watershed level.	
	• Develop fire suppression, burning plans on a landscape scale to consider	

Human Uses

Synthesis: *What are the influences and relationships between human uses and other ecosystem processes in the watershed?*

How do other physical, biological and social ecosystem processes influence this issue?	How much influence do these processes have? High, Medium, Low	How likely to change by management actions? High, Medium, Low, No
Issue: Heritage site degradation		
Physical: Erosion, freeze-thaw cycles and wind thrown trees	Medium	Low
Biological: Root growth of plants and trees, burrowing by small mammals, and trampling by large animals such as big game	Low	No
Social: Artifact collection	Medium - Low	Low
Social: Management disturbance	Medium - High	High
Issue: Interpretation		
Social: People are interested in learning about historic properties but very little has been accomplished toward interpreting past human activities.	Low	Medium
Issue: Economic Sustainability		
Physical: Soil, slope, aspect, elevation, climate, etc. influence vegetative growth, which in turn influences the potential products available from the forest.	Low	Low
Biological: Vegetation, especially trees, provide the primary forest products utilized by local communities.	High	Medium

Human Uses

Recommendations: *What and where are the opportunities for management, restoration or improvement within the watershed?*

Objective of Management Action	Potential Treatments	Priority
Issue: Heritage site degradation		
	• Manage stands to minimize susceptibility of windthrow.	Medium
• Site Protection	• Provide education to the public on the value of heritage resources and their protection.	Medium
• Site Protection	• Develop a management plan that establishes priorities for site testing and/or protecting those sites that are at risk of losing their integrity, context, and character from natural causes and human activities. In the process of testing these sites, other resources can gain information to help in planning their various projects.	High
	• Recover pollen core samples from several bogs, ponds and wet meadows to help recreate the vegetative history of the area. This must be done prior to any disturbance to the stratigraphy of these areas.	Low
	• Develop a management plan that establishes priorities for nominating eligible historic sites and linear features to the NRHP, and maintenance of these sites and features.	High
Issue: Interpretation		
• Public Education	• Create a thematic plan that looks at the interpretive value of the Blowout watershed and establishes priorities for those sites to be interpreted. This plan could benefit multiple resources, multiple agencies and the public. It should include all as partners in completing and administering the document	Low
Issue: Economic Sustainability		
• Improve soil productivity through fertilization	•	Low – Medium
• Provide for a sustainable timber supply. • Provide for a variety of forest products. • Balance communities needs for increased tourism/recreation opportunities with other resource objectives.	• Set appropriate harvest levels within the management allocation requirements and the ecological limits of the watershed. • Use commercial timber harvest as one method of achieving a variety of ecosystem objectives such as thinning to increase growth and therefore development toward late-successional habitat. • Provide post and poles through pre-commercial thinning, beargrass, boughs, rocks, Christmas trees, etc. • Work with local tourism organizations to analyze potential tourism opportunities on National Forest System lands and marketing strategies for these opportunities.	High

Issue: Economic Sustainability (continued)		
How do other physical, biological and social ecosystem processes influence this issue?	How much influence do these processes have? High, Medium, Low	How likely to change by management actions? High, Medium, Low, No
Social: Detroit Reservoir and surrounding Forest lands have created an important economic resource to local communities. Local tourism economy is dependent on high water levels of Detroit Reservoir.	High	Medium
Social: The forest products industry, and tourism generated from recreation in the Detroit Lake area and highway travel, support the diversifying economies of North Santiam Canyon communities. Species and watershed protection measures and changing public sentiment about selling forest resources (like old growth) as commodities, combined with a changing political climate, have resulted in a sharp reduction in the timber supply from National Forests and other public lands, to operate local mills. This reduction has threatened the economic sustainability of historically forest-dependent communities in the North Santiam Canyon, and have prompted them to develop economic strategies to adjust to a different future.	Medium - High	Medium - High
Social: Scientific research, public sentiment and political processes, etc. can influence forest management practices, which in turn, can influence the amount and types of products available to local communities.	Medium	Medium

Issue: Recreation Opportunities		
How do other physical, biological and social ecosystem processes influence this issue?	How much influence do these processes have? High, Medium, Low	How likely to change by management actions? High, Medium, Low, No
Social: There is a demand for a diverse set of recreation opportunities (settings and activities) ranging from a Primitive to Roaded Natural setting. As the physical environment is changed through various resource management practices so may the desired proportion of settings available to the public, including roaded opportunities. The demand for Semi-primitive settings are not met in the Region, and future demand on the Forest will exceed the supply.	Low – Medium	Low – Medium
Physical: Landform and topography influence human use patterns. For example, steep topography concentrates visitor use mostly to the flat valley bottom around the reservoir. Weather is a strong determining factor when people recreate and the type of activities which they engage in.	High	No
Biological: Old growth or mature Douglas-fir forests and other vegetation provide the recreational setting and influence the type of recreational activities that occur in the area.	High	Medium
Biological: Wildlife and fish provide recreation opportunities such as hunting, fishing, and wildlife viewing.	High	Medium - High

Issue: Economic Sustainability (continued)		
Objective of Management Action	Potential Treatments	Priority
• Resolve the conflict of local recreation needs vs. downstream water quality and quantity needs.	• Participate with other agencies and entities in the resolution of conflicts with Detroit Reservoir water level needs.	Medium
	• Maintain a diverse set of recreation opportunities to enhance tourism in the area and provide benefits to the local economy.	
• Increase public understanding of resource management.		Medium

Issue: Recreation Opportunities		
Objective of Management Action	Potential Treatments	Priority
	• See Appendix A – Implementation Guide for the Coffin – Bachelor Mountain Dispersed Recreation Semi-primitive Motorized Area.	
• Maintain and enhance desirable recreation settings through various vegetation management practices.	• See Vegetation Recommendations.	Medium
• Maintain habitat components for native terrestrial wildlife species. Increase awareness of wildlife needs and habitat characteristics.	• See recommendations under Maintaining habitat components for native terrestrial species.	Medium

Issue: Recreation Opportunities (continued)		
How do other physical, biological and social ecosystem processes influence this issue?	How much influence do these processes have? High, Medium, Low	How likely to change by management actions? High, Medium, Low, No
Social: Construction of Detroit Dam, that formed Detroit Reservoir, serves as a recreational destination point and influences use.	High	No
Social: Improved highway access and proximity to urban areas provided easier access to recreational opportunities and has increased use.	Medium	No
Social: Population growth, socio-economic status and cultural background influences user demand.	High	No
Social: Social capacity in excess of resource capacity increases resource impacts such as soil compaction, etc.	High	Medium
Issue: Dispersed Recreation Opportunities		
Social: Increased dispersed recreational use due to high and increasing demands for this opportunity may place additional pressures on resources.	Medium	Medium

Issue: Recreation Opportunities (continued)		
Objective of Management Action	Potential Treatments	Priority
• Provide for a wide range of demanded recreational settings to achieve satisfactory user experience.	• Monitor and evaluate the effectiveness of recent recreational developments around the reservoir and update the Detroit Lake Composite Area Management Guide. • Implement a carrying capacity study of the reservoir to help determine future development (i.e. marina and launching expansion, parking, etc.) and management strategies around Detroit Lake (restrictions, designated use areas, etc.) • Develop an area interpretive plan.	High
• Decrease resource impacts and improve aesthetics at recreational areas.	• Restore and rehabilitate resource damage in high use campsite areas around Detroit and Blowout Creek, especially within riparian reserves. Provide sanitary facilities where feasible.	Medium
Issue: Dispersed Recreation Opportunities		
• **Recreation/Scenic Resources** provide for more upland recreational opportunities to help alleviate the recreation pressure with increasing use around the lake.	• ***Pinnacle Peak Special Interest Area Plan***: The Forest Plan requires an area management plan to be developed for SIA's describing the site-specific management objectives, enhancement programs, and other acceptable uses and activities such as recreation nature trails, interpretive media, parking and sanitation facilities.	High
	• ***Area Interpretive Plan:*** There are many opportunities within Blowout to interpret natural and cultural resources. Some opportunities to consider include: • Quartzville Byway Corridor • Blowout Beaver Ponds, wildlife • Pinnacle Peak-geological, wildlife • Little Meadows-botanical, wildlife • Coffin Mountain-fire history, lookout, views, landscape management • Geology of Blowout • Scar Mountain-cultural • Self-Guided Tour Routes	Medium
	• ***Blowout Suspension Bridge***: The bridge is showing signs of aging and needs to be restored or replaced.	High
	• Provide additional dispersed campsites along the reservoir where demand exists. (For example: Blowout and Box Canyon Creek)	Medium
	• Provide trail opportunities that are in demand. • Construct the Detroit Reservoir Shoreline Trail as identified in the LMP, and other suitable potential areas. For example: Box Canyon Creek, Coffin Mountain, Lost Creek, etc.	Medium – High
	• Enhance huckleberry opportunities within the Scar Mountain area.	

How do other physical, biological and social ecosystem processes influence this issue?	How much influence do these processes have? High, Medium, Low	How likely to change by management actions? High, Medium, Low, No
Issue: Scenic Quality		
Physical: Fire, geology, topography and water all influence the scenic character of the area.	Medium	Low
Biological: Vegetative reestablishment following management activities and or catastrophic events influences scenic quality.	High	Low
Social: Timber harvest, road construction, shoreline draw-down created by the dam, have altered natural scenic quality.	High	Medium
Biological: Diseases such as *Phellinus* affect management within visual allocations. Treatment of *Phellinus* pockets (clearcut) may conflict opening size within visual allocations.	Medium	Medium
Issue: Public Safety		
Physical: Erosional Processes can create safety hazards or damage to facilities.	Medium	Low
Biological: Trees can create safety hazards or facility damage.	Medium	Medium – High
Social: Lack of adequate facilities, signing and enforcement creates safety issues.	Medium	Medium - High
Issue: Firewood Supply & Demand		
Social: Decreasing firewood supplies are not able to keep up with the demand for fuel wood by people in the region.	High	Medium

Objective of Management Action	Potential Treatments	Priority
Issue: Scenic Quality		
• Prevent large scale stand replacing fires by decreasing fire hazard and risk		High
• Reestablish vegetation promptly.	• See Vegetation Recommendations.	Medium
• Implement management actions to minimize adverse impacts to scenic quality (harvest unit design, facility placement on the landscape). • Maintain and enhance the inherent beauty and integrity of the watershed.	• Develop a Viewshed Implementation Guide. • Implement the recommended guidelines defined in this watershed analysis for regeneration harvest. • Develop standards and guidelines for Army Corps. of Engineer lands that are managed by the USDA Forest Service. • Maintain and improve scenic overlooks of the reservoir along the highway and Blowout Road. • Improve scenic opportunities (views, overlooks, diverse vegetation) along the Quartzville Back County Byway).	Medium – High
Issue: Public Safety		
• Restoration of erosion prone areas.	• See Recommendations under erosion processes	
• Provide for public safety	• Remove hazard trees within developed recreation areas, popular dispersed sites, and within approximately 1 tree length from the prism of well traveled roads. • Improve parking around the reservoir to reduce congestion along the highway and Blowout Road. • Fire prevention and fuels management to reduce risk. • Post warning signs of dangerous situations or facilities. • Provide road maintenance on roads used by the public.	Medium - High
Issue: Firewood Supply & Demand		
• Increase available firewood supplies without causing significant impacts on ecosystem values.	• Develop a program to allow the collection of firewood outside of established harvest areas	High

Facilities

Synthesis:

How do other physical, biological and social ecosystem processes influence this issue?	How much influence do these processes have? High, Medium, Low	How likely to change by management actions? High, Medium, Low, No
Issue: Maintaining Facilities		
Physical: Topography and soil types determine facility location	High	No
Physical: Weather, such as snow, ice, floods, wind, etc. can damage facilities.	Medium	Low
Physical: Facilities deteriorate with age.	Low	Low
Biological: Vegetation can damage facilities	Medium	Low
Social: Vandalism and use (wear and tear) can be costly.	High	Medium
Social: Demand and need influences the type of facilities created.	High	No
Issue: Sediment Production		
Physical: See similar processes under Geologic Resources		

Facilities

Recommendations:

Objective of Management Action	Potential Treatments	Priority
Issue: Maintaining Facilities		
	•	
• Maintain facility condition at or above acceptable standards, and meet current public needs.	• Replace and maintain facilities reported in the Recreation Facilities Conditions Assessment	
	• Upgrade sanitary facilities at campgrounds and day use area to meet public expectations. Install sanitary facilities at dispersed areas that have sanitation problems, where feasible.	
	• Improve parking around the reservoir to accommodate current demand.	
	• Update and inventory road system for GIS and TMS programs and revise Road Management Objectives	
Issue: Sediment Production		
• Restoration of erosion prone areas	• Inventory road system to determine storm proofing and decommissioning needs	
• Maintenance of existing roads	• Upgrade stream crossing to allow for fish passage and design for 100-year stream flow	
	• Reroute drainage to stable receiving areas.	
	• Relieve inboard ditch line more frequently	
	• Replace deteriorated culverts, waterbar and outslope.	
	• Harden road prism through rock placement.	
	• Mulch and revegetate bare, erosion-prone surfaces such as cuts and fill slopes, wherever sediments have access to the stream system.	

USDA Forest Service
Willamette National Forest
Detroit Ranger District

Implementation Guide

for the
Coffin-Bachelor Mountain Dispersed Recreation
Semiprimitive Motorized Area

April 21, 1998

Coffin - Bachelor Mountain Dispersed Recreation Semi Primitive Motorized Area Implementation Guide

Willamette National Forest
Detroit Ranger District

April 1998

Scale 1:28000
04/15/98

Request #1727c

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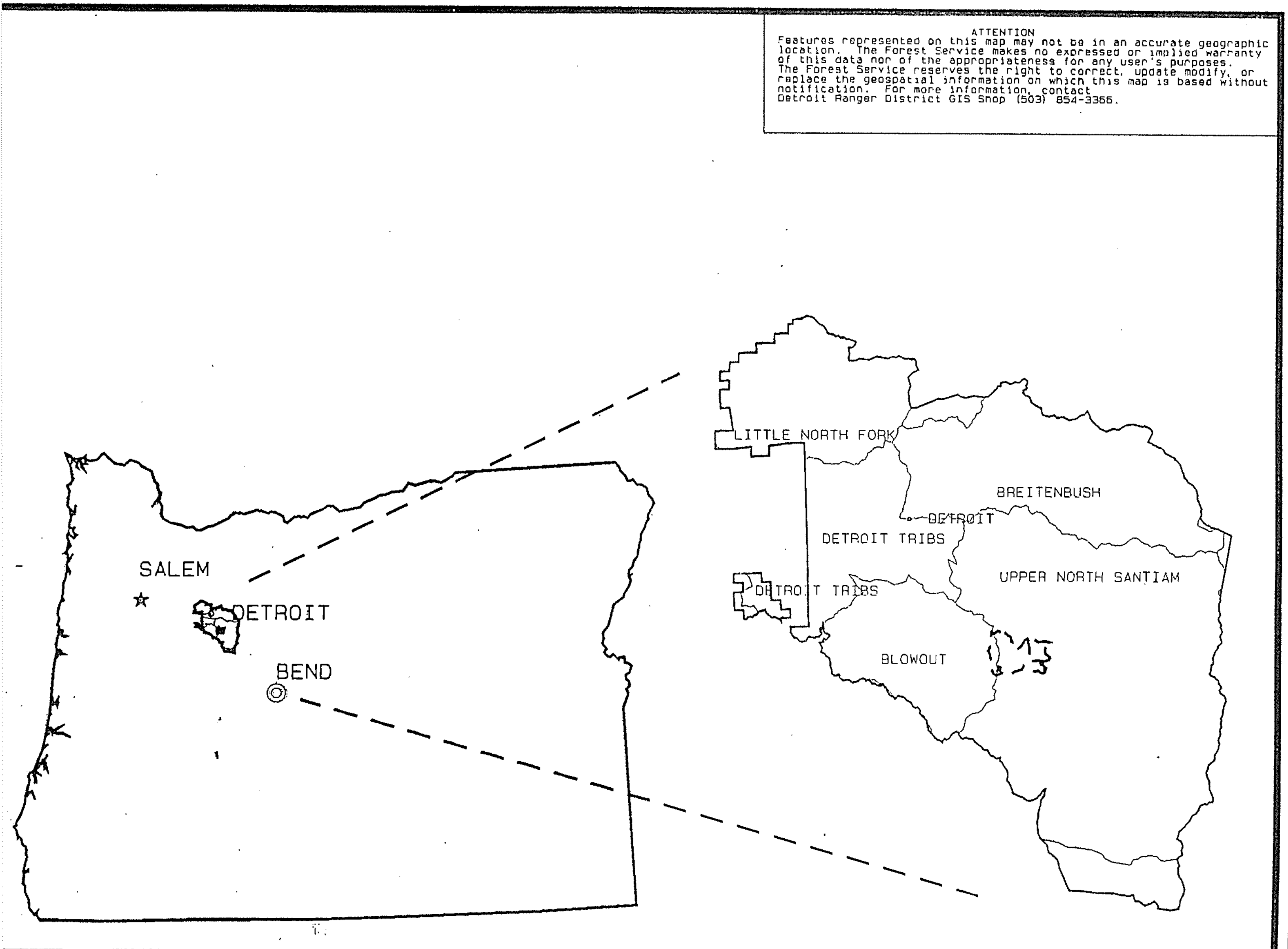
Vicinity Map

Coffin - Bachelor Mountain Semi Primitive Area
Detroit Ranger District



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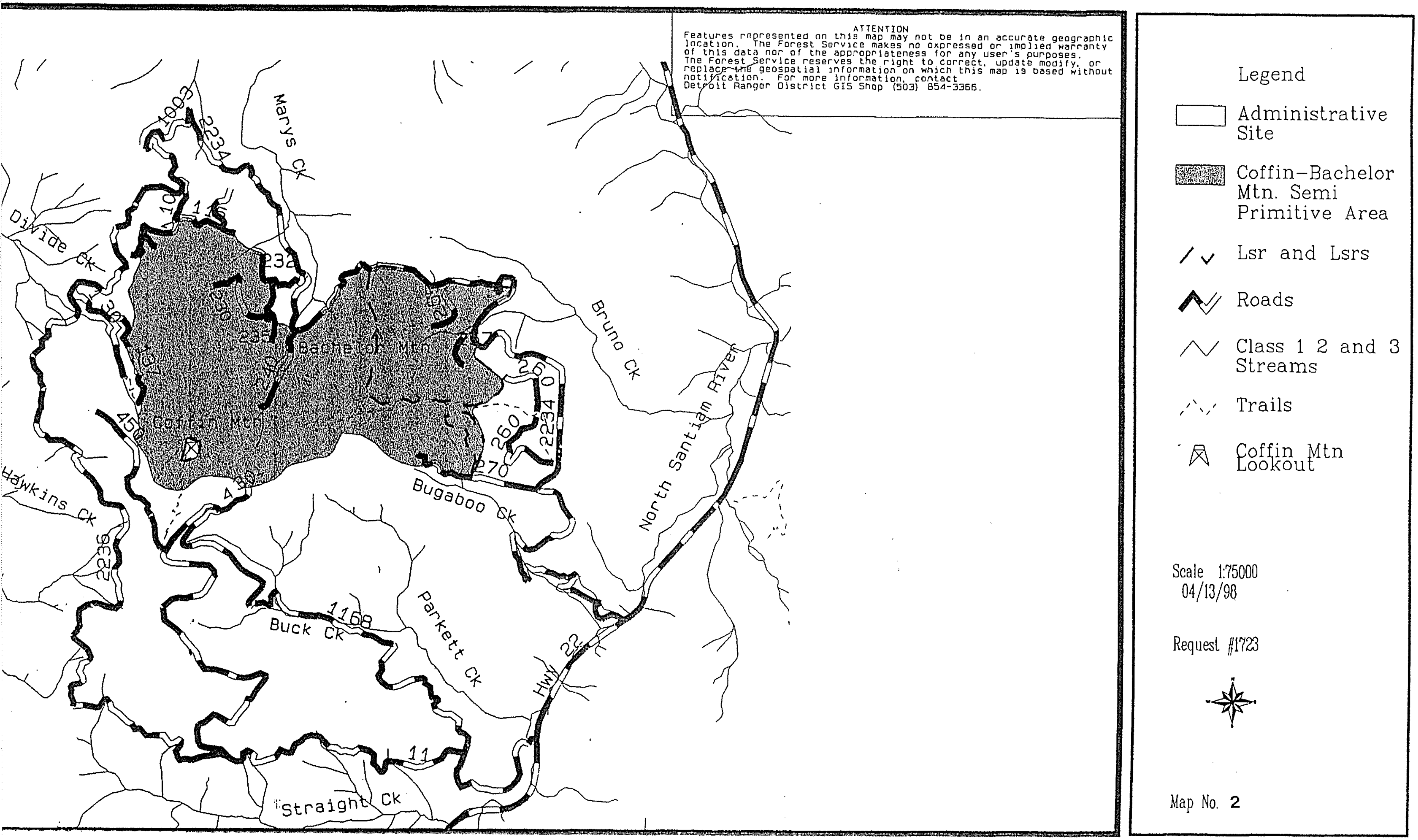
Request #1727

Map No. 1

Coffin - Bachelor Mountain Semi Primitive Area
Detroit Ranger District



PURPOSE AND SCOPE

The 1990 Willamette National Forest Land and Resource Management Plan designated the area surrounding Coffin Mountain and Bachelor Mountain as a Dispersed Recreation Area managed to provide Semiprimitive Motorized settings and experiences. The Implementation Guide is required by the 1990 Forest Plan, and provides management direction and project implementation guidance specific to the Semiprimitive Motorized Area. The implementation guide is not a decision document. For any projects or activities proposed within the area, agency policies and procedures regarding the National Environmental Policy Act and planning regulations will be followed.

The 1990 Willamette National Forest Land and Resource Management Plan has since been amended by the *Record of Decision and Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth related Species within the Range of the Northern Spotted Owl (1994)*. As part of the Forest Plan implementation process, Watershed Analyses were completed for the 137,000 acre Upper North Santiam Watershed during 1995, and for the 34,000 acre Blowout Watershed in 1994. As a result of these analyses, recommendations were proposed that would move the existing condition of these watersheds toward the desired condition envisioned in the amended Forest Plan. When the original Forest Plan was written requiring implementation guides, Watershed Analysis was unknown so many recommendations have already been identified through the Watershed Analysis process. For the purpose of this guide, pertinent recommendations discussed in Watershed Analyses will be included, and additional recommendations will result as part of this area-specific process.

Part of the Coffin-Bachelor Mountain Semiprimitive area lies within the Jefferson R0214 Late-Successional Reserve (LSR) in which an assessment is required under the Northwest Forest Plan. Assessments of the conditions and functions for each LSR or group of smaller individual LSRs are to provide information to managers, planners and the public from which to evaluate proposed activities and facilitate implementation of appropriate management activities for the LSRs that assure activities meet the LSR standards and guidelines and further LSR objectives. Currently, a draft Mid-Willamette Late Successional Reserve Assessment has been completed.

Recognizing that our current knowledge of the ecosystem and the actual conditions will change over time, a periodic review of Watershed Analyses and LSR Assessments should occur and be revised to reflect new information or changed conditions. Recommendations resulting from this Implementation Guide will be reviewed for any inconsistencies with future revisions of Watershed Analyses and the LSR Assessment.

LOCATION

The Coffin-Bachelor Mountain Semiprimitive area encompasses approximately 3,513 acres and contains 770 acres of Late Successional Reserves. Most of the area east of Coffin Mountain (approximately 2977 acres) lies within a Tier II watershed, which provides a source of high quality water to downstream users.

The Coffin-Bachelor Mountain Semiprimitive Area lies in the North Santiam River basin on the western slope of the Cascade mountain range within Linn County. The area lies approximately 2.5 miles west of State Highway 22 and North Santiam River within Township 11S, in the northeast 1/4 of R6E, and northwest 1/4 of R7E. The area lies within the western Cascade physiographic province and occupies 2977 acres in the southern Marys and northern Straight Landform Blocks of the Upper North Santiam Watershed (Upper North Santiam Watershed Analysis, 1995); and 536 acres of the Hawkins subdrainage within the Blowout Watershed (Blowout Watershed Analysis, 1994).

DESIRED FUTURE CONDITION

Social Setting

The desired condition for the Coffin-Bachelor Mountain Dispersed Recreation-Semiprimitive Motorized Area, as described by the 1990 Forest Plan, is an area that provides for a wide range of recreation opportunities where visitors can experience a moderate degree of isolation from the sights and sounds of human activity. Recreational use will vary by season but will generally remain light and visitor interaction will be infrequent. There is moderate opportunity for solitude, tranquility, and closeness to nature; and a high degree of self-reliance, challenge and risk in using motorized equipment. Activities associated with this area are both motorized and nonmotorized in nature. Specific recreational activities are centered around consumptive and nonconsumptive use of land and water areas that could include, hiking, camping, hunting, horseback riding, mountain biking, off-road vehicle use, nature study, and fishing.

Physical Setting

The setting of this management area will be characterized by an environment where the natural landscape may have been subtly modified but where alterations will not draw the attention of most users. The area will predominately be a natural or natural-appearing environment of moderate to large size. Vegetation alterations resulting from regeneration harvests are very small in size and few in number, widely dispersed and not obvious. Regeneration timber harvest in this management area will occur at a rate of up to 7% of the suitable and available acres during the first 10 years following Forest Plan implementation.

Facilities

Access to and within the area will be provided by trails and roads. Site modification for facilities is minimal. Except as necessary to protect fragile resources, signing and developments will be limited. Facilities will be limited to trail structures or other structures to meet sanitary or safety needs of visitors. Developments will be simple in design and constructed with materials that blend with features of the natural landscape. The area will be managed to minimize the presence of on-site controls and use restrictions. Visitor information services such as interpretation is through very limited on-site facilities but use of maps, brochures and guide books is acceptable.

ISSUES AND CONCERNS

Physical

Soils/Geology

- Excessive fuel accumulation creates potential for sufficient fire intensity to damage soil.

Hydrology

- Timber management activities can create soil disturbance that accelerates erosion processes and have the potential to affect water quality.
- Transportation management activities can create soil disturbance and redirect natural drainage patterns that accelerate erosion processes and have the potential to affect water quality.
- Motorized and non-motorized recreation can create soil disturbance that accelerates erosion processes and have the potential to affect water quality.

Biological

Vegetation

- High stand densities have resulted in decreased stand vigor and increased tree mortality.

Fire

- The fire regime for this area is classified as a "High Severity Fire Regime" based on hazard risk. Historically, fires in this area are infrequent (100 year intervals), usually high-intensity, and stand replacing in character.
- Fuel loading has significantly increased in second growth stands during the last decade primarily due to tree mortality created by high stand densities, and blowdown. Fire suppression has contributed to long term fuel accumulation. Fuel buildup increases the risk of stand replacing fires. Untreated stands will continue to have mortality and will continue to contribute to these high fuel loadings.

Wildlife

- There is a lack of multi-storied structure within fire regenerated, even-aged stands created within the last 100 years.

- Younger stands in the area that resulted from fire and management activities, are lacking snags and down woody debris of adequate size and range of conditions. Most large down wood in these stands are in advanced stages of decay.

- High fuel loadings increase risk of stand replacement fires, especially within the Late Successional Reserve.

- The Coffin-Bachelor Mountain area lies within portions of five big game Management Emphasis Areas (MEA). Divide, Marys, Bugaboo and Bruno MEA's are below acceptable limits for overall habitat condition for big game due to high road densities and lack of forage.

- Quarter township 11061 lies within the Santiam Area of Concern and is located within a portion of the Coffin-Bachelor Mountain area. This quarter township falls below the 50-11-40 rule with 47.5% of the stands averaging at least 11 inches diameter breast height and 40% canopy closure.

- Studies show off-road vehicle (ORV) use may conflict with big game due to harassment or disturbance during nesting, calving and denning periods. Potential ORV use on trails is a concern due to noise disturbance that would be distributed over a wider area.

Social

Heritage

- A large prehistoric lithic scatter site is being impacted from recreation use, road maintenance and blowdown activity. Potential ORV use on area trails can impact heritage sites.

Recreation/Scenic

- Currently, there is conflicting direction on how the area is to be managed. According to the Forest Plan, the area is to be managed for semiprimitive motorized experiences which allows activities that are both motorized and nonmotorized in nature. Conversely, all area roads are closed to motorized use in order to meet big game management objectives identified in the Forest Plan. In addition, the current trail system was not constructed to a standard that would accommodate motorized travel.

- Area trails are not meeting maintenance standards. A declining trail management budget reduces the ability of adequately maintaining the existing trail system.

- Coffin Mountain lookout attracts visitors which can sometimes conflict with the lookout's ability for wildfire detection. Personal safety of and courtesy toward the lookout staff is an issue.

- Large scale fires have the potential to impact the visual quality of the area, semiprimitive recreational experiences of visitors, forest commodities and administrative sites.

- Pre-1990 Forest Plan timber management created openings larger than current standards allow within this allocation. Some of these stands are still in a visually disturbed condition.

Transportation

- Declining road maintenance budgets reduces the ability to adequately maintain existing roads. Inadequately maintained roads affect user safety and the ability to use roads.

- The Flood of 1996 caused some road damage within the area.

- The 2236 road (Coopers Ridge Road), west of the area may continue to fail due to soil type. This road is not a high priority for maintenance.

CURRENT CONDITION

Physical

Soils/Geology

The most dominant landscape feature within this subwatershed is the formidable and protruding rock face on the escarpment of Coffin Mountain (elev. 5771 feet). Named for its ominous, box-like feature, Coffin Mountain is an erosional remnant of an extinct volcanic eruption and lava flow. Second in grandeur but first in height is Bachelor Mountain (at 5953 feet), located almost directly across the Marys Creek canyon from Coffin Mountain. The area contains a variety of landforms which are geomorphically diverse and highly complex. These landforms range from extensively glaciated upland benches and headwalls at the higher elevations; to stabilized slump/earthflow complexes; to steep, shallow soiled, highly dissected headlands with rock scarps and bluffs; and finally to extensive areas of lower elevation benches, flats and terraces that formed by glacial outwash processes.

Mid Pleistocene (one million years ago) glaciation was probably the principal force that carved the characteristic U-shaped valley into the underlying Western Cascade volcanic strata. These upland benches and flats now form the headwaters of Marys Creek. This glacier probably extended to the west of this analysis area, and may have completed its journey where Detroit Dam is presently located. It is unknown if glacial ice actually occupied the upper valleys of these tributaries during the last Ice Age (10,000 years ago). Late Pleistocene (10,000-500,000 years ago) glaciation probably had minimal direct effect in the area, except for the likelihood of localized ice fields on the northern aspects of the tallest peaks and ridges.

The steep sidewalls that comprise most of the analysis area are extensively dissected, show numerous rock outcrops and bluffs, and support an extensive blanket of fire-regenerated Douglas-fir and noble fir on the shallow, mostly rocky soils. By contrast, the gently sloping to flat lying terrace deposits of the valley bottom are comprised almost entirely of glacial outwash materials. On the steep, rocky sideslopes, ravel and slough predominate when vegetation is absent, such as after catastrophic fire events. Most sediment input into the system is a result of natural gradual downslope movement of soil from gravity and activity such as rainfall and freeze/thaw. Localized areas of active slope instability are present, primarily in the form of highly prone debris or snow chute zones. With the steep dissected nature of the valley walls, debris chutes would play a major role in the down slope movement of soil and debris in those localized areas. Since little evidence was found to indicate that this is a major source of sediment generation in this century, it would seem that this mechanism is highly episodic in nature, and related to fire and/or flood events of past centuries.

Hydrology and Water Quality

The Coffin-Bachelor Mountain area is located within the western Cascade physiography which typically contains steep slopes and colluvial benches. The steep sideslopes contribute water to the stream systems through snow runoff and groundwater. Characteristics of these stream systems depend upon the location of the channel along the hillside. Headwater channels are steep, greater than 35 percent, and contain sideslopes greater than 65 percent. Channel material primarily consists of boulders and bedrock. There is past evidence of debris torrents, however, these areas have since revegetated with alder and willow. The area is still prone to snow avalanches. Midslope channels are moderately steep, 5 to 35 percent, and contain mostly small boulders and cobble. Colluvial benches have been created along these midslopes. At the slope break of these benches, the channels are steep and have similar characteristics to headwater stream channels.

The hydrology of the area is dominated by snow which contributes to the source of water within stream channels. Due to the high elevation ranging from 3500 to 6000 feet, and the north facing aspect of the Marys Creek drainage, snow doesn't melt until early summer. This snowpack keeps the groundwater table high and creates seasonal wet areas. The wet areas are primarily found on the colluvial benches due to the deeper soil depth and the ability of these areas to hold water. Water quality for the area is high. Headwater areas tend to produce seasonal flows following snowmelt, and perennial streams are associated with groundwater sources. Turbidity levels are low due to wet areas acting as a filtration system, trapping and storing fine sediments.

Large woody material is a key component within stream channels for energy dissipation and sediment storage. Most of the large woody material is decomposing and has some to no structural integrity. The areas with frequent fire frequency do not contain the level of woody material within the channel as those areas with less frequent fire. Past harvest activities have occurred along Marys Creek. The riparian vegetation has since reestablished but it will take time before the conifers reach adequate size to contribute large woody debris to the stream.

Biological

Vegetation

The Pacific silver fir plant association is the predominant series within the Coffin-Bachelor Mountain area. It also includes a lesser amount of mountain hemlock at higher elevations. These plant associations are generally influenced by heavy snowpack which provides good moisture but shorter growing seasons. The predominant tree species are noble fir, Douglas-fir, and western hemlock.

Managed Stands (regeneration harvest)

Coffin - Bachelor Mountain Semi Primitive Area
Detroit Ranger District

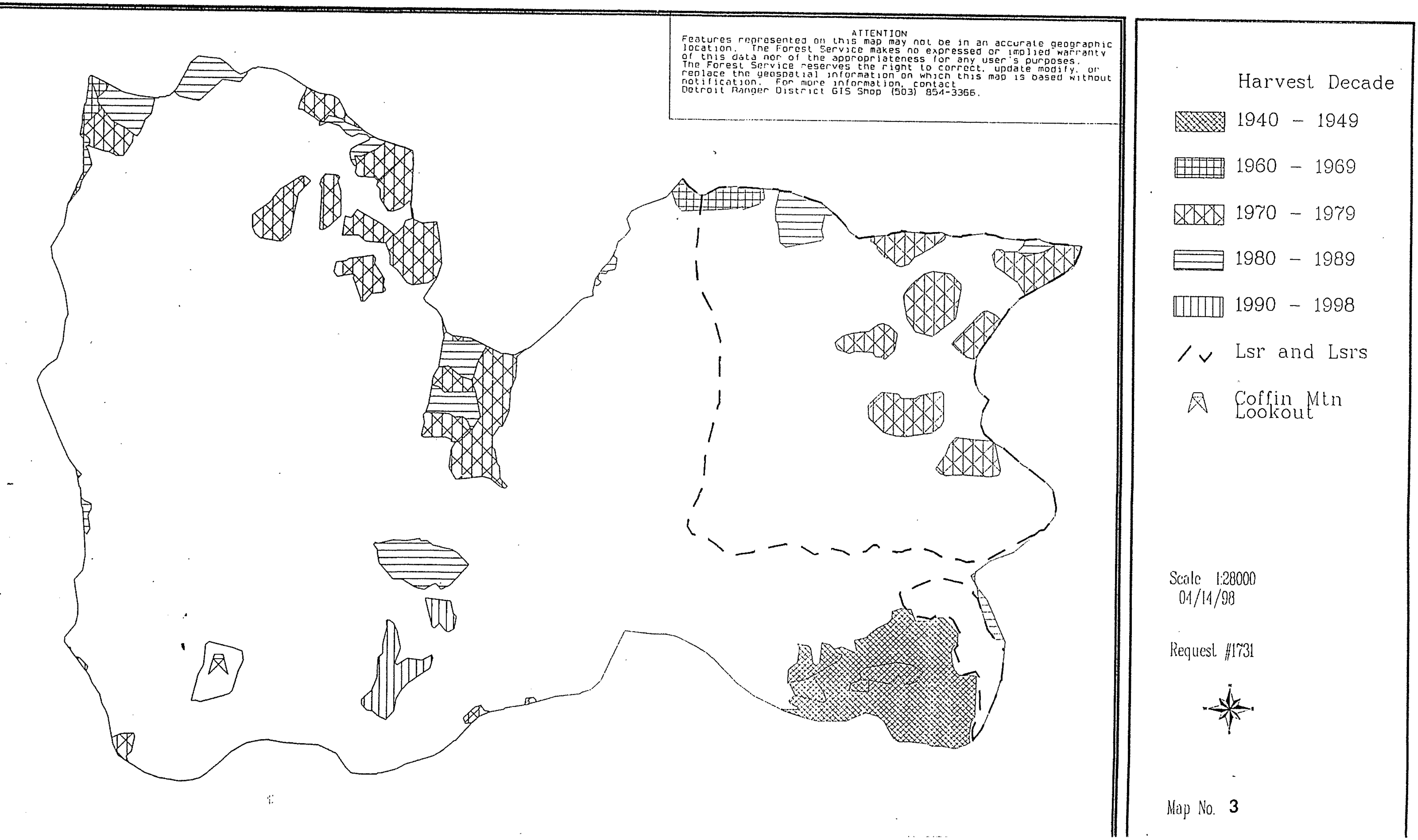


Table 1. Harvest by Decade

Decade	Acres
1940-1949	121
1960-1969	20
1970-1979	240
1980-1989	95
1990-1998	24
Total	500

Of the approximately 3,513 acres in the area, about 500 acres have been harvested for timber within the past 50 years (*Table 1 & Map 3*), primarily in 1948 and a period between 1979-1985. The earliest stands were harvested in 1948 and presently contain trees in the small diameter size class. Stands harvested in the 1960's are composed of pole sized trees. Stands harvested in the 1970-1979's have reached a sapling size class, and those harvested since the 1980's are reaching a sapling size class.

Table 2. Tree Size Class Distribution

Size Class	Acres
Seedlings	84
Saplings (1.0 to 4.9 d.b.h.)	333
Poles (5.0 to 8.9 d.b.h.)	81
Small (9.0 to 20.9 d.b.h.)	1381
Medium (21.0 to 31.9 d.b.h.)	284
Large (32 or greater d.b.h.)	850
Nonforest (e.g. meadows, etc.)	500
Total	3513

In terms of tree size. the diameter class of 9 to 20.9 inches occupies the largest in total area at about 1381 acres (*Table 2, & Map 4)*. This size class owes most of its origins to a large stand replacement fire which occurred during the 1890's and burned approximately 1582 acres within the area. In 1967, the Buck Mountain fire burned approximately 251 acres in the southern portion of the area. This area is characterized as containing sapling to small sized trees with the upper rocky slopes containing unsuitable soil types for successful regeneration of trees.

Approximately 1634 acres of the Coffin-Bachelor Mountain area is in late successional condition. These stands are 21 inches in diameter or greater with an average age of about

Size Classes

Coffin - Bachelor Mountain Semi Primitive Area
Detroit Ranger District

ATTENTION

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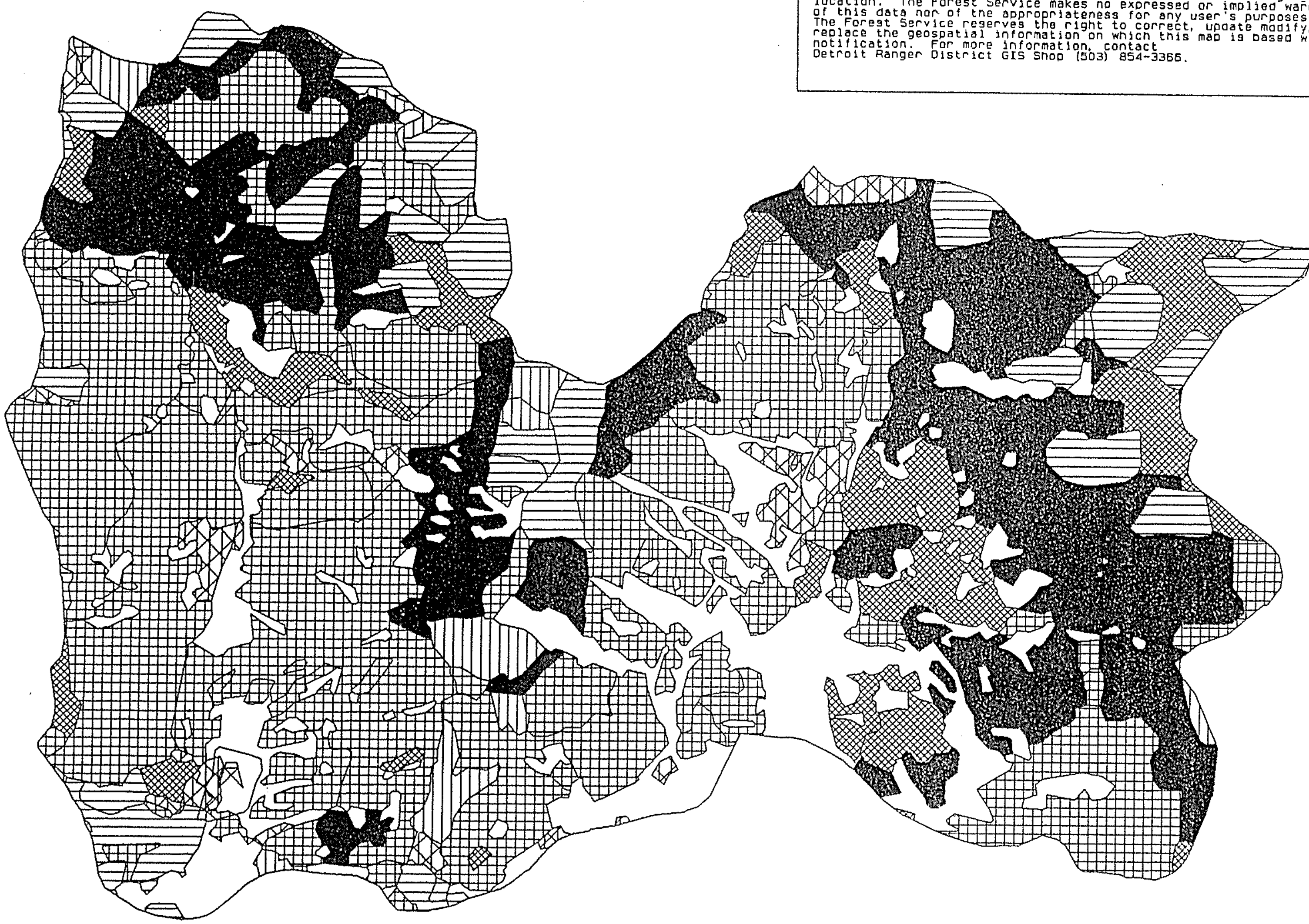


Legend

- Non Forest
- Seedlings
- Saplings
- Poles
- Small Trees
- Medium Trees
- Large Trees
- Coffin Mtn Lookout

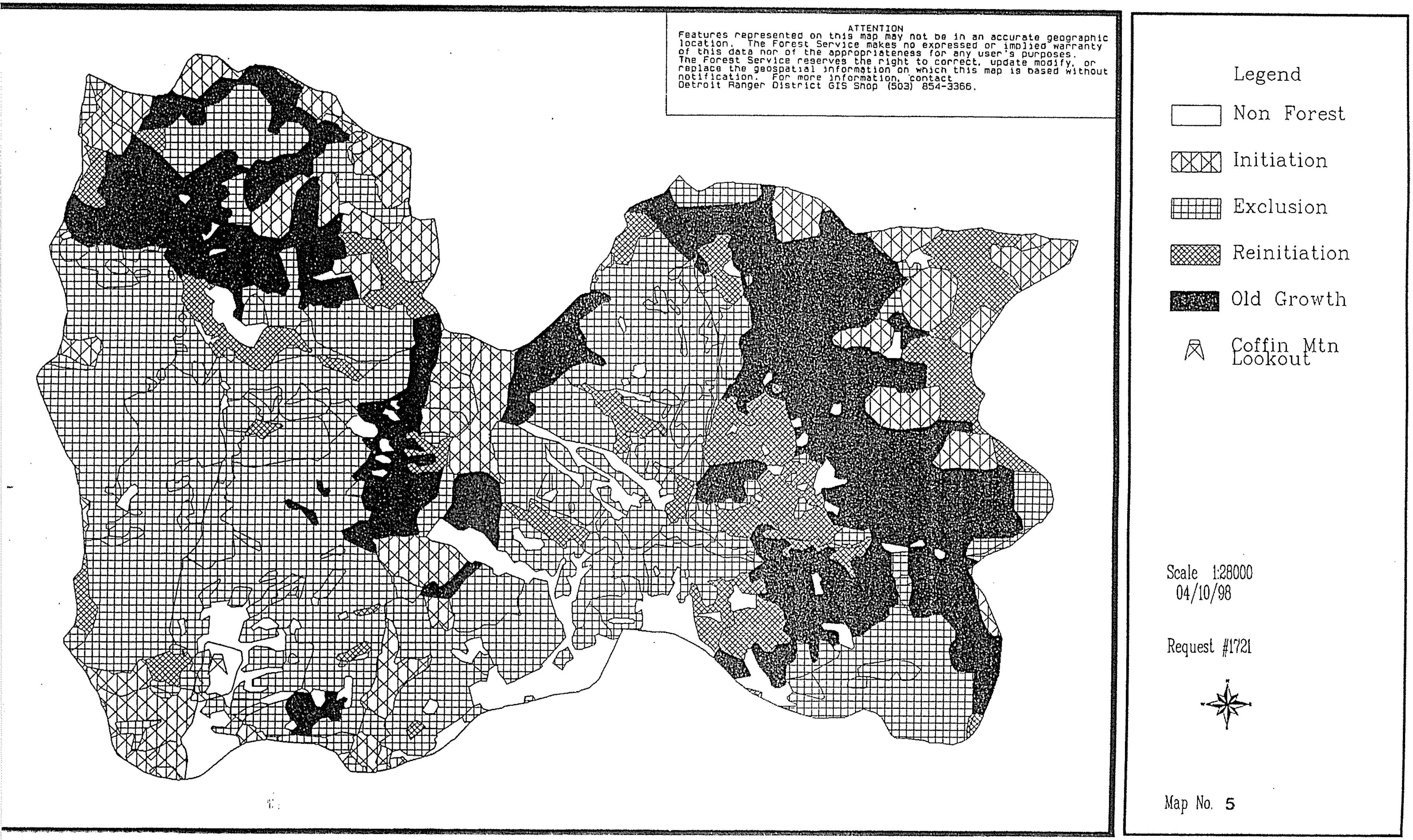
Scale 1:28000
04/16/98

Request #1720

Map No. 4

Structural Stages

Coffin - Bachelor Mountain Semi Primitive Area
Detroit Ranger District



375-400 years, and primarily occur in the Late Successional Reserves, valley bottom of the Marys Creek drainage, and northwest corner of the analysis area *(Maps 4 & 5).*

In areas where fires have occurred, natural regeneration has resulted with stands containing predominantly noble fir. The high elevation of the area creates favorable growing conditions for this tree species. The area is recognized as having high quality noble fir, a demand within the special forest products market, primarily for boughs. Areas identified for potential bough harvest include existing managed stands *(Map #3)*, and an area to the west of Coffin Mountain that burned during the Buck Mountain Fire.

According to the Forest Plan, scheduled even-aged (regeneration) harvest should not exceed 7% of the suitable and available acres during the first 10 years following Forest Plan implementation (Forest Plan MA-10b-06). Some variation in harvest rate is permitted in consideration of uneven-aged silvicultural systems, differences in rotation length due to site conditions or species-dependent growth rates, and operational feasibility of harvest treatments. The Coffin-Bachelor Mountain area contains 1167 acres of total suitable and available land base for regeneration harvest within Matrix. Based on this acreage, current decade even-aged harvest rate within the analysis area is at 2%. No commercial thinning or partial cut treatments have occurred.

Based on the current condition of stands and the area available within Matrix that would meet Forest Plan standards and guidelines, approximately 288 acres of land is suitable and available for regeneration harvest, and 700 acres is suitable and available for commercial thinning or partial cut treatments. However, no more than 58 acres can be regeneration harvested during the remainder of this decade. Commercial thinning treatments are permitted.

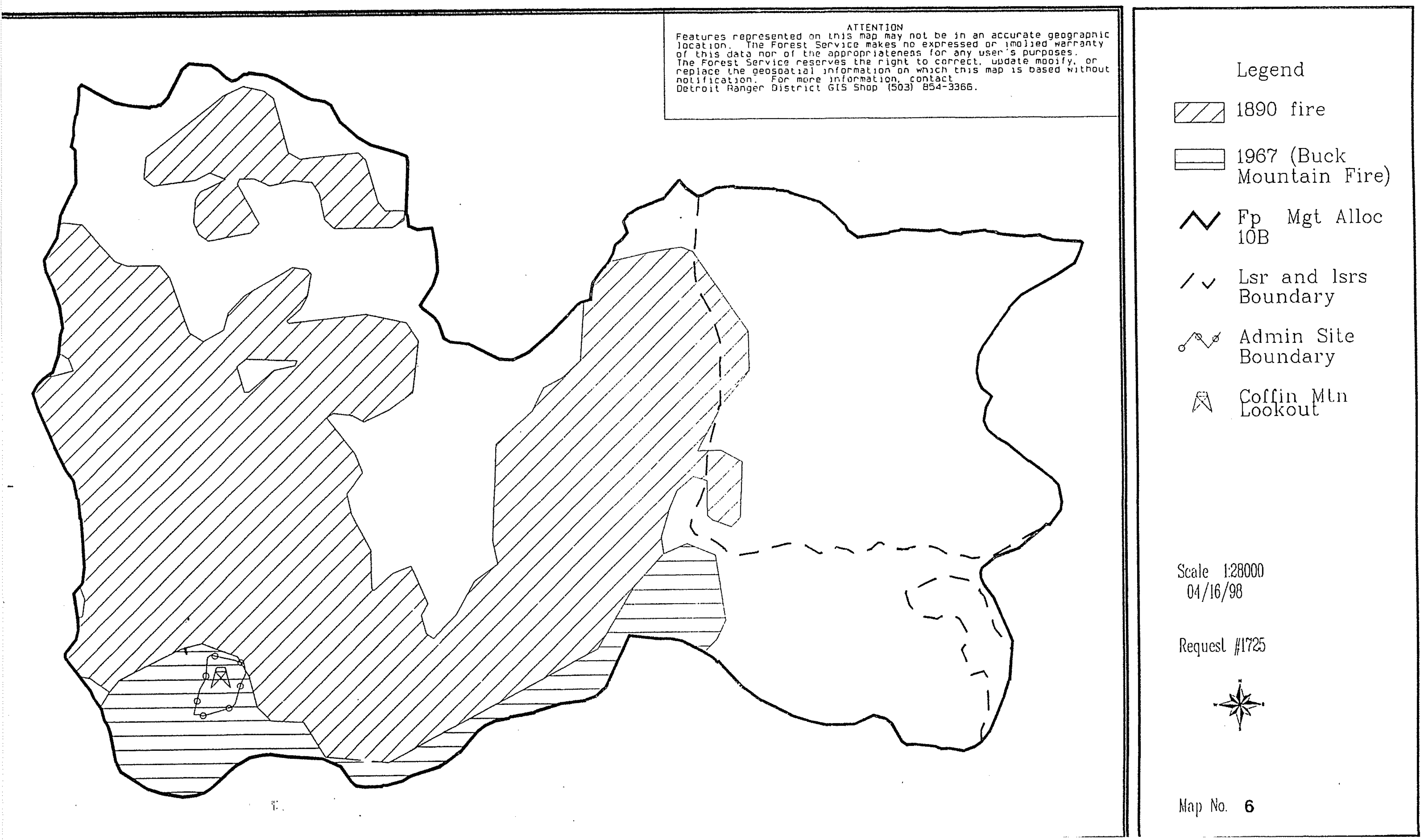
Fire

Historically, fire has been the key process working within this area. Extensive fire activity occurred during the 1890's and burned approximately 52% of the Coffin-Bachelor area *(Map 6)*. Fire patterns and fire frequency have affected aquatic habitat; soil productivity; vegetation patterns and species distribution; and the distribution and abundance of snag and down wood habitat within the area. Areas not affected by recent fires include; the Late Successional Reserve and area to the south, lower Marys Creek drainage and portions of the northwest corner of the Coffin-Bachelor Mountain area *(refer to the medium and large size classes, Map 4*). The vast majority of these older stands date from the early 1600's when fires burned over most of the Upper North Santiam Watershed.

Fire suppression has changed the pattern and distribution of vegetation over the landscape. Fire suppression activities have been very successful in reducing the numbers and size of fires since early this century. Consequently, fuel loadings within stands have accumulated over time contributing to increased fire hazard.

Past Fires

Coffin - Bachelor Mountain Semi Primitive Area
Detroit Ranger District



The fire regime for this area is classified as a "High Severity Fire Regime." In this regime, fires are characterized as infrequent, usually high-intensity and often result in stand replacement. The general area is susceptible to lightening starts due to the high ridge system. Potential for human caused fires also exist.

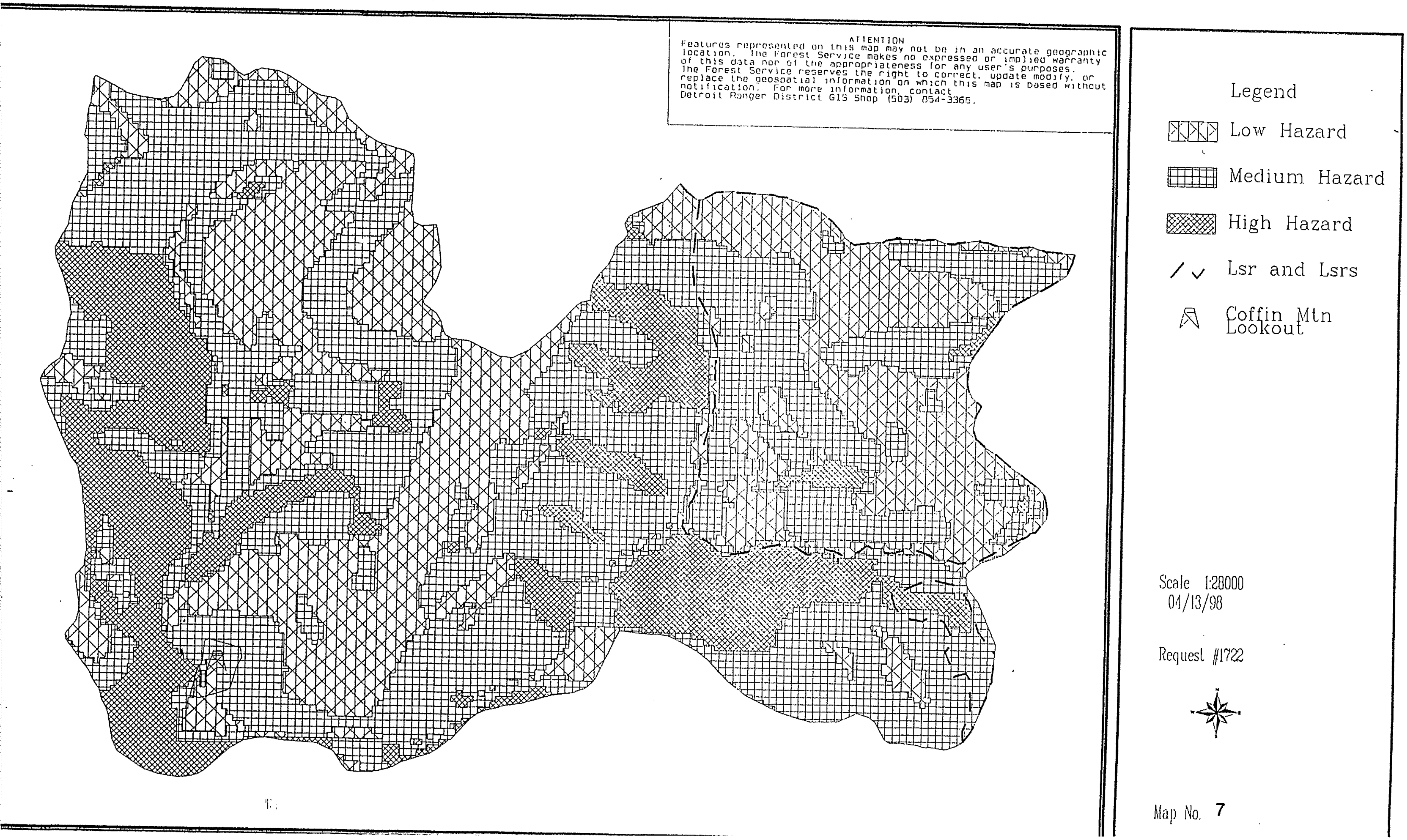
The Geographical Information System (GIS) was used to analyze fire hazard. Generally, south, southwest and west aspects over 40% slopes contribute to high fire hazard on the west side of the semiprimitive recreational area, and a portion to the south and west side of the LSR *(Map 7)*. Although not shown on the map, a high fire hazard also exists along the southern boundary outside of the Coffin-Bachelor Mountain area. Recent fire disturbance patterns closely correlates with this high hazard analysis. Within fire regenerated stands (9.0 to 20.0 dbh size class), high stand densities have resulted in decreased stand vigor and increased tree mortality. Mortality is occurring within these stands due to stocking levels in excess of optimum growing conditions. Tree mortality has significantly increased fuel loadings over the past decade, in addition to blowdown, snowdown and fire suppression. Field reconnaissance of these fire regenerated stands within the Marys Creek drainage indicate fuel loadings average 20 tons per acre. This accumulation is above maximum acceptable fuel loadings described in the Forest Plan Standards and Guidelines (FW-252).

Geographical Information System was also used to identify stands characteristic of fuel models that have a high fire hazard *(Map 8)*. A majority of the remaining area that did not burn within the last 100 years or has not been harvested is classified as a Fire Behavior Fuel Model 10. Most of these stands are located in moderate to low fire risk areas (slopes over 40% with N, NE and NW aspects and slopes under 40% with S, SE and SW aspects). Fuel Model 10 is characterized by overmature old growth stands that contain heavy accumulations of litter and down woody material. These areas are estimated to have 12 tons per acre of less than 3 inch (diameter) dead and live fuels. This indicates that fires in this fuel model are at the upper limit of control by direct attack should a fire escape initial attack or go undetected. Wind or drier conditions could lead to an escaped fire. A few Fuel Model 10 type stands are located along a ridge adjacent the south boundary of the LSR and within the LSR, and contain steep slopes and southern aspects that are a high hazard risk for fire.

The High Severity Fire Regime suggests with the combination of high fire risk (potential for lightning or human caused fires) and increased hazard with fuel loadings and steep slopes with south and west aspects (increased fire behavior intensity); this area has potential for a stand replacing fire should a fire go undetected or escape initial attack. Resources at risk of fire in the area include: water quality, facilities such as the Coffin Mountain lookout and area trails; young regeneration and mature stands of timber; the visual integrity of the semiprimitive area; and wildlife habitat, especially Late Successional Reserves.

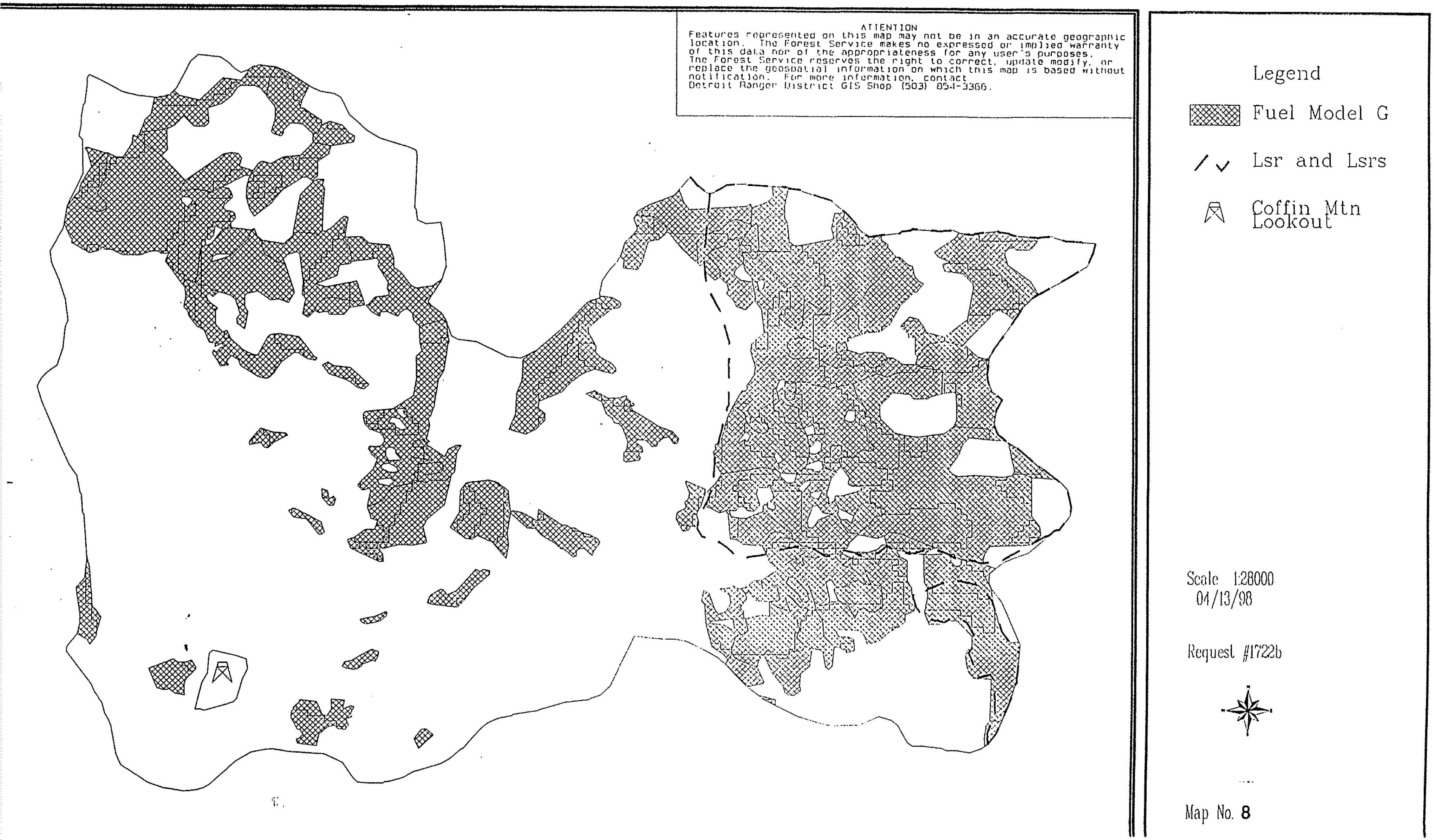
Fire Hazard Slopes and Aspects

Coffin - Bachelor Mountain Semi Primitive Area
Detroit Ranger District



High Fire Hazard Fuel Models

Coffin - Bachelor Mountain Semi Primitive Area
Detroit Ranger District



Special Habitats

The Coffin area is characterized by a high diversity of special habitat types. These special habitats tend to be scattered throughout the landscape creating a mosaic pattern with a background matrix of recently burned land in the Coffin-Bachelor area, a matrix of fire regeneration in most of upper Marys Creek drainage, and a matrix of late successional forest east of Bachelor Mountain. The most common types include dry rock gardens, sitka alder patches, and talus slopes/boulder fields. Other special habitat types found in this management area include mesic meadows, moist rock gardens, ponds, and one dry meadow. Plant species diversity is high on Coffin Mountain and Bachelor Mountain, both of which have rock gardens at a variety of elevations, aspects, and hydrological regimes. Most of the mesic meadows in the Coffin and Bachelor areas are semi-disturbed, indicative of high big game use.

Forest Plan Standard and Guideline FW-211 protects special wildlife and plant habitats through a buffered zone in areas where timber harvest is allowable.

Gorman's aster (Aster gormanii), a Region 6 sensitive plant, is found on the top of Coffin Mountain and on the ridges surrounding Bachelor Mountain. Gorman's aster is mostly restricted to small-grained scree slopes and higher elevations (4500 ft. to 6500 ft.). Rock paintbrush (Castilleja rupicola), a plant listed on the forest review list, also occurs on Coffin Mountain.

The Coffin area has a relatively low occurrence of noxious weed infestation. The west boundary has a higher abundance of noxious weeds, and these include Scotch broom, St. John's wort, Canada and bull thistles.

Wildlife

Habitat Condition

Large even-aged fire regenerated stands of approximately 90 year old trees with residual older trees cover about 40% of the area. These stands are interspersed with older stands that survived the fire. Past harvest activity has resulted in 20-25% of the area being fragmented, mainly within the northern and eastern areas *(refer to Maps 3 & 5)*. These harvested areas are separated by early to mid-seral stage stands with some mature to late-successional stands. With the exception the Buck Mountain Fire area, the remaining area is fairly contiguous with small nonforested habitats scattered throughout.

The younger stands in the area (less than 100 years old) that resulted from past fires and management activities have low snags densities and are lacking down woody debris of adequate size and range of conditions. Most of the large down wood in previously burned areas are in advanced stages of decay (class 4 and 5). Some large residual trees are scattered in these stands. Small patches of blowdown/snowthrow make up the majority of down woody debris in these stands. Within the Marys Creek drainage, there are patches of jackstrawed blowdown that have very high levels of small (<12" dbh) down wood. Older stands minorly affected by the fire probably experienced underburning. Most of snags in the analysis area are located in these stands. In the Marys Creek drainage, these older stands mostly occupy the lower third of the slope and in the large riparian complexes.

Most of the forested areas are single storied or two storied stands. The single story stands are a result of recent stand replacement fires and contain high tree densities and canopy closure. Ground vegetation is virtually absent in these suppressed stands. The older stands tend to have an understory of brush and young trees, however, no mid-story.

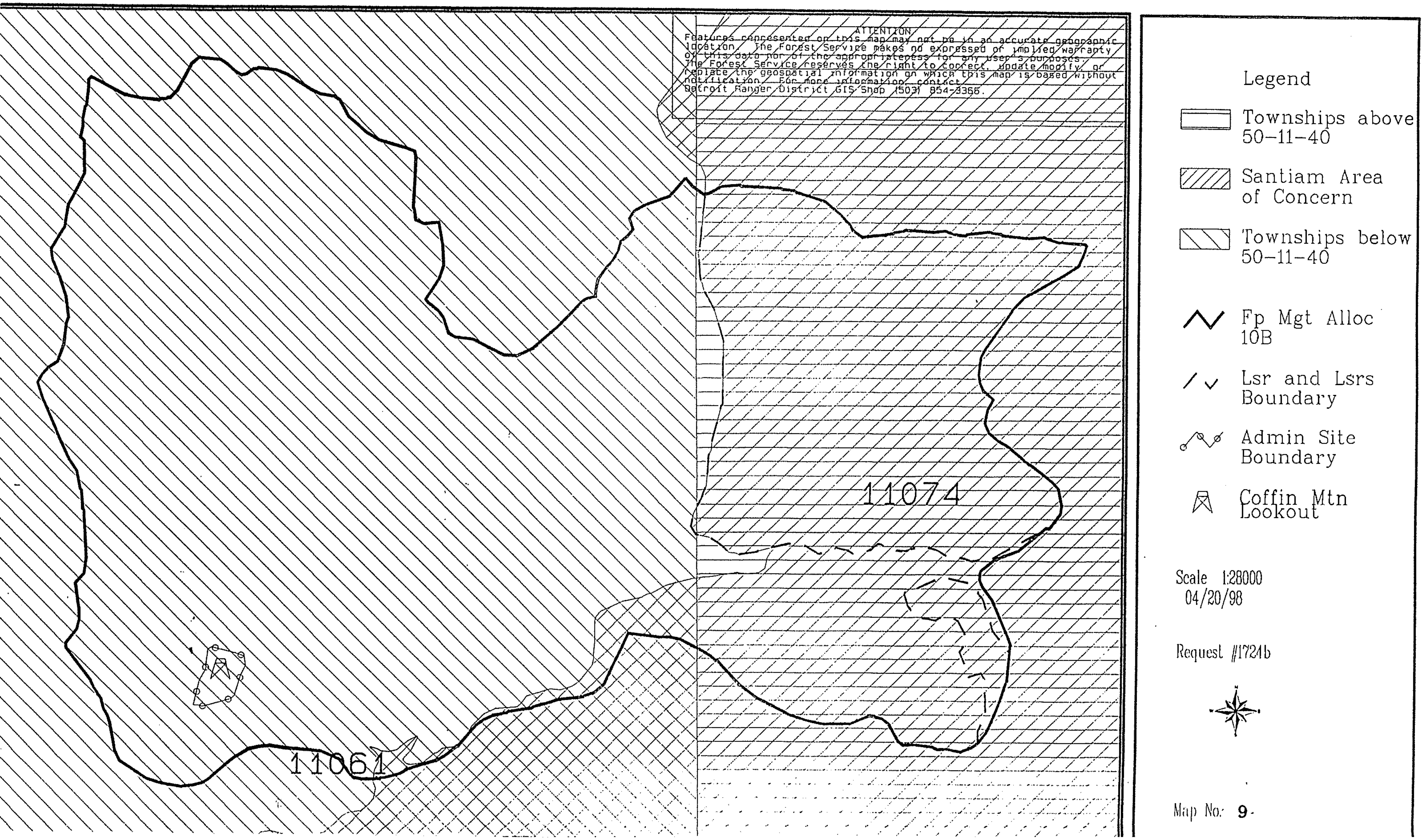
The Santiam Area of Concern (SAoC) was originally identified by the U.S. Fish and Wildlife Service because of concern over having adequate intra-provincial movement for northern spotted owls and other late seral dependent species. The SAoC was established to ensure the availability of adequate dispersal habitat and provide connectivity between Late-Successional Reserves. A boundary revision for the Santiam Area of Concern has been proposed based on new information provided by District and Forest wildlife biologists *(Map 9)*. The U.S. Fish and Wildlife Service and the Forest Service are in the process of reviewing these changes. When the new SAoC boundaries are implemented, the analysis area will occupy approximately 1200 acres within the SAoC but it will comprise a different portion of the area.

Currently, about 1200 acres of the Coffin-Bachelor area lies within the Santiam Area of Concern (SAoC) *(Map 10)*. Quarter townships within the SAoC are required to meet the 50-11-40 rule. The 50-11-40 rule stipulates that 50% of the stands must average at least 11 inches diameter breast height and 40% canopy closure. The Coffin-Bachelor Mountain area lies within quarter townships 11061 and 11074. Both quarter townships lie within the SAoC. Quarter township 11061 is just below the 50-11-40 rule at 47.5%, and quarter township 11074 is currently at 50.3%.

Special habitats such as meadows, rock outcrops, talus slopes and ponds are scattered throughout this area and account for approximately 14% of the land base. These special habitats are utilized by a wide range of species including, small mammals, raptors, and deer and elk.

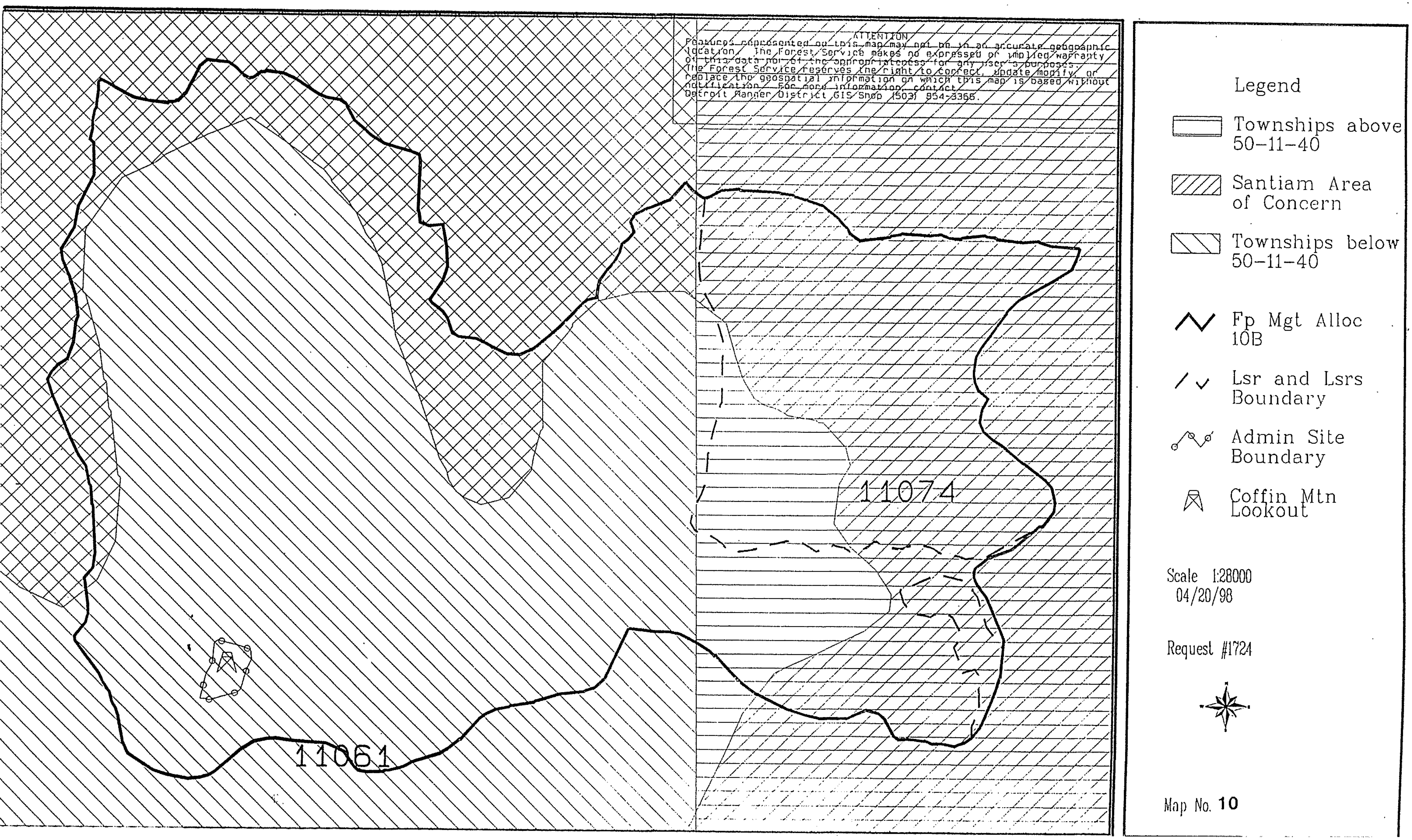
Proposed Santiam Area of Concern and 50-11-40 Conditions

Coffin - Bachelor Mountain Semi Primitive Area
Detroit Ranger District



Santiam Area of Concern and 50-11-40 Conditions

Coffin - Bachelor Mountain Semi Primitive Area
Detroit Ranger District



Habitat Use

Big Game:

The Coffin-Bachelor area lies within high and moderate management emphasis areas for elk. Part of Bruno, Marys, Straight, Bugaboo and Divide Creek Management Emphasis Areas lie within the analysis area and are managed for summer range *(Map 11)*. The plant associations in this area have the highest productivity for big game forage. The area is heavily used by deer and elk, particularly within plantations. Numerous game trails and sign can be found in and around these areas. The older plantations and forested areas provide hiding/thermal cover, while the younger plantations and meadows are used primarily for foraging.

The Wisdom Elk Habitat Suitability Model is used as a tool for providing information on the trends that are occurring concerning habitat effectiveness for big game. Observations have been made that the Wisdom Model may not depict all the actual conditions that are occurring on the landscape. For example, commercial thinning treatments can create forage but model outputs do not reflect this habitat condition. The Wisdom Model is currently being refined by the Forest Service and Oregon Department of Fish and Wildlife.

Wisdom Model results indicate Bruno, Marys, Bugaboo and Divide Creek drainages are below the objective value for Overall Habitat Effectiveness (HE) as specified in the Forest Plan *(Table 3)*. All these areas have habitat condition variables below acceptable standards for road densities and forage. In addition, the Bruno Creek drainage is below acceptable limits for cover. Straight Creek is above the objective value for Overall Habitat Effectiveness probably due to the large amount of forage available in the area burned by the Buck Mountain Fire. The Overall Habitat Effectiveness objective values and current condition values for summer range are shown in bold in *Table 3* on the following page.

Table 3. Overall Habitat Effectiveness Values for Elk Management Emphasis Areas

Elk Management Emphasis Area	Objective Overall HE Value** 0.6	Current Overall HE Value	Emphasis
Marys			
Winter Range	0.6	0.51	High
Summer/Winter	**0.6**	**0.55**	
Divide			
Winter Range	0.6	0.48	High
Summer/Winter	**0.6**	**0.49**	
Bruno			
Winter Range	0.6	0.51	High
Summer/Winter	**0.6**	**0.51**	
Bugaboo			
Winter Range	0.6	N/A	Moderate
Summer/Winter	**0.5**	**0.49**	
Straight			
Winter Range	0.6	0.45	Moderate
Summer/Winter	**0.5**	**0.53**	

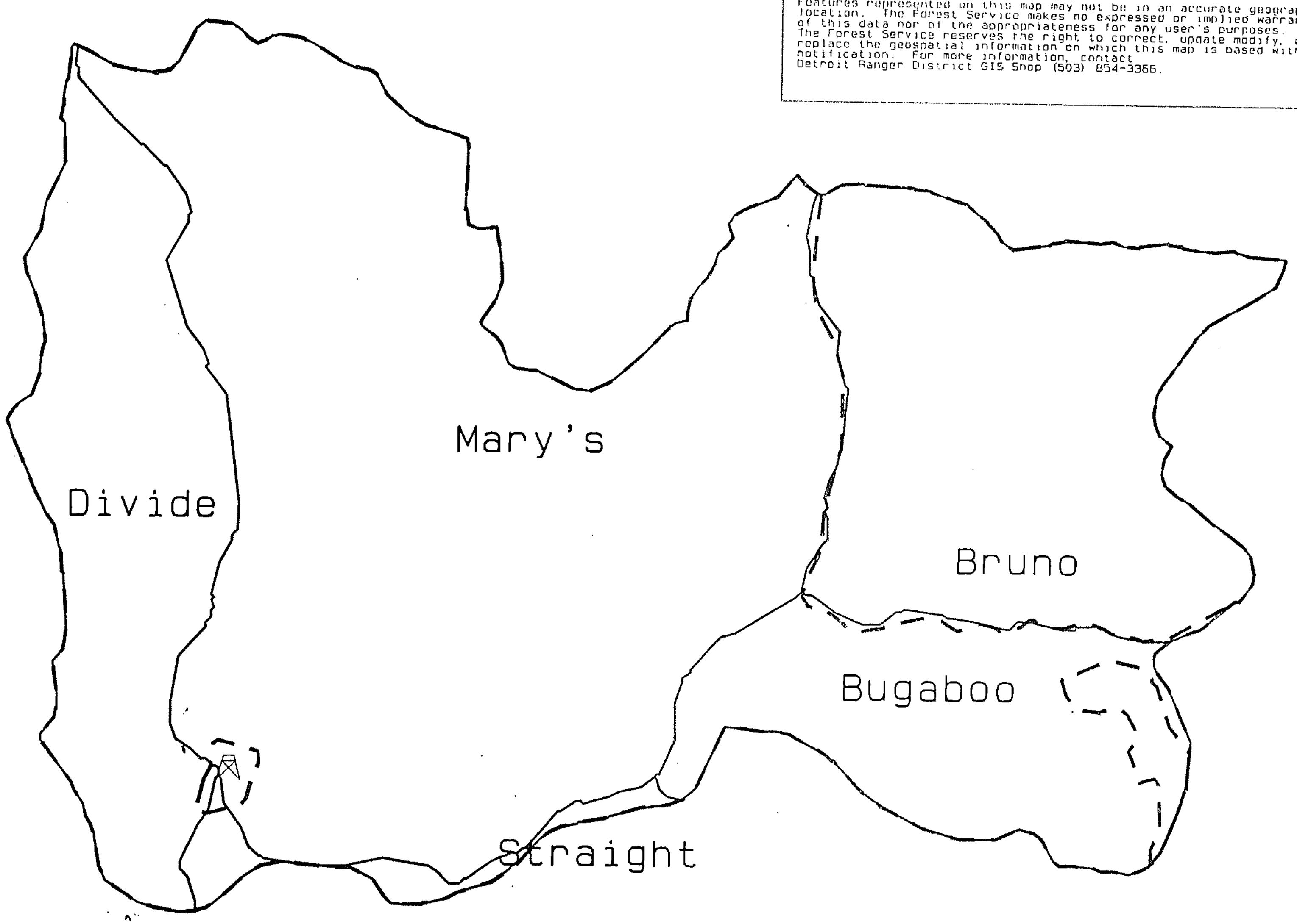
** Overall Habitat Effectiveness objectives that should be maintained or achieved during the first ten years following Forest Plan implementation (desired future condition). Viability ranges used are described in A Model to Evaluate Elk Habitat In Western Oregon

1.0 = Optimal
0.6 - 0.9 = Highly Viable
0.4 - 0.5 = Viable
0.2 - 0.3 = Marginal
0.05- 0.1 = Possible Non-Viable

Permanent road closures have not been enforced due to difficulty of maintaining gates primarily due to vandalism or lack of signing to inform the public of road closures. Public use of closed roads has led to disturbance of big game during critical times.

Elk Emphasis Areas

Coffin - Bachelor Mountain Semi Primitive Area
Detroit Ranger District



Legend

- 1890 fire
- 1967 (Buck Mountain Fire)
- Mgt Alloc 10B and Lsr Bnd
- Coffin Mtn Lookout

Scale 1:28000
04/14/98

Request #1726

Map No. 11

Threatened, Endangered and Sensitive (TES) Species:

This area has habitat that would be suitable for Threatened, Endangered or Sensitive species such as great gray owl and northern spotted owl. Approximately 730 acres of the Jefferson Late Successional Reserve (R0214) lies within the northeast portion of the analysis area. Forty acres of a LSRs overlap into the southeast portion of this area. This LSRs is connected to the activity center of a pair of spotted owls. These areas will be managed to enhance late successional stand characteristics.

Non-TES Species:

This area currently provides habitat suitable for a variety of non-TES species. Riparian areas, meadows, ponds, and other special habitats; as well as various ages of forested areas provide habitat for a wide range of non-TES species. Special habitats and riparian areas account for 25% of the land base in this area.

Fish:

The Coffin-Bachelor area has no known fish bearing streams within its boundaries. Adjacent fish bearing waters include Lower Marys Creek and the North Santiam River which support populations of rainbow trout, cutthroat trout, white fish, kokanee salmon, land-locked spring chinook salmon, and several non-game fish such as dace and sculpin.

Social

Heritage

Approximately 650 acres have been surveyed for the occurrence of heritage resources within the Coffin-Bachelor Mountain Semiprimitive Area. The surveys resulted in the location of 23 (prehistoric/historic) sites and isolated finds.

Evidence of prehistoric use in the area appears in the form of "Open Air" lithic scatters of obsidian and crypotcrystalline sillica, and rock cairns. Historically, the Mololla are reported to have inhabited the western slopes of the Oregon Cascade Range. The Molalla were comprised of three subgroups: the Northern Molalla, Southern Molalla, and a the Upper Santiam band of the Kalapuya. This Santiam Drainage lies within the tribal area of the Upper Santiam.

Ethnographic evidence indicated that aboriginal groups, possibly Kalapuya, Molalla, and Warm Springs have used the area for seasonal hunting, huckleberry picking and gathering of other wild plants. Information on the use of the general area can also be inferred form the oral history of the Warm Springs Confederation as told by the elder women. They relate stories of their grandparents utilizing and maintaining the huckleberry grounds through fire near the Coffin Mountain area.

Historic use appears in the form of packer camps, land claims, early Forest Service administrative and communications networks, including lookout stations. These networks were maintained by Forest Service administrative personnel primarily through an extensive trail network (often adapting to pre-existing trails) connecting trail shelters and lookouts. The primary use of the stations was for forest fire control. The trails are recognized from numerous historical maps of the district (1913, 1920, 1931, 1937, 1948, 1950, and 1951). The trails were often confined to ridge and ridge slopes.

The Coffin Mountain trail #3425 served as a main arterial for access to and from the Coffin Mountain lookout. The lookout and trail first appear on a 1913 historical map depicting the Santiam National Forest lands. The two sites continue to appear on maps of the Santiam National Forest (1920, 1931), Willamette National Forest (1937, 1950), and the Detroit Ranger District (1948). According to these maps, the Hula Shelter, Coffin Mountain Lookout and Fish Lake Ranger Station were all connected by this trail, which also supported a telephone line for communication. The trail log from 1936 charts the course of the trail from the North Santiam near the location of Idanha to the Scar Mountain trail.

Socio-economic

The forest products industry, and tourism generated from recreation on the Detroit Ranger District contribute to the economic base and support the diversifying economies of local communities. The timber industry is still an important component of the North Santiam Canyon economy, however, timber related employment is not expected to reach levels as in the past. In recent years, the communities have been affected by declining timber supplies, and have developed economic development strategies to adjust to a different future.

The Forest Service is a partner with community economic and tourism organizations since many community goals depend upon National Forest lands. The canyon communities began exploring ways of attracting more tourism dollars. Communities have also looked into economic diversification through secondary wood products manufacturing or through new markets in nontraditional forest products.

Although public demand for firewood remains high, the ability to fulfill the need has diminished steadily since 1992 with the reduction of timber harvest and land management changes to protect nesting, denning and foraging habitat for various wildlife species.

Recreation/Scenic

Visitor use of this area is relatively low and primarily day use in nature. Since user interaction is very low, the area meets the social setting defined within the semiprimitive motorized classification of the Recreation Opportunity Spectrum. However, the activities and experiences associated within the area are nonmotorized in nature due to lack of facilities available for motorized types of activities.

Recreational use of this area will likely increase due to population growth, and increasing demand for semiprimitive settings and experiences (SCORP 1988, 1994). According to the Forest Plan, even if existing inventories of semiprimitive opportunities were maintained, future demand is expected to exceed capacity by the year 2010. In addition, between the year 2010 and 2030, use within all Wilderness Resource Spectrum (WRS) classes will exceed inventory capacity. It is likely with future demands at Mt. Jefferson Wilderness, strategies for managing use will be required. This may have implications on semiprimitive areas outside of Wilderness, potentially displacing users to limited existing non-Wilderness semiprimitive areas such as Coffin-Bachelor Mountain. "Promotion" of Coffin-Bachelor Mountain area trails on the Forest website (Internet), and depicting these trails on the Quartzville Backcountry Byway kiosk map and brochures, will likely encourage use.

Common activities occurring within the area include; hiking, hunting, viewing scenery, nature study, huckleberry picking and photography. Most dispersed camping occurs adjacent the Coffin-Bachelor Mountain area and at trailheads. Some dispersed camping occurs on Coffin Mountain near the lookout.

The season is fairly short due to early snowfall at high elevations. Snow typically melts by early June, and wildflowers begin to bloom in July which draws visitors to the area. The season typically ends in October and is a popular area for big game hunters between August through October. Coffin Mountain has recently gained attention by paragliders and is being considered and evaluated for feasibility by local paraglider/hang glider organizations. Bachelor Mountain may also have the desirable elements that are required for safe and reliable paragliding. There is no documented winter use within this area. The area was analyzed in the Detroit Ranger District Winter Sports Plan for potential winter recreation development, however, due to inaccessibility and steepness of terrain, the area is not suitable for winter recreation management.

The Coffin-Bachelor Mountain Semiprimitive area contains a network of trails that access prominent features within the area including Coffin Mountain, Bachelor Mountain, Bugaboo Ridge and Bruno Meadows. These trails offer spectacular panoramic views of the Cascades from vantage points, and cross a variety of habitat types such as: rock gardens and wet meadows that contain colorful displays of wildflowers; huckleberry fields created by historical and recent natural fires; and second and old growth Douglas-fir/Noble fir stands at lower elevations to sub-alpine species/mountain hemlock at higher elevations.

The following trail management classes were assigned by the Forest Plan, and established a specific level of management protection for each trail corridor (*Table 4)* (Refer to Forest Plan Standards and Guidelines FW-043-056).

Table 4. Coffin-Bachelor Mountain Area Trail Management Classification

Trail	Trail No.	Mgmt. Class	Mileage
Coffin Mountain	3425	III	2.1
Coffin Lookout	3392	IV	1.0
Bachelor Mountain	3420	III	1.9
Bugaboo Ridge	3423	III IV	1.9 1.2
Bruno Meadows	3424	III	1.5
		Total Trail Mileage	8.4

In addition to trail management classes, trails are assigned a maintenance class. All trails except for Coffin Mountain, are managed to meet Class III maintenance standards. Coffin Mountain trail receives less maintenance and is classified as a level II. Level I trails receive minimal maintenance and maintain primitive characteristics while Level V are higher priority trails and are maintained at higher standards. Currently, trails are not meeting maintenance standards due to trail maintenance backlog. Access to the Coffin Mountain trailhead via 2236-137 Road was damaged during the Flood of 1996 and is not accessible by vehicle.

Coffin Mountain and Bachelor Mountain are currently under the three year National Recreation Demonstration Fee Program authorized by Congress that began in 1997. Visitors must purchase a "Trail Park" permit to park within 1/4 mile of designated trailheads. Funding collected through the program will be returned to maintain trails and trailheads in the Trail Park program.

Under the Forest Plan, the Coffin-Bachelor Mountain area was designated a semiprimitive motorized area which allows access by motorized vehicles such as snowmobiles, trail bikes and ORV's not greater than 42 inches in width. The general area is open for off road vehicles and mountain bikes. However, since the early 1990's, all area roads have been gated and year round closure orders enforced for big game habitat effectiveness objectives. In addition, existing trails were not designed for motorized use, however, use is permitted. All trails, except the Coffin Lookout Trail, are remnants of historic administrative trails. ORV use of trails in this area has not been observed. Travel on gated roads and trails is primarily by foot but equestrian use has occurred on occasion during the hunting season. Gates on several roads have been vandalized allowing illegal access on roads by motorized vehicles. ATV and trailbike use behind gates is an increasing problem across the District. Law enforcement officials have difficulty enforcing road closures due to broken gates, and lack of signing explaining closures.

Coffin Mountain Lookout Trail receives the highest visitor use among trails in the area. Use in 1997 was estimated at 225 visitors. Coffin Mountain contains an administrative site with a lookout structure that is seasonally staffed for detection of forest fires. The lookout staff expressed difficulties in keeping an "eagle eye" for fire detection when distracted by visitors on the lookout deck. There have been occasions during the evening hours when the lookout has been confronted with drunk and verbally abusive visitors that make the lookouts personal safety a concern. Other lack of considerations on behalf of visitors has made lookout operation disruptive or inconvenient. Visitors often want to use the lookout's water supply or pit toilet which are intended for lookout use only. In addition, camping adjacent the lookout has been disruptive or inconsiderate to the privacy of the lookout. Recently, signs have been posted at the trailhead explaining courtesy and considerations while visiting the lookout.

The Coffin-Bachelor Mountain area is managed to maintain high scenic integrity. All design and implementation practices should meet the Visual Quality Objective of Partial Retention (Forest Plan, MA-10b-05). Standards and guidelines specify acceptable levels of timber management relating to even-aged management. The Forest Plan stipulates, created openings as a result of even-aged management should be no greater than 8 acres in size or 3 acres on major travel corridor frontage zones (Standard and Guideline MA-10b-07).

Approximately 500 acres of this area was harvested in the last 50 years *(Map 3)*. Past regeneration harvest activities, planned and implemented prior to the 1990 Forest Plan, were larger in size than what is currently acceptable; and design elements were not considered in layout of units. Some of the stands harvested since 1985 are in a visually "disturbed condition."

The sizes, arrangements, concentrations and geometric character of harvest treatments will have an effect on the scenic quality until seedling/sapling size stands recover within the next decade. In addition, the contrast to adjacent uncut stands will have a lasting effect on scenic quality for several decades. Some areas harvested since the 1980's can be characterized as meeting modification standards for visual quality. Regeneration harvests within these areas should not occur until these areas recover.

Transportation

There are two primary access routes from Highway 22 to the Coffin-Bachelor Mountain area. One is from the 11 Road to the 1168 road, and reaches the southwest portion of the area which accesses Coffin Lookout and Bachelor Mountain Trailheads. In addition, the 2236 Road is accessed from the 11 Road and reaches the western portion of the area. Finally, the second access is from the 2234 Road which reaches the west and north portion of the semiprimitive area including Marys Creek, Bruno Meadows and Bugaboo Ridge.

Only 4.6 miles of local roads currently exist within the analysis area. Most of these roads are deteriorating due to lack of maintenance. With declining road maintenance budgets, and concerns related to watershed quality and wildlife habitat effectiveness, road decommissioning and obliteration will need to be addressed across the District.

The majority of the Coffin-Bachelor Mountain area is located in a key watershed. Key watersheds are highest priority for watershed restoration. There should be no net increase of roads, and a reduction of road densities where funding is sufficient.

The following pages contain information on the current condition of the transportation network, and definitions of maintenance and traffic service levels.

Table 5. COFFIN/BACHELOR MOUNTAIN SEMIPRIMITIVE MOTORIZED RECREATION AREA CURRENT ROAD CONDITIONS

ACCESS TO COFFIN/BACHELOR MTN. IS BY FOREST ROAD 11 FROM STATE HIGHWAY 22 AT MP 69.59

ROAD NUMBER	MAINTENANCE LEVEL	TRAFFIC SERVICE LEVEL	SURFACE	LANES	COMMENTS
11	4	B	asphalt	2	From the junction of State Highway 22 to MP 3.10 was reconstructed in 1997. From MP 3.10 to MP 4.13 junction of Forest Road 1168, some asphalt repair is needed but travel is not hindered.
1168	2	C	aggregate	1	MP 1.40 of Forest Road 11is MP 0.00 of Forest Road 1168 to MP 2.54 meets criteria shown in the cells left. Between MP 2.33 and MP 5.22 the integrity of the road prism is jeopardy and is not maintained to maintenance level 2 or to traffic service level C. There are two closed gates one at MP 1.84 and the other at MP 5.22. Road closure effective 8-15 through 11-30.
1168	3	C	aggregate	1	From MP 5.22 to MP 9.86 junction with Forest Road 11, Forest road criteria is shown in the cells left. The road is not maintained to maintenance level 3 or to traffic service level C.
1168-430	2	D	native	1	MP 5.24 of Forest Road 1168 is MP 0.00 of Forest Road 1168-430. Road is out sloped with no culverts. Road accesses trail # 3420.
1168-450	2	D	native	1	MP 5.94 of Forest Road 1168 is MP 0.00 of Forest Road 1168-450. Road is out sloped with culverts in drainage's, and is gated with an aluminum pipe and has a year round road closure. Road accesses trail #3392.
1168-451	1	D	native	1	At MP 0.05 of Forest Road 1168-450 is MP 0.00 of Forest Road 1168-451. Road gated with an aluminum pipe. Road is brushed in, is not derivable and has a year round road closure.

ACCESS TO COFFIN/BACHELOR MTN. AREA BY FOREST ROAD 2234 FROM STATE HIGHWAY 22 AT MP 68.20.

ROAD NUMBER	MAINTENANCE LEVEL	TRAFFIC SERVICE LEVEL	SURFACE	LANES	COMMENTS
2234	3	C	asphalt	1	From the junction of State Highway 22 to MP 1.61 will be reconstructed and maintained by Parkaboo Timber sale. Currently, this segment of the road is not maintained to maintenance level 3 or to traffic service level C.
2234	3	C	aggregate	1	From MP 1.61 to MP 3.36 will be maintained and reconstructed by Parkaboo Timber sale. Currently, this segment of the road is not maintained to maintenance level 3 or to traffic service C.

ACCESS TO COFFIN/BACHELOR MTN. AREA BY FOREST ROAD 2234 FROM STATE HIGHWAY 22 AT MP 68.20

ROAD NUMBER	MAINTENANCE LEVEL	TRAFFIC SERVICE LEVEL	SURFACE	LANES	COMMENTS
2234	3	C	aggregate	1	From MP 3.36 to 7.91 maintenance and reconstruction is required. Currently, this segment of the road is not maintained to maintenance level 3 or to traffic service C.
2234	3	C	asphalt	1	From MP 7.91 to 9.56 the asphalt surface is in bad condition and reconstruction is required. Currently, this segment of the road is not maintained to maintenance level 3 or to traffic service C.
2234-230	2	D	aggregate	1	MP 9.56 of Forest Road 2234 is MP 0.00 of Forest Road 2234-230. There is some minor water damage on this road. Gate is broken. Year round road closure
2234-232	2	D	aggregate	1	MP 0.44 of Forest Road 2234-230 is MP 0.00 of Forest Road 2234-232. This road is 0.38 miles in length and is out sloped with culverts in the drainage's. There is a large fill failure at about MP 0.32. Year round road closure.
2234-235	2	D	pit run	1	MP 0.76 of Forest Road 2234-230 is MP 0.00 of Forest Road 2234-235. This road is out sloped with no culverts. Year round road closures.
2234-240	2	D	pit run	1	MP 8.97 of Forest Road 2234 is MP 0.00 of Forest Road 2234--240. This road has a locked gate, and is out sloped with culverts in the drainage's. At the upper end of the road is a 5 Ft. culvert with a trash rack. There is water damage at the beginning of the road and major water damage at MP 0.15. Year round road closure.
2234-255	2	D	aggregate	1	MP 8.01 of Forest Road 2234 is MP 0.00 of Forest Road 2234-255. This road had a locked gate, and is out sloped with no culverts. Year round road closure.
2234-257	N/A	N/A	pit run	1	MP 5.60 of Forest Road 2234 is MP 0.00 of Forest Road 2234-257. This road has no Road Management Plan. The road is brushed in and is not derivable. Road is gated year round with an aluminum pipe gate.
2234-260	2	D	aggregate	1	MP 3.68 of Forest Road 2234 is MP 0.00 of Forest Road 2234-260. This road is out sloped with culverts in the drainages. There is water damage in the steeper areas of this road. Guardrail gate at MP 0.20 is broken. Year round closure. Road accesses Trail # 3424.
2234-263	2	D	aggregate	1	MP 0.99 of Forest Road 2234-260 is MP 0.00 of Forest Road 2234-263. This road is out sloped with culverts in the drainage's. There is water damage in the steeper areas of this road. Year round road closure.

ACCESS TO COFFIN/BACHELOR MTN AREA BY FOREST ROADS 2234,1003 AND 2236 FROM STATE HIGHWAY 22 AT MP 55. 68.

ROAD NUMBER	MAINTENANCE LEVEL	TRAFFIC SERVICE LEVEL	SURFACE	LANES	COMMENTS
2234-270	2	D	pit run	1	MP 3.36 of Forest Road 2234 is MP 0.00 of Forest Road 2234-270. This road has a ditch on the up hill side with no culverts. There is no water damage on this road. Gate at MP 0.02 is locked and lock can not be opened with a key. Year round road closure.
2236-110	1	D	pit run	1	MP 0.63 of Forest Road 2236 is MP 0.00 of Forest Road 2236-110. This road is out sloped with culverts in the drainage's. There is minor water damage on this road to MP 0.70. Beyond MP 0.70, as you start up the hill, the road is blocked by a slide, and beyond that a large fill failure has removed the entire road prism. Gate at MP 0.08 is locked. Year round road closure.
2238-115	1	D	pit run	1	MP 0.50 of Forest Road 2236-110 is MP 0.00 of Forest Road 2236-115. This road is a ditch with no culverts to MP 0.22. There is no water damage on this road segment. Just beyond MP 0.22, the road is blocked by fallen trees and cut failures. Year round road closure.
2236-130	NO RMP'S	D	pit run	1	MP 2.66 of Forest Road 2236 is MP 0.00 of Forest Road 2236-130. Road is derivable to MP 0.51 junction of Forest Road2236-173. From MP 0.51 the road is brushed in and at MP 0.75 the outside half of the road failed. Gate at MP 0.02. Year round road closure.
2236-137	NO RMP'S	D	pit run	1	MP 0.51of Forest Road 2236-130 is MP 0.00 of Forest Road 2236-137. Water damage from MP 0.03 to MP 0.20. Down timber makes the road difficult to drive to trail head (Trail #3425) at MP 1.00 Road is derivable using high clearance vehicles only. Year round road closure beyond trailhead.

ROAD MAINTENANCE LEVELS
TRANSPORTATION SYSTEM MAINTENANCE HANDBOOK -FSH 6/83 R-6 SUPP 4-

Roads maintained to Level 1 and 2 standard do not need to meet Highway Safety Standards.

Level 1

Roads in this level are to be in a long-term storage category and not used fir motor vehicle access, except as required to perform corrective maintenance. Access for short-term project use is financed by the benefiting project for opening, operating and maintaining entrance devices and reclosing or blocking the facility.

Level 2

Roads maintained at Level 2 are high-clearance, vehicle-use roads and are not maintained for public passenger car travel, but may be used by Forest Visitors unless specifically prohibited. The condition of the road intersection, road surface and roadway conditions discourage passenger car use.

Maintenance standards in level 2 very, based on management's stated objectives, whether Forest Visitor high-clearance use is "encouraged" or merely "accepted."

Level 3

Roads in this and higher maintenance levels are subject to the applicable standards of the Highway Safety Act. They are maintained to be passable for public passenger cars operated at prudent driving speeds. Road geometric normally should comply with standards corresponding to Traffic Levels C or better.

Level 4

Road geometric should normally comply with standards corresponding to Traffic service Levels B or better, unless deficiencies are marked. User comfort is given more consideration than for Level 3; however, the prime consideration remains user safety.

Level 5

Roads in this level are maintained for safe travel at prudent driving speeds in excess of 35 mph. Aesthetics, user comfort and convenience are incorporated into maintenance practices.

ble 6.

TRAFFIC SERVICE LEVELS				
ROAD PRECONSTRUCTION HANDBOOK FSH 7709.54 FSH 5/87 AMEND				
	A	B	C	D
Flow	Free flowing with adequate parking facilities.	Congested during heavy traffic such as during peak logging or recreation activities.	Interrupted by limited passing facilities, or slowed by the road conditions.	flow is slow or may be blocked by an activity. Two way traffic is difficult and may require backing to pass.
Volumes	Uncontrolled; will accom-modate the expected traffic volumes.	Occasionally controlled during heavy use periods.	Erratic; frequently controlled as the capacity is reached.	Intermittent and usually controlled. Volume is limited to that associated with the single use.
Vehicle Types	Mixed; Includes the critical vehicle and all vehicles normally found on public roads.	Mixed; Includes the critical vehicle and all vehicles normally found on public roads.	Controlled mix; accommo dates all vehicle types including the critical vehicles. Some use may be controlled to vehicle types.	Single use; not designed for mixed traffic. Some vehicles may not be able to negogate. Concurrent use traffic is restricted.
Critical Vehicle	Clearances are adequate to allow free travel. Overload permits are required.	Traffic controls needed where clearances are marginal. Overload permits are required.	Special provisions may be needed. Some vehicles will have difficulty negotiating some	Some vehicles may not be able to negotiate. Loads may have to be off-laded and walked in.
Safety	Safety features are a part of the design.	High priority in design. Some protection is accomplished by traffic management.	Most protection is provided by management.	The need for protection is minimized by low speeds and strict traffic controls.
Traffic Management	Normally limited to regulatory, warning and guide signs and permits.	Employed to reduce traffic volume and conflicts.	Traffic controls are frequently needed during periods of high use by the dominant resource activity.	Used to discourage or prohibit traffic other than that associated with the single purpose.
User Cost	Minimize; transportation efficiency is important.	Generally higher than "A" because of slower speeds and increased delays.	Not important; efficiency of travel may be traded for lower const-ruction costs.	Not considered
Alignment	Design speed is the predom-ant factor within feasible topographic limitations.	Influenced more strongly by topography than speed and efficiency.	Generally dictated by topographic features and environmental factors. Design speeds are generally low.	Dictated by topography environmental factors, and the design and critical vehicle limitations. Speed is not important.
Road Surface	Stable and smooth with little or no dust, considering the normal season of use.	Stable for the predominant traffic for the normal use season. Periodic dust control for heavy use or environmental reasons. Smoothness is commensurate with the design speed.	May not be stable under all traffic or weather conditions during the normal use season. Surface rutting, roughness and dust may be present, but controlled for environmental or investment protection.	Rough and irregular. Travel with low clearance vehicles is difficult. Stable during dry conditions. Rutting and dusting controlled only for soil and water protection.

MANAGEMENT OBJECTIVES

Physical

Soils/Geology

- Long term maintenance of soil productivity and slope stability.

Hydrology

- Manage riparian reserve areas to encourage late successional characteristics.
- Manage transportation system, including roads and trails, and recreation uses to protect water quality.

Biological

Vegetation

- Manage vegetation to meet a variety of resource objectives relating to scenic quality, recreation experiences, commodity production, big game habitat and late-successional characteristics.
- Increase stand vigor and health.
- Maintain local populations of Gorman's aster.

Fire

- Minimize the potential for large scale uncontrolled wildfires within the area.

Wildlife

- Promote and enhance late seral stand structure within the portion of the Coffin-Bachelor area that lies within the RO214S Late Successional Reserve.
- Increase the size of trees within riparian reserves to move stands toward late successional stage at a faster rate.
- Minimize potential for loss of late successional stands by catastrophic wildfire.
- Manage quarter townships, 11061 and 11074, that are within the Santiam Area of Concern

to meet the 50-11-40 rule.

- Increase the level of down woody debris and number of snags in the areas that are not meeting Standards and Guidelines.

- Maintain and enhance a high level of diversity and habitat types.

- Manage and enhance high quality big game habitat.

Social

Heritage

- Protect significant and eligible cultural sites from adverse effects due to ground disturbing activities and other activities, e.g. natural processes, vandalism, etc.

Socioeconomic

- Produce forest product commodities, including timber and special forest products. Increase future yields of commercial timber stands.

- Provide a variety of recreational opportunities to enhance and support the local tourism economy.

Recreation/Scenic

- Manage setting to enhance dispersed recreation opportunities for semiprimitive experiences.

- Minimize conflicts between recreation users and the operation of Coffin Mountain Lookout. Maintain personal safety of fire lookout personnel.

- Manage and enhance the landscape for a high scenic integrity.

Transportation

- Maintain appropriate roads and identify decommissioning opportunities.

MANAGEMENT STRATEGIES

Physical

Soils

- Minimize potential for uncontrolled wildfire of extreme severity that may damage soil by reducing excessive fuel accumulations.
- Decommission roads that can not be maintained.

Hydrology

- Decommission roads determined to be unnecessary for access to promote hydrologic stability.
- Accelerate the development of late-successional characteristics in riparian reserves to attain objectives outlined in the Aquatic Conservation Strategy through use of appropriate silvicultural techniques. For example, commercially thin stands within selected Riparian Reserves to accelerate tree growth, improve health of stands, and accelerate attainment of late successional characteristics.
- Incorporate General Water Quality Best Management Practices in the development of timber harvest plans.
- Incorporate Best Management Practices in the development and maintenance of trails and roads in the area.

Biological

Vegetation/Fire

- Reduce stand density which is causing tree mortality in fire regenerated second growth stands through silvicultural treatments such as commercial thinnings and partial cuts. Reducing stocking levels will reduce future mortality and decrease fuel hazard in the long term. If left untreated, stands will continue to have accelerated mortality and will continue to contribute to higher fuel loadings.
- Reduce stocking levels of stands to increase tree spacing and diameters to reduce the ability for stands to carry fire, and to increase stand vigor and health. Commercial thinning will remove the smaller diameter suppressed trees which will reduce competition for larger dominant trees and improve their ability for future growth.

- Regeneration harvest in Matrix land that will not respond to commercial thinning, and by methods that will meet scenic quality objectives and improve habitat for big game.

- Maintain and enhance growth and health of managed stands through timber stand improvement projects such as precommercial thinning, fertilization and pruning.

- Salvage blowdown where conditions exceed Standards and Guidelines for down woody material.

- Continue to monitor Gorman's aster on Bachelor Mountain and manage the species in accordance with the Conservation Strategy for Aster gormanii (1994).

Wildlife

- Use thinning treatments to promote tree growth and improve 50/11/40 conditions, and encourage understory development which enhances herb and shrub layer, e.g. foraging habitat for big game.

- In Matrix, create small, irregular shaped openings within the landscape to improve big game habitat.

- Reduce road densities to improve big game habitat effectiveness.

- Accelerate old growth characteristics within stand initiation, stem exclusion and understory reinitiation stands within Riparian Reserves and LSR through use of appropriate silvicultural techniques including precommercial thinning, fertilization, and commercial thinning.

- Salvage blowdown concentrations that inhibit late successional development within LSR.

- Create snags and down wood in areas not meeting Standards and Guidelines through timber sales or Knutsen-Vanderberg funds.

- Promote stand diversity by various management projects such as thinnings including within Riparian Reserves where it would meet Aquatic Conservation Strategy Objectives. Create small openings within stands throughout Matrix.

- Maintain and enhance existing meadows by reducing trees that are encroaching on meadows due to fire suppression.

Social

Heritage

- Test high probability areas currently being impacted by road and recreational use for cultural significance and eligibility to the National Register of Historic Places. Implement mitigation methods by excavation or avoidance.

Sustainable communities

- Increase future yields of commercial timber stands by releasing dominant trees, precommercial thinning, fertilization, and regenerating stands that have achieved culmination of mean annual increment.

- In matrix land, provide for wood harvest production to meet Forest Plan objectives through small regeneration harvests, commercial thinnings, salvage (e.g. blowdown, insects and disease, catastrophic event) and partial cuts.

- Provide special forest product opportunities including but not limited to boughs, Christmas trees, etc.

- In matrix land, provide firewood opportunities created by timber harvesting.

Recreation/Scenic

- Future Implementation Guides should be incorporated as part of the Watershed Analysis revision process.

- Maintain trails at assigned maintenance levels and manage corridor to meet the Visual Quality Objective of partial retention. Improve tread and drainage on all area trails not meeting maintenance standards. Find alternative sources of accomplishing trail maintenance work through partnership efforts.

- Off-road vehicle use is not compatible with sensitive resources of this management area, including wildlife and heritage resources. In addition, the management area is not large enough to provide a suitable recreation attraction to ORV users who can access many miles of trails/roads and large acreage in a daily outing. Only 4.6 miles of local roads, all less than a mile, exist within the semiprimitive area. Also, the steep terrain does not provide adequate opportunity for an expanded or widened trail system necessary for a safe experience for motorized vehicles without disturbance to sensitive resources. No ORV use on trails had been documented and all roads are permanently closed for wildlife habitat effectiveness. Finally, with declining road maintenance funding, deteriorating road conditions and watershed concerns; road decommissioning opportunities have been identified for many local roads within the area. A change in management allocation to a semiprimitive nonmotorized area or another appropriate management area is recommended for the next Forest Plan update.

- Improve all existing trailheads to provide for adequate parking, and improve signage. Signs should inform users of use ethics, regulations and opportunities, including a map of the area. Increase fire prevention education through signs at area entry points or by direct public contact.

- An outstanding opportunity exists for interpretation, however, on-site interpretation should be very minimal. Fire history, geology, cultural history, wildlife and special habitats, diversity of vegetation and wildflower identification could all be topics for interpretation that could be presented by a brochure, guidebook or sign at the trailhead. This would allow the visitor some sense of self-discovery while maintaining the semiprimitive character of the area with minimal developments. On-site interpretation would be appropriate near the lookout since developments already exist, and presence of the lookout would reduce the amount of vandalism. In addition, interpretive and informational signing may help reduce the amount of distractions to the lookout, including answering "the most common asked questions." Landscape interpretation could be presented at this site due to the panoramic view of a good portion of the area.

- To minimize conflicts to the lookout, a special order could be enforced to designate the lookout area beyond the upper lookout trail junction as a day use area only. Primitive signs could be posted to designate the day use area at the lookout junction. A gate could be placed on the lookout deck and closed to the public at the lookouts discretion. Finally, signs should be posted at the trailhead about rules and use ethics.

- The Coffin-Bachelor Mountain area can provide an alternative to Wilderness. Encouraging use to non-Wilderness areas such as this one could help alleviate overuse within the Mt. Jefferson Wilderness. Area trails are currently promoted on the Internet through the Forest Website, and by recommendations of District Frontliner staff to visitors seeking suggestions for places to visit. Monitor use levels to determine if opportunities for semiprimitive experiences are being maintained.

- Design size and shape of regeneration harvest to meet scenic objectives as prescribed in the Forest Plan, e.g. small, irregular openings that borrow from the landscape. Thinning and partial cuts are encouraged to maintain large scale contiguous vegetation patterns. In addition, reducing potential for fire and increasing stand vigor and health will improve scenic quality over the landscape and maintain the desirable setting for semiprimitive experiences to occur.

- To maintain semiprimitive objectives seek advise from a recreation Resource Advisor, and use "Light Hand Tactics" when suppressing wildfires when possible.

Transportation

- Complete an Access and Travel Management Plan for all District roads. Road maintenance and decommissioning plans should be based on resource protections needs, long term access needs, public safety and economics. Local roads are generally candidates for decommissioning. Roads to be decommissioned should meet the criteria identified in the Upper North Santiam Watershed Analysis.