Blowout Watershed Analysis

Detroit Ranger District
Willamette National Forest
October 1, 1994

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Chapter 1

Maps

IA. Purpose

The ultimate purpose of this analysis is to meet the ecosystem management objectives outlined in the *Standards and Guidelines for Management of Habitat for Late-Successions and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl*.

This watershed analysis is an attempt to reach that goal by trying to understand the major ecological structures, functions and processes and their interactions within the Blowout analysis area so that better decisions about managing the area can be made. It will serve as a basis for supporting decisions for implementing management prescriptions including setting and refining riparian and other reserve boundaries, developing restoration strategies and priorities, developing funding and project implementation priorities, and determining monitoring strategies.

The analysis is by no means a comprehensive inventory process or a complete study of the ecological processes and interactions in the Blowout. We have neither the budget nor the expertise to fully inventory or understand every aspect of the ecology of the area. Instead, it is a focused analysis intended to address issues and key questions needing to be answered prior to making management decisions. The analysis will be refined in future iterations as we learn more about the area and its ecological interactions.

IB. General Overview

This section briefly describes the major attributes of the Blowout area to set the stage for the analysis.

Introduction

The Blowout analysis area has been extensively harvested. Approximately 39 percent of the 34,000 acre study area has been cut since 1940, when timber harvest began in earnest in the area. Most of the cutting has been in the form of clearcuts or other types of regeneration harvest.

The first harvesting in the area was done by railroad in the 1930's. The railroad line extended up Blowout Creek to its confluence with K Creek, but District records do not show how many acres were harvested during this period.

The following table shows the amount of harvest by decade since 1940 (see also, *figure 1a*).

Years	Acres Harvested
1940-1949	474
1950-1959	853
1960-1969	3,114
1970-1979	4,810
1980-1989	3,197
1990-1994	697
Total	13,145

Location

The Blowout analysis area is situated on the western slope of the Cascade Range in northwestern Oregon. It is almost entirely on national forest system land on the Detroit Ranger District of the Willamette National Forest. (*figures 1b and 1c*)

What's in a Name

A commonly asked question is "Why is it called Blowout Creek?" About the only historical reference we could locate that identified the origins of the name Blowout Creek comes from a 1925 Oregon Historical Society Quarterly. This reference states that Blowout Lakes on Blowout Creek were so named because of a great landslide nearby resembling a blowout of the mountainside.

Selection of Analysis Area

The Blowout Analysis Area was selected by process of elimination rather than from any scientific process. Politics, rule changes and repeated changes in land allocations from those initially designated in the 1990 Forest Plan have affected analysis area selection far more than science has.

The Detroit Ranger District is divided into 11 analysis area (*figure 1d)*. Initially the intent was to enter one or two of these analysis areas per year and rotate through all eleven areas once or twice per decade. The rotation process was accelerated right from the start when Section 318 of the 1990 Appropriations Bill designated a timber harvest target for the Region. This timber harvest necessitated entry into four analysis areas (Lynx-Big Meadows, Parkett-Mari, Pamelia and Ida-Mary) the first year. Since that time three more have been entered (French, West Breit and Detroit Tribs). Two of the remaining four areas (Elkhorn-Cedar and Opal-Battle Ax) are deferred pending the outcome of a Bill before Congress to change the allocation of the area to a Research Natural Area. One area (Upper Breit) was recently allocated as a Late Successional Reserve, so the only realistic area to consider at this time was Blowout.

Climate

The area falls under the influence of the Pacific maritime climate. As mid-latitude storms approach from the west, they are forced to rise as they encounter the Cascades, resulting in large amounts of terrain induced precipitation on the western slopes. As a result Blowout receives approximately 80-120 inches of precipitation annually, mostly in the form of snow. Most of the precipitation falls during the winter months, with November through March accounting for more than 75 percent of the total precipitation. Spring and fall rains and snow and summer thunderstorms contribute to the annual total, but they are dwarfed by the winter precipitation totals.

Monthly mean snowfall totals vary with elevation. Since precipitation tends to increase with increasing elevation, more potential moisture for snowfall is available at higher elevations. Since temperatures generally decrease with increasing elevation, those high precipitation amounts are more likely to be in the form of snow. Monthly mean temperatures range from 42.4 to 59.5 degrees.

Major Landowners and Land Uses

There are three major landowners in the Blowout study area: 1) U.S. Forest Service, 2) Army Corps of Engineers and 3) John Hancock (*figure 1e*).

Most of the 34,000 acre Blowout Analysis area is public land managed by the U.S. Forest Service. The management of the natural resources in the area is guided by the 1990 Willamette National Forest Land and Resource Management Plan as amended by the Standards and Guidelines for Management of Habitat for Late-Successions and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl.

On National Forest System land, primary land uses (*figure 1f*) designated by the above plans include:

a) a Special Interest Area in the vicinity of Pinnacle Peak designated for its unique geologic features.
b) a Dispersed Recreation Area where a wide range of recreation opportunities are provided in conjunction with management of resources such as wood, water, scenery, wildlife, etc.
c) Scenic allocations where the visual quality of the forest landscape is managed along with various other resources.
d) an Administrative Use Site which contains a fire lookout and communications equipment.
e) a General Forest allocation where timber production that is compatible with multiple use and environmental objectives is the goal.
f) a system of Riparian Reserves that provide an area along streams, wetlands, ponds and lakes and unstable and potentially unstable areas where riparian-dependent resources receive primary emphasis. In addition, the areas serve as dispersal habitat for certain terrestrial species.
g) a Late Successional Reserve allocation where the objective is to protect and enhance conditions of late successional and old growth forest ecosystems, which serve as habitat for late-successional and old-growth related species.

The next largest owner in the drainage is John Hancock Corp. This company owns approximately 1600 acres of land that is managed for wood fiber production in accordance with the State of Oregon Forest Practices Act.

Finally, a small portion of land adjacent to Detroit Reservoir is Corps of Engineer land. This land is administered by the U.S. Forest Service.

Vegetation

Coniferous forests dominate the Blowout analysis area. The most common tree species encountered in the area are Douglas-fir, western hemlock, and western redcedar. At higher elevations Pacific silver fir, noble fir and mountain
hemlock become more common. Associated species include: Pacific yew, western white pine, sugar pine and incense cedar and hardwoods such as red alder, big leaf maple and black cottonwood.

Shrub layer vegetation commonly includes rhododendron, Oregon grape, vine maple, salal, and bear grass.

Topography/Geology

Elevations in the analysis area range from 1560 feet, at Detroit Reservoir during high pool, to 5771 feet at Coffin Mountain (*figure 1g*).

The 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. The surface expression of these rock formations has been extensively changed by glacial activity and slope instability.

In the last several hundred thousand years, 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.

Water/Fish

The analysis area consists of Blowout Creek and its tributaries and Box Canyon Creek and its tributaries. Both Creeks drain directly into Detroit Reservoir, a lake formed behind Detroit Dam, on the North Santiam River.

Detroit Dam is primarily a flood control facility but it also provides hydroelectric power. It was built in the 1950's and has no fish passage facilities. The reservoir behind the dam is popular for boating, fishing, and swimming and provides an economic base for the town of Detroit.

The North Santiam River serves as a domestic water supply for several downstream municipalities, an irrigation source for farmers, fish and aquatic habitat and is an important recreational and scenic

feature in the area.

The North Santiam River joins the Santiam River near the town of Jefferson. It then flows into the Willamette River near Buena Vista and flows north into the Columbia River near Portland. The Columbia River empties into the Pacific Ocean at Astoria.

Blowout Creek and many of its tributaries currently support two species of salmonid fish. Rainbow trout are found in the lower reaches below any migration barriers while cutthroat trout are primarily found above the first barrier encountered working upstream. Black-sided dace, long nosed dace and sculpin are non-game fish found in the drainage.

Wildlife

A variety of wildlife species inhabit the Blowout study area using the many different habitats that are available across the landscape. Examples of species that are known to use the area are: deer; elk; bear; various birds of prey including owls and eagles; cats such as bobcats and mountain lions; ducks; furbearers; bats; herpetiles; neotropical migrant birds, numerous rodents, fish, insects, etc. Some species are year long residents, others use the area seasonally, and some just pass through the area.

Various special habitats such as meadows, wetlands, talus slopes, etc. dot the landscape. These habitats play an important role in maintaining certain species and allowing for refuges while species disperse over the landscape.

Topography plays a role in dispersing individuals or groups. Blowout is located immediately south and east of Detroit Reservoir. A major ridge separates it from Sweet Home Ranger District to the south. Another major ridge defines the eastern boundary. These two ridges are important in seasonal migrations of several species, including big game.

Much of the eastern portion of the analysis area is in winter range. The Divide-Hawkins area of the winter range is one of the most heavily utilized winter ranges on the district. In addition, there is a Bald Eagle management area in the northwest corner of the analysis area. Box Canyon drainage, in the west, is a Late Successional Reserve and there is a network of Pine Marten areas and 100 acre Late Successional Reserves dotting the analysis area (*figures 1h, 1i, 1j, and 1k*).

Transportation

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 in this area accessing public and private land (*figure 11*). Included in these are 17 miles of major forest arterials, 39 miles of forest collector roads and 129 mile of local timber access roads. Road densities average 3.58 miles per square mile over the study area. The following two roads make up the Forest Service Arterial system in this watershed.

Road 10, Blowout Road, accesses several developed campgrounds, permittee sites, private land holdings, and a large amount of dispersed recreational activities located around Detroit reservoir. It is the major route used for all activities carried out in this watershed.

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

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

People, Recreation and Scenic Resources

Human use of the area dates back to prehistoric times. 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. The local economy is still dependent on natural resources but dollars are derived both from scenery and resource extraction. Saw timber and a variety of other forest products provide employment opportunities as do dispersed recreational activities such as hunting, camping, fishing, hiking, sightseeing, etc.

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IIA. Issues and Values

Vegetation

Vegetation types, structure and distribution are a result of the effect of soils; topography; climate and weather; biotic influences such as insect, disease, and animals; genetics, and abiotic factors such as fire and human activity. Forest management activities may be creating vegetative conditions outside the natural range of variability.

Fire suppression has reduced the amount of natural disturbance in this century and has altered the character of vegetation in some stands.

Timber management activities have the potential for reducing species diversity within the ecosystem.

Forest management and disturbance processes have an effect on biodiversity; as gauged by:

1) the amount, distribution, and condition of native plant populations and communities
2) the amount, distribution, and population trends of introduced and noxious weeds.

Fragmentation of vegetation due to timber harvesting and road building may adversely affect the sustainability of certain species of ecosystems.

The amount and distribution of late successional forests is less than was present at the time of early European settlement due to timber harvesting.

Management activities, primarily timber harvest and road construction, have altered the landscape and changed the scenic quality of the watershed from pre-settlement conditions.
The forest vegetation has the capability of producing an assortment of commodities to the local and regional economies.

The Blowout is valued for its timber and special forest products.

Box Canyon Creek and scattered other locations throughout the analysis area are valued for their old growth ecosystems which include habitat for old-growth dependent species such as the northern spotted owl.

Soil, Water and Fish

Portions of the analysis area are among the most unstable areas on the entire Ranger District. In addition, there are a lot of areas that are unsuited for management because of rocks and cliffs, often these are associated with slumps, but not always.

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.

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

Stream temperatures within Blowout Creek and some tributaries exceed State Water Quality standards for about three months out of the year.

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

The 1964 flood and past management activities have combined to create monotypic, diversity poor stream channels in the Blowout.

Fish habitat quality has been reduced due to past management activities, including road construction, cutting and yarding of trees, removal of down wood from the stream and riparian zone, and slash treatment. The system has been affected in the following ways:

1) Large woody material that was removed from the channel and the associated riparian zones had an immediate affect on instream fish habitat quality as well as a long term affect by removing future instream large wood from the riparian zone.
2) 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 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 juvenile cutthroat and rainbow trout. Higher summer temperatures may also be having an affect on the species mix of amphibians found in the

lower Blowout.

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

These problems may hamper the Oregon Department of Fish and Wildlife's proposed reintroduction of anadromous fish into the Blowout portion of there historic range.

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

The Blowout is valued for its fish and water resources.

Wildlife

The road, cover, and forage variables of the Wisdom Model are currently in violation of Forest Plan standards and guidelines. Road densities in winter range exceed desired levels for big game habitat effectiveness and are in violation of Forest Plan standards and guidelines. Seasonal and permanent road closures have not been enforced, leading to disturbance of big game during critical times. In addition, winter range lacks high quality cover and forage.

Big game population numbers may be outside the range of natural variability (high). Oregon Department of Fish and Wildlife's goals for big game numbers in this area may be incompatible with habitat goals and natural population levels.

Past harvest activities, slash disposal treatments, and salvage have resulted in inadequate snag and down woody debris levels in most subbasins. Habitat capability for primary cavity excavators does not meet the 40% potential population requirements in six out of nine subbasins. Past slash disposal treatments have burned many of the existing snags and down woody debris left in harvest units resulting in the snags and down wood being unusable. Fire suppression may have also reduced the number of snags and down woody debris in the watershed and curtailed the creation of these habitat components across the landscape.

Inadequate amounts of snags and down woody debris may limit recruitment of new snag and down woody dependent individuals into the population. Fewer snag and down woody debris dependent species may lead to a pest outbreak leading to an overabundance of disease and death in the forest. Nutrient recycling may be significantly reduced without adequate amounts of down woody debris being recruited. Without adequate levels of these habitat components, the food chain may be reduced by not providing habitat for those smaller food chain species.

Old growth and mature habitat is highly fragmented resulting in poor connectivity. Past management activities may have reduced the quality of habitat by reducing the fragment size, isolating old growth fragments and removing habitat components such as snags and down woody material from within these.

Owl dispersal habitat has been reduced below U.S. Fish and Wildlife's 50-11-40 Rule within two quarter townships. Two additional quarter townships, with portions that lie within the analysis area, are near violation. Most spotted owl pairs/resident singles are in a "take" situation.

Many old growth dependent species have not been surveyed for, except for the spotted owl, to determine important habitat areas to retain. Fragmentation of existing old growth patches reduces the recruitment of new populations, which may ultimately limit the gene pool. Species are exposed to increased predation and mortality which could lead to a significant decline in some population numbers and sizes.

The Blowout area is valued for its wildlife including deer, elk, bear, various birds of prey, cats such as bobcat and mountain lions, ducks, furbearers, bats, herpetiles, neotropical migrant birds, numerous rodents, fish, insects, etc.

Transportation

Road Densities: The current road density for Blowout analysis is approximately 3.58 miles per square mile, over the entire watershed. Road miles used in this analysis include only the system roads in our GIS program. There are some private roads and non-system spurs not inventoried and not included in this analysis. The exclusion of these roads should have no significant impact on results of the analysis.

Three important elements of the road density issue are listed and described below.

1) Water routing efficiency: Roads can disrupt the natural hydrologic flow paths, including diversion of stream flow and interception of surface and subsurface flow. The controversial step of closing or decommissioning selected roads by removing those elements of a road that reroute hill slope drainage and present slope stability hazards, can minimize disruption of these natural hydrologic drainage networks.
2) 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.

2) 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.

Access and Travel Management: Management of our transportation system needs to provide protection to our resources while providing 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. Restriction of access and travel should be the minimum to achieve management objectives consistent with legal requirements, user safety, environmental considerations and economics. Below are listed and described the broad range of users needing access to the Blowout analysis area. This list is not meant to be all inclusive, but only broad descriptive categories.

1) Recreation: Provide for a broad range of recreational opportunities in a variety of settings.
2) Fire: Address motor patrol needs for fire detection and allow for reasonable response time for initial attack of forest fires.
3) Commercial Operations and Permittees: Manage access to provide opportunities for timber harvest activities, Special Forest Products, mineral uses and personal use permits.
4) Ownership: Maintain access to private land and negotiate cooperative agreements to help meet the needs and management objectives of all parties.
5) Administrative: Provide access to meet resource management needs and management allocation requirements.

Sediment Production: Roads modify natural hill slope drainage networks and 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 contribute to the discussion of sediment production from road systems, they are listed below:

1) 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.
2) 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.

3) 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.
4) 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 on a steep downward spiral.

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.

People, Recreation and Scenic Resources

Heritage Resources: A high percentage of heritage resource sites have been adversely impacted by human and natural processes.

Very few adversely affected heritage resource sites have been mitigated to determine their eligibility to the National Register of Historic Places.

Very little has been accomplished toward interpreting past human activities within the Blowout watershed. Forest Plan standard and guideline FW-272 is not being met.

Recreation: The Blowout Analysis Area is valued for its dispersed recreation opportunities, such as hunting, fishing, hiking, camping, sightseeing, etc.

Increased dispersed recreational use due to high and increasing demands for this opportunity may place additional pressures on resources. Heavy use of popular dispersed campsites and user trails that were haphazardly developed by visitors have caused some site degradation. In these areas, often vegetation loss and tree damage, soil compaction and surface erosion occurs.
Another concern with use of dispersed sites is the disposal of human waste. Since a large percentage of dispersed sites occur along streams and lakes, site degradation, stream bank instability, and human/animal waste may have some impact to water quality and fish habitat as a result of sedimentation and bacterial contaminants entering the system. In addition, these visual impacts may diminish recreation experiences and scenic quality.

There are no interpretive opportunities provided within the Blowout drainage. In a larger context, there has been minimal interpretation of natural and heritage resources within the North Santiam River Basin. There are no permanent on-site interpretive opportunities, such as interpretive signing or self-guides trails available. Interpretive talks have been conducted but very few and far between. Currently, we are not meeting standards and guidelines which state the Forest shall provide for a wide range of developed and dispersed recreation opportunities compatible with individual management area objectives and sensitive to public demands. It further states, natural processes, historic or cultural features will be interpreted and displayed for public awareness and enjoyment.

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 would require a well maintained route while four wheel drive units and ORV's would prefer a more rugged experience. Safety of roads is a concern within the roaded recreation settings. For visitors who would like a more Semi-primitive experience, roads would be a major detractor. Backcountry driving or driving for pleasure is a popular activity within Blowout. Key access routes should be maintained to continue this opportunity, and allow visitors to access recreation destinations within the Roaded settings.

There is a demand for a diverse set of recreation opportunities (settings and activities) ranging from Primitive to Roaded Natural/Modified or even leaning to Rural within the forest setting. 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.

Dispersed recreationists use areas that are habitat for native wildlife, fish and plant species. The kind of activity and experience that the physical setting can provide is what attracts visitors to these habitats. A major change in habitat could affect some types of dispersed recreation. A large reduction in forage and/or cover for big game could reduce hunting opportunities. Log and boulder structures placed in streams to stabilize channels and improve fish habitat can pose barriers and make a stream extremely dangerous for kayakers.

Scenic Resources: Management activities, primarily timber administration and road construction, have altered the landscape and changed the scenic quality of the watershed from pre-settlement conditions.

IIB. Key Questions

Vegetation

What types and distribution of vegetation occurred in the watershed prior to European settlement? What disturbance factors led to those conditions?

What types and distribution of vegetation currently occur in the watershed? What disturbance factors are currently at work in the watershed?

How are current vegetation types and distribution different from pre-settlement conditions? Are current vegetation conditions and distribution outside the range of natural variability?

Are there plant species, populations or plant communities that are in decline due to past management activities, insects, disease or non-native plant competition?

What are the plant species of concern in the watershed, and what current information is available on their status?

Are there native plant populations and plant communities which are decreasing as a result of past management practices, natural disturbances, or non-native plant competition?

Soil, Water and Fish

What factors affect stream channel morphology, water quality, and stream channel condition, and how do these change through time within the Blowout?

What is the role of large wood within the riparian reserve areas of the Blowout Watershed? Where is there a deficit of large wood in or adjacent to streams? Will riparian vegetation allow recruitment of large wood to the channel? How long will recovery take?

How has the dam affected the sediment distribution and transport capacity of the channel downstream of the dam?

What affect has the magnitude and frequency of peak flows had on the channel characteristics within the Blowout, and what relationship has management had in the natural range of variability of these flows?

What beneficial uses occur within the watershed and what response do they have to the natural range of variability within the riparian reserves?

What are the physical components or processes operating in the uplands, and what are the sediment delivery mechanisms and relative rates to the streams by landform or slope position?

What is the range of variability, both temporally and spatially, of the disturbance regimes, both natural and management induced, that effect the uplands?

Have roads created and expanded drainage systems that may effect the size and timing of peak flows?

Are the current types and levels of use in the watershed having impacts on resource conditions including water quality, riparian vegetation and soil conditions?

Have beneficial uses such as fish spawning and rearing, and domestic water sources been impacted in the watershed and have management activities been involved in these changes? Which beneficial uses have been impacted and what is the cause or nature of the impact?

What is the current condition of the aquatic habitat for resident populations of rainbow and cutthroat trout and future re-introductions of winter steelhead and spring chinook salmon? Are the conditions within the expected range of natural variation?

What are the fish species that have had migration patterns blocked or disrupted due to the physical barrier of the dam? To what extent has the migration patterns been altered (spring chinook, winter steelhead, Bull trout)?

Where are the year-round cold water source areas for the streams in the Blowout and where can their contribution to base flows be identified as critical?

What is the distribution and abundance of native fish species in the watershed?

What is the potential production of winter steelhead and spring chinook in the drainage?

How has the dam affected bull trout populations in the watershed, (last seen in the drainage in 1945)?

Have stream temperatures been affected by management activities and how have they changed over time?

Wildlife

What special habitats exist within the area and what is the existing condition of these? What role do they play across the landscape?

Are default riparian reserves adequate to maintain habitat and dispersal requirements for riparian and terrestrial associated species?

Does the current abundance and distribution of habitat, for each group of species analyzed, fall within the range of natural variability?

What is the existing condition of wildlife habitat (amount of early, mid, and late seral stages, quality of habitat, connectivity, etc.) within the Blowout?

What is the current abundance and distribution of snags and down woody debris?

What are the wildlife species that have had migration patterns blocked or disrupted?

Transportation

What are the access needs and conditions in the watershed?

How does this transportation system address all the conflicting issues of the varied users?

What are the tradeoffs made in a transportation system that cannot meet the needs of all users?

People, Recreation and Scenic Resources

What are the historic and current human use patterns within the Blowout watershed? How do they compare?

What is the existing conditions of Heritage resource sites throughout the Blowout watershed? How does this compare to the rest of the district?

What is the potential for interpreting the historic human use patterns within the Blowout watershed?

How have prehistoric and historic land uses affected current vegetation patterns within non-forested habitats?

What is the present recreational use within the Watershed?

What kinds of recreational opportunities do people want to experience?

What kind of recreation opportunities can the watershed provide?

Is the recreation resource (supply) consistent with current visitor needs and demands? How is supply and demand for recreation resources expected to change in the future?

What role does the Blowout landscape play in the provision of recreation opportunities in the North Santiam Basin and region?

Are current levels of recreation use impacting user experience, including scenic qualities, social interactions and safety?

Are current levels of recreation use impacting natural and heritage resources, including site degradation, vegetation loss, water quality, etc?

What is the interpretive potential of natural, historical and cultural resources within the watershed? What kind of information does the Forest Service want to communicate? What kinds of information do visitors want or need?

What is the present scenic condition of the watershed and how will it change?

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 critical slope instability areas have been delineated in the field. 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).

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 evapo-transpiration 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.

Water: Earthflows can affect stream channels in several ways. If the flow contains sufficient large woody material, the roughness of the woody material tends to slow the migration of the flow so its distribution downstream is minimal. Flow flats would then be established upstream of the accumulation of woody material and the stream channel would occupy either intergravel space or meander on the flats. Energy increases in the stream channel would occur as a result of the change in gradient at the toe of the flow. These increased energies could result in the removal of finer materials and the creation of higher gradient channels, or a falls could develop, and the stream channel would lose its energy 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.

Portions of the flow may scour stream channels to bedrock depending on their speed and viscosity. These bedrock reaches, for a short time, would contain over-steepened upper channel banks. Woody material would be recruited from the channel banks and colluvium would then be collected. This process would rebuild the diversity within the channel.

Earthflows would also create smaller channels along their margins or on their flow faces. Wetland areas would be created as sag ponds associated with these flows or as a result of

the flows on the landscape.

Wildlife: Land flows can be found throughout the Blowout Analysis Area. Blowout Cliff and Cooper's Cliffs represent two major land flow occurrences. There are many more rock/talus areas which may have been the result of slope failures. Land flow activity results in uneven topography, often creating wet areas or elevated areas where certain animals take refuge. Additionally, wet and elevated areas are often dominated by vegetation types different than those in adjacent areas. Specialized areas created by land flows not only provide wet areas for riparian associated species, but rock/talus habitats that are utilized by a whole other group of species. These areas also provide forage for big game which may be a different type of forage found in other parts of the watershed.

People, Recreation and Scenic Resources: 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 those pulling an RV trailer.

D. Insects and Diseases

Vegetation: *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 in 15-20 year and 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 have mortality that is still standing, the trees are too small to topple over yet.

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, in Blowout, Western white pine and sugar pine. 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 regeneration of the same species.

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 a low population levels, very little damage was 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.

Wildlife: Disease and insects can create locally patchy stands (DeBell and Franklin 1987). This type of disturbance can produce the snags and down woody debris that are essential to the survival of some species. The insects themselves provide a food source for primary cavity excavators. Patchiness may result in forage establishment for big game. It may lead to the development of uneven aged stands. Laminated root rot pockets are distributed throughout the Blowout Analysis Area in differing sized patches. It has created down woody debris and opened the canopy up for forage creation. It selects for certain species and results small patches of diversity across the landscape.

People, Recreation and Scenic Resources: Insects and disease can cause tree and stand mortality which creates a hazardous situation to recreationists 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.

E. Management

General Overview: Management activities affecting the landscape started with railroad logging. 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 (Table 3c).

Table 3c. Decade Harvest in the Blowout since 1940

Years	Acres Harvested
1940-1949	474
1950-1959	854
1960-1969	3,114
1970-1979	4,810
1980-1989	3,197
1990-1994	697
Total	**13,145**

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 are currently planted in each harvest unit.

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.

Soil, Water and Fish: *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: 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.

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

When logging 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 is the 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.

Stream channels responded to the change 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.

Transportation systems, road locations, reduced floodplain areas by channelizing flows and disconnecting them with their flood plains, increased the energy of the channel and cause channel bank instability.

Wildlife: The Blowout Analysis Area has been managed intensively for timber. Consequently, man's activities were and still are a formidable influence on big game and old growth dependent species in the area. Timber harvest began in the 1930's but the majority of the logging occurred between the late 1960's and the early 1980's.

Management disturbance has interacted with natural occurrences to shape the landscape. Human fire suppression activities have changed fire patterns and altered the landscape. Man replaced fire as the primary method of forest fragmentation, creating abundant forage and facilitating large scale population growth for both deer and elk. However, negative impacts also resulted from management activities.

Logging followed by slash burning has been called a mimic of natural processes (Agee, 1989). Although some aspects may be similar, the functional result in the past has been quite different: no snags are left and much more soil disturbance is present after logging which may redirect post disturbance plant succession (Scott, 1980).

Historically, fire occurred randomly throughout the area. Wildfires created numerous small openings and an occasional large opening in the forest. Openings created by fire were undoubtedly variable in shape. Edges of openings were sometimes feathered, forming as fires slowly burned themselves out. In contrast to more random distribution of openings created by fire, openings created by harvest activities were concentrated in flatter, more accessible terrain. Harvest units were often large, old growth timber, uniformly shaped, and were placed adjacent to one another making larger openings. This provided additional habitat for edge dependent species. Large openings and uniformly shaped units do not generate high edge-to-cover ratios. High edge-to-cover ratios and good juxtaposition of forage to cover provide ideal habitat conditions for big game.

Less than 20% of the old growth forest remains and the fragmentation of the remaining old growth stands may degrade the quality of these areas for plants and wildlife. Fragmentation of forests on Federal lands in the Pacific Northwest is a product of staggered-set clearcutting of late successional forests (Lehmkuhl and Ruggerio, 1991). Harvest activities create a mosaic of patches throughout the landscape. These patches become smaller and more isolated as logging continues. The viability of remnant patches as wildlife habitat is a function of myriad edge effects that depend on patch size and isolation (Lehmkuhl and Ruggerio 1991). Some researchers suggest that a fundamental change in microclimate occurs within 160 meters of the forest edge which creates conditions different from the patch interior (Franklin and Foreman 1987, Harris 1984). So consequently, patches 10 hectares in size are effectively all edge and have lost the essential attributes of the old growth condition.

Management activities that produce edge effects can generate many products that are undesirable for interior species. Competition between interior and edge species may occur when edge species that colonize the early-successional habitats and forest edges created by logging also use the interior of remaining forests (Anderson 1979, Askins and others 1987, Lehmkuhl and others 1991, Reese and Ratti 1988 and Yahner 1989). Generalists species occurring in the forest at the time of fragmentation may benefit from environmental changes outside the forest. These generalist species may alter community interactions and result, for example, in greater competition with other animal species or altered plant-animal interactions (Janzen 1986).

Secondary extinctions may result from the elimination of keystone species (Paine 1969, Soule' 1986). Gilbert (1980) and Terbough (1988) described situations in the tropics where the elimination of top predators could have cascading effects through the community by changing the size or structure of prey populations, which in turn influence plant-animal interactions. Continued logging resulting in smaller stand size may have detrimental effects to the wildlife populations and the sensitive balance of these populations.

The probability that a population will persist even when it has experienced habitat loss through fragmentation is a function of population density or abundance. The larger the species, the greater the vulnerability to extinction due to habitat loss (Diamond 1984). These species also experience a low fecundity rate (Pimm and others 1988). Dispersal ability also comes into play. Those species with persistence despite isolation from fragmentation may rescue dwindling populations or form new populations where others have become locally extinct (Brown and Kodric-Brown 1977). And those species with a low persistence have a higher risk of extinction.

Small patches may serve a function to some species such as amphibians and small

mammals and may be desirable to maintain. Small patches may be adequate to support viable populations of amphibians, invertebrates, and perhaps small mammals since these species can inhabit smaller patches than larger species. These may be important sources for re-colonization of adjacent stands that become suitable over time.

Management also accentuates the effects of floods and land flows. Due to the high number of roads within the area, we may increase the sedimentation flow into the streams which may have already been overloaded from past flood events. This type of action may have a negative effect on species such as the tailed frog larvae which rely on interstitial spaces between rocks and substrate to live. It may also fill up backwater areas that are important to species such as herpetiles, small mammals, and invertebrates. Logging activities may increase erosion of particular land flow areas if not monitored. This may have a negative effect on the unique vegetative types found within these areas by drastically altering habitat. In turn, animal species that have co-evolved with these vegetative types may be negatively effected.

Management activities have exposed the forest to increased pressure from the human population via an extensive road system. Many roads have been constructed across the landscape to access past harvest units. This further fragments the landscape and subjects dispersing or foraging individuals to increased predation, stress, and possibly death due to hunting or poaching. Important travel corridors have either been bisected or eliminated by the extensive road system. These corridors are important for the continued immigration and emigration of animals and the maintenance of inter-population gene flow. Genetic diversity resulting from gene flow is an important facet of maintaining biodiversity. They are also important in seasonal and non-seasonal migration routes from summering to wintering grounds and vice versa. Undo stress may lower reproduction rates and may cause animals to move to inhospitable areas where forage or secure areas are difficult to attain during already high stress times. This may lead to decreased population levels.

People, Recreation and Scenic Resources: The Blowout Analysis area has been intensively managed for timber since the 1930's. Road construction opened up many subbasins 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 diverse needs and demands of the public.

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Chapter 4

IV. Stratification

Maps

IV. Stratification

In reality, ecosystems grade more or less in a continuum across the landscape. Although exact lines cannot be drawn, approximations can be made of areas that have similar characteristics and that can be analyzed together. These approximations, or stratifications of areas that are similar, or that may respond similarly, help to simplify the analysis.

Depending on what is being analyzed, stratifications for one resource may not make sense for another. The following is a discussion of the stratifications that were used for the various resource areas.

Vegetation

In preparation for field reconnaissance, aerial photos were used to group trees into approximately 2,937 timber stand types in the 34,000 analysis area. For each stand, photo interpretations were made of tree size class, climax species, major plant association and year of origin (estimated from size class). This information was input into the Geographic Information System (GIS) database.

For some stands in the GIS database, only the basic stand information described above was known. For others, data had been collected in the past and had been stored in the database, so additional information was known for these stands. For still others, new information was gathered during field reconnaissance.

Obviously, not all of these stands were looked at in depth because of time constraints. Intense field reconnaissance was done, on approximately 3,000 acres of these timber stands, in areas with a high probability of some action occurring there in the near future. The remainder of the stands were analyzed in more general terms from photos and information in the database.

For discussion and analysis purposes, timber stands were grouped into major plant associations. For the Blowout these plant associations were: western hemlock; Pacific silver fir; Douglas-fir; and mountain hemlock.

Old growth was analyzed by both fifth and sixth field watersheds. Not all of the information was known about fifth field watershed because of varying ownerships. Sixth field watershed analysis helped pinpoint specific areas within the fifth field areas where old growth was lacking.

Soil

A fundamental constituent of watershed analysis is upland condition. Upland condition involves a complex set of interacting variables that includes geology, topography,

climate, soils and vegetation. The relative importance and performance of these attributes is best assessed and critiqued by qualified personnel engaged in intensive field level investigation and data collection in a systematic and meaningful manner. Field work generally followed a relatively specific sequence that attempted to develop a "story" about the landscape and provided the basis for the technical conclusions. In specific, the principal performers on the upland stage are geomorphic setting, landtype distribution, soil suitability, slope stability, and site productivity.

The process started with a determination of the geomorphic setting or the basic geologic framework in which the landscape was formed. Landtype distribution was determined by entirely re-mapping the project area, based on intensive field reconnaissance and utilizing the 1973 WNF Soil Resource Inventory definitions. As part of this landtyping process, soil suitability was evaluated. Unsuited soils were designated in two categories: unreforestable and irreversible impact from active slope instability. When actively unstable or potentially highly unstable areas were encountered, additional field review occurred to determine the failure history and the likely future failure potential that was anticipated (based on a geotechnical review). Lastly, site productivity was evaluated to determine regeneration potential, erosion resistance, management opportunities, and needed mitigations. These five activities just as often occur simultaneously as sequentially in order to manage a multiple working hypothesis about the landscape and finally to settle on a likely geologic context and time frame for basin morphology and erosion rates.

Several decisions had to be made in order to conduct a meaningful analysis of the study area in the appropriate time frame. For the Blowout, a decision was made to use planning subdrainages (PSUB) to organize the terrain and analyze the upland condition. These PSUB's range in size from about 3000 to 5000 acres and are not always true stream drainages, but may be split by major streams. It was decided that this unit was small enough to provide meaningful conclusions about geologic processes, and large enough not to bog down in meaningless details.

Water and Fish

The study area was analyzed at the following four scales: 1) The total analysis area, 34,000 acres; 2) The Project Implementation Guide (PIG) scale; approximately 7,000 acres (*figure 4a*); 3) The planning subdrainage (PSUB) scale; 3,000 to 5,000 acres areas that were historically used for timber planning. These follow watershed lines but may split a watershed down the middle, along a stream (*figure 4b)*; and 4) The planning subdivision (PDIV) scale; these are 3rd order watersheds, approximately 500 acre areas in size (*figure 4c*). The planning subdrainages were too large to get fine enough resolution to truly identify where hydrologic cumulative effects were occurring, so they were broken down into 46 watershed areas called (PDIVS) so a more complete picture of trouble spots could be made.

Wildlife

Wildlife habitat and analyses were stratified in several different ways to capture the many different requirements of the Land Management Plan and other regulations from U.S. Fish and Wildlife.

Big game analysis was stratified by big game management emphasis areas (MEA's) which are comprised of subbasins. The following management emphasis areas were analyzed: Box Canyon, Cliff, Upper Blowout, Divide, and Beard.

Spotted Owl and other late-successional species analysis was stratified in two different ways: by subbasin and by quarter township *(figure 4d).* All nine subbasins were analyzed for amount of habitat, condition of habitat, connectivity, and number of owl pairs/resident singles.

50-11-40 analysis was completed at the quarter township level to analyze amount and connectivity of dispersal habitat remaining. Subbasins analyzed were Beard, Divide, Hawkins, Upper Blowout, Lost, Cliff, Ivy, Box Canyon and South Side Blowout. Quarter townships analyzed were 10052, 10053, 10062, 10063, 11051, 11052, 11054, 11061, 11062, 11063, and 11064.

Some species did not have enough information to stratify. Therefore, analysis was done for the watershed as a whole.

People, Recreation and Scenic Resources

The discussions for heritage resources were stratified by planning subdrainage to simplify the analysis.

In the field, survey areas were stratified by the probability of heritage resource sites occurring in an area. All of the high probability ground and a 20 percent sampling of the low probability ground was surveyed. Probable site locations were determined by an archaeologist after gleaning information from heritage resource files (inventory reports, site reports, historic maps, and ethnographic information); topographic maps; the Oracle database; and the Geographic Information System (GIS). Survey design attempted to cover the possible discovery of the various site types known to occur within the project area as well as heritage properties known or believed to exist within the planning area.

Recreation and Scenic Resources were analyzed by stratifying the analysis area into management allocations and recreation opportunity spectrums (ROS).

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Chapter 5

V. Past and Current Conditions

Maps

V. Past and Current Conditions

Vegetation

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. At the highest elevations, mountain hemlock becomes a stand component. Other associated tree species include: Pacific yew, western white pine, 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.

Accurate data for stand ages is only partially available for the analysis area. Age information is known for managed stands but had to be inferred from tree size class data for natural stands. The following map (*figure 5a)* depicts the current tree size class distribution for the study area. From this map, one can infer stand ages because size classes are closely associated with age. Usually the smaller the size class, the younger the stand. A historical perspective of size class distribution, and therefore ages, can be seen in *figures 5b and 5c* showing the vegetative conditions in the area in 1950 and 1893.

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 how much old growth, as defined by PNW-447, remains in each fifth field watershed and in each smaller sixth field watershed.

Table 5a. Percent of Area in PNW-447 Old Growth by Subwatershed

5th Field Water-shed	Area of 5th Field Watershed on District	Percent PNW-447 Old Growth in 5th Field on the District	Sixth Field Subwatersheds	Acres of 6th Field in Blowout	Percent PNW-447 Old Growth in Blowout by 6th Field
03	26,119	13.7	Lower Detroit Reservoir	4	2.8
04	288*	3.7	Upper Quartzville Canal/Elk Creek	267 7	3.9 0
78	82,667**	17.8	Upper Detroit Reservoir Lower Blowout Box Canyon Creek Middle Blowout Upper Blowout Idanha	6 7,507 6,602 14,825 4,775 4	3.0 14.6 17.8 16.2 17.3 0.7
79	96,304**	20.7	Bugaboo Twin Meadows	1 3	0 1

* At this time we do not have databases that are compatible with other landowners. So we cannot easily determine the percent of old growth in 5th field watersheds not in our ownership.

** These watershed are entirely within the Detroit Ranger District

Second Growth of Natural Origin: A common assumption by lay people is that prior to 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 recedar 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 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 groups 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.

For Blowout not all areas 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 following chart depicts the major climax species plant associations by tree size class for the study area (*see also figure 5d*).

Table 5b. Plant Associations by Tree Size Class

Tree Diameter Class*	**Western Hemlock Plant Associations**		**Pacific Silver Fir Plant Associations**		**Totals**	
	Acres	***Percent of Area***	***Acres***	***Percent of Area***	***Acres***	***Percent of Area***
0.9 - 4.9"	2,878	19	6,357	33	9,235	27
5.0 - 8.9"	1,914	13	1,158	6	3,072	9
9.0 - 20.9"	5,116	34	2,737	14	7,853	23
21"+	4,695	31	8,579	45	13,274	39
Total	**14,970**	**44**	**19,034**	**56**	**34,004**	**100**

* <2% of the stands in the drainage are in mountain hemlock and Douglas-fir plant associations and are not included in this table.

Special Habitats (Non-forest plant communities): The occurrence of special habitats and their distribution across the landscape is important for biodiversity of plant and animal species. 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.

Past management practices that have had an influence on special habitat areas include roading through or adjacent to these areas, failing to retain trees to buffer the areas, and direct disturbance of the areas during timber harvest. Wet special habitats such as wet meadows, ponds, bogs, and moist rock gardens have been disproportionately impacted by management activities (see Table 5c).

Table 5c. Special Habitats in the Blowout Analysis Area

Type of Special Habitat	Number of Habitats (approx. number of habitat types out of 133 identified by photo or in field)	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 (based on 54 habitats inventoried in 1994)	
		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 Meadows	19	13	68	1	5	10	53	2	11
Pond	12	5	42			5	42	2	17
Mesic Meadows	10	2	20	1	10			2	20
Cliff	9					1	11		
Sitka Alder	9			1	11	1	11		
Swamp: hardwoods	8					1	13		
Sedge meadows	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 meadow	1								

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 (Table 5d), 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.

Table 5d. 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.

Old-growth Associated Species: In the *Forest Ecosystem Management Assessment Team* (FEMAT) report and the Standards and Guidelines associated with the Record of Decision for the President's Forest Plan, a large emphasis was placed on organisms which have been largely overlooked in traditional forest management such as mosses, liverworts, lichens and fungi. These species have not been systematically inventoried anywhere in Region 6. Existing information is patchy and often associated with graduate-level research projects and research in the HJ Andrews Experimental Forest. Some information is available through herbarium specimens. A few species listed in the standards and guidelines are found on the Detroit District-no specific data is available for the Blowout Analysis Area (See Table 5e).

Table 5e. Species Listed in the President's Forest Plan Standards and Guidelines

Species Type	Latin Name	Survey Strategy
Lichen	*Lobaria pulmonaria*	4
Lichen	*Lobaria oregana*	4
False Truffle	*Rhizopogon abietis*	3
Rare False Truffle	*Alvopa alexsmithii*	1,3
Rare Undesc. False Truffle	*Hydnotrya sp.*	1,3
Rare Undesc. False Truffle	*Martellia sp.*	1,3
Vascular Plant	*Allotropa virgata*	1,2

Since no surveys have taken place, the necessity to acquire an adequate knowledge of the distribution of old-growth associated species is paramount. The two cryptogam species above will be subjects of survey strategy 4; general regional surveys to be conducted by the Regional Ecosystem Office, initiated no later than fiscal year 1996. Three of the four false truffles will be under survey strategy 1, manage known sites, and with the fourth under survey strategy 3, conduct extensive surveys and manage sites. The vascular plant, candystick, will be under survey strategy 1, and strategy 2, survey prior to activities and manage sites.

Uncommon Plants: Uncommon plants have no special status in management 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:

Table 5f. 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 have been tracked by informal database, but in the future, sites should be placed in the GIS data base and populations tracked through time. Inventories have been conducted on an informal basis, when the District Botanist was looking for sensitive plants. It should be noted that, like sensitive plants, most of these uncommon plants are found in special habitats. The first three occurrences in Table 5f are protected by virtue of special habitat designation. Fringed pinesap occurs in coniferous forest, and has no such protection.

Noxious Weeds: A number of noxious weeds are found in the Blowout Analysis Area (see Table 5g). 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.

Table 5g. Noxious Weeds in Blowout Analysis Area

Weed Name	Classification
Spotted knapweed	New invader
Tansy ragwort	Established
Scotch broom	Established
St. John's-wort	Established
Canada thistle	Established

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. 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 a propagule source 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* and white sweet-clover *Melilotus alba* - the latter is found in abundance on the Sweet Home Ranger District.

Soils/Geology

General Overview: The 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 entire analysis area is subdivided into nine planning subdrainages (PSUB). These PSUB's can be grouped into three relatively similar sections: steep rocky canyons, a transition area, and the drainages dominated by earthflows and glacial activity (*figure 5e*).

The following section will assess each PSUB by the natural features of the watershed; and a description of the distribution, type and relative importance of the principal upland environmental processes and time frames of operation. (For all soils/geology discussions about PSUBs, refer to *figures 5e and 5f).*

Steep Rocky Canyons

PSUB: Box Canyon 78t

Physical Description: Elevation ranges from 1560 feet to 4930 feet. Except in the headwaters, the drainage is generally highly dissected, with steep, shallow rocky soils. The headwaters display limited areas of benches and more gently rolling terrain (primarily 78t.3.1, 78t.3.2, 78t.3.3, and the southern third of 78t.3) that resulted from cirque activity associated with glaciations, long past (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.

Slope Forming Processes: Stream downcutting of the volcanic formations that comprise the Western Cascades has been the principal process active in this drainage. Stabilized slump/landflow activity has reshaped the few gently sloping areas in the head waters with some actively unstable areas still 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 and much of the basin had major fire activity 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)

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 stem as well as side channels that probably equals the outputs from colluvial processes over the fire cycle period.

Unsuited / Site Class: Site Class ranges from IV to V. Unsuited areas are common and generally formed by rocks and cliffs (especially in 78 t and t.1).

Transition Zone

PSUB: Southside Blowout 78s

Physical Description: Elevation ranges from 1560 to 4580 feet. Complex highly dissected topography is evident with stable upland benches that formed from glacial activity (mid to early Pleistocene) separated by precipitous precipices. Extensive, very steep, shallow rocky sideslopes encompass the crags and extend to the valley bottoms. Some limited slumping of the glacial benches has occurred, but these have stabilized for the most part. Soils are primarily residual and colluvial in nature on the steeper slopes with glacial soils on the benches. This PSUB is geomorhpically 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.

Slope Forming Processes: Slopes have resulted primarily as a result of steam downcutting by Blowout Creek. Massive landflows from the Blowout Cliffs area pushed Blowout Creek to the south. This resulted in the steep canyons and rock cliffs that dominate this PSUB.

Sediment Delivery Mechanisms: Debris chute activity is the major sediment delivery mechanism. Pockets of soil from the older glacial deposits or highly weathered residual volcanic material continue to fail downslope in a catastrophic manner. Large woody debris often controls the size and extent of the debris flows. Small unstable areas occur in all PDIVs.

Unsuited / Site Class: Site Class ranges for IV to V. Unsuited areas are common to all PDIVs and generally formed by rocks and cliffs.

PSUB: Cliff 78r

Physical Description: Cliff Creek is the transitional basin between the steep, shallow soiled rocky PSUB like Box Canyon, the glaciated areas of Divide Creek and the unstable areas of westside Blowout. Elevation ranges from 1840 to 4930 feet. Mid Pleistocene (?) glaciation has left numerous stable upland bench areas and small cirque basins. A

geomorphically diverse and complex area, this drainage contains landforms that range from highly glaciated upland benches and headwalls at the higher elevations, to large-scale stabilized slump/earthflow complexes (78r.2.2 and 78r.2.3), to localized areas of actively unstable landflows (78r.1 and 78r.2, to steep, shallow soiled, highly dissected headlands with rock scarps and bluffs, to relatively flat stream terraces in the lowlands (78r) near the confluence with Blowout Creek.

Slope Forming Processes: In addition to extensive glacial activity in the mid Pleistocene (?), slump/earthflows and translational debris chutes have played and continue to shape the landforms and streams of this basin. Stream erosion and deposition have shaped the lower portion of this drainage where Blowout and Ivy Creeks meet as the Blowout shifted locations from west to east several times over a distance of almost one half mile. Evidence of this stream movement continues downstream as the confluence of Blowout and Cliff Creek approach where 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 and rotational failures is the dominate sediment delivery method 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 of 3 to 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 Cliff Creek with sediment for decades, and possibly centuries, to come. Finally, creep and colluvial deposition certainly play some roll in sediment delivery, especially in the more stable areas. Fire activity has accelerated that rate in the past, but large scale fires have not played a significant role in the last 500 years or so.

Unsuited / Site Class: Site Class ranges from III to V with IV and V the most common. Unsuited land is split between the actively unstable areas and rocks and cliffs.

Slump and Glacial

PSUB: Beard - Kay 78l

Physical Description: Elevation ranges from 1560 feet to 3900 feet. This PSUB 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. Soils vary widely in origin, type, and depth, but are generally deep, stable and productive.

Slope Forming Processes: The major slope forming process has been stream incision into highly weathered volcanic strata, glacial deposits, and slumped deposits of the previously mentioned material. Blowout Creek itself has been significantly manipulated by large earthflows that moved to the south from the highlands (78l.3, 78l.F.3, and

78l.F.4) along the Blowout Cliffs to force the stream to the south against the steep rocky slopes of Southside Blowout (78s). 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. Slope instability is not now a factor in this PSUB. 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 mover is likey creep and colluvial processes that are constantly at work and accelerate during periods of large scale fire events. Beard has an extensive fire history in the last 500 years with much of the area burning and reburning.

Unsuited / Site Class: Site Class ranges from III to V with extensive areas Site Class IV common. Unsuited areas are not that common, despite the overwhelming nature of the Blowout Cliffs area, and are comprised almost entirely of rocks and cliffs.

PSUB: Divide 78m

Physical Description: Elevation ranges from 1840 feet to 5770 feet. A geomorphically complex area, Divide Creek has a rolling nature with broad gently sloping ridges and nearly flat benches that are separated by shallow soiled, scarps and sharp slope breaks. Soils vary in origin, but are often glacial or fluvial in many areas, and the more residual types often slumped into place.

Slope Forming Processes: Slump earth flows of glacial derived material have been the dominate process in this drainage. Indeed, almost are areas show some influence from glaciation, slumping, or stream downcutting of this material.

Sediment Delivery Mechanisms: Despite the extensive history of slump related soil movement in this PSUB, little active instability remains except in one site. This area 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. For the upper part of Divide Creek, creep and colluvial processes are predominant and certainly accelerate during periods of large scale fire events. Divide 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.

Unsuited / Site Class: Site Class ranges from III to V with extensive areas Site Class IV common. Other than the one unstable area, unsuited areas are rare.

PSUB: Hawkins 78n

Physical Description: Elevation ranges from 1920 feet to 5770 feet. A geomorphically complex area, Hawkins Creek has a rolling nature with broad gently sloping ridges and nearly flat benches that are separated by shallow soiled, scarps and sharp slope breaks, often into the main drainages. Soils vary in origin, but are often glacial or fluvial in many areas, and the more residual types often slumped into place.

Slope Forming Processes: Direct glacial deposition (morraines or tills) or slump/earth flows of glacial derived material have been the dominate process in this drainage. Indeed, almost are areas show some influence from glaciation, slumping, or stream downcutting of this material. In some areas, benches comprised of residual soil and saprolite show the effects of glacial scour in the distant past.

Sediment Delivery Mechanisms: Despite the extensive history of slump related soil movement in this PSUB, little active instability remains except for two sites. The smaller of about 13 acres is located (at the south boundary of 78n.F.1) adjacent to the Upper Blowout PSUB and will be discussed with that area. The larger of 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.

Unsuited / Site Class: Site Class ranges from III to V with extensive areas Site Class IV common. Other than the unstable area, unsuited areas are rare.

PSUBS: Westside Blowout-Ivy 78q, Lost 78p, and Upper Blowout 78u

Physical Description: West Side Blowout, Lost, and Upper Blowout form, respectively, the west, central, and east sides of a large, mid Pleistocene (?) cirque basin that created an extensive valley glacier in most of the Blowout drainage. Elevation ranges, respectively, are 2370 to 4840 feet, 2380 to 5020 feet, and 2380 to 5230 feet. As expected, another geomorphically diverse and complex area, these drainages form the headwaters of the Blowout system. Landforms 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.

Slope Forming Processes: In addition to extensive glacial activity in the mid Pleistocene (?), slump/earthflows and translational debris chutes have played and continue to shape the landforms and streams of these three basins. Examples are located in 78u.2, 78p.3, and 78q.F.2, and 78q.1.1.1. Stream deposition has shaped the lower portions of these basins where Blowout, Ivy, and Divide Creeks come together (78q, and 78q.1). Extensive stream terrace deposits have been formed with some as high as 400 feet in elevation about the current valley floor.

Sediment Delivery Mechanisms: As was discussed previously, slope instability by both translational and rotational failures is the dominate sediment delivery method to the streams. Within these basins in the rotational category are the Blowout Slide of over 70 acres and five actively unstable areas of 10 to 20 acres. One area for example, an actively unstable area at the northwest corner of Upper Blowout (78u) and the southwest corner of Hawkins (78n.F.1) toes directly into the Blowout and has moved this stream to the west approximately 200 to 300 feet in the last couple of hundred years or so. In addition, there are at least 10 areas of 8 to over 15 acres which contain extensive debris chute activity, much of which has occurred in the last 50 years. These unstable areas have supplied and will continue to supply the upper Blowout with sediment for centuries to come. Finally, creep and colluvial deposition certainly play some roll in sediment delivery, especially in the more stable areas. Fire activity has accelerated that rate in the past, but large scale fires have not played a significant role for the most part in the last 500 years or so. Late Pleistocene and/or Holocene glacial activity was probably confined to the highest elevations with north aspects and was defined primarily by localized ice fields and periglacial environments.

Unsuited / Site Class: Site Class ranges from III to V with IV and V the most common. Unsuited land is split between the unstable areas and rocks and cliffs.

Hydrology

There are two distinct drainage systems in the area, streams that are tributary to Box Canyon Creek in the western portion of the analysis area and streams that are tributary to Blowout Creek in the eastern portion of the analysis area. 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 (*figure 5g*).

The analysis area is relatively steep and well drained as evidenced by stream densities of approximately 5.25 miles/sq. mile.

Numerous wetlands exist within the area because of earthflow activity. These wetlands are typically in the form of sag ponds and shallow ground water surface interfaces and are well distributed across the landscape, providing water sources for many species. The wetlands are an extension of the riverine system or are isolated occurrences generally associated with geologic features.

Stream substrate material varies from bedrock to gravel and is dominated by boulder/cobble material in the lower valley reaches.

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 and are commonly within the 68 to 70 F degree range throughout the summer (*figure 5h*).

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 *(figure 5i).*

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.

Sediment: The analysis area contains a lot of highly unstable ground which produces earthflows that contribute large volumes of sediment to the streams. Historically, this sediment would have been temporarily trapped by large woody debris in the stream channels and would later be transported through the stream and valley systems during major hydrologic events. A 100 year storm event occurred in 1964 which when combined with management activities at the time resulted in montypic, diversity poor stream channels. Today, much of the large woody material that was once present, is lacking from streams. This is mainly a result of past management practices and fires.

Less woody debris reduces the stream channel's storage capacity for sediment so more sediment is transported through the system during a hydrologic event today than in historic times. This may impact downstream users and storage capacity of the reservoir, in time.

Roads have the potential to result in increased size and frequency of debris slides and increased sediment into stream channels. One important example in Blowout is road 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 into the stream channel.

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 are, 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 (Table 5h shows road densities by planning subdrainge).

Table 5h. Road densities within the Blowout analysis area

Planning Subdrainage		Miles of Road	Acres of Roads	Road Density per Square Mile
78L	Beard	30.5	8.4	3.63
78M	Divide	29.25	7.0	4.18
78N	Hawkins	18.62	4.5	4.14
78P	Lost	17.88	3.94	4.54
78Q	West Side Ivy	22.18	6.2	3.58
78R	Cliff	20.18	5.38	3.75
78S	Southside Blowout	6.86	3.38	2.04
78T	Box Canyon	28.19	10.31	2.73
78U	Upper Blowout	16.31	3.58	4.55
Other Misc.		0.15	0.43	2.87
Totals		**190.12**	**53.12**	**Ave.= 3.58**

Hydrologic Recovery is calculated to estimate the capability of timber stands to intercept snow, rain and wind during rain-on-snow events. Hydrologic recovery is used 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 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 within the analysis area are within 10 points of the Forest Plan Threshold midpoints, some above the midpoint values and some below (*figure 5j*). When those planning subdrainages are broken into smaller units for finer resolution and to better isolate problem areas 31 of the 46 wastershed areas are within 10 points of, above or below, ARP threshold midpoints (*figure 5k*). Numerous channels within the area; Lost, Cliff, Blowout, Divide, and Ivy Creeks have shown or are showing signs of cumulative watershed effects.

Table 5i. The following subdivisions do not meet the hydrologic recovery (ARP) recommendations:

Planning Subdrainage	Division of Subdrainage	Recommended ARP	Actual ARP	Comments
78l Beard		75		
	78L.1	75	72	
	78L.1.1	75	72	
	78L.1.2.1	75	73	
	78L.1.3	75	62	
	78L.3	75	66	Type 7 & 8
	78L.1.2	80	78	
78M Divide		70		
	78M.1	70	66	
	78M.1.2	75	72	Type 7 & 8
78N Hawkins		70		
	78n.3	70	60	
78P Lost		70		
	78P.1	75	72	Type 7 & 8
	78P.3	70	51	
	78P.3.1	70	48	
78R Cliff		70		
	78R.2	75	75	At recommended level
	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	

Twenty seven timber sales, for which hydrologic records have been kept, have been planned within this area since 1982. The cumulative effects analysis of the most recent sales show that high risk of cumulative effects exist.

Summary: Due to inherent instability, the watershed has experienced numerous earthflows. Fire and management activities have altered the landscape and have created a condition for increased peak flows that result in hillslope and channel stability concerns. 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, (*figures 5l, 5m, 5n and 5o*).

Water temperature is a concern in the lower stream reaches in the analysis area, but appears to be recovering with vegetative growth in the riparian areas. Overall, the watershed appears to be within it natural range of variability except for the loss of woody material within the stream systems.

Downstream Effects: Channel conditions and water temperatures downstream of Detroit and Big Cliff dams have experienced changes as a result of the dams. Temperatures have remained constantly low throughout the year (42-55 degrees F), while historically a wider range of temperature variation occurred. In addition, Detroit reservoir has acted as a large settling pond for sediment since its construction in the early 1950's. This has created high water quality downstream. This quality is however, outside the range of natural variability for this particular river system.

From a fluvial geomorphology standpoint, the dams have created a sediment starved system in the lower North Santiam River. Peak flows that historically would have carried fines and gravels out of the headwater areas are interrupted by the dams presence. Historic sand and gravel bars that once existed in the lower river have been reduced or replaced with cobble/boulder bars. Numerous locations within the lower river have scoured down to basalt and contain mainly small to large boulders. Peak flows mobilize the remaining gravel bars and distribute them downstream. No replacement gravel is

available except from small tributaries downstream of the dam and from the Little North Fork system. Effects are most noticeable on the river from Big Cliff Dam to the confluence of the Little North Santiam river.

Fish

***History*:** Prior to the management activities of the twentieth century, the Blowout basin riparian areas contained stands of old growth Douglas-fir, western hemlock and western redcedar.

Runs of winter steelhead and spring chinook salmon probably spawned in the lower two miles of Blowout Creek, and in the 1.5 miles below the first falls in Box Canyon Creek.

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 highly 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 Survey 1990-93, 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 prior to logging activities. The temperature taken two miles up Blowout Creek on July 18, 1938 was 53 degrees F. Lower than present day temperatures.

Existing Condition of Fish Habitat: (USFS Surveys 1990-93) 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 1990-93 survey. Deep pools and boulders were also found to be providing the majority of cover available in 1982 according to the Oregon Department of Fish and Wildlife survey.

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

microhabitats as it dissipates 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. 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.

Water temperatures have been monitored on 7 stations on the main stem and 13 stations on 5 tributaries since the summer of 1980. Eight years of data have shown temperatures in excess of 58 degrees F in Blowout Creek, with many days exceeding 70 degrees F. Divide and Ivy Creeks have also shown temperatures consistently exceeding 58 degrees 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.

A survey by the Bureau of Fisheries in 1938 showed water temperature in Blowout Creek to be 53 degrees 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 degrees 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.

Biology: Waterfowl are often sighted on Blowout Creek. Harlequin ducks and great blue herons have been sighted numerous times. Wood ducks and mallards have often been observed in the "Blowout Beaver Ponds" in the Cliff Creek watershed.

Beaver activity is evident in Blowout Creek up to as least as far as Hawkins Creek. Small, secondary pools have been formed by beaver construction in a few side channels.

Other riparian dependent species sighted in Blowout Creek include the red-legged frog, mink, an immature bald eagle and osprey.

Elk and deer use the riparian area throughout the Blowout watershed for wallows and winter forage.

Fish-bearing streams in the Blowout watershed include Blowout Creek and tributaries Beard Creek, K Creek, Cliff Creek, Divide Creek, Ivy Creek, Fireweed Creek, Hawkins Creek, Lost Creek and Box Canyon Creek (*figure 5p*). Perennial tributaries, not known to have fish include Little Cliff Creek, Lunch Creek, Deadfall Creek, Junco Creek and

numerous other smaller streams (Heller 1974, USFS Survey 1990-93, Wetherby 1982).

Fish passage in Blowout Creek is free of barriers up to a series of four falls, near Hawkins Creek. Only cutthroat trout were found above these falls. No culverts are present throughout the surveyed reaches. An historic barrier which existed about 2 miles up Blowout Creek is no longer thought to be a barrier. At high pool the site is inundated by Detroit Reservoir and when the water is down it probably passable by fish.

For historical and existing distributions of salmonid species throughout Blowout Creek and its tributaries (*figures 5q and 5r*). Rainbow trout were usually not found above minor barriers, indicating they may be descendants of historical steelhead populations or derived from hatchery rainbow trout plants in Detroit Reservoir or lower Blowout Creek. Cutthroat were recorded above presently impassable falls, but their upstream limit was usually another barrier (W.Hunt, ODF&W, 1980).

Other species found in the surveys were long-nose dace, black-sided dace, sculpin, Pacific giant salamanders and crayfish. One large Pacific giant salamander measured 12 inches long.

Spawning by cutthroat trout apparently takes place during the winter months, while rainbow spawning extends into May (ODF&W, 1982). Spawning gravel was not formally surveyed in Blowout Creek but observations noted only infrequently scattered, small, isolated pockets of spawning gravel.

A low amount of suitable spawning-gravel may be due to a lack of structural material storing gravels in the channel. During the high flow events in November 1991, gravel storage significantly increased downstream of structures installed in October of 1991. The streambed and channel configuration that has developed since the 1964 flood and subsequent cleanout apparently has a low capacity for trapping and storing gravels.

Past Projects: Stream restoration projects were implemented in Blowout Creek below Cliff Creek and above Ivy Creek in 1991. 168 large boulders were placed in clusters and individually along 0.25 miles of Blowout Creek below Cliff Creek and 35 log and boulder structures were installed over 1.1 mile section from the Ivy Creek confluence upstream. The most recent project area in Blowout Creek is between Ivy Creek and Cliff Creek. Large logs and boulders have been imported from off-site to introduce new structural material to the stream channel.

A review of the table below indicates that many of the streams in the Blowout watershed analysis area do not meet one or more the defined objectives for quality aquatic habitat.

Table 5j. Current Aquatic Habitat Conditions Compared with Objectives

Stream	Large Woody Material/Mile		Pools/Mile		Width:Depth Ratio		Temp. (Degrees F)	
	Current	Objective	Current	Objective	Current	Objective	Current	Objective
Blowout	35	80-105	10	30-40	15	>12	64	<58
Beard	109	>80	37	100	12	<12	52	<58
K	60	>80	7	70-80	12	<12	56	<58
Cliff	63	>80	9	65	9	<12	59	<58
Divide	40	>80	14	75-80	7	<12	59	<58
Ivy	44	>80	6	70-80	11	<12	61	<58
Hawkins	81	>80	32	90	6	<12	50	<58
Lost	80	>80	7	60	10	<12	48	<58
Box Canyon	120	>80	26	70	12	<12	59	<58

Note: The current conditions except for water temperature are averages for several reaches. Water temperature is the highest recorded in the last 2-3 years (USFS Survey 1990-93)

LWD- Blowout Creek, followed closely by Divide Creek and Ivy Creek are all significantly deficient in large woody material. K Creek and Cliff Creek are also below the defined objectives (*figure 5s*).

Pools - None of the streams come even close to meeting the objectives for quality pool habitat (*figure 5t)*.

Width:Depth Ratio - On average most of the streams are near the objectives for width:depth. There are reaches though, especially in Blowout Creek, Beard Creek and Box Canyon Creek that significantly exceed the objectives (*figure 5u*).

Temperature - Most of the streams in the Blowout Watershed analysis area are not meeting State water quality standards for temperature in salmonid producing streams in the Willamette Basin. Blowout Creek, at 64 degrees F. has exhibited the highest temperatures found in monitoring since 1991, while Cliff, Divide**,** Ivy and Box Canyon Creeks have all exceeded State standards since 1991 but by not as much. In the early 1980's both Blowout and Ivy Creeks exceeded 70 degrees F.

Wildlife

There are a vast number of wildlife species represented in the Blowout Analysis Area, so many in fact, that an analysis of each individual species was not possible in the time frames given. In order to make an analysis of the wildlife in the area manageable, wildlife species had to be grouped into categories that made sense.

At the time of the analysis, the Guilding Model was still being developed. This model helps establish the types of habitats that are present in an area and identifies species that are associated with those habitats to help facilitate the analysis.

For this analysis, representative species were selected by a wildlife biologist based on personal knowledge of the area. In selecting representative species, habitat specialists not habitat generalists were used. It is know that animals need three basis things to survive: food, water and shelter. An assumption was made that if these things were provided for the habitat specialists, then the habitat generalists would be taken care of as well.

The following is an outline of representative species selected for analysis and the reasons for their selection.

Spotted Owls were selected as a representative of late successional forest habitats and because they are a threatened species.

Bald Eagles were analyzed because they require some characteristics of late successional habitat and are also a threatened species.

Peregrine Falcons represent special habitats such as cliffs that were known to be present in the analysis area and are also an endangered species.

Herptiles and harlequin ducks represent riparian dependent species.

Marten and fishers represent furbearers and small mammals that are also riparian associated.

Bats are representative of both snag habitat and riparian areas.

Neotropical migrant birds are representative of several habitat types that are present in the analysis area. Some are associated with late successional forests, some are riparian dependent and others live in various special habitats.

Big game represent species that prefer edges and small openings over interior habitat. In addition, there is an interest in this species for recreational hunting and analysis is required under the Forest Plan.

In addition to specific groups of species, certain habitats were also analyzed. These

habitats included *snag* and *down woody* habitats because they area a main component that many species need to survive and/or reproduce.

Spotted Owls

A. Management Allocations

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) established a series of Late Successional Reserves (LSR) designed to protect and enhance conditions of late-successional and old-growth forest ecosystems and to serve as habitat for late-successional and old-growth related species, including the northern spotted owl.

A portion of Late Successional Reserve that straddles Sweet Home and Detroit Ranger Districts is located in the western part of the Blowout Analysis Area (*figure 5v*). An analysis of the health of this Late Successional Reserve is being completed on the Sweet Home District and will be incorporated into this document when the information becomes available.

The **Endangered Species Act** 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.

One *critical habitat unit* is located in the Blowout analysis area: CHU OR-14. CHU Or-14 was established along the western edge of the Western Cascade Province to provide essential nesting, roosting, foraging, and dispersal habitat for owls (*figure 5w*). The U.S. Fish and Wildlife Service would have 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 Impacts Statement on Management for the Northern Spotted Owl int he National Forests** (January 1992). These areas encompass portions of the northern spotted owl's range that impose a high risk of isolating owl populations, or that act as critical links or barriers between populations. A 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 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* (*figure 5x*) 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.

B. Dispersal Habitat

When adequate dispersal habitat is not yet available in the riparian reserves, it could eventually be attained through riparian manipulation to developed 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 50-11-40 rule, which was established by the Interagency Scientific Committee's Conservation Strategy for the Northern Spotted Owl, can be implemented in other areas.

The 50-11-40 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 inches and a canopy closure of 40 percent. All land-use allocations on forest lands within the quarter township contribute to meeting this rule. Below is a table describing the status of spotted owl dispersal habitat by quarter township in the analysis area *(see also, figures y and z)*

The 50-11-40 analysis is based on tree size classes which are broken into three categories: small (0 - 8.9" dbh); medium (9.0 - 20.9" dbh), and large (>21"dbh). When looking at the table below, note that spotted owl dispersal habitat generally falls in the medium and large size class categories, but because of the way information was retrieved from the GIS database, the medium size class contains some trees less than 11" dbh required by the 50-11-40 analysis. Trees between 9.0 and 10.9" dbh show up in this category but do not contribute to owl dispersal. This may sway the analysis slightly.

Table 5k. Spotted Owl Dispersal Habitat in Riparian Reserves

Quarter Township Number	Acres of Riparian Reserves	Acres of Small Size Class Trees	Acres of Medium Size Class Trees	Acres of Large Size class Trees	Percent of Riparian Reserves meeting 50-11-40
10052	799	236	396	167	70
10053	324	71	144	109	78
10062	37	20	17	0	45
10063	484	154	247	83	68
11051	1147	425	452	270	62
11052	208	75	65	68	63
11054	650	129	397	124	80
11061	443	145	174	124	67
11062	151	92	37	22	39
11063	880	358	259	263	59
11064	1450	459	695	296	68

Table 5l. Spotted Owl Dispersal Habitat

Entire Quarter Townships			Quarter Townships within Blowout Analysis Area				
Number	Total Acres	Percent Meeting 50-11-40	Total Acres	Acres of Small Size Class Trees	Acres of Medium Size Class Trees	Acres of Large Size Class Trees	Percent Meeting 50-11-40
10052	5760	74	4550	1138	2569	843	74
10053	5760	50	1510	450	722	338	70
10062	5760	50	218	115	101	0	46
10063	5760	57	2770	983	1424	363	64
11051	5760	59	5760	2204	2306	1239	61
11052	5760	54	1070	524	310	236	51
11054	5760	51	3488	1068	1761	660	69
11061	5760	61	2464	886	1297	282	64
11062	5760	43	968	605	238	124	37
11063	5760	48	4764	2173	1250	1342	54
11064	5760	57	5760	2096	2715	1010	64

C. Nesting, foraging and atypical nesting habitat analysis

Another analysis was done to determine the amount of spotted owl foraging, nesting and atypical nesting habitat available in each quarter township (Table 5m). Analysis was completed through use of the Owl Habitat (OHAB) database layer in the Geographic Information System (GIS) and with a planimeter. In addition, foraging, nesting, and atypical habitat was measured within riparian reserves in each quarter township (Table 5n and *figures 5aa and 5bb*).

The importance of analyzing owl habitat both ways is that some species are strongly associated with late-successional forests. The owl habitat (OHAB) database layer represents much of the late-successional forests within the watershed but there is a chance that some of these late-successional forests were not delineated because of the mapping requirements of the OHAB layer. The size class analysis would pick up the stands not delineated on the OHAB layer.

Table 5m. Acreage of Foraging, Nesting and Atypical Nesting Spotted Owl Habitat in Quarter Townships

Quarter Township Number	Total Acres in Quarter Township	Total Acres in Blowout	Acres of Foraging Habitat	Acres of Nesting Habitat	Acres of Atypical Nesting Habitat	Percent of Owl Habitat in Blowout
10052	5760	4550	101	736	0	18
10053	5760	1510	332	386	0	47
10062	5760	218	0	0	0	0
10063	5760	2770	175	873	0	37
11051	5760	5760	1326	1395	80	48
11052	5760	1070	192	0	66	24
11054	5760	3488	933	683	222	52
11061	5760	2464	140	270	0	16
11062	5760	968	135	22	152	31
11063	5760	4764	1503	94	54	34
11064	5760	5760	983	812	334	36

All acreages are approximate (obtained by planimeter)

Table 5n. Acreage of Foraging, Nesting and Atypical Nesting Spotted Owl Habitat in Riparian Reserves

Quarter Township Number	Riparian Acres	Acres of Foraging Habitat	Acres of Nesting Habitat	Acres of Atypical Nesting Habitat	Percent of Owl Habitat within Quarter Township in Blowout
10052	799	15	180	0	24
10053	324	55	109	0	50
10062	37	0	0	0	0
10063	484	34	213	0	51
11051	1147	299	279	3	50
11052	208	56	0	35	43
11054	650	228	158	82	72
11061	443	48	114	0	36
11062	151	25	0	4	19
11063	880	342	39	21	45

11064	1450	290	204	132	43

All acreages are approximate (GIS generated)

Discussion of Analysis by Quarter Township

For the following discussion, please refer to *figure 5cc* for location of quarter townships.

10052: Approximately 3/4 of this quarter township lies within the Blowout analysis area, with a small portion also being within a Late-Successional Reserve.

Dispersal Habitat: There is abundant dispersal habitat in both the Blowout study area and the quarter township as a whole. About 70 percent of the riparian reserves in the study area qualify as dispersal habitat.

Nesting and Foraging Habitat: Only about 18 percent of the quarter township that is in the analysis area is foraging or nesting habitat. There is an abundant amount of medium size class stands above 11" dbh and 40% canopy closure, but the trees do not meet the foraging or nesting requirements yet. A lot of the medium size class stands are located in riparian reserves.

There is virtually no spotted owl nesting or foraging habitat above the main stem of Blowout Creek in this quarter township, except for a few isolated late-successional stands that remain intact.

Below the main stem of Blowout Creek, near the southwest quarter, there is sufficient nesting and dispersal habitat in the riparian reserves. These stands are intact until you reach Blowout Creek. Most of this habitat is located inside the Late Successional Reserve, however.

Owl habitat becomes more fragmented as you move east. Private land encompasses approximately 1500 acres of this quarter township and many of the streams north of the main stem and in the southeast corner are composed mainly of medium and small size classes.

10053: Approximately 1/3 of this quarter township lies within the Blowout analysis area and all of the quarter township that is in the analysis area is also in the Late-Successional Reserve.

Dispersal Habitat: Currently, this quarter township is at the minimum level for dispersal habitat under the 50-11-40 rule but within the study area, 70 percent of the quarter township is dispersal habitat. This is well above the 50 percent required by the 50-11-40 rule.

This habitat is important to maintain because it is at the upper end of the Late Successional Reserve and should supply ample habitat for dispersal to other Late Successional Reserves. As with the above quarter township, an abundant amount of habitat 11" dbh and greater is accounted for that doesn't meet spotted owl foraging habitat definitions.

Nesting and Foraging Habitat: Habitat within the riparian reserves is intact, for the most part, and connectivity is good. Overall, spotted owl habitat is plentiful in this area.

10062: A large portion of this quarter township is private land and only about 218 acres is in the Blowout analysis area.

Dispersal Habitat: This quarter township is at the minimum level for 50-11-40 and the portion of the quarter township in the Blowout analysis area is slightly below the minimum level for 50-11-40. Riparian reserves are also below minimum levels for 50-11-40. It appears that riparian reserves are about half medium and half small size class stands in this area. Habitat that meets 50-11-40 is not yet foraging habitat.

Nesting and Foraging: There is no nesting or foraging habitat in the Blowout portion of this quarter township.

10063:
Approximately half of this quarter township lies within the Blowout analysis area.

Dispersal Habitat: Riparian reserve habitat is highly intact with good connectivity. However, as you near the confluence of K Creek and Blowout Creek, only medium structure remains.

The Blowout section of the quarter township has a higher percentage of dispersal habitat than the quarter township overall, as shown by the stand size analysis. Many stands were still computed as meeting the 11" dbh requirement but do not meet foraging habitat definitions.

Nesting and foraging habitat: The spotted owl habitat that remains in this area is classed mostly as nesting habitat and can be found in large contiguous blocks averaging 300 acres in size. The majority of the harvested riparian reserves are in small size classes.

11051: This is one of two full quarter townships within the Blowout analysis area. Approximately 1/3 of the quarter township lies within the Late-Successional Reserve.

Dispersal Habitat: Connectivity within the Cliff Creek riparian reserve is good until you near the confluence of Blowout Creek where it turns to medium size class. The Box Canyon tributary and many small side tributaries are patchy with a lot of small size class stands.

The analysis shows that an abundant amount of stands meet the 11" dbh requirement but because the medium size class analysis also included trees from 9.0" to 10.9", this may be skewed. Many stands in this area may be in the 9.0" to 10.9" size class.
Nesting and Foraging Habitat: About 50 percent of the area is nesting or foraging

habitat in both the quarter township and within the riparian reserves.

11052: Approximately 1/5 of this quarter township lies within the Blowout analysis area.

Dispersal Habitat: The quarter township is just above the minimum levels for dispersal habitat, but the riparian reserves have slightly more. About 63 percent of the riparian reserves in this area qualify as dispersal habitat.

There is little connectivity and many of the headwater areas are cut. The riparian reserve areas that have been cut are mostly small size class stands now.

Stand size analysis shows that the portion of the quarter township in the Blowout analysis area contain less dispersal habitat than the remainder of the quarter township. So the portion in the analysis area is limiting the entire quarter township.

Nesting and Foraging Habitat: Overall about 24 percent of the quarter township within the study area is nesting or foraging habitat, but most of that is atypical habitat (mostly medium size class). In the riparian reserves about 43 percent is foraging or nesting habitat.

11054: Approximately 3/4 of the quarter township lies within the Blowout analysis area and all of that is in the Late-Successional Reserve.

Dispersal Habitat: Connectivity within riparian reserves is good. Habitat overall is fragmented but large stands can still be found.

Stand size analysis shows that the dispersal habitat in the quarter township is less than in the study area. The riparian reserves have more dispersal habitat than either the study area or the overall quarter township.

11061:
Approximately 1/2 of the quarter township lies within the Blowout Analysis Area.

Dispersal Habitat The quarter township overall, the Blowout portion of the quarter township and the riparian reserves all have about 60+ percent dispersal habitat. The Blowout portion of the quarter township is not limiting for spotted owl dispersal. Distribution of dispersal habitat is patchy and a fair amount of 11" dbh stands have been counted, so these areas are just becoming dispersal habitat.

Nesting and Foraging Habitat: Virtually no nesting or foraging habitat remains in this quarter township, except small patches in the upper third of the quarter township. Areas of Divide Creek are nesting habitat, however, the headwaters have been harvested.

Within the rest of the area, there are places where the only remaining habitat is in the riparian reserve creating a funnel effect. Medium structure is found within several of

the remaining riparian reserves.

11062:

Only a small section of this quarter township lies within the Blowout Analysis Area.

Dispersal Habitat: This quarter township is below 50-11-40 (43%). The Blowout portion of the quarter township is only 37 percent dispersal habitat, so this area is a limiting factor for the entire quarter township. The majority of remaining area is in small seral stages.

Nesting and Foraging Habitat: Very little nesting and foraging habitat remains in this portion of the study area and much that does remain is in isolated stands. The is almost no nesting or foraging habitat within the riparian reserves. Much of the riparian reserves that have been harvested are now small structure.

11063: Most of this quarter township lies within the Blowout Analysis Area.

Dispersal Habitat: This quarter township is below 50-11-40. Patchy connectivity remains within riparian reserves.

Stand size analysis shows the Blowout section of the quarter township has slightly more dispersal habitat than the quarter township overall. Because of the way the size classes were accounted for in the analysis, some of the stands between 9.0 and 10.9 inches may have contributed to dispersal habitat in this area when in fact they were not yet dispersal habitat.

Nesting and Foraging Habitat: Most of quarter township contains foraging habitat. A lot of the remaining riparian reserves are small structure.

11064: This entire quarter township lies within Blowout Analysis Area.

Dispersal Habitat: Connectivity is patchy. The main stem of Blowout Creek and Ivy Creek have large areas of small structure. A lot of stands are just large enough to meet dispersal habitat characteristics but do not yet meet foraging habitat requirements.

Nesting and Foraging Habitat: Divide Creek is composed of a lot of atypical nesting and foraging habitat (medium structure). Nesting and foraging habitat in the area is patchy with some areas being isolated from others. Much of the habitat left is in the riparian reserves.

Currently, 35% of the Blowout Analysis Area is considered ow nesting, foraging or atypical nesting habitat. This does not represent all the late-successional stands, but it accounts for most of them. According to an analysis completed by GIS on amounts of vegetation by tree size, trees 21" dbh or greater cover 39% of the watershed.

Type of Spotted Owl Habitat	Percentage
Nesting	15%
Foraging	18%
Atypical	03%
Total	**35%**

Owl habitat was analyzed by subbasin as well as quarter townships. Below are the percentages of owl habitat by subbasin.

Subbasin	Percentage of Spotted Owl Habitat
Beard	17.5%
Divide	27.0%
Hawkins	29.0%
Upper Blowout	22.0%
Lost	39.0%
West-side Blowout/Ivy	42.0%
Cliff	47.0%
Box Canyon	52.5%
South Side Blowout	40.0%

There are 22 spotted owl pairs/resident singles with home ranges that fall within or overlap the Blowout study area. Resident singles are spotted owls that have established a territory and have been heard in the same location on three different outings. Seventeen pairs/resident singles occupy territories within the analysis area boundary, an additional five pairs/resident singles have been located outside the watershed but a portion of their home range falls within the project boundary.

Of the 22 pairs/resident singles, 16 are "take". "Take" is a term defined in Section 7 of the Endangered Species Act and it refers to the amount of habitat remaining within each pair/resident single's home range. A 1.2 mile circular radius around an activity center is

used to define the home range of spotted owls for managerial purposes.
The U.S. Fish and Wildlife Service dictates that within 1.2 miles, each pair/resident single must have 1182 acres of nesting and foraging habitat and within 0.7 miles, they must have 500 acres. If the pair/resident single has less than the required acres, the situation is termed as "take". Thirteen pairs/resident singles are take at both 0.7 and 1.2 miles and three are take at 0.7 miles only. Six pairs/resident singles are found in and around the Box Canyon and South Side Blowout subbasins where large contiguous blocks of nesting and foraging habitat still remain.

Circle Analysis for pairs and resident singles within the Blowout Analysis Area

Circle Number	Pair Name	1.2 Mile	0.7 Mile	"Take"
37	Box Canyon	1804	701	
38	Low Blow	1017	319	X
39	Lower Kay	1036	356	X
40	Blowout SOHA	1448	532	
45	Bonk	1624	459	X
55	Mustache	1486	640	
58*	Rainbow	886	338	X
58	Blowout Creek	980	359	X
60	Pinhead	1085	341	X
62	Lucky	1236	447	X
64*	Tomboy	370	311	X
69*	Parkett	1101	411	X
74*	Buck Mountain	492	168	X
79	Cub Point	932	435	X
80	Lost Creek	873	289	X
85	Bagel	1626	747	
86	Cliff Creek	1264	409	X
87	Kay Kapers	1011	483	X
91	Divide	777	287	X
105*	Sauer	392	318	X
109	Lucky Butte	1315	505	

110	Heater	1563	558	

* - Delineates those paris/resident singles outside the watershed but with portions of home ranges that fall within.

For the following discussion refer to *figure 5dd*:

Beard: The amount of foraging and nesting habitat (OHAB) in individual subbasins varies greatly. Within the Beard subbasin, most of the habitat occurs within the eastern half. Virtually no habitat remains within the western half. However, the majority of the remaining habitat meets the criteria for nesting habitat. Two spotted owl pairs reside within this subbasin, both which are take.

Divide: Most of the habitat delineated within the Divide subbasin is nesting habitat. A small amount is classified as atypical nesting. A spotted owl pair was discovered nesting in a grove of trees that is characterized by smaller diameter trees, little room to fly, and a limited amount of snags and down woody debris. However, there were residual old growth trees scattered throughout the stand. The owls were nesting in one of the old trees. Thus, the stand was delineated as atypical habitat. Two spotted owl pairs reside in this subbasin, both which are take.

Hawkins: The Hawkins subbasin is primarily foraging habitat. It also has a small amount of atypical habitat. The designated stand is adjacent to the nest grove and the pair of owls are utilizing it to forage. It has little connectivity to the Divide subbasin and many isolated old growth stands are scattered throughout the area. Most of the eastern 1/3 of the subbasin is devoid of any habitat due to heavy harvest levels. One spotted owl pair is located within this subbasin and it is take.

Upper Blowout: Upper Blowout subbasin is similar to Hawkins due to much of the existing habitat is foraging habitat. This is the most fragmented subbasin in the watershed. Stands of 80 acres or less remain with virtually no connectivity between them. One spotted owl pair resides within the subbasin and it is take.

Lost: No nesting habitat occurs within the Lost subbasin. However, this subbasin is not as fragmented as others mentioned and provides for better connectivity. No spotted owl pairs or resident singles have been located within this subbasin.

West-side Blowout Ivy: Foraging habitat dominates West-side Blowout subbasin. A good network of connective habitat remains. One spotted pair and one resident single have been located within this subbasin. The resident single is take.

Cliff: Cliff subbasin is composed of large blocks of nesting habitat interspersed with foraging habitat. However, the northeastern corner is devoid of any owl habitat. One spotted owl resident single and two pairs reside within this subbasin. One pair and the resident single are take.

Box Canyon: subbasin is composed of equal amounts of foraging and nesting habitat. Very large blocks of contiguous habitat remain. A small amount of atypical nesting and foraging habitat is identified for two pairs of spotted owls. Two spotted owl pairs and two spotted owl resident singles have been located within this subbasin. One pair and one resident single are take.

South Side Blowout: One very large block of nesting habitat remains within the South Side Blowout subbasin. Several other scattered stands also exist. Two spotted owl pairs have been located within this subbasin. One of them is take.

Little existing information exists on the following groups of species. Therefore, they will not be stratified by subbasin but rather analyzed on a watershed basis.

Bald Eagles

A portion of the Detroit Lake Bald Eagle Management Area (BEMA) lies within the boundary of the Blowout Analysis Area (*figure 5ee*). The BEMA encompasses Box Canyon, South Side Blowout, and Beard subbasins around the perimeter of Detroit Lake. See the Bald Eagle Management Plan for management strategies within the primary and potential nest zones which references activities that are restricted to provide security for nesting bald eagles.

Several sightings of bald eagles have been reported in the Blowout watershed. The following are general locations of the sightings: Blowout Creek, Blowout-Cliff Creek confluence, north of Pinnacle Peak, and west of Cliff Creek. Habitat exists along many of the major streams in the watershed.

Most of the larger streams within the Blowout watershed have enough habitat along the edges to facilitate foraging in the area. Many residual old growth and mature trees remain dotted along the riparian areas the watershed. There is not enough habitat within the Blowout to allow for nesting of another pair and dispersal habitat is not an issue for this species.

Peregrine Falcons

Aerial reconnaissance of potential nest sites were conducted in 1990, 1991, and 1992. No peregrines were located. Also in 1992, an aerial search of the Blowout Analysis Area was conducted to survey the high potential sites. No peregrines were observed. In 1993, a nesting pair of peregrines was found on the Detroit Ranger District in what was considered marginal habitat by the previous aerial reconnaissance flights.

Suitable habitat exists in the analysis area for peregrine falcons scattered throughout the area. Blowout Cliffs is a high priority site and would provide excellent habitat for these birds. However, this site may lack adequate ledges or "potholes" for nesting. Nesting habitat is adequate within the Blowout.

Since most of the falcon's prey is associated with openings around forest edges, there should be ample foraging habitat within the Blowout watershed. However, management activities such as road building and timber harvest, may have eliminated some of the main food sources for the prey species.

No surveys have been done to determine prey species present and associated food source availability within this area. Some prey species may also be associated with snag levels. Six out of nine subbasins do not meet the 40% potential population level required in the Forest Plan. Falcons also forage in and around riparian areas. Riparian habitat is probably adequate to meet the needs of this species.

Herpetiles

The Blowout watershed has not been surveyed for herpetiles. Several ponds were surveyed in the analysis area, but not to protocol. General surveys were done while visiting the adjacent stands.

Herpetologist, Marc Hayes, visited the district and helped survey the Blowout beaver ponds as well as several other areas. Species seen most frequently in pond surveys were rough-skinned newts and Northwestern salamanders. It was discovered that Blowout beaver ponds were a major breeding site for red-legged frogs.

These informal surveys and random observations in the watershed have indicated the presence of several different species so far: red-legged frogs, common garter snakes, Pacific giant salamanders, Northwestern garter snakes, Pacific tree frogs, rough-skinned newts, and Northwestern salamanders. However, this is not an all inclusive list. No surveys were performed for terrestrial salamanders. There is a large amount of habitat in the watershed that still needs to be inventoried.

Most herpetiles are riparian associated, especially headwater areas. There are two species that are strongly associated with down woody debris. Approximately 80% of the headwater areas within Blowout have been harvested at some time. This may have limited population numbers and severely reduced species ranges. Habitat components have been reduced such as down woody debris. Mid seral stands will probably not have the amount or distribution of these components like would occur within late-successional stands. Harvest may have caused stream temperatures to be increased dispelling individuals or populations. Fragmentation may limit dispersal of individuals across the watershed.

Three quarter townships have very severely reduced riparian areas (10052, 10062, and 11062). These are all headwater areas. Four QT's have moderate to severely reduced riparian areas (10053, 11052, 11061, and 11064). QT's 10063, 11051, 11054, and 11063 have fairly reduced riparian reserves.

Harlequin Ducks

Approximately four miles of Blowout Creek were surveyed for harlequin ducks. Three

pairs were sighted in the watershed, two pairs in Blowout Creek and one pair in Cliff Creek. Three males were seen alone in the survey. These are assumed to be the same males associated with the pairs observed. No nests were found and no young were observed during that year's survey.

Several streams have suitable habitat and need to be surveyed. Habitat exists in Blowout Creek, Cliff Creek, portions of Ivy Creek, Divide Creek, Lost Creek, and possibly K Creek. It is unknown if Box Canyon Creek provides any suitable habitat. Structures were placed in Blowout Creek in 1990, 1991, and 1993. This increased the number of loafing sites available but may have impacted the stream flow enough to discourage harlequins from using this creek. Large woody material may be absent from harvest units adjacent to streams, thus lowering the potential number of loafing sites. Sedimentation may effect stream dwelling macroinvertebrates, a principle prey item of harlequins, therefore effecting their food supply.

Martens and Fishers

Marten and fisher were not surveyed for in the Blowout Analysis Area. However, a reserve network of core areas and foraging areas is established within the analysis area for marten. The network was established by the Forest Plan to provide a combination of managed sites and designated no-harvest sites which will ensure continued interaction of marten individuals and populations within the forest. Each core is approximately 160 acres and is no farther than three miles from any other no harvest area that meets the marten habitat criteria for size. Each core area is to be linked with three other areas and the width of each area shall exceed 400 yards. No programmed harvest is allowed.

Fishers require a closed canopy forest that varies in age as long as it contains adequate prey populations and large diameter trees and snags above 6 meters for nesting. They avoid openings and are sensitive to fragmentation. Loss of habitat due to fragmentation and removal of large woody debris and snags from harvest units are reasons for their decline. Marten require down woody debris of all decay stages, large patches of late-successional forests, and intact forests along riparian areas. Six out of nine subbasins are below the 40% potential population requirement for snags outlined by the Forest Plan. Blowout is very fragmented with only the interior of Box Canyon and portions of South Side Blowout having large intact stands. Riparian reserves are also fragmented.

Bats

Surveys for bats have not been done for the Blowout watershed. A Townsend's big-eared bat was located as a result of an incidental sighting. This roost site has been monitored for three years to observe any differences in behavior or numbers present. The bat was not observed in 1993, but this does not indicate that the site was unused.

Several other species of bats have been observed foraging throughout the area by the district spotted owl crew on night visits. A mist-netting project was done by Stuart Perlmeter and Springfield Junior High at a small pond and riparian area along Blowout Creek and the 10 road. Species captured are as

follows: little brown bat *myotis lucifugus*, long-eared bat *Myotis evotis*, silver-haired bat *Lasionycteris noctivagans*, big brown bat *Eptesicus fuscus*, hoary bat *Lasiurus cinereus*, and Townsend's big-eared bat *Plecotus townsendii*.

J. Mark Perkins, bat expert, has surveyed for bats on the Detroit Ranger District on two different occasions. Six species of bats were found with four of those species located in the Blowout watershed. The silver-haired bat, little brown bat, long-legged bat *Myotis volans*, and Townsend's big-eared bat were found within the analysis area while the big brown bat and long-eared myotis were found elsewhere on the district.

Many bat species are strongly associated with late-successional forests and require roosting sites near riparian areas. They tend to prefer snags for roosting. Harvest has limited roosting and nesting areas by removing snags. Late-successional forests intact within riparian areas is low. Six out of nine subbasins are below the 40% potential population level required by the Forest Plan. Only Cliff and South Side Blowout subbasins are above 40%.

Neotropical Migrant Birds

Neotropical migrants were not surveyed in the Blowout watershed. However, there have been incidental sightings reported for 15 species. Fifteen other species have been documented on Detroit Ranger District and may occur within the area but were not reported. Several of these species are fairly common and thus, observation forms are not filled out.

Kelly Bettinger, birder, helped in surveying Blowout beaver ponds and the meadow complex in T.11S., R.5E., Section 17 to aid in the identification of bird calls and visual sightings of birds. Eleven species of birds were identified at the beaver ponds while 23 species were identified at the meadow complex. Several additional species were seen using the meadow complex on a different outing. This outing took place around fall migration time and this habitat may serve as an important stop-over site for many migrants.

There are several special habitat areas within the watershed that provide habitat for a variety of species. They range from wet meadows, ponds, riparian areas, mature/old growth, and vine maple talus areas. However, the analysis area is very fragmented. This may have led to habitat loss for some species or exposed them to predation or parasitism by other bird species such as the brown-headed cowbird. A thorough examination of the habitat types and bird species present is needed in this area. See section on condition of special habitats for further information.

Big Game

For the following discussion refer to *figure 5ff*:

Box Canyon Management Emphasis Area (MEA)

Due to the topography of this MEA, cover is the dominant habitat type. Much of the area is steep and thus, unfavorable to big game movement and forage. The western and southern perimeters were harvested in the past 10 to 20 years. Most of the areas targeted for harvest were flat and were probably used as big game travel corridors in both seasonal and non-seasonal migrations.

The remainder of the MEA is composed of a large block of contiguous optimal cover in the northern end of the MEA. This is not desirable to big game in that juxtaposition of forage to cover is not created in this scenario. Most of the cover lies in large blocks and in inaccessible places while most of the forage lies on the perimeter of the MEA with little or no cover to use as corridors. Winter range is very steep and somewhat inaccessible due to Detroit Lake and Blowout Creek.

Big game seem to use the southern portion of the MEA more than other areas due to the favorable terrain and special habitats found within this area. Both wet and dry meadows exist on the Detroit district and Sweet Home district. Few current elk travel corridors exist to connect Detroit to the Sweet Home district. Some areas of high use have been made into islands by past harvest activities, leaving the big game who use these areas at greater risk to predation and easy targets for hunters.

Cliff Management Emphasis Area (MEA)

In the northern portion of this MEA, cover is readily available though there is a large block of contiguous thermal cover which is second growth which may be underutilized due to it being of lower quality. Most of the remaining cover is high quality thermal cover with little optimal cover represented in this portion of the MEA. Travel corridors are not a problem on this end of the MEA although there are some very large openings present. Much of the land within these large openings may not be utilized as forage because it is too far from adequate cover. The western and northern portions of the MEA are fairly steep but not totally inaccessible to big game travel. More harvest activities have taken place in the southern portion of the MEA creating very large openings throughout the area. Connective travel corridors are absent from important use areas. More optimal cover remains in the southern portion of the MEA. Past harvest activities targeted flatter terrain. Several opportunities for improving forage quality, such as seeding and fertilizing harvest units, were missed.

Big game use seems to be concentrated more in the southern portion of the MEA due to the favorable terrain and abundant special habitat areas. Pinnacle

Peak Special Habitat Area and the headwaters of Ivy Creek have several meadows and wet areas scattered throughout. This landscape pattern allows big game to forage without being at great risk from predators or hunters due to the juxtaposition of these meadows to cover. This MEA also borders a high use wintering area on the northeastern edge. Very few connecting travel corridors exist from this MEA to the high use area. Winter range in this MEA is also important and receives a fair amount of use. At the present time there is 85% cover within winter range, however only 10% of that is optimal cover. Although the Wisdom model shows the road variable at 0.27 overall, this may be an underestimate. Many roads are gated and the model may not reflect this. But, even though the roads are gated, they still can be used for administrative use and vandalism may occur resulting in a disfunctional gate. This allows the roads to be accessed freely.

Upper Blowout Management Emphasis Area (MEA)

This MEA is different from the rest of the MEA's in that there is a fairly equal proportion of the cover elements with optimal cover being the most limited. Most of this MEA is favorable terrain with gentle slopes. There are a few steep, cliffy areas along Lost Creek and Blowout Creek. This MEA is very fragmented and several large openings exist but there is good juxtaposition of forage to thermal/optimal cover. This arrangement allows more of the area to be utilized by big game. A significant amount of new forage exists at the present time so the need for forage creation won't be great. A small portion of the MEA lies within winter range. Several important travel corridors connecting patches of optimal/thermal cover are missing. Four important habitat connections that may be used as travel corridors between this MEA and the Sweet Home district currently exist and need to be maintained. Most of the previous harvest units were not treated for forage enhancement.

Divide Management Emphasis Area (MEA)

This MEA differs from the other MEA's in that it contains an overabundance of thermal cover in large blocks that has comparable habitat components. Most areas are small pole-sized or slightly larger sized stands concentrated in large blocks. This landscape pattern is due to a frequent fire regime that was present in this area. Several large openings exist from past harvest activities. Some of these areas receive little utilization due to the size of the unit. There is little optimal cover in this MEA and it is poorly interspersed within the landscape. The cover variable is to be maintained at 0.5 or above according to FW-149 with a significant portion of this cover to be optimal cover. Presently, only 13% of the total acres is represented by optimal cover within winter range. However, there is good juxtaposition of forage to thermal/optimal cover. Several smaller harvest units are interspersed within the larger blocks of thermal cover.

Within this MEA is probably one of, if not the, most heavily utilized areas of the Blowout Analysis Area. It contains the most heavily used wintering area,

located along the western and somewhat the northern boundaries. This wintering area is comprised of favorable terrain, a southerly aspect, and low elevations with a good amount of available forage. Several viable travel corridors exist at the present time and need to be maintained. However, an important travel corridor to the Bachelor Mountain area is missing. Bachelor Mountain is an important summering ground for many big game. The roads variable is very low in both the overall run and the winter range run of the Wisdom model. However, with field reconnaissance, it was shown that many roads are now gated. The HE value may be misrepresented if the gated roads truly function as closed roads.

Beard Management Emphasis Area (MEA)

This MEA is composed of very large blocks of thermal cover which provides low quality foraging habitat, especially in the western half of the MEA. Most of the thermal cover is a very large monotypic stand as a result of past railroad logging activities and fire. There are large tracts of private land within the MEA, most of which looks very similar to the monotypic stands of thermal cover on national forest lands. Very little optimal cover remains. Existing optimal cover is concentrated in the eastern half of the MEA. Some new forage areas exist due to the harvest of the Beard timber sale. Most of the flatter terrain has been harvested. The remainder of the MEA has moderately steep ground. Blowout Cliff and a band going eastwardly are virtually inaccessible due to the steepness. Travel corridors within the MEA are not a problem. However, only two small strips of timber still remain that connect the MEA to Rainbow Lake which is an important area for big game.

Table 5o. Big Game Habitat Effectiveness

Elk Management Emphasis Area	Viability Range (HE standard)*			Objective Overall HE Value**	Current Overall HE Value
	High	***Mod.***	***Low***		
Beard	.60-1.0				
Winter Range				0.60	0.45
Summer Range				0.60	0.45
Box Canyon		.40-.50			
Winter Range				0.60	0.36
Summer Range				0.50	0.55
Divide		0.6-1.0			
Winter Range				0.60	0.48
Summer Range				0.60	0.49
Cliff		.40-.50			
Winter Range				0.60	0.46
Summer Range				0.50	0.50
Upper Blowout		.40-.50			0.58
Winter Range				0.60	0.47
Summer Range				0.50	

Table 5p. Existing Condition for Each Big Game Management Emphasis Area.

Management Emphasis Area	Total Acres	Winter Range Acres	Percent Forage	Percent Hiding Cover	Percent Thermal Cover	Percent Optimal Cover
Beard	5381	4279	15	16	62	7
Box Canyon	8931	520	21	15	45	19
Cliff	7594	1407	20	22	42	16
Divide	7619	4060	21	20	49	10
Upper Blowout	4936	322	29	27	30	14

Table 5q. Big Game Habitat Effectiveness within Management Emphasis Areas

Management Emphasis Area	Size and Spacing	Open Roads	Cover Quality	Forage Quality	Habitat Effectiveness Index*
Beard	0.83	0.33	0.46	0.34	0.45
Box Canyon	0.89	0.45	0.54	0.40	0.55
Cliff	0.93	0.34	0.49	0.41	0.50
Divide	0.94	0.29	0.46	0.47	0.49
Upper Blowout	0.97	0.26	0.45	0.43	0.47

*Habitat Effectiveness Index (HEI) indicates overall rating for management emphasis area.

Table 5r. Big Game Habitat Effectiveness in Winter Range within each Management Emphasis Area

Management Emphasis Area	Size and Spacing	Open Roads	Cover Quality	Forage Quality	Habitat Effectiveness Index*
Beard	0.79	0.35	0.47	0.32	0.45
Box Canyon	0.60	0.58	0.32	0.15	0.36
Cliff	0.77	0.27	0.46	0.47	0.46
Divide	0.93	0.24	0.50	0.48	0.48
Upper Blowout	0.96	0.47	0.64	0.39	0.58

*Habitat Effectiveness Index (HEI) indicates overall rating for management emphasis area.

Snags and Down Woody Debris

Snag density varies by subbasin in the Blowout Analysis Area. Variation occurs for several different reasons. Some of the subbasins experience a recurring fire regime that retards development of large timber. A heavy harvest regime has also left some subbasins with low levels of snags. In the past, managers have left few or no snags in harvest units. Additionally, OSHA (Occupational Health and Safety Administration) requirements have resulted in reduced snag levels in the area. OSHA requires snags to be felled if they pose a hazard to workers. The windstorm of 1990 caused catastrophic blowdown which decreased snag levels, but increased down woody debris levels.

The following are the current snag levels for each subbasin. These are approximate percentages obtained by using the Snag Model.

Table 5s. Snag Levels by Subbasin

Subbasin	Current Condition
Beard	22%
Divide	22%
Hawkins	26%
Lost	39%
West-side Blowout Ivy	38%
Cliff	45%
South Side Blowout	50%
Box Canyon	48%
Upper Blowout	20%

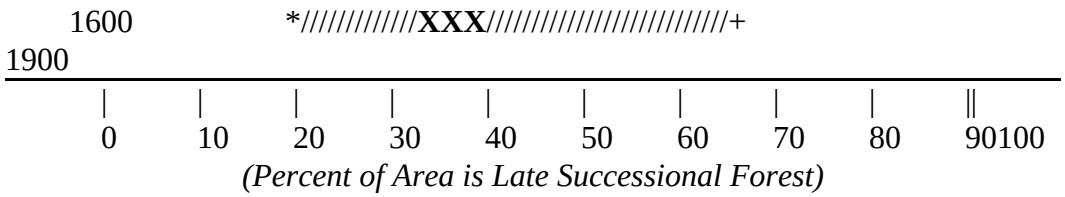
Standard and Guideline FW-122 states that "habitat capability for primary cavity excavators shall be maintained to provide for at least 40% or greater potential populations". Six out of nine subbasins within the Blowout Analysis Area are in violation of S&G FW-122.

Down woody debris levels were not inventoried in the analysis area. Standards and Guidelines specify down woody debris prescriptions for different plant associations. However, past 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 cannot occur except around the perimeter where there is timber of sufficient size. Heavy salvage has resulted in the loss of the down woody debris habitat component in many areas such as roadsides, in past harvest units, and on easily accessible terrain. The short supply of firewood has now become an issue in further reducing down woody debris levels.

Range of Natural Variability

The range of natural variability for late successional forests within the Blowout watershed was determined by Dave Leach, District Silviculturist and was based between years 1600 and 1900. Information was gleaned from stand exams, aerial photo interpretation, and other sources to determine the range of natural variability.

Range of Natural Variability



* - Fire had been widespread throughout area, leaving little late-successional forest remaining.
\+ - Since 1850, fires have consumed ~6000 acres (18%) of Blowout. Much of the remaining was considered late successional forest.
XXX - Represents current levels of late-successional forests within the Blowout watershed.

The analysis area is within the range of natural variability for late-successional forests but it is unknown if it is within the range of variability for populations of species. It is assumed that big game populations are larger now than historic levels.

Lower population numbers may have resulted for spotted owls, terrestrial amphibians, bats, marten, and possibly fisher with approximately only 20% of the watershed within late-successional forests during the 1600's. Little nesting and foraging habitat would have existed for these late-successional associated species. However, larger populations of big game, edge dependent species and generalists species may have been higher as the area started to re-vegetate. Components of late-successional forests were probably still available in areas where the fire didn't burn as hot providing small refuges for these species. And small islands of late-successional forests may have played a role in the re-colonization of adjacent areas as the watershed grew older forests.

Having 80% of the area within late-successional forests may have had an effect on edge dependent and early seral species. Populations of late-successional associated species were probably at high levels. Although the fisher is not strongly associated with late-successional forests, it is effected by fragmentation. Populations of species like the fisher were also higher.

We are probably below the range of natural variability for snags and down woody debris due to management activities. Bald eagles may not have been present until the reservoir was established and big game numbers are higher now.

Migration Patterns

No information is available about migration patterns of the species located within the

Blowout watershed. However, general assumptions can be made by extrapolating information from their natural histories. Many species have had migration patterns blocked or disrupted by fragmentation, either caused by natural disturbance events or management activities. Big game, spotted owls, amphibians, marten, fisher, red tree vole, and other late-successional associated species can be forced to use less desired travelways due to fragmentation. Roads may have the same effect on some of these species. Roads have been shown to have negative effects on big game. Natural processes such as landflows and catastrophic blowdown may block dispersing amphibians. Those species with small home ranges are more likely to be effected the most. Those species who can fly are at an advantage and may be able to cross a clearing with ease, unlike a clouded salamander.

Survey and Manage Species

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* outlines species to be protected through survey and management in Table C-3 of that document. The survey and manage guideline directs agencies to survey areas prior to ground disturbing activities and manage known sites. The guidelines applies to any land allocation and contains four components with differing priorities.

Within known or suspected ranges and within the habitat types or vegetation communities associated with the species, surveys for red tree voles must precede the design of all ground-disturbing activities that will be implemented in 1997 or later. Development of survey protocols for the other 71 species listed in Table C-3 must begin in 1994 and proceed as soon as possible. These surveys must be completed prior to ground disturbing activities that will be implemented in FY. 1999 or later. However, protocols have not been developed for surveys for all of these species, including the red tree vole, and the expertise needed to conduct them is not readily available in some cases.

Additional analysis was completed on 1120 species. Of those, 486 species and 4 insect groups did not pass the screens that were established. The findings of these analyses is located in the *Final Environmental Impact Statement for Management of Habitat for Late-Succession and Old-Growth Forest Related Species with the Range of the Northern Spotted Owl* (FEIS), Appendix J2. It is unknown whether we are obligated to follow these mitigation measures at this time. However, there is a consolidated list of possible mitigation measures described for all species located on pages J2-7 through J2-10.

Many of the species within Appendix J2 are associated with riparian areas. Some of the species may not be closely associated with riparian areas but with late-successional forests or components of late-successional forests. Below is a short description of the species that have potential of being located within the Blowout drainage.

Land Snails

Prophysaon coeruleum and *Prophysaon dubium* are the only two mollusks that have a potential of being located in this area. *P. coeruleum* occurs in relatively undisturbed,

moist forests from low to middle elevations. *P. dubium* is a partial riparian associate but is also found in rockslide areas. These species are rare. It is thought that riparian reserves will provide substantial protection to these species and where the species is located outside riparian reserves, establishment of small reserves may provide adequate protection.

Amphibians

Of those riparian species analyzed, all that failed to pass the screens are associated with small permanently flowing streams. Riparian Reserve Scenario 2, which we are presently under, won't adequately maintain cool, clear water conditions critical for foraging and thermo-regulation for these species. Wider reserves along intermittent streams outside Tier 1 Key Watersheds is recommended for Cope's Giant salamander, black salamander, Cascade torrent salamander*, southern torrent salamander, and tailed frog*. (* - indicates species that have the potential to be located here.) Recommendations include surveys to identify stream segments in which these species are present. Riparian Reserve Scenario 1 would be implemented within these segments.

The Cascade torrent salamander occurs in or near cold, clear streams and seeps, especially in association with talus, small rocks, and gravel areas. Loss of headwater stream habitat may have caused local loss of populations and this species may be sensitive to global warming.

The tailed frog is associated with fast, flowing permanent streams and headwaters within forested areas. The tailed frog is sensitive to water temperature changes and sedimentation. It can occur up to 10,000 feet. Local loss of populations may be due to loss of habitat, increased stream temperatures, and sedimentation.

Two of the five terrestrial salamanders that failed the screens have the potential to be found in the area (clouded salamander and the Oregon slender salamander). These two species are typically associated with large logs. The clouded salamander inhabits large logs and stumps of varying decay stages usually under forest cover. To mitigate for this species, they recommend levels of logs >16 inches dbh be increased within Matrix lands. The Oregon slender salamander is associated with large well decayed down woody debris in association with late-successional forests. Recommended mitigation measures for this species include retaining a continuous supply of >16 inch dbh logs well distributed over the area. This amount should be within the range of natural variability for the respective area.

Bats

Five species of bats failed the established screens. They are divided into three groups: 1) small, nonmigratory, crevice-roosting bats with widespread distributions that use snags, decadent trees, buildings, bridges, and caves for roosting and hibernating (fringed myotis, long-eared myotis and long-legged myotis); 2) hoary bat (a large, solitary, migratory, obligatory foliage roosting bat with a widespread distribution); and 3) silver-haired bat (a large, migratory, widely distributed, snag and decadent tree roosting bat).

There is a strong concern that loss of snags and decadent trees from the widespread conversion of old growth forests to young, even-aged plantations, human disturbance and destruction of caves and mines, and demolition of old wooden bridges and buildings have significantly reduced the availability of potential roost sites for crevice roosting bats. New evidence is emerging that indicates that snags and old, decadent trees are far more important to many bat species for roosting than had been previously suspected. Pacific Northwest bats forage primarily over riparian zones, especially streams and ponds. There is also some concern that inadequate riparian protection in previous timber harvest activities have reduced the availability of foraging habitat for bats (Appendix J2).

The fringed myotis may only potentially be found within this area. It prefers forests with relatively dry moisture regimes. It is generally found in close proximity to mature forests. This bat is a gleaning species that forages at or within the forest canopy, primarily within the riparian habitats. The long-eared myotis forages by gleaning and pursuing moths and beetles at edges of mature forests, especially riparian zones. Small water sources appear to be important for this bat species. The long-legged myotis may only potentially be found within this area. It prefers Ponderosa pine forests. It forages exclusively on moths high above the canopy and spends a considerable amount of time foraging in drainages and intermittent streams.

Hoary bats are not expected to use single trees as roosts due to a lack of environmental buffering and protection from disturbance. Clumping trees would be a desired mitigation measure for this species. This species is strongly associated with mature forests for both roosting and foraging. They eat mainly large moths that are pursued at forest edges in riparian zones or along forested ridges.

Mitigation for the silver-haired bats may allow for additional roost sites within matrix and protection of roost sites in caves, mines, and wooden structures. Clumping wildlife trees would b desirable for this species. It is strongly associated with old growth forests for roosting and foraging. These bats forage by pursuing prey over dense mature forests near streams and ponds, feeding on a wide variety of arthropods. They are known to follow stream corridors when traveling from roosts to foraging areas.
Mitigation measures for most of these bat species call for additional buffers around wetlands. However, the Willamette National Forest Land and Resource Management Plan (LMP) is more restrictive than the mitigation measures recommended. Therefore, we will continue to adhere to the LMP.

Other Mammals

Three additional mammals failed to pass the established screens (fisher, marten, and red tree vole - northern species).

Fishers are not dependent upon late-succession forests, but appear to require closed canopy forests. They avoid openings and clearcuts. In the Pacific Northwest, fishers are associated with low and mid-elevation forests in which deep snowpacks do not accumulate. They were rarely recorded above 1,200 meters (~3900 feet). Martens;

however, are able to pursue prey in deep snow and within the subnivean layer. There is an elevational stratification of optimal habitat for these two species in the western Cascades. Fishers prefer forests that have complex physical structure near the forest floor and they rely on large snags for denning habitat. Martens are dependent on down woody debris of various decay classes, large patches of late-successional forest, and intact forest along riparian zones. Martens preferentially select resting sites in large diameter trees near streams, either because larger trees tend to occur in more mesic conditions near streams, because of the desirable microclimate, or because of proximity of prey that are more numerous in streamside habitat.

Mitigation measures recommended for the fisher are to reduce levels of fragmentation and to increase down woody debris levels in the matrix. Mitigation measures recommended for the marten are to increase down woody debris in the matrix and implement Riparian Reserve Scenario 1 throughout the species range.

Red tree voles have very limited dispersal capabilities. They are clearly a closed canopy species associated with late-successional forests and, in particular, with very large Douglas-fir trees. Mitigation measures recommended are to reduce levels of fragmentation and provide dispersal corridors for this species.

Transportation

The transportation system (*see figures gg and hh*) in the Blowout watershed provides access to 34,000 acres of forest lands. The Forest service maintains 185 miles of forest roads in this area accessing public and private land. Included in these are 17 miles of major forest arterials, 39 miles of forest collector roads and 129 mile of local timber access roads. The following two roads make up the Forest Service Arterial system in this watershed:

- Road 10, Bowout Rd., accesses several developed campgrounds, permittee sites, private land holdings, and a large amount of dispersed recreational activities located around Detroit reservoir. It is the major route used for all activities carried out in this watershed.

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

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

Development of this transportation has occurred primarily in the last 50 years. Prior to the mid 1940's this area was accessible only through a large trail system developed from Native American travel ways and expanded on to meet the administrative needs of the 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 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 normal operating practice during this period of time. The result is a piecemeal system built for a single use without thought to long term consequences.

The existing condition of the road system in Blowout covers a large range of variables. A large portion of he roads are built on stable benches and flats, and many of the road built on full bench ground was not severely sidecast. There are several cases of roads constructed through actively moving slide areas. Road 10 at M.P. 8.8 is the most obvious example of this. When this road fails it will close the major access route into the Blowout Analysis Area.

A critical issue in looking at the condition of these roads is the deterioration of the drainage system. Common design practices of the day did not call for consideration of the 100-year storm event as is called for in the ROD. The corrugated metal pipes used in the construction of these roads has met and exceeded its design life and reconstruction work has not kept up with replacement needs. There are failures occurring. A major storm event has not occurred in this area in many years. When one happens it will stretch the capacity of the drainage systems beyond it's designed intent and it's condition

capabilities.

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 causes serious impact on the drainage system and the road structure. These little roads can be major producers of sediment delivery.

People, Recreation and Scenic Resources

Cascade Prehistory

To give a broad overview of the Prehistoric Human use of the Central Cascades I have chosen to briefly summarize Greg Butchard's ecological model. The model organizes the Central Cascades into five stages based on major environmental periods and or time periods dominated by identifiable, sustained settlement and subsistence modes. For a more in depth understanding of his model please refer to Butchard 1990:16-25.

Early Broad-Spectrum Foraging Cira 13,000 to 8500 BP

Human Populations migrated into North America along with the Pleistocene Megafauna as the Wisconsin Glacier retreated. During this time the economically most important resource was the mammoth and the bison. Small, highly mobile groups moved with the larger animals while obtaining other resources along the way. By circa 12,000 to 10,000 years ago the central Cascades should have been able to support populations of elk and mule and black tail deer. At this time human population began to exploit the elk and deer by migrating upward into the cascades during the summer and fall and heading back to the lower elevations in the winter and spring following the seasonal cycle of big game.

Mesofaunal Broad-Sprectrum Foraging: 8500 to 5000 BP

General climatic drying took place from early to mid Holocene. East of the Cascades the drying trend created adverse conditions for ungulates forcing them to migrate into the montane uplands and wet western valleys where forest cover was reduce and replaced with more open grass and parkland habitats. These new conditions created ideal foraging for the ungulates. Higher elevation sites with a low density of archaeological materials would have resulted from the increase in ungulate habitat and a greater human demand on the resource. The human population should have been represented by a higher percentage of small mobile groups that conformed to the Ungulates seasonal foraging cycle.

Early Semisedentary Foraging: Circa 5000 to 2500 B.P.

During this time the Cascades returned to a more mesic environmental conditions at the close of the altithermal reducing big game (elk) habitat by increasing forest cover in the mountains and west-side lowlands. This climatic change combined with an increase in human population density created the need for humans to develop a subsistence/settlement system that was able to sustain higher demands on subsistence resources within increasingly limited space.

Along with the humans becoming semi-sedentary foragers they began managing the landscape through forest fires to create more optimum habitat for ungulate and other less important resources.

"Semisedentary foraging systems can support higher population densities primarily through increased reliance on seasonally abundant, labor intensive resources that can be stored and used as a stable commodity over winter (Burtchard 1990:21)."

Anadromous fish, root foods and wappato were available to human populations inhabiting the Central Cascades and reliance on these resources as a staple food item supplemented by big game foraging begins the transition to the semisedentary forager subsistence/settlement pattern.

Intensive Semisedentary Foraging: Circa 2500 to 500 B.P.

This period experiences a continuance of a semisedentary foraging lifestyle with an even greater increase in human populations using the Central Cascades. These populations sought to exploit a greater variety of resources at a higher rate. Resource stress placed on a growing population forced humans to create a more refined hunting method with the use of the bow and arrow. This technological change in tool use provided access to smaller mammals, broadening their resource base.

Cold season lowland settlements continued along with maintaining satellite upland task specific sites within the Cascades. Ungulate and plant resource habitat continued to be managed through fire at a high frequency. Long distance trade became more popular which should be reflected in the lithic assemblages recovered from archaeological sites.

At the close of this period population density was reaching carrying capacity size of semi-sedentary systems foraging and exploiting resources in the central Cascades.

Post Apocalypse Strategies: Circa 500 B.P. to the Present

During this period the humans experienced rapid population decline. This decline would give the appearance that resources are more abundant, creating chaos to their organized labor systems responsible for intensive food acquisition. People could not return to broad-spectrum foraging pattern, because big game populations were stressed by previous intensive hunting practices. The people during this period initially continued the semi-sedentary settlements with seasonal foraging sites in the Cascade's higher elevations. Settlement locations centered in those areas that gave the largest return of resources i.e. salmon, camas, wappato and big game. Big game should have recovered to higher densities due to a decrease in hunting.

A major alteration to the aboriginal population involved the expansion of the Euro-american system. Aboriginal populations in the process of reforming their economic systems could not compete with the Euro-american way of life and use of the land. "Settlers established farms, logging, fishing and industrial operations in areas that previously supported the indigenous economy." Around 1855 the Kalapuya and Molala tribes were placed on reservations with the signing of the Dayton treaty.

Blowout Area Cultural Overview

A recently excavated site within the Blowout drainage yielded a hearth feature (prehistoric fire pit) containing charcoal. The charcoal radiocarbon dated at 2,960 BP. 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.

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 Kalauya, 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 ridgelines 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.

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 connects the Volcano trail with the Coffin Mountain trail. The 1947 trail log notes thirteen springs and 10 meadows along the route. The trail also

connects the Volcano trail with the Coffin Mountain trail.

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.

Surveys: A total of 5520 acres out of 34,000 acres have been surveyed for the occurrence of heritage resources within the Blowout Watershed (*figure 5ii*). The surveys resulted in the location of over a hundred sites and isolated finds.

According to Heritage Resource Oracle 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, mainly from road construction and timber harvest activities. The degree of disturbance ranges from as minimal as a skid trail running through a site to as major as excavating a road or cultivating the soil within a site. Another disturbance is created by wind thrown trees over the past multi-thousand years (Nilsson 1989); an occurrence which has become more prevalent with the increase in timber harvest activities. The damage created occurs from the tree uprooting, creating a large cavity in the soil.

The types of prehistoric sites recorded in the area include mainly "Open Air" lithic scatters of obsidian and cryptocrystalline silica. Seventy-one percent of the total sites in this watershed are located on the topslope of a major ridgeline (saddles, knolls, crest) and 23 percent are located on midslope benches mainly of ridgelines and 6 percent are located on stream terraces or floodplains. Eighty-four percent of the sites are located on slopes less than 10 percent.

Sites predominantly occupy areas within the Pacific Silver Fir 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 1-800 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).

National Register of Historic Places: Three of the sites (lithic scatters) were found to be eligible to the National Register of Historic Places but none of the sites have actually been placed on the NRHP. Eligibility was based on 36CFR60.4 "Criteria for evaluation ":

> The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association and
>
> (a) that are associated with events that have made a significant contribution to the broad patterns of our history; or
>
> (b) that area associated with the lives of persons significant in our past; or
>
> (c) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
>
> (d) that have yielded, or may be likely to yield, information important in prehistory or history.

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.

Factors that have Influenced Site Degradation: 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.

Prior to the late 1970's the Forest Service showed very little interest in past human activity. District personnel collected some data on site locations encountered in the field

while accomplishing their other duties (Rakestraw 1990). Beginning around 1978-1979 site discovery has been accomplished through systematic surveys for a broad range of ground disturbing projects and from informants on and off the district who provided archaeologists with site location information. This resulted in a dramatic increase in the number of sites located and recorded. In turn, measures were recommended to protect historic values inherent in these properties. Site protection measures range from complete avoidance of the site and corresponding protection of its environmental setting to mitigation procedures which conserve the historic or scientific values of the resource (FW-267). Sites found to be eligible to the National Register of Historic Places are afforded protection under Standard and Guideline FW-268.

Site discoverability is greatly influenced by visibility factors. The western Cascades forest has very dense understory brush and a thick duff layer of moss. Many areas support thick ground cover of salal, Oregon grape, beargrass and ferns. These conditions created a challenge for the surveyor when it comes to site discovery. The Willamette National Forest archaeologist's have adopted the survey method of scraping the duff down to mineral soil every 25 to 30 meters at regular intervals to help facilitate site discovery in areas with a high probability of site discovery.

Most sites have incurred varying degrees of site degradation through root production of plants and trees, trampling by game animals, burrowing by small mammals, erosion and freeze thaw cycles, and wind thrown trees.

Site Distribution By Subdrainage

Site frequencies reported below are based on differing levels of survey in the various subdrainages. Survey intensity, ground visibility and discoverability are all factors associated with locating sites within the each subdrainages. Other factors include the percentage of high and low probability ground within each subdrainage.

Beard:

Prehistoric: A total of 769 acres out of 5355 acres have been surveyed within Beard subdrainage. As a result of the survey two prehistoric sites were located and recorded. Both sites are located on midslope benches with slopes of 7 and 15 percent. Elevation on site is 2080 and 2760 feet.

Historic: Beard bridge is the only historic site formally recorded within the Beard Subdrainage. The bridge consists of three twenty-yard long logs, lying horizontally, providing the under structure. A number of spikes remain in the logs and a number of planks are strewn about the area. The bridge is possibly associated with the construction of a jeep/logging road. The road appears to be placed on top of the Blowout trail, which appears on historical maps of the area from 1920, 1931, and 1937. The bridge is greatly deteriorated and has collapsed into Beard Creek. The bridge cannot bear vehicular traffic; at best it provides pedestrian access across Beard Creek.

Divide:

Prehistoric: A total of 816 acres have been survey within Divide subdrainage. As a result of the surveys 7 prehistoric sites were documented. The sites are located at an average elevation of 3336 feet with a range of 2040 to 3800 feet. On site slope ranges from 0 to 20 percent with an average of 7.8 percent. Fifty-seven percent of the sites are located on topslopes of ridgeline either in a saddle, on a knoll or ridgetop. Twenty-eight percent are located on toeslopes and 14 percent are located in stream headwaters basins.

Historic: Coffin Burn Trail shelter is located within Divide subdrainage. The exact construction date is unknown bu the shelter appears on the 1935 Willamette National Forest Map. The shelter is currently in good condition. The framing, siding and roofing are sound. The shelter was blown over in the mid-1970's but was rebuilt using the original materials (Cox Jr. 1988). Since it was rebuilt the roof has also been replaced in kind. The surrounding timber was harvested several years ago and the shelter now stands in a clearcut.

Hawkins:

Prehistoric: A total of 646 acres out of 4535 acres have been surveyed within Hawkins subdrainage. During the surveys four prehistoric sites were located and recorded. The sites are located at an average elevation of 4437 feet with a range of 3975 to 4900 feet. On-site slope ranges from 5 to 12 percent with an average of 8 percent. Fifty percent of the sites are located on ridgeline topslopes and fifty percent are located on benches midslope or near a stream headwaters basin.

Prehistoric site 18-04-354 has been scientifically tested for eligibility to the National Register of Historic Places. The site was found to be not eligible based on a low density of artifacts (Draper et al 1994).

Historic: A segment of the Historic Coffin trail has been recorded within the Hawkins subdrainage. This segment spans a length of 376 meters. The trail is readily discernible and is cut into the ground. A telephone wire runs along most of this segment of trail along with tree blazes and ceramic insulators. This segment of trail is in excellent condition.

Lost:

Prehistoric: A total of 370 acres out of 2523 acres (15 percent) have been surveyed within the Lost subdrainage. As a result of the survey 15 prehistoric sites were located and recorded. The average elevation is 4344 feet with a range of 3920 to 4500 feet. On-site slope ranges from 2 to 10 percent with an average of 5 percent. Sixty-seven percent of the sites are located on ridgeline topslopes either in a saddle, rock shelter, near a meadow or on a knoll and 33 percent are located on midslope benches of ridgelines.

Two prehistoric sites (18-04-137/35LIN241 and 18-04-337/35LIN515) have been scientifically tested for eligibility to the National Register of Historic Places. Both were found to be eligible. Site 18-04-137 was found to be eligible based on the antiquity of the artifacts recovered and the likelihood of yielding additional information about the prehistory of the upland western Cascades (Bell 1982). Site 18-04-337 was found to be eligible based on high densities of cultural material, a hearth feature that produced a carbon 14 date of 2930 +- 80 years before the present, and the ability provide additional data about human use in the central cascades (Draper et al; 1994).

Historic: Scar doe hunting camp is located along the Scar Mt trail. The site was identified by the remnants left behind. Items identified from the camp include wire, telephone insulators, square head nails, and a wooden board nailed to a tree with the inscription "DOE CAMP".

West Side Blowout-Ivy:

Prehistoric: Twenty-one percent of the area or 846 acres out of 3968 acres have been surveyed within the West Side Blowout-Ivy subdrainage. As a result 7 sites were located and recorded. The sites are located at an average elevation of 4255 feet and range from 2600 4480 feet. On site slope ranges from 0 to 5 percent with an average of 5 percent. Fifty-seven percent of the sites are located on ridgetops, 28 percent are located on midslope benches and 14 percent are located in a ridgetop saddle near a stream headwaters basins.

Site 18-04-16 was tested for eligibility during the summer of 1987. The site was considered not to be scientifically valuable and therefore not eligible for listing on the National Register of Historic Places (Spencer;1989).

Historic: No sites dating to the historic era have been formally recorded in the West-side Blowout-Ivy subdrainage.

Cliff:

Prehistoric: A total of 850 acres out of 3446 acres or 24 percent have been surveyed within Cliff subdrainage. As a result only one site (18-04-015/35LIN301 was located and recorded. This site is located on a ridgetop saddle with a zero percent slope. The site was evaluated in 1985 for National Register Eligibility and found to be eligible. Data recovery excavations in 1988 indicated the site to have been occupied seasonally during the period of circa 3000 B.C. to A.D. 1800 (Nilsson 1989).

Historic: No historic sites have been recorded within this subdrainage.

South Side Blowout:

Prehistoric: Six percent or 137 acres out of 2160 acres have been surveyed within South Side Blowout. As a result of the surveys 3 prehistoric sites were located and recorded. One site is located on stream terrace, one site located in a saddle near a stream headwaters basin and one site is located on a ridgeline topslope. The on site slope averages 5 percent. The sites are located at an average elevation of 3538 feet and range from 2800 to 3975 feet.

Site 18-04-91/35LIN133 was scientifically tested for National Register Eligibility and found not to be eligible based on post-depositional disturbances affecting both the surface and sub-surface patterning of cultural materials (Elsesser; 1985:i)

Historic: An explosive shed and bridge have been recorded within the South Side Blowout Subdrainage. The site was determined to be at least 80 years old based on a relative dating of a tree growing out of the structure. Both structures show the wearing of time. The roof has fallen in two or three places and numerous boards have come loose or started to deteriorate. The bridge is worn and much of the wood is deteriorating. The association with these two structures is unknown at this time.

Box Canyon:

Prehistoric: A total of 566 acres out of 6604 acres or 8.5 percent have been surveyed within the Box Canyon subdrainage. As a result 16 sites were located and recorded within the Box Canyon subdrainage. Fifty-six percent are located on the ridgeline topslopes within a saddle or near a meadow, 37 percent are located on midslope benches, and six percent (1 site) are located in a saddle near a stream headwaters basin. The average on-site slope is 13 percent with a range of 0 to 30 percent. The sites are located at an average elevation of 3995 feet and range from 3680 to 4400 feet.

Historic: An historical campsite, with an unknown association was found in the early 1980's by a Forest Service employee. Remnants of timber from a cabin, spoon, wood stove components, a carbide light, boots, and an old army first-aid kit with a 1918 stamp were observed . The site's association is unknown. The camp has been disturbed from past timber harvest related activities.

Upper Blowout:

Prehistoric: A total of 395 acres out of 2294 acres (17 percent) have been surveyed within the Upper Blowout subdrainage. As a result 11 sites were located and recorded. Eighty-two percent are located on ridgeline topslopes within saddles, on benches and knolls. Nine percent of the sites are located in a saddle near a stream headwaters basin and nine percent are located on a midslope bench. On site slope ranges from 0 to 17 percent with an average slope of 4 percent.

The sites are located at elevations ranging from 1900 to 4440 feet with an average

elevation of 3322 feet.

Historic: A segment of the Scar-Straight Mountain trail has been recorded. The trail segment has a readily discernible tread that is cut into the slope. A the trail leads into a clearcut the tread is less visible. The portion within the forested area has "i" shaped blazes running parallel and downslope of the tread.

Recreation and Scenic Resources

Recreation Opportunity Spectrum: While recreation must have a physical base of land or water, the product, recreation experience, is a personal or social phenomenon. Although the management is resource based, the actual recreational activities are a result of people, their perceptions, wants and behavior (NFMA Committee Report, 1979). While the goal of the recreationist is to obtain satisfactory experiences, the goal of the recreation resource manager becomes one of providing the opportunities for obtaining these experiences. By managing the natural resource settings, and the activities which occur within it, the manager is providing experiences to take place. Recreation opportunities can be expressed in terms of three principle components, the activities, the setting, and the experience. For recreation management and planning assistance, possible combinations of activities, settings and probable experience opportunities have been arranged along a continuum called the Recreation Resource Opportunity Spectrum (ROS). ROS is divided into seven classes; Primitive, Semiprimitive Motorized, Semiprimitive Nonmotorized, Roaded Natural, Roaded Modified, Rural and Urban (*figure 5jj)*. In classifying recreation opportunities, ROS considers access, remoteness, naturalness, facilities and site maintenance, social encounters, visitor impacts, and visitor management.

A goal of Forest management direction is to provide a range and amount of dispersed recreation opportunities which is consistent with public demand for a variety of activities and settings. For recreation planners to determine what kinds of opportunities to provide, an overall analysis needs to be conducted on a larger scale beyond watersheds (eg. basin, Forest and region). Each watershed will provide for different experiences, and may not range the gamut of opportunities in ROS nor does it have to. Therefore, the big picture must be viewed in order to determine whether or not supply and demand can be met and what opportunities can be provided within a single watershed. For example, currently there is a shortage of settings in the Semiprimitive class in the region, and will be a future shortage in this setting on the Forest. Potentially, Blowout can provide for this setting in the future.

Use Impacts and Conflicts of use: As long as a recreation resource is abundant, allocation isn't an issue. However, when it becomes limited, demand exceeds supply, managers have to figure out how to divide the scarce resource. Currently, this is not an issue in Blowout. However, with population growth and other socio-economic variables, recreation demand is expected to increase. As recreation increases so does the impact within a setting. Limits of acceptable use may need to be determined and/or restoration projects may need to be implemented in order to mitigate overuse impacts to the resource and among visitors.

The Blowout area can supply diverse types of dispersed recreation experiences. A facet of having diverse types of uses is that some dispersed activities conflict with each other and may be completely incompatible. An existing setting or potential recreation development may attract two different types of user groups which participate in conflicting activities. For example, developing a trail may entice both hikers and mountain bikers but may result in safety hazards to the recreationists, and detract from their enjoyment of the activity.

Past Conditions: 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.

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. Most of the watershed was timbered from Box Canyon subbasin on the west to Hawkins subbasin to the east, and south to Lost subbasin. 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.

The Detroit Dam Construction was completed in 1952. 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. 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 to respond to the recreation need along the reservoir by creating Hoover and Southshore Campgrounds located on Blowout Road just outside of the Blowout watershed. During the 1960's, visitors, typically family groups from the Santiam Valley and mid-Willamette Valley, began to come to the lake for camping, waterskiing and swimming activities. Recreation use of the lake and it's shoreline campgrounds have steadily increased over the decades.

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 subbasins 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.

Scenic Resources: 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, marked by periodic events or 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 (Table 5t, *Figure 5kk*). Less than one percent of the area contained stands of seedlings, saplings and poles. Wildfire occurrences during 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 featured 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.

Table 5t. 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 was 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 as shown by the percentage of seedlings, saplings and poles in Table 5u and *Figure 5ll*. Other than the

five percent 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 (see Scenic Resources Existing Condition, *Figure 5mm*)

Table 5u. 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%

Existing condition (recreation): 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 Blowout arm. The Blowout drainage receives a moderate portion of the North Santiam River Basin visitors.

The North Santiam River Basin receives intensive recreational use due to it's proximity to major population centers, and the array of recreational opportunities that this "backyard" destination has to offer. Most frequent users of the North Santiam Watershed are from the mid-Willamette Valley and Portland Metropolitan area. A large percentage of the people coming to the North Santiam drainage are repeat visitors. Dispersed recreation activities within the North Santiam drainage can easily attract in excess of 200,000 visitors based on District Recreation Resource Information System (RIS) estimations in 1993. In addition, Detroit Lake receives 199,800 visitors a year.

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. 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% 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.

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 Semiprimitive Motorized (SPM). Semiprimitive 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.

Dispersed Recreation Opportunities: No developed recreational sites such as campgrounds, boat ramps or picnic sites are locate within the Blowout Analysis Area. However, the area offers an array of dispersed recreational opportunities. Activities typically associated with dispersed recreation in the watershed are camping, hiking, driving for pleasure, sightseeing, hunting, fishing, swimming, huckleberry picking, biking, 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 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. Areas of particular interest for selected dispersed recreation activities are highlighted below.

Detroit Lake encompasses a small portion of the analysis area, 188 acres, but contributes to a significant amount of use within the drainage. A popular site located on the lake at the confluence of Box Canyon and Blowout Creeks, attract visitors to engage in sail and motor boating, fishing, swimming, and land and boat camping activities. The Blowout Creek Suspension Bridge is used as a jumping/diving platform by many young visitors

which poses a safety concern. Concentrated dispersed camping occurs along Blowout Creek between the Suspension and Blowout Bridges. A popular pool in Blowout Creek receives high use during hot days. This particular site has heavily eroded user trails leading down a steep slope to the pool site which also poses a safety concern.

The analysis area contains two maintained trail systems, Coffin Mountain and Coffin Lookout Trails, that lead to the District Lookout site which receives 300 visitors annually. Coffin Mountain Lookout is still operated today and offers visitors an awesome panoramic view of prominent peaks of the Western Cascades.

Historically, it is believed that aboriginal groups gathered huckleberres and burned these fields within the vicinity of Scar Mountain. Huckleberry picking at Scar Mountain is an activity enjoyed by visitors today.

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, six developed campgrounds, Highway 22, Highway 20 at Sweet Home, and the Quartzville Corridor which contains Quartzville Creek, a Wild and Scenic River. Straight Creek Road which bisects the upper portion of the watershed will be designated a "Backcountry Byway" tour route in cooperation with the Bureau of Land Management and Linn County in 1995.

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.

Dispersed Recreation Impacts: 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% of the campsites found within the watershed are located near streams, particularly Blowout Creek at just over 50%. These areas receive the most frequent use and subsequently, the most impact to resources ranging from moderate to heavy damage with one site rating at extreme. A moderately damaged site has some tree damage and may have a barren core. Impact of camping use is apparent but not excessive. A heavily damaged site is characterized by having a barren core with some tree damage. An extremely damaged site consists of a large barren core, heavily damaged trees, exposed roots, and has erosion problems.

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. Frequency of use is from 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.

Conditions of the most heavily impacted dispersed camping sites within Blowout, include compaction, erosion, vegetation loss and tree damage. Vehicular access to sites are not limiting which may attribute to some of the degradation of these sites. Another contributing factor to the condition they exhibit is the amount of use sites receive each season based on their popularity or proximity to specific areas of interest such as the Blowout Creek and Detroit Lake.

Dispersed site conditions within the watershed exhibits other characteristics that are a function of area users behaviors. It is common to find human waste proximal to dispersed sites. In addition, often waste associated with the camping experience; product containers, cigarette butts, 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.

The presence of human waste and debris, tree damage and loss, denuded and compacted camp areas, all have an effect on the scenic quality of the area the site, and may diminish recreation experience opportunity in those areas of the watershed.

Scenic Quality Objectives by Management Area: The Willamette National Forest LMP has assigned Visual Quality Objectives (VQO's) for each Management Area (MA) on the Forest. The Blowout Analysis Area has four visual objectives to be maintained. (*Figure 5nn*).

For the purpose of the analysis, it is assumed that private land will maintain a Maximum Modification Visual Quality Objective; and Army Corps of Engineer land will meet a Partial Retention VQO. General Forest (MA-14a) and private land comprises 90 percent, 30,619 acres, of the analysis area and is managed to meet a VQO of Maximum Modification. Pinnacle Peak Special Interest Area (MA-5a) composes less than one percent, 211 acres, of the total area and is managed to meet a VQO of Retention. Management Area 11a, Scenic-Modification Middleground, is managed to meet a VQO of Modification, and encompasses six percent, 1897 acres, of the analysis area. Finally, Army Corps of Engineer land; MA-11c, Scenic-Partial Retention Middleground; MA-13b, Coffin Mountain Administrative Site; and MA-10b, Dispersed Recreation-Semiprimitive Motorized comprises three percent, 1,088 acres, of the Blowout Analysis Area, and is managed to meet a VQO of Partial Retention.

Currently, there is no Visual Quality Objective for the Late-Successional Reserve that lies within the Blowout Analysis Area. The LSR encompasses the Box Canyon drainage which had a Maximum Modification Visual Quality Objective under the Forest Plan. With the newly designated LSR allocation, the reserve will likely be managed to achieve a Partial Retention VQO in order to meet the objectives of creating and maintaining late-successional habitats.

Existing Visual Condition Analysis by Management Area: At this time 32 percent of the Blowout Analysis Area is predominately composed of stands with small size tree classes (Table 5r). These were areas that were harvested during the 1960's and 1970's. Twelve percent of the drainage is composed of medium sized trees. Fifteen percent of the area is comprised of a mix of large and old growth stands where a significant portion lies within the Box Canyon subbasin. With 20 percent of the area in relatively new harvest units, the geometrical character along with the strong horizontal lines from cut and fill slopes, create a landscape that would appear Heavily Altered.

Currently, the Late Successional Reserve is composed of 10 percent pole sized stands of trees; and 33 percent of the area contains seedling and sapling regeneration. Another 33 percent of the area has a mix of medium, large and old growth trees primarily in the lower portion of Box Canyon subbasin. Finally, 32 percent of the LSR is composed of stands of small sized trees. The Visual Condition of the landscape within the LSR 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 a harvest rate of 23 percent.

Table 5r. Viewshed Condition - Current

Mgmt. Area	Harvest Rate Objective (%)	Existing Disturbed Condition (%)	Maximum Disturbed Condition (%)	Seedlings /Saplings (acres)	Poles (ac.)	Small Trees (ac.)	Medium Trees (ac.)	Old Growth /Large Trees (ac.)	Non-Forest (acres)	Total Acres
5a	0	4	0	8	8	8	135	33	19	211
10b	7	2	14	10	72	411	8	1	28	530
11a	12	10	24	183	100	529	149	790	146	1,897
11c	10	5	20	19	12	212	23	106	14	386
13b	0	0	0	0	0	3	0	0	0	3
14a	13	22	26	6,507	5,255	8,544	3,787	4,065	875	29,038
Private	13	5	26	74	314	1,018	22	2	156	1,586
COE	12	0	24	0	8	145	1	0	15	169
Lake	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%**

As illustrated in this table, the existing condition for MA-14a exceeds it's respective decade harvest rate, however, it does not exceed the Forest Plan standard for maximum disturbance. This Management Area composes 90 percent of the total area. Management Area 5a exceeds the Forest Plan's maximum disturbance condition. The remaining Management Areas existing condition fall below the decade harvest rate. 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.

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Chapter 6

VI. Conditions, Trends and Effects of Future Land Management

Maps

VI. Condition Trends and Effects of Future Land Management

Vegetation

Trends in vegetation development in the Blowout have been altered through management of timber resources (*Figures 6a and 6b*) and with fire suppression. It is relatively easy to point out differences between the natural and managed vegetation on a specific site, however it is difficult to draw conclusions about the overall effects on the drainage as a whole and even less credible when addressing the entire North Santiam Watershed. Because of the extreme swings in disturbance from near total burning in the 1600's to nearly total late successional stands in the 1800's it is hard to arrive at a disturbance pattern that can be compared to present day management. Fire suppression in this century masks whatever fire occurrence might have happened.

Timber management activities have changed significantly since early logging in the 1940's so that comparisons between natural development and current practices need to be somewhat specific to the time frame they are being compared to.

Earlier timber management, generally up to about 1970, tended to plant few tree species, and tended to have a lower utilization of timber thus leaving more down logs. Broadcast burning for site preparation and hazard reductions varied from no burning to hot fall burns which in some cases damaged site productivity. Very few alternatives to, or alterations to the clearcut method were made.

The 1970's brought such changes as increased utilization, a period of little broadcast burning, and later spring and summer burning. They also brought better logging systems, more soil protection, shelterwoods, commercial thinning, and fertilization.

The 1980's added more tree species, including rust resistant white pine, and forest genetics. Pre-commercial thinning was modified to ensure more species diversity and pruning was reintroduced after no activity since the 1960's.

The 1990's have modified harvesting by leaving snags and green trees, much more down woody debris and have left more units unburned. The 1990's have also seen a large increase in the sales of special forest products, primarily boughs, Christmas trees, and post and poles.

Comparing planted stands and second growth, naturally regenerated is complicated by the fact that natural stands vary a great deal depending on burning intensity. Due to intensive utilization over most of the past 50 years, most plantations lack the downed material or snags that may be present in burned, naturally regenerated areas. Where very intensive burns or re-burning occurred, they may be lacking there as well. As far as species diversity of plants, there appears to be at least as many or more in the artificially

regenerated sites than on the naturally burned areas. In the Blowout and most of the District, fire regenerated stands tend to be overstocked, primarily with Douglas-fir, creating a low-light condition which generally precludes the occurrence of other species. This condition may occur as early as twenty years after disturbance and persists well into the second century of development. Shade tolerant species may occur in these stands but do not generally attain any significant development until the overstory begins to decline.

Primarily due to thinnings, managed plantations tend to create light conditions that permit earlier regeneration and release of vegetation other than the dominant tree species. The dramatic response of brush and shade tolerant conifers following commercial thinning is a common example not seen in the natural disturbance regime. The small patch sizes of most harvest openings versus larger natural fire sizes, may also be contributing to seeding from adjacent areas. Planting of multiple tree species also creates a type of diversity not commonly found in fire regenerated stands. Western red cedar and Western hemlock generally lag far behind Douglas-fir in natural stands, but planting these species at the same time and retaining them during thinnings gives them the position of codominants in the stand.

The degree of natural under burning in the Blowout is not clear since stand records are not complete enough to generally distinguish them from other multi-canopy stands. On the ground, it is relatively easy to identify under burned stands. They are generally characterized by remnant mature fire resistant trees with an understory of shade tolerant species that usually occur at very high stocking levels. Immediately after under burning and for a few decades after, these stands must have been fairly open to light, and also with a large component of snags and downed logs. This type of stand condition does not exist currently due to lack of fire.

The existence of numerous young plantations in Blowout may contribute to a condition where high intensity burns are increasingly likely. Retention of snags and increased downed material may increase resistance to control of fires. Reduced road access and reductions in personnel and timber purchaser assistance in fire suppression may all act together to increase the frequency of large fires over the level experienced previously this century.

Special Habitats (Non-forest plant communities)

This section will focus on implications for the future condition of the Blowout Analysis Area under a "new ethic" management regime compared to no management at all. The effects of the five natural disturbance agents will be discussed, as well as future management options for special habitats, species of concern, and noxious weeds.

Fire: No further management in this analysis area may, in the short term, continue to perpetuate the existing vegetation pattern. The conversion of many acres to an early

secondary successional condition has increased the potential of repeated re-burns due to the high surface fire potential that exists in early successional Douglas-fir forest (Agee 1991). In addition, the vast tracts of even aged, second growth Douglas-fir forest low in the Blowout drainage are more susceptible to a stand replacing fire due to the lack of fire breaks. In any event, superimposing a natural fire pattern on top of current vegetation patterns will not substantially ameliorate the contrast between the low elevation second growth stands and the higher elevation old growth/early successional mosaic.

Forest management that mimics historic fire pattern can facilitate the return of pre-management landscape structures and functions. A desired future condition that distributes stand types and includes longer rotations to simulate estimated fire cycles, partial cuts and small harvest units to simulate small patchy fires of various intensities, and large units with minimal soil disturbance and retained green trees, snags, and dead and down to simulate large fires will not only be more resilient to future fire events, but will also ensure a viable distribution of effective plant and animal habitat. Reducing the intensity of management at high elevations where fire is more frequent, where plant species diversity is greatest, and where recovery from mechanical disturbance is most problematic, will also result in a more diverse and resilient system.

Flood: No further management in the Blowout Analysis Area would probably, over time, result in re-creation of some of the natural elements of flood control, including the structures and pools that dissipate energy in streams, and the swamp, marsh, and bog communities that contribute to water storage and quality. Over the short term, however, the current condition of high elevation clearcuts and extensive roads increases the likelihood of continued erosion, slumps, slides, and sediment loading into streams.

One advantage to continued management is the ability to monitor and regenerate sites where stand establishment is slow, and the ability to rehabilitate, maintain the stability of, or reclaim, roads. The opportunity also exists to accelerate the re-creation of the natural elements through restoration techniques. Working to restore the watershed in this way provides the additional benefit of stability in the short term, wile we implement landscape designs that will allow natural processes to provide stability in the long term.

Land Flow: No further management in the Blowout Analysis Area will probably result in increased long-term stability. But like the flood example, lack of routine silvicultural practices and road maintenance or sufficient reclamation of roads may result in conditions getting worse before they get better.

Landscape planning and design can help to thwart potential soil stability problems by managing drainages and connected subdrainages as a whole. It is a much more integrative approach that dictates a closer look at Analysis Area processes and possible cumulative effects of activities. The first step is to identify problem areas. The second step is to solicit information from all resources on what steps can be taken to promote

stability. If we can avoid compounding the effect of land flow, we can begin to return the area to the level of disturbance that is inherent within the landscape. For the Blowout, the inherent level of land flow disturbance is quite high. Therefore, the amount of land flow disturbance vegetation types such as vine maple/talus and red or Sitka alder avalanche vegetation will remain quite high. But I would also expect an increase in the succession of disturbance sites to coniferous forest, and the development of various riparian associated vegetation types if preventative and restorative steps are taken.

Disease: No further management in the Blowout Analysis Area will eventually result in a return of the domination of environmental processes and cycles over insect and pathogen spread. These processes can retard or eliminate spread as well as facilitate it. If conditions are favorable, hardwoods, shrubs, and resistant conifers can invade disease centers as susceptible trees die out, thus promoting local species diversity. In the case of Phellinus, windthrow of live, mature trees can reduce innoculum in the soil since Phellinus will die in roots exposed to air (Hadfied et al 1986). Fire can keep disease populations in check. It is important to recognize that some species have evolved to exploit niches created by insect and pathogen damage, and that total elimination of these vectors is not desirable.

Landscape planning and design gives us the option to allow natural processes to influence disease and pathogen spread in areas slated for little or no management activities, while practicing control techniques in more heavily managed areas to counteract the tendency of increased spread due to management practices. We can mimic natural processes and increase biodiversity by replacing infected trees with native non-susceptible species. We can reduce the additional stress added by past management practices by wise use of prescribed fire and by adopting different harvest strategies and scheduling timber harvest in a way that minimizes edge effects. By narrowing the focus for where to apply control measures, we can be more effective with this application and ensure long term success.

Wind: No further management in the Blowout Analysis Area would, over time, revert the area to a less wind prone condition. However, steps can be taken to minimize the susceptibility of managed stands to wind damage. Vulnerable areas must be identified. Special habitats can be buffered. Harvest schedules that reduce the amount of edge can be employed. Where edge exists, creation of wedge formations and feathering can diminish or divert the full force of wind.

Special Habitats and Species of Concern

On the Willamette National Forest, our 1990 forest plan has gone beyond single species management. Hickman (1968) estimated that 85% of plant species diversity in this region can be found in non-forest plant communities such as meadows, rock outcrops, and wetlands, although these types account for only 5% of the land base. The Willamette Forest Plan directs us to maintain these habitats, and if necessary, protect them from

human disturbance (FW-211). Not only does this preserve the existing biodiversity, but it protects the majority of sensitive species and other species of concern that do tend to occupy these habitat types. The forest plan also directs us to maintain existing diversity on forest, landscape and stand levels (FW-201). Other standards and guidelines address the need to leave intact areas that exhibit quality old growth characteristics and corridors that connect these areas (FW-202 to FW-207).

Combining principles from conservation biology, landscape ecology, ecological restoration and current management practices can help identify a desired future condition (see Appendix 1). The same type of strategy that has been used to survey for sensitive plants can be employed on a landscape scale to preserve and enhance existing biodiversity. As with sensitive plants, special habitats and rare forested plant associations located during field reconnaissance can be evaluated as to the need for protection as well as the opportunities available for experimental manipulation (restoration, disturbance monitoring). Disturbed areas can also be assessed regarding the feasibility and probable effectiveness of restoration work. Designing protected nodes and corridors so that they include a large proportion of special habitats and populations of species of concern will help maintain existing plant and animal biodiversity. The number of these habitats to protect will depend on such factors as the number and proportion of each type left undisturbed in the analysis area, their susceptibility to disturbance, their importance as habitat to wildlife, and the contribution they make towards water quality. Utilizing information gathered for landscape analysis such as fire pattern, wildlife and water dynamics, and human use can aid in determining the scope and extent of these factors.

In the Blowout Analysis Area, many of the mesic to hydric and species rich special habitats are found in the headwaters region. In addition to being susceptible to the adverse effects of disturbance, the high elevations at which these habitats occur suggest harsher growing conditions. Placement of a system of nodes and corridors in this area of headwalls and headwaters would likely protect biodiversity and water quality values. It also represents an opportunity to connect riparian corridors and adjacent watersheds. Midslope meadows and ponds could be connected to the riparian corridors as part of this system. It should be pointed out that corridors do not necessarily need to be static, they can be adjacent bands of timber which are harvested on long rotations. Retention of some trees around certain special habitats may still be necessary. Since the numerous vine maple/talus communities are less prone to disturbance and are widespread within the analysis area, protection is less of an imperative and would be determined on a site specific basis.

The existing condition of the Blowout Analysis Area indicates that special habitats prone to disturbance must be protected, but it also provides endless opportunity for adaptive management. After nodes and corridors are designated, the remaining patches can be characterized according to those management activities (silviculture techniques, rotation ages, watershed restoration, wildlife habitat enhancement, etc.) that will yield the most

benefit in terms of support to the protected areas, function within the matrix, and timber production. Useful information for this characterization includes stand exam (aspect, slope, elevation, etc.), watershed, wildlife, soils, and fire history data.

Restoration efforts should focus on areas where benefit/cost ratios are high. Benefit should be evaluated based on the contribution of an area to the structure and function of landscape processes. Cost should be evaluated on such factors as the probability of effectiveness and the availability of equipment and expertise. In the Blowout, the numerous beaver ponds, swamps, and sedge meadows located in the lower elevation second growth stands deserve attention. They represent a large portion of the biodiversity present in the local area. Many of these sites were either created or at least affected by earlier timber harvest activities, and are in various stages of "pristineness". Enhancing or protecting those sites that already exhibit desirable habitat qualities (based on resident species composition and richness, plant and animal) or watershed restoration opportunities (backwaters for flood control) would be a prudent investment. In many cases, this objective could be achieved by road closures and rehabilitation, followed by re-vegetation with native species if necessary.

Noxious Weeds: This procedure would also assist in retarding the spread of undesirable ruderals. Inventory and identification of areas where weed control may be effective and subsequent treatment can reverse the trend of increasing populations of non-native flora in favor of those species native to the local area. Connected corridors can provide a natural barrier to the spread of noxious weeds. Focus on weed control and steps to prevent the spread of weeds could then be directed to those areas where intensive management (disturbance) takes place, instead of the need to consider the entire landscape. Competitive plantings, using native species for re-vegetation, can help reclaim areas from weed establishment.

A desired future condition for the Blowout, therefore, should include protected and semi-protected areas that include and link biodiversity hot spots, and adaptive management areas where disturbed areas will be enhanced by various management techniques including prevention of habitat degradation by closing roads, restoration where habitat has been degraded, and stand improvement to meet other habitat objectives. Inventory and monitoring work, focused on previously ignored but important species such as cryptogams (mosses, liverworts, and lichens) and other species of concern as well as on project designs and effectiveness, must become an integral part of watershed analyses in order to successfully improve watershed health and protect biodiversity.

Soils, Water and Fish

Several areas do not meet the Forest Plan recommendations pertaining to hydrologic recovery (FW -093)(BMP-W-5). Large areas, subdivisions, will be closed to additional roads and harvest activity, which disturbs canopy closure, until sufficient recovery occurs

to reduce risk of increased peak flows and channel bank/bed erosion.

State water quality, temperature requirements (FW-088, & 089) standards are not at Forest Plan desired levels. Maintenance and improvement of full riparian management zones along selected class IV and al of class III-I streams will be required. Disturbance to riparian canopy would not meet riparian objectives for class III to I streams.

Large woody material in stream channels is lacking. In order to meet desired future conditions material will need to be imported from off site to allow for stream recovery. This requirement of wood will be in direct conflict with salvage sale objectives to sell salvageable material. Material needed for restoration of the stream would be large material, 16 inches and greater diameter, with root wads attached. Lengths would vary with long lengths, greater than 40 feet, preferred.

Road densities are high within the area. Road related sediment sources stem from fill failure, shotgun culverts, drainage patterns being interrupted, and surface erosion. Consideration of road objectives, and mitigations need to be established. Sediment control needs to be one of the objectives for roads within the area (FW-097)(BMP-R-7). Drainage structures need to be removed on temporary roads (FW-102).

Potential Effects: Draft criteria for implementation of the Anadromous Fisheries Implementation Guide (AFPIG), show the area to be lacking in large woody material per mile and the number of pools per mile. With finalization of this criteria pending it is apparent that this area would not meet the standards established. Any decision at this point in time would either aid the agency to be in compliance with these requirements of the near future. Additional large wood within the stream channels would allow for the forest to move closer to its desired future condition for the area. The effect would then be on salvage potential for this area.

Completion of field analysis identified areas of various sensitivity in relation to fire, flood, wind, and past management (*Figure 6c*). Recovery rates within these areas are dependent upon other resource concerns for the area. Large woody material could be introduced into the area, riparian reserves could be managed to help bring areas back to historic conditions. The relationship this type of management has with other resource areas may not be compatible due to Threatened and Endangered Species Act.

Water Temperature: The expectation for temperature is that as riparian vegetation recovers over time and stream shading increases and becomes more effective at blocking solar radiation, overall temperatures will lower. An increase of in-channel complexity will also help speed up this process. The time frame for reaching temperatures in line with State standards may be 10's of years down the road in Blowout Creek, due to the initial loss of large trees in stream-side areas and the length of time it will take to replace them. A trend of lowering of temperatures from those of the early 1980's can be seen in

Figures 6d and 6e.

Habitat Complexity: Habitat complexity in streams can be improved much quicker than temperature, through the artificial introduction of large wood complexes where it is lacking. This has already begun in Blowout Creek and these introductions are being monitored for effectiveness and the information learned will help guide future activities in Blowout Creek and other streams such as Ivy, Divide, and Cliff Creeks that are being evaluated for restoration work.

We think that restoration of complexity towards a more natural functioning system can be done in a reasonable short time. Much more work and long term monitoring will have to be done before we know for sure if this statement is true or to what degree it is true. Also, artificial restoration is something you have to be into for the long haul until nature can take over. In systems with no stream-side vegetation over 6 to 12 inches dbh you may be looking at from 100 to 200 years for recruitment of adequate sized large woody material. This means, given the lifespan of in-stream large woody structures as anything from less than 5 years to over 20, there will need to be a continuing program of maintenance and new input to protect our investment.

Wildlife

Big Game: A majority of the Box Canyon Management Emphasis Area has become a Late Successional Reserve and the emphasis will not be on big game. Special habitats may be over utilized as forage becomes less and less available. Some roads may begin to grow over and fragmentation will begin to lessen in 50 years with early seral stands becoming hiding and thermal cover (*figures 6f , 6g, 6h and 6i*). Future management activities are unsure within this area at this time. Activities that may occur within the LSR will focus on modifying habitat to become owl habitat at a faster rate. Thinning stands may facilitate the growth of forage species. De-commissioning roads may aid in forage generation by creating linear meadows.

Trends for the remaining management emphasis areas will maintain present levels of big game. However, new standards and guidelines outlined in the ROD will need to take precedence. This may make forage creation more difficult. Road miles are likely to decrease due to dropping budgets. Upper Blowout MEA is very fragmented and innovative ideas and uses of the land may need to take place before a heavy emphasis is placed on big game. Future management activities are likely to focus on stand enhancement opportunities within second growth stands. This will presumably initiate an upward trend in cover values, especially for optimal cover over time.

Late-Successional Associated Species: The Box Canyon subbasin is now a LSR shifting the emphasis to protection and enhancement of late-successional forests and species. Fragmentation may lessen over time since activities that will occur within this area are to

provide conditions under which trees may grow more vigorously, developing larger diameters and greater heights in a shorter period of time.

Dispersal habitat will be maintained or things will be done to show an upward trend by adhering to the 50-11-40 Rule. Techniques will be designed to aid in creating habitat components needed for late-successional associated species. With the corridor system in place, this will also help in maintaining dispersal habitat and meeting interior habitat objectives.

More information will be gained by inventory of species outlined in the ROD. Suitable habitat for these species will be identified and mitigation measures will be applied to lessen effects on these groups by management activities. ROD Standards and Guidelines will assure protection of riparian reserves and special habitats as well as other areas.

Future management activities are likely to focus on stand enhancement opportunities within second growth and fire regenerated stands to achieve late-successional characteristics. However, the effects of these activities may not be seen for a long time.

Snags and Down Woody Debris: With the implementation of the ROD, both snags and down woody debris levels should increase. It recognizes that past management may have had a negative effect on these two components and that many species need these for survival.

Future management activities will be required to meet standards and guidelines for these two components. Stand enhancement activities may accelerate the creation of snags and down woody debris. Due to the shortage of firewood, however, some snags and especially down woody debris will be taken illegally. This is not expected to decrease the levels overall.

Transportation

Recent social and economics trends also have impacts on the transportation system in the Blowout. Deterioration has resulted due the reduced levels of timber harvest revenue and other funding that financed annual maintenance activities. Reductions have resulted in our inability to maintain all roads at a level that provides adequate resource protection. Roads are becoming impassable due to the lack of maintenance. If funding continues to be inadequate more and more roads will be closing themselves through road prism and drainage failures. Road storm proofing and decommissioning can move us towards a more hydrologically stable road system as funding becomes available.

People, Recreation and Scenic Resources

Heritage Resources can help direct a desired future condition within the Blowout drainage by following an ecological and functional approach to interpreting and reconstructing the human past. Archaeologists and other resource specialists can gain information not only on the function of the site but also on soil formation, environmental patterns, floral and faunal history and availability and hence their influence on the distribution of human populations. Also, we can look at human populations influence on the environment.

"An ecological approach looks at explaining macroscopic issues such as dispersal of human settlements across the landscape, basic resource exploitative patterns, the character of technologies used to manipulate elements of the environment, and the causes of the changes in these patterns through time" (Butchard;1990:9).

We can recover some of this information by first looking at the site distribution within the Blowout watershed and then through excavation of a selected number of prehistoric sites. Sediment cores can be recovered from anaerobic lakes and bogs to look at plant macro fossils to help provide records of local vegetation (Brubaker 1991)s.

Soil scientists can examine differing soil layers that are exposed through excavation. These layers and their characteristics can offer important clues to the environmental conditions under which they have form. Some of the characteristics to examine in the soil are the presence of pores caused by roots, soil fauna and water piping; the presence of roots and root traces, charcoal and earthworm castings (Parsons; 1994). All of this information can open up a window below the surface to help us understand the dynamic relationship between humans and their environment and also understand natural events and changes in forest composition.

Future Effects: A proposal for a desired future condition of the target landscape involves a corridor schema which has three components; a high elevation/ridge top corridor; a transition zone around the high elevation corridor; and a rotating corridor. These corridors will achieve various recreational settings, and enhance various wildlife and plant species which will provide some unique recreational and interpretive opportunities. Over time, the composition of the landscape will achieve desirable visual objectives. As human use increases, these impacts could affect resources and special habitats that we are trying to protect. Therefore, certain measures will need to be taken to alleviate degradation of human impact to these areas.

Management of the high elevation/ridge line corridor would promote a return of the area to pre-management structures and functions, and allow natural processes occur. The placement of this corridor is intended to provide stability and preserve the biodiversity of stands and special habitats that are more susceptible to due to harsher growing conditions.

This corridor connects riparian zones of adjacent watersheds, special habitat areas and Special Interest Areas. Cultural sites are often found on ridge lines which shall benefit from this protected corridor. The transition zone is intended to reduce the abrupt edge effects on the high elevation corridor and within the transition zone that would result from being adjacent to more intensively managed areas. Management activities would occur in these zones using new landscape techniques such as feathering, wedge designs and variable thinning. Other management activities that can reduce edge and provide varied habitat include small and irregular shaped regeneration harvest units. The rotating corridor is composed of mature and old growth stands connected with riparian buffers with a minimum width of 1000 feet. The intent of the corridor is to rotate stands for harvest while keeping the connectivity of the corridor intact.

The future Visual Condition of the watershed is expected to improve over current conditions when considering several developments and trends affecting forest management activities. With the target landscape corridor scenario, as described above, opportunities to experiment with new landscape design techniques will enhance future scenic resources. As forest manages 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, high elevation corridor 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 President's 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 future Visual Quality Objectives; and the objectives of creating and maintaining late-successional habitats.

Recreation Growth: Future recreation use in general will likely be affected by changes in various socio-economic indicators (e.g. population growth, disposable income, leisure time), the availability of opportunities, technology, weather conditions, and other variables. Studies which have developed future growth projections for recreation cannot anticipate fluctuations in weather patterns nor predict events such as economic recessions. Their projections assume that demand for recreation is present and will increase with a

growing population. Population growth rates in the mid-Willamette Valley and Portland metropolitan areas in the 1980's averaged about 1% a year but increased to 1.9% from 196 to 1990 (Walker and Macy, 1992). For the period 1980-1989, the Forest experienced a 2.7% yearly increase in all forms of recreation use. Projections of increased dispersed recreation growth patterns for various activities common in Blowout are as follows; camping (3.4%), driving/sightseeing (2.6%), hiking (4.7%), swimming (4.2%), hunting (2.6%), boating (2.6%), and fishing (2.2%). Based on these factors and the general trends in past use, it seems appropriate to assume that future participation in dispersed activities in Blowout will increase as long as opportunities are provided.

Recreation Demand and Supply: The information on recreation demand that is reported in the Oregon State Comprehensive Outdoor 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). Thus, it is clear that settings catering to these recreational standards are especially valuable to the public.
Total dispersed recreation capacity for the Forest exceeds projected total use levels through 2040 (Forest Plan 1990). This relationship, however, is not consistent among all ROS classes. Even if existing inventories of Semi-primitive opportunities were maintained, future demand is expected to exceed capacity by the year 2010. In addition, between 2010 and 2030, use within all Wilderness ROS classes will exceed inventory capacity. It is likely with future demands at Mount Jefferson Wilderness limits to daily entrances will be required. This will have implications on semi-primitive areas outside of the Wilderness, particularly displacing users to limited existing non-Wilderness semi-primitive areas. Providing areas alternative to Wilderness will be needed to help alleviate pressure of increasing numbers of visitors desiring that setting and experience. As stated in the LMP, it is anticipated that during implementation of the Forest Plan some Roadless Areas will become enveloped through road construction and timber harvest. Thus, removing Semi-primitive opportunities within the Forest and placing even more demand for this setting.

Late Successional and Riparian Reserves may represent an opportunity to provide dispersed recreation settings. Given the conservation objectives and species viability concerns associated with Reserves, it is likely these settings will result in additional protection, as well as an opportunity to provide a desired and demanded recreational setting. These areas will likely shift the ROS continuum to a more natural or Semi-primitive setting. This will be important given the high demand that exists in the region for dispersed recreation, especially for Semi-primitive settings. In context to the North Santiam River basin, this may be an opportunity to achieve this setting since there is a limited and potentially a declining supply that will be available.

Access: The absence or presence of roads is one of the most critical aspects of a setting that affects people's recreation experience. In a recreation supply and demand picture,

there is generally more than enough roaded settings to meet current and future demand. A shortage of unroaded settings is anticipated, particularly in the Semi-primitive Non-motorized setting. 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. This may provide an opportunity to create a desired setting in the future. However, it is important that key roads used in particular roaded recreation settings maintain their existence.

Providing new opportunities: According to the Detroit Lake Composite Area Management Plan summary of market demand analysis, demand for recreation use at Detroit Lake is expected to increase. Increasing demand and limited supply means there will be increased pressure on Detroit Lake as a recreation destination. Current demands for camping exceeds number of 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 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 drainage. Additional dispersed camping areas will need to be developed to accommodate the demand.

Overnight visitors seek day use activities in close proximity from the lake. Other than water-based activities, there is limited activities in close proximity to the lake. A recommendation for improving recreational opportunities and experiences for Detroit Lake visitors was to provide for more upland recreation development such as trails, wildlife viewing and interpretive opportunities for learning about the area's natural, historical and cultural resources. The Blowout drainage has many potential recreation opportunities and will provide some of these experiences to help alleviate the pressure with increasing use on the lake.

Demand for winter sports opportunities is very high on the Forest with annual growth rates for cross-country skiing at 16.3%, and snowmobiling, snowshoeing and snow play each at 4.9%. 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 also lies within the big game winter range area. Therefore, no formal development shall occur in these areas. The Five-Way Junction area located on the south boundary of the analysis area, has a higher suitability rating and lies outside of winter range. It may be developed as a winter recreation site to meet the demands of winter recreation in the future.

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Vegetation

More information and research is needed before definite answers to the key questions concerning vegetation can be offered. However, trends are evident. Many of the special habitats in the Blowout Analysis Area have been subject to management disturbance resulting from location of timber harvest and road building activities. Aside from vegetation change or loss due to direct disturbance, influence from adjacent disturbance ranges from increased exposure to natural disturbance, edge effects such as micro climatic changes and weed invasions, to loss of the ecotone between special habitat and forest. In many cases, the ecotone provides more structural, functional, and species diversity than either the forest or the special habitat. Chen (1991) reports that "the most extreme micro climatic conditions sometimes occur at the edge rather than in the clearcut." Although thorough studies have not been done to document the effects of management disturbance on different special habitat types, we need to ensure that a representative number of each of the habitat types are left undisturbed if we are ever to find out. In the Blowout, this means full protection from further management disturbance for wet special habitat types like wet meadows, ponds, bogs, and sedge meadows.

In the past, the focus for the district botanist was primarily sensitive plant survey. The change in management philosophy towards an ecosystem approach has broadened that focus to include gathering information on many other vascular plant species, as well as many other types of species (cryptogams, fungi, etc.). Site specific information is mostly lacking for many of these species, but a start has been made on the identification of important species and the gathering of information on their habitat requirements and range status. Planning for the collection of site specific information has begun and is outlined in the President's Forest Plan and in the Willamette National Forest Land Management Plan.

The ecosystem approach to management has also broadened our focus to more fully consider the role and effects of disturbance vegetation in ecosystem processes. Here again, more information is needed to adequately address this question. But the pattern of noxious weed occurrence in the Blowout offers no great surprises-infestations occur where disturbance is continuous (roads, rock pits), and these same features provide propagule source and dispersal routes for further infestation. The life history strategies of most noxious weeds involve disturbed area establishment, making total eradication where large scale disturbance occurs nearly impossible. However, establishment and spread of noxious weeds can be curtailed by controlling the pattern of disturbance as well as controlling large populations that serve as propagule sources.

Disturbance is a natural and integral part of the ecosystem, but its the compounding nature of disturbance due to management activities and overuse that is of concern-the

associated soil compaction and loss of structure and function, and the types of species that invade after these particular types of disturbances occur. Soil compaction can either preclude vegetation from re-establishing, or can change the habitat such that different plant species invade the area replacing vegetation previously present or replacing what would be the normal early successional vegetation for that habitat type. Most disturbance centers are connected by roads that provide pathways for weeds to spread. This substantial change in vegetation type, especially in and around richly biodiverse special habitat types, may well disrupt plant-animal interactions and other ecosystem processes.

Soil

Soil: The Pilot Watershed Analysis Guide requires that the results of the analysis be utilized to identify the watershed processes and ecosystem concerns that will need to be addressed at the project planning scale in different parts of the watershed, as appropriate. Noteworthy natural disturbance events are numerous and have indelibly impacted Blowout and Box Canyon in the short stretch since deglaciation. Stand replacement fires have altered the canopy cover and organic matter distribution over the entire basin probably twice within the last 800 to 1000 years and certainly within the last 250 years in many localized areas. Slope instability continues to shift both mountain sides and stream channels and profoundly influence channel morphology. Stabilized slump/ glacial complexes comprise over 12540 acres (about 37%) of the analysis area and denote an extensive history of soil movement and stream response that probably dates well back into the last glacial and perhaps interglacial periods. For certain, active slope instability has significantly altered stream conditions on many channels in as little as the last 300 years or so.

From an upland standpoint, man's activities in this basin, primarily timber harvest, have had little commensurate effect for all the supposed implications of timber management, except for the excessive removal of large woody debris. The following issues will be discussed as directed in the Pilot Watershed Analysis Guide:

A. General Planning

1. ***Slope Instability***: Most areas of larger scale, active slope instability associated with slump/earthflows have yet to be directly harvested. Indirect effects from drainage and evapotranspiration changes are not readily apparent at this point. Numerous areas not affected by harvest and road construction display movement rates equal to or sometimes exceeding management disturbed areas. Timber harvest has accelerated failure rates in some highly debris chute prone localities, but again much of these land types have been eschewed in the last decade. For the most part, translational failure features in the older plantations have now healed over and stabilized. As was explained in the previous section, actively unstable and potentially

highly unstable, not necessarily unsuited terrain has been eliminated from management considerations.

2. ***Fire Effects***: Fire is a natural ecological component of the west Cascades ecosystem. Fire recurrence intervals of 200 to 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 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 forth coming 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 wild fire management because of a growing loss of access capability.

3. ***Compaction***: 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 roll 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 land types where side slopes 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 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" o an equivalent winged ripper in order to return the site to near original productivity.

Considering that most side slopes 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.

B. Transportation Planning

Surprisingly, from a sediment generation and movement standpoint, roads have not had a significant effect on stream generated sediment and sediment budgets. Approximately 300 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% side slope 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 (78q.F.1)" 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.

Consequently, additional roading is considered acceptable in this basin. However, the previous discussion does not imply that expanding the road network is an excursion lightly traveled. Aggressive road decommissioning and storm proofing are necessary on many local roads to educe the risk of catastrophic failure during storm events. Sidecast pull back of unstable fills on steep hillsides is essential. This major focus initially will be in Cliff Creek (78r) on FS RD 1012820 and its tributaries where the worst problems occur.

Geotechnical evaluations of future roading options are necessary to reduce or eliminate potential problems. Such reports, including both the reconnaissance phase and more detailed P-line investigations, have commonly been completed on proposed road routes since the mid 1970's. FW-310 indicates that Forest development roads shall be located, designed, constructed, and reconstructed based on the following criteria: resource management objectives, environmental needs, safety, traffic requirements, traffic service levels, vehicle characteristics, road users, season of use, and economics. In order to meet the environmental needs, road design, construction and maintenance will be implemented with Best Management Practices (BMP) to meet State Water Quality standards (FW-094). Specific BMP objectives that are applicable to road construction and reconstruction will follow. They may be used alone or in conjunction with each other to reduce erosion and sediment yield to streams and wetlands.

Locate and design roads to minimize soil and water resource impacts (R-1, -4, R-10, R-11, R-12):

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 (R-3, R-3, R-9, R-20);

Minimize erosion by conducting operations during minimal runoff periods (R-9, R-20);

Minimize erosion by road cuts, fill slopes and the travel way by various soil stabilization measures (seeding, mulching, straw bales, erosion netting, etc. (R-5, R-8);

Minimize the 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 (R-6, R-7, R-13, R-14);

Insure that debris generated during road construction is kept out of streams and to prevent slash and debris from subsequently obstructing channels (R-15) (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 (R-18, R-19).

C. Restoration:

Large woody debris requirements are necessary in two different capacities: 1) on the upland side slope for nutrient recycling, soil structure maturation, and ravel reduction, and 2) in the stream channels for drainage structures and sediment storage. Large woody debris (LWD) is the one act on the timber management stage where poor performance has produced adverse effects to the natural regime. It is likely that infrequent periods of intense repeated fires in the past duplicated the loss of LWD and organic matter that was once manifested by timber management. However, this level of organic depredation is not generally evident in the study area for the last 500 to 800 years or so.

1. The lack of LWD requirements in conjunction with PUM yarding eliminated most large organic matter on units harvested from about 1975 to 1985 or 1986. This fact coupled with hotter summer and fall burns served to eliminate substantial quantities of organic material from many units. These concerns have been radically reduced in recent years with the revision of old standards or the creation of new guidelines.

   Duff Retention is the percent of effective ground cover (generally considered the duff and litter layer and based on the existing pre-management condition) that needs to remain after cessation of management activities (FW-084 and FW-085) in order to minimize nutrient loss, and to protect against erosion. Consequently, specific duff retention standards will be recommended for most management actions. In all most all instances, PUM yarding is not recommended and has been eliminated in order to provide for the retention of additional woody debris to further minimize sloughing and raveling on the steeper slopes (FW-084), and to provide for added nutrient recycling (FW-085) and wildlife habitat (FW-212). Another aspect of long term nutrient availability and ectomycorrhizal formation is the amount of larger woody material retained on site. Management activities will be planned to maintain enough large woody debris (dead and down) to provide for a healthy forest ecosystem and ensure adequate nutrient cycling (FW-085). At this time, site specific needs will be considered commensurate with wildlife objectives as outlined in FW-212a and

FW-213a (as amended). However, since fire is a natural component of the west Cascades ecology, broadcast burning under controlled conditions is an acceptable slash treatment alternative for most sites. Non-burning options should also be considered (FW-250 and FW-251). Grapple piling (on the gentler slopes), the minor spot burning of concentrations, or hand pile and burn may be other options to evaluate. These factors will have to be considered on a case-by-case basis in conjunction with silvicultural and slash treatment objectives.

2. In some areas, stream integrity has been seriously compromised by the harvest of timber both in the riparian areas and in the uplands. In the stream channels this is evidenced by the lack of structure and sediment storage, and either extensive bedrock channels or conversely long riffle reaches. In the uplands, debris chute areas without large woody debris have moved only sediment into the channels. In many cases, this has resulted in either the complete stripping of sediment and structure on higher gradient reaches, or the overloading of existing structures on the lower gradient sections. The importance of large woody debris and stream structure can not be over emphasized. On a portion of a Cliff Creek tributary, for example, on an unharvested hillside, several thousand cubic yards of material failed directly into the channel about five years ago. Almost no sediment moved down stream (except suspended) because of a massive debris jam that was created as the cover of timber on the slide area piled up in the creek bottom. Specific restoration opportunities will be outlined in the Hydrology Report.

D. Indirect and Cumulative Effects Assessment

At this time, no single unit measure of long-term soil productivity is widely used. Information on the survival and growth of planted seedlings may indicate short-term changes in site productivity. However, the relationship of short-term changes to long-term productivity is not fully understood at present. Experience indicates that the potential impacts on soils are best evaluated on a site specific, project by project basis. The major soils concerns - compaction, nutrient loss, displacement and instability - are most effectively reviewed, for both short and long-term effects, at the project level. With proper project implementation unacceptable cumulative effects on the soils resource are not anticipated (BMP W-5). Consequently, the utilization of soil protection measures and best management practices will generally preclude the need for additional cumulative effects analysis. Deviations from the standards and guidelines would be the primary trigger for a cumulative effects review.

E. Monitoring:

Prescriptions for soil protection, watershed considerations and riparian needs take into account past and predicted future land management activities. The soils mitigation measures, as well as the streamside management zones, are designed to provide a level of riparian habitat protection and erosion control that is consistent with the standards and guidelines of the Willamette National Forest's Land and Resource Management Plan (1990). On site sedimentation is anticipated to be within National Forest and Oregon State Guidelines. With project implementation, site specific prescriptions or mitigation measures are designed to meet or exceed the requirements outlined in the General Water Quality Best Management Practices Handbook (Pacific Northwest Region, November 1988). As project development proceeds, appropriate constraints or mitigations may be added or changed in order to better meet the intent of adequate resource protection or enhancement as directed in the 1990 Willamette National Forest Land and Resource Management Plan and Final Environmental Impact Statement. 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.

Hydrology

The goal of this analysis was to systematically evaluate resource characteristics and establish the relative value of their functions on the landscape. In reviewing the Blowout water analysis it is apparent that fire, flood, and management of the large wood, within the watershed were the main functions. Changes in the spatial and temporal differences between fire and management and reduction of large wood, within the riparian areas, created characteristics of the watershed. The overlying function that had the greatest effect was large woody material reduction within the riparian reserves.

The Detroit and Big Cliff dams currently have a positive and negative effect on downstream water resources. These need further investigation and discussion at a much larger scale than the Blowout analysis area to place tem in perspective.

Riparian reserve delineation was done and various widths were prescribed utilizing a seven step process that looked at 1. upslope stability; 2. stream energy; 3. channel bank stability; 4. vegetation; 5. beneficial uses; 6. restoration; and 7. creation of final prescription. As a result of this analysis 5,819 acres were prescribed as riparian reserves. Direction was provided to the manager as to the associated risks surrounding the riparian reserves and management opportunities, and site specific information was provided to the manager.

Potential management opportunities were developed to help bring the existing condition into the range of natural variability.

Fisheries

Large woody material(LWM) - The current conditions indicate many of the streams in the Blowout watershed are not meeting objectives for LWM. Much of the streamside area in Blowout Creek is dominated by alder. There are few large trees in many reaches to supply LWM to the stream. Even in some of the areas in Blowout Creek with large trees left near the stream there is little in-stream large wood. Historically LWM probably entered the stream from blowdown, slope failures and to a lesser extent channel movement. The primary impact to the recruitment of LWM to the system has been timber harvest in the riparian zones beginning in the late 1930's and early 1940's. Another impact to large wood in Blowout Creek was the stream cleanout the Forest Service did in the late 1950's and then again in 1967 after the "1964 Flood". This virtually removed all of the large wood in Blowout Creek from the Forest Boundary to just below Hawkins Creek.

Quality Pools - Many of the streams in the Blowout Watershed have low numbers of quality pools. Most of these are also the same streams that are low in large wood complexity. If the assumption is made that the amount of large wood complexity is a major influence on the number of quality pools present in a stream then the discussion above for LWM also fits here.

Width:Depth Ratios - Width to depth ratios are highest in Blowout Creek. The cleaning out of the stream channel in the 50's and 60's and the road up Blowout Creek that confined it to its existing channel are all contributors to the widening and shallowing of the stream. The increased energy due to removal of complexity and straightening of the channel changed Blowout Creek to a more riffle dominated system.

Temperature - Surveys since 1991 have shown that many of the streams in the Blowout watershed have exceeded or come close to exceeding State water quality standards for temperature. The streams with the highest temperatures are Blowout and Ivy Creeks. High summer time, low flow temperatures are primarily due to high amounts of thermal input due to lack of stream cover and shading. Wide shallow streams also increase the amount of thermal input received. Many of the streams have had significant amounts of timber harvest in the riparian zones that removed much of the streamside shading. Blowout Creek and Ivy Creek had significant harvests in the late 60's and 70's that probably contributed to the high stream temperatures in the early 80's. The smaller streams seem to be showing a trend of lowering temperatures as vegetation begins to shade the channels again. It is probably taking much longer for Blowout Creek to respond due to its much larger size and therefore the much larger trees needed to provide shade.

Protection of Quality Habitat

The protection of already existing quality habitat is essential. The key is establishment of

appropriate riparian reserve boundaries that would buffer the stream from up-slope activities and provide for long term needs of large wood and shade. Management of proposed non-riparian reserve related activities such as road building, mining, and recreation development should closely follow the direction for Management Area 15 in the Forest Plan (USDA 1990) and for Riparian Reserves in the ROD (USDA/USDI 1994).

This is also an important first step in restoring habitat that has been degraded by past management activities. Without this level of protection, the effectiveness of restoration activities could be jeopardized.

The proposed riparian reserve widths in Figure 7a should be, along with any future needed site specific changes, sufficient to protect existing and future riparian and stream values.

Wildlife

Both natural processes and management have had an influence in shaping habitat and wildlife populations of today. Fire, wind, insects and disease, floods, and landflows have all had some effect on the landscape. Management has probably had the largest influence with many negative effects for late-successional associated species: fragmentation of habitat, loss of habitat, loss of essential components, and increased populations of edge dependent species.

50-11-40 analysis was done on the district and two of 11 quarter townships within the Blowout Analysis Area are in violation with three quarter townships at minimum or very near minimum levels. This analysis indicates the amount of spotted owl dispersal left within a given area. The ROD has delineated riparian reserves to serve as dispersal habitat. Many species beside the spotted owl are reliant on riparian reserves in some aspect of their life: invertebrates, amphibians, bats, red tree vole and marten to name a few.

Each quarter township was analyzed for the amount of dispersal habitat remaining within riparian reserves. Amounts of small, medium, and large structure were measured for these riparian reserves and the percentage of habitat remaining computed.

Analysis has shown that two quarter townships are below 50% within riparian reserves and mitigation for this may be to exceed SAT buffer widths. SAT buffers were retained in the rest of the quarter townships because no surveys have taken place for species outlined in the ROD.

Currently, 35% of the Blowout watershed is owl habitat. Twenty-two spotted owl pairs/resident singles reside in the watershed of which 16 are take. Fragmentation ad loss

of habitat have resulted in this finding. A corridor system was developed to maintain interior habitat and adequate dispersal habitat. Gaps were identified within the corridor and these stands will be highlighted to receive stand enhancement activities to accelerate growth of these areas.

Six out of nine subbasins are in violation of standards and guidelines dealing with snags and down woody debris levels. New standards and guidelines outlined within the ROD should help mitigate these findings as well as incorporating innovative ideas on the landscape to increase these levels.

Three management emphasis areas for big game are also in violation with 1 management emphasis area at minimum standards. All five management emphasis areas are in violation of S&G's within winter range. The Wisdom Model was used to determine these findings and it was found that cover, forage and roads were limiting factors in many of these areas.

It was determined that we are within the range of natural variability for late-successional forests but it is unknown for wildlife populations. However, we are near the low end and measures for increasing late-successional forests will be implemented.

This analysis has shown that many things are unknown and much work needs to take place before questions are answered. With the implementation of the President's Plan, we may see an upward trend in some of these areas and move away from species being listed to species being de-listed over time.

Transportation

The Willamette National Forest Land and Resource Management Plan establishes a goal for the transportation system to provide visually pleasing and efficient access for the movement of people and materials involved in the use, protection and management of forest lands. It also states that design and construction techniques will be employed to make roads lay easy on the land, reducing potential soil erosion and mass movement. Reconstruction projects will correct or alleviate erosion and road stability problems and provide for safe public access.

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 sets further objectives for the management of the road system:

1. Federal, state, and county agencies should cooperate to achieve consistency in road design, operation, and maintenance necessary to attain Aquatic Conservation Strategy objectives.

2. Each existing or planned road must meet the Aquatic Conservation Strategy objective.

3. Determine the influence of each road on the Aquatic Conservation Strategy objectives through watershed analysis.

4. New culverts, bridges and other stream crossing shall be constructed, and existing culverts, bridges and other stream crossings determined to pose a substantial risk to riparian conditions will be improved, to accommodate at least the 100-year flood, including associate bedload and debris

5. Minimize sediment delivery to streams from roads.

6. Provide and maintain fish passage at all road crossings of existing and potential fish-bearing streams.

7. Develop and implement a Road Management Plan or Transportation Management Plan that will meet the Aquatic Conservation Strategy objectives.

Existing systems and programs meet some of these objectives. Through this analysis deficiencies have been found that point to the need for future projects to fill in the information voids.

The principle goal in reference to the transportation system in this analysis, is to develop a transportation management plan for each road that will meet the Aquatic Conservation Strategy Objectives. First the Interdisciplinary Team established four levels of use, one of which would be applied to each road in the analysis area.

1. Open: Open to all traffic. Seasonal restrictions can apply to any road under this designation.

2. Administrative: Unlimited administrative use. Closed to all public vehicular traffic. Seasonal restrictions can apply to any road under this designation.

3. Restricted: Closed to all public vehicular traffic. Administrative use is limited to one round vehicular trip per month. Use must be monitored and trip limits enforced. Administrative use is permitted in fire emergency situations. Seasonal restrictions can apply to any road under this designation.

4. Closed: Closed to all vehicular traffic. Roads will be decommissioned to a level needed to stabilize roadbed, eliminate potentials for storm damage and preclude the need for annual maintenance.

Each resource representative looked at the roads and determined the level of use that would best fit its resource needs. Using the four key issues of Sedimentation Production, Road Densities, Access and Travel Management and Economics, the Interdisciplinary Team determined a level of use for each road. Much compromise was used to mediate between conflicting needs. This recommendation will assist future access and travel management plan strategy to move towards the target landscape that we developed for the Blowout.

People, Recreation and Scenic Resources

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. 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.

Factors that have influenced site degradation: 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.

Prior to the late 1970's the Forest Service showed very little interest in past human activity. District personnel collected some data on site locations encountered in the field while accomplishing their other duties (Rakestraw 1990). Beginning around 1978-1979 site discovery has been accomplished through systematic surveys for a broad range of ground disturbing projects and from informants on and off the district who provided archaeologists with site location information. This resulted in a dramatic increase in the number of sites located and recorded. In turn, measures were recommended to protect historic values inherent in these properties. Site protection measures range from complete avoidance of the site and corresponding protection of its environmental setting to mitigation procedures which conserve the historic or scientific values of the resource (FW-267). Sites found to be eligible to the National Register of Historic Places are afforded protection under Standard and Guideline FW-268.

Site disoverability is greatly influenced by visibility factors. The western Cascades forest has very dense understory brush and a thick duff layer of moss. Many areas support thick ground cover of salal, Oregon grape, beargrass, and ferns. These conditions create a

challenge for the surveyor when it comes to site discovery. The Willamette National Forest archaeologist's have adopted the survey method of scraping the duff down to mineral soil every 25 to 30 meters at regular intervals to help facilitate site discovery in areas with a high probability of site discovery.

Most sites have incurred a varying degrees of site degradation through root production of plants and trees, trampling by game animals, burrowing by small mammals, erosion and freeze thaw cycles, and wind thrown trees.

Future Management Considerations: A proposal for a desired future condition of the target landscape involves a corridor schema which has three components; a high elevation/ridge top corridor; a transition zone around the high elevation corridor; and a rotating corridor. These corridors will achieve various recreational settings, and enhance various wildlife and plant species which will provide some unique recreational and interpretive opportunities. Over time, the composition of the landscape will achieve desirable visual objectives. As human use increases, these impacts could affect resources and special habitats that we are trying to protect. Therefore, certain measures will need to be taken to alleviate degradation of human impact to these areas.

Management of the high elevation/ridge line corridor would promote a return of the area to pre-management structures and functions, and allow natural processes occur. The placement of this corridor is intended to provide stability and preserve the biodiversity of stands and special habitats that are more susceptible to due to harsher growing conditions. This corridor connects riparian zones of adjacent watersheds, special habitat areas and Special Interest Areas. Cultural sits are often found on ridge lines which shall benefit from this protected corridor. The transition zone is intended to reduce the abrupt edge effects on the high elevation corridor and within the transition zone that would result from being adjacent to more intensively managed areas. Management activities would occur in these zones using new landscape techniques such as feathering, wedge designs and variable thinning. Other management activities that can reduce edge and provide varied habitat include small and irregular shaped regeneration harvest units. The rotating corridor is composed of mature and old growth stands connected with riparian buffers with a minimum width of 1000 feet. The intent of the corridor is to rotate stands for harvest while keeping the connectivity of the corridor intact.

The future Visual Condition of the watershed is expected to improve over current conditions when considering several developments and trends affecting forest management activities. With the target landscape corridor scenario, as described above, opportunities to experiment with new landscape design techniques will enhance future scenic resources. 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, high elevation corridor 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 President's 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 future Visual Quality Objectives; and the objectives of creating and maintaining late-successional habitats.

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Chapter 8

VIII. Riparian Reserve Width Prescriptions

Maps

VIII. Riparian Reserve Width Prescriptions

One of the principal objectives of the watershed analysis is the design of site specific prescriptions for riparian reserves. These site specific prescriptions were done in a staged but integrated process. At each stage a minimum acceptable riparian reserve width was established to meet resource needs. The next stage used that minimum width as a starting point and added to it, if necessary, to meet additional resource objectives. The order of analysis was upland condition, hydrology, fisheries and wildlife. The following is a description of the process.

A. Upland Condition

In order to determine the type, aerial extent, frequency, and intensity of watershed processes, including mass movements, surface erosion, and other processes affecting the flow of water, sediment, organic material, or disturbance through a watershed soils and geology considered the following processes.

Two components that formed the foundation for the analysis process were (1) the 1990 Willamette National Forest Land and Resource Management Plan (LRMP) which includes Management Area 15 (MA-15) Standards and Guides for Riparian Protection; and (2) the professional judgement of resource personnel that developed from experience and intensive field reconnaissance and review. Management Area 15 (MA-15) preserves and enhances the vegetation and lands adjacent to rivers, streams, and lakes, as well as other wetlands for animal and plant species that are dependent on them. The basic LRMP MA-15 Standards and Guides MA-15-01 to MA-15-41 represent the collective thought and wisdom of over a decade of prior experience by Willamette National Forest watershed personnel.

A fundamental constituent of watershed analysis, and an appropriate place to begin the inquiry, is upland condition. Upland condition involves a complex set of interacting variables that includes geology, topography, climate, soils and vegetation. The relative importance and performance of these attributes is best assessed ad critiqued by qualified personnel engaged in intensive field level investigation and data collection in a systematic and meaningful manner. Field work generally followed a relatively specific sequence that attempted to develop a "story" about the landscape and provided the basis for the technical conclusions. In specific, the principal performers on the upland stage are; 1.) geomorphic setting, 2.) landtype distribution, 3.) soil suitability, 4.) slope stability, and 5.) site productivity (*see figure 8a*)

This process started with a determination of the geomorphic setting or the basic geologic framework in which the landscape was formed. Landtype distribution was determined by entirely re-mapping the project area, based on intensive field reconnaissance and utilizing the 1973 WNF Soil Resource Inventory definitions. As

part of this landtyping process, soil suitability was evaluated. Unsuited soils were designated in two categories: unreforestable and irreversible impact from active slope instability. When actively unstable or potentially highly unstable areas were encountered, additional field review occurred to determine the failure history and the likely future failure potential that was anticipated (based on a geotechnical review) (*figures 8b and 8c*). Lastly, site productivity was evaluated to determine regeneration potential, erosion resistance, management opportunities, and needed mitigations. These five activities just as often occur simultaneously as sequentially in order to manage a multiple working hypothesis about the landscape and finally to settle on a likely geologic context and time frame for basin morphology and erosion rates.

One of the principal objectives of the watershed analysis is the design of site specific prescriptions for riparian reserves. In this report, these are formulated within the conceptual framework of "minimum adequate protection". Riparian reserves are additive outward from the stream. Prescriptions for non soil/water related resources are justified on their own merits. The soil/water portion is an integrated prescription that begins with an Upland/Slope Stability Riparian Reserve Objective which defines a riparian reserve width based on upland condition only. It ends with a final riparian reserve designation that also considers beneficial use, water quality, and stream channel condition. In all cases, except where spatial factors (size of the specific subdivision under review) come into consideration, riparian reserve widths are maintained or increase over the upland distance, when hydrologic factors are considered.

The basic building blocks for the Upland Slope Stability Riparian Reserve prescriptions are the MA-15 Standards and Guides and the FEMAT standards and quides. With the MA -15 direction, buffer widths are shown as acceptable ranges. The range of acceptable widths for the various stream classes is as follows: (horizontal width)

Class I:	150 to 400 feet.
Class II:	100 to 200 feet.
Class III stable:	50 to 100 ft.
Class III possibly unstable:	75 to 125 ft.
Class IV stable:	No prescribed buffer necessary.
Class IV moderately stable -	25 to 50 feet.
Class IV potentially unstable:	25 to 100 feet.
Ephemeral channels -	No protection.

The basis used to develop the upland prescription is the LRMP MA-15 Standard and Guide at the lower range of adequate protection. Each of the five factors - geomorphic setting, landtype distribution, soil suitability, slope stability, and site productivity - will be considered and evaluated in light of the low range of acceptability for adequate riparian

protection. If this low range appears acceptable for the specific topic being considered, then a sidewards arrow (---->) is displayed in the evaluation box. If an increased riparian reserve distance is considered necessary, based on upland conditions, then an upward arrow (/|\) was designated. All factors were not considered equally and the summing of arrows does not indicate a direct correlation with absolute distance. Buffer widths were increased when the field evidence indicated more protection was required to meet the WNF LRMP and the President's Plan DEIS. As it was defined as such, the President's Forest Plan interim widths for Riparian Reserves provides a high level of fish habitat and riparian protection. Consequently, the distances outlined for the Interim Riparian Reserve widths are considered an upper limit of acceptable protection. Table 4 shows the form utilized and contains a more detailed explanation of the five factors and the specific analysis items include for each.

B. Hydrology

Evaluation Process: A seven step process was followed to evaluate and interpret the existing information, creating a logical, standardized means of prescribing riparian reserve widths (*See Tables a, b, c, d*). These steps are:

1. Upland Condition; the geology and soils report a prescribed Rx was developed taking into account five variables; 1. Geomorphic Setting, 2. Land type distribution, 3. Soil Suitability, 4. Slope Stability and 5. Site Productivity. This information was then used to establish minimum riparian reserve widths.

2. Stream Energy Signature; are characteristics that represent the amount of energy the stream has to do work. Some of the obvious characters are substrate, gradient, width depth ratios, residual pool volume, and whether the area is a transport reach or a depositional reach. In order to calibrate ones eye similar streams within in the same geologic setting were observed. Streams where disturbance was a minimal, were the used as base level, to compare other streams against. A crude type of paired watershed analysis was done. Taking this information into the analysis process one needed to compare similar settings. Questions then asked were: does the substrate fit the gradient; does it fit the drainage characteristics; does it match the parent material present, or was it imported from upslope; is the channel storing sediment; does anything look out of place or different from its minimally disturbed comparative stream?

   If upon answering these questions it look as if the stream was of a high energy signature, and this was due to past management eg. large wood removal, clearcutting, road drainage, the riparian reserve area would be increased. If the stream appeared to be of a characteristic signature for that

class stream the riparian reserve area would be consistent with the upslope prescription. If the stream appeared to be of a characteristic low energy signature and the past management was intensive a lower riparian reserve width may be prescribed. Under the last scenario it is important to note that the deviation from the upland prescription would be a result a scale. Upland prescriptions are based on geologic settings and streams occur in atypical settings that don't fit general geologic settings.

Upon reviewing all of the information on the previous forms a decision as to the adequacy of the upland prescriptions was made. Documentation as to the deviations from the upland prescription were made. Wider/Same/Narrower?

3. Channel Stability; Elements considered in this step include Upper channel bank condition, presence absence effectiveness large woody material, Vegetative rooting strength for channel banks, unstable land within riparian reserve, and embeddedness of substrate. Starting with the upland prescription a similar thought process to number 2 occurred. Questions asked: Are upper banks stable; is wood present as an energy dissipator; type of vegetation providing rooting strength; is there moss in the channel; does substrate move readily; are there any unstable areas toeing in the channel; how much of an increase in peak flows would it take to mobilize wood or channel bank material; and how fast does channel recover from a input of sediment? The question was then asked; is the upland prescription adequate? Increase in riparian reserve widths would be the result of channel banks showing recent raveling and instability being present within the channel. If the channel appears to be characteristic of the paired channel reviewed upland prescription would stand. If the channel appeared to be very stable and have adequate wood and be resistant to increased peak flows a narrower Rx would be prescribed. Spatial considerations like in number two are important.

   Upon review all of the information from the previous forms and answering the question above a decision would be made Wider/Same/Narrower than upland prescription.

4. Existing Riparian Vegetation (*see figure 8c*); The size class, stand composition, diversity, and existing widths were looked at to determine if existing vegetation would adequately provide the needed structure for stream channel. If small size class material was present and diversity was lacking, an increase in the riparian reserve widths would be prescribed. If the size class had good diversity and a mix of size classes the upland prescription would be maintained, and if the riparian area was dominated by large size class and diversity was evident the prescription would be narrower

than the upland prescription.

Upon reviewing all of the information on the previous forms a call as to the adequacy of the upland prescriptions is made. Documentation as to the deviations from the upland prescription are made. Wider/Same/Narrower?

5. Beneficial Uses; beneficial uses were used as a flag for additional protection. An example of the way the flag was used was if fish or any other aquatic uses were identified a review of the adequacy of refugia area within the upland prescribed riparian reserves were considered. If these areas were considered marginal to maintain the refugia areas riparian reserve widths were increased. If adequate, widths were maintained and if more than adequate reduced. Other beneficial uses within the area were considered in the same manner. Recreation was the only other use that modified prescription other than aquatic resource.

   Upon reviewing all of the information on the previous forms a call as to the adequacy of the upland prescriptions is made. Documentation as to the deviations from the upland prescription are made. Wider/Same/Narrower?

6. Restoration: under this step restoration opportunities were looked at to determine if through restoration the riparian reserve widths would change. Upland areas, Streams, roads, and road crossing were the focal point of this step. If through restoration or lack of restoration narrower, wider, or similar reserve widths would be needed they were adjusted accordingly.

   Upon reviewing all of the information on the previous forms a call as to the adequacy of the upland prescriptions is made. Documentation as to the deviations from the upland prescription are made. Wider/Same/Narrower?

7. Final Stream Prescriptions; final riparian reserve widths are then established looking at all of the component parts and making a judgement. These parts are Steps 1-6 mentioned above. The rational for the changes were then documented. Steps were not all equal in importance. To capture a somewhat conservative stance but yet be defensible, the rational considered the magnitude of each step. An example would be; A class III stream channel with high stream energy and unstable channel banks, increase in width would be required. Looking at each step to determine if the major theme is, that reserve widths should be wider, they were made wider. If the theme was split, with a mix of wider and similar width prescriptions, the prescription would be made wider or maintained at the upland width. Only when all of the steps indicated a narrower width, was the prescription made narrower than the upland recommendation.

It is important to note at this time that if a fisheries was present in one PDIV area that riparian reserve areas would be maintained or increased as one goes down stream.

C. Fisheries

The fisheries biologist then reviewed the hydrology criteria and determined if reserve widths needed further adjustment.

D. Wildlife

The wildlife biologist used the following procedure to further refine riparian reserve width. Part of the function of riparian reserves is to serve as spotted owl dispersal habitat.

1) determined 50-11-40 by quarter township
2) determined amount of spotted owl nesting and foraging habitat within the riparian reserve
3) determined amount of 50-11-40 within riparian reserve, then did analysis to show difference between 50-11-40 and nesting and foraging habitat
4) completed circle analysis for spotted owls and determined take situations at 0.7 and 1.2 miles
5) looked at connectivity within riparian reserves and species requirements
6) where 50-11-40 was below recommended levels in small portions of quarter townships, recommended riparian habitat manipulation to bring the habitat into conformance with standards for dispersal habitat. If a lot of the quarter township had little or no dispersal habitat in the riparian reserves then pine marten and pileated woodpecker habitat areas were retained and/or riparian habitat and proposed for manipulation to create dispersal habitat faster.
7) where 50-11-40 was met - full SAT buffers were recommended because we don't have any survey information on species in question, to reduce buffers at this time.

Figure **a. PSUB: Upland Condition Evaluation Form**

Basis for comparison is Land and Resource Mangement Plan (MA-15-03 Standards and Guidelines at the lower (narrower) range of adequate protection.

Geomorphic Setting **Slope Forming Process**	Geologic history, primarily late Pleistocene and Holocene geomorphic events. Basis sediment delivery mechanisms and time frames in which they operate. West or High Cascades physiographic province	
Landtype Distribution **Description**	Complexity of landtypes, their spatial orientation and distribution across the landscape. Location of critical soils in relation to other landtypes	
Soil Suitability	Type, amount, and distribution of unsuited lands	
Slope Stability **Sediment Delivery**	Amount of potentially unstable, not necessarily unsuited lands. Translational or rotational failure mechanisms and movement rates. Failure history.	
Site Productivity	Range of Site Class and regeneration potential. Moisture holding capacity. Resistance to disturbance from natural or management induced events. Basis for suspension and duff retention objectives	

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Chapter 9

IX. Desired Conditions

Maps

IX. Desired Conditions

Using the Land Management Plan as a basis for the desired condition, several changes were proposed after the analysis was completed. Those changes included:

1. **Additional area added to the Late Successional Reserve that was originally proposed to be mostly on the Sweet Home Ranger District.**

   Originally the President's plan called for very little of the analysis area to be a Late Successional Reserve. It was recommended and accepted that the Box Canyon subdrainage portion of the analysis area be designated in the President's plan as a Late Successional Reserve. Because of the steep nature of the drainage, little harvest has occurred in the northern portion of this drainage. For this reason, it contains a relatively large, contiguous block of mature/old growth timber that would take many decades to reproduce. In addition, the area currently supports spotted owls and would serve as a north/south link between late successional reserves.

   From a historical perspective, it appears that this area is less fire prone than the eastern portion of the analysis area (at least in the last several hundred years) so from an ecological standpoint it probably served a similar function in pre-management days.

2. **Riparian Reserve Widths Modifications**

   Riparian reserve widths would be 170 ft. standard tree height. Riparian reserves would generally be default widths as proposed in the President's Plan. In one area, resource concerns would require that the widths be wider than recommended in the President's Plan.

3. **Corridor Proposal**

   The proposed Blowout corridor schema includes three basic components: a high elevation, ridgetop corridor; a transition zone around that corridor, and a rotating corridor (mostly in winter range).

   High Elevation Corridor

   The high elevation corridor is located on the ridgetops surrounding Box Canyon and along the southern ridgetops of Blowout along the Sweet Home Ranger District Boundary. Placement of this corridor is intended to provide stability o, and preserve the biodiversity of, stands and special habitats in the inherently diverse silver fire and mountain hemlock zones that are more

susceptible to disturbance due to harsher growing conditions. Connectivity between special habitats, riparian zones and adjacent watershed also serves to facilitate dispersal and migration of species within these areas. Isolation of these stands and special habitats due to timber harvest compounds the effect of exposure to the elements and predations, and may lead to both the overuse of these habitats and the genetic instability in populations that occur there.

Management in this corridor should be limited to those activities that have no effect on, or actually promote a return of the area to pre-management structure and function. Such activities as thinning, pruning, and special forest product sales should be allowed as long as no detrimental effects on this goal can be identified.

Transition Zone

This zone is intended to reduce the abrupt edge effects on the high elevation corridor and within the transition zone that would result from being adjacent to more intensively managed areas. It would also provide more varied habitat for resident and migrating species. This zone could serve as an area to evaluate new techniques in buffer design (e.g. feathering, wedge designs, and variable thinning, with the resulting opportunity to manage for uneven-aged stands.

Other management activities that can reduce edge and provide varied habitat include small regeneration harvest units, as well as irregularly shaped units which can provide some edge habitat without large openings that would attract disturbance species and increase exposure to wind. To insure the effectiveness of this zone, special attention should be paid to long term stand scheduling.

Rotating Corridor and Zone

From where the high elevation, ridgetop corridor ends, a larger zone continues to go around the Blowout drainage, with two bridges through the middle of the drainage from east to was. This zone is for a rotating through time, mature and old growth corridor that consists of a combination of connected stands and riparian buffers with a minimum width of 1000 feet. The emphasis for this corridor is to manage for old growth characteristics that benefit species dependent on old growth habitat. This corridor lies mostly within the western hemlock zone. Corridor with will be variable and dependent on the dimensions of selected stands and riparian zones. The 1000 foot minimum width is viewed as a way of connecting the larger stands and riparian buffers while minimizing edge effects within these areas. Based on the standard

estimate that a buffer of two tree lengths ameliorates microclimatic effects, the very center of such a minimum connecter strip should retain interior characteristics. We have already designated the stands that will fit this criteria for a corridor in 50 years (the corridor nearly exists now, a few stands need more growth). The intent of a rotating corridor is to schedule stand so that it is not necessary to remove them from the timber base. When other stands have growth up to support another mature/old growth corridor, stands from the original corridor can be scheduled for harvest. It is expected that a minimum percentage will be set for the old growth component. Location of the rotating corridor zone is intended to include a mix of different habitat types other than riparian, from special habitat like wet meadows to fire regenerated pole stands which provide habitat for a different assemblage of prey species. This zone also includes a large range of elevations and aspects.

Management options being considered to maximize old growth characteristics include fertilization, pre-commercial and commercial thinnings, creations of snags and small openings, hardwood plantings, and uneven aged management of stands.

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Fisheries

Proposed future management of riparian and in-stream conditions for fisheries should be aimed at those habitat features that are most limiting that habitat potential.

In much of the Blowout watershed these are high water temperature and the lack of habitat complexity due to lack of large wood in the channel.

Temperature: Reducing stream temperatures is a long term objective that is tied to the recover of streamside vegetation along with an increase in stream complexity and reduction of stream surface area exposed to solar radiation. Speeding up the process of temperature reduction can be done through active management of streamside vegetation for larger trees and more cover. This could be accomplished through thinning of conifer stands for increased growth and thinning and underplanting alder stands with conifers, for future larger trees.

Potential project sites are found along many of the streams in the Blowout watershed. Target areas for vegetative management are streams that have show the highest temperatures. These are found along Blowout Creek, Cliff Creek, Ivy Creek and Divide Creek.

Habitat Complexity: The streams in the Blowout watershed like most other stream systems of similar size in forested areas are dependent for much of their habitat complexity on the interactions of large wood and boulders within the stream channel. The natural input of large wood for stream complexity comes from trees falling into the channel, movement of the channel across the floodplain, and slope failures moving trees into the channel. This input has been cut off in many parts of the watershed due to harvest and salvage in streamside areas which removes large wood for future input. The other reason for the lack of large wood in Blowout Creek is the actual removal of wood from the channel that was done in the late 50's and after the 1964 flood. This was done to facilitate water movement in the channel and reduce the risk to improvements such as the roads and bridges in Blowout Creek.

There are two way to recover the complexity lost from those actions. The first is to wait 100 to 200 years or longer for natural wood recover and the second is to actively pursue a program of re-introduction of large wood and boulder complexes into the stream channels presently lacking that complexity.

A program to being restoring complexity to Blowout Creek was begun in 1991 and continued in 1992 and 1993. These sites are being monitored for effectiveness of the structures and more complexity may be added as needed. New sites may also be added. Other streams are also being evaluated and projects may be developed for cliff Creek, Divide Creek and Ivy Creek.

Transportation

Update the inventory of the road system for GIS and TMS programs and revise Road Management Objectives as needed.

Inventory road system to determine storm proofing and decommissioning needs.

Upgrade stream crossing to allow for fish passage and design for 100-year stream flow.

Re-route drainage to stable receiving areas.

Relieve inboard ditchline more frequently.

Replace deteriorated culverts.

Harden road prism through rock replacement.

Mulch and re-vegetate bare, erosion-prone surfaces such as cuts and fill slopes wherever sediments have access to the stream systems.

Remove culverts and replace with low maintenance drainage system.

De-compact road surfaces by scarification and replant.

Waterbar and outslope.

Seed and plant native vegetation on decommissioned roadbeds.

Apply site-specific drainage solutions wherever erosive concentrations of road drainages or streamflow are causing sediment delivery to streams.

Road 10, mile point 8.8, relocate ½ mile of road around major slide area. Estimated cost in 1994, approx. $175,000.

Road 10, mile point 14.75, repair a major slump. Estimated cost in 1994 approximately $75,000.

Road 10, mile point 5.6 to 13.32, minor patching and slurry seal. Estimate cost for 1994 approximately $41,000.

Road 1013 220, repair slipout and replace log stringer bridge with arch pipe.

Cliff Creek bridge, road 1000 068, will need replacement if a management of the area requires a larger yarder.

Wildlife

Snag creation
Forage seeding
Peregrine falcon habitat enhancement
Meadow enhancement
Eagle monitoring
Beaver pond enhancement

The following description will cover the big projects. Projects such as browse cutbacks, incorporating down woody material into stand that are deficient in down woody material, planting fruit-bearing shrubs, placing structures (bluebird boxes, squirrel, etc.), and riparian plantings are not identified due to the small nature of these projects and not being able to identify those areas on photos. Also, snag creation may take place in harvest units, but until these are identified, a description cannot be given.

Location	Problem/Project
T11S, R5E, Sections 8 and 17	Meadow encroachment- extend meadow into timber to aid in cover and forage. Plant shrubs along edges of meadow area.
T11S, R5E, Section 16	Seed and fertilize two units. Small pond off 1133 road and 339 spur - plant screen of trees near pond. May be other things to do here too.
T11S, R5E, Section 15	Newly cut unit (Section 15 and 22) - Seed and fertilize, top some trees, maybe bat boxes. Re-distribute down woody material from just above cut unit into unit. Seed and fertilize this area. Meadow area along 349 spur to look at.
T11S, R5E, Section 14	Unit at end of 360 spur - top some trees, non-game songbird boxes, plant fruit-bearing shrubs, bluebird boxes. Sedge plantings along Cliff Creek (possibly).
T11S, R5E, Section 23	Seed and fertilize two burned units. Bigger unit- bird boxes? Three meadow areas - 1- pothole for herps; 2 and 3 - alder thinnings, and maybe other projects for neo-tropical migrant birds.

T11S, R5E, Section 24	Pond - thin stand around it slightly, wood duck boxes, incorporate down woody material from stand into pond, plant cattails, make island in middle for waterfowl.
T11S, R5E, Section 19	West side of Pinnacle Peak - marshes and meadows - calving areas?, incorporate down woody material, bird boxes, thinning, sedge plantings in pond area.
T11S, R5E, Section 30	Near 1014 jct. and marsh area - plant deer browse
T11S, R6E, Section 31	Two meadow areas - thin alders, possibly calving area.
T11S, R6E, Section 29	SE- to some trees here SE NE off 077 spur- top trees and bluebird boxes
T11S, R6E, Section 28	Marsh- plant hardwoods around edges
T11S, R6E, Sections 21 and 28	Top trees in blowdown area, bluebird boxes
T11S, R5E, Section 15	Thin meadow area inside timber. Seed and fertilize unit off 270 spur, top trees in unit between 2236 road and 455 spur (SE).
T10S, R5E, Section 26	SW meadow-like area- create permanent meadow
T10S, R5E, Section 35	NE alder patch - convert alders to cottonwoods and willows.
T10S, R5E, Section 25	SW wet meadow near Beard Creek - clear alders
T10S, R5E, Section 35	Hardwoods along road - create permanent meadow
T10S, R5E, Sections 22 and 23	Blowout Cliffs - enhance peregrine habitat - create suitable ledge for nesting.
T11S, R6E, Sections 6 and 7	Blowout beaver ponds- interpret site, parking area, deepen ponds, move down woody material, viewing blinds, etc.
T11S, R6E, Section 6	Below Blowout beaver ponds- create permanent meadows.
T11S, R5E, Section 1	Two Low Blow units - seed and fertilize, plant fruit-bearing shrubs
T11S, R5E, Section 1	068 spur- convert to cottonwoods and willows
	Two ponds on 820 spur- sedge plantings for herps,

T11S, R5E, Section 12	waterfowl habitat enhancement
T10S, R5E, Section 35	Low Blow unit 4- seed and fertilize
T11S, R5E, Section 2	off 827 spur - plant deer forage, bluebird boxes, top trees pond and meadow- wood duck boxes, relocate down woody material into clearcut, sedge planting for herps, plant cattails
T11S, R5E, Section 10	top trees, seed and fertilize newly cut unit
T10S, R5E, Section 33	thin out alder- permanent meadow in part of it and plant cottonwoods in some of area.
T11S, R5E, Section 9	top trees and relocate down woody material into unit below or take excess and place into adjacent units.
T11S, R5E, Sections 8 and 9	Two recently cut units- seed and fertilize, top some trees
T11S, R5E, Section 5	long unit- top trees newly cut units- seed and fertilize meadow- clear alders and plant willow and cottonwoods
T10S, R6E, Section 30	seed and fertilize two units
T10S, R6E, Section 29	seed and fertilize big unit off 416 spur.
T10S, R6E, Section 31	seed and fertilize two small units.
T10S, R6E, Section 33	seed and fertilize two units.
T11S, R6E, Section 4	look at marsh area near 125 spur
T11S, R6E, Section 9	check out marsh
T10S, R6E, Section 34	look at meadow area

People

Below are four project that need to be completed to work toward meeting the standards and guidelines for Heritage Resources outlined in the Forest Plan.

1. Create a thematic plan that looks at the interpretive value of the Blowout watershed and established priorities for those sites to be interpreted. This plan could benefit multi-resource departments, multi-agencies, and the public. It should include all as partners in completing and administering the document.

Prehistoric Sites

2. A management plan needs to be developed that establishes priorities for 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 such as meadow improvement projects.

3. Recover pollen core samples from several bogs, ponds, and wet meadows to help re-create the vegetative history of the area. This must be done prior to any disturbance to the stratigraphy of the area.

Historic Sites

4. 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.

Recreation/Scenic Resources

Following are some site specific recreational opportunities which should be considered in future management planning to help meet the current and future dispersed recreation demands:

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. Pinnacle Peak SIA is designated for its geological interest. However, the area has significant recreational, plant, wildlife and water values.

Area Interpretive Plan: There are many opportunities within Blowout to interpret natural and cultural resources. The key to developing an effective interpretive program that meets the needs and demands of visitors is to prepare an interpretive plan. An assessment of

interpretive potential (topics); and an analysis of goals, audience, parameters, and priorities would be required. In addition, proposing appropriate themes, prescribing media for presenting the information, and developing design guidelines is part of the process. Goals for interpretation are to assist the visitor in developing a keener awareness, appreciation, and understanding of the area's resources. It also encourages thoughtful use, thus minimizing human impact to the area's resources. Lastly, it promotes public understanding of management goals and objectives. Interpretive planning is a multi-resource planning effort and should include other agencies and public. The plan will answer the key question relating to interpretation.

Blowout suspension bridge: The bridge itself is a significant recreational attraction. It dates from the early 1950's and is one of the last remaining bridges of its type in the regional. It is also the focal pint of other activities including camping, fishing, and swimming. The bridge is showing signs of aging and needs to be restored or replaced.

Blowout/Box Canyon Creek Walk-in Campsites: This project would develop some dispersed campsites on the peninsula between the mouths of the creek. Access to the sites would be via the suspension bridge and by re-opening a segment of abandoned trail beyond the bridge. It will require an easement across a short distance of private land, presently owned by John Handcock Corporation. This will provide an easy hike-in or boat-in dispersed camping opportunity. The sites would be part of a larger network of similar sites accessed by the shoreline trail. There is a current demand to provide for more camping opportunities along the reservoir.

Box Canyon Creek Trail: This is a proposed trail route off of the shoreline trail along Detroit Reservoir. It would follow the creek upstream to the confluence of streams forming the "box." Interpretation could enhance the visitor's appreciation and enjoyment of the natural "old growth" forest surroundings.

Blowout Creek Swimming Hole: This is a popular swimming area on the Blowout Creek. The trail leading down to the pool is steep and heavily eroded. This site could benefit from rehabilitation of the trail and establishing a route.

Detroit Reservoir Shoreline Trail: this is an identified project in the current LMP (Southside Trail #3365). The trail is also addressed in the Detroit Lake Composite Area Management Guide, published in 1992. The objective is to construct a multi-purpose trail around the south side of Detroit Reservoir.

Coffin Mountain Trail (#3425): Coffin Mountain Trail, dating from the 1920's, is the original administrative access route to the lookout. Although the route has been shortened considerably by roads, the remaining 2 ½ miles of system trails is very scenic. Future management should maintain road access to the trailhead, improve directional signing and parking and provide for reconstruction and long term retention of the trail route.

Scar Mountain Huckleberry Fields: Most of the huckleberry fields in the vicinity of Scar Mountain are a result of natural wildfires which occurred around the turn of the century. Past timber harvest activity has resulted in some supplemental acres. However, fire suppression policy has allowed natural timber encroachment to reduce the overall acreage. Public access has also been hampered by current road closure policy. Long term vegetative management policy should consider maintaining a representative acreage of this vegetative type to meet watershed, wildlife, and recreational needs in the vicinity of Scar Mountain.

Lost Creek Falls/Canyon: Lost Creek passes over and through a very scenic falls and narrow canyon immediately above the Blowout Road crossing. Future management plans should provide for parking, and an access/nature trail to enhance visitor enjoyment of this attraction.

Boundary Auto Tour: A self guiding auto tour route should be developed following roads 2212 and 1133 along the current Detroit-Sweet Home district boundary. Information and interpretive signing, brochures or tapes would enhance visitor enjoyment. A variety of themes could be developed such as management history, human history, wildlife uses of the area, ecosystem dynamics, etc. which the traveler can view /visit along the route.

Coffin Mountain Shelter/Trail: Coffin Mountain shelter is one of two remaining shelters on the Detroit Ranger District. This structure and the abandoned trail route has recreational value and has cultural significance as well. Management plans should consider reconstruction of the shelter and re-establishing the abandoned original trail route from the shelter through to connect with the Coffin Mountain trail.