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Department of
Agriculture

Forest Service

Pacific
Northwest
Region

1996

# East Fork Hood River & Middle Fork Hood River Watershed Analyses

Mt. Hood National Forest
Hood River Ranger District

# East Fork Hood River
## and
# Middle Fork Hood River Watershed Analyses

### First Iteration


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# *DOCUMENT ORGANIZATION*

**This document contains the Watershed Analyses for the East Fork of the Hood River and the Middle Fork of the Hood River. This Watershed Analysis provides Forest Service Line Officers and Resource Specialists with a broad scale assessment of the condition of forest resources and ecological processes. The Analysis describes the Desired Future Condition based on the Mt. Hood National Forests Land and Resource Management Plan (1990) and the Northwest Forest Plan (1994). An update of this document will occur in the future with subsequent iterations as conditions change or new information becomes available. This is a living document to guide land managers.**

The Document is organized into five chapters:

- Chapter One is a "Characterization" of the two watersheds in terms of location, physical features, natural processes, Forest Plan allocations, Northwest Forest Plan designations, and Social significance.
- Chapter Two contains the "Issues" identified through an interdisciplinary scoping process. This chapter describes the process used to identify the Issues along with a brief discussion of the rationale for identifying the issues.
- Chapter Three contains the Watershed "Analysis." The Chapter contains two sections: the East Fork Hood River, and the Middle Fork Hood River. The sections describe the Reference Conditions, Current Conditions, and Synthesis of the analysis for each watershed.
    * The "Reference Condition" subsection describes watershed conditions within the reference period of 1900 to present. The Reference Condition explains how ecological conditions have changed over time as a result of human influence and natural disturbances.
    * The "Current Condition" subsection describes the quantitative and qualitative analysis findings. The intent is to describe the watershed based on current knowledge (1996) and identify what changes have occurred during the reference period to create the existing landscape.
    * Finally, the "Synthesis" subsection discusses the integration of separate ecosystem elements as they affect the whole system. It identifies management actions that have occurred throughout the reference period to identify key concerns within the watersheds.
- Chapter Four describes the "Desired Future Condition" for these watersheds. This chapter contains the results of the Landscape Analysis and Design process that conceptually describes the desired landscape in the distant future (200+ years), and an Interim Design ($\leq$ 10 years). The Interim Design describes how to begin moving the landscape towards the Conceptual Design.
- Chapter Five compiles the recommendations that are forthcoming from this analysis. It includes a summary of recommendations from the Interim Design Process and the Access and Travel Management report. In addition, this chapter contains a review of the Highway 35 Viewshed Management Guide, a discussion of data gaps, identification of additional analysis needs, and identification of monitoring needs.

These five chapters combine to describe how the watershed has changed over time, the existing conditions and how management or restoration can move the watershed towards the Desired Future Condition.

As an aid to navigating through the document, Headers identify the Chapter and Footers identify both the Chapter title and page number.

**Watershed Analysis is not a "Decision" document.** Any recommendation must undergo additional analysis before implementation. In many cases this will require an Environmental Analysis (EA) or an Environmental Impact Statement (EIS) to display the effects on a site specific basis as required by the National Environmental Policy Act (NEPA). Any recommended changes to Standards and Guidelines for the Mt. Hood National Forests Land and Resource Management Plan would require a Forest Plan Amendment.

# CHAPTER 1

# CHARACTERIZATION

This chapter "characterizes" the East Fork & Middle Fork Watersheds in terms of the Physical Features, Management Direction, and Social Importance of these watersheds (See Appendix - M for additional information). The information presented here is a general overview intended to acquaint the reader with some of the characteristics unique to these watersheds.

## *Physical Characteristics*

The East Fork and Middle Fork Hood River Watersheds are located in the northwestern part of the Deschutes Province (Figure 1.1.), with the majority of the watersheds land base lying within the administrative boundary of the Mt. Hood National Forest, Hood River Ranger District. Both watersheds lie entirely within Hood River County, Oregon and contain both National Forest System Lands and non-federal lands (county & private ownerships) (Table 1-1).

Table 1-1. - Breakdown of Watershed Acreage.

| | Acres | Percent of Watershed |
|---|---|---|
| East Fork Hood River Watershed | | |
| Total Non-Federal Land Acres | 24,309 | 34% |
| Non-Federal Land Outside NF Administrative Boundary | 21,102 | |
| Non-Federal Land Inside NF Administrative Boundary | 3,207 | |
| Total National Forest System Land Acres | 47,924 | 66% |
| Total Acres Within East Fork Watershed | 72,233 | 100% |
| Middle Fork Hood River Watershed | | |
| Total Non-Federal Land Acres | 7,565 | 26% |
| Non-Federal Land Outside NF Administrative Boundary | 5,246 | |
| Non-Federal Land Inside NF Administrative Boundary | 2,319 | |
| Total National Forest System Land Acres | 21,075 | 74% |
| Total Acres Within Middle Fork Watershed | 28,640 | 100% |
| Total Acres Within Both Watersheds | 100,873 | |

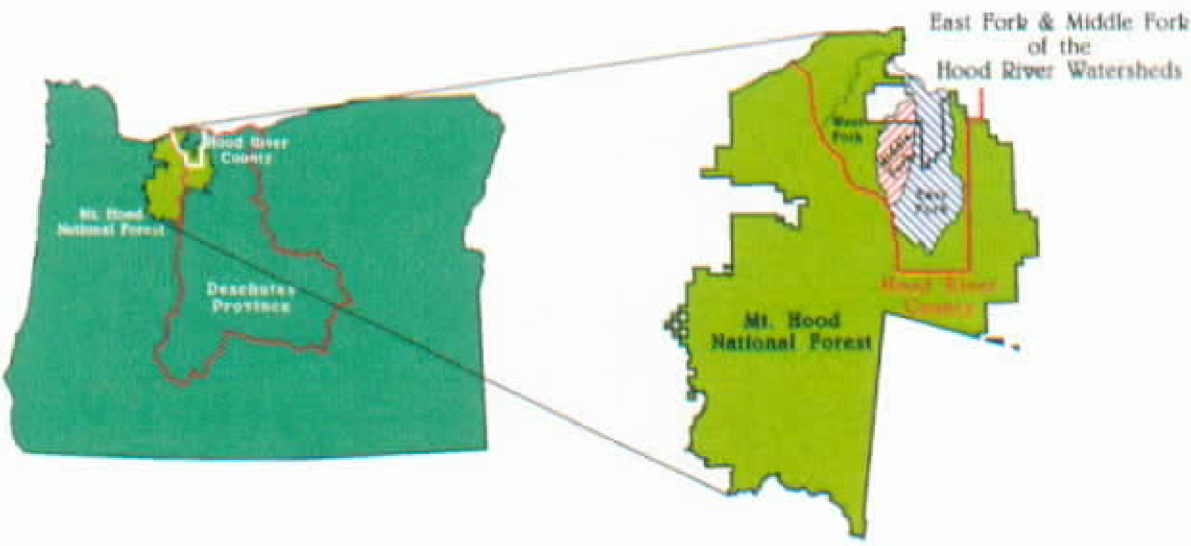


Figure 1.1. - Location of the East Fork & Middle Fork Watersheds within Oregon.

The East Fork & Middle Fork are two distinct watersheds that share a common boundary. Many of the Landscape Patterns, Ecological Processes, and Flows cross this boundary. Though they are considered separate at the 5th field watershed scale (See Glossary), there exist critical linkages between the watersheds for sustaining certain ecosystem functions at a larger basin scale.

## *Landscape Patterns*

The highest point in both of these watersheds is the summit of Mt. Hood. The East Fork Hood River Watershed begins on the eastern slopes of Mt. Hood and is generally dissected north to south by the East Fork of the Hood River forming a classic glacial "U-shaped" valley. As the East Fork Hood River flows north towards the Columbia River, it is joined in a pinnate pattern by seventeen subwatersheds (6th field watersheds). In contrast, the Middle Fork Hood River Watershed begins on the Northeastern slopes of Mt. Hood and has a more palmate hydrologic pattern on the landscape. Three major streams (subwatersheds) come together to form the beginning of the Middle Fork Hood River which then flows generally north towards its confluence with the East Fork Hood River. There is a total of seven subwatersheds (6th field watersheds) within this watershed. (See Appendix - M)

The vegetative patterns are highly variable within these two watersheds. Vegetative zones range from high alpine non-vegetated types on the slopes of Mt. Hood, to Ponderosa pine woodlands in the lower or northern parts of the valley (See Appendix - M). These two watersheds are part of the transition zone between eastside and westside vegetative types. Elevation and aspect play a large part in how the vegetative patterns are distributed across the landscape, though Mt. Hood determines moisture distribution across the landscape which also affects vegetative patterns.

Vegetative patterns have never been static. Volcanic eruptions, glacial movement, and changes in local climates have kept this landscape in a constant state of flux over the centuries. In the last century, Euro-American has been a factor in shaping the vegetative patterns that we see distributed across the landscape today. Early European sheep herders used fire to maintain open timber stands to provide good grazing forage for their flocks. Fire was also used by settlers homesteading the area to clear land for agriculture. Some of these fires burned thousands of acres before they were extinguished naturally. Timber harvest has been a use of the vegetation within these watersheds as far back as the turn of the century.

Possibly the biggest factor altering the vegetative pattern in the lower parts of these watersheds was the growth of the fruit industry. Fruit production dates back to before the turn of the century in these watersheds. With time, increasing acres were cut or burned to make room for fruit orchards. To this day, most of the lower parts of these watersheds are covered with fruit orchards where once there were coniferous forests and a network of riparian habitat. This change in the vegetative pattern and land use has had a significant influence on resources across the landscape.

These watersheds contain a network of meadow complexes consisting of both wet meadows and dry meadows. These meadow complexes play an important function in these watersheds for terrestrial species as well as some aquatic species. They are also highly valued by recreationists that visit the area. Roads and parking lots are located in proximity to many of these meadows. Human use of meadow areas has occurred and is increasing. Many of these meadows were maintained by early settlers in order to provide places to graze sheep and cattle. Currently, one grazing allotment (Long Prairie Allotment) is still being utilized today within the East Fork Watershed. No grazing is permitted within the Middle Fork Watershed.

There are many unique features in these two watersheds that combine to define the Landscape Patterns that we see today. Some features are natural such as Mt. Hood and the Parkdale Lava Beds. Others are a result of human influence over the landscape.

Prominent landscape features in these Watersheds include (Figure 1.2):

- Mt. Hood (portion)
- Mt. Hood Wilderness (portion)
- Surveyors Ridge Late Successional Reserve (portion)
- Parkdale Lava Beds Geologic Area
- Cloud Cap Tilly Jane Historic Area (Cloud Cap Inn, Tilly Jane Campground, Cloud Cap Saddle Campground
- Laurance Lake Reservoir
- Bonneville Power Administration (BPA) power line corridor (portion)
- Dog River diversion (the City of The Dalles municipal water supply)
- Highway 35 Viewshed and Forest Service Road 44 Viewshed.
- Glacial Streams (Clark, Newton, Coe, Eliot)
- Irrigation Diversions.
- Mt. Hood Meadows and Cooper Spur Ski Areas.
- Teacup Lake.
- The Narrows (East Fork Hood River stream reach between narrow rock walls).
- Surveyors Ridge.

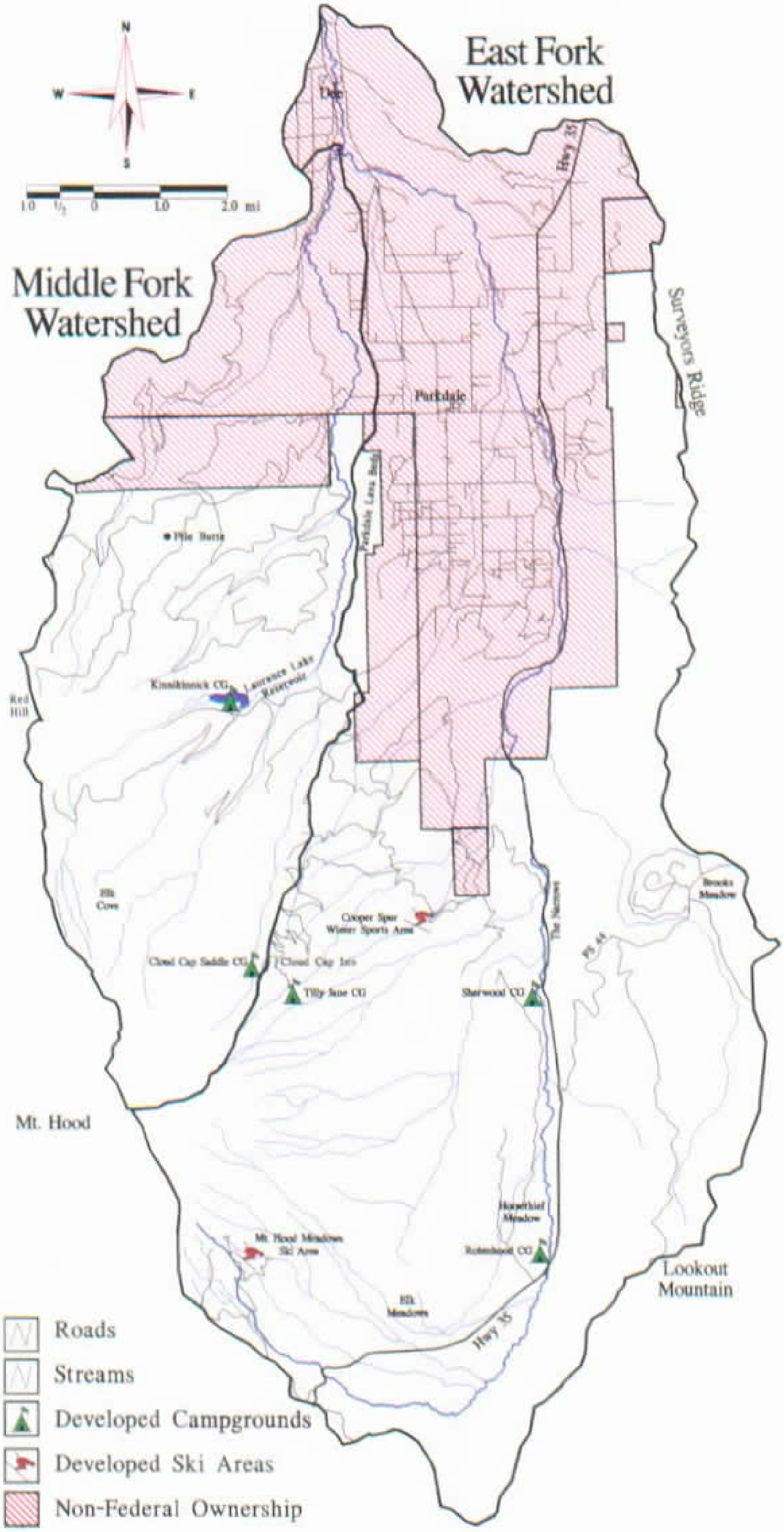


**Figure 1.2. - Prominent Features of the East Fork & Middle Fork Hood River Watersheds.**

## *Ecological Processes*

The primary ecological processes at work in these watersheds are associated with the hydrologic systems. Other processes such as genetic interchange and migration of wildlife, nutrient cycling, and vegetative development are also at work in these watersheds.

Four streams originate from glaciers on the slopes of Mt. Hood. Clark Creek and Newton Creek are part of the East Fork Watershed and Coe Branch and Eliot Branch are part of the Middle Fork Watershed. These streams affect the total hydrologic system by the amount and timing of their release of sediment within the watershed. In 1977, as part of the Mt. Hood National Forests Soil Resource Inventory, the Mt. Hood glaciers were photographed from the air. From these photos, resource specialists can determine the extent of the glaciers' movements over time. Currently, the glaciers are retreating, releasing large amounts of silt and sediment.

Most of the streams in these watersheds lie entirely within the rain-on-snow zone. Typically, this zone extends from 2500'- 4500', however, because of the shape and orientation of the East Fork Watershed and its proximity to Mt. Hood, the entire watershed reacts to rain-on-snow in a similar manner. The Middle Fork follows a normal pattern but receives higher average rainfall than the East Fork watershed.

Most of the streams within these watersheds originate from springs on the slopes of Mt. Hood. These non-glacial streams generally have steep gradients and are subject to debris torrents during rain-on-snow events. Rain-on-snow events produce large quantities of water from the melting of snow. This release of large quantities of water into the streams, over a very short period of time, can dramatically affect the hydrologic regime within the watershed. Debris torrents, along with other channel forming processes, dramatically alter the stream channels downstream. These channel forming processes affect the infrastructure resulting in the need for additional maintenance. Debris torrents, though infrequent, affect aquatic habitat within the main stream channels. Large Woody Debris (LWD) is redistributed or flushed out of the system, affecting aquatic habitat and aquatic life.

Ecological processes for wildlife are primarily the genetic interchanges between population groups. These watersheds are an important connectivity link within the northern part of Mt. Hood. Structural development of the forest vegetation and its distribution across the landscape plays an important role in defining the viability of genetic interchange for all species. This is more of an issue within the Middle Fork Watershed than in the East Fork Watershed because of past timber harvesting that concentrated on the removal of late seral stands.

Nutrient cycling is primarily a function of climate and moisture, however, the presence, arrangement, and composition of forest debris are critical to this cycle. Decaying forest debris such as large logs provide habitat for fungal growth which in provides food for small mammals and other life forms. Small mammals and other life forms distribute these nutrients across the landscape through food caching and defecation. Decaying forest debris also releases nutrients directly into the soil, increasing productivity and providing nutrients for plant growth.

## *Flows*

Human Flows are the most obvious across the landscape. There exists a vast network of roads and trails, especially in areas around Mt. Hood and in the lower valley on non-federal lands. Most of the human flows in the East Fork Watershed are centered around accessing recreational opportunities on and around Mt. Hood. Two developed Ski Areas, Mt. Hood Meadows and Cooper Spur, draw visitors throughout the winter months along Highway 35 both from the North and south. Other popular uses of these watersheds during the winter months include Nordic skiing, sledding, and snowmobiling. In the summer months, visitors again travel Highway 35 (Mt. Hood Loop Highway), to access trails in and around Mt. Hood and its Wilderness. Camping is also popular in these watersheds. There is a high demand for both dispersed as well as developed camping.

Roads direct human flows within these watersheds. The roads that have the most influence on directing the flow of humans within the East Fork Watershed are Highway 35 (Mt. Hood Loop Highway) and Forest Service Road 44 which provides summer access to communities to the East. The Laurance Lake Road (2840) is the most significant road in the Middle Fork Watershed. Forest Service Road 16 and its associated system of roads provides access to National Forest System Lands north of Laurance Lake.

Certain landscape features, such as the Mt. Hood Wilderness, Mt. Hood Meadows Ski Area, and Laurance Lake (Figure 1.2), influence human flows in these watersheds. Other features include scenic vistas, Cloud Cap Inn, Lookout Mountain, and the Parkdale Lava Beds Geologic Area.

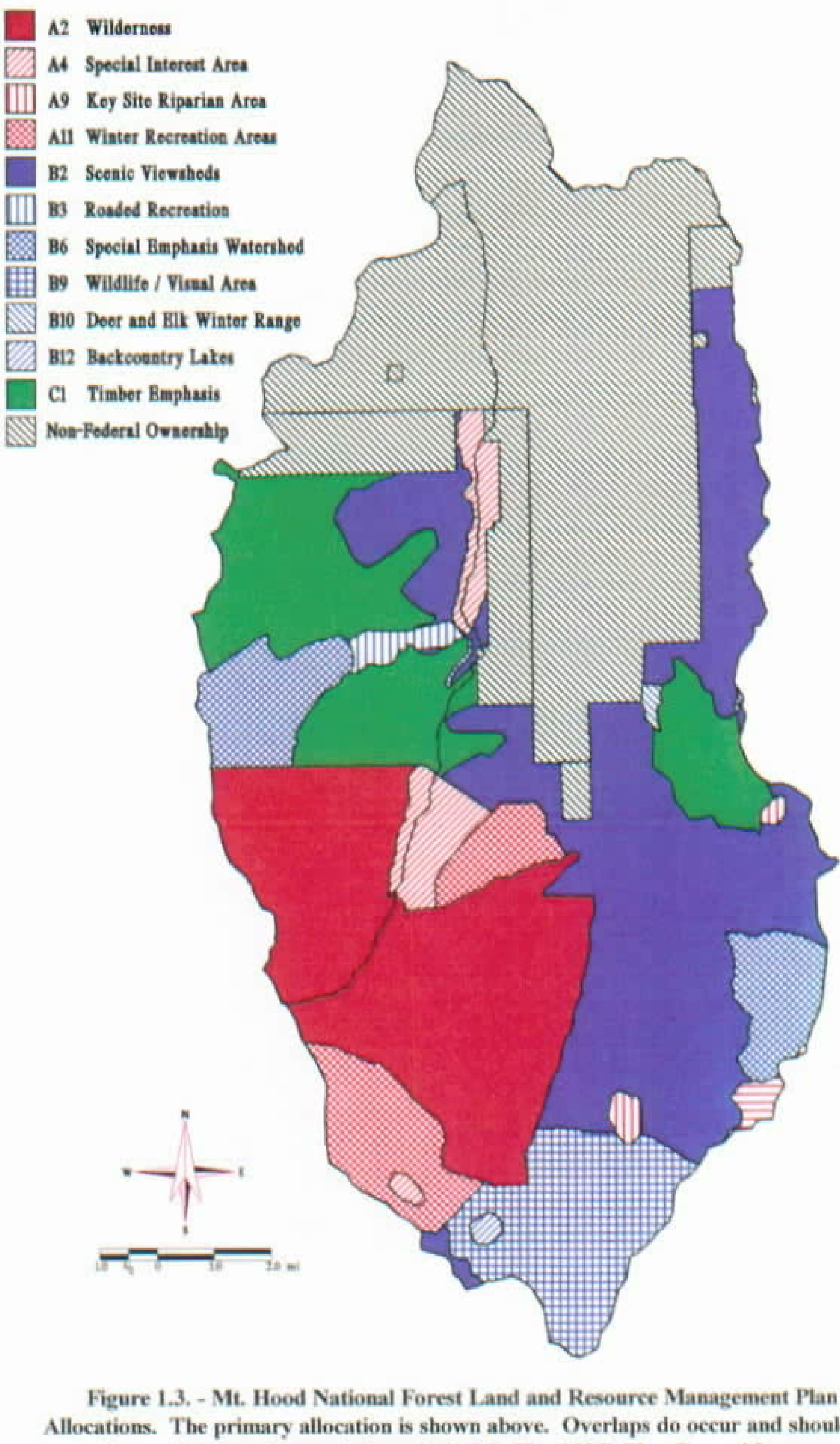


**Figure 1.3. - Mt. Hood National Forest Land and Resource Management Plan Allocations. The primary allocation is shown above. Overlaps do occur and should be site specifically referenced through the Mt. Hood N.F. Plan Control Layers.**

### *Northwest Forest Plan*

Management direction outlined within the Northwest Forest Plan ROD is divided into seven Land Allocations: Congressionally Reserved Areas, Late Successional Reserves, Adaptive Management Areas (AMAs), Managed Late Successional Areas, Administratively Withdrawn Areas, Riparian Reserves, and Matrix. Lands are further categorized as Tier 1 Key Watersheds, Tier 2 Key Watersheds, and non-Key Watersheds. Key Watersheds overlay portions of all six categories of designated areas and matrix, and place additional management requirements or emphasis on activities in those areas. Watershed Analysis is required in Key Watersheds, roadless areas in non-Key Watersheds, and Riparian Reserves prior to determining how proposed land management activities meet the Aquatic Conservation Strategy objectives.

Another obvious flow across the landscape is the hydrologic flow. A network of streams and rivers combine to form two distinct watersheds. In the Middle Fork watershed, Clear Branch and Pinnacle Creek flow into Laurance Lake Reservoir. This reservoir affects sediment movement and stream flows below the Clear Branch Dam. The confluence of Clear Branch and Coe Branch defines the start of the Middle Fork Hood River. Where the Middle Fork and East Fork join defines the start of the mainstem of the Hood River which flows to the Columbia River. In both watersheds, the natural flow of water is interrupted by Irrigation Withdrawals, Municipal Water Supply Withdrawals, and diversions for Power Generation Facilities. Most of the withdrawn water is diverted into other watersheds and is lost from the hydrologic system from which it originated.

Wildlife flows exist within these watersheds but are less obvious. Migrations of deer and elk occur both in a north/south direction along the East Fork as well as east/west between watersheds. The East Fork Watershed is potentially an important migration corridor for raptors. Due to the 20 mile north-south ridge complex (Surveyors Ridge) defining the eastern and southern end of the watershed, this migration corridor may be used by a large majority of the northwestern raptor species in their migration south. Other wildlife migration flows are even less obvious because the migrations do not cover large distances and often take long periods of time to complete, as is the case with small home range species such as some amphibian species.

A high voltage transmission powerline crosses both watersheds in the lower valley. The Bonneville Power Administration transmission line provides a flow of electricity and its presence influences other flows on the landscape because of the need to manage the vegetation along the corridor.

## *Administrative Characteristics*

The portion of the East Fork Hood River Watershed and Middle Fork Hood River Watershed which lies within the National Forest System administrative boundary is managed in accordance with the Standards and Guidelines contained in the Mt. Hood National Forest's Land and Resource Management Plan (1990), and the Northwest Forest Plan ROD (1994).

### *Mt. Hood National Forest's Land and Resource Management Plan*

Management direction outlined in the Mt. Hood National Forest's Land and Resource Management Plan is divided into two categories: *Forestwide* Standards and Guidelines, and *Management Prescriptions* (Standards and Guidelines) for "Management Areas" (MAs). Management Area groups are referred to as land allocations. (Figure 1.3.)

#### *"A" Allocations*

The Middle Fork Hood River and East Fork Hood River watersheds contain four of the twelve "A" land allocations (A2, A4, A9, A11). With the exception of A2 Wilderness, these MAs allow timber harvest to occur as a tool to accomplish primary goals but does not include regulated timber production. In some cases, timber salvage is also allowed.

#### *"B" Allocations*

The Middle Fork and East Fork contain eight of the twelve "B" land allocations (B2, B3, B5, B6, B7, B9, B10, B12). These Management Areas have primary goals other than timber production, however, timber production is recognized as a secondary goal. Regulated timber harvest is a planned output.

#### *"C" Allocation*

The Middle Fork and East Fork contain lands within the "C" land allocation (C1). This Management Area has a primary goal of timber production. Regulated timber harvest is a planned output. A myriad of other resource values will also be realized.

The Middle Fork and East Fork Hood River watersheds are classified as non-Key Watersheds and contain five of the Northwest Forest Plan Land Allocations: Congressionally Reserved Areas, Late Successional Reserves, Administratively Withdrawn Areas, Riparian Reserves, and Matrix. (Figure 1.4)

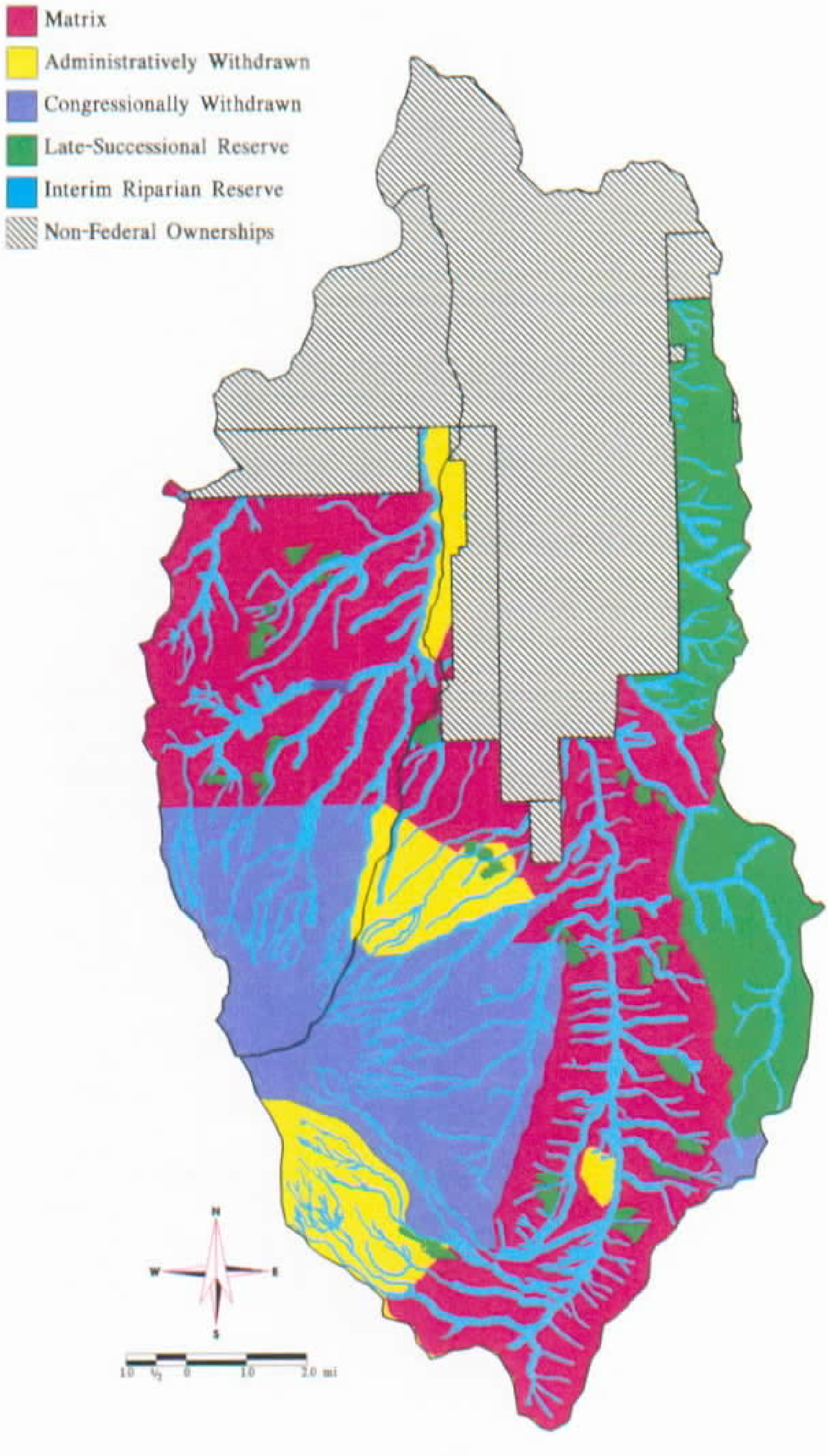


**Figure 1.4. - Northwest Forest Plan Allocations**

## *Social Characteristics*

There are tangible and intangible connections between people and the land. The economic ties are so intertwined that it may no longer be possible to quantify the monetary benefits to the watersheds.

Both watersheds lie completely within Hood River County. Seventy-six per cent of the county (250,039 acres) is in public ownership of some form. The majority of these public lands are managed by the Mt. Hood National Forest. East Fork and Middle Fork Hood River Watersheds combined make up 29.8% (100,873 acres) of the landbase of Hood River County.

The county is surrounded on all sides by federal land and federal authority. There is a sense of cohesion and community, both geographically and socially, among many upper valley and Hood River Valley residents.

### *Population and Industry*

The current population of Hood River county (1995) is 18,700 with a seasonal fluctuation of about 2,000 agricultural workers. Since 1980, the population of the county has grown slowly, but steadily. Hood River County's natural rate of increase is 0.76% (1990 census). The majority of new residents are/will be in-migrants. This growth in population is part of a larger, national trend of growth in the West. Hood River County's population is projected to increase by 3,000 to 4,000 persons every five years, reaching an estimated 36,483 by the year 2040. This essentially is double the current population. (ICB Report, 1996)

Scenery and natural beauty were prime reasons that people first settled here. Currently, people are moving to the area for improved quality of life. Most often the natural environment (scenery), abundance of year-round recreation, good drinking water and clean air are cited as reasons for moving here. Because it is a tourist destination, the City of Hood River has a higher level of social amenities (restaurants, micro-breweries, galleries, retail shops) than other towns its size. This service industry contributes to the livability of the area and its economic fabric.

Windsurfing opportunities attract participants of this sport to the area. The social organization characteristic of windsurfers and the developing technology contribute to economic diversification and the changing social/cultural complexion of the valley.

This county is neither rural nor urban, but somewhere in between. The average per capita personal income ($17,181) is considerably lower than the national average ($20,700), and is the fourth lowest in the state of Oregon. The state per capita income level is about 10% below the national average. In Hood River County, the average unemployment rate remains higher than the state average for the last twenty years. The average annual unemployment rate in the county is 9.6% for the last decade. In the last 20 years, all job growth has been in the services sector. In the last two years, the retail trade had contributed the bigger share of job growth. The poverty rate in the county as determined in the 1990 census is 15.7%, translating to 2610 persons living below the poverty level. The county economy is built on agriculture (1,461 jobs), services (1,910 jobs), and manufacturing (1,349 jobs).

Agriculture is infused into the lifestyle, landscape and economy of the Hood River Valley. Agriculture contributes to scenic value in this area, and is a component of tourism. Agri-tourism is a growing niche market in Oregon. More than fifty percent of the agricultural acreage in the county is in the upper valley (19,500 acres). Three irrigation districts irrigate a total of 16,600 acres with water from these watersheds. Wood products industries (logging and manufacturing) provided 3.6% (310 jobs) of total employment in Hood River County in March 1995.

The Hood River Valley is a forest-dependent community. It is immediately adjacent to forests, and has a high degree of economic dependence on tourism related jobs and services. Forest-based industries are part of the local economy. This dependence is also supported by the quality of life attributes such as scenery, clean air and clean water that the forest provides local residents.

The county encompasses 32,350 acres of private industry forest, 17,700 acres of private non-industrial forest, and 1,363 acres of state forest, in addition to National Forest System Lands. In Fiscal Year 1994, Hood River County received $2,067,601 from the federal government in so-called "Owl Guarantees". In FY 1996, the payment will be $1,994,627. These payments will decline by 10% per year until 2000, when the "Owl Guarantees" end. When the safety net expires, the county is likely to feel significant financial impacts.

Hood River County owns 31,000 acres of forest lands managed as a tree farm. This revenue represents about 12.5% of the county budget.

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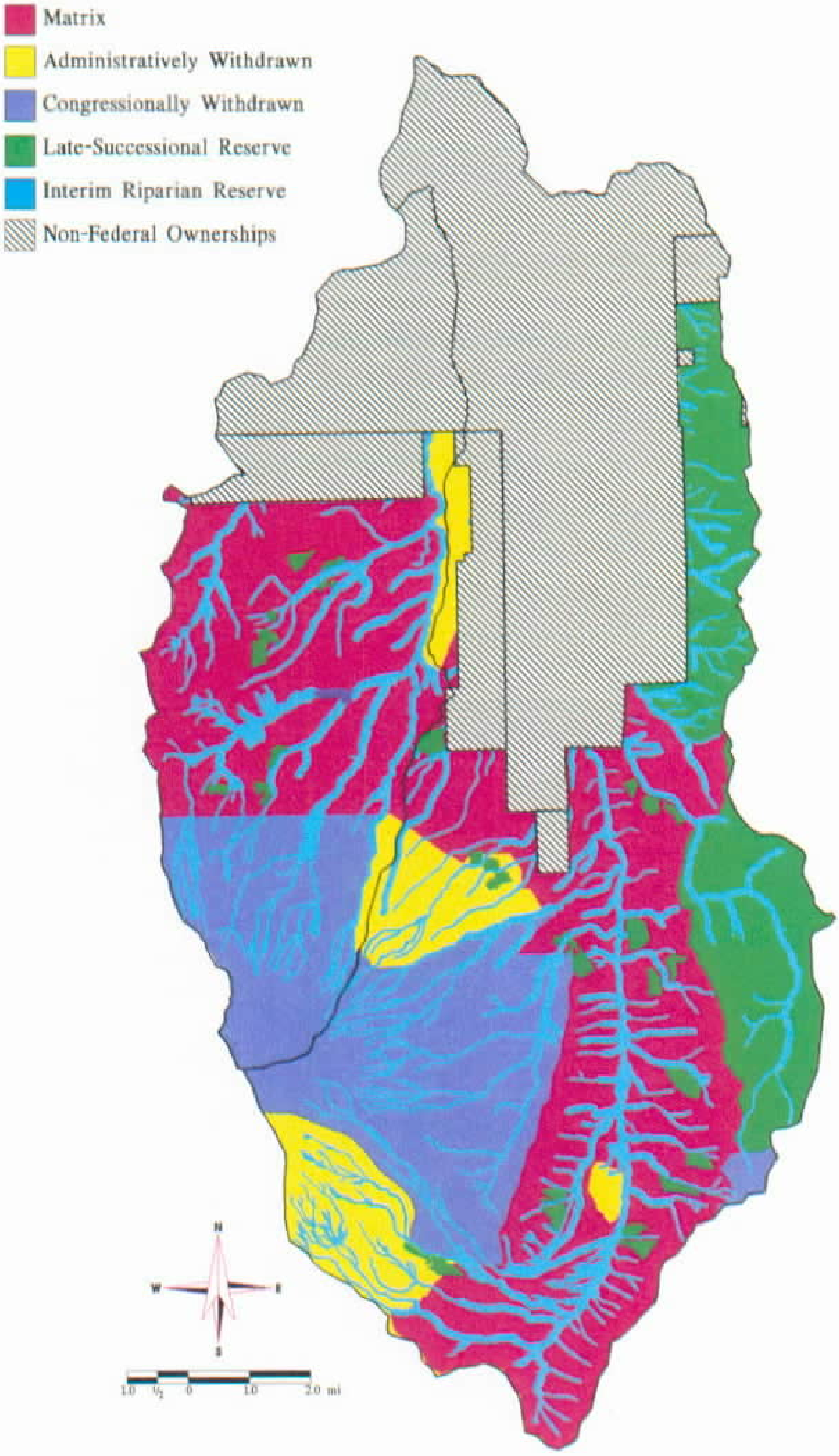


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## *Visitors to the Watershed*

In 1994, 1,560,000 people visited Mt. Hood and the Columbia Gorge. The Oregon Visitor Profile (1994) suggests that the Mt. Hood / Columbia Gorge region attracts mainly nature-oriented enthusiasts. A large majority engage in outdoor activities. Proximity to Portland has had an influence on the number of visitors to these watersheds due to its population growth. The outdoor experience seems to be one of the strongest tourist attractors in Oregon. Nearly half of all visitors (47%) engage in outdoor activities especially hiking (23%), viewing wildlife (17%), and visiting natural attractions (26%).

Hood River and Wasco counties have shown substantial growth in lodging tax receipts. In Hood River county, travelers spent $26,091,000 in 1992, or $1,482 per county resident. This is higher than the state average of $1,052 per capita spending, suggesting a more affluent group of visitors, and a slightly higher level of economic dependence on the visitor industry. In general the visitors to this area are recreationists. East Fork Watershed holds some of their most popular destinations.

The economy of Hood River County is anchored in tourism (services), agriculture and manufacturing. All three sectors of the economy have significant ties to these watersheds. Water for agriculture, wood for industry, and recreation/scenic amenities for tourists are among the most predominant links between the economy and the watersheds. A well-maintained transportation corridor physically links people and the forest.

Residents value the same forest amenities as tourists, along with good drinking water, valuable open space and cultural experiences (berry, mushroom harvest) within the watersheds. Maintenance of a high quality environment has become a critical component of this areas economic development. Economic contributions of federal lands in these watersheds go far beyond commodities yielded. Other economic links and relationships outside of this county are important but not shown here.

# CHAPTER 2

# ISSUES

**This chapter contains the Issues that were identified through an interdisciplinary review of the Characterization and Reference Conditions. The chapter describes the process that led to the identification of the issues and a brief discussion of the rationale behind the issues.**

## *Issue Identification Process*

Issues were identified through an interdisciplinary process including Forest Service resource specialists and conversations with other agency representatives and the public. The process began with a brainstorming session that identified current knowledge about the watershed. This process resulted in over 200 pieces of information that were categorized as informational or potential problems. The potential problem statements were sorted into similar groupings and a general "Issue" statement was crafted. The following sections describe the Issues felt to be of most importance in this analysis.

## *Issues Identified*

### *Issue 1 – Fish populations have declined in the watershed.*

Fisheries biologists from most Federal, State, and Tribal organizations agree that fish populations are currently lower than historic levels. No hard data exists on historic population levels. There is enough anecdotal evidence to suggest that fish numbers were much higher around the turn of the century. While fisheries biologists agree that the levels have declined, there is uncertainty as to the cause. A combination of factors has likely affected the abundance of aquatic life. Over the last century, upland and in-stream management practices have had detrimental effects on fish habitat and aquatic life. Practices such as splash dams, log drives, and commercial fish wheels and horse seines on the Columbia River, may have contributed to lowering fish populations. While these practices have disappeared, new practices in and around streams continue to have detrimental effects on fish and aquatic habitat.

### *Issue 2 – A holistic approach to forest management has not been fully implemented.*

Prior to implementation of the Northwest Forest Plan ROD, few federal land management agencies formally planned or analyzed from a landscape perspective. Project implementation often fell short of an integrated approach to forest resource management. Consideration was given to site specific effects within artificial boundaries and landscape effects were not fully analyzed or understood. A holistic approach to forest management requires the land managers evaluation of effects at a larger scale, including the connected and cumulative effects of site specific actions. In these watersheds, land managers have not fully considered the landscape effects of:

- Managing the forest vegetative matrix with regards to diverse wildlife habitat needs
- Using non-native plants for slope stabilization
- Land exchanges with regards to wildlife migration and genetic interchange
- Highway 35 and National Forest road placement and maintenance
- Vegetative management strategies in regards to the invasion of noxious weeds
- Rock quarries in regards to future road construction and maintenance needs
- Balancing increased recreational demands with ecological impacts

### *Issue 3 – The quantity and distribution of low elevation late-seral habitat has placed some late-seral dependent species at risk..*

Most timber harvest since the turn of the century has occurred in high value mature timber. In a natural ecosystem, mature stands of trees provide "late-seral" habitat structure. A large percentage of these mature stands were harvested in the past century as a result of increased public demand for lumber. Agricultural development, federal land exchanges, and harvesting in riparian areas affected the low elevation connectivity between adjacent watersheds and linkages between Late-Successional Reserves. The resulting fragmentation of the landscape has jeopardized the viability of late-seral dependent species.

### *Issue 4 – The growing demand for recreation is affecting the quality of the recreation experience.*

As the demand for recreation opportunities increases, resource conflicts will become more numerous. Many recreationists desire a different forest setting from commodity oriented users who have contrasting and often conflicting views on forest management strategies. With the shift of societal values away from commodity extraction towards recreation values, the number of recreationists increases while the quality of the recreation experience decreases. The ability to provide additional recreation opportunities are limited because of declining federal funds for improvements, and the lands' capacity to provide the variety desired by recreationists.

# CHAPTER 3

# ANALYSIS

**This chapter contains information about the Reference Condition, Current Condition, and analysis Synthesis. Much of the information in previous chapters presented the East Fork and Middle Fork Watersheds as a single unit. This chapter considers the watersheds separately to highlight their differences and uniqueness. It is divided into two "Sections", one for each watershed.**

# *SECTION 1*
# *EAST FORK HOOD RIVER WATERSHED ANALYSIS*

## *EAST FORK REFERENCE CONDITION*

### *Introduction*

The determination of a reference condition is valuable to gain a clearer understanding of the formation and development of ecosystems and landscapes. It would be ideal to describe the reference point in time far enough back to predate human disturbances on the landscape. This picture becomes speculative at best because few records of the landscape prior to human disturbance exist. For this reason, a point in time of 1900 was chosen as a reference period when human involvement on the national forest lands of the watershed was minimal and the private lands of this watershed were still at the beginnings of development. Projections as to the character of the reference period landscape were made by utilizing historic personal accounts and documented historic data.

By 1900, human settlement was well established in the lower valley near the communities of Parkdale and Mt. Hood. Human initiated fires had already swept over portions of the lower elevations. Other than the fires and some conversion to agriculture, human induced vegetative manipulation had not occurred on the upland forest areas.

### *Human Uses - East Fork Reference Condition*

Prior to 1900, accounts of Native American use of the watershed are very generalized. Settlements were transitory related to annual hunting and gathering opportunities. Trails were well established through the upper valley onto the lower slopes of Mt. Hood and along Surveyors Ridge. While other American Indian groups may have used either or both watersheds, the three groups that most commonly visited the area were most probably the Hood River and The Dalles Chinookans, also known as the Wascos, one or two groups of Tenino from the east, and the Molala from the south.

Seasonally, and depending on altitude and environment, huckleberry, camas, lomatiums, beargrass and other plants, deer, elk and game of all sizes were important foods obtained in the watershed and were processed for use throughout the year. Fish were caught in tributaries and main forks of the Hood River. Collecting and preparing each of these foods meant establishing a camp for several days. Families usually used the same fields and hearths for drying year after year. Intentional burning of underbrush to clear travel routes and to maintain huckleberry patches is well documented.

Today, most of the Native American descendants of the area are enrolled on either the Yakima or Warm Springs reservations (Garrett Crowley, 1995). The Warm Springs enrollees have treaty rights of access, hunting and gathering on the Mt. Hood National Forest, and continue those activities today.

Euro-american settlement in the lower valley of the East Fork watershed began in 1880 with three families, who established farms and homes in the Mt. Hood area. This was the beginning of the community of Mt. Hood. Parkdale was established in approximately 1906 and grew with the arrival of the railroad a few years later. As news of this prolific and beautiful valley spread, many prosperous easterners moved in and settled the upper valley. Old Indian trails were utilized to build a wagon road up Tilly Jane Creek to the flanks of Eliot Glacier. The Cloud Cap Inn was constructed in 1889 and became a prominent destination for tourists, climbers and scientists. Other than mountain adventures, recreation was primarily confined to the lower valley prior to 1900.

Sheep herding and cattle grazing were commonly conducted on the upper slopes of the watershed prior to 1900. Most meadow systems were used as well as some forested areas. In order to have good pasturage for sheep year after year, underburning was occasionally necessary. Additionally, sheep trampling at higher elevations was severly impacting the thinner soils. Shortly after establishment of the Cascade Range Forest Reserve in 1893, sheep and cattle grazing were banned from National Forest lands. However, domestic animal grazing continued on the forest reserve slopes until after the turn of the century.

## *Fire History - East Fork Reference Condition*

An analysis was conducted, utilizing historic aerial and panoramic photography, that evaluated natural fire related disturbance to the vegetative landscape. Due to the extensive fires intentionally set by homesteaders in the northern part of the watershed in the 1880's, natural disturbance patterns were available for review only in the upper valley to the south of the Highway 35/Road 4400 junction. From this analysis, an average patch size of 62 acres was estimated to have been the natural fire disturbance size in the upper valley of the watershed (See Figure 3.1). Because of the small area available for analysis, this patch size is just an estimate and cannot be expanded to encompass the entire watershed. The lower valley is thought to have had smaller natural fire patches than those created by the human induced fires (1000+ acres) prior to the turn of the century. In these areas, it is believed that natural fire probably occurred more frequently and with less catastrophic results but early human development has masked the natural patterns that would allow verification of this theory. Additionally, natural fires would have begun on ridge tops, as a result of lightning strikes, and backed into valley bottoms.

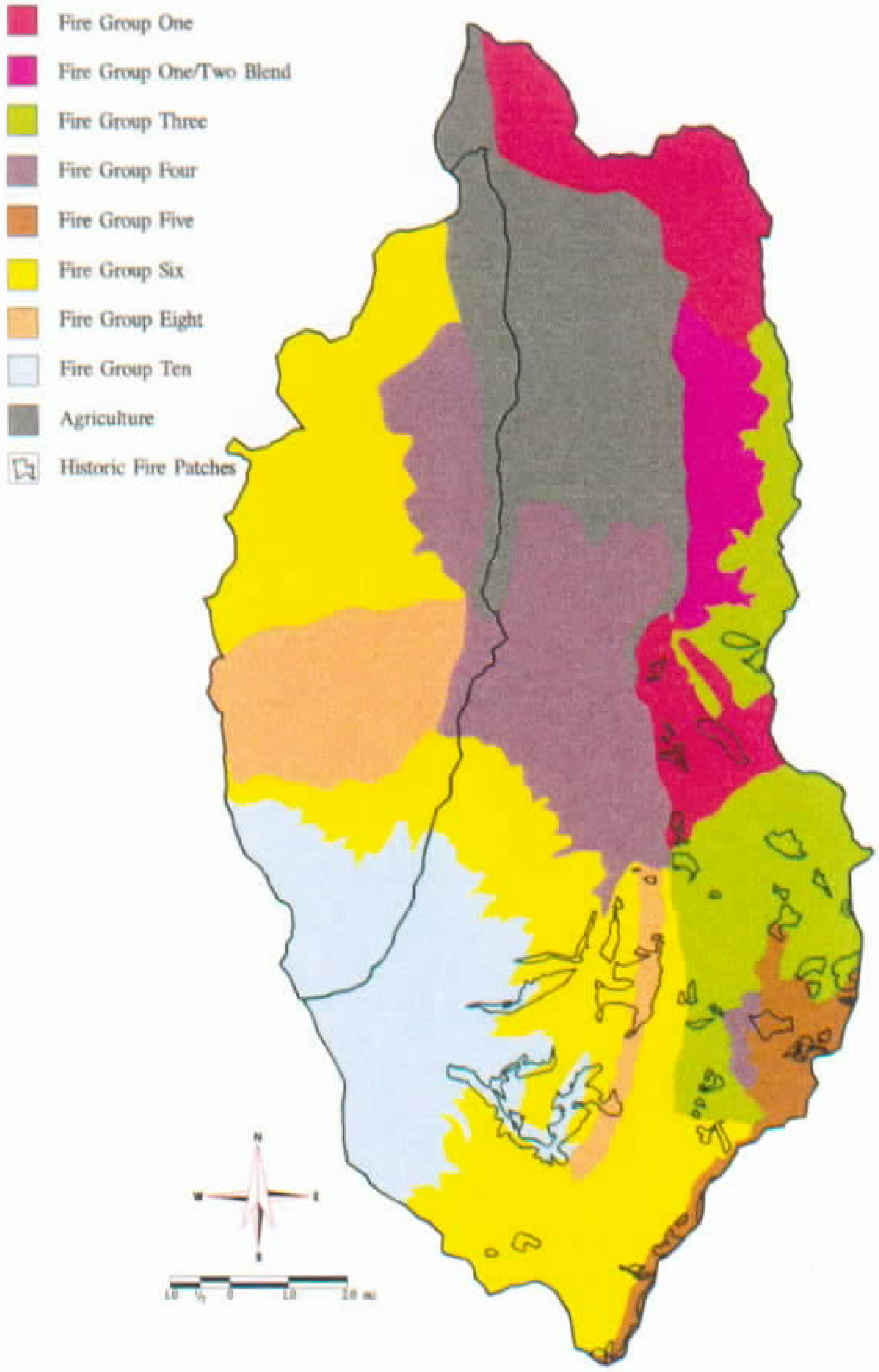


Figure 3.1. -- Fire Regimes / Fire Patches.

Fire regime groups for the East Fork watershed were evaluated based on ecology plot data and the fire ecology of the Mid-Columbia region (Evers et al., 1994). These groups offer a general evaluation of fire return interval and disturbance size for different portions of the watershed (See Figure 3.1). The East Fork watershed contains eight fire regime groups that range from the alpine areas in the south (Fire Groups six and ten) through the moist bottomlands (Fire Groups four and eight) to the dryer ridges in the east (Fire Groups three and five) and north (Fire Groups one and two). Expected size, fire behavior, and return interval of natural fire varies widely across the watershed. (See Appendix E, Fire Regimes and Fire History Report).

### *Vegetation - East Fork Reference Condition*

A reference condition for the vegetation was developed using 1901 (H. D. Langille) and 1954 (Hood River County) timber type maps, 1947 resource aerial photography, and to some extent General Land Office (GLO) survey notes. The 1954 Forest Type Map was used as a base for the reference vegetation because it had been digitized into an automated format. This map indicates that no harvest had previously occurred on National Forest within the East Fork watershed. Vegetative changes seemed to follow a reasonable progression between the 1901 Forest Type Map and the 1947 aerial photography. The GLO notes were used to verify delineated timber types along selected survey lines. Comparisons proved to be reasonably accurate.

For consistency with the way current vegetation is being displayed, a crosswalk was developed using the 1954 stand data to categorize seral stages. These categories were attached to the automated 1954 polygon delineation's. Comparisons with the 1901 map were used to adjust the seral stages back to the reference period. Historic seral stages (See Figure 3.2) from this comparison display an estimate of stand development at the reference period.

From this snapshot of 1901, the primary forest type within the watershed is viewed (See Figure 3.2) as a matrix ofsapling/pole and small tree conifer forest. Many of the identified stands occupying the higher elevation sub-alpine areas are delineated on these type maps as low volume forest stands. It must be recognized that, due to site characteristics, these sub-alpine forests are not likely to reach a size structure that is typically associated with late seral forest habitat found at lower elevations. Within the matrix, large patches of late seral forest (greater than 21" diameter) are present in the areas of the upper valley and the lower slopes of Tilly Jane Creek. Additionally, early seral forest patches (young seedlings or recently deforested) make up most of the northern portion of the watershed and dot the upper slopes. Young stands generated after fires extend in fingers up Polallie Creek and along the east face of Elk Mountain. In the far north end of the watershed, forested stands were continuous from the base of Surveyors Ridge to the Middle Fork Hood River. It is believed that portions of the lower valley contained a series of wetland complexes with continuous riparian forest habitat.

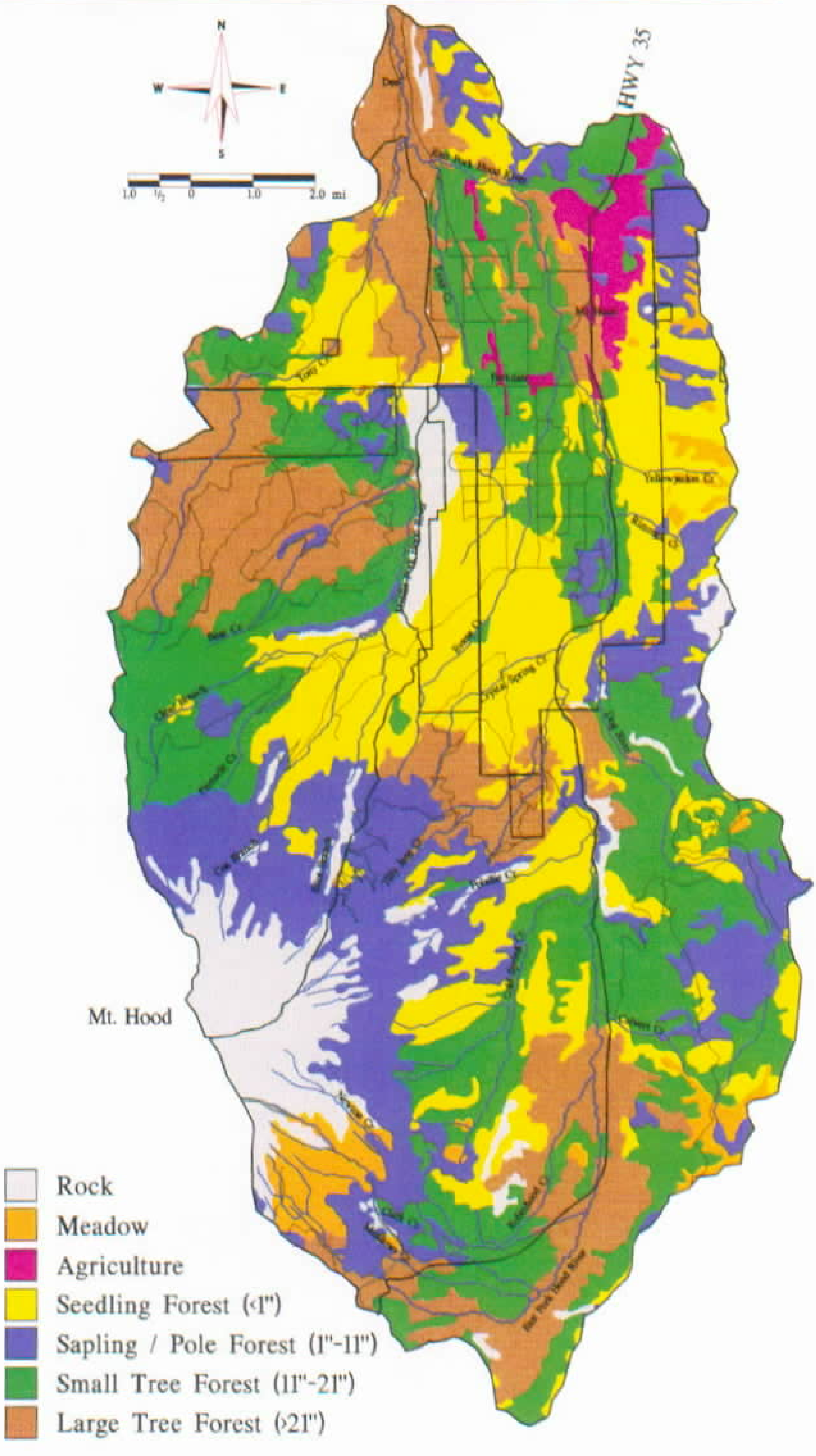


Figure 3.2. - Historic Vegetative Seral Stages.

## *Hydrologic System - East Fork Reference Condition*

The naturally occurring processes that influence the East Fork watershed riparian and aquatic habitats are complex and varied due to the proximity of the drainage to Mt. Hood. A combination of the local geology, climate, and glaciation related to Mt. Hood have historically influenced the shape of the streams and associated riparian areas.

Landslides and debris flows have been common in much of the watershed and have had a significant affect on the East Fork drainage system. Steep drainages within unstable areas (See Figure 3.3) have high potential for landslide and debris flows during intense precipitation events, especially those occurring on a snowpack (rain on snow events). Naturally occuring woody debris structures that sort sediment and provide fish habitat are not only created and built upon but can also be destroyed by these events.

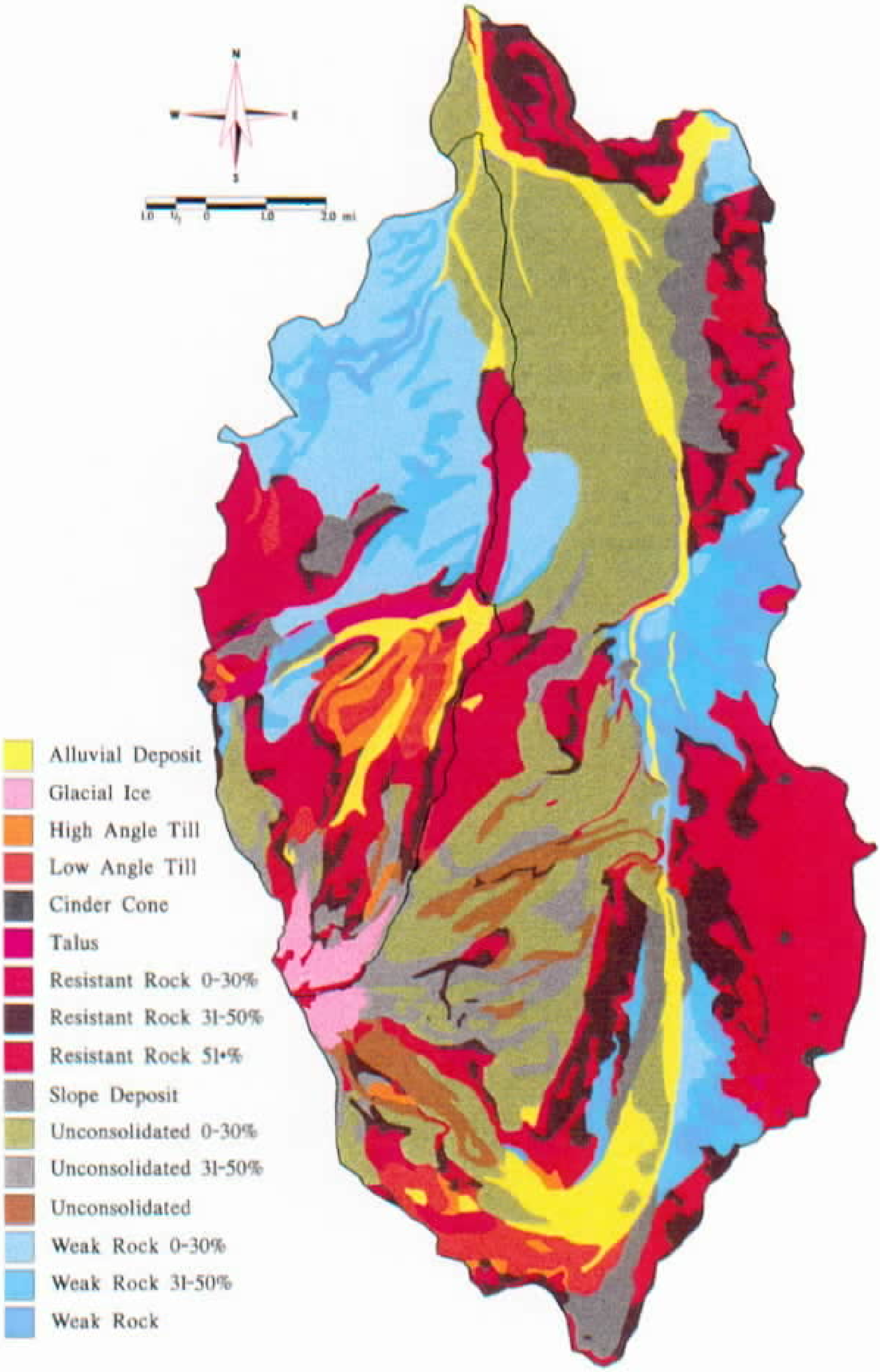


Figure 3.3. - Geologic Landforms.

Historically, the potential for large wood was substantially greater than is possible today primarily due to differences in riparian forest composition. In the mainstem East Fork, large wood that fell into the channel was transported through stepper sections and collected in depositional areas (See Figure 3.4). In smaller streams and tributaries, stream flows were not capable of moving large wood but did transport small woody debris into the mainstem. The continuous movement of woody debris through the watershed system is directly related to the size of the stream channel, peak flows, and woody debris input potential.

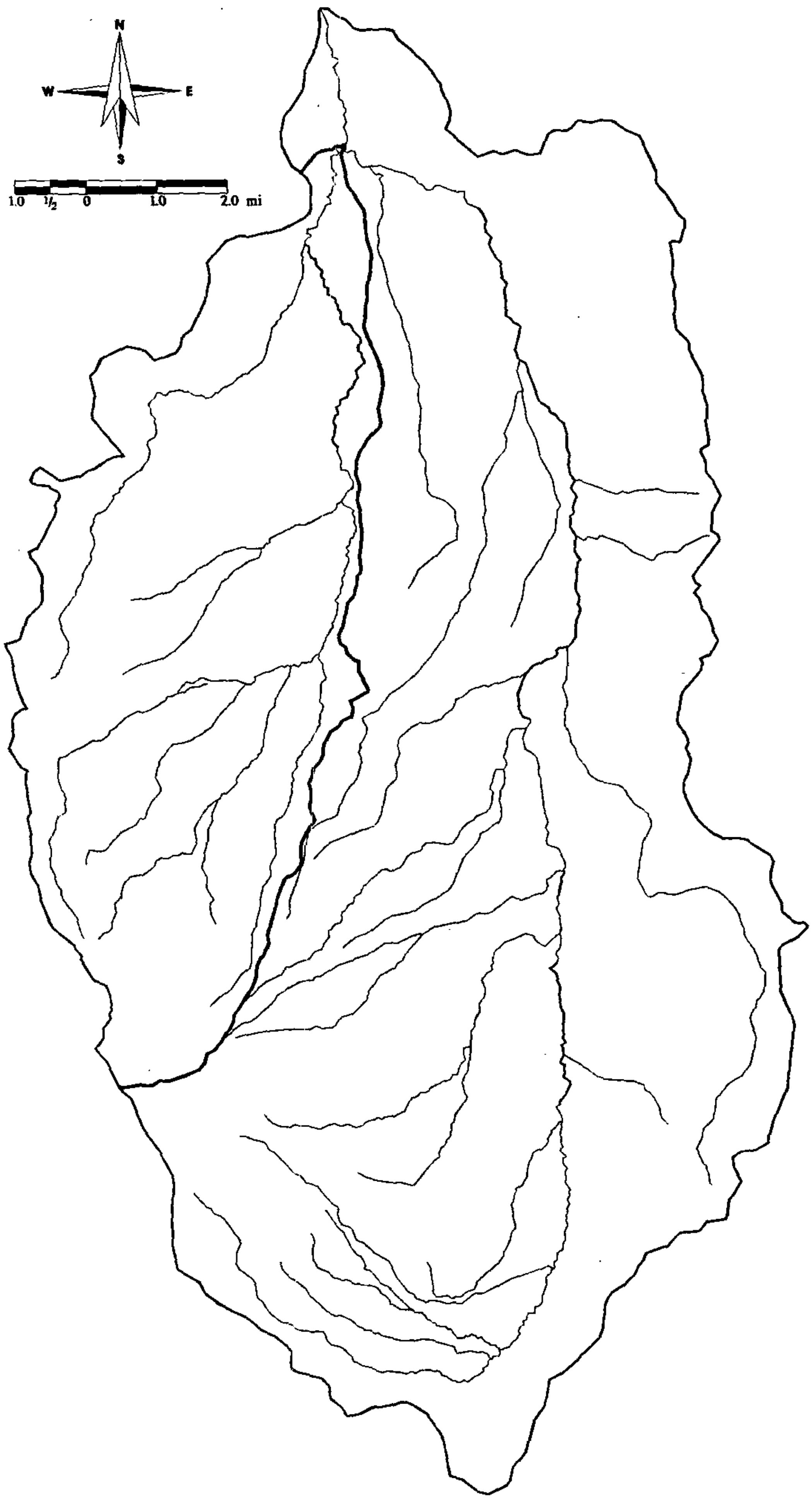


Figure 3.4. - Mainstem Habitat Areas. (Depositional Areas in red)

Large diameter wood was available along most lower gradient stream reaches and some steeper tributaries. Wood was deposited in riparian areas by windthrow, river bank undercutting, landslides, and debris torrents. Landslides occurring in steep narrow valleys had the potential to become debris torrents which obliterated riparian vegetation. Large trees mixed with other debris, if deposited in a consolidated mass, would have created complex habitat for aquatic life. Generally, debris torrents obliterate steep gradient tributary riparian areas but increase riparian area complexity and total biomass quantity in down stream deposition zones.

### *Fish and Habitat - East Fork Reference Condition*

Historically, the East Fork mainstem riparian areas produced substantial quantities of large stems that were available to the stream channel. Large wood found in tributary channels typically was not transported into the mainstem. The large wood that grew in the riparian area from Robinhood Campground to The Narrows, and in the lower reaches below Polallie Creek was a major source to the main stem channel. In the lower reaches, the large volumes of wood in the channel influenced the formation of a very wide wetland stream complex that provided abundant rearing and refuge habitats for aquatic life. Tributary streams to the mainstem had large volumes of wood and provided high-quality spawning and rearing habitat for anadromous and resident salmonids.

The influence of glacial melt and sediment load regarding anadromous fish runs within the East Fork is undetermined. It could relate to the historical carrying capacity for anadromous fish runs and run timing although it is important to remember that the fish have evolved in conjunction with the glacial sediments of this system. Newton and Clark Creeks are the only two glacial tributaries to the East Fork. In late summer during high glacial sediment loading periods, the non-glacial tributary streams were likely important rearing areas.

Anadromous fish species known to occur within the East Fork of the Hood River included steelhead trout (Oncorhynchus mykiss irideus), coho salmon ( O. kisutch), sea-run cutthroat trout (O. clarki), and Pacific lamprey (Entosphenus tridentatus). In addition, spring chinook salmon (O. tshawytcha) may have resided in the East Fork Hood River watershed. Resident fish species indigenous to the watershed were coldwater fish such as rainbow trout (O. mykiss), cutthroat trout, bull trout (Salvelinus confluentus), and sculpin (Cottus spp.). Other fish residing in the Columbia River and the mainstem Hood River that could have resided within the watershed include suckers (Catostomus spp.), mountain whitefish (Prosopium williamsoni), and northern squawfish (Ptychocheilus oregonensis).

Historically, steelhead are documented as far upstream as Cold Springs Creek and could have migrated much further. Sea run cutthroat likely traveled above The Narrows (See Figure 1.2). Upper limits of distribution for these fish stocks and others are unknown (See Appendix I, Fisheries Report).

During the mid to late 1800's, habitat loss was occurring throughout the Columbia Basin due to mining, logging, and agricultural developments. Commercial fish harvest and the number of canneries along the Columbia system peaked in 1883 (Lichatowich et al., 1996). Historical run size and distribution of anadromous salmonids ascending the Hood River are not known. Prior to the reference period some logging, fish harvest, and agriculture occurred within the watershed. Although some impacts to fish stocks occurred, they were likely lower in the watershed and perceived to have been minimal compared to post reference period.

### *Wildlife and Habitat - East Fork Reference Condition*

Historically, the watershed provided for a diversity of wildlife species through an array of dispersed habitat types. Patch size of forest seral stages were fairly large (See Figure 3.2). Generally, the transitional ecotypes (eastside/westside cascades) within this watershed maintained genetic linkages and migration pathways both north/south and east/west around Mt. Hood. In the late 1800's, large fires originated from the southern portion of the lower valley. They effectively converted much of the mature and late seral habitats believed to be a part of the central portion of the watershed to early seral patches. Large downed logs and large diameter snags were prevalent throughout most seral stages within the watershed. Large meadows, forested wetlands, cliffs, rocky areas, and a large lava flow supported a diversity of special habitats scattered throughout the watershed.

Large home range, late-successional species such as northern spotted owl, pine marten, fisher, wolverine, goshawk, and pileated woodpecker were likely plentiful and well distributed. In addition, peregrine falcons were a possible ecosystem component. There are five, medium to high potential, peregrine cliff sites located within the watershed When fish runs within the streams were higher, it is expected that bald eagles were also prominent within the middle to lower portions of the watershed. Grizzly bear, wolf, cougar, and black bear were likely inhabitants that topped the food chain. Condor are known to have occupied the Columbia basin and would have at least foraged within the watershed. Mountain goat may have been an inhabitant, found at upper elevations, along ridges near Mt. Hood.

The lower valley was covered with braided stream networks containing abundant riparian vegetation and downed logs. This area would have provided habitat for an array of wildlife including: bald eagles, pond and painted turtle, harlequin duck, wolverine, and Cope's giant salamander.

## *EAST FORK CURRENT CONDITION*

### *Introduction*

Current conditions within the East Fork are the result of almost a century of disturbance. Changes have occurred across the watershed. This section addresses some of the major elements of change that have shaped the landscape and offer a picture of what exists today.

### *Human Uses - East Fork Current Condition*

Since 1900, agriculture, industry, and rural residential development have encompassed most of the private lands of the northern portion of the watershed. Agriculture has been dominated by fruit orchard production although other crops are also grown. The primary industries have been forestry and fruit processing, and in recent years tourism. Secondary industries, such as mechantile, community services and infrastructure development and maintenance, have expanded as population levels have increased.

The railroad, completed to Parkdale in 1910, was probably the most influential agent of the area creating opportunities for moving people and goods. Early on, the train was used for hauling timber, shipping fruit and carrying passengers. As roads were constructed in the area, the railroad became secondary to this more convenient mode of transportation. By the mid 1920s, the Mt. Hood Loop Highway was built and motor touring around Mt. Hood became very popular. The route today from Parkdale up The Cooper Spur road to Highway 35 and south to Bennett Pass is roughly the same alignment as the original loop highway.

Logging on National Forest lands did not begin within the watershed until the 1940s. Harvest levels have increased since then but not as rapidly as in other areas of the forest. This is possibly due to the vast younger stands that have been developing here over the last 100 years and the availability of high value timber in the more accessable low elevation areas.

Road construction to support state travel routes, logging, and recreation has occurred within the drainage. Highway 35 is the major road system through the watershed, completed in 1925 and constructed in many areas adjacent to the East Fork mainstem channel. The portion presently located on National Forest land is part of the original Loop Highway although it was straightened in the 60's during development of the Mt. Hood Meadows ski area. The lower portion, north of Polallie Creek, was first constructed during the same time. In 1980, this section of the highway was reconstructed in the aftermath of the Polallie debris flow event. The portion of the highway between Polallie Creek and Dog River was reconstructed above the floodplain. Below Dog River, reconstruction was adjacent to the channel with levees added as flood control measures. From first construction, through reconstruction and annual maintenance, Highway 35 is a repeated impact to the natural flow of the East Fork and the biota that maintain the health of the stream system.

In recent years, increased visitor use within the watershed has multiplied due to population growth and the popularity of outdoor recreation. Recreationists primarily utilize opportunities within the watershed for hiking, biking, camping, rock climbing, nordic and alpine skiing, and auto touring (See Appendix D, Recreation Report).

Use in the Mt. Hood Wilderness has increased significantly over the last 10 years. Elk Meadow, Cloud Cap/Cooper Spur area, Gnarl Ridge, and the Timberline Trail all exceed standards for encounters (an indicator of solitude). Demand for wilderness uses seem to be growing at a steady rate.

Mt. Hood Meadows Ski Area is the second largest ski area in Oregon with 360,000 skier visits during the 94/95 season. Opportunities for nordic skiing have increased within the upper valley of the watershed with the expansion of the Teacup System and the Mt. Hood Meadows System. Demand for the traditional nordic touring appears to be flat or declining in the last 5 years. However, demand for quality groomed track nordic, and backcountry touring and telemarking seems to be growing.

Mountain biking, and hiking use continues to increase.. The most popular trails, Tamanawas in particular, are overcrowded on many weekends, decreasing the quality of the experience. Mountain biking use has increased dramatically over the past decade. The quality of the trail tread is deminished on trails used by mountain bikes, due in a large part to their design (being for hiker and horse use), and the increasing volume of use.

There are only two developed National Forest campground facilities along highway 35, at Robinhood and Sherwood. Both areas are old, worn out, and not designed for modern vehicles. There are two Hood River County campgrounds, Routson and Tollbridge, located in the lower portion of the watershed. Both facilities are maintained and operated annually during the tourism season. Dispersed camping is very popular within the East Fork drainage, especially on National Forest lands. Many user created roads and campsites exist between highway 35 and the East Fork mainstem. These sites continue to expand over time in number and size. Many roads and sites have been blocked but barriers are often circumvented by users.

### *Fire History - East Fork Current Condition*

Since 1900, fire frequency has varied. Many of the lower elevation areas were intentionally burned prior to the 1930s to clear vegetation for road construction, maintain established travel routes, develop agriculture, and establish homestead sites. Historic fire records for the period between 1930 and 1990 indicate relatively few ignitions and no large fires in the watershed. Increased access gained through developed road systems enabled rapid suppression of fires.

### *Vegetation - East Fork Current Condition*

A vegetative picture of the watershed was constructed from a combination of current vegetation data bases covering different portions of the area. From three primary data bases, ISAT, MOMS and TRI, stand information was used to generate stand seral stages (See Figure 3.5). The three data bases were necessary to provide a complete picture of the entire watershed (See Appendix K, Silviculture Report).

Utilizing the databases, a GIS (Geographic Information System) spatial analysis generated a view of the vegetative landscape. As seen with the vegetation depicted for the reference period, the general landscape is covered with a matrix of mid seral forest. The current matrix has shifted to slightly more developed stands, larger in size and not as open. The main differences are noted in the late seral and early seral patch combinations within the matrix. Late seral forest patches occupy a greater percentage of the watershed now than during the reference period (See Figure 3.6) although they have declined since the 1950's. Current patch distribution is more widespread but also more disjointed than at the reference period. Early seral patches are a result of harvest activities since the 1950's, and are scattered through many of the late seral patches. Connectivity of late seral habitat has been reduced by management related fragmentation.

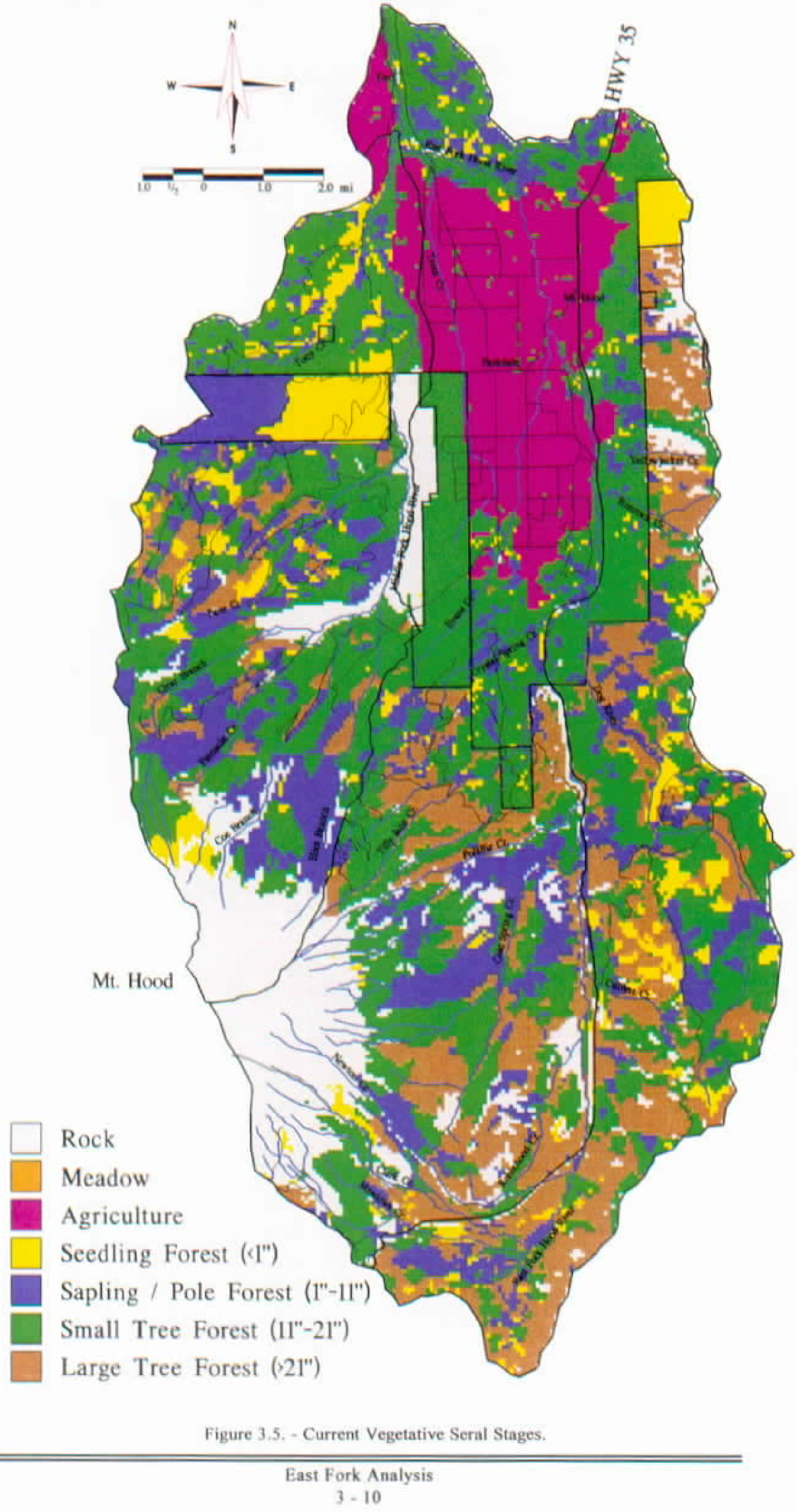


Figure 3.5. - Current Vegetative Seral Stages.

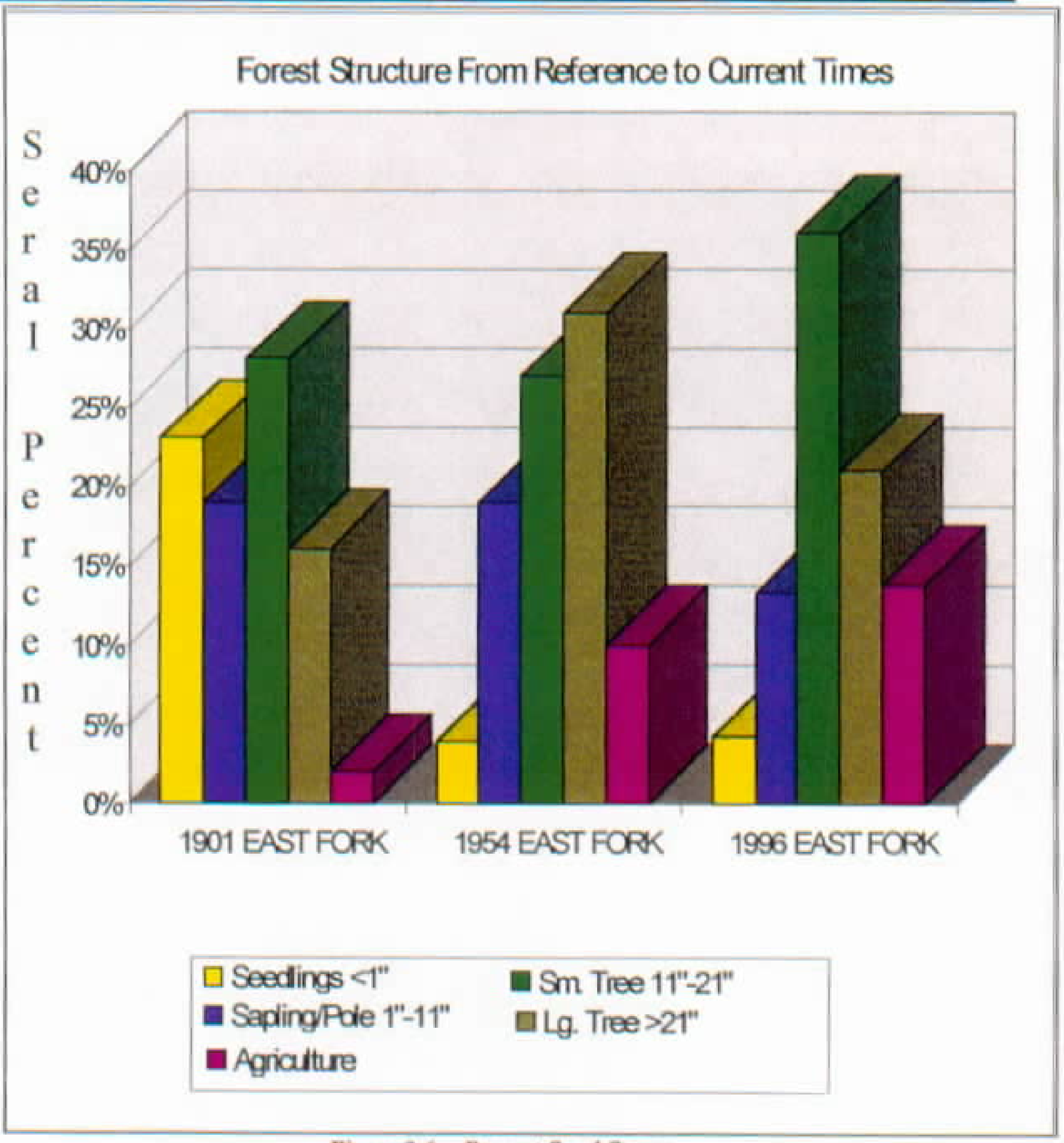


Figure 3.6. - Percent Seral Stages.

The large early seral patches seen in the reference condition have developed into mid-seral forest resulting from human induced fires. Minimal harvest activities have occurred within these. In many places, particularly the eastern slopes of the watershed, concerns for continued forest integrity are increasing due to the long term lack of fire maintenance. Understory seral species are overstocking many stands. In recent years, root disease and insects have developed more readily in the Tilly Jane and Polallie Creeks areas. Past timber management activities, harvesting mainly late seral stands, have centered primarily within the Pocket Creek, Culvert Creek, Engineers Creek, and Dog River drainages.

Native plant communities within the watershed are in jeopardy of invasion by and the expansion of noxious weed populations. Of the state list of noxious weeds, the watershed contains 14 designated weeds (See Appendix L, Noxious Weed Report). These weeds have been found along all of the major roadways and are present in most of the timber sale units harvested within the last 20 years. Currently, the invasion rate of noxious weeds is greater than control efforts mainly due to insufficient funding at both the state and federal levels. Some plants, not classified as "noxious" weeds, also warrant control due to their aggressive growth in sensitive areas.

The 1994 Record of Decision (ROD) for the Northwest Forest Plan identifies 354 plant species to be protected through survey and manage standards and guidelines. There are no known sites with mosses, liverworts, or vascular plant listed species in the East Fork watershed. However, there are eleven fungi and one lichen species on this list that are known within the East Fork watershed. They are found on the edges of wet and dry meadows, and riparian areas of the watershed (See Appendix L, Survey & Manage Plant Report).

*Hydrologic Systems - East Fork Current Condition*

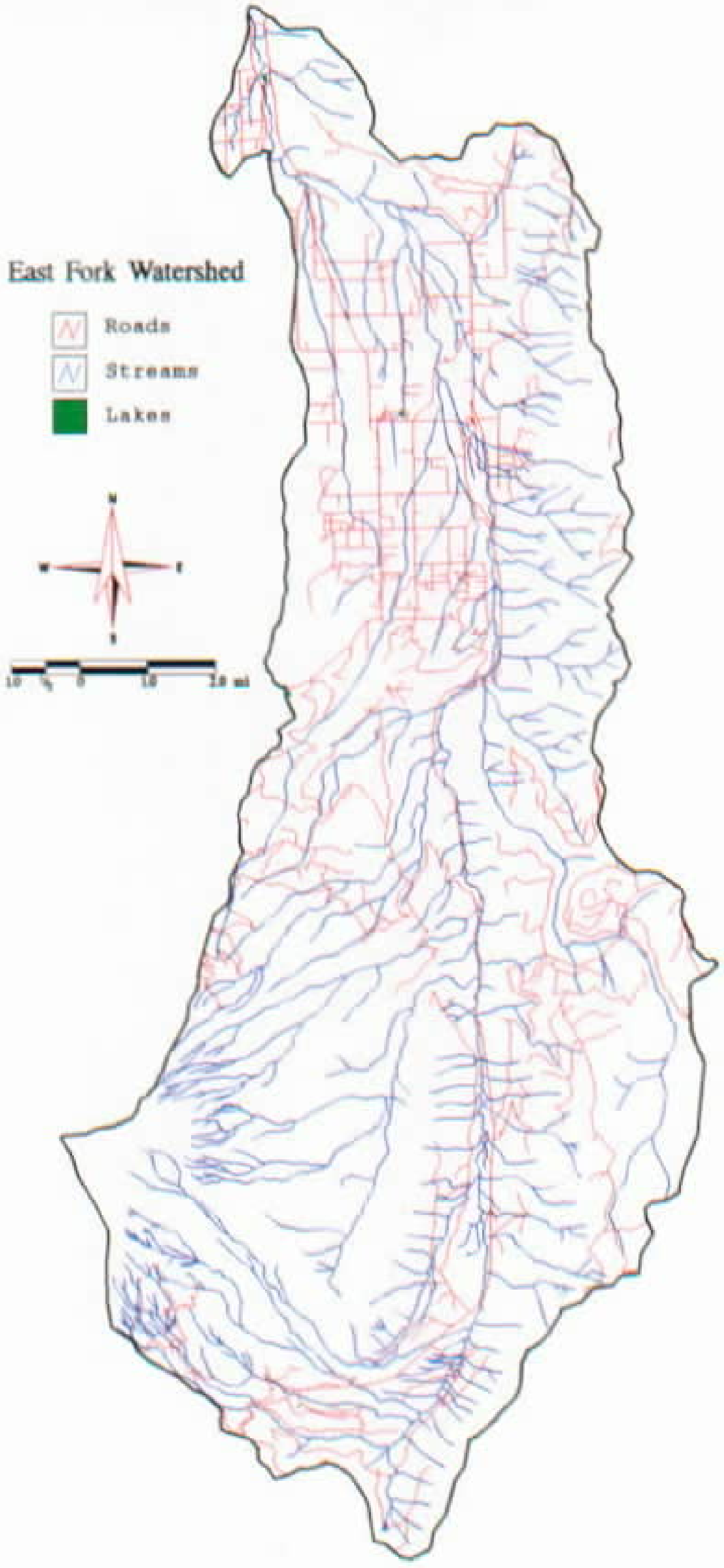


Figure 3.7. - East Fork of the Hood River Watershed Streams and Roads systems.

Analysis found that tributaries with large scale catastrophic disturbances naturally have less in-channel wood related habitat and early seral riparian vegetation. In many other areas of the watershed, past management has changed the riparian ecosystem functions by altering the riparian vegetation and removing in-stream large woody material. During the '60s and '70s, stream cleanout was an encouraged practice. There is agreement among current local specialists that there is less in-stream woody habitat today than prior to European settlement.

Within the mainstem of the East Fork, three areas were noted as depositional areas more likely to collect large woody material (See Figure 3.4). In general, these locations have very wide flood prone areas, are lower in gradient than the upstream reaches, and dissipate stream velocity and energy. In contrast, many upstream reaches are capable of transporting large, medium and small sized woody material depending on stream size. Not all tributary systems are capable of moving large woody material downstream unless a debris flow or similar sized flood event occurs. The hotspots identified in the mainstem and the adjacent tributaries were likely areas of excellent fish spawning and rearing habitat.

On the lower East Fork, historical accounts brought forth in analysis suggest that large volumes of wood created a very wide wetland stream complex. Structural habitat, capable of supporting historic population levels of anadromous fish in the East Fork, is limited today. Euro-american settlement and management activities have significantly altered these areas. Headwater areas have received riparian related impacts also but to a lesser degree than the bottom land areas of the drainage. Along the East Fork mainstem between Robinhood and Sherwood campgrounds, the Forest Service salvaged large downed wood in and adjacent to the channel in 1979. It is likely that this type of activity has occurred within other areas of the watershed, not limited to any one ownership. Evidence of downcutting, floodplain abandonment, or aggrading stream channels are visible in the East Fork watershed and are indicative of stream systems that are out of balance.

The composition of seral stages of the vegetation help determine the potential for snowmelt, snowpack retention, and evapotranspiration. The hydrologic recovery of the vegetation influences flood and base flow levels. One index of hydrologic recovery is the Aggregate Recovery Percent (ARP). ARP is a mathematical model which puts numerical value on the risk of increasing peak flows that can lead to associated watershed damages. It is the cumulative watershed effects model specified for use in the Mt. Hood Forest Plan. An ARP analysis was conducted on each 6th field watershed within the 5th field East Fork watershed. Road densities and recovery conditions varied (See Table 3-1). Although not surprising , these analyses show the agriculture lands in Trout Creek, Evans Creek and Lower East Fork subwatersheds having the highest risk for increased rain on snow peak flows. The Dog River and Crystal Springs drainages are the only others that analyzed marginally recovered (See Figure 3.8).

Table 3-1. - East Fork Subwatershed Statistics.

| Subwatershed | Total Acres | Riparian Reserve Acres | Riparian Reserve Percent | * System Roads (mi/mi²) | Linear Stream (mi/mi²) | ARP | * Riparian LWD Potential Standing Large Conifer (Percent Riparian Area) | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Low | Medium | High |
| Trout Cr | 4710 | 260 | 6 | 4.14 | 2.35 | 41 | 84 | 16 | |
| Evans Cr | 5201 | 556 | 11 | 4.87 | 2.74 | 50 | 37 | 51 | 12 |
| Yellowjacket Cr | 855 | 156 | 18 | 0.85 | 4.05 | 90 | 63 | 3 | 34 |
| Rimrock Cr | 622 | 144 | 23 | 0.48 | 3.68 | 90 | 19 | 28 | 53 |
| Dog River | 8144 | 1388 | 17 | 2.36 | 2.01 | 77 | 22 | 52 | 27 |
| Crystal Spr | 1881 | 122 | 6 | 3.42 | 2.60 | 79 | 24 | 55 | 20 |
| Tilly Jane Cr | 2860 | 718 | 25 | 2.47 | 3.97 | 96 | 28 | 43 | 29 |
| Polallie Cr | 2903 | 1224 | 42 | 0.44 | 4.48 | 90 | 73 | 18 | 9 |
| Cold Spring Cr | 5810 | 1230 | 21 | 0.01 | 3.16 | 90 | 34 | 45 | 21 |
| Culvert Cr | 1037 | 236 | 23 | 2.80 | 2.61 | 84 | 36 | 17 | 47 |
| Robinhood Cr | 2071 | 804 | 39 | 1.83 | 3.71 | 92 | 50 | 15 | 35 |
| Newton Cr | 2060 | 490 | 24 | 0.25 | 3.09 | 90 | 65 | 22 | 12 |
| Clark Cr | 2269 | 683 | 30 | 0.58 | 4.46 | 90 | 58 | 28 | 14 |
| Meadows Cr | 1106 | 292 | 26 | 3.38 | 3.74 | 88 | 72 | 28 | |
| East Fork U | 8101 | 2974 | 37 | 2.72 | 3.79 | 90 | 49 | 24 | 27 |
| East Fork | 5832 | 1435 | 25 | 2.87 | 2.84 | 90 | 28 | 46 | 26 |
| East Fork L | 16767 | 438 | 3 | 2.92 | 2.97 | 68 | 36 | 31 | 33 |
| Totals | 72229 | 13150 | | | | | | | |
| Average | | | 18 | 2.14 | 3.31 | 82 | 46 | 31 | 33 |

* Notes: **Riparian Large Woody Debris (LWD) Potential** is the riparian vegetations ability, at this time, to produce organic structure material for stream habitat from standing live trees. **System Road Density** is based on the total roaded miles maintained on the sub-watershed.

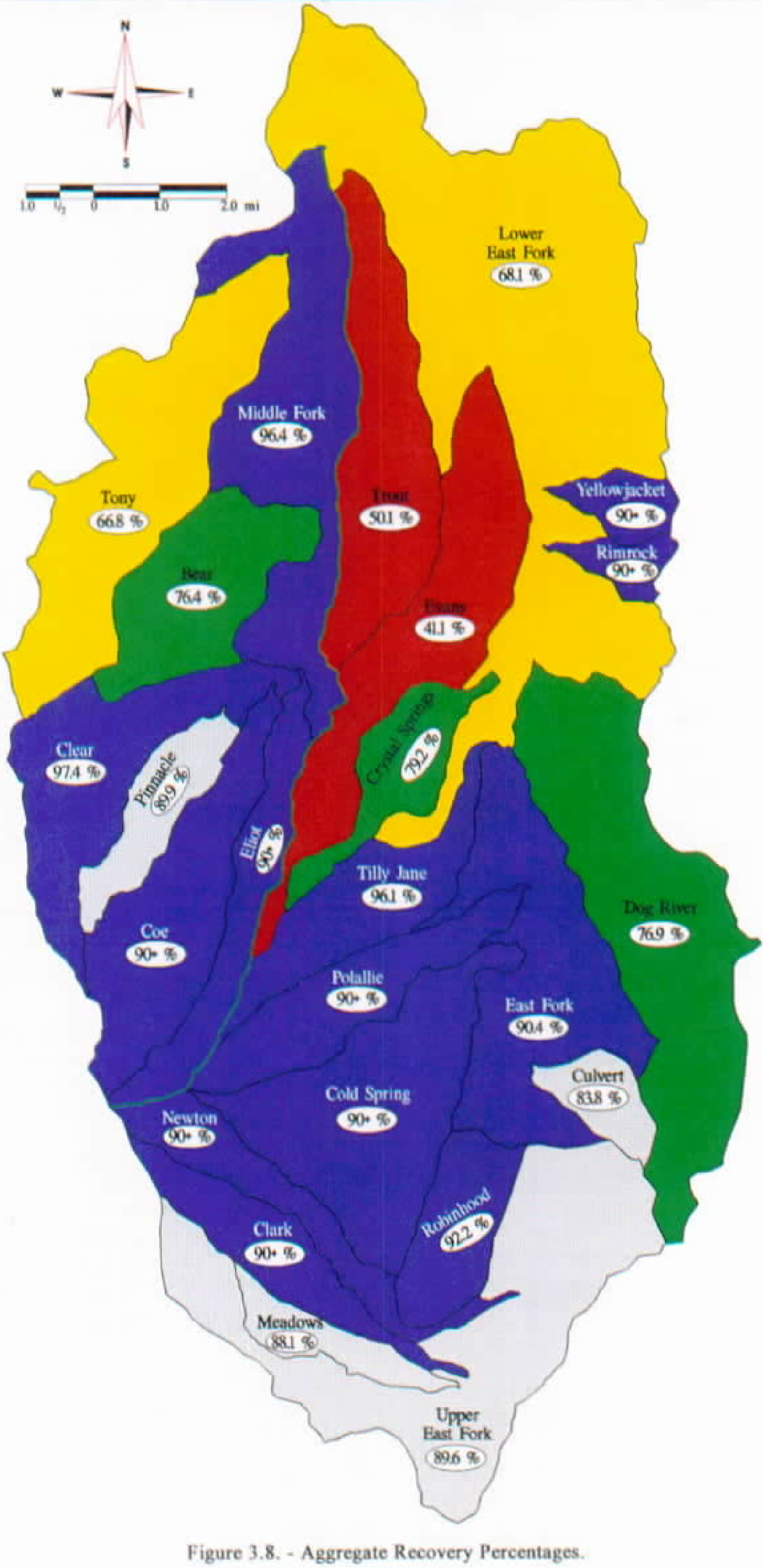


Figure 3.8. - Aggregate Recovery Percentages.

## *Fish and Habitat - East Fork Current Condition*

From a fisheries standpoint, the period beginning in 1900 to the present day was one of great loss both in numbers of fish and in habitat quantity and quality. Commercial fishing in the Columbia River continued unabated into the early 1900s. Fish wheels were banned in Oregon in 1926 and in Washington in 1934 but other forms of fishing such as dip and gill netting continued. Probably the most significant impact to anadromous fish within the watershed was the barrier created by the Hines dam which was located at the northern most portion of the Eastfork watershed for approximately 41 years.

The fish resources have been impacted in many ways throughout the Columbia Basin since the reference period. Within the East Fork watershed, detrimental management actions that occurred include:

- Fish harvest and possibly fish stocking
- Timber harvest within and adjacent to streams
- Splash damming for log transport
- Agricultural development and management
- Riparian area conversion to other uses, some degrading stream channels
- Irrigation withdrawals and non-screened intakes
- Forest and county roads - increased drainage patterns and sediment input
- Highway 35 construction - constrained and altered the alignment of the East Fork mainstem
- Manmade Barriers - ( i.e. Powerdale, Hines and Clear Branch dams).

The current salmonid fish stocks within the East Fork include winter steelhead trout, coho salmon, sea run cutthroat trout, rainbow and cutthroat trout. Rainbow and cutthroat trout are the only two found throughout the watershed. Winter steelhead found in the East Fork are a mixture of hatchery and indigenous fish. Relatively few travel as far upstream as the National Forest boundary. Stocking of winter steelhead has occurred in the Hood River system since 1962. Recently, an ambitious supplementle effort is underway to develop a naturally reproducing, indigenous winter steelhead run by the early 21st century. Coho salmon indigenous to the Hood River system are likely extinct. The few fish entering the system today are thought to be strays from other river systems and may spawn naturally in the lower portions of the East Fork up to Dog River. Little is known about the sea run cutthroat trout in the Hood River system but they appear to be very few in number. The limited information suggests that most of these fish are found in the mainstem Hood River and the East Fork. Recent fish counts for these species are shown in Table 2 of Appendix I, Fisheries Report.

Two streams having glacial origin, Newton and Clark Creeks, are part of the watershed. There is some question of glacial melt and sediment load impact on anadromous fish runs within this watershed. An analysis was conducted using assumptions for background sediment levels in glaciated and non-glaciated streams, to compare relative sediment inputs by the two stream types and resulting dilutions within the mainstem (See Appendix G, Hydrology Report). The analysis shows glacial sediment substantially diluted through the total length of the East Fork Hood River and at a much lower percentage than the Middle Fork Hood River. The threshold for spawning or rearing in glacial systems is unclear but indigenous fish have evolved within these systems.

Aside from the in-stream structural enhancement work on National Forest stream reaches, there are two current management activities/improvements underway for the basin. The Confederated Tribes of the Warm Springs, Oregon Department of Fish and Wildlife, and Bonneville Power Administration are collaborating on a large scale supplementation project designed to restore natural runs of spring chinook salmon, and winter and summer steelhead trout to the river system. Up and downstream fish passage improvements are either planned or completed for virtually every remaining man made passage impediment relating to irrigation and hydropower in the watershed. Many road crossing culverts are likely barriers at some or all flows. Passage surveys need to be conducted to determine which road crossings are barriers and in need of replacement.

## *Wildlife and Habitat - East Fork Current Condition*

Compared to other watersheds on the eastside of the Mt. Hood forest, the East Fork watershed contains an above average level of late-successional habitat. Some large gaps in continuity of this habitat do exist. The largest percentage occurs in the upper portion of the watershed. The majority of this habitat is outside of the Mt. Hood Wilderness. Continuity between patches is still adequate although the integrity of the late seral matrix has been reduced since mid-century by timber harvest. In the lower (northern) portion of the watershed, the current level of late-successional habitat is less than that identified for the reference period. The Surveyors ridge area is an exception to these lower levels. Along this ridge, fire exclusion has allowed stand development to continue into late seral structures and higher stocking levels.

The lower portions of the watershed, below 3500 feet elevation, include agricultural lands, forest land under other public and private ownership, and a small band of National Forest at the higher elevations. Much of the agricultural area historically consisted of mature and late seral forest with a well dispersed network of streams. The forest land, other than Federally owned, will be managed following the regulations in the Oregon State Forest Practices Act. Timber management will include riparian and upland wildlife habitat considerations at least to the extent required by the law. There is a very small portion of land near 3500 feet in elevation located on National Forest lands. The wildfires of the 1880s, harvest of late seral stands in recent years, and insect/disease problems have left this narrow corridor with very little effective late seral habitat.

Within the East Fork watershed, 15 spotted owl activity centers are known including the highest elevation owl pair on the Mt. Hood National Forest. It is located at 4600 feet near Mt. Hood Meadows Ski area.

Some recent unconfirmed sightings of wolverine have been reported within the watershed. This species is known to have naturally low population density and a very large home range. The flow of this species across the watershed has most likely been altered by the presence of Highway 35 and the development that has occurred within the lower valley. Secluded reproductive/denning habitat within the watershed, particularly within the Mt. Hood Wilderness, is still very viable.

Pine martens are an abundant inhabitant of the East Fork watershed. This species is linked to moderate levels of down logs, mainly in mature/late seral forest stands. Prime habitat for this species is located in the upper elevations of the watershed. This exists particularly in unfragmented stands around Mt. Hood Meadows Ski area and along Bluegrass Ridge north to the upper portions of Polallie and Tilly Jane subwatersheds.

There are known occurrances of harlequin duck from above Robinhood campground to below Tollbridge Park. The quantity of this species in the watershed stands out when compared to other watersheds on the forest. It is expected that additional pairs of this species would have historically occurred even lower in the watershed. The reason for the abundance of this species within the watershed is unclear. It may indicate good populations of aquatic invertebrates (prey species) within the streams, be associated with the proximity of the area to the Columbia River and access from wintering waters of the Pacific Ocean, or other factors..

Compared to other watersheds on the Mt. Hood National Forest, the East Fork has many wetland/meadow complexes. These areas provide some of the best summer range for deer and elk species on the east side of the cascades. They also provide unique habitat for a number of aquatic and riparian associated species.

Deer and elk are a visible component of the East Fork watershed. These species migrate through the watershed in spring and fall, moving along Bluegrass Ridge and the lower portion of the Cooper spur area. They cross Highway 35 and travel eastward over Gumjuwac Saddle and the upper portions of Puppy Creek and Dog River. Summer range includes the upper portion of East Fork, particularly in the Meadows, Clark, and Upper East Fork sub watersheds.

Bald eagles are not permanent inhabitants of the watershed. Depleted fish runs have reduced the available prey base and are most likely the limiting factor to occupation by this species in the East Fork. Oregon Department of Fish and Wildlife (ODFW) has suspected that the Hood River basin contains a winter roost but has been unable to locate any. The majority of the winter use is along the Columbia River but birds have been seen foraging inland to the watershed.

Other species now absent include the peregrine falcon, grizzly bear, mountain goat, grey wolf, and California condor. Recovery efforts underway may eventually return falcons and condor to the watershed. Both painted and pond turtle habitat of the lower riparian areas are now mostly agricultural lands. An individual pond turtle was located near Toll Bridge Park within the past 5 years. This individual is likely a vestige of past populations.

## *EAST FORK ISSUE SYNTHESIS*

### *Introduction*

This section discusses the resource issues that have developed in the watershed as a result of the human involvement and management on the ecosystem. The four primary issues that surfaced through analysis team discussions are the focal point for synthesis of related impacts.

## *East Fork Issue #1 Synthesis - Fish Populations have declined in the watershed.*

The decline of fish populations is a much farther reaching issue than just the Hood River system. Habitat degradation, alteration and loss have occurred throughout the entire Columbia basin and significantly influenced the quantity of annual returning fish stocks.

It is important to realize that impacts occurring in the East Fork watershed do contribute to the overall problem in a cumulative sense. Assuming that strong anadromous fish runs returned to the Hood River system, they face habitat loss due to large wood removal and channel alteration, reduced water quality, and passage barriers.

### *Lower Reaches * Non-Federal Ownership's*

Human development within and adjacent to the riparian areas has been extensive. Much of these once forested areas have been converted to agricultural and residential uses. In many areas surface waters have been diverted or drained to reduce saturated soil conditions. Road systems within the lower valley are adjacent to or have at least crossed all streams. All sub-watersheds within the lower valley have greater than 3 miles/sq. mi. road densities (See Appendix G, Hydrology Report). In many cases, stream channels have been straightened or pushed to one side to facilitate agricultural and road developments. Riparian areas in this portion of the watershed are in a variety of conditions but channels generally lack large amounts of in-stream, wood.

Hines dam, located on the Main Stem Hood River near Dee, was a barrier to fish passage for most of the period from 1925, when it was constructed, to June 1966, when it was dismantled. Fish passage was constructed after about year 10 but the ladder was not well maintained and is thought to have been non-functional much of the time. This one impact was probably the most detrimental action restricting anadromous fish runs within the watershed.

During late summer, the East Fork Irrigation District reduces water flow within the East Fork., at times taking all the water out of the East Fork channel. This action can be an effective barrier to migrating fish both in terms of passage capability and water temperature tolerance. Summer water temperatures within the East Fork mainstem are at times high enough (See Appendix H, Water Quality Report) to influence biological effects such as reduced disease resistance for anadromous fish. From comparisons with sites upstream and downstream, the elevated temperatures may be associated with irrigation withdrawals at the East Fork Irrigation District ditch.

### *Upper Reaches * National Forest System Lands*

Based on recent studies conducted by Oregon Department of Fish And Wildlife (ODFW), the Confederated Tribes of Warm Springs (CTWS), and U.S. Forest Service (USFS) biologists, there do not appear to be any anadromous fish traveling as far upstream as The Narrows of the East Fork Hood River or beyond. However, there are no known passage barriers and fish could be migrating above this point. These reaches function as a filter for the entire system that sort sediments, maintain quality water output, and during peak flows can provide woody structural components to the lower reaches for habitat development.

The most important issue on National Forest land is the loss of large wood in streams and the potential for future recruitment of large wood from riparian areas. The stability of these river/stream systems is primarily a function of the structure provided by large wood within key stream reaches. Historically, peak flow energy developed and changed the arrangement and distribution of woody structures to influence overall channel stability, fish habitat, and provide quality water down stream.

Management activities that increase peak flows and runoff can substantially increase the risk of slides and debris torrents. Rain melting an existing snow pack quickly increases total runoff which exacerbates erosion and can cause decreased stream bank stability and channel incisement. Timber harvest activities have occurred within riparian areas and in some cases within the stream channels of the watershed. In 1979, salvage operations removed all wood from the East Fork mainstem between Robinhood and Sherwood campgrounds. These large accumulations provided vital habitat for anadromous and resident fish. Harvest activities within and adjacent to riparian areas have also occurred within the Robinhood and Pocket Creek drainages.

Forest road systems have paralleled and crossed many of the streams of the watershed creating potential sediment input sources and extending drainage systems. Debris flows are common to many streams of the East Fork, especially the glacial drainages of Newton and Clark Creeks. The wide valley floor of the upper East Fork functioned as a multiple channel forming area that dissipated debris torrents. Present conditions in this portion of the watershed have disrupted these natural processes. The construction and maintenance of Highway 35 significantly alters the ability of the East Fork mainstem to stabilize within the valley floor. Within The Narrows, Highway 35 has restricted the river to one channel option where the valley floor naturally allowed a wider meander area. Both up stream and down stream from The Narrows the valley floor has evidence of multple historic channels that are now constrained repeatedly by Highway 35 maintenance operations.

### *East Fork Issue #2 Synthesis - A Holistic Approach to Forest Management*

The issue is not that we don't strive for holistic management but that policy and budgetary constraints tend to suggest a simpler more custodial management. Historically, management focused on the parts of the forest - specific wildlife species, recreational demands, timber emphasis areas - with poor regard for the landscape ecology of the forest. For the past 30 years, forest vegetative management has been planned/analyzed at an increasingly larger scale. However, today's vegetative patterns across the watershed show increasing fragmentation. Holistic management includes connected and cumulative actions with a landscape view of the resources on the land and their ecological interactions. The following paragraphs illustrate impacts resulting from past management.

The analysis considered migration paths and population interaction dynamics for multiple species and suggests that connected late seral habitat is not currently present in the forests below 3500 foot elevation. Fires, harvest of late seral forest, short rotation forest management, and forest conversion to other uses have all contributed to this problem. The potential to develop late seral habitat conditions through vegetative manipulation exists for the future. Forest Service management actions that could support this development are limited to a narrow band of National Forest near 3500 foot. The problem is compounded by a land exchange currently in process that removes a large portion of T1S, R9E, Section 36 from federal ownership. This land is key to low elevation connective forest habitat development.

Non-native plants and noxious weeds have been introduced to the watershed in many ways. Sources of continuing infestation include rock quarries, trails open to horse use, and uncertified seed and straw used for erosion control. Rock quarries provide a breeding ground for noxious weeds which can then be transported unchecked throughout the forest. The feed and manure of horses can carry new noxious weed seeds into meadows and other more sensitive areas. Houndstongue (Cynoglossum officinale) and Yellow starthistle (Centaurea solstitialis) were found for the first time in 1995 on national forest land in the East Fork watershed. This species can pose an immediate threat throughout the watershed if not removed promptly. Competing noxious weeds have been shown to hoard nutrients and moisture, secrete allopathic substances, produce vast amounts of seeds, spread vegetatively, and create generally unfavorable conditions for the growth of native plants. Additionally, some erosion control measures have introduced pervasive non-native plants inadvertently. Such plants as Bird's foot trefoil (Lotus corniculatus) were used for road bank stabilization in the Mt. Hood Meadows area. The plant is noted for soil holding qualities but also thrives in sensitive meadow areas.

Highway 35 is maintained to provide access between the Columbia Gorge and Highway 26. The road's location through this watershed, especially along the East Fork mainstem, has been plagued with washouts and high maintenance. Typically, the highway paralleling the East Fork has been armored against detrimental effects of natural channel forming processes that regularly occur. The dynamics of the river system in this watershed were not adequately appreciated as the size of the highway evolved. Proactive highway maintenance along the valley floor can allow natural channel processes to co-exist with the travel way. Specific areas that draw attention are the crossings at Newton and Clark Creeks, The Narrows area, and the section between Dog River and Base Line road.

Forest road networks have typically been planned and constructed for timber harvest access (See Appendix C, Transportation Report). Exceptions to this are Cloud Cap road and Cooper Spur road. With the timber sale program declining, there has been a reduction of road drainage maintenance funds within the watershed. As a result, the frequency and number of failures has increased. The winter of 1996 brought extreme weather and peak flows in streams equating to a 30 year event. Major damage occurred to the existing transportation network. The district can expect these types of incidents to continue until roads are closed, obliterated, or maintenance requirements begin to meet expected maintenance funding. Rock quarry development and maintenance follow closely with road system needs. The cost effectiveness of managing rock pits for road reconstruction and maintenance is questionable (See Appendix C, Transportation Report).

The extreme increases in recreation demands were not projected and current funding does not meet the need for further development. Many dispersed sites cause negative effect on water quality from human waste, petroleum products, road erosion, and loss of riparian vegetation. A particular area of concern is at the Nottingham area adjacent to the East Fork mainstem. Many of the sites are greater than 1,000 square feet and are located immediately adjacent to the river. Overuse is taking its toll on the riparian vegetation. Vehicles are driven up to the rivers edge, and trampling by an excessive number of visitors is occurring randomly. Because these sites are not developed, toilets are not provided and human waste is often found throughout the area. Other sites along the East Fork have similar problems due to the lack of management. Additionally, trail systems that follow riparian areas are not all suited for the types of uses occurring today.

### *East Fork Issue #3 Synthesis - Low Elevation Late Seral Forest Wildlife Habitat Quality and Distribution*

This issue primarily surrounds the quality and distribution of late seral habitat needed to support diverse wildlife populations across the lower elevations (below 3500 foot) of the watershed. All species require suitable habitat distributed across the landscape in such a way so as to provide dispersal linkage and/or reproductive needs for their continued survival. This linkage may be called "connectivity" and varies depending on habitat needs. For instance, large home range species, such as spotted owl or wolverine, can tolerate a greater distribution distance between late-successional blocks than can a small home range species, such as the shrew-mole. Additionally, while the distance between the blocks of habitat for the large home range species can be greater, the size of the late-successional blocks must also be large to meet their needs. Small home range species can tolerate smaller blocks as long as they are in relatively close proximity. Species such as the shrew-mole may find adequate habitat in riparian areas but sometimes the connectivity link with adjacent blocks of habitat is minimal or non-existent.

The concept of conservation biology is the foundation for the Northwest Forest Plan LSR strategy. The plan was designed to ensure long term viability of late-successional associated species, by providing good quality late-successional habitat, protected through land allocations, and well distributed across the landscape. Areas allocated as LSR's will provide habitat for "population clusters" of late-successional associated species and ensure reliable reproduction and genetic interchange. To maintain species viability, these "population clusters" are to be inter-linked by riparian reserves, identified spotted owl centers, congressionally reserved areas, and administratively withdrawn lands.

Considering the landscape scale of the Hood River basin, the East Fork watershed in conjunction with the Middle Fork watersed are key connective links, at lower elevations east/west, for species travel ways and population genetic interactions. The Surveyors Ridge LSR assessment recognized these watersheds as the only avenue west across the north side of Mt. Hood to the Bull Run LSR.

Generally within the East Fork watershed, the quality and distribution of late seral habitat is variable. The quality of the habitat relates to the size and configuration of the late seral patch. The distribution of the patches will determine connective flows throughout the watershed and onto adjacent landscapes. On federal lands, harvest since the 1950's has fragmented some of the larger late seral blocks reducing the quality of the interior habitat. Analysis shows that the upper valley has a higher percentage of late seral habitat today than in 1900. In the lower valley, most of the late seral habitat blocks have been compromised by agricultural development and timber harvest.

The primary area of concern is the east/west connection at low elevations. This link is currently quite tenuous. When assessed visually at the Basin level, there is an apparent lack of viable late-successional habitat to support connectivity. Most lands below 3500 feet are located off National Forest. Additionally, nearly a section (640 acres) of lower elevation National Forest land is currently in process for trade to Hood River County. The remaining lands on National Forest contain a mixture of young (sparse to overstocked), and late seral (fragmented) stands in poor condition. Some harvest of late seral stands has contributed to the young forests but most of these early to mid seral stands have grown out of the fires that swept this area prior to the turn of the century. Generally, large snags and downed wood are lacking in these stands. Overall below 3500 foot elevation, late-successional connective forest habitat is less and perhaps eliminated as a result of the conversion of late seral forest to agriculture, the large fires before the turn of the century, and clear cut timber harvest practices.

Species associated with open patches or patch mosaics (open areas interspersed with forested areas) are quite plentiful now across the watershed, particularly in the northern portion. The composition of wildlife in this northern area is the most significant shift. Species adapted to open, disturbed, or mosaic habitats have replaced the mature, late-successional, and generalist habitat associates that previously occupied the area.

In addition to wildlife species, there are several fungi, lichens, mosses, liverworts, and vascular plants that may be associated with late-successional forests and are listed as survey and manage species in the Northwest Forest Plan, Record of Decision (ROD). On federal lands, the ROD

(Page C-5) directs field surveys to be conducted in all projects proposed for implementation in 1999 and later. If any Survey and Manage species are found incidentally within a planning area prior to 1996, they will be protected according to REO management provisions. Listed non-vascular plants found within the watershed may be affected by existing and proposed management actions both directly and indirectly.

## *East Fork Issue 4 Synthesis - The growing demand for recreation is affecting the quality of the recreation experience.*

The popularity of the Hood River Valley is growing, primarily due to the quality and variety of recreation opportunities. The spectrum of recreation throughout the basin has changed over the past 60-80 years. Within the watershed, there has been a noticeable increased demand for mountain bike routes, hiking trails, nature touring, and skiing opportunities. Population increases in urban areas and shifts in societal values toward nature are changing the recreation arena (See Appendix B, Social Assessment). Leisure time has become more important and people tend to want to escape city life for the outdoors. More and more, people from the large cities are recreating in rural areas. Additionally, fishing and hunting remain as significant outdoor uses of the watershed.

The East Fork watershed contains two developed ski areas, one of which is the second largest ski area in Oregon (Mt. Hood Meadows), and over 60 miles of Nordic Ski trails. An SEIS will be issued the summer of 1996 to consider expansion of the persons at one time (PAOT), permit area, and a summer use program. A decision on the expansion is expected in the fall of 1996. The other developed area, Cooper Spur Ski Area, does not presently have a master plan addressing expansion ideas.

There are numerous portals into the Mt. Hood Wilderness that are easily accessible to those recreationists who desire the primitive to semi-primitive end of the recreation spectrum. It is likely that the numbers of users will be restricted within the next decade to conform with wilderness standards. This will displace probably 1/3 to 1/2 of the estimated 8,000 RVD's in the portion of the Mt. Hood Wilderness within the East Fork and Middle Fork watersheds to other recreation areas in the Badger wilderness, or in trails outside wilderness, perhaps in the East Fork watershed.

A unique opportunity for easy access rock climbing exists at Pete's Pillars (Also known as Pete's Pile) just above Polallie Creek in The Narrows area of the East Fork mainstem. If Highway 35 is widened through The Narrows, the rock formation may be damaged, removed, or the access made difficult. Other opportunities exist in more remote areas on the flanks of Mt. Hood.

Although trail networks have been adequate for hikers, an increase in mountain bike use on several trail systems has placed additional strain on the trails infrastructure. Recently implemented seasonal closure of trails, and hardening of selected areas should help to alleviate the problems, but the large numbers of bikers will continue to place wear and tear on trail systems.

The demand for camping and day use is expected to increase as the population of Metropolitan Portland increases. Within the watershed, there are three developed campgrounds (Robinhood, Sherwood, and Tilly Jane) on National Forest System Lands, and two additional developed campgrounds (Tollbridge and Routson) on Hood River County lands. Of the National Forest campgrounds, Sherwood and Robinhood, located along highway 35 and the East Fork mainstem, are in poor condition and inadequate for demands. Throughout the watershed, developed camping is at or near capacity for the peak use season. The demand for developed sites is expected to more than double in the next decade. Any further increase in use will continue to degrade the facilities on federal lands and the user experience. Forest Service Recreation Construction funding for development of new campgrounds is highly unlikely and little opportunity exists for the expansion of existing facilities. Many campers, either by choice or due to overcrowding in developed sites, locate in dispersed camping sites.

In addition to the developed campgrounds, dispersed campsites can be found nearly everywhere there is water or a view of Mt. Hood. Dispersed camping demand is also rising as more people discover the joys of dispersed camping and more roads and traditional dispersed campsites are closed. Management of these dispersed campsites is especially difficult because of the historical uses. One notable site, located adjacent to the East Fork Hood River, is Nottingham which has a long history of use. Despite restrictions on use of the area, this dispersed site is full nearly every weekend during the summer months.

# *SECTION 2*
# *MIDDLE FORK HOOD RIVER WATERSHED ANALYSIS*

## *MIDDLE FORK REFERENCE CONDITION*

### *Introduction*

A reference condition for the Middle Fork watershed was established in a similar manner as with the East Fork watershed, setting 1900 as the reference period. The large human caused fires of the 1880's also impacted this watershed. No roads or forest management had yet occurred on National Forests. The Middle Fork irrigation ditch was in place by this time drawing water from Eliot Branch.

### *Human Uses - Middle Fork Reference Condition*

Human use of the watershed has occurred for up to 10,000 years. There is a logical separation between the many millennium that existed with very little change prior to the 20th century and the significant altering of the landscape during the 1900's.

The specific use of the Middle Fork watershed by Native Americans from the Columbia River area is not distinguishable from the uses known on the East Fork watershed. It is believed that portions of this watershed also were seasonally settled while hunting and gathering was conducted. The relatively gentle terrain and lower elevations of a large portion of the Middle Fork could have offered excellent hunting and gathering areas (See Appendix A, History).

Euro-american settlement began in the Middle Fork watershed in approximately 1881. The Buskirk family, strawberry farmers, and the Winans family, loggers, developed a small area near what is now the community of Dee. Leading up to the 1900's, the economies of the white settlers focused on cutting cordwood, fishing and farming. Significant land clearing was required to establish productive agricultural land. Shortly after the reference period, the area experienced a significant change with the introduction of the railroad, the development of the lumber mill at Dee, and the influx of tourists to the valley. Recreation in the upper part of the watershed prior during this period was confined to the upper slopes near Mt. Hood.

Sheep and cattle grazing were also conducted within the Middle Fork watershed. Herds were known to move across the watershed from the north to the Red Hill area and from east to west along the upper slopes from Cloud Cap and upper Clear Branch.

### *Fire History - Middle Fork Reference Condition*

The analysis of natural fire disturbance that was conducted on the East Fork was not possible on the Middle Fork watershed. The extensive fires and harvest areas that occurred early on complicated the vegetation patterns of the landscape to the point that there was little confidence in identifying natural occurring patches.

Although the Middle Fork watershed has a range of elevations similar to the East Fork, the smaller size of this watershed is condensed on the north side of Mt. Hood. As a result, it does not contain the full range of east/west transition vegetation or precipitation patterns found across the East Fork. Fire regime groups were evaluated based on ecology plot data and fire ecology of the Mid-Columbia area (Evers et al., 1994) to offer a general evaluation of fire return interval and disturbance size for different portions of the watershed. The Middle Fork watershed contains four of these fire regime groups (See Figure 3.1). An expected size and return interval of natural fire can be estimated from these fire regime groups.

### *Vegetation - Middle Fork Reference Condition*

As with the East Fork watershed, a reference condition of the vegetation was developed using the 1901 and 1954 timber type maps. The same process was utilized to verify, manipulate, and display the vegetation for those periods.

The 1901 snapshot of the Middle Fork watershed offers a slightly different picture than the East Fork. Seral types seemed to be quite clumped and segregated (See Figure 3.2). Most of Tony Creek and the upper portions of Bear Creek sub watersheds contained late seral (> 21" diameter) forests. A combination of sapling/pole (1'-11' diameter) and small tree (11"-21" diameter) forests occupied the lower elevations of Bear Creek drainage, the upper elevations of the Clear Branch, and the slopes directly flanking Mt. Hood. The remaining lower elevations of the watershed, including Clear, Coe, and Eliot Branches, were in early seral stages of development due to fires generated from the lower valley of the East Fork. On National Forest lands a common ecological matrix that joined the landscape was not obvious during this time period. To the north and east, the continuity of late seral habitat was broken by a large early seral patch in the lower reaches of Tony Creek. The configuration of this patch suggests that it originated from the large fires that occurred prior to the turn of the century.

### *Hydrologic System - Middle Fork Reference Condition*

The hydrology of the Middle Fork watershed is conveniently divided by a large uplifted ridge system directly north of Clear Branch. Upper reaches of the watershed include the glacial systems, Coe and Eliot sub watersheds, coupled with Pinnacle Creek and Clear Branch subwatersheds. The lower reaches are fed by Bear and Tony Creeks which originate from Red Hill and Blue Ridge.

Landslides and debris flows are historically common only within the upper reaches of the watershed and mostly within Coe and Eliot Branches. Although the lower reaches of the watershed are formed on weak rock, a generally smooth topography with moderate slope gradients support a relatively stable landscape. Most soils in the Middle Fork tend to have deep ash mantles with occasional rock outcrops and a high percentage of coarse material resulting in well drained soils. The soils have a generally higher resistive character than in the East Fork and therefore a lower potential for natural erosion.

As with the East Fork, large woody debris in stream channels was probably abundant in most of the Middle Fork watershed. The meandering low gradient channel of Clear Branch along the existing site of Laurance Lake was likely a deposition zone for large accumulations of woody debris. Within Coe and Eliot Branches, the potential for additional input from adjacent riparian forests was likely reduced by fires. Additionally, within these sub watersheds, periodic debris flows have allowed mostly small trees to grow in headwaters riparian areas. Bear Creek and Tony Creek drainages produced cold quality water to the mainstem and were likely well supplied with large wood that maintained stable healthy channels. Because of the small size of these streams most of the wood that fell into these channels was not transported to the mainstem Middle Fork. The Parkdale Lava Beds, formed adjacent to the upper mainstem, straightened and constrained the channel so that at peak flows woody debris was typically moved downstream. The lower reaches of the mainstem are thought to be the collection zone where large wood accumulated creating complex in-stream and riparian habitat (See Figure 3.4).

### *Fish and Habitat - Middle Fork Reference Condition*

The streams of the Middle Fork watershed historically had large quantities of wood related fish habitat. Two locations are thought to be major areas for quality fish habitat development. One exists along the lower Middle Fork mainstem between the confluence of Bear Creek and Tony Creek and the other along the reach of Clear Branch that is now inundated by Laurance Lake.

Fish found in the Middle Fork watershed included anadromous species such as steelhead trout, coho salmon, sea-run cutthroat, and Pacific lamprey as well as resident rainbow trout, cutthroat trout, and bull trout. Spring chinook salmon may have resided in the watershed. The resident salmonids were likely distributed throughout the watershed, limited only by natural barriers and steep gradients. Based on current evidence, some bull trout may have migrated to and from the Columbia River.

Steep stream gradients or other natural barriers were the only limits for passage of anadromous fish species. Although it is unknown if they used glaciated tributaries, steelhead and coho likely journeyed as far upstream as Clear Branch above Pinnacle Creek. Non-glacial tributary streams were likely important rearing areas during the high glacial sediment loading periods of late summer and early fall.

Prior to the turn of the century, significant impacts to fish stocks in the drainage primarily came from downstream actions within the lower Columbia basin such as commercial fish harvest. Very little logging or agriculture had occurred within the watershed and man made barriers along the mainstem had not yet been constructed. An irrigation ditch originating from Eliot Branch was in place by this time but impacts from that withdrawal are thought to be minimal.

### *Wildlife and Habitat - Middle Fork Reference Condition*

Much of this area is similar in historic condition to the East Fork watershed. The wildfires of the late 1800's that impacted the lower portions of the East Fork also affected some of the lower elevations of the Middle Fork. Historically, patch sizes for all seral stages were much larger but distribution was consolidated into block areas. A large block of late-successional habitat was located in the middle to western portion of the watershed. Mid seral and mature forest covered most of the remainder of the watershed except for the east/southeast portion where early seral conditions existed (See Figure 3.2). This large early seral patch was a divider that separated the late-successional habitats in the Middle Fork watershed by 2-3 miles from those located in the East Fork watershed to the southeast.

After the development of the large early seral patch, connected late-successional habitat across the southern portion of the Middle Fork only occurred at the higher elevations across Eliot, Coe and Clear Branch to Red Hill and Blue Ridge. At lower elevations, below 3500 foot, habitat connectivity for late-successional associates east/west across the Middle Fork was north of the Parkdale Lava Beds in Tony and Bear Creek drainages. At this time, the connection was the bridge between the East Fork and West Fork watersheds.

Wildlife species composition was similar to the East Fork although some differences did occur. Only one potential peregrine site is known within the watershed on the cliffs of the Pinnacle. The Parkdale Lava Beds are a prominent feature adjacent to the Middle Fork mainstem that provide unique habitat for a variety of small mammal species.

## MIDDLE FORK CURRENT CONDITION

### Introduction

Current conditions within the Middle Fork are a result of almost a century of disturbance, both human and natural, that have occurred since the reference period. Human involvement in this landscape has by far been the greatest instigator of change. During the first half of this century changes were subtle but from approximately 1950 to today, major shifts in the landscape picture have occurred.

### Human Uses - Middle Fork Current Condition

Approximately 26% of the lands within the Middle Fork watershed are located off National Forest. Of these lands, only a small portion, a part of the small community of Dee, has been converted to agricultural (primarily orchards) or residential uses. The remainder is managed as other public or private industrial forests.

The mill at Dee including Hines Dam, actually located in the East Fork watershed, influenced the Middle Fork watershed through the private forest land harvesting and fish passage barrier that it generated. The earliest harvests were transported by the railroad and were acquired mostly from the West Fork watershed but did include the lower slopes of Tony Creek due to their adjacent access from the rail line.

Through mid century, harvest within the Middle Fork watershed became more prominent. A roads network on National Forest lands in the upper Tony and Bear Creek drainages was developing by the 1940's. Over the next 40 years most of the forests of this portion of the watershed were scheduled and harvested with an even aged management scheme. Within the southern portion of the watershed, harvest activities did occur but most of the forests were young and still growing out of the early catastrophic fire events. The land use focus here was more towards water development. A large flat area along Clear Branch was harvested in the 1960s in preparation for Laurance Lake to impound water for irrigation withdrawal and power generation. With the lake came increased recreation use of the area for picnicking, camping, and fishing.

Recreation use within the Middle Fork watershed is primarily focused at Laurance Lake and in the Mt. Hood Wilderness, both in the southern portion of the watershed. Fishing, camping, picnicking, mountain climbing, and wilderness access are the main uses in this area. In the northern portion of the watershed on National Forest lands, recreation activity is primarily from the local community. Hunting, berry picking and dispersed camping are the main uses in this area.

Use of the Mt. Hood Wilderness has significantly increased over the last 10 years. Current wilderness standards for encounters (an indicator of solitude) are being exceeded in the area between Cloud Cap and Elk Cove. Climbing on the north side routes of Mt. Hood seems to be fairly constant over the recent years, and currently within acceptable standards. Data is limited in support of this use but information is gathered annually and accuracy should improve.

Trails within the Middle Fork watershed generally feed into the Mt. Hood Wilderness. Mountain bike opportunities are presently limited in this watershed although soils here may be better suited for bike traffic than those of the East Fork.

There is only one developed campground in the Middle Fork Watershed and access to this facility is through the East Fork Watershed (Cloud Cap Saddle Campground). This facility experiences high use throughout the summer season because it is a popular portal to the Mt. Hood Wilderness and direct access to the timberline of Mt. Hood. One other facility, Kinnickinnick, is located at Laurance Lake. Although this is designated a day-use area, overnight camping has been allowed here as well as at other diapersed sites around the lake and along Clear Branch. Fishing, swimming, non-motorized boating, picnicking, and dispersed camping all occur in the area of the lake. Due to concerns about bull trout and water quality in Clear Branch, the road beyond the lake has been closed at Kinnickinnick. A pit toilet, and some tables exist at Kinnickinnick now but camping is non-fee and largely unregulated.

### *Fire History - Middle Fork Current Condition*

Large natural fires have not been common within the Middle Fork watershed in this century. Where timber management has occurred, broadcast burning and other treatment of activity fuels has been applied to support reforestation. Aside from the large fires of the 1880's, a large area of the Clear Branch drainage sweeping north to Red Hill burned during the 1930's. This fire was human caused. Generally, since the Red Hill burn the Middle Fork watershed has been relatively safe from natural wildfire occurrances. Currently, young overstocked stands are developing throughout the watershed and available fuel and higher risk are accumulating.

### *Vegetation - Middle Fork Current Condition*

The current vegetative picture for the Middle Fork watershed was constructed using the same process described for the East Fork watershed.

Utilizing spatial analysis of current vegetative data, it can be seen that the present day forest is a matrix of mid seral structure (See Figure 3.5). Except for a few fragmented clumps, late seral forests do not exist in any quantity.

As seen at the reference period, on National Forest lands late seral forests occurred primarily in the Tony and upper Bear Creek drainages. These gentle sloping lands became available for harvest beginning in the 1940's with the development of road networks in the area. As late as 1954 harvest was minimal in this area, but by the late 1980's conversion of most of the late seral forest had occurred (See Figure 3.9). Today these areas are well stocked with sapling/pole and small tree (1" to 21" diameter) forests. This forest structure continues north in the watershed across the private industrial forests of the lower Tony Creek sub watershed.

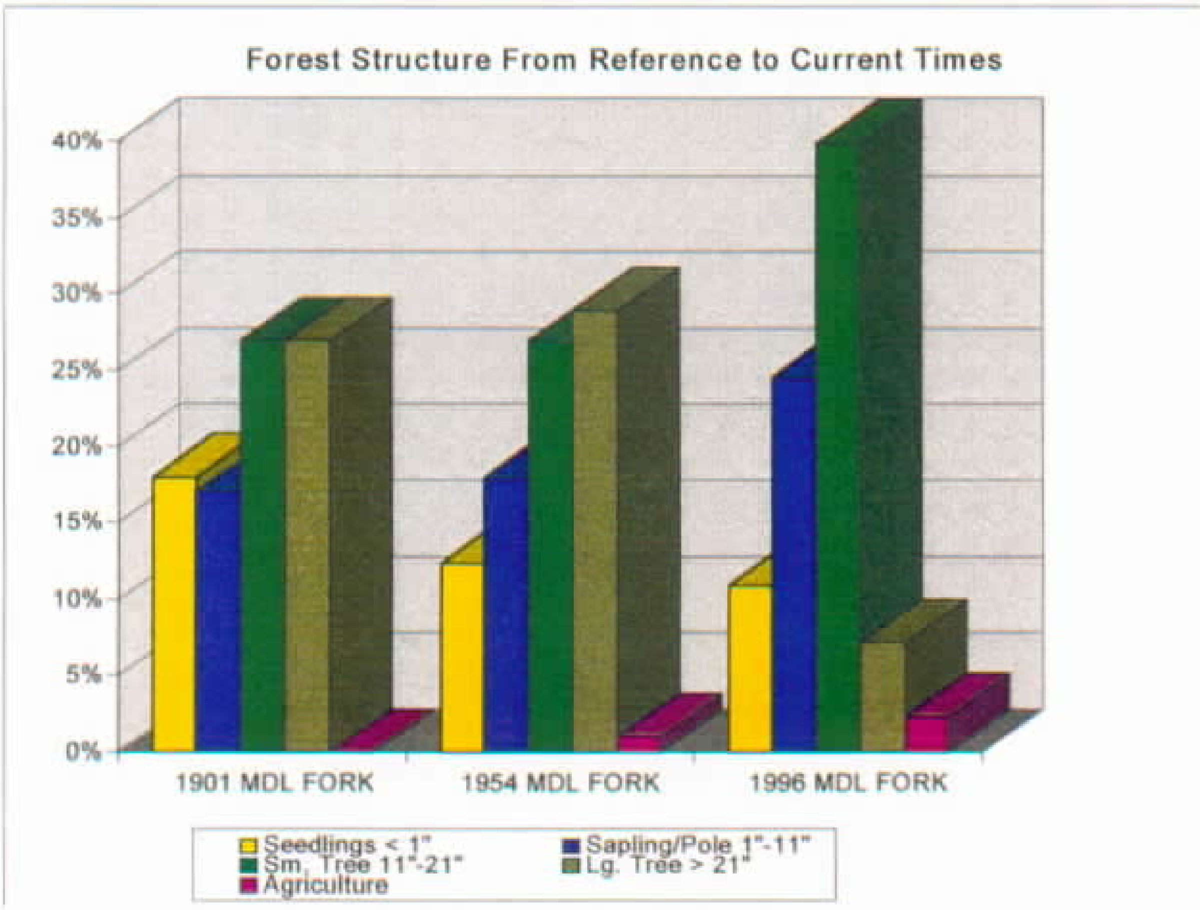


Figure 3.9. - Percent Seral Stages.

Much of the area of the southern portion of the watershed followed a similar path. Late seral forests that developed through the middle of this century in the upper Pinnacle and Clear Branch sub watersheds have been fragmented by harvests in the last 40 years. The sapling/pole and small tree structures that predominate here were regenerated naturally after the large fires that occurred near the turn of the century.

Permanent non-forest open patches within the forested matrix of the watershed are located on the slopes of Mt. Hood above timberline, the Parkdale Lava Beds, and a large rock scree slope above Laurance Lake.

The concern for the development of noxious weed populations within the East Fork watershed is also shared for the Middle Fork. Human uses associated with the extensive road systems support weed invasion and the habitat necessary for further expansion of populations is present. Control measures are inadequate primarily due to unrealistic funding levels.

There are no known sites of Survey and Manage listed plants (vascular or non-vascular) in the Middle Fork watershed although potential habitat does exist in many areas.

### *Hydrologic Systems - Middle Fork Current Condition*

Existing riparian habitat and function within the Middle Fork watershed is formed and maintained similarly to the East Fork but on a smaller scale. Landforms prone to landslides and generating debris flows are primarily found in the upper reaches of the two glacial sub watersheds (Coe and Eliot) of the Middle Fork system. Riparian ecosystems have been impacted by management activities throughout many of the sub watersheds of the Middle Fork but especially within the Tony and Bear Creek drainages. Resulting from both natural and human, impacts it is safe to say that existing in stream and potential wood related riparian habitat is less today than it was at the reference period.

Two areas were identified in the Middle Fork system where natural accumulations of woody debris (See Appendix G, Hydrology Report) were believed to exist at the reference period. Only one of these, the lower reach of the Middle Fork mainstem, is available to continue to accumulate quantities of wood. Most of this reach is located along private lands and little is known as to the quality of the existing habitat. Clear Branch Dam flooded most of the other area. From historic aerial photos, it can be seen that the channel in the Laurance Lake location meandered widely to include the entire valley bottom as the riparian influence area.

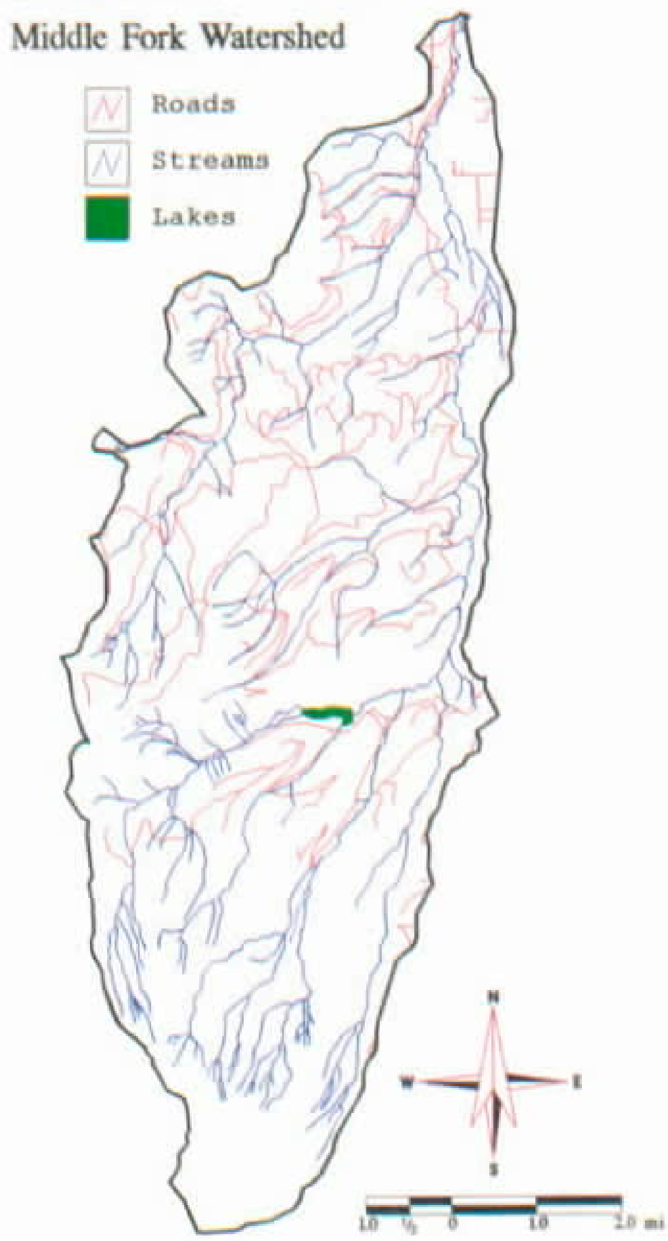


Figure 3.10. - Middle Fork of the Hood River Watershed Streams and Roads systems.

The greatest disruption to hydrologic processes in the Middle Fork system is the Laurance Lake impoundment. The dam was constructed in 1969 to supply additional water for irrigation and to support hydroelectric power production. Laurance Lake changes the natural flow of Clear Branch, especially during reservoir refill in the spring. The dam functions as a barrier for fish migration, a barrier to sediment movement downstream, and alters the water temperature regime in both the lake and downstream. Presently, a fish trap has been constructed at the base of the dam to allow the option of passing fish upstream. The lack of sediment dispersal through the system raises a concern for adequate spawning gravels delivered downstream. Temperature measurements above Laurance Lake are cooler than below the dam by up to 4°C at certain times of year (See Appendix H, Water Quality Report). Temperature variations extend late into the fall of the year.

An ARP analysis was conducted for all of the 6th field sub watersheds. Road densities and recovery conditions varied (See Table 3-2). Although the Tony Creek drainage results indicated a high risk of failure due to peak flow rain-on-snow events, consideration must be given to the stability of the soils and the gentle topography in this area. An ARP rating slightly below forest standards for recovery may not be as critical in this drainage. Bear Creek drainage was the only other sub watershed for which the ARP value indicated a moderate risk of watershed damage from rain-on-snow events. However, this risk is lessened because of the stable soils and gentle topography similar to that of Tony Creek drainage.

**Table 3-2. - Middle Fork Subwatershed Statistics.**

| Subwatershed | Total Acres | Riparian Reserve Acres | Riparian Reserve Percent | * System Roads (mi/mi2) | Linear Stream (mi/mi2) | ARP | * Riparian LWD Potential Standing Large Conifer (Percent Riparian Area) | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Low | Medium | High |
| Tony Cr | 6545 | 831 | 13 | 3.67 | 2.65 | 67 | 72 | 25 | 3 |
| Bear Cr | 3522 | 752 | 21 | 3.70 | 2.50 | 76 | 63 | 35 | 2 |
| Clear Br | 4180 | 1206 | 29 | 1.16 | 3.87 | 97 | 64 | 30 | 6 |
| Coe Br | 4213 | 865 | 21 | 0.70 | 3.32 | 90 | 69 | 28 | 3 |
| Pinnacle Cr | 1623 | 338 | 21 | 1.80 | 2.54 | 90 | 39 | 40 | 21 |
| Eliot Br | 2448 | 502 | 21 | 1.00 | 3.08 | 90 | 53 | 30 | 17 |
| Middle Fk | 6109 | 831 | 14 | 2.90 | 2.88 | 96 | 61 | 38 | 1 |
| Totals | 28640 | 5325 | | | | | | | |
| Average | | | 19 | 2.13 | 2.98 | 87 | 60 | 32 | 8 |

* Notes: **Riparian Large Woody Debris (LWD) Potential** is the riparian vegetations ability, at this time, to produce organic structure material for stream habitat from standing live trees. Derived from the Mt. Hood National Forest, SCCA database LWD analysis.
**System Road Density** is based on the total roaded miles maintained on the sub watershed.

## *Fish and Habitat - Middle Fork Current Condition*

Total numbers of fish have declined considerably over the last century and for reasons farther reaching than impacts isolated within this drainage alone.

Fish species residing within the Middle Fork watershed are the same as those found in the East Fork with the exception of bull trout. Prior to the construction of Clear Branch dam, coho salmon, and likely steelhead spawned in Clear Branch within the reach now inundated by Laurance Lake. Presently, very few of these fish ascend the Middle Fork past the National Forest boundary. Rainbow and cutthroat trout are found above and below Laurance Lake and rainbow are stocked annually into the lake. Recently, USFS personnel discovered cutthroat trout above a large falls in Clear Branch approximately 2.0 miles upstream from Laurance Lake. The falls is an upstream migration barrier which makes this population of cutthroat genetically isolated.

Bull trout are a USFS, Region 6 and State of Oregon sensitive species and have been determined by USFWS to be warranted, but precluded, for listing as threatened or endangered. Currently, bull trout are found only in Clear Branch above and below the Clear Branch dam, Pinnacle Creek, Coe Branch, and Compass Creek. Additionally, they utilize the Middle Fork for rearing and as a travel corridor to and from the Columbia River. Historically, they were likely more widespread.

Clear Branch dam is a barrier to upstream and possibly downstream migration for all fish species. Fish above the dam are essentially cut off from downstream populations. ODFW did test whether fish passing over the spillway would survive the drop and all fish (juvenile steelhead) captured were unharmed. A few bull trout were also captured in the downstream migrant trap during spring/early summer, 1996. Trapping results indicate successful downstream migration over the dam is possible but continued sampling is needed to determine if bull trout are actually passing over the dam. The few caught in 1996 may have resided in Clear Branch below the dam and happened to be captured in the trap.

The reservoir and dam also affect downstream water temperatures and sediment routing. Fall water temperatures below the dam are higher than those considered optimal for bull trout spawning. Spawning size gravel is also limited below the dam because the dam traps sediment from above. For these reasons, successful spawning of bull trout in Clear Branch below Laurance Lake is questionable.

Within the watershed, forest management has impacted aquatic and riparian ecosystems, reducing the quality and quantity of fish habitat. High road densities and extensive timber harvest in Bear and Tony Creeks sub watersheds increase the frequency and magnitude of peak stream flows. This fact, coupled with riparian harvest and historic stream cleanout, heightens the potential for erosion, stream downcutting, and loss of fish habitat. Removal of in-channel wood is documented in Clear Branch and Coe Branch in the 1960's and 1970's and likely occurred elsewhere.

There are two glacial stream systems within the Middle Fork watershed. An analysis was conducted, using assumptions for background sediment levels in non-glaciated and glaciated streams, to compare relative sediment inputs by stream type. The analysis further looked at the dilutions of these sediments as they moved through the mainstem (See Appendix G, Hydrology Report). The results of this analysis show that the smaller Middle Fork system carries a greater percentage of glacial silt through it's length than the East Fork watershed although impacts to fish resources are unknown.

In addition to the current management activities/improvements for the Hood River Basin mentioned in Section 1, a bull trout conservation strategy is being developed through a cooperative effort and is scheduled for completion by summer, 1997.

### *Wildlife and Habitat - Middle Fork Current Condition*

In contrast to the East Fork watershed, the Middle Fork contains very little late seral forested habitat. This watershed has experienced significant alterations of late seral abundance and distribution mainly due to timber harvest and human induced fires. The lack of late seral habitat in the Middle Fork watershed creates a significant connectivity linkage barrier across the north side of Mt. Hood for species dependent on this type of habitat. The late seral habitat that does remain is severely fragmented and isolated which in turn impacts the abundance, distribution, and population integrity of late seral forest associated wildlife species. In addition, many of the older harvest areas lack a legacy of snags and down logs which are necessary to maintain primary and secondary cavity nesters and other snag and log habitat associated species.

Approximately 1,600 acres of late-successional habitat is currently present in the watershed in a quality and distribution usable by smaller home range associated species. For large home range late-successional associates there are no acres present within the watershed that meet usable quality and distribution standards known for these species. In recent years, late-successional large home range species such as the northern goshawk, spotted owl, pileated woodpecker, wolverine, and pine martin, have all been documented within the Middle Fork watershed. Sightings of most of these species have been near Cloud Cap/Tilly Jane area on the border with the East Fork watershed. It is likely, due to the limited availability of this habitat type, that all these species are scarce to non-existent residents within much of the watershed and their continued survival, within the watershed over the next 10 to 20 years, can not be assured. There are four spotted owl pairs residing in the watershed as of 1993. Re-surveys for some of those pairs since that time have not confirmed continued presence.

Approximately one quarter of the watershed is comprised of non-federal ownership, and can be expected to be managed for short rotation timber production and agriculture. These lands are all found on the northern end of the watershed and include mostly lands below 3500 feet in elevation. Although lands below this elevation are present on National Forest in the Bear Creek and upper Middle Fork sub watersheds, a low elevation connection to Tony Creek and across Blue Ridge to the West Fork Hood River can only be attained through the northern portion of the watershed on private forest lands.

Species no longer present within the watershed include: grizzly bear, mountain goat, grey wolf, and California condor. Bald eagles are not full time inhabitants of the watershed. As with the East Fork, ODFW considers the area as potential winter roost and forage lands.

## *MIDDLE FORK ISSUE SYNTHESIS*

### *Introduction*

This section discusses the resource issues that have developed in the watershed as a result of the human involvement and management of the ecosystem. The four primary issues that surfaced through analysis discussions are the focal point for synthesis of related impacts. Since the East Fork and the Middle Fork watersheds are so closely tied, much of the discussion found in Section 1 of thischapter will also apply here. An attempt will be made in this chapter to paraphrase common areas and expand on things unique to the Middle Fork watershed.

### *Middle Fork Issue #1 Synthesis - Fish Populations have declined in the watershed.*

As in the East Fork, the Middle Fork watershed fish populations have been impacted by activities both within and outside the watershed. Hines dam may have been the most significant negative impact to anadromous fish runs, and likely migration of bull trout, this century. Compared to the East Fork watershed, agricultural and residential development are a lesser impact but have contributed to reduced water quality.

Although state and federal management agencies are charged with protecting and/or restoring all fish species, recent focus in this watershed is on bull trout and anadromous salmonids. The bull trout population in Middle Fork watershed is small and isolated compared to some others in Oregon and as such may be more sensitive to negative impacts. Preliminary genetic studies indicate this population is different than others throughout the state.

Large woody debris is lacking within the Middle Fork stream system. Probably more important is that the ability to recruit wood naturally has been diminished. Much of the harvest activity in the last 40 years was not very sensitive to maintaining riparian forest or retaining downed wood in streams. This is especially evident within the Tony and Bear Creek sub watersheds. Historic anadromous salmonid and bull trout use in these drainages is unknown but some use is likely. These systems certainly provided clear, cold water to the Middle Fork mainstem downstream. The upper sub drainages of Coe, Eliot, Pinnacle, and portions of Clear Branch have young riparian forests still recovering from the large fire that swept this area near the turn of the century. Silviculture, sensitive to riparian forest development, could accelerate recovery of large wood potential throughout the system.

Clear Branch Dam is another major impact to the fish resources within the watershed. The dam effectively divided fish populations, altered natural channel forming processes, altered water temperatures, and the reservoir pool has eliminated much of the spawning and rearing habitat in upper Clear Branch. Other Middle Fork Irrigation District (MFID) installations, the Coe and Eliot Branch water diversions, have impacted bull trout and possibly anadromous fish by reducing water flows downstream and hindering both up and downstream passage. MFID has a downstream migrant screen and fish ladder in place on the Coe Branch diversion. A downstream migrant screen was in place at the Eliot Branch diversion in 1996 but was removed due to the large amounts of glacial sediment and debris. A fish ladder is not present at the Eliot Branch diversion. Success of these measures is unknown. Bull trout are not documented in Eliot Branch but use is suspected based on possible sightings in Evans Creek, an East Fork tributary which recieves water from the Middle Fork through the Eliot Branch ditch system..

Road systems cross and in some cases parallel stream and riparian systems. Several crossings are not adequate for fish passage and have effectively isolated populations. This may be also occurring within the Tony and Bear Creek drainages but fish migration into these streams is not well known at this time. Impacting road systems and crossing are known to exist along Pinnacle Creek and within Coe and Clear Branches. During high irrigation demand and low precipitation , the combination of the low reservoir level in Laurance Lake and the culvert placement at Pinnicle Creek have effectively blocked bull trout passage into Pinnacle Creek. Other culverts on this stream function similarly to exacerbate the problem.

### *Middle Fork Issue #2 Synthesis - A Holistic approach to forest management.*

As with the East Fork, the issue is focused at historical management that dealt with the parts of the forest and how individual resources were treated on individual sites. Future management in the Middle Fork is ripe for the evaluation of connected and cumulative actions. There is operational history on most of these lands.

Since mid century, the late seral forests and the large tree component of many stands within this watershed were efficiently scheduled for conversion to young thrifty even aged forest and the schedule implemented. The result of this efficiency is a lack of late seral forest within the watershed (only 9% of the stands remaining on National Forest). However, due to ingrowth 40% of the stands are between 11"-21" diameter (Small Tree Seral Stage) and 25% of the stands are between 1"-11" diameter (Sapling/Poles Seral Stage). From a vegetative standpoint, an opportunity exists to shape these forests into a landscape ecology conducive to multiple resource benefits. Many of the parts are missing though, such as large snags, down logs, and viable riparian forests. As with the East Fork, low elevation connective late seral habitat does not exist for dependent wildlife species. Within the past 10 years, almost four full sections of National Forest lands were traded to private holdings at the northern edge of the previous forest boundary. These lands could have supplied the low elevation connection around File Butte between Bear and Tony Creeks.

The forest roads network of the watershed was well designed to support timber management. In the last few years many roads have been closed and obliterated. The main system roads are well defined for future management needs. Some further reductions are possible to bring the watershed more in line with maintenance funding.

Recreation is concentrated in the southern portion of the watershed near Laurance Lake and within the Mt. Hood Wilderness. At Laurance Lake, facilities are grossly inadequate and there is a high potential for damage to the bull trout fish stocks within this drainage. Bull trout require clean, cold water to survive. The degradation of riparian vegetation due to dispersed camping, the inputs of fecal coliform bacteria due to inadequate sanitation facilities, increased sedimentation from roads and trails, and petro-chemicals from vehicles adjacent to the water may put this fish species in jeopardy. Within the Mt. Hood Wilderness, multiple trail crossing and overuse are damaging the meadows at Elk Cove.

### ***Middle Fork Issue #3 Synthesis - Late Seral habitat quality and distribution***

Large blocks of late seral habitat existed in this watershed from 1900 through mid-century. Since the 1950's, extensive harvesting has significantly reduced the level and distribution of late seral habitat. Extremely fragmented small pockets of this habitat are all that remain today. This watershed has the lowest level of viable late-successional habitat and the fewest identified owl pairs on the Mt. Hood forest. Based on the current structure of these forests, species associated with late-successional habitat and large to medium home range are not expected to persist within this watershed into the immediate future.

At the larger basin level, connectivity of late-successional habitat around the north side of Mt. Hood is a great concern particularly at lower elevations. As described in the East Fork analysis, a connective habitat link is necessary in order to maintain wildlife population interchange east/west between the Surveyors Ridge LSR and the Bull Run LSR. The habitat of the Middle Fork is a key component of that linkage. Extensive harvest, human induced fires, agricultural development, and human habitation have all contributed to the loss of the landscape link within this watershed.

Continuing from the East Fork, the National Forest lands below 3500 foot elevation consist of a narrow rind of forest. Most of these lands have been harvested or converted to early seral conditions by wildfire. Future stand management that supports the development of late-successional like conditions is needed to maintain a landscape link for late-successional associated wildlife species.

Snags and downed logs are integral characteristics of any seral stage stand and provide habitat for a variety of species, even within young forests. In young forests, they are vital for dispersal of late-successional species between habitat blocks. The large fires from the late 1800's left an overall lack of large snags and downed logs. In many areas where snags did remain after the fires, they were felled for safety concerns. Additionally, harvesting practices over the past 40 years have retained very little snag or downed woody material. Without this structural element in a large portion of the Middle Fork, the lack of connectivity issue intensifies. The severity increases to include not only small and medium home range species but also those species tied to down logs and snags. A list of associated species can be found in Appendix J, Wildlife Report.

***Middle Fork Issue 4 Synthesis - The growing demand for recreation is affecting the quality of the recreation experience.***

Recreation opportunities in the Middle Fork Hood River Watershed are limited. The primary focus is in two areas; the Mt. Hood Wilderness, and the area around Laurance Lake.

The Mt. Hood Wilderness is experiencing very high use within this watershed. Proposed restrictions on visitors could displace a significant number of users to other trail facilities mostly outside this watershed. Additionally, if the south side climb opportunity on Mt. Hood is regulated, it is likely that more climbers will attempt the north side routes (most likely Sunshine and Cooper Spur). The Wilderness provides the only opportunities in the drainage to experience alpine and sub-alpine zones, and to study ecosystems in a near natural state. Demand for this environment is expected to increase and limitations on use are inevitable to help maintain the resource.

The demand for developed recreation sites is expected to more than double in the next decade. Dispersed camping demand is also rising, due in part to more people discovering the joys of dispersed camping. Additionally, the lack of supply is an increasing contradiction as more and more roads and traditional dispersed campsites are closed due to lack of maintenance funds and resource concerns. The area around Laurance Lake is a prime example of the paradox. It is increasing in popularity with all types of recreation visitors. The existing camping, trails, and sanitation facilities do not meet the present demands for the area and Bull Trout issues within Clear Branch raise questions for increasing development and use.

# CHAPTER 4

# DESIRED FUTURE CONDITION

This chapter contains information about the Desired Future Condition of the East Fork and Middle Fork Watersheds. The information presented summarizes the results of the Landscape Analysis and Design Process. It considers the landscape patterns, processes, and flows of the forest plan direction to propose a design for the future.

## *Conceptual Landscape Design*

### *Introduction*

The Conceptual Landscape Design provided the vehicle used to determine the landscape pattern. This complies with the Forest Plan, Northwest Forest Plan and site specific local objectives. The intent of this exercise creates a futuristic picture of the watershed and provides a synchronization to execute the plan.

### *Conceptual Landscape Pattern & Structure [ Long Term 50 - 200+ yrs ]*

The interdisciplinary team used the results of analysis and synthesis to develop design elements for the two watersheds. The Mt. Hood Forest Plan allocations and Northwest Forest Plan defined the landscape objectives. These design elements graphically display (See Figure 4.1) a mosaic character of the intended landscape in 200+ years.

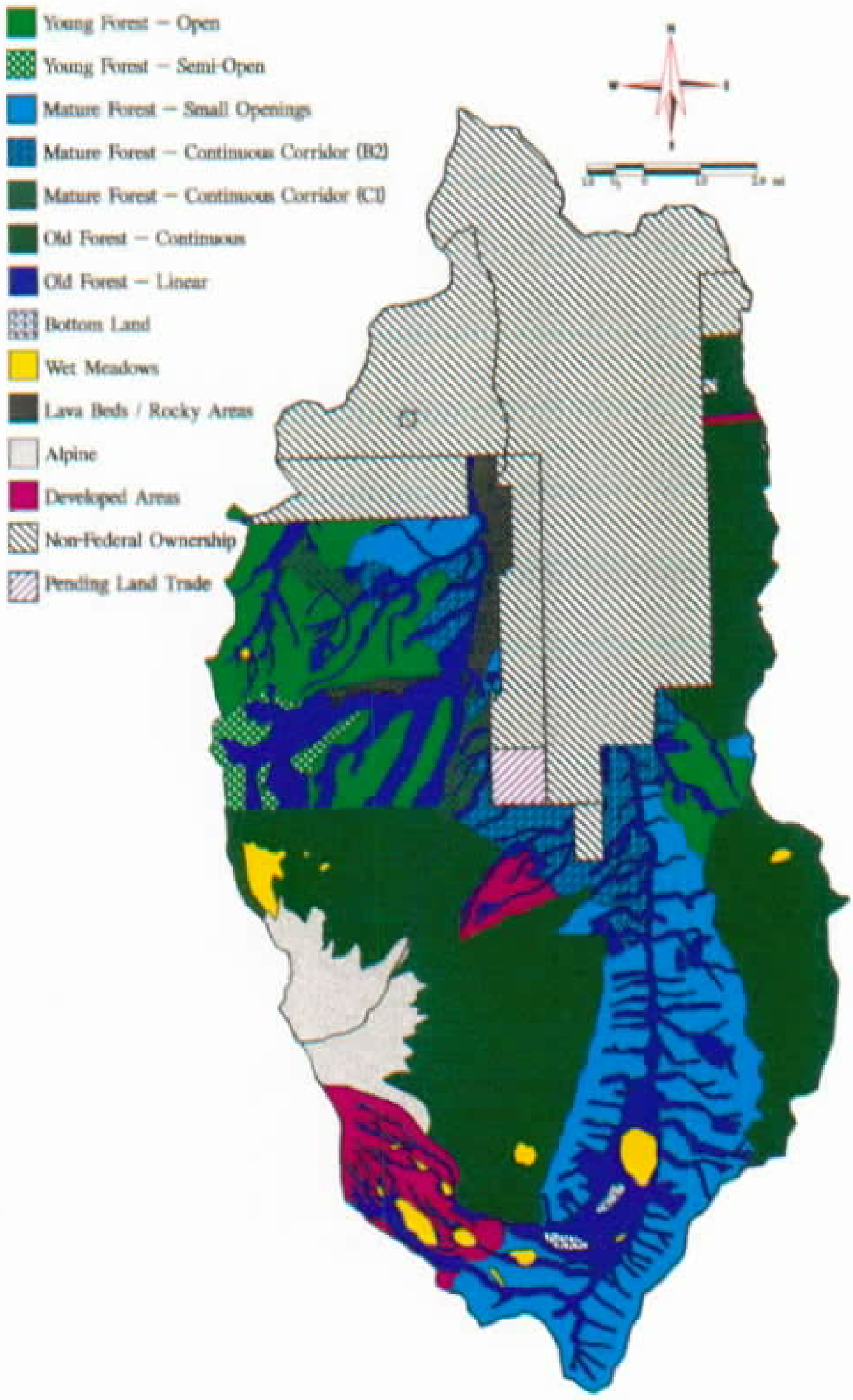


Figure 4.1. - Conceptual Landscape Design
East and Middle Forks of the Hood River.

Table 4-1. -- Conceptual Landscape Design Element Descriptions

| | |
|---|---|
| <u>YOUNG FOREST / OPEN</u><br>[Aggregated Forest--Early to Mid Seral]<br>**Mt. Hood Forest Plan**<br>-C1 Timber Emphasis<br>**Northwest Forest Plan**<br>-Matrix<br>**General Landscape Overview**<br>Forests are primarily composed of early to mid-seral stand structures. Continuous open patches are less than 40 acres in size and contain remnant small patches from the previous stands. Continuous mature forests may not always interconnect. Refugia blocks are apparent. | **Major Assumptions**<br>• Timber emphasis is the primary focus. Forests are managed for a sustained harvest. |
| <u>YOUNG FOREST / SEMI-OPEN</u><br>[Aggregated Forest--Early to Mid Seral]<br>**Mt. Hood Forest Plan**<br>-B6 Special Emphasis Watersheds<br>**Northwest Forest Plan**<br>-Matrix<br>**General Landscape Overview**<br>Open patch size does not exceed 40 acres. Late seral forest structure provides adequate connectivity within the headwaters of Clear Branch. | **Major Assumptions**<br>• ARP is limited to at least 82% . Forest management actions are focuses on long term watershed maintenance. |
| <u>MATURE FOREST / SMALL OPENINGS</u><br>[Perforated Forest--Mid Seral]<br>**Mt. Hood Forest Plan**<br>-B2 Scenic Viewshed<br>-B10 Deer and Elk winter Range<br>**Northwest Forest Plan**<br>-Matrix<br>**General Landscape Overview**<br>The forests in this design element are growing through variable stages of succession. They display vertical texture to the forested landscape mosaic. Open patches, generally less than 5 acres, cover approximately 20% of the area. | **Major Assumptions**<br>• Forests are managed in accordance with the Highway 35 Scenic Viewshed Guide.<br>• Emphasis for wildlife management in the upper East Fork watershed. This includes elk calving areas and late seral habitat. |
| <u>MATURE FOREST / CONTINUOUS CORRIDOR B2</u><br>[Terrestrial Connectivity]<br>**Mt. Hood Forest Plan**<br>-A4 Special Interest Area<br>-A11 Winter Recreation Areas<br>-B2 Scenic Viewsheds<br>**Northwest Forest Plan**<br>-Matrix<br>-Administratively Withdrawn Areas<br>**General Landscape Overview**<br>Terrestrial species (especially those with small to medium size home range) retain genetic east/west connection between LSRs and riparian reserves. The opportunity to retain this connectivity function on private lands is unlikely. Approximately 75% of the corridor is either in forest structural stages of understory reinitiation or late seral (unevenaged structure). The remainder consists of managed open patches, generally less than 2 acres in size. The management of these areas retains 100% of their biological potential for snag retention and large woody debris. | **Major Assumptions**<br>• The managment of this design element is generally as scenic viewshed. Wildlife emphasis should stress a low elevation connective pathway for small to medium home range species. |

| MATURE FOREST / CONTINUOUS CORRIDOR C1 | Major Assumptions |
|---|---|
| [Terrestrial Connectivity]<br>**Mt. Hood Forest Plan**<br>-C1 Timber Emphasis<br>**Northwest Forest Plan**<br>-Matrix<br>**General Landscape Overview**<br>Continuous mature forest structure allowing terrestrial species (especially those with small to medium size home range) to retain east/west genetic connection between LSRs. These corridor management areas connect upland riparian reserves locations.<br>Openings can occur as large as 40 acres. Over 50% of the element is maintained as late seral structure that permits connectivity. These pathways may shift and realign as early seral stands mature. The remainder consists of managed open patches, generally less than 2 acres in size. These areas are managed to retain 100% of their biological potential for snag retention and large woody debris. | • These corridors are located near File Butte and along the eastern slopes of Eliot Branch. These areas should be managed as understory reinitiation and late seral stages to support the movement of late seral dependent species. |
| **OLD FOREST/ CONTINUOUS** | **Major Assumptions** |
| [Late Seral]<br>**Mt. Hood Forest Plan Allocations**<br>-A2 Wilderness Prescription<br>-A4 Special Interest Area<br>-B2 Scenic Viewsheds<br>-B6 Special Emphasis Watersheds<br>**Northwest Forest Plan Designations**<br>-Late-Successional Reserve<br>-Congressionally Reserved<br>-Riparian Reserves<br>-Administratively Withdrawn Areas<br>**General Landscape Overview**<br>-Wilderness forests<br>-Natural Openings/ Special Habitats<br>-Aquatic/Riparian Reserves | • Much of the Mt. Hood Wilderness will function as late seral habitat. Higher elevation forest wilderness will develop old age characteristics, but not have the quality of lower elevation stands.<br>• Surveyor's Ridge LSR should be managed for late seral habitat.<br>• Wet and rocky areas will be managed for their special habitat qualities. Forested edges of these areas are late seral structure.<br>• Wildfire is used to seral state structure. |
| **OLD FOREST / LINEAR** | **Major Assumptions** |
| [Late Seral]<br>**Mt. Hood Forest Plan Allocations**<br>This design element includes all allocations within the watershed. Wilderness area representation is not shown as linear.<br>**Northwest Forest Plan**<br>This design element includes all designations within the watersheds. Surveyor's LSR representation is shown as non-linear.<br>**General Landscape Overview**<br>This design element represents a network of late seral structural habitat within both watersheds. Management directs development of large trees. This will support forest floor LWD, especially within the riparian areas for stream recruitment. Adjacent terrestrial habitats primarily connect through this network within headwater areas. | • Riparian reserves are managed as late seral structure.<br>• Riparian reserves function as connective terrestrial habitats.<br>• Wet and rocky areas will be managed for their special habitat qualities. Forested edges of these areas are late seral structure.<br>• The Mt. Hood Forest Planning Team develops a Riparian Reserve boundary based on a Vegetation Zone database. Adjustments are based on knowledge of the area and verified through appropriate NEPA actions. Boundaries expand or contract where necessary. |

| | |
|---|---|
| **BOTTOM LAND**<br><br>**Mt. Hood Forest Plan**<br>-B9 Wildlife/Visual<br>**Northwest Forest Plan**<br>-Matrix<br>**General Landscape Overview**<br>This design area should have regulated timber harvest with green tree retention in patches greater than 2.5 acres. The intent of bottom land is to maintain multi-seral stage stands that include large diameter trees to withstand stream debris from a meandering East Fork. | **Major Assumptions**<br>• Forests are managed in accordance with the Highway 35 Scenic Viewshed Guide.<br>There is an emphasis for wildlife management in the upper valley of the East Fork watershed. This includes elk calving areas and late seral habitat. |
| **WET MEADOWS**<br>[Special Habitats]<br>**Mt. Hood Forest Plan**<br>-A2 Wilderness Prescription<br>-A4 Special Interest Area<br>-A9 Key Site Riparian Area<br>-A11 Winter Recreation Area<br>-B6 Special-Emphasis Watersheds<br>-B7 General -Riparian<br>**Northwest Forest Plan**<br>-Riparian Reserves<br>-LSR<br>**General Landscape Overview**<br>Design element includes both wet and dry meadows where grass/forb/shrub dominated areas occur in patches or patch complexes. Generally inundated with water or cold air throughout most of the year. These areas generally have forested edges of late seral structure. In some cases forest patches occur within the meadows. Examples include Hood River Meadows, Elk Meadows, Horsethief Meadow, and Brooks Meadow. | **Major Assumptions**<br>• Meadows considered in this design element are greater than 10 acres. Management is in support of natural ecological processes that are occurring, and protect from excessive human intrusion. Restoration occurs in areas where unnatural disturbance has occurred. |
| **LAVA BEDS / ROCKY AREAS**<br>[Rocky Patch]<br>**Mt. Hood Forest Plan**<br>-A4 Special Interest Area<br>**Northwest Forest Plan**<br>-Matrix<br>**General Landscape Overview**<br>Volcanic lava formation or rocky areas (landscape scale) with little vegetation and occasional conifer encroachment. | **Major Assumptions**<br>• A single large lava rock area with some tree canopy managed for special geologic interest. Management based on joint partnership with other governmental agencies and private landowners. |
| **ALPINE**<br>[Non-forested, high elevation patch]<br>**Mt. Hood Forest Plan**<br>-A2 Wilderness Prescription<br>**Northwest Forest Plan**<br>-Congressionally Reserved<br>-Riparian Reserve<br>**General Landscape Overview**<br>Exposed rock, gravels and pyroclastics with glacier patches extending from the upper reaches of Mt. Hood. Some tree canopy is included, but generally is above the timberline. Alpine shrubs and forbs prevail in microsites. | **Major Assumptions**<br>• Includes all high elevation, non-forested alpine areas outside ski area boundaries on the flanks of Mt. Hood. Management is conducted as wilderness. |

| DEVELOPED AREAS (Human Patch - Infrastructure) | Major Assumptions |
|---|---|
| -Roads and Trails<br>-BPA Powerline<br>-Developed Sites<br>* Mt. Hood Meadows Ski Area<br>* Coopers Spur Ski Area<br>◊ Campgrounds (not identified on map):<br>◊ Robinhood<br>◊ Sherwood<br>◊ Tilly Jane<br>◊ Cloud Cap<br>◊ Kinnikinnick<br>Design Element: Variable depending on area. | • Developed areas will expand, in most cases, to meet the needs of the user.<br>• Restrictions to access and use of developed areas will occur to maintain natural resources |
| **OTHER OWNERSHIP [Human Dominated Landscape]** | **Major Assumptions** |
| -Hood River County<br>-Private lands<br>-Design Element: Not Applicable | • Limited growth in the valley will occur because of county land use restrictions |

## *Proposed Interim Landscape Design*

### *Process*

This section documents the Interim Design Plan (IDP) developed by the analysis team using the "narrative process." This Conceptual Design considers a desired future condition (DFC) 50 to 200 years. The Interim Design Plan recommends the next 10 years management practices needed to facilitate the DFC.

The team organized project areas within the two watersheds. Each had common problems/opportunities within their distinctive geographic boundary. These Interim Design Areas (IDA) are delineated on the Interim Design Map (See Figure 4.2).

Within each IDA, management actions are Recommended as possible projects:

- Conceptual Forest suggests vegetative management that should or should not be conducted in the interim period.
- Projects are specific improvement or restoration opportunities that should be considered during the interim period.
- Further Analysis consists of ideas surfaced in this process, but beyond the scope of this analysis. Data Gaps should be filled before an action can be recommended.

This interim design expresses conceptual line and form on the landscape. The analysis encourages specific vegetative management be planned and implemented on a stand level (VEGIS polygon) basis. This will ensure the long-term monitoring of forest structural development.

This process identifies road related analysis and future project recommendations. The Ranger District Access and Travel Management Guide (A&TM) identifies most of these recommendations.

Chapter 5 summarizes the recommendations formulated in this interim design.

### *Watershed Specifics*

#### *East Fork Watershed*

The East Fork watershed includes approximately 21% late seral stage forest. This includes the riparian allocation lands and the Surveyor's Ridge LSR. This percentage is deceiving when viewed from a connectivity perspective. Late seral stand management is possible in some of the watershed during the interim period. Maintaining connectivity is critical to achieving the DFC. A holistic approach to stand management is needed throughout the East Fork watershed.

The IDA designations do not fully address the productivity within this watershed. Generally, soil productivity is greatest in the valley bottoms and the lower slopes, decreasing in the higher elevations.

### *Middle Fork Watershed*

Approximately 9% of the entire Middle Fork watershed exists in a late seral stage. The entire watershed is considered Matrix (Northwest Forest Plan designation) and subject to the 15% rule for late seral forests. These stands are classified as deficient.

The team divided a portion of the Middle Fork Watershed into the North Middle Fork and the South Middle Fork IDAs. The North Middle Fork IDA includes the Tony Creek, Bear Creek and Middle Fork subwatersheds. The South Middle Fork IDA includes Clear Branch, Pinnacle, Coe, and Eliot subwatersheds. Productivity within the Middle Fork IDAs are as follows:

- North Middle Fork. Has better potential for tree growing sites than the South Middle Fork. The area supports fast growth and successful stand development. This is extremely important to terrestrial animals that reside in lower elevations and milder climate.
- South Middle Fork. This is a harsh climate for tree growing. The higher elevations stifle tree growth. The late seral habitat must survive increased disturbance such as wind, insects and disease.

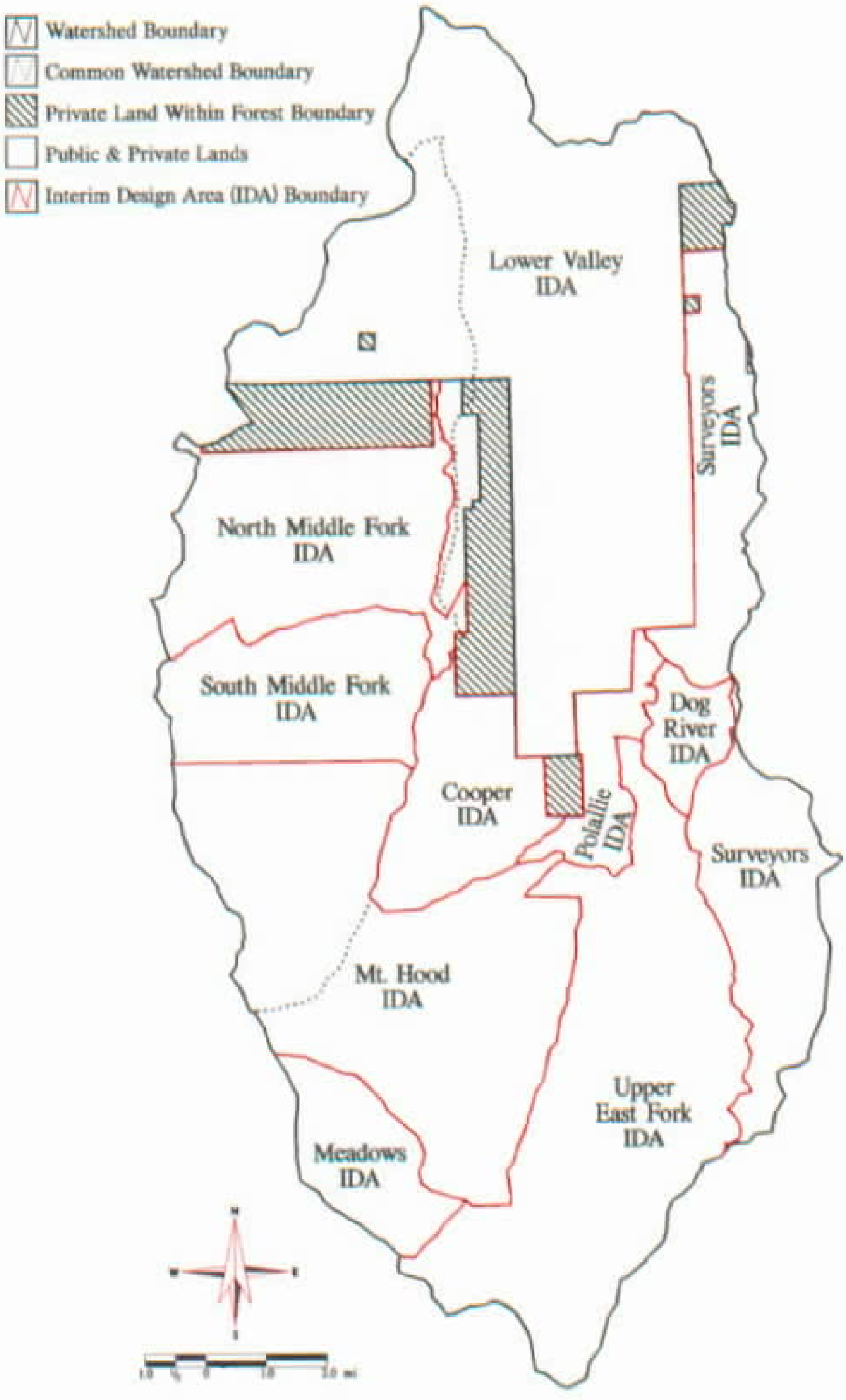


Figure 4.2. - Interim Landscape Design Areas (IDAs).
East and Middle Forks of the Hood River.

## *Interim Design Areas Conceptual Forest Recommendations*

The East Fork watershed IDAs include Cooper, Polallie, Dog River, East Fork, Meadows, and Surveyors. Delineation of these IDAs boundaries do not follow subwatershed boundaries. The intent is to identify common needs and opportunities.

The Mt. Hood Wilderness is considered one IDA (Mt. Hood) and includes portions of both the East Fork and Middle Fork watersheds.

The Lower Valley IDA crosses the East and Middle Fork watershed boundary as well as the Lava Beds and other non-Forest Service lands of the lower valley.

### *Cooper IDA*

Management in this area should focus on late seral habitat management. This IDA functions marginally as a low elevation connectivity corridor available on the National Forest lands of the watershed. This is the only low elevation connective landscape pathways between Surveyors Ridge and Bull Run LSRs. Other land ownership is expected to be managed for short tree growth rotations. Connective pathways must be maintained for east-west species integrity.

The district should continue to participate with land owners who border the national forest in managing fuels and late seral stand structures. A 300 foot shaded fuel break (SFB) and associated fuels management should be considered the primary focus along the forest boundary. The primary goal for the interior forest should concentrate on late seral habitat development with a secondary for fire risk. Fuel breaks should include a higher than normal snag and down-log density. The SFB should be characterized by an intermittent vegetative mosaic that includes intensive fuel treatment at potential high risk areas. It should allow ground vegetation and possible canopy structure for low fire risk areas.

Stand management needs to reduce fire hazard and improve late seral habitat and general forest health. Management for fisheries and wildlife is consistent with the Winter Recreation (A11) land allocation and should not conflict with the ski area permit agreement.

### *Polallie IDA*

Late seral habitat management similar to that of the Cooper IDA should be the focus of this area. There is a need for development of a low elevation connective corridor of late seral habitat.

Stands adjacent to the National Forest boundary should be managed with objectives of developing fuels that support urban interface with fire and late seral stand structure objectives. Guidelines for stand development should be similar to those described in the Cooper IDA recommendations. A shaded fuel break along the forest boundary is needed to at least Forest Service Road 3511.

### *Dog River IDA*

Late seral habitat should be maintained during the interim period. The emphasis of forest management should be on young and overstocked stands. Stand management should propose pre-commercial and commercial thinning to promote tree size development.

There is a potential risk to the forest health of several stands within this area due to fire exclusion and root disease. Many of the young stands within this IDA consist of dense understory overtopped by large Ponderosa pine and Douglas fir. A reintroduction of fire, where it historically occurred as a management tool, may not appropriate in these areas.

### *Upper East Fork IDA*

Harvest should occur in small tree and sapling/pole stands during the interim period. Late seral stands may be available for harvest. Viewshed, riparian reserve, and connectivity considerations must be evaluated across the landscape. The proportion of late seral component in this IDA exceeds the reference period. Fragmentation over the past two decades has impacted its distribution.

Degenerating forest health conditions are a result of fire exclusion. Its dense canopies of Grand and Douglas fir understory developed under open large tree forests. Management of these stands should consider thinning treatments and fuels management. Fire should return to the system where applicable.

Riparian reserves are functioning well as connectivity corridors. The late seral stands located above the riparian reserve headwaters (within B-2 areas) to the LSR boundary at the ridge should support connectivity. Tumble and Engineers Creek are primary examples.

Time riparian area management operations to incorporate treatments of upland harvests. Creative economics need to implement the silviculture prescription essential to manage these areas.

Many areas within the main riparian reserve in the upper East Fork have small openings created during 60s'-70s' to manage frost pocket and blowdown. The treatment has had mixed results. Late seral structure may develop in these areas. Harvest plans should consider windfirm boundaries when designing harvest systems. A large tree component needs to buffer debris flows and withstand stream channel shifts that occur. This would provide shade as well as a future source of LWD.

Late seral habitat must be a linked mosaic below the ridge system near Gunsight Butte for LSR connectivity (Surveyors to White River). Components of late seral must be maintained or enhanced as a result of both LSR assessments.

Steep riparian corridors may not be capable of producing viable late seral habitat. In these areas, connective habitat may need to interlock upland areas.

### *Meadows IDA*

Management of the forest within this area will be consistent with ski area direction described in the Mt. Hood Meadows Ski Area FEIS.

The existing sub-alpine forest with interspersed meadow complexes, ski runs, lifts, parking lots and buildings will dominate this area for at least through the interim period.

### *Surveyors IDA*

The Surveyors Ridge LSR assessment discusses a design for the forest management of this area. The assessment considers pathways of connective habitat between LSRs. The watershed analysis team reviewed the recommendations for consistency with other IDAs within these watersheds.

### *North Middle Fork IDA*

Late Seral stands can not be removed during the interim period except where treatment for forest health maintenance is necessary. Stand management should focus on treatment of the sapling/pole and small tree stages.

Management actions that focus on riparian reserve stand developments are a higher priority than upland Timber Emphasis (C1) areas. Silviculture treatments should support the development of existing young forests into late seral like structure and enhance connectivity corridors. Any vegetation management actions within the reserves are unique.

Vegetative management should use a landscape approach. Management proposals need to incorporate treatments that include the upland and riparian areas to support connectivity corridor objectives. This will provide opportunities for economic implementation. These treatments are applicable within the Bear Creek riparian and the B-2/Connectivity Corridor.

The C1 areas should concentrate vegetation management of younger stands, sapling/pole and small tree with highest potential to gain late seral characteristics. Treatments should use both pre-commercial and commercial harvest techniques to enhance late seral stand development. Creative management measures such as using fire crews, alternative services programs and special forest product contracts (e.g., poles, boughs, and Christmas trees) should be implemented with young, less economical treatments.

The Conceptual Design cells within this Interim Design Area, should first include the File Butte Corridor, second the Bear Creek riparian B-2 connectivity corridor and finally the Tony Creek riparian area and the C1 uplands.

#### *Recommended - Further Analysis*

Opportunities to emphasize for continued management or developments include:

- Huckleberry picking - management needed to maintain or enhance fields
- Hunting - additional enforcement needed in this area
- Forest Service Road 1611/1612 - managed and promoted as a mountain bike loop
- Christmas tree cutting areas - management plan development

- Snowmobile trail use - management and promotion

### *South Middle Fork IDA*

The removal of Late Seral stands in the interim period should be avoided, except where treatment for forest health maintenance is necessary. Stand management should focus on treatment of the sapling/pole and small tree stage development.

Riparian areas are highest priority for stand structure management for both ACS objectives (especially along upper Clear Branch) and terrestrial connectivity objectives (especially along the lower Clear Branch and Eliot Branch).

The recommended planning of the riparian reserves in this IDA will require creative silviculture to implement economic stand development. The timing of treatment for upland areas should reduced riparian characteristics.

There is a need to concentrate vegetation management in younger stands, sapling/pole and small tree with highest potential to gain late seral structure. Prescribe treatments using both precommercial and commercial harvest techniques to enhance late seral stand structure development. There is a need for creative management measures such as fire crews, alternative services programs, and special forest products contracts (e.g., poles, boughs and Christmas trees) where economically feasible treatments for young stands are limited.

The priorities for stand management identified within this Conceptual Design cell IDA should address the Lower Clear Branch/Eliot Branch connective corridor development, and then the upper Clear Branch riparian reserve. Finally the IDA should consider the upland C1 and B6 areas.

#### *Recommended - Further Analysis*

The Mt. Hood Wilderness LAC process will recommend that the Elk Cove Trail have reduced hiker density to limit its current high use. Additional recommendations include:

- Close the trailhead access road near Pinnacle Creek by extending the trail. This would make a safer access parking area.
- Keep the road open to the existing trailhead and consider reconstruction of the road surface.

Forest Service Road 2840 crosses the headwaters area of Clear Branch. The Interdisciplinary team should evaluate the last 1.5 miles for closure and possible obliteration. This requires coordination with the Middle Fork Irrigation District to insure access to the snow station.

### *Mt. Hood IDA*

The conceptual forest expects to maintain vegetation in a condition that approximates the reference conditions.

These stands should be densely stocked with variable canopy structures (some uniform, some vertically varied) and generally of small diameter.

Some Stands along the lower slopes of this IDA can will reach a stature typically thought of as late seral habitat, endemic to these watersheds.

### *Lower Valley IDA*

This IDA consists of mostly of non-forest service lands. Upland forested areas are expected to be managed primarily as short rotation commercial wood product forests. The valley bottom areas will continue as agricultural and rural residential landscape. Forests are expected to be found only in isolated patches within the valley. Many patches will likely contain mature trees, but patch size will generally be too small to allow interior forest functions. The Lava Beds area is considered non-forest although trees do exist. The area is a special geologic area that draws public interest to this unique feature.

# CHAPTER 5

# RECOMMENDATIONS

## *Interim Design Project Recommendations Summary*

Projects recommended in the interim design of the previous chapter are summarized in this section. The team reviewed the project list and rated each as having either a *High, Moderate* or *Low* priority. These levels of priority are defined as:

*High*- This project/analysis has a high potential to support development of the long term Desired Future Conditions. Implementation during the interim period is highly recommended.

*Medium*- This project/analysis will moderately support development of the long term Desired Future Conditions. It is recommended that funding be sought for implementation.

*Low*- This project/analysis may further enhance the ecosystem to achieve the Desired Future Conditions.

Most project were given a high priority because projects that surfaced through analysis were only those considered to be important within the watersheds. The priorities are added to assist managers with project scheduling efforts and to help match projects within annual budget constraints.

*Cooper IDA*

***Recommended - Projects***

High

- Develop a Fire Management Plan at urban interfaces with the National Forest boundary; specifically at the Cooper Spur area which includes:
  -Community fire partnerships with adjacent landowners that will emphasize awareness and prevention (ref. 3-9, 4-7).
  -Shaded fuel break (SFB) along the forest boundary of approximately 300 feet width (ref. 4-7, E-2).
  -Coordination with Hood River County to support protection and prevention efforts (ref. 4-7).
  -Consider evacuation techniques, escape routes, and safe zones in the plan. Stand management treatments should strive to facilitate these objectives (ref. 4-7).
- Completion of the Cloud Cap Historic Area Management Plan. This plan should be in concert with a connective corridor development in this IDA. The lower slopes of the historic area are critical to the development of connectivity corridors (ref. 2-1, 3-19, 3-16, 3-17, 4-7, J-3).
- Cloud Cap road "fish log" selection. Selection and moving "fish logs" from along the Cloud Cap Road. Trees will be felled as part of a road maintenance project and identified for future stream projects (ref. 2-1, 3-15, I-2).

Medium

- Tilly Jane trail #643 and Polallie Ridge trail #643A require maintenance to provide adequate safety and manage resource damage occurring from mountain bike and horse use. Local group can serve as stewards of these trails (ref. 2-1, 3-20).
- The district should propose timber projects designed to meet the objectives of the Forest Plan as amended by the NW Forest Plan. Interim design project recommendations of the Cooper IDA should be emphasized as long as they do not conflict with Forest Plan allocations (ref. 2-1, 3-8, 3-11, 3-18).

*Polallie IDA*

***Recommended - Projects***

High

- Develop an Urban Interface Fire Management Plan similar to the one recommended in the Cooper IDA (ref. 3-2, 4-7).
- A connective trail from Polallie Ridge Trail #644 to Highway 35 is needed. The construction of this trail will offer an alternate route from the Polallie area that could relieve hiker pressure from the Tamanawas Falls trail system (ref. 2-1, 3-8, 4-7, D-2).
- Potential historic fish habitat exists between the mouth of Polallie Creek and the northern end of "The Narrows" on the mainstem East Fork of the Hood River. There is an opportunity for habitat improvement along this reach (ref. 2-1, 3-14, 4-3, I-3).
- A Riparian Restoration Management Plan is recommended downstream from Polallie Creek. The interim period should consider management opportunities within the Polallie stream reach to Dog River (and possibly to Old Cooper Spur Highway). This area includes National Forest and non-Forest Service ownership adjacent to the

stream. The plan should include riparian restoration opportunities that foster channel stability, enhance meandering alignment of the channel and develop off-channel pools. The project is estimated to be very expensive. Planning and implementation efforts need a cooperative effort by both public and private land owners (ref. 2-1, 3-15, 3-16, 4-3, K-2).

Low

- A kiosk information center should be installed in conjunction with the proposed trailhead at Polallie to orient recreationalists to the East Fork drainage. This area functions as a gateway to the National Forest (ref. 2-1, 3-20, B-10, D-5).

***Dog River IDA***

***Recommended - Projects***

High

- Reconstruct the Dog River Trail to withstand heavy mountain bike use (ref. 2-1, D-2).

***Upper East Fork IDA***

***Recommended - Projects***

High

- A detailed comprehensive Ten Year Action Plan is needed for this area. This IDA encompasses a large area of the watershed. A comprehensive plan would be valuable in coordinating vegetative management with the variety of other uses (ref. K-2).
- High Prairie Meadow Restoration (ref. 4-4).
- Relocate East Fork Trail #650 outside of the riparian area to minimize riparian zone impacts (ref. 2-1, D-2).
- Pillory Timber Sale Fisheries KV. Plan and implement fisheries habitat restoration project in East Fork Hood River. Work consists of instream habitat improvement and riparian planting (ref. 2-1, 4-9).
- Visitor information management should continue to support focused recreation management.
  * Tamanawas Falls is a popular spot on the district. Encourage alternative trails to Sahalie Falls or Umbrella Falls (ref. 3-8, D-2, D-4).
  * Wilderness hikers need information on the new trailhead at Clark Creek Sno-park. This new piece of Elk Meadows Trail was designed to relieve trail use from the Mt. Hood Meadows area. A conflict between mountain bike riders and hikers has existed along the Mt. Hood Meadows route (ref. 2-1, D-1).
- The East Fork mainstem needs habitat restoration. Analysis determined that the East Fork mainstem between Sherwood and Robinhood campgrounds historically contained a multitude of woody debris. This primary filter for the system supported water quality and fish habitat. The Forest Service either salvaged or cleared downed-wood in and adjacent to the stream in 1979. Restoration work needs to provide an opportunity for large wood input at key locations to allow the stream to restore this former structure and increase channel sinuosity (ref. 2-1, 3-8, 3-15, 3-16, G-2).
- Develop an East Fork Recreation Plan to include a strategy for management of camping in the East Fork drainage (primarily in this IDA). Campers concentrate in Sherwood and Robinhood Camp Grounds, along Pocket Creek, and Nottingham and small dispersed sites on both sides of Highway 35. Most are within riparian areas and all are within the riparian reserves. Resource damage occurs at Nottingham camping area. The Robinhood Camp Ground Site Plan is complete. Riparian restoration should be part of the management strategy. Consider revegetation stand structural development, riparian and aquatic habitat restoration. Campsites, trails, human traffic zones, vehicle traffic and parking sanitation facilities should be properly located. Camping areas and roads require hazard tree management. Develop an alternative campground in the upland areas along Forest Service Road 3500640. Dispersed camping along Forest Service Roads 4400630, 4410 and spurs. Gumjuwac trailhead is an area accessible to horse trailers and can be developed as part of Robinhood Pit restoration (ref. 2-1, 3-8, D 4-6).
- Establish a Mycological Special Interest Area to protect type locality (Cloud Cap). Survey suitable habitat to find additional populations. Monitor populations for recreation impacts (ref. L-1).

Low

- Bennett Pass Trail #684 needs completion to Gunsight Trail. The Mt. Hood Forest Plan proposed this project, but construction was never completed (ref. 2-1).
- Teacup Lake Trail #677 should be maintained for huckleberry pickers (ref. L-23).

***Meadows IDA***

***Recommended - Projects***

The Mt. Hood Meadows Ski Area FEIS describes the development and restoration projects approved as part of the master plan for the area.

High

- Restoration of the Stringer Meadow Special Interest Area to remove gravel and sediment accumulated from snow blowing and grading of the MHM access road (FSR 3555) and parking lot. Develop an interpretive plan for the Stringer Meadow special Interest Area. Discourage off trail mountain biking and hiking in the meadow. Develop culvert maintenance plan for MHM area (ref. 2-1, 3-8, 3-19, 3-20, 4-4, 4-5, 4-8, 4-10, C-7).
- Timberline Trail Threatened and Endangered (T/E) habitat restoration. Restoration of 0.5 acres at the stream crossing near the junction of Umbrella Falls trail and Timberline trail. Hand place stepping stones of on-site rocks into muddy sections of the trail and stream crossing (ref. L-33).
- East Fork headwaters T/E habitat restoration. Decompact soils consisting of one acre at the old Texas lift site. Recontour the landscape to naturalize the area. Plan native species from on-site seed sources (ref. 4-5, D-1, L-33, M-3).
- Evaluate culvert and waterbar effectiveness for MHM area roads (ref. 4-5, C-7, C-8).

Medium

- Upgrade turbidity meters at MHM water quality stations with increased range (ref. H-4, H-5).
- Subalpine native plant community restoration. Eliminate Bird's-foot treefoil (Lotus Corniculatus) from a 3.5 acre near Hood River Meadows. This is an aggressive non-native weed that is crowding out native subalpine plants and has spread to over 70% cover dominance. Eradication will be completed by hand pulling over several years, spot application of herbicide, and intensive replanting with native species (ref. L-29).

***Surveyors IDA***

***Recommended - Projects***

High

- Restoration of High Prairie Meadow. A diversion of the natural ground water occurs through the meadow. The portion of the meadow above the road system remains wet. The meadow below the road has dried and appears to be converting to forest. Natural drainage should be restored to the hydrology of this system (ref. 4-4).
- Bald Butte T/E plant habitat restoration. Restore 2 acres directly under and adjacent to the power lines and at the trailhead/parking lot. This includes 3 acres on the summit of Bald Butte. Napweed will be hand-pulled and the soil decompacted. Boulders are to be installed to stop off-road use. This area will be omitted from range allotments. Educational signs and brochures at the trailhead will be installed to focus public awareness (ref. L-1).

Medium

- Restoration at Brooks Meadow. A detailed restoration plan should be developed by an interdisciplinary team with input from an alpine ecologist and landscape architect. The plan should address decompaction of soils, rerouting of streams, rock crossings at trail junctions, and mimicking the natural composition of plant communities in the vicinity of revegetation projects (ref. 4-4).

***North Middle Fork IDA***

***Recommended - Projects***

High

- The restoration of Tony Creek headwaters is needed. This includes road obliteration or preparation of the surface for perpetual self maintenance. Harvest operations around meadows and within wet soil areas have changed the hydrology of the area (ref. 3-22, 3-23).

- The tanker fill at Forest Service Road 1600 and Tony Creek crossing should be refitted and buried. This facility is routinely vandalized (ref. 3-27).
- Refit culvert in Forest Service Road 16 at the Tony Creek crossing to improve fish passage (ref. 2-1, 3-27).

***South Middle Fork IDA***

*Recommended - Projects*

High

- Develop a Laurance Lake Management Plan that addresses the recreation demands and necessary vegetation management. Human use is expected to exceed current facility capacities. Much of today's present use is by the local community. Sanitation facilities are poor at the lake site and non- existent in the surrounding dispersed areas. Two proposed mountain bike trails will further increase visitor use. Soil and vegetative restoration is needed on the dispersed sites located along Forest Service Roads (FSR) 2840 and 2840640 and in the picnic area near the lake. Laurance Lake road systems are potential routes for winter recreation (ref. D-2, D-4).
- FSR 2840630 and its spur roads from the gate to its termination need either to be repaired or partial obliterated. This road needs evaluation for vegetation management access into upland C1 lands. The road is located primarily within the recommended riparian reserve (ref. 2-1, 3-28).
- Conduct a road culvert analysis of the FSR 2840650 that accesses the Elk Cove trailhead. Dispersed camping sites at this vicinity needs to be better managed. Two road culverts are restricting fish passage to Pinnacle Creek. One pipe in the lake allows vehicular access to the dam at low pool. This will be removed during the 1996 field season. The culvert on the Forest Service 2840 road will be removed and the road relocated to an alignment that better supports fish passage. A site in this area is recorded as a historic tribal huckleberry picking camp (ref. 3-28).
- Clear Branch/Pinnacle Creek fish habitat restoration. Survey, plan and write EA for riparian and instream habitat rehabilitation projects above and below Clear Branch Dam. Projects are a high priority in the Hatfield flood package. Projects are in the conceptual stage only at this time so the project size, exact locations, etc. may change after field review (ref. 4-3).
- Continue ongoing coordination with ODFW, USFWS, Tribe, Middle Fork Irrigation District, and Hood river County to finalize a bull trout conservation strategy for the Hood River Basin. Project will culminate in a written conservation strategy to be used as a blueprint for Bull Trout recovery by all agencies. The hope is that this strategy will prevent listing of bull trout as threatened or endangered (ref. 3-26, 3-27, I-8).
- Challenge Cost Share (C.C.S.) project with ODFW and USFWS. Build two kiosks in the vicinity of Kinnickinnick Camp Ground educating the public concerning bull trout, bull trout habitat, regulations,, etc. An associated project is designing and producing bull trout posters and fliers in English and Spanish to place in the kiosks and other areas. USFWS has contributed $22,000 towards the project for construction and printing costs. The forest Service asks for money to pay for salary (ref. 2-1, 3-23, 3-28, 4-5, D-5).
- Bull trout snorkeling and radio tracking. Continue ongoing partnership with ODFW and Tribe to monitor bull trout migration and spawning/ this is a C.C.S. project with the above partners and for the fist time, US Fish and wildlife Service. Surveys begin in early summer and continue into the fall. Much of the field work is completed by seasonal employees. Summary reports are written each winter (ref. 3-26, 3-27, I-8).
- A Pit Closure Analysis will be conducted for the quarry by the end of 1996. A gate administratively closes the upper end of Laurance Lake. The road from the gate should be obliterated if the quarry is no longer needed. The gate is presently a management problem and dispersed camping fire rings are found beyond the closure. The rock pit and the road have the potential for causing resource damage if the stream meanders. The road past the pit was poorly obliterated in and needs further restoration work (ref. 3-18, 5-5, C-6).
- Fish habitat improvement through LWD is needed in Clear branch above Laurance Lake to the FSR 2840640 bridge (ref. 3-27).
- Lower Pinnacle Cr. Fish Barrier Restoration. Survey and plan replacing the FSR 2840650 culvert on Pinnacle Creek located approximately one mile upstream from Laurance Lake. Objective of the project is to improve fish passage. Anticipate using watershed restoration funds to implement the project in 1998 (ref. 4-3, I-15).

- Upper Pinnacle Cr. Fish Barrier Restoration Survey and plan replacing the FSR 2840 culvert on Pinnacle Creek located at Laurance Lake with a bridge. Objective of the project is to improve fish passage. (Anticipate using watershed restoration funds to implement the project in 1998) (ref. 4-3, I-15).
- Operation of upstream migrant fish trap at base of Clear Branch dam. Cooperative effort with ODFW and Middle Fork Irrigation District. Will take approximately 9-15 man hours per week to operate the trap (ref. I-15).

Medium

- Plan and implement construction of an intake structure for the Laurance Lake Dam fish trap to keep debris and bodies out of the trap. Associated project is to pour a concrete slab next to trap to be used as a working platform while measuring fish, etc. May need amendment to existing EA (ref. 2-1, 3-15, 3-27, I-15).

### *Mt. Hood IDA*

#### *Recommended - Projects*

Medium

- Refer to Mt. Hood Wilderness Limits of Acceptable Change (LAC) process to direct management of this area. Restoration, development, and visitor management recommendations are included in this process (ref. 4-5).

### *Lower Valley IDA*

#### *Recommended - Projects*

Medium

- Develop a Lava Bed Management Plan. The Mt. Hood Forest Plan projected a management plan that has not been completed. An early 1960s management plan defined this area as a geologic special interest area. The Regional Cave Management Plan guidelines apply, since lava tubes are present in the area. Other issues to explore are human impacts to these natural habitats and the Wild and Scenic River nomination process. Opportunities include an interpretive center, trails, and connection with the Mt. Hood Railroad. This could be a cooperative effort with adjacent land owners and businesses. The portion of the Lava beds owned by Hood River County is designated a Special Natural Area that directs recreation emphasis (ref. 4-4).

## *Additional Recommendations*

High

- The East and Middle Forks of the Hood River are subject to the same restrictions on the licensing, permitting and exempting from licensing and the construction of water resource projects as provided for components of the National Wild and Scenic Rivers System pursuant to section 7(a) of the Wild and Scenic Rivers Act. Both rivers have had studies conducted to determine their eligibility status. A suitability study has recommended the East Fork not to be considered suitable for inclusion as a Wild and Scenic River. The lack of funding currently prevents the suitability study for the Middle Fork. The Middle Fork is an outstanding candidate for legibility and a suitability study should be conducted when funds become available.
- Many of the older harvest units, particularly within Middle Fork, lack snags and down logs, primary and secondary cavity nesters associated with early seral stands may be few in numbers. In turn, as the stands begin to develop into mature stands, a new set of species (cavity nesters associated with late seral stands) will also be few in numbers. Creation of large diameter snags along the edge of some of these older units would benefit some early seral cavity nesters (this would not maximize the benefits-ideally, snags would be created in the middle or dispersed throughout the openings), as well as those species associated with older seral stages, particularly as the harvested area grows up. Down logs should also be placed within these older harvest units, mainly to benefit small mammals, amphibians, fungi and other plants, as well as insects. These benefits will be both in the short and long run, as the stands continue down their path of development (ref. 3-7, 3-15, 4-2, J-20).
- Continue existing implementation, effectiveness, and Forest Plan monitoring within streams and lakes on the district. Effort is a joint fish/watershed activity and includes temperature, water quality, discharge, fish distribution, and spawning surveys, Most

field work is conducted by seasonal employees, generally this work is funded using OPS dollars (ref. 2-1, 4-3).

Medium

- At Red Hill, Bennett Pass, and Hood River Meadows areas, thin forested edges of selected, publicly accessible huckleberry thickets to maintain openings. Crew collect huckleberries for seed from Hood River Meadows area, Bennett Pass area, and Red Hill area. Grow seeds at local nursery for planting (ref. 3-18, 3-19).
- Projects which actively pursue the return of anadromous fish and other prey species to the watershed, in an abundance to support bald eagles, should be initiated. This goal will take long term commitment and planning to be successful (ref. 3-7, 3-8, 3-15, J-20).
- Riparian restoration within the lower portions of the East Fork could be actively pursued. Working with other agencies and interested publics, stream and riparian structure could be developed in some areas, with the overall goal of providing for some riparian and late seral linkage (ref. 3-3, 3-7, 3-15, 4-2).
- Riparian enhancement on Forest is also of importance, particularly within the Middle Fork watershed. Development of late seral structural characteristics, including placement of large down logs, is needed in many of the creek systems. Older cull decks could be used to place partially decayed logs within the riparian system (ref. 3-22, 3-23, 3-27, 3-28, 4-2, 4-3).
- Pursue a cooperative partnership with Hood River County and lower valley land owners to develop a joint strategy on connective late seral like forest habitat across the lower elevations of both watersheds. This strategy would focus on how to rotate harvest areas so as to provide a designed link spatially and temporally. Management could emphasize silviculture that supports late seral characteristics while producing wood products (ref. 4-3, J-4, J-7, J-20).

Low

- A healthy ecosystem has all of its components. Therefore, the reintroduction of wolf, condor, grizzly bear and mountain goat should be assessed. While there are some social limitations to the success/pursuit of some of these ideas, they all further the concept of restoration (ref. 3-7, 3-8, 3-28, J-8, J-20).
- A long term goal of restoration within the watershed should be to see the return of bald eagle. Projects whose activities pursue the return of anadromous fish ant other prey species to the watershed, in an abundance to support Bald Eagles should be initiated. This goal will take log term commitment and planning to be successful (ref. 3-28).
- Additional road closures within the Middle Fork watershed would help to promote greater wildlife security. Deer and elk are frequently poached in this area. A reduction of roads would not only assist the vigor of these species, but also species which prey or scavenge them. Many of these closures were identified through the LAD process (ref. 3-16, J-20).

## *Further Analysis Needs*

- Fish passage barriers due to irrigation withdrawal mainstem de-watering.
- Assessment of historic silvicultural treatment results.
- Visual assessment of temporary roads and skid roads not captured in the GIS transportation layer. Utilize aerial photo survey coupled with field verification.
- An assessment of conductivity changes on the East Fork in relation to wastewater treatment plants.
- Evaluate specific impacts to the stream biota. Several years of macroinvertebrate monitoring has been conducted by district personnel but final result have not been received from the laboratory contractor.
- The Cooper Spur Ski Area was developed in 1926. It is considered an inexpensive, family oriented local ski area. Its inclusion within the transition zone of rain and snow limits its predictability for economic success. The Winter Sports ski area (A11) covers approximately 1400 acres. Five-hundred acres has the vertical elevation change necessary for potential development. Eighty acres are currently managed as ski area. There is no planned expansion by the present owners. A re-evaluation of the Mt. Hood Forest Plan land allocation may be appropriate (ref. 4-5).
- The potential of a new trail constructed on county lands to connect with the forest trail system (ref. 3-20).

- The Polallie trail bridge no longer is functional as a result of the 1996 floods. Management problems exist with the present alignment of the crossing. Further assessment is needed to determine if the crossing is needed (ref. 2-1, D-2).
- Evaluate the numbers (percentage late seral) and spatial distribution within this area Timber Emphasis (C1) versus Riparian Reserves. The current vegetation layer used in the analysis of this IDA raises questions relating to the percentage of late seral remaining in the C1 allocation. There is a concern for the integrity of connective habitat during the interim period (ref. 4-3, 4-8, K-3, K-5).
- A traffic assessment needs to be completed for the 3550 road system. This road is published in a mountain bike touring book and may see increased use beyond its current service level. Dispersed parking may be an opportunity along the roadway (ref. 2-1, 3-20, D 1-6).
- Evaluate the effects of recreation at Cloud Cap and Tilly Jane for fungi species Gastroboletus Subalpinus and Thaxerogasterpinque (ref. L 3-4).
- Conduct a logging feasibility study for this IDA to supplement the Highway 35 Viewshed Plan's needs. There is a concern that the unroaded upper elevation areas projected for harvest are not economically feasible (ref. 2-1, 3-9, 3-12, K-5).

## *Access & Travel Management Recommendations*

### *Introduction*

This section identifies suggested general road management practices and recommends changes to the Access and Travel Management Plan (ATM) for each of the watersheds. Recommendations for road closures were formulated by review teams and sent out to district personnel from silviculture, timber, recreation, and hydrology for confirmation.

Roads listed for obliteration were not foreseen as necessary for management activities within the next 10 years. These recommendations are brought forward with watershed analysis as potential and existing restoration projects. In most cases, further assessment will be required to implement these recommendations.

The roads addressed for closure were placed in one of three categories:

* Obliterate - restore drainage and infiltration, possibly recontour;
* Closed Maintenance Free - Restore drainage, block access, keep tread;
* Administrative Closure - Gate/barricade, no resource damage foreseen.

Where administrative closures are recommended, management should include the posting of official closure signs, maintaining them current and legibly intact.

### *General Road Management*

The ATM plan is designed to identify a road system that can be maintained and utilized in the near future. This document and watershed analysis is intended to support that effort. Discussions were generated through various team reviews as part of watershed analysis in regard to management and maintenance of road facilities within the watersheds. Several items were brought to the forefront as general road management that should be encouraged to maintain a healthy watershed.

- ATM plan development should include criteria for road retention, maintenance, and life expectancy of need. Revisions to active road systems should be focused by road density evaluations, sub-watershed ARP calculations, and an interdisciplinary review of future management needs.
- Develop standards for revegetation of road cut and fill slopes.
- Develop road ditch maintenance standards for forest roads and Highway 35. Support the local Hood River Watershed Group's efforts to develop standards for County road ditch maintenance.
- Implement a monitoring program that assesses management effectiveness.

### *East Fork Hood River Watershed*

A review team verified the existing ATM plan desired future condition. Using a roads overlay, the team systematically addressed all the road systems within the watershed. The results listed below identify roads recommended for obliteration, closure, maintenance, or further evaluation to assess future needs and existing or potential resource damage.

| System Roads | Spurs | Recommendations |
|---|---|---|
| 3500 | -680 system | Teacup Lake road system, presently under an administrative closure. Recommend evaluation of the need for maintenance free conditions. Resource damage may be occurring in some areas. Evaluate system for silviculture and recreation management needs. Obliteration of some segments may be appropriate, culvert removal and drainage restoration may be adequate on other segments. |
| 3500 | -830,831,832 | Road system needs adequate closure at the entrance from the highway. Recommend road drainage restored to maintenance free condition. |
| 3540 | | Pocket Creek road system, presently under an administrative closure at highway 35 from 12/1 through 4/1. Recommend extending this closure for wildlife purposes later into the spring or early summer. Recommend evaluation for year round closure of the portion of this road located past the 640 spur. Consider recreation, silviculture and timber resource needs on this segment prior to closure. If closed, recommend maintenance free conditions in areas where resource damage potential exists. |
| | - 640,641 | Presently closed with a guardrail. Recommend maintenance free conditions in areas where resource damage potential exists. |
| | - 620 system | Presently closed. Recommend evaluation for maintenance free condition. Culvert crossings are only foreseen problem areas. Need evaluation for Nordic ski traffic. |
| | -012 | Recommend closure with maintenance free conditions. |
| | -630 | Recommend obliteration. |
| 3500 | -670 | Presently gated, administrative closure during winter season, 12/1 through 4/1. Recommend an extended seasonal closure for wildlife purposes, late spring or early summer. |
| 3520 | | Recommend closure beyond the recent washout (at approximately 1.25 mi.), restoration to maintenance free conditions. Recommend extension of existing winter closure at highway, 12/1 through 4/1, to include spring/early summer for wildlife concerns. |
| | -630,640,650 /651 | Presently closed with dirt berms. Recommend for obliteration or better closure, 4X4 traffic is presently crossing the berms. |
| | -621 | Recommend for obliteration. |
| | -622 | Recommend repairs if road has a need to remain open. Potential for resource damage presently exists. |
| 3500 | -620 | Nottingham road. Recommend restoration, repair and improvement of portions of this road. Road linked with dispersed camping in this area. |
| | -640 | Recommend evaluation for obliteration or repair. |
| | -641,642 | Recommend for obliteration. |
| | -740 | Presently closed with dirt berm. Recommend maintenance free conditioning, maintain bermed closure. |
| | -750 | Native surface road receiving 4X4 use with spurs being created. Recommend evaluation for closure or management before resource damage occurs. |
| 4400 | -630,631 | Recommend closure in a maintenance free condition. |
| 4410 | -630 | Recommend evaluation. Consider closure in a maintenance free condition or maintained and managed as access for dispersed camping areas. Silviculture needs access at least by ATV. |
| | -660 | Recommend for obliteration. |
| | -120,140,180 | Recommend for obliteration. Objective is to reduce road densities in this area. |
| 3511 | -620 | Recommend closure in maintenance free condition at the section line between sections 35 & 36. Section 36 is soon to be traded to Hood River County. |
| 3512 | -012 | Recommend road remain open with restoration and maintenance work conducted where needed. |

*Middle Fork Hood River Watershed*

A review team verified the existing ATM plan desired future condition. Using a roads overlay, the team systematically addressed all the road systems within the watershed. The results listed below identify roads recommended for obliteration, closure, maintenance, or further evaluation to assess future needs and existing or potential resource damage.

| System Roads | Spurs | Recommendations |
|---|---|---|
| 2840 | -640 | Close, restore drainage, keep tread from 1612 junction to point of closure (on top). Lower portion (Laurance Lake) - close, re-contour, and rehab the second rock pit. This pit is currently impacting the riparian area. Obliterate the road portion from the first rock pit upstream to the Clear Branch crossing bridge. Keep in mind that a future hiking trail (Rick's loop around the Laurance Lake area) will be needed. Maintain a CFR closure from the campground to the first rock pit. |
| 2840 | -650 | Need to improve the drainage and re-rock the entire segment. Needs a bigger turn-around at the trailhead. |
| 2840 | -680 | Obliterated FY-95, Planted FY-96. |
| 2840 | -660 | Close, restore drainage, keep tread. |
| 2840 | | Close, restore drainage, keep tread (approximately last 1 3/4 miles from current slippage to end of road). MFID is OK with this proposal and should not impact their snow survey course (6-4-96). |
| 2840 | -621 | Improve drainage and re-rock near 620 junction. |
| 2840 | -622 | Close, restore drainage, keep native surface tread. |
| 2840 | -630 | This provides access to the ridge which will be needed in the future for logging systems. Portions of this road passes through unstable and wet areas and are causing resource damage.<br>**Options**:<br>- Spur from the 2840-650 to gain access to the ridge. Obliterate switchbacks and keep the road that parallels Coe Creek.<br>- Re-rock from gate to the slide area. Need to fix plugged culvert and drainage past the slide area. |
| 1610 | -630 | Close, restore drainage, keep tread (from end of EP to end of road only). |
| 1610 | -640 | Close, restore drainage, keep tread. |
| 1610 | -650 | Possibly close, restore drainage, keep tread; or utilize for dispersed camping or other uses (no resource damage known). |
| 1612 | -660 | Obliterate (KV funds collected) |
| 1612 | -670 | Obliterate (KV funds collected) |
| 1630 | -660 | The road is currently filling in with vegetation and is impassable to standard 2 wheel drive vehicles. This road accesses a trailhead. Recommend close, restore drainage, keep tread. Move trailhead back to closure or re-locate to the old 1631 tie in. |
| 1631 | | Evaluate beyond 011 spur for closure and restored drainage maintenance free; or rehabilitation of maintenance problem areas. |
| 1640 | -620 | Needs evaluation. Possibly close, restore drainage, keep tread; or consider full obliteration. Road within riparian reserve. |
| 1640 | -630 | Close, restore drainage, keep tread. |

## State Highway 35 Viewshed Management Guide

In 1991, a Viewshed Management Guide was published for the Highway 35 viewshed located along the East and Middle Forks of Hood River. Because the guide was developed recently and based on Mt. Hood Forest Plan direction, the decision was made to review the information presented.

The viewshed management guide was completed prior to the Northwest Forest Plan Record of Decision and the requirement for watershed analysis at the landscape scale. Watershed analysis encompasses a larger landscape of these two watersheds than the area identified as viewshed and considers a broader scope of resource interactions. Even though this discrepancy in scale exists, it seems appropriate to validate, where possible, the information within the viewshed guide based on this more recent analysis.

Selected sections of Chapter III, Guidelines and Recommendations of the viewshed guide were distributed to watershed analysis team specialists for review. They were asked to review the content and validate the consistency of the information with current knowledge of the watersheds and management direction for these areas. Nothing earth-shattering was concluded, but a few notes from each review are recorded here to help draw the viewshed management guide into this watershed analysis.

### Section C. Recreation in the Viewshed

Consideration for trails management addressed within the viewshed guide are consistent with present information and management. It is recommended that the viewshed guide be utilized for trails management within the viewshed. Connected trails located outside the viewshed area should be managed in support of the viewshed area.

The guidelines for camping and day use management found in the viewshed guide are not consistent with current knowledge and management within the watersheds. Recommendations for camping and day use management from this analysis can be found in this chapter and further information is within Appendix D, Recreation Report.

### Section D. Silviculture and Timber Management

Proposed timber management and prescribed silviculture treatments are varied within the watershed based on the inclusion of the Northwest Forest Plan direction. Several land allocations are blended within the viewshed area that create a complex matrix of treatment possibilities. It is recommended that the viewshed guide information be utilized to support visual quality objective development but vegetative management recommendations proposed with this watershed analysis are thought to be compatible and more holistic for the landscape.

### Section G. Fire Ecology and Fuels Management

Most all of this section was consistent with present knowledge within the watersheds. Management of activity fuels within the watersheds seemed to need better clarification. Present understanding is that activity or natural fuel loading may require management prescriptions that include broadcast burn and hand pile/burn treatments. Burning prescriptions however (especially including these treatments) must be sensitive to the visual quality objectives for specific areas.

### Section H. Wildlife Management

The list of commonly found animals identified in the viewshed guide is questionable. The general wildlife information presented is valid for these areas of the watersheds.

### Section I. Fisheries and Watershed

The fisheries information contained within the viewshed guide is not considered consistent with the knowledge and management currently understood for these watershed areas. Recommendations for fisheries management from this analysis can be found within this chapter and further information is within Appendix I (Fisheries Report).

## *Data Gaps*

Data gaps are found in much of the information that was generated for this analysis. Subsequent iterations of this analysis can be conducted as new information is acquired. This section offers a generated listing of resource data gaps that are listed as *Significant* and *Less Significant*.

*Significant* data gaps cause the analysis to be inconclusive.
*Less Significant* data gaps allow a conclusion to be drawn from the analysis, but limits its accuracy or specificity.

Significant Data Gaps:

- More comprehensive water quality data.
- Biodegradability statistics/studies on specific pesticides in use: toxicology studies of these chemicals on various aquatic biota; amount and timing of pesticide applications in the various subwatersheds (including forest silvicultural chemicals); water quality studies focused on agrochemical.
- Nutrient and dissolved oxygen levels in affected and unaffected streams; fertilizer use statistics for the Hood River Valley.

Less Significant Data Gaps

- Quantified road/stream interaction with the stream substrate.
- A complete vegetative inventory of the watersheds, field data supported.
- A reasonable field sample verification of the current vegetative data base.
- Summer suspended sediment and turbidity data on Clark and Newton Creeks.
- Upper limits of distribution and fish species presence/absence needs to be verified.
- Inventory of abandoned roads.
- Hiker use data on high-use trail systems.
- Water temperature data on the East Fork below the National Forest boundary.
- Dispersed camping site inventory.
- Location of heritage sites.
- Adequate information/expertise to support identification of late-successional habitat associated bryophytes.
- Data and analysis gaps identified as part of the West Fork of Hood River Watershed Analysis may also apply to the East Fork and Middle Fork of Hood River watersheds.

## *Monitoring*

All monitoring projects recommended are considered essential to the evaluation of trends and observations of forest management.

- Develop a systematic plan and protocol for landscape change photopoints. Establish photopoints for long term monitoring of implemented projects.
- Develop implementation and effectiveness monitoring protocols for all projects completed.
- Current insect and disease levels and population development. Conduct annual checks at specific locations. Record dead/dying and dead/live ratios to evaluate stand conditions.
- Quantify the amount of sediment loading from management activities.
- Monitor all Bull Trout related fisheries projects.
- Continue current water temperature monitoring. Include stations above and below the diversion for East Fork irrigation ditch and below Laurance Lake (directly below the dam and approximately 1/4 mile downstream).
- Establish a long term monitoring scheme in conjunction with prescribed silviculture for riparian and terrestrial forest development. Monitoring designs that address the outcome of silvicultural systems implemented must be planned at the time prescribed activities are developed. Where possible, the sample design should be incorporated as part of the treatment. Sample areas should be installed with the pre-sale activities. Follow-up sampling and the analysis of findings are necessary tools for the long term adaptive management strategy.

# APPENDIX

# *HISTORICAL ASSESSMENT*

## *EAST & MIDDLE FORKS OF THE HOOD RIVER WATERSHED ANALYSIS*

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May 31, 1996

## *Introduction*

**This report is an overview of the human aspects and uses of the East and Middle Fork watersheds. Opening the discussion is a description of how the environment was formed, through the geologic history of the watershed. The remainder focuses on the history of the people who inhabited the area, divided into cultural periods.**

Geology of the East and Middle Fork Watersheds. The East and Middle Fork watersheds lie within the High Cascades physiographic region. The north-south trending Cascade range began developing about 40 million years ago (mya) as a series of low volcanoes stretching east of the Pacific coastline. About 5 mya, the old range rose and tilted, creating the Blue River Ramp, and causing a rain shadow east of the mountains. At approximately the same time the High Cascades, populated by large, relatively recent volcanoes appeared (Reese 1988). Basaltic flows, not directly related to mountain building processes, poured over the landscape from vents in the earth's surface between 15 and 5 mya. Not constant, these flows would continue for long periods and then stop for equally long periods. Sediments and vegetation compressed between the flows weathered from the eroding lava as chert or petrified wood, both useful in tool manufacture by later human residents.

About 15 mya, the Columbia River cut across the landscape. First positioned further south, various geologic events pushed it to its present course. During the Pleistocene, with the ebb and flow of glaciers, Lake Missoula formed in what is now western Montana as a result of an ice dam and melting glacial ice. Periodically the ice dam failed, causing cataclysmic flooding throughout the Columbia River Gorge area and valleys. The cycle of dam building and failing was repeated many times from 40,000 to 12,000 years ago. During the last phase of the final glaciation, from 15,000 to 12,000 years ago, a series of at least 40 floods, called the Bretz floods, poured through the Gorge and surroundings, carving and remolding the landscape as they passed (Allen 1984, Allen and Burns 1986, Reese 1988). Although the flows of water would have been restricted by Middle Mountain, some inundation including water back-up would have affected both watersheds during higher volume floods. Plants on the lower elevations would have suffered impact. Some animal, and perhaps fish populations may have fluctuated.

Going back to a little before 5.3 mya, the entire area including terrain east of the High Cascades exhibited a short period of explosive volcanism which threw ash, cinders and debris from vents and some shield volcanoes. Then, about 5 or 4 mya, earthquakes along the eastern edge of the High Cascades, were produced by a major faultline over 60 miles long extending north-south on both sides of the Columbia. In the watersheds, the fault runs parallel to the East Fork. Lateral stresses along the break are responsible for a vertical displacement of some 2,000 feet resulting in the anticline or up-folding of land which forms the escarpment of the east wall of the Hood River Valley. Besides the Hood River faultline, there are a number of other faults in the area, some of which are contained in the East and Middle Fork watersheds. Most are only a few miles long, and none has shown surface movement within an historical context. The Hood River faultline, after a long period of quiet, has been active in the Pleistocene and perhaps even more recently. Allen (1984) has suggested that the Bridge of the Gods landslide of A.D. 1260 may have been triggered by an earthquake. Also, research indicates that earthquakes of a magnitude greater than 7.5 have occurred off the coastline within the last 10,000 years (Reese 1988). In addition to folding and earthquakes, the vents dotting the eastern ridgeline and escarpment have extruded basaltic lava flows as recently as 340,000 years ago, in the Pleistocene.

More specific to the East and Middle Fork watersheds is the influence of Mt. Hood. Sporadically active for millions of years, late Pleistocene evidence of a series of mudflows spanning over 10 thousand years is widespread in the Upper Valley through which rivers from both watersheds pass (Crandell 1980). Mudflows, which Reese (1988:517) describes as a "cross between a flash flood and a landslide of volcanic ash mud," are usually thick and hard to revegetate. Also dating to this time and found on the slopes within the watershed are pyroclastic flows which consist of gases and fragmentary rock. One of these flows near the present location of the Cloud Cap Inn averages 40 feet in thickness. Both pyroclastic and mudflows underlie glacial moraine dating to 29,000 years ago. In addition to deposition from Mt. Hood, three vents located on the lower flanks of the volcano at The Pinnacle, close to the present location of the Cloud Cap Inn, and on the valley floor near the Middle Fork called the

Parkdale Lava Beds have been responsible for lava flows which are chemically similar to each other, but quite different than the flows from the volcano (Crandell 1980). As with other volcanic action, flows from these vents have happened periodically over time, predating 40,000 years ago and continuing past the last glacial retreat. Each vent operates independently and at different time intervals.

The last, major glacial advance, called the Fraser Glaciation (29,000 to 10,000 years ago), changed the symmetry and form of the mountain by removing over 1,000 feet of its height and transforming the north and northeast sides with the action of grinding ice (Harris 1980). This left till deposits on the slopes measuring from one to three feet in depth. Estimates of glacial extent on the northeast side of the mountain are inexact, because later mudflows have obscured traces of the lateral and terminal moraines, but are thought to have descended to around 4,500 feet in elevation (Crandell 1980). Each successive glacial advance tended to obscure the previous landscape through redistribution, erosion, and other weathering forces. In fact, with its coarse, unsorted texture, the moraine deposits resemble those from the Polallie eruptions of Mt. Hood dating between 15,000 to 12,000 years ago.

The Polallie eruptive period, when active, impacted large parts of both watersheds. Characterized by pyroclastic flows, mudflows and ash clouds, a typical deposit some 325 feet thick near the present location of Tilly Guard Station contains an interbedding of both types of flows (Crandell 1980). Many of the deposits were channeled and limited by existing glacial ice. Mount Hood Meadows on the east slopes, for instance, was completely covered during much of the Fraser advance, so although some Polallie deposits are found at the head of the basin, none occur in the meadow. The last Polallie eruptions contained mudflows which inundated the valley floor, along the East Fork and may have pushed as far as the Columbia River.

With the beginning of the Holocene (12,000 years ago to present), the Ice Age was in its final retreat, causing the ocean level to rise about 300 feet to its present height. The last huge flood as a result of the ebb and flow of ice dams occurred between 12,000 and 13,000 years ago. Volcanic activity had continued through the Ice Ages. Within the Holocene, volcanic activity along the crest of the Cascades has continued sporadically, with long quiet periods being more characteristic (Whitney 1989; Allen 1984). Corresponding in age to some of the Parkdale lava flows, the largest Holocene eruption in the Cascades Range was Mt. Mazama around 7,000 years ago. A rhyolitic explosion of dramatic proportion, the volcano destroyed itself and blanketed the entire region with ash (Whitney 1989). The numerous basalt shield volcanoes in the area, though, have shown only sparse activity in this time frame (Allen 1984). Mt. Hood has had two major eruptive phases labeled Timberline and Old Maid. Both of these were either pyroclastic or mud flow in nature, and involved more the southern and southwestern sides of the mountain. The Timberline eruptive period is loosely bracketed between 1,800 and 1,500 years ago. While the heaviest impacts were elsewhere, a small volume pumice emission, containing chunks of lava is found scattered to the east of the mountain, and two deposits of ash separated by decades or as much as a century, occupy the same but wider area. On the slopes, evidence of avalanches date to this time as well (Crandell 1980). The Old Maid eruptive period, only 300 to 200 years ago (in AD 1600s to late 1700s), was responsible for heavy ash falls on the eastern slopes, measuring eight inches on Cooper Spur, and over one foot further away. Minor episodes of debris, ash and mudflow have occurred as well throughout the Holocene. Historic records of such events are documented around 1800, 1859, 1865 and 1903.

Other events which have localized but dramatic impacts include landslides, wind and ice storms. Large landslides and slope failures, particularly due to flooding have been recorded as recently as 1980 and 1996. Wind and ice storms can cause blowdown of large numbers of trees. Some evidence of avalanche activity has been mentioned. The ability of these events to affect the immediate environment and animal habitat, may have interrupted the routine existence of Native Americans in the past, as it has the lives of present residents using both drainage systems.

<u>Climatic Processes.</u> As would be expected, the end years of the Pleistocene became increasingly warmer and dryer. This trend continued into the Holocene. From about 10,500 to 8,500 years ago, the climate was similar to today's, warmer than during the Pleistocene but still relatively cool and moist. The Hypsithermal, from 8,500 to about 3,000 years ago, was warmer and drier than today, although there were fluctuations in both space and time (Reese 1988). About 3,000 years ago, the climate became cooler and sometimes more humid than at present. During this time, glaciers advanced in Alaska and on Mt. Rainier (Reese 1988) and perhaps on Mt. Hood.

Besides the broader climatic changes over time, conditions differ between one side of the Cascade crest and the other. Temperatures differ less than precipitation, with the west side at higher elevations being slightly cooler than the east side in summer and about 8°F cooler in winter. The mountain is, of course, always cooler. On the other hand, rainfall amounts on the western edge of the watershed approach 100 inches annually while the eastern edge can receive as little as 35 inches (Green 1981). This high variation between east and west indicates that even though the regional climate can be broadly characterized for periods of thousands of years, these sweeping pictures can mask local differences.

People who first inhabited the area were nomadic and their adaptations matched the regional environment. Later, as seasonal rounds became modified to specific areas, technologies and lifestyles changed to reflect local use strategies.

## *The Human Picture*

Because few professional excavations have been done in these watersheds, there is no recognized cultural timeline particular to the Middle and East Forks. There are, however, any number of such timelines for the region. Most share enough similarity that the interrelationships are easily observable. The following sequence includes both cultural and functional attributes of the prehistoric and historic people using this environment. Dates are approximate.

Paleoindian (20,000+ to 8,500 years ago). Archaeologists are uncertain when the first humans crossed into the Americas. Some scholars suggest that they came onto the continents 40,000 or more years ago. While possible, proof is evasive. Evidence of man-made bone or stone tools before 20,000 years ago is often problematic due to poor preservation or questionable human manufacture, lack of reliable dates, and redistribution possibilities. The first entrance onto this continent could have occurred during parts of the Fraser Glaciation, when low ocean levels would have permitted the Bering Land Bridge between Asia and Alaska to exist, or by boat along the Pacific coast through the Aleutian Arc (Fladmark 1983, Burtchard 1994).

At least by 20,000 to 15,000 years ago the first humans occupied the Pacific Northwest. These low density populations are characterized as early broad spectrum foragers who followed the migrations of megafauna, such as mammoth, and other exploitable animals on the new landscape. In this culture, housing was temporary, material possessions were limited in size and number, and all gear was portable (Mierendorf 1986). Campsites were located close to butchering sites or other task specific areas. Of course, the season and weather influenced campsite placement as well.

Having little control over their environment or the animals they hunted, these nomadic hunters remained flexible to survive. They were extremely mobile, traveling from one resource locality to another. Earlier foraging groups moved frequently to exploit the immediate resources available, such as mammoth or bison in tundra and steppe vegetation. Later, elk and deer were also followed into the expanding grasslands. Smaller animals were also hunted. Because they did not necessarily use the same campsites season to season, or year to year, food storage was impractical. Animal kills would have comprised much of their food base year-round. Some plant gathering during warmer seasons served as an incidental food source, as well as supplying fibers for clothing and utilitarian gear.

While food sources depended on local availability, stone tools and the raw material to make them were curated. Usually large and of high quality, well made tools were considered extremely valuable and kept for as long as they were useful. In fact, they were often abandoned long distances from their original source. Carlson (1983) and Minor (1987) recognize two projectile point traditions in the Pacific Northwest from this time period. Fluted Clovis points characterize the first style, while the second is lanceolate stemmed, such as Windust. There is some debate on whether the two styles represent distinct cultural entities or different technologies within the same foraging culture. Besides lithic or stone tools, bone tools were important for such things as spear points, pressure flaking stones, and sewing clothes and gear.

Early travelers residing in this area, would have been subjected to the already mentioned Bretz floods at a rate of one or two every century until around 12,000 years ago. These torrents would have disrupted the lives of animal and human populations, as well as removing traces of past campsites. While most of the watershed areas were not affected by Bretz floods, high water tables and other occasional floods may have kept low elevations as wetland at least part of the year. Also ending about 12,000 years ago was the Polallie eruptive phase which tended to involve large parts of the East and some of the Middle Fork drainage systems in its activity. Besides resident wildlife, sometimes migratory herds and following human bands may have been caught in these eruptions. In addition, especially after an episode of mudflow, the landscape would appear similar to those seen now around Mt. St. Helens. Human presence in the area would not be felt after such an awesome happening until the land could again support them, and until the stories of the volcanic event became memory and legend. Higher terrain may not have supported vegetation until remaining glaciers began to recede, allowing growing seasons to became longer and encouraging more diverse plant life. Forested areas eventually covered much of the same ground and with the same species that are found today. Megafauna were present, though in lesser numbers, and mesofauna such as elk and deer began to take advantage of habitat changes.

Early Archaic (8,500 to 5,500 years ago). The Early Archaic is a period of transition when foragers reacted to the continuing changes in their environment. The hallmark of this time period was the Hypsithermal, which began about 8,500 years ago. The Hypsithermal, or Altithermal, was both warmer and drier than today's climate. Forests receded, and more open, parkland conditions occurred.

Grasslands expanded. While human populations still relied on broad spectrum foraging, megafauna, such as mammoths, camels, and giant bison, became extinct due to several factors, including environmental changes and human predation. Mesofauna, such as deer and elk, assumed a greater role as hunted animals. Early Archaic groups also hunted rabbits, beaver, otter, and muskrats along with other small mammals and birds. Intensive salmon fishing at Fivemile Rapids started during this time frame, although that has been recently questioned (Butler 1992), and increasing use of plants is evident.

The driving force behind foraging groups and their movements remained the distribution and abundance of big game. Some researchers believe, though, that the droughts of the Hypsithermal caused people to avoid warmer, lower elevations and flat expanses with little available water. River valleys, riparian zones, and mountainous areas which supported game served as an answer to the lack of water elsewhere.

With land use restricted and hunted species changing, human lifestyles also gradually changed. Forager group size remained about the same and absolute numbers, while growing, were still small. Interaction, such as trade, among groups was increasing, usually in resource areas with higher population densities. Future relationships and communications systems inside and among resident groups of the area were forming. Campsites were still temporary and probably often open air, but the distances traveled between them was less in order to stay near water, and occupancy was longer. Still, no evidence has been found of structures with any permanence or features such as storage pits or caches (Mierendorf 1986). More milling stones have been found, indicating greater use, although not dependence, on plant foods.

While milling stones gained in prominence over the course of the Early Archaic, other tools changed. Initially the projectile points were the same as the stemmed and unstemmed spear points found in Paleoindian times. The Windust is one of the more frequently seen styles until 8,000 years ago (Aikens 1993). Gradually, willow leaf shaped points with tips at both ends became more common, although the two overlap. As the Windust styles faded from the record, smaller, but still large, side-notched dart points become more popular. These points were probably used as javelin heads with an atlatl assist for control and distance. Other frequently encountered tools include oval or ovate knives, scrapers, burins, gravers, monos, cobblestones, and hammerstones. Fishhooks have been noted, too. The interesting thing about the lithic and other tool inventory of the Early Archaic was its progression towards more specialized tools, such as fishhooks, and the fact that tools were no longer carefully managed items, transported long distances and carefully crafted. Rather, the stone used was local in origin and often of poor quality. Tools were much cruder, without the finesse seen earlier. They appeared to be more expedient.

East and Middle Fork watersheds should have been a fairly popular location during this time period. The climate would have been warmer, but with enough moisture to encourage mesofauna and human populations to linger for stretches of time on their migrations. Based on pollen profiles, Burtchard and Keeler (1994) suggest that some of the east side of the Cascades may have been wetter as a local condition. Closed canopy forest, parklands, meadows, lakes, and rivers with associated riparian areas and all the transition systems in between would have been available. Foragers would have found mesofauna and plants for food and fiber. There were probably fish, but perhaps different or fewer species, depending on stream temperature and conditions.

<u>Middle Archaic (5,500 to 2,500 years ago).</u> There is no dramatic break between the Early and Middle Archaic, rather it starts as a question of emphasis and becomes a change in lifestyle. During this time period, populations developed a semi-sedentary foraging and collecting strategy analogous to the rise of agriculture elsewhere. Reasons for increasing social and subsistence complexity vary. The warmer, drier climate of the Hypsithermal continued to restrict the amount of territory available to inhabitants, human and otherwise, well into this period. Little use of certain sites to the east of the watersheds, which were occupied frequently in the Early Archaic, and again in the Late Archaic, after a return of cooler moister conditions, may reflect climatic and other difficulties of this time frame. Any possible sites along the Columbia River to the west of the watersheds were destroyed about 725 years ago during the Late Archaic by the Bonneville or Bridge of the Gods Landslide which caused catastrophic flooding.

In the harsh Middle Archaic environment, Burtchard (1994) believes that the carrying capacity limits were reached. In other words, the landscape could not support more people. As the forager population increased, causing big game resources to decrease, humans had to develop more effective strategies to acquire food. Mierendorf (1986), on the other hand, views hunter/gatherer intensification from a different perspective. He notes that resources in the region were abundant, but not evenly distributed and often seasonal in nature. In both discussions, human populations were growing and an adequate food supply was a problem. Earlier social interactions as well as less frequent travel may have encouraged the evolution of settlement systems. At the center of these systems were semi-permanent winter villages. Social activities which tied the group together occurred in these villages during winter and at major harvesting events. Village members dispersed at certain times for organized, labor intensive collection of specific foods, such as salmon or camas, which were then stored for winter in large quantities. Deer and elk, while still important, were less predictable and no longer the major staple. At temporary and smaller seasonal camps, game animals and other secondary resources were collected, processed, and returned to the larger camp or village.

Structures are the hallmark of a semi-sedentary lifestyle. The first houses documented in the region date to between 5,500 and 5,000 years ago. All of these were semi-subterranean; the walls and roof were built over a hole dug in the ground. Two villages discovered near the north shore of the Columbia each contain over ten circular to oval housepits. Other structures from various sites include storage pits, which are extremely important in a more sedentary society, and hearths and ovens for cooking. At Wildcat Canyon, possible wells for water may date to this time (Dumond and Minor 1983). Essentially, people were learning to modify their environment to more effectively exploit it. Settlements were probably located in the most convenient spots possible to reach a broad range of stable and seasonal resources. In fact, discontinuous use of some locations may only be due to a difference in settlement patterns in response to climatic changes (Minor 1988).

Trade, already done to a small degree, became more important locally, using long established routes. Capitalizing on certain available resources which they had in great quantity, groups residing in this vicinity traded fish, roots, and berries for other foods or raw materials including shells from the coast, and stone such as obsidian, soapstone, nephrite and copper from other regions. Information was also traded. Cultural and self identities became more visible. Some of the stone and shells received in trade were used to make jewelry for personal ornamentation. Pendant, beads, and stone pipes date to this time. No rock art from these watersheds is known, but in the surrounding area, hunting scenes showing men with atlatls and dogs in pursuit of game are similar to dated samples found elsewhere in the region (Keyser 1992). One instance of cremation burials dating to the close of this period indicates a concern with an afterlife. Zoomorphic art and other sculptures date to the Middle Archaic and woodworking for personal or ceremonial objects have been found. Everyday tools and artifacts occasionally show design or decoration as well.

The diagnostic artifact during the Middle Archaic is a stemmed triangular point with a broad neck. This projectile type comes in a variety of styles and was used as a dart in association with an atlatl. Lanceolate and leaf-shaped points continue, but are not common. Other stone tools include gravers, choppers, celts, hammers, retouched flakes, atlatl weights, ground slate knives and points, grinders, mortars, and recurrent woodworking tools. Tool kits indicate that although there may have been other resource intensification, hunting technology from the Early Archaic was perceived as adequate to obtain deer and elk needed with little modification. Tools used for food processing are frequent at some sites, and more tools related to home construction appear as time progresses. Not readily preserved, but necessary to their hunting and gathering activities would have been a variety of bone tools and basketry.

With the Bridge of the Gods landslide destroying remnants of any sites along the Columbia in this period, and the apparent gap in occupation of others, how the East and Middle Fork watersheds were used during the Middle Archaic is unclear. For both animal and human populations, the fairly easy access to the Upper Valley with its riparian zones, and the slopes around it and the Middle Fork would have been a draw even in warmer periods, and certainly as the climate changed. Terrain burned by occasional forest fires during the Early Archaic and into this period may have revegetated as a pine parkland, or with different species, such as oak and meadow plants. Minor (1988) mentions that camas was more widespread during the Hypsithermal than at any other time. Gradually cooler, moister conditions would have reversed the trend, but for part of the Middle Archaic, peoples may have been more active in some of the lower watershed elevations given the more abundant resources of desirable plants, and forage attracting big game. Excessive heat and low precipitation may have restricted their movements seasonally, however. The higher slopes would have remained forested, and the resources on them, such as berries, beargrass and game, while somewhat different in elevation or range, would have been relatively the same. Depending on the plants in the meadows and prairies, more windblown dust, and runoff during rains may have been swept into the tributaries and rivers in the watersheds. This and temperature fluctuations may have occasionally affected fish, but they were probably normally plentiful, and also a well used resource.

<u>Late Archaic (2,500 to 500 years ago).</u> The key concept in the Late Archaic is intensification. About 500 to 1000 years before this period began, the climate became cooler and moister once again, with local and short term fluctuations. Plants and animals reentered areas abandoned during more severe drought conditions, and foraging human populations moved with them. Once sporadically inhabited sites near the Columbia were reinhabited and became important settlements once more. Whether descendants of the same groups or other foraging cultures reoccupied these areas, is not known.

Apparently the opportunity to expand physically also led to population growth. This along with the resulting increasing density was the primary cause of the social and technological adaptations of the time. Semi-permanent settlements became larger and greater in number. As before, each was centered

Discovery of gold in Idaho and eastern Oregon in 1862, and movement in reaction to the Civil War, led to a wave of immigration through the Gorge and, by 1865, the valleys and land adjacent to water had been homesteaded, ending the period of initial settlement (Warren 1977; Donovan et. al. 1994). Most came to farm, but miners looking for gold lived in trapper's cabins along the creeks within both watersheds, including the Robertson brothers who settled near the base of Bald Butte. A passable wagon road from Hood River into the Upper Valley was constructed in 1867. In addition, old Indian trails connected this area to The Dalles over Bald Butte, and in the other direction, to Oregon City. In 1874, photographers from the railroad and advertising agencies took pictures of the Upper Valley and its early orchards to publicize the sale of railroad grant land. Finally, in the late 1870s, the Upper Valley was surveyed which was a welcome development by most, although it meant that those already resident had to repurchase their homes. In 1881, the area east of the Cascades and south of the Columbia River was encompassed into Wasco County and that same year the Coe family offered land to new settlers in the valley. A new wave of immigrants entered with the completion of the transcontinental railroad in 1882. Some of the new families around Mt. Hood included the Coopers, Langilles, Grahams, Tomlinsons, Welches, Friedenbergs and Dimmicks. By 1884, the town contained a school, general store and post office. The first school was on Woodworth, where Grace or Carrie Graham taught 14 pupils. Just down the road, a covered bridge crossed the river. Most of the children came to school on Baldwin's ox cart because of the danger of bears and cougars (Warren 1977). The post office also served the Dee and Parkdale areas after they were settled as well. By the 1890s, the town also contained a blacksmith, a barbershop, a library, a box factory to supply the orchards and a grange. Regular dances, complete with a borrowed piano, were held for entertainment.

Starting in 1881, a small area near the confluence of the East and West Forks of Hood River was settled by John Buskirk and the extended Winans family, which became the town of Winans. Buskirk started strawberry farming along the West Fork, but he and most of the Winans brothers were in timber. In 1903 the Oregon Lumber Company purchased the mill in Hood River and much of the business. Two years later, on land adjacent to Winans on the East Fork, they constructed a mill and dam, closing the one in Hood River. For the first year, railroad cars along with cabins served as residences around the mill. As homes were constructed, the mill provided electricity. The town, Dee, was named for one of the stockholders in the company. Several Japanese immigrants, such as Morioka, Sato, and Toda, settled around town working first at the mill and clearing timber, and then planting orchards. In fact, as any of the land on Dee Flat was logged, it was usually sold to orchardists, a pattern which continued in the Upper Valley. A school was built in Dee in 1908, because the Mt. Hood school was such a distance to transport the children, and in 1924 a box factory was opened, which proved important to the economy during the Depression.

The World's Columbia Exposition in 1893 and the Lewis and Clark Exposition in 1905 brought world-wide acclaim for the area's fruit and beautiful scenery, which resulted in more people moving into the valley and the rich building summer homes. Young men with family wealth, often from the east coast, came to make their marks. In 1903, only a few places had been built in the Parkdale area, but around 1905, the "New Yorkers" started appearing in groups. McIsaac, Keating, Babson, Allen, Goodlander and Craven were among the over 60 single males and men with young families to arrive over the next decade (Hood River County Historical Society 1992). Differences between the Parkdale and Mt. Hood communities were apparent. Although they are only a few miles apart, there was a feeling that one had little in common with the other as far as background and outlook. Parkdale was not as family centered as the rest of the Upper Valley originally; in the beginning only the Hutsons and the Knights had children. Further, with family backing, residents of Parkdale often had more capital to use to start their businesses, and there was a greater emphasis on educational entertainment. In fact, starting in 1912, the Chatauquas from the east made yearly stopovers in the area, even performing occasionally at the lava beds. The community voted on the name "Parkdale" in 1906, and opened a post office.

Between 1905 and 1910, property values were at an all time high, with an unimproved acre going for $150; Hood River County was one of the wealthiest in the state. Additional acreage to the south of Parkdale was opened to settlement in 1907, although it was some 1000 feet higher in elevation than previously settled tracts. Much of this land was known as Valley Crest, although it never had a post office. In one area near Dog River, homesteaders came mostly from Oregon and Washington, including Hannum and Hanaman. Others, such as Weygandt, Rogers, London, Bowe and Kanemasu, who came from further away originally, settled elsewhere along the upper end, such as below Cooper Spur. Another community without a post office in the Upper Valley was Trout Creek, which was a stopover on the railroad line, and was settled as the land was logged.

Early on, fruit was very important to the economy of Hood River valley. Coe had planted fruit trees with his other produce, as well as herding livestock. On the west side of Hood River and around the East and West Fork confluence area, other farmers followed, growing peaches, strawberries, and other produce. While many orchards were begun later in the Upper Valley, some started well before the turn of the century. Baldwin had apples and pears growing soon after he arrived. Steamboats had provided early fruit growers with selling opportunities at the docks and in Portland. Thomas Coon who raised strawberries in the 1880s, quickly saw the shipping potential of the new railroad. Strawberries remained a major crop around Mt. Hood and Bald Butte into the 1890s, and the early part of the 20th century. They won a Blue Ribbon for Weygandt at the World's Fair in 1905. Soon, produce being shipped all over the state and country included apples, peaches, strawberries, prunes, pears, and blackberries. The mainline for Mt. Hood Railroad was completed in 1906, allowing for easier fruit transport from Dee. An auxiliary line was opened to Parkdale in 1910, and a new depot in Hood River was constructed in 1911 to handle the expanding business. Shipments to Alaska, London and the Orient were common (Winans 1949). Other industry, such as making packing boxes, developed to support the orchards. In 1893, Coon and others throughout the Hood River Valley area began a farmer's cooperative, one of the first in the area, and in the early part of this century, AGA formed to eliminate haphazard marketing and reduce overhead. In 1964, it became the Diamond Fruit Company.

In the 1890s, after the camas fields had been drained, American Indians picked strawberries in the Upper Valley. Around the turn of the century, Japanese and other immigrants replaced the Natives, working in mostly strawberry and apple orchards, until they owned their own land. In fact, Japanese, German, Finnish and French immigrants arriving around the turn of the century worked in a variety of positions, but many eventually became orchardists. During the 1920s and 30s, migrant farmers and persons displaced by the Depression picked an even greater variety of produce, some staying for other jobs as well. Within the last several decades and into the present, Hispanics, who started as migrant workers, are becoming area residents with a variety of employments. From the very beginning, women and children living in the valleys have served in all stages of harvest, including picking, sorting and packing.

In the 1890s, the Davenport brothers, led by Franklin, started constructing a flume system in the West Fork watershed which could accommodate both irrigation and logging uses. By the turn of the century, the value of the affected acreage tripled and plantings of fruit crops increased. In 1895, the East Fork Irrigating Company was formed and began to appropriate water. Much of the impetus for its inception was Charles Bone, who owned a farm on Middle Fork at the base of Gilhouley or Middle Mountain. Although some people were against irrigation, and open ditches were not extremely efficient, produce returns would have been marginal at best without the extra water. Using Chinese labor, the ten year project eventually dispersed water using a system of ditches, flumes and pipelines. Because of financial problems, the company dissolved in 1914, and reformed as the East Fork Irrigation District. Part of their immediate agenda included diverting a large amount of water from the East Fork near the town of Mt. Hood. Although the Oregon Lumber Company objected with an injunction because of water loss to the mill at Dee, eventually, in 1924, the State Supreme Court found that the irrigation district had prior rights. The power company had also sued the District and was awarded power on the lower river. The District replaced the last flume with ditchline in 1954, and the last original wood pipe, in 1961. Occasional problems over the years have included heavy siltation and water shortages. Ditchwalkers were employed on every District to keep the irrigation system free of debris and blockages, and to prevent unauthorized water diversions. This District now serves some 9,000 acres (Crowley 1995).

Middle Fork Irrigation District got its start from some of the early homesteaders as well. In the 1960s, in partnership with the Forest Service, the district dammed Clear Branch, which provides part of the District's supply, in order to form Laurance Lake. Presently, Middle Fork Irrigation operates on a year round basis, while East Fork Irrigation closes during colder months. Beginning about 1910, the Glacier Ditch Company served residents of the Valley Crest area. Water was obtained from Sand, now Polallie, Creek. As with other open ditches, it was difficult and costly to keep in repair, and inefficient. Between 1950 and 1953 Glacier Ditch merged with the Middle Fork Irrigation District. Because of the shortened growing season, maintaining these high elevation farms was difficult even with water, and a large number of properties are now occupied as summer homes or by non-orchardists. Some of the acreage was resold to the US government and is managed by the Forest Service.

Besides weather problems, insects and disease have presented challenges. Around the turn of the century, spraying crops was introduced, and the number and types of applications have increased ever since. Much of the unforested acreage within the two watersheds is now occupied by orchards. Throughout the 1900s, the economy of the fruit growers has generally flourished. After the severe winter of 1919/20, when most of the apple crop was lost, farmers started to grow more pears and experiment with heartier apple varieties. Although there have been occasional bad years, the wide variety of pears, apples, strawberries and other fruits has helped maintain profits (Hood River County Historical Society 1992; Donovan et al. 1994).

Although orchards were important early in Hood River and the valleys, much of the lower elevations in the Upper Valley remained forested into the 1890s. The timber industry in the watersheds began with the arrival of the early settlers. The first homesteaders looked at forested lands as acreage to be cleared and converted to agriculture. Because forests were seen as never ending, the first lumber mills in the area were not very conservative in their methods of production. Although dozens of families made money cutting cords of wood for the steamship lines along the Columbia, the industry was a minor concern until the completion of the railroad in the 1880s. Much of the wood was then shipped to eastern Oregon. During the late 1800s there were several logging companies operating mills or owning tracts of forest land within the two watersheds. In addition to flume transport on the west side of Hood River, between 1898 and 1903, logs were floated down both the East and West Forks to a large mill at the mouth of Hood River owned by the Lost Lake Lumber Company. This method proved costly. Both rivers were too shallow to drive logs most of the year, and during high runoff, the rapid flow made this method dangerous to loggers. Even splash dams, constructed in 1901, did not raise the East Fork to desirable levels. In 1904, the Oregon Lumber Company, which had bought most of the Lost Lake Lumber Company, decided that railroad transportation would be a better solution than further modifying the East Fork. Having reorganized their operation with a new mill and huge dam at Dee, the addition of the railroad streamlined the procedure. Timber business throughout the area got an additional boost supplying San Francisco after the 1906 earthquake.

By 1913 the area around Parkdale had been logged and the flat terrain between the East and Middle Forks was being cut. The company tracts between the Middle and West Forks south of Dee Flat were more challenging, with rougher terrain, and they were not as marketable as farm land after being logged. Occasional land exchanges between private companies and the Forest Service were negotiated as early as the 1920s. To transport logs to the mill, railroad track was laid to areas being cut each season and pulled when harvesting was completed. In addition to cutting their own lands, lumber companies were competing for contracts awarded by the Oregon National Forest, later renamed the Mt. Hood National Forest. In the 1930s, Region 6 of the National Forest contained about 8% of the total forested area in the United States, and 51% of that was under federal management (Otis et. al 1986). Stanley Walters, the District Ranger during most of this time, was a proponent of leaving some trees rather than clearcutting the entire sale area. Unfortunately railroad logging technology prevented selective cutting, although some trees were left near the peripheries of the individual units. In 1937 as an experiment to achieve selective cuts, tractor logging was tried on some Forest Service lands, but it was unsuccessful. Companies cutting on private lands made no such attempts, and clearcutting was done whenever possible. Fires associated with logging were common. Many were kept to minimal size by the combined efforts of Forest Service and lumber company employees. During the 1930s, the Civilian Conservation Corps workers often doubled as firefighters on forested lands, as well. At least by the 1920s, lookouts were strategically placed throughout the forest, such as the one on Bald Butte, and equipped with telephones to give quick alarms on any suspicious smoke.

In 1924, a new concrete dam with an improved fish ladder was begun at Dee to replace the older one. Before this, every Sunday the mill would flush out debris that was caught in the dam during the week, a practice which annoyed fishermen. Fishing at Punchbowl Falls near Dee was considered excellent by early settlers, and the area had been used prehistorically for fishing and gathering. The new dam meant the cleaning procedures need only be done a few times a year (Pope 1992). During the 1930s labor unrest concerning the disparity of wages between Portland and Hood River mill workers resulted in incidental violence and several fires being set in Oregon Lumber Company buildings and on forest tracts (Pope 1992). Base pay did increase appreciably, but not until W.W.II. Beginning in the 1920s, as the construction of roads increased and they were better maintained, timber companies used the railroad less and trucks more. By the 1940s, most log transport was on trucks. After experimentation in the 1920s and 30s, decking logs at the Dee mill became standard procedure in 1940.

Many mills and lumber companies, such as those owned by Kelly, Winans and Buskirk, Davidson, and Hardmans lasted only a short time. Some had operated as family businesses. In 1939, the Newall sawmill in Parkdale burned down. In 1943, Sterling Hanel started a mill in the East Fork watershed employing many area residents, which is still operating, although recently under different management. Starting in 1948, the Oregon Lumber Company at Dee reorganized to produce different wood products, and sold their holdings several years later. The Forest Service has played an active role in timber production within both watersheds practically since its inception. Using the tools learned in ecosystem management, they will remain an important partner in the industry. In addition, rotational harvesting of forested County lands remains a necessary source of their own budget revenues.

Between the last few decades of the 1800s and the first decade of the 1900s, a lot of open areas in both watersheds were used for pasturage. Some of the acreage in the southern part of the valley which burned in the 1880s was too high for an adequate growing season and some of it was not open to settlement. In addition, there were large meadows which provided forage for grazing animals. Several of the valley ranchers herded cattle in these areas. Others pastured sheep in the summer for major owners from The Dalles and the Willamette Valley. Sheep coming to the Mt. Hood area arrived in June (Nelson 1991). Those going to the East Fork watershed from the Willamette followed around the south side of the mountain, continuing along the eastern slopes using such locations as Elk Meadows and Blue Grass Ridge, and skirting the East Fork Valley. The sheep from The Dalles were often grazed along the slopes to the east of the East Fork. Bands followed the slopes of Mt. Hood, Surveyors Ridge and Gilhouley Mountain. Sheep pasturing in the Middle Fork drainages traveled around the west side of the volcano, through Eden Park. Slopes west of the Cloud Cap Inn were used, for instance, as were areas around Red Hill, Clear Creek and even further north. A band consisting of between 2,000 and 3,000 sheep would exhaust the forage in an area, and move an average of once a week. In general, the yearly grazing pattern began near the base of the slopes and worked upwards with snow melt (Nelson 1991). Grazing continued into the ground cover at the treeline. Cattle also grazed many of the same areas, but they did not require the amount of openness in the understory that sheep did.

The establishment of the 1893 Cascade Range Forest Reserve initiated the idea of forest values. Previously, forested and grazing lands were viewed as belonging to no one, and therefore no one's responsibility (Nelson 1991). Before, forest fires were viewed as a tool. In order to have good pasturage for sheep year after year, underburning was occasionally necessary. Sheepmen set fires to increase range land, but other settlers and American Indians set fires for various purposes as well, with little regard to their spread (Nelson 1991). Additionally, sheep trampling at higher elevations was destroying the thinner soil over bedrock layers. People, including John Muir, were concerned about the damage caused by sheep; cattle were seen as less destructive. With the creation of the reserve, areas in the Middle and East Fork watersheds, which had been widely used in grazing were closed. Rangers attempted to keep sheep out, but often did not bother with cattle, since they were just loose upon the range, and not being driven. Both sheep and cattle grazed Forest Reserve slopes until after the turn of the century.

Three individuals who were sheepherders in the around the turn of the century were Jim Slede, who grazed sheep around Bald Butte, Joe Hess and Dennis McCulley. Joe came to Mt. Hood as a ten year old in 1895. During the summers while he was a teenager, he worked for one of the major sheep growers in The Dalles, pasturing sheep in the Dog River area. Hess Road in Mt. Hood is named for the family.

Dennis, also a shepherd in these watersheds, always carried a very expensive gold pocket watch. One summer, his brother, Hugh, went searching for him and found him dead. Apparently, Dennis had mistaken a bottle of sheep dip for his normal bottle of whiskey. Hugh got Tomlinson, now the owner of the Baldwin sawmill, to make a coffin, and the two with several others went to bury the body, now dead for some time. The climb was steep, there were no roads, and the weather had been warm. They pushed Dennis onto a sheet with poles, and quickly whipped the sheet into the coffin. The ground was rocky and shallow, so they piled a cairn over the coffin. When they had finished, someone remembered the watch, but none of them wanted to get it at that point. No one admitted getting it later.

Another industry which affected the watersheds was fish canning. Canneries began on the Columbia in the 1880s after a patented fish wheel made business profitable. By the turn of the century there were over 100 canneries along the river. The heavy commercial fishing began the decimation of anadromous fish runs in the Hood and other river systems. On the East and Middle Forks of Hood River, local fishing was also changed by dams, such as the first one at Dee which had no fish ladder; resident fishermen, who originally thought there was no end to fish runs; runoff from logging and farming; irrigation draw downs; and pollution. Recent efforts by concerned government agencies, groups and individuals are aimed at trying to protect and restore certain of the anadromous and resident fish populations including salmon and bull trout.

In the first half of the 1800s, most of the Euro-Americans in the area were trappers who reportedly remained close to the Columbia River, rarely entering into the Hood River drainages, although at least one early trapper's cabin was located on the lava beds. Some of the subsequent trapping was associated with prospecting in the 1860s, and into the 1930s. Presently, the Oregon Department of Fish and Wildlife can and does issue trapping permits for either watershed. Mining played a very small part in the settling and economy of the two watersheds. Some prospectors thought that gold might be found here as in eastern Oregon, California or Alaska. Surveyors Ridge was more often investigated, but slopes above Tony Creek, and the sides of Mt. Hood were also occasionally tested from the 1850s at least into the 1930s. The only active mines are several small quarries within and just outside the boundaries of the watersheds which are intermittent sources of unprocessed rock of varying dimensions.

People's goals changed and modified with time and opportunity. Avery Friedenberg, who came to look for gold along Surveyors Ridge, stayed to homestead. David Cooper and some of his neighbors, who were homesteaders, thought they could capitalize on tourism brought by the railroad, by constructing a mountain resort. One summer in the 1880s, Cooper, Henry Coe and Oscar Stranahan decided that after the already raging forest fires had cleared the way, they would make an assent up the northeast side of Mt. Hood. In August, when the men arrived at the present Toll Bridge area, however, they found that the fires had died before reaching the slopes. In the past, several Indian trails on the slopes were used for huckleberry and pine nut gathering, but a wind storm years before had effectively blocked the trails, and they were now overgrown. After a couple of days of trying to break through the brush, Coe and Stranahan wanted to stop, and stayed in camp, but Cooper decided to try once more. Shortly after he returned, they all had to run from a forest fire which had started on the lower slopes and was advancing quickly towards them. They called the campsite Roaring Camp for that reason. Some accounts of the story mention Cooper as the cause of the fire. A few weeks later, the three returned on horses and blazed a trail to Eliot Glacier.

The men organized the Mt. Hood Trail and Wagon Road Company; they applied for a charter to build a toll road and operate a stageline, and established a base at Roaring Camp. The 12+ mile rustic road was built along paths of least resistance, and without bridges. Snows the first winter retreated in June, at which time a tent camp was erected in Tilly Jane Meadows, named for Tilly Jane Ladd, an early guest. Marian Cooper acted as hostess that summer. The season opened in August, but not many people registered that year. There was a $1.00 camping fee, and a $10.00 round trip stage fee. The road was so treacherous and steep that many riders opted to walk the last stretch. In 1888, Cooper's company sold their interest to William Ladd, a Portland banker, and several partners. With new capital, improvements were made on the road using Chinese labor. Construction on Cloud Cap Inn began in 1889, and by August, it was in operation. Although the inn offered lavish accommodations and views of three mountains besides Mt. Hood, there were not many guests. Heavy snows the next year made for a short and again unprofitable season. In 1891, under a more realistic budget, and with a better understanding of its clientele, the inn was opened with Sarah Langille as hostess, and her two sons as mountain guides. Sarah Langille's managerial abilities and friendliness were the key to having satisfied guests and a profitable business. While some of the people who visited the inn were tourists or climbers, more were scientists, including botanists and geologists, civil engineers and representatives of US agencies. President Cleveland's creation of the Cascade Range Forest Reserve in 1893 spurred more interest and visitors to the area. Phones were added in 1896. In 1907, a Cadillac was the first car to drove to the inn; others had tried in previous years but failed. In 1906, Mrs. Langille retired and the inn occupancy and management started to decline.

Transportation within the watersheds has been issue in the economic growth and limitations of the valley since the first Euro-Americans arrived. Sitting in a cul-du-sac, initial roads bypassed the Upper Valley, until the 1860s when the area was finally settled. In 1882, when the railroad came to Hood River, farmers quickly understood its potential in shipping produce to other places. Cooper and others saw the additional possibilities of catering to tourists using the railroad to visit from other places. Their toll road acknowledged the importance of access in supporting recreational tourism as well as every day travel. Still, most residents were comfortable being partially isolated, as long as they could get their produce to market. Shortly after the turn of the century, though, new residents of Parkdale such as McIsaac, and Keating, lobbied Wasco County for road building funds. When the County refused, Parkdale and other communities formed Hood River County in 1908. Another avenue for better connections to the outside world proved to be the Oregon Lumber Company's plans to continue their railroad generally southward from Dee to facilitate timber movement to the mill. Orchardists across the Middle Fork and Parkdale areas, recognizing the railroad's significance to their businesses, convinced the company to extend the railroad from Dee into the East Fork watershed, rather than follow the easier, less expensive western route (Pope 1992; Crowley 1995).

Early railroad construction crews from Hood River to Dee contained Japanese field hands from La Grande, who along with local help were inexperienced, so first miles came slowly. Later, Greeks replaced the first crews who quit for better paying jobs. The leg to Parkdale was completed in May, 1910. That year McIsaac opened a grocery store to accommodate the increase in traffic. Like the earlier introduction of the horse, the railroad created new opportunities for moving goods and people from one place to another. The train was used for hauling timber, shipping fruit and carrying passengers. The trip from Parkdale to Hood River could actually be made in about an hour, but with scheduled stops it took closer to three. Passengers criticized the rates and service. As a placating measure, the company offered shippers reduced rates in 1912, although townspeople still complained to the Railroad Commission. Occasionally, railroad started fires, and flooding which damaged rail lines caused problems. In 1916, a 20 passenger jitney, which was an open-sided bus fitted with railroad adapted, steel flanged wheels, began four round trips daily, connecting Parkdale, Dee, Odell, and Hood River. Curtains and heaters were installed for winter use. Although there were a series of cars through the years, the name "Galloping Goose" was applied to all. Over time railroad use decreased. During the 1920s, with the depletion of forested lands, and the construction of the Mt. Hood Loop Road which allowed truck transport, timber from the valleys accounted for fewer railroad cars used than did produce. Passengers became fewer on the jitneys as affordability of automobiles increased and when the jitney burned in 1935, it was not replaced. By the 1950s, as roads improved, trucks carried over half of the lumber and much of the fruit shipments. By 1979, there were only three trains a week. Finally, in the mid-1980s, the railroad was converted into a tourist attraction, which is its purpose today.

Tourism and outdoor recreation everywhere responded to new opportunities created by the popularity of the automobile. In the early 1910s, the Columbia River Highway from Troutdale to The Dalles was designed and built to drive in leisure amid scenic views of the landscape and river. Some criticized the project as spending money on a diversion that only the wealthy could afford, but the road moved produce and people in general as well. Using that highway as a springboard, businesses in Hood River and the valley wanted to construct a Loop Highway around the east side of Mt. Hood. One of the most enthusiastic proponents was Homer Rogers, who lived on the northeast slopes of the mountain, three miles south of Parkdale. Rogers, who arrived from New York in 1910, had tried farming only to realize the land was too high for very profitable growing seasons. In 1913, he converted his large home into the Mt. Hood Lodge, capable of hosting about a dozen guests. Along with others, Rogers saw the possibilities of making his enterprise more lucrative by the influx of additional tourists. In 1915, he led two parties of federal and state officials, and surveyors around the mountain. In 1919, a route past the lodge was selected for construction, and Rogers acquired the Cloud Cap Inn as well. J. O. Hannum, a county commissioner, built the Homestead Inn, another hotel, near the Mt. Hood Lodge about 1922 to take advantage of the proposed route. When the Mt. Hood Loop Highway was completed in the mid-1920s, it offered points of interest throughout the day long drive from Portland, and was extremely popular. Unfortunately, people who did stop at the Mt. Hood Lodge, usually picnicked on the lawn, enjoyed the views and continued on their way without spending any money. The lodge was closed in 1926, and burned in 1933. Because it was better located, the Homestead Inn sometimes had more registered guests. In addition, Hannum was also active in promoting local skiing and skiing competitions. After he died suddenly in 1927, though, the business did not last, and the inn was razed in the 1930s (Grauer 1975).

One of the scenic views offered by the Loop Highway was the Sahalie Falls Bridge, an open spandrel, rib-type structure crossing the East Fork just south of the Sahalie Falls. A small turnout with a stone masonry drinking fountain gave those stopping a better view. Originally spelled Sahale on older maps, the word is Chinookan meaning high or heavenly. The bridge is one of a thematic group of bridges nominated to the National Register of Historic Places in 1985 and determined eligible (Smith et. al. 1989). When the highway was realigned in the 1960s, the bridge was bypassed, and is now part of a side road.

When it was new, the Mt. Hood Loop Highway made short-term use of open lands more attractive, which brought an increasing involvement in recreation from the Forest Service. Moving from an entirely timber and range oriented organization, their philosophy during the 1920s and 30s concerned their expanding role in facilitating public access to the land. For instance, campgrounds, including Robinhood and Sherwood, were constructed as stopovers along the road. A playground for children at Sherwood was popular with both tourists and local residents. Recreation opportunities, such as hiking trails were constructed and other activities, such as gathering huckleberries in late summer, were encouraged. Some of the larger or more popular campgrounds had Guard Stations, occupied in the summer by rangers and usually equipped with telephones to other stations, lookouts and the main office.

The Forest Service managed the area surrounding The Cloud Cap Inn and, after Rogers sold them the building around 1925, it was run by concessionaires. In an attempt to attract people to that area, the road was reconstructed in 1926. Using new ideas, the design realigned the route in a series of switchbacks, rather than straight up the mountain. This greatly improved the assent, which brought afternoon visitors, but not paying guests. That same year, Tilly Jane Guard Station with both a lower summer and second story winter entrance was built, and a campground established. Francis E. Williamson, Jr. of the Forest Service was responsible for planning and overseeing much of this work.

The Civilian Conservation Corps (CCC), which existed from 1933 to 1942, fit in well with the changed Forest Service philosophy. Many of the projects implemented, strengthened the service's growing trend toward recreational development. The Mt. Hood National Forest organized ten CCC camps over the course of the program, which, along with the Willamette National Forest was the highest number of camps located on any forest. The camps most involved with these two watersheds were F-11 out of Zigzag and F-7 at Wyeth which had the longest occupations on the forest, and F-8 at Dee which had one of the shortest.

One of the first projects the F-11 camp undertook was constructing the Timberline Trail. Planned and approved earlier, it was ready to implement when the Corps arrived. The trail was designed for hiking and horseback riding, and encircled the mountain at timberline. Also called Round-the-Mountain Trail, it was to intersect other trails, making it an important link in the broadening system. Stone shelters every four miles were fashioned into the plan, in a design style similar to the Appalachian Trail. The stone buildings would provide shelter, and not be scavenged for wood. Not all of the shelters were built to the plans specifications; a few are still standing. The trail's position at timberline in conjunction with the planned shelters, made it unique to the region. Williamson, Jr., who conceived, planned, and designed the trail, oversaw its construction from 1933 until its finish in 1935. Not only did the trail reflect the new direction of the Forest Service, it was an element in the friendly rivalry at the time between the Forest Service and the Park Service. Eligible for nomination to the National Register of Historic Places, the trail remains important for its scenic opportunities, rich botanical experience, and wide variety of geological formations. Associated with and to the southeast of the trail is an additional shelter of log and pole frame construction in Elk Meadows. This site is popular with both hikers and horseback campers.

A spike camp from F-7 was located within the present Historic District to the south of the Cloud Cap Inn in 1934. Besides work on various trails, the crews improved and may have enlarged the Tilly Jane Campground, and maintained the Tilly Jane Guard Station and garage. They also constructed the warming hut located on the south side of Tilly Jane Creek next to the Cooper Spur ski trail. Today only structural outlines and foundations of the camp and its access road are visible.

Although active for just a short time, F-8, the Dee Camp, located between Dee and Parkdale, was responsible for building the administration complex and ranger's house in Parkdale. Some of the planned structures were not built, and others no longer exist. With the exception of the ranger's house, the remaining buildings are arranged in a U shape around a driveway and parking area. The ranger's residence is a wood frame building with several added touches that give it character. There is an associated garage. The ranger station office is a rectangular, symmetrical, wood frame building and porch, both with gable roofs. Other buildings included another residence, a warehouse and blacksmith shop, a machine shop with storage space, and a gas house. While the District Office is now located in Mt. Hood, the complex still functions as a work center. Before this project, rangers on this district used their own homes as offices.

One more project completed by the CCC was another warming shelter in the Cooper Spur area, next to a trail used for hiking and skiing. A good example of Cascadian architecture, it is rectangular using a rustic, symmetrical design. This massive masonry and peeled log structure has a large, heavy stone fireplace occupying the back wall, one open side, and a partially open front. As with the Timberline Trail, preliminary work has been done to nominate it to the National Register of Historic Places. Since the F-7 crews worked on adapting the old wagon road from Cloud Cap Inn into a winter ski trail, it seems probable that this was their work also. Crews from most camps also worked on improvements to campgrounds, tried to control different pests and diseases found in trees, and fought fires. Six of the ten camps on the Mt. Hood, including F-7 were sent to help with the dramatic Tillamook burn in 1933.

Climbing Mt. Hood has been popular since the 1800s with tourists and residents alike. The Cloud Cap Inn sponsored hikes to the top, with Will and Doug Langille as guides in the beginning. Later, two Swiss climbers worked at the inn. Mark Weygandt started working there in the early 1900s and the Swiss men taught him the art of climbing and cobbling shoes. When the Swiss left for another job, Weygandt stayed. Over the years he made between 500-600 climbs, taking many people to the top. Early climbers covered their faces with Vaseline and charcoal and wore colored glasses to protect themselves from the sun's glare. In the summer of 1915, a railroad sponsored outing to climb Mt. Hood attracted over 90 persons. In 1921, the American Legion began their yearly July 4th climbs to the top. Some years, the Langille brothers and Weygandt, led the group. A very popular event, sometimes thousands of people camped and partied overnight, and then over 100 would climb to the top the next day. The climbs continued until 1953, when monetary problems caused them to be discontinued.

Several mountaineering clubs have used the north side of Mt. Hood as their base of operations for years. First, the Snowshoe Club was begun in the early 1900s by a group of Portlanders who enjoyed yearly winter outings at the Cloud Cap Inn. In 1910, Weygandt convinced them to construct their own building near the inn. The club remains active, and continues to maintain their building. Two other organizations are climber oriented search and rescue groups. The Crag Rats got their start in 1926, after Mace Baldwin, Percy Bucklin and Jesse Puddy among others successfully rescued of a small boy who had gotten separated from his parents on a hike. Part of the initiation requirements still include having climbed two major peaks in the Pacific Northwest. In 1952, the Crag Rats accepted responsibility for management of the Cloud Cap Inn which had been closed since 1946. They added interior plumbing and a drinking fountain, and were instrumental in saving the structure from destruction by natural and human forces. For the past 40 years they have done an excellent job maintaining the building to National Register standards. The Alpinees, which formed in 1947, are the other active search and rescue club. Formed after W.W.II, by Jack Baldwin, Myron Weygandt and others, they were a younger generation of climbers with interests similar to the Crag Rats, and in fact, some of them belonged to that group, as well. Many had been active in the war, and were aware of the advances, new techniques and scientific information concerning mountain climbing and search and rescue that had developed (Grauer 1975). Both groups still have strong memberships, and maintain their purposes as both fun climbing clubs, and serious search and rescue organizations.

Sporadic downhill skiing lessons were offered around 1913 at the Mt. Hood Lodge, and the Homestead Inn began brushing an area for the sport in the mid 1920s. In the late 1940s, the Weygandt brothers, Baldwin and others resurrected the Cooper Spur Junction for skiing. Although the resort has gone through a number of changes and managements, the permit with the Forest Service remains active. Located on the lower slopes of the mountain, the area is limited in its length of season and the amount of challenge it can provide, but is ideal for family and beginner skiing.

With recreation being such an important basis for the Mt. Loop corridor, and many clubs and organizations using the mountain, some of the area's business people, along with more experienced downhill skiers convinced the Forest Service to consider opening a ski resort on the Hood River County side of the mountain. Starting in the late 1950s, those interested began to develop the idea. Eventually, they organized themselves into Hood River Meadows Ski, Inc. After spending countless hours searching for an area which met certain requirements, and structuring the basic design, they were ready. Although Hood River Meadows Ski, Inc. originally approached Franklin Drake, an interested contractor, about joining their group, he decided to develop another proposal using his own ideas, instead. Called Mt. Hood Meadows, Oregon, Ltd., it was headed by Drake with the backing of a number of other businessmen. The Forest Service accepted bids from both concerns in March 1966, and awarded the contract to the latter group. Although they were in favor of having a large ski resort, many area residents were dissatisfied that the contract was not awarded to the Hood River group (Hood River News 1966; Punk 1966).

Construction on the road to the facility had begun even before the bids were registered. Grechen Fraser, the first American to win a gold medal in the Winter Olympics, was the official guest at the opening ceremonies at Mt. Hood Meadows in January 1967. Available for use were two lifts, a T-bar, the lodge and a 700 car parking lot. According to Drake, future plans included motels, a swimming pool, a stable and private homes on 400 acres near Highway 35 in the East Fork watershed. Access to the ski resort was possible only by going through Hood River until the 1968/69 season, when the state agreed to keep the southern part of the Mt. Hood Loop open for the first time, cutting about one half hour off travel time from Portland. Open over weekends, lift tickets at Meadows were $6 a day. In 1978, a Master Plan written by the Forest Service helped give direction to the additional developments at Mt. Hood Meadows. Since then, the number of lifts and types of skiing opportunities have increased, as has the cost of a lift ticket. At present, the Forest Service is in the process of developing a new Master Plan. To further that, the decision notice on the supplemental environmental impact statement will be finalized in 1996, this year. The Oregon Department of Transportation is also interested in future plans, since congestion and dangerous winter conditions of Highways 35 and 26 are factors in numerous accidents each season.

Recent natural events of historic interest have included the ice storm of 1970, which caused a lot of blow down, and heavy rains, which have caused floods and landslides. The Christmas Flood of 1964 was a classic rain-on-snow event considered to have had such a cataclysmic force that a similar episode would occur only once every 500 years. The discharge of water caused heavy destruction along the floodplains of the Hood River system. Additional flood events in the 1960s and 70s of lesser magnitude were responsible for damage every few years to the newly aligned Highway 35, since long stretches of the road were within the floodplain of the East Fork. The Polallie Landslide in 1980 started on Christmas evening at the head of Polallie Creek Canyon. The debris flow carried trees, boulders and unconsolidated volcanic deposits at a rate of 40 feet per second down the channel. At the confluence with the East Fork, the huge debris volume of approximately 100,000 cubic yards created a temporary dam which is estimated to have lasted for twelve minutes. When the 85 acre lake of water and debris burst through, it swept down the East Fork causing miles of damage. One camper was killed and an Oregon Department of Transportation employee was trapped in his truck until rescuers could reach him. Five miles of the highway were damaged or completely destroyed, three bridges were impacted and the main supply pipeline of the Crystal Springs Water District received $1 million worth of damage (Gallino and Pierson 1984). After this episode of destruction, some parts of Highway 35 were realigned away from the river. Floods in February, 1996 were equivalent to a 25 year flood, and have caused damage to roads, hiking trails and recreational areas.

The cultural history of an area is a significant reminder of what was important in the recent and ancient past to the people who lived here: how they treated each other, used the land and made their livings. While parts of that legacy disappear, some of the essentials remain to foster a respectful pride, and joyful satisfaction in the land, and these people. Hopefully, the examples they provided will give insight to this and future generations who try to live healthy lives and solve the problems with which they are presented.

## *REFERENCES*


Aikens, C. Melvin. 1993. Archaeology of Oregon. U.S. Department of the Interior. Bureau of Land Management, Portland, OR.

Allen, John E. 1984. The magnificent gateway. Timber Press, Fair Grove, OR.

Allen, John E. and M. Burns. 1986. Cataclysms on the Columbia. Timber Press, Portland, OR.

Beckham, Stephen D. 1984. "This Place is Romantic and Wild:" An Historical Overview of the Cascades Area, Fort Cascades, and the Cascades Townsite, Washington Territory. Heritage Resource Associates #27.

Beckham, Stephen D., Rick Minor, Kathrine A. Toepel, and Jo Reese. 1988. Prehistory and history of the Columbia River Gorge National Scenic Area, Oregon and Washington. USDA Forest Service Contract No. 53-04H1-84730. Heritage Research Associates, Inc., Bend, OR.

Blukis Onat, Astrida. 1989. Cultural Control of Resources in the Pacific Northwest of North America. Circum-Pacific History Conference. Seattle, WA.

Boyd, Robert T. 1990. Demographic history, 1774-1874. P. 135-148 in Handbook of North American Indians. Wayne Suttles, Ed. Smithsonian Institution, Washington, DC.

Bryant, Richard L., Leslie Conton, Robert E. Hurlbett, and John R. Nelson. 1978. Overview of the Mt. Hood National Forest, Oregon. Report of Pro-Lysts, Inc. to the Mt. Hood National Forest.

Burtchard, Greg C. 1994. Posy archaeological project, upland use of the central Cascades: Mt. Hood National Forest, Oregon. Portland State University, Department of Archaeology and Anthropology, Portland, OR.

Burtchard, Greg C. and Robert Keeler. 1994. Mt. Hood cultural resource reevaluation project; Mt. Hood National Forest, Oregon. Portland State University, Department of Archaeology and Anthropology, Portland, OR.

Butler, Virginia L. 1993. Natural Versus Cultural Salmonid Remains: Origin of The Dalles Roadcut Bones, Columbia River, Oregon, USA. Journal of Archaeological Science 20:1-24.

Carr, Bill 1983. A history of Bridal Veil Lumbering Company. USDA Forest Service, Mt. Hood National Forest, Gresham, OR.

Carlson, Roy A. 1983. The Far West. In Early Man In the New World, edited by Richard Shutler, Jr., pp. 73-96. Sage Publications, Beverly Hills.

Coon, T.R. (comp.). ca 1930. History of the early pioneer families of Hood River, Oregon. Hood River Pioneer Association, Hood River, OR.

Crandell, Dwight R. 1980. Recent eruptive history of Mount Hood, Oregon and potential hazards from future eruptions. Geological Survey Bulletin 1492. US Geological Survey, Washington, DC.

Cressman, Luther S., David L. Cole, Wilbur A. Davis, Thomas M. Newman, and Daniel J. Sheans. 1960. Cultural sequences at The Dalles, Oregon: a contribution to Pacific Northwest prehistory. Transactions of the American Philosophical Society 50(10).

Donovan, Sally and Associates. 1994. City of Hood River historic context statement. Prepared for the City of Hood River, Hood River, OR.

Dumond, Don E. and Rick Minor. 1983. Archaeology in the John Day Reservoir: the Wildcat Canyon site, 35-GM-9. University of Oregon Anthropological Papers 30.

Fladmark, Knut R. 1983. Times and places: environmental correlates of mid-to-late Wisconsin human population expansion in North America. P. 13-42 in Early man in the new world. R. Shutler, ed. Sage Publications, Beverly Hills, CA.

Franklin, Jerry F. and C.T. Dryness. 1973. Natural vegetation of Oregon and Washington. Oregon State University Press, Corvallis, OR. 452 p.

French, Katherine, Yvonne Hajda, Robert Moore and David Ellis. 1995. An Ethnographic Study of the Mt. Hood National Forest, Oregon. Archaeological Investigations Northwest, Inc. Report #86.

Gallino, Gary L. and Thomas C. Pierson. 1984. The 1980 Polallie Creek Debris Flow and Subsequent Dam-Break Flood, East Fork Hood River Basin, Oregon. U.S. Geological Survey, Open File Report 84-578. Portland, OR.

Garrett-Crowley, Susan editor, 1995. Legacy: A Centennial Celebration of Hood River and the Columbia Gorge. Hood River News.

Grauer, Jack 1975. Mt. Hood: A Complete History. privately published.

Green, George R. 1981. Soil survey of Hood River County, OR. USDA Soil Conservation Service, in cooperation with the Oregon Agricultural Experiment Station.

Harris, Stephen L. 1980. Fire & Ice. The Cascade Volcanoes. Pacific Search Press, Seattle, WA.

Hood River County Historical Society. 1982. History of Hood River County, Oregon: 1852-1982. Taylor Publishing Co., Dallas, TX. 558 p.

Hood River County Historical Society. 1987. History of Hood River County, Vol. II: 1852-1987. Taylor Publishing Co., Dallas, TX. 523 p.

Hood River Newspaper. issues from March to December, 1966.

Illustrated History of Central Oregon. 1905. Western Historical Publishing Co. Spokane, WA.

Jenkins Dennis L. and Thomas J. Connolly. 1994. Archaeological Excavations at the Paquet Gulch Bridge Site: A Pithouse Village in the Deschutes River Basin, Southwestern Columbia Plateau, Oregon. University of Oregon Anthropological Papers #49.

Keyser, James D. 1992. Indian rock art of the Columbia Plateau. University of Washington Press, Seattle, WA.

Mierendorf, Robert R. 1986. People of the North Cascades. USDI National Park Service, Pacific Northwest Region, Seattle, WA.

Minor, Rick 1988. Environmental setting. P. 5-21 in Prehistory and history of the Columbia River Gorge National Scenic Area, Oregon and Washington. USDA Forest Service Contract No. 53-04H1-84730. Heritage Research Associates, Inc., Bend, OR.

Murdock, George Peter. 1938. Notes on the Tenino, Molala, and Paiute of Oregon. American Anthropologist. n.s., 40:395-402.

Murdock, George Peter. 1980 The Tenino Indians. Ethnology 19:129-149.

Nelson, David C. 1991. Sheep Grazing History of the Mt. Hood National Wilderness. USDA Forest Service. Gresham, OR.

Otis, Alison T., William D. Honey, Thomas C. Hogg, and Kimberly K. Lakin. 1986. The Forest Service and The Civilian Conservation Corps: 1933-42. USDA Forest Service FS-395. Corvallis, OR.

Pope, Clement L. 1992. Switchback to the timber: a history of the Mount Hood Railroad and the Oregon Lumber Company. Old Forester Publishing Co., Parkdale, OR. 119 p.

Punk Newspaper. December 29, 1966

Ray, Verne F. 1939. Cultural relations in the plateau of northwestern America. Los Angeles, CA.

Reese, Jo. 1988. Culture history. P. 40-73 in Prehistory and history of the Columbia River Gorge National Scenic Area, Oregon and Washington. USDA Forest Service Contract No. 53-04H1-84730. Heritage Research Associates, Inc., Bend, OR.

Smith, Dwight A. 1985. Historic Bridges of Oregon Thematic Group. Oregon State Highway Division. Oregon Department of Transportation, Salem, OR.

Thomas, Edward Harper. 1970. Chinook: A History and Dictionary. Binfords and Mort. Portland, OR.

Toepel, Kathrine A. 1988. Sahaptins. in Prehistory and history of the Columbia River Gorge National Scenic Area, Oregon and Washington. USDA Forest Service Contract No. 53-04H1-84730. Heritage Research Associates, Inc., Bend, OR.

USDA Forest Service, Mt. Hood National Forest. 1991. Compiling and Researching Local History: Interviews of local residents (draft). Parkdale, Oregon, Unpublished Literature on file at Hood River ranger Station.

Warren, Esther. 1977. Columbia Gorge Story. Itemizer-Observer Press. Dallas OR.

Whitney, Stephen 1989. Naturalist's guide to the Pacific Northwest. Sierra Club, San Francisco, CA.

Winans, Eph. 1991. Hood River...As I have known it. Hood River Historical Society, Hood River, Oregon.

# *SOCIAL AND ECONOMIC ASSESSMENT*

## *EAST & MIDDLE FORKS OF THE HOOD RIVER WATERSHED ANALYSIS*

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## *Introduction*

This report is prepared as a component of watershed analysis, with the basic assumption that the human population is an integral component of the watershed. There are tangible and intangible connections between people and the land. People are linked to these watersheds in spiritual, emotional and sensory ways - the spiritual lift of the scenery, the family bonding of a woodcutting trip, the tradition of mushroom collection in Asian families, the history of making a living from the land that runs through many families... The economic ties are so intertwined that it may no longer be possible to quantify the monetary benefits of the watersheds. Recreation, commodities, water for agriculture, water for domestic use, transportation corridors, valuable fisheries, wildlife habitat, hydroelectric power all contribute to the economics of life for people in and below these watersheds.

## *Purpose*

It is the purpose of this report to examine some of the social and economic links between people and these watersheds, and to make some inferences about effects of future management actions on those links.

## *Scope*

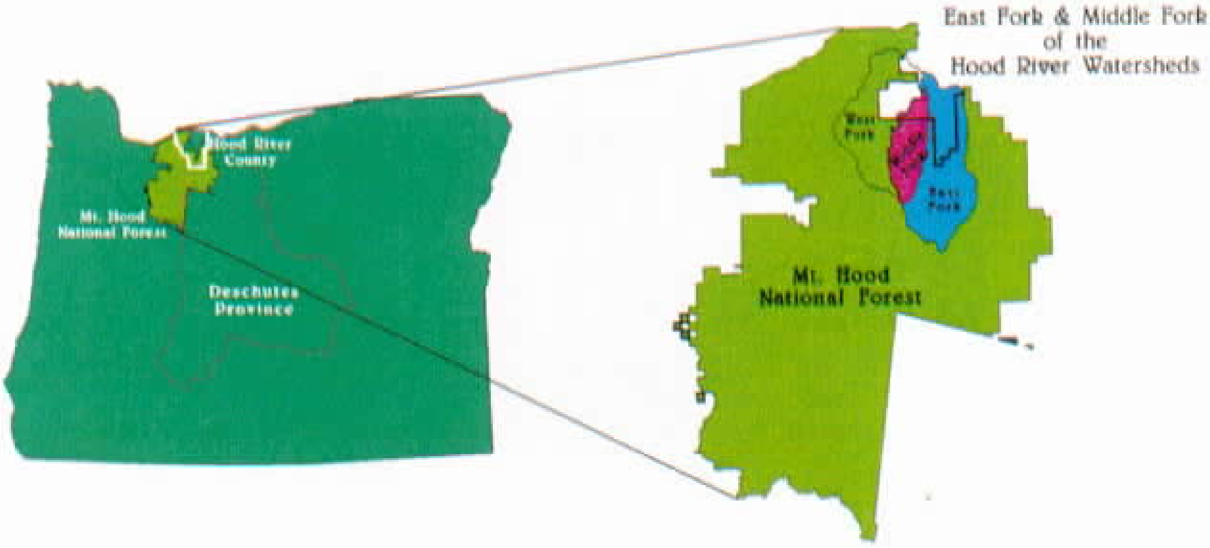
While people from around the globe come to Mt. Hood, and this region of Oregon, and carry home with them values and experiences, the scope of this report will take in less than the world, but a little more than the two small communities within the watersheds themselves. In most cases this report will focus on the social and economic ties between the Hood River Valley and the watersheds, except in cases where it is more or also appropriate to look at a regional or more local level.

## *Methods*

A variety of methods were used in compiling this report including: research of historic and current literature, oral interviews with local officials and residents, and consultation with sociologists and an economist.

## *Geographic area*

Both watersheds lie completely within Hood River County, which is the second smallest county in the state of Oregon, comprising 338,560 acres or 529 square miles. Seventy-six per cent of the county (250,039 acres) is in public ownership of some form. The majority of these lands are managed by the Mt. Hood National Forest. East Fork and Middle Fork Hood River Watersheds combined make up 29.8% (100,873 acres) of the landbase of Hood River County.



Only twenty-four percent (88,320 acres or 138 square miles) of the county landbase is in private ownership for a population of roughly 20,000 people. This gives a density of 122 people per square mile in the private landbase. This is a much higher density than is traditionally found in rural areas. This density of population is important in the political complexion of the county - making people and issues more concentrated.

Sixty seven percent of the population lives outside the urban growth boundary in single-family dwellings. Presently, the zoning is in place to accommodate another 10,000 people in the valley. Hood River County is currently doing an amendment and update to the comprehensive land use plan that will extend for the next twenty years.

The county is surrounded on all sides by federal land and federal authority. Fifty square miles of the county landbase is in the CRGNSA. The last available lands in the county that are not yet developed are the forested lands. The county is currently being challenged in the state court for denying a permit to build on forested land. They anticipate more of these challenges and more requests to put homes on land zoned for forest.

Three population centers exist in the valley. The communities of Mt. Hood and Parkdale are in the upper valley, Odell in the middle valley, and the city of Hood River in the lower valley. Of these, only Hood River is incorporated. The communities of Mt. Hood and Parkdale are both within the EFHR watershed. The combined population of the Mt. Hood/Parkdale area is roughly 2,500 people. The Hood River Valley is geographically isolated, separated from other communities by mountains, ridges and the Columbia River. The City of Cascade Locks, located in western Hood River County, is a population center but is so far away from these watersheds, that it is not examined in depth in this report.

There is a sense of cohesion and community, both geographically and socially, among many upper valley residents, and Hood River Valley residents in general. Mt. Hood /Parkdale communities though incorporated, are organized, and were recently awarded a grant from the USDA Rural Economic Development program to do a long range plan for economic diversification. State Highway 35, which bisects the county, is a major transportation corridor and forms one third of the Mt. Hood Loop, a popular scenic driving route for tourists.

## *Social Assessment*

### *Historical Overview*

Immediately prior to Euro-American settlement of the valley, the Hood River area was home to the Dog River band of Wasco Indians, as well as a Chinookan speaking tribe known as the Cascade Indians. They lived from the land in a seasonal migration through the valley and into the surrounding mountains harvesting root foods, berries and game. The Indian population, already decimated from introduced disease, faced inevitable change as settlers arrived in the Gorge. The town of Hood River spread along the riverfront, and the settlement of the Upper Hood River Valley began to fill the traditional summer camping sites. Many Native people dispersed across the Columbia River or onto reservations. By 1910 the census listed only fifteen Indians in Hood River County.(Garrett Crowley, 1995)

Today, most of the descendants of the Wasco and Cascade people are enrolled on either the Yakama and Warm Springs reservations (Garrett Crowley, 1995). The Warm Springs enrollees have rights of access, hunting and gathering on the Mt. Hood National Forest, and continue those activities today.

### *Upper Valley Settlement*

The lower parts of the valley were settled in the 1860's. Early economies focused on cutting cordwood, fishing and farming. The first commercial orchards were established there in 1870. The upper valley was first settled in 1880 by three families, who made farms and homes in the Mt. Hood area. The community of Mt. Hood was a farming community. Parkdale grew with the arrival of the railroad. Many prosperous easterners settled in the upper valley. Japanese-American families have been in the upper valley since about 1908.

Railroads were central to the settlement of the area. The Hood River Valley was used in national advertising by Union Pacific Railroad; scenic excursions to this area were marketed. People came from the east in waves, drawn by the scenery. One particularly big wave came after the Lewis & Clark exposition in Portland in 1908. During that exposition, thousands of people came on scenic rail excursions to the valley and many bought land. These links between tourism and development continue today.

Several hotels in the Mt. Hood area such as the Cooper's Tent Hotel, Homestead Inn, Mt. Hood Lodge and Cloud Cap Inn drew tourists to the upper valley and contributed to the early economy and social fabric of the Hood River Valley. Cloud Cap Inn was visited by scientists from all over the country who came to study the alpine environment in relative luxury. (Krussow 1996).

## *Early characterizations*

Scenery and natural beauty were prime reasons that people settled here. Agriculture has been prized since the early days. The settled land was highly valued because of the amount of work it took to clear and work it. Geographic isolation lends itself to independent natures, and "obstinacy" and "pride" are words used in early descriptions of valley residents (Winans).

## *Current Population*

The current population of Hood River County (1995) is 18,700 with a seasonal fluctuation of about 2,000 agricultural workers. Since 1980, the population of the county has grown slowly, but steadily. Most new residents have settled in the unincorporated areas of the county. While the population of the City of Hood River has grown by only 600 in the 15 year period 1980-1995, the unincorporated rural areas grew by 2,000 people in the same period.

This growth in population is part of a larger, national trend of growth in the west. The United States population grew by over 69 million people between 1960 and 1990, and much of this growth occurred in the South Census Region and the West Census Region. The West had the greatest rate of change from one decennial census to the next of all the regions in the US in each of the last three decades.

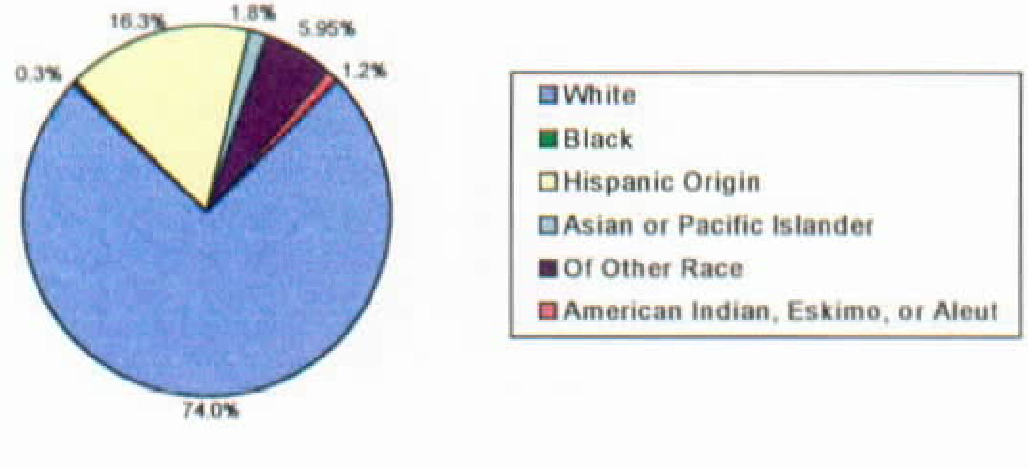
**Table 1. Demographic Data for Hood River County, Oregon from the Center for Population Research & Census, Portland State University.**

| | 1995 | 1994 | 1993 | 1992 | 1991 | 1986 | 1980 |
|---|---|---|---|---|---|---|---|
| **Total Population** | 18,700 | 18,400 | 17,900 | 17,600 | 17,100 | 16,200 | 15,835 |
| **Cascade Locks** | 1,045 | 1,035 | 1,025 | 970 | 975 | 825 | 838 |
| **Hood River** | 4,940 | 4,875 | 4,725 | 4,725 | 4,715 | 4,520 | 4,329 |
| **Unincorporated** | 12,715 | 12,490 | 12,150 | 11,905 | 11,410 | 10,855 | 10,668 |

## *Age and Gender In Hood River County*

The age distribution of the population is directly linked to the size and composition of the current and future labor force and may also be important to the consideration of a variety of other economic and social considerations such as demand for recreation, provision of social services, and economic development opportunities. The 1990 census shows an almost equal distribution of males and females in the county, with 27.3% of the population under age 18. Fourteen percent of the population is sixty five or older. Seventy four per cent of the population is white, 16.3% is of Hispanic origin; .3% is black; 1.2% is American Indian, Eskimo or Aleut; and 1.8% of the population is Asian or Pacific Islander. 5.95% of the population of the county is of other race.

**Table 2. Ethnic distribution in Hood River County, from USDC, Bureau of Census, 1990. Percentages are percent of total population.**



71.4% of county residents age 25 and older are high school graduates. Of these, 18% have attended at least four years of college. This rate of education is somewhat lower than other counties, perhaps reflecting the lower educational attainment levels of some seasonal agricultural workers.

## *Recent National Population Trends: 1990 to 1992*

Recent trends show continued strong population growth in the West with some of the fastest growing states being in the Northwest. Between the census in 1990 (April 1) and the intercensal estimate for 1992 (July 1) Nevada led the nation with an 11.1 percent increase in population, and Idaho (5.9 percent), Washington (5.7 percent), Utah (5.1 percent), and Oregon (4.6 percent) all grew at rates well above California's rate of 3.8 percent and the US rate of 2.6 percent.

The Portland-Vancouver Metro area grows by more than seventy-five people every day. During the last four years, the four-county metro area has grown by an additional 110,000 people. The metro region is expected to have about 1,000,000 more people by the year 2040.

Hood River County lies on the cusp of Eastern Oregon and Western Oregon. Eastern Oregon also experienced increased growth rates in the late 1980s, which continued into the early 1990s. Eastside growth in Oregon accounted for about 13 percent of Oregon's population gain between 1990 and 1992 as opposed to 5 percent between 1980 and 1990. Hood River County's population is projected to increase by 3,000 to 4,000 persons every five years, reaching an estimated 36,483 by the year 2040. This essentially is double the population that is here now. (ICB Report 1996) Population forecasts vary. Although these increases appear high, they are based on the most current estimates available at this time.

## *Changes In Population*

Population change is a function of the number of births and deaths, and the number of people migrating in (in-migration) and out (out-migration) of a given region. The combined effect of the first two is called "natural increase," and of the last two, "net migration". Births and deaths have long-term effects but slowly-felt impacts in terms of local markets and services, whereas migration tends to have immediate and more broadly distributed impacts to the landscape. Hood River County's natural rate of increase is .76% (1990 census), therefore, the majority of new residents are/will be in-migrants. Migration is an important variable in understanding social and economic change.

## *Migration in the West*

Between 1970 and 1980, the West experienced a net in-migration of about 4.5 million people; and between 1980 and 1990, the region had about 5 million more in-migrants than out-migrants.

Oregon experienced net out-migration early in the 1980s followed by net in-migration in the late 1980s and early 1990s. Data from the 1990 Census indicates that Californians are moving to Arizona, Nevada, Oregon, Washington, Utah, and Idaho (ICB 1996). A recent survey of Oregon in-migrants found that 43 percent of the new Oregonians came from California .

## *Reasons for Moving*

Migration flows, as described above, are the combined effect of many people's individual decisions to move. People move into communities for many reasons: job, family, cost of living, quality of life, shared values and a sense of community, other unidentified factors or a combination of reasons. The perception of getting away from drugs, violence, and congestion may also be other reasons for moving. Developing technology and necessary resources may also "pull" in-migrants to specific communities. In Hood River County, windsurfing pulls participants of this sport to the area. The social organization developed around windsurfing and the developing technology has contributed to economic diversification, and is changing the social/cultural complexion of the valley. In-migrating windsurfers getting housing and jobs (whether seasonal or year-round) add to the mix of values in the community. For those not drawn by the sport of windsurfing, other recreation and "quality of life" amenities are overwhelmingly cited as the reason for relocation.

Migration decisions are typically complex, making it difficult to separate out the influence of any one factor. On a national level, generally speaking, a "rural renaissance" is happening. Growth in rural areas is outpacing growth in metro/urban areas. A number of factors seem to have contributed to this rural renaissance, including the decentralization of manufacturing and health and education services, a slackening of the exodus from agriculture, greater residential sprawl of metropolitan commuters into surrounding nonmetropolitan areas, the modernization of rural communities and roads, and people's desire to live in smaller communities (ICB Report 1996).

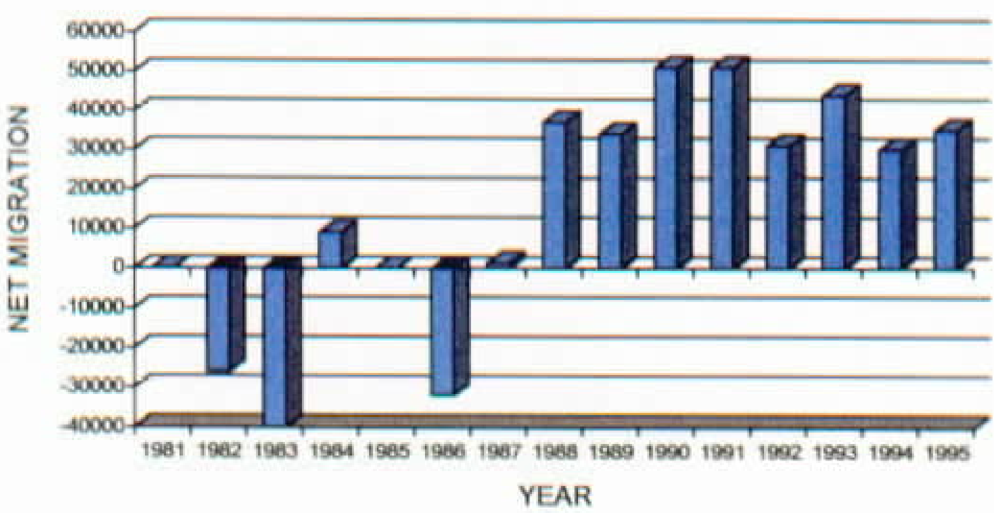
People are not moving to Hood River County for jobs, but rather for improved quality of life, which could be thought of as a higher level of amenities. Most often the natural environment (scenery), abundance of year-round recreation, good drinking water and clean air are cited as reasons for moving here. Because it is a tourist destination, the City of Hood River has a higher level of social amenities (restaurants, micro-breweries, galleries, retail shops) than other towns its size. These businesses contribute to the livability of the area, and its economic fabric.

The same amenities that attract windsurfers and other in-migrants to this area also attract retirees. While retirees are a small but growing segment of the population of the valley now, this potential is important to note in light of some national population trends.

The aging of the baby boom cohort, who were ages 26-44 in 1990, will be one of the most significant demographic changes in the future to affect both metro and nonmetro areas in all regions of the country. The Census Bureau projections show the percent of the population over 65 in the Northwest growing from 12 percent in 1993 to 16 percent in 2020 - this represents a gain of over a million people in this age class (as opposed to a gain of 3.5 million in all other age classes combined). The Census Bureau makes longer term projections for the Nation and these show the percentage of the population that is 65 years and over rising from 12.5 percent in 1990 to 20.2 percent by 2030. When and where "boomers" decide to retire, how much income they have, and how they choose to spend it will be important to regional and local economies. (ICB Report 1996).

Long-term population projections indicate for the Northwest and the Interior Basin, an aging population, and a more racially and ethnically diverse population. The population projections by race and Hispanic origin show an increasingly diverse population both nationally and in the Northwest. Asian and Pacific Islanders and Hispanics (of any race) are projected to be the fastest growing groups between 1993 and 2020 in the Northwest. By 2020, these groups are projected to make up nearly twice the proportion of the population that they made up in 1993 in the four-state area.

Table 3. Oregon Net Migration




## *Hispanic Population*

Migrant farm workers from Mexico first came to this area during World War II, to harvest fruit while local men were away. Since then, Hispanic seasonal workers have become an important part of the agricultural industry. Not all of the migrant workers "migrate". Workers have been offered citizenship several times since the 1940's, and many have settled. About 2400 workers relocate here seasonally to harvest the fruit and work in the orchards. Most of the seasonal workers are housed in the upper and middle Hood River Valley. In the upper valley workers generally stay on a "ranch" belonging to an orchardist, though they may work for more than one orchardist in a season. Historically, close ties have developed between some workers and orchardists, and it is not uncommon for some orchardists to go to Mexico in the wintertime and visit with the workers' families. There is a reciprocity that is not found in other agricultural communities e.g. the Yakima Valley. Affordable housing for agricultural workers with families is a significant social issue in the Hood River Valley (Nelson, 1996).

### *Japanese-American Population*

The Japanese-American people who live in the valley comprise 1.8% of the population (1990 census), but make a much more significant social contribution. They hold an important chapter in the history of the valley, and today many are among the community's most esteemed citizens and students. The City of Hood River has an active sister-city relationship with the town of Tsuruta in Japan.

Local Japanese-American people have a specific cultural connection to these watersheds, having settled in the upper valley as early as 1908. Harvesting and sharing forest mushrooms is an important tradition in many Japanese-American families (Kiyokawa 1996). The Matsutake mushrooms are prized, and are often given as gifts between family members.

### *Indian People*

The East Fork and Middle Fork Hood River Watersheds are within lands ceded by the Confederated Tribes of the Warm Springs. People from the reservation come to these watersheds to harvest huckleberries, wild edibles, medicinal and useful plants.

## *Social Assessment - Values and Beliefs*

### *Forest Dependence*

As it is defined in the FEMAT Report, the Hood River Valley is a forest-dependent community. It is immediately adjacent to forests, and has a high degree of economic dependence on tourism-related jobs and services. Forest-based industries are part of the local economy. This dependence is also supported by the quality of life attributes such as scenery, clean air and clean water that the forest provides local residents.

### *Rural and Urban Values*

The FEMAT Report suggests that the lifestyles and values built around commodities extraction belong largely to rural America, and that as our society becomes more urbanized and suburbanized, "rural" Americans feel loss, frustration and powerlessness. Recent letters to the editor in the local paper, and other observations suggest that these feelings do exist here. The proportion of "rural" values to "urban" values as they relate to commodities extraction and forest management can be expected to decrease in this area as it continues to be reshaped by in-migration. The phenomenal growth of the Portland area, a result of the same in-migration, is producing a large, urban population with urban values. That population can be expected to exert an increasing demand for all forest amenities on these watersheds.

### *Fallout From In-Migration*

In-migration can produce a "rootless" population, with limited attachments or commitments to the local community. That coupled with increased tendencies toward environmentalism among urban migrants can lead to a radical shift in the values of an area. Hood River County may now be experiencing such a phenomenon. The "attachments" of the new residents are likely to be different from those of long-term residents.

At first glance, Hood River County may appear to be a rural place. A majority of the population lives in single-family homes outside the urban growth boundaries; the economy has strong ties to agriculture. But the population density and the diversity of population suggest otherwise. This county is neither rural nor urban, but somewhere in between. New residents are bringing more "urban" values. Long-term residents are dealing with global economic change, and shifts in public policy that do not seem to their economic benefit, or challenge "rural" values.

### *Oregon Values and Beliefs Survey*

The Oregon Business Council released results from an extensive survey of Oregonians' values and beliefs in 1993. This study showed more commonalties than differences between the core values of urban and rural residents of the state. All groups surveyed identified "participation in family" as their most important value; "career or job opportunity" as second; and "concern for the environment" as third in a set of ten personal values.

The FEMAT team reviewed a number of surveys that focused specifically on environmental values. These surveys showed:

1) Environmental concern has been increasing in all parts of the world in the past 20 years, including among rural residents of the Pacific Northwest.

2) Urban residents in the PNW generally express stronger environmental values and concerns than rural residents, but this is a matter of degree, not of presence or absence of concern.
3) At present, generational differences in environmental values and concerns appear much greater than urban-rural differences; the younger the age, the greater the concern.

## Economic Assessment

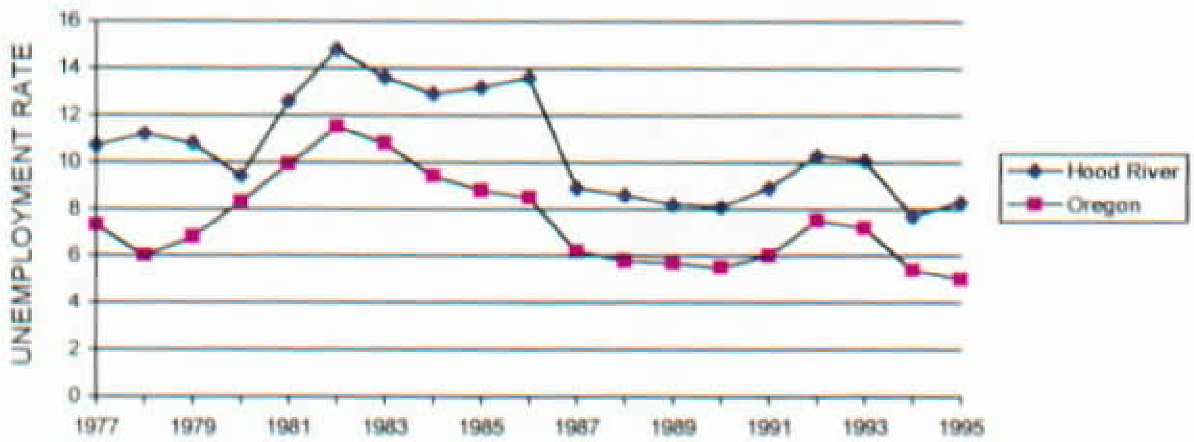
### Economy and Employment

Hood River is not a wealthy county. The 1994 per capita income ($18,061) is considerably lower than the national average ($20,700). The state per capita income level is about 10% below the national average.

Employment is an indicator of general labor market conditions. In Hood River County, the average unemployment rate has remained higher than the state average for the last twenty years. This is in spite of the fact that the state's unemployment rate has been below the national average for 25 months running. The average annual unemployment rate in the county was 9.6 % over the last decade. Due to the seasonal nature of agricultural and recreation-service work, there are major fluctuations in the rates of unemployment in the county throughout any given year. Generally, the month with the highest unemployment is June (14.4% in 1995), and the lowest unemployment comes with the fruit harvest season in September (4.7 % in 1995). In 1995 there were 9,840 persons in the peak workforce. On average 820 people are unemployed in the county. In the last 20 years, all job growth has been in the services sector. In the last two years, the retail trade has contributed bigger share of job growth. Mt. Hood Meadows is included as a service.

**Table 4. Unemployment Rate in Hood River County compared to the State of Oregon. From the Oregon Employment Division, 1996.**

| | UNEMPLOYMENT | | | PER CAPITA INCOME | | |
|---|---|---|---|---|---|---|
| Year | Hood River | Oregon | Difference | Hood River | Oregon | Difference |
| 1977 | 10.7 | 7.3 | 3.4 | 7.2 | 7.4 | -0.2 |
| 1978 | 11.2 | 6.0 | 5.2 | 7.9 | 8.2 | -0.3 |
| 1979 | 10.8 | 6.8 | 4.0 | 8.8 | 9.1 | -0.3 |
| 1980 | 9.4 | 8.3 | 1.1 | 10.1 | 9.9 | 0.2 |
| 1981 | 12.6 | 9.9 | 2.7 | 10.3 | 10.5 | -0.2 |
| 1982 | 14.8 | 11.5 | 3.3 | 10.2 | 10.6 | -0.4 |
| 1983 | 13.6 | 10.8 | 2.8 | 10.5 | 11.4 | -0.9 |
| 1984 | 12.9 | 9.4 | 3.5 | 11.0 | 12.3 | -1.3 |
| 1985 | 13.2 | 8.8 | 4.4 | 12.1 | 12.9 | -0.8 |
| 1986 | 13.6 | 8.5 | 5.1 | 11.9 | 13.5 | -1.6 |
| 1987 | 8.9 | 6.2 | 2.7 | 12.9 | 14.2 | -1.3 |
| 1988 | 8.6 | 5.8 | 2.8 | 13.7 | 15.1 | -1.4 |
| 1989 | 8.2 | 5.7 | 2.5 | 14.3 | 16.3 | -2.0 |
| 1990 | 8.1 | 5.5 | 2.6 | 15.5 | 17.2 | -1.7 |
| 1991 | 8.9 | 6.0 | 2.9 | 16.3 | 17.8 | -1.5 |
| 1992 | 10.3 | 7.5 | 2.8 | 16.8 | 18.7 | -1.9 |
| 1993 | 10.1 | 7.2 | 2.9 | 17.2 | 19.4 | -2.2 |
| 1994 | 7.7 | 5.4 | 2.3 | | | |
| 1995 | 8.3 | 5.0 | | | | |




The poverty rate in the county as determined in the 1990 census is 15.7%, translating to 2610 persons living below the poverty level and 14,056 persons living above the poverty level. 3061 persons (18%) of the population were considered economically disadvantaged in 1990. By 1995, this number grew to 4,130 persons or 21% of the population.

Generally speaking, the county does not mirror national economic trends, going into recessions sooner and coming out later than the rest of the country. Also generally speaking, the gap between the "haves" and the "have-nots" is widening in this county as it is nationally (Fridley 1996).

### *Personal Incomes*

Fifteen to twenty years ago, 15-20 percent of the personal income in the Hood River Valley came from agriculture. Now the total personal income from agriculture is closer to 10%. The earnings from employment are about the same percentage as twenty years ago, but the slack from the decline in agriculture has been made up with transfer payments, and rents, dividends and interest. This indicates not only that more retirees have come here (or more people retired) but also that more well-to-do people are here.

Total personal income is a comprehensive measure of income from all sources accruing to the residents of an area. As such it is a broad indicator of the size and growth of the local or regional economy and perhaps even more appropriately a measure of local buying power. The total personal income for Hood River County is $304,323,000 (1994). The total payroll for the county in 1994 was $168,008,563. An economic downturn began in Hood River County in the late 1970's and has not shown much improvement. 1979 was a peak year for forest products employment in the county with about 800 jobs. Reasons for the lower incomes include loss of industries from the area that pay higher wages. There has been growth in the transfer payments and rent, dividends & interest, but not enough to keep up with the state and national averages for income.

The county economy now is built on agriculture (1,461 jobs), services (1,910 jobs) and manufacturing (1,349 jobs). Retail trade employs 1,695 people. In 1994 the average annual wage in the county was $18,436. Average annual wages vary: communications ($34,433), manufacturing ($23,349), wood products manufacturing ($28,879), government-federal ($33,680), state & local government($26,691), construction ($21,076) and retail ($12,106). The average annual income from agriculture in 1995 was $13,394. The manufacturing industry in this county is fairly diverse and not as volatile as other counties which may be more dependent on lumber and wood.

Because of the presence of Sprint/United Telephone in Hood River, the communications infrastructure is superior to other communities of this size. This is allowing small, higher-tech industries to emerge. The Mt. Hood Economic Alliance, a regional economic alliance between Hood River and Clackamas counties, emphasizes agriculture, computer software and tourism as areas for economic development in Hood River County. Communications employment is a stabilizing force in the local economy because it is the highest wage industry, with many professional and technical type jobs.

In the Mt. Hood and Parkdale area, the majority of jobs are in fruit packing, wood products manufacturing, agriculture, government, and services, though undoubtedly many people commute to other places to work. Statistics exclusive to the upper valley are not available.

Table 5. Employment & Average Wages in Hood River County, Oregon. From Oregon Employment Division, 1996.

| | Average # Employed | Average Annual Wage (1994) |
|---|---|---|
| Total Jobs (1994) | 9,113 | $ 18,436 |
| Agriculture (all) | 1,461 | $ 13,394 |
| Services | 1,910 | $14,651 |
| Manufacturing (all) | 1,349 | $23,349 |
| Wood Products Mfg. | 479 | $ 28,879 |
| Government (Federal, State, and Local) | 1,177 | $27,765 |
| Retail Trade | 1,695 | $ 12,106 |
| Communications | 455 | $34,433 |

## *Economy - Agriculture*

Agriculture is infused into the lifestyle, landscape and economy of the Hood River Valley. In addition to wages and income, there are lifestyles and values associated with farms and orchards. Farming is a way of life around which many families operate, particularly families in these watersheds. Additionally, agriculture contributes to scenic value of this area, and is a component of tourism. People come to see the fruit blossoms, the fall colors, the harvest, and to participate in related special events. Agri-tourism is a growing niche market in Oregon... tourists enjoy seeing these farms.

Hood River County produces as much as 30% of all winter pears grown in the United States, and accounts for about 2% of the nation's apple production. The county is the leader among Oregon's fruit growing districts for tons of apples and pears produced. (Thompsen 1996)

Income from agriculture makes up 8.4 % (1993) of the total income in the county. This is down from a high of 20.3% in 1974. Until the mid-1970's agriculture income made up about 20% of the total income in the county. Now, it is consistently closer to 10% of the total income. Gains in the retail sector as well as an increased income from rents, dividends and transfer payments have compensated for the loss. Agriculture is a volatile component of any economy, there are good and bad years for crops and incomes. Hood River County is no exception.(Fridley 1996)

More than fifty percent of the agricultural acreage in the county is in the upper valley (19,500 acres). Three irrigation districts (Mt. Hood, Middle Fork, and East Fork) irrigate a total of 16,600 acres with water from these watersheds.

| | Total Acres |
|---|---|
| County | 338,560 |
| Private Land Base | 88,320 |
| Farms | 27,201 |
| Irrigated | 17,674 |
| Orchards | 14,696 |
| Hay & Pasture | 2,021 |

## *Wood Products Industries*

Wood products industries (logging and manufacturing) provided 3.6% of total employment in Hood River County in March 1995, or 310 jobs. The largest employer in the industry is Hanel Mill, which was recently sold to Morgan and Hill of Mill City, Oregon. The average annual payroll of the mill is about $2.4 million, with millions of dollars in additional spending. They employ 119 people. In recent years, the mill has cut back to two shifts. Hanel Mill buys timber from this area, from both public and private lands, as it is available. They currently process about 270,000 board feet per day and operate five days a week on two forty-hour shifts. Currently (April 1996) most of their timber is coming from DNR lands in Washington. They do not import logs from other countries, but are purchasing logs from farther and farther away. Historically, they have sold their products to domestic markets. There is a slight shift towards more foreign markets as the mill strives to remain flexible.

Dee Forest Products, located in the upper Hood River Valley, employs 78 people in the manufacture of hardboard. The mill has an average annual payroll of about $2.25 million. The majority of their workers live in Hood River. Raw materials for production, chips, sawdust, and ply trim, come from mills and plants in northern Oregon and southern Washington. Their products are sold throughout the US and Canada.

The county encompasses 32,350 acres of private industrial forest, 17,700 acres of private non-industrial forest, and 1,363 acres of state forest, in addition to National Forest lands.

### *The "Owl Guarantee" Payments*

Prior to 1990, counties with National Forest lands received a percentage of timber sale receipts from those lands to compensate for the loss of taxbase. The formula was based on the percentage of National Forest lands in the county. With the decline in the federal timber harvest that began with the controversies related to Spotted Owl habitat, a law was passed in 1990 to provide a "parachute" to counties accustomed to these revenues. These payments are known as "Owl Guarantee" payments, and by law, they cannot decline more than 10% per year for the ten year period which began in 1990.

In Fiscal Year 1994 Hood River County received $2,067,601.33 from the federal government in so-called "Owl Guarantees". In FY 1996, the payment will be $1,994,627.17. These payments will decline by 10% per year until 2000, when the "Owl Guarantees" end. The actual value of timber sold from National Forest lands in Hood River County in 1994 was $559,000. Without the federal subsidy, the county would have received about 25% of that or $140,000. When the safety net goes away, the county is likely to feel significant financial impacts.

### *Receipts From County Timber Sales*

Hood River County owns 32,350 acres of forest lands which it manages as a tree farm. The county Department of Forestry generally sells 9.5-10 million board feet of timber per year. In 1994-5 this produced revenues of $2,919,803, an increase of $22,911 from timber revenues in 1993-4. Most revenue from county timber sales goes into the general fund. In 1994-5, $1,633,200 of timber revenue was transferred to the county general fund. This comprised 32.8% of the general fund. Timber revenues made up 15.2% of the total county budget (94-95). This income to the county has offset the need for additional taxes. Income from timber sales funds or partially funds 17 departments of the county government.

Additional economic benefits from the county timber program include contracts and employment.

## *The Economy of Tourism and Recreation*

### *Visitor Volume*

In 1994, 26.1 million people traveled in Oregon. Six per cent of these, 1,560,000 people, visited Mt. Hood and the Columbia Gorge. If they drove around the mountain, as many of them do, they passed through the East Fork Watershed. The Oregon Visitor Profile (1994) suggests that the Mt. Hood Columbia Gorge region attracts mainly nature-oriented outdoor enthusiasts. A large majority engage in outdoor activities, many of which are winter-related.

Of all the visitors to the state, these 6% are most likely to stay in a campground or RV park. Statewide, about 14% of visitors stay in campgrounds. In-state visitors (residents) are also more likely to stay in campgrounds. About one-third of the visitor volume is from out-of-state, and two-thirds is from in-state. Out-of-state visitors account for half of all spending. Twenty three percent of the out-of-state visitors come from Washington, twenty two percent come from California. International guests make up one tenth of the total number of travelers. Forty per cent of the overseas visitors are from Pacific Rim countries, with Japan sending more visitors than any other country in the world. Hood River may have a higher than average number of Japanese visitors due to the strong cross-cultural ties between some people here and places in Japan.

Although in-state and out-of-state visitors seem to engage in the same kinds of activities, out-of-staters are more likely to participate in more activities than their in-state counterparts. The outdoor experience seems to be one of the strongest tourist attractors in Oregon. Nearly half of all visitors engage in outdoor activities (47%) especially hiking (23%) viewing wildlife (17%), and visiting natural attractions (26%).

### *Economic Impacts*

The Gorge Region (Hood River and Wasco counties) has shown substantial growth in lodging tax receipts. Revenues from transient lodging taxes grew 25.6% to $414,467 in 1992/3 following a similar increase of 21.4 percent the previous year. Hood River County received $153,653 in 1992-3 from lodging tax receipts, and anticipated receipts of $170,000 in 1996. In Hood River County, about half of this money is put into the general fund, and most of the rest goes to promote tourism.

Travel and tourism spending in Oregon totaled over $3.13 billion in 1992, up 5.6% from 1991. Every $1000 spent by visitors in Oregon generated $190 in wage and salary income in 1992. In Hood River County, travelers spent $26,091,000 in 1992, or $1482 per county resident. This is higher than the state average of $1052 per capita spending, suggesting a more affluent group of visitors, and a slightly higher level of economic dependence on the visitor industry. This spending generated a payroll of $4,890,000 which directly created 487 jobs in 1992 (OTD).

In Hood River County, 60% of visitor expenditures went to commercial accommodations. Day visitors from Portland are notable. They spent about $2 million dollars in the county in 1992, supporting a payroll of $414,000 and forty three jobs. Spending by all travelers in the county increased by 17.6 % from 1991 to 1992.

Generally speaking, a community economy based in tourism is somewhat vulnerable to fluctuations in the outside economy.

### *Hood River County Visitors*

In general the visitors to this area are recreationists, enjoying multi-sport, multi-day stays. The same people who windsurf also mountain bike, climb, hike, ski, and snowboard. They come for the scenery, the unique outdoor experiences. East Fork watershed holds some of their most popular destinations - Cloud Cap, Cooper Spur, Dog River Trail, Surveyors Ridge Trail, Timberline Trail, Tamanawas Falls and Mt. Hood Meadows.

### *Future Trends In Tourism*

The Oregon Tourism Division in its 1995-1997 marketing plan identifies these niche markets for development:

Agri- and Nature-based Tourism

Cultural and Heritage Tourism

Adventure Travel

The Eastern Oregon Visitors Association identifies these niche markets for development in 1995-1998:

Heritage and History

Culture

Eco-tourism and Natural Resources

Experiential & Participatory

If these represent future trends in tourism, this area may hold even greater tourism potential.

### *Tourism and In-Migration*

Tourism and in-migration are related, either because tourists discover areas and move there or because economic opportunities in tourism attract migrants.

## *Economy Summary*

The economy of Hood River County is anchored in tourism (services), agriculture and manufacturing. All three sectors of the economy have significant ties to these watersheds. Water for agriculture, wood for industry and recreation/scenic amenities for tourists are among the most predominant links between the economy and the watersheds. A major transportation corridor physically links people and the forest.

Residents value the same forest amenities as tourists, along with good drinking water, valuable open space and cultural experiences (berry, mushroom harvest) within the watersheds. Maintenance of a high quality environment has become a critical component of this areas economic development. Economic contributions of federal lands in these watersheds go far beyond commodities yielded. We must also recognize that there are economic links and relationships outside of this county that are important but not shown here.

## *Literature Cited*


Anderson, Rachel Dee Forest Products, Personal Communication, May 1996.

Beuter, John H. Legacy and Promise, Oregon's Forests and Wood Products Industry, A Report for the Oregon Business Council and the Oregon Forest Resources Institute. 1994

Chamness, Dan, Hood River County Budget Director, Personal Communication, April 1996.

CPR (Center For Population Research), Portland State University, Population Estimates For Oregon: July 1995

Winans, Eph, Hood River As I Have Known It, Hood River Historical Society, 1991.

Fey, Mike. Hanel Mill, Personal Communication, April 1996.

E.O.V.A. (Eastern Oregon Visitor's Association) Marketing and Strategic Plan 1997 & 1998, Draft, January 1996

Fridley, Dallas, Regional Economist, Oregon Employment Division, Hood River, Oregon. Personal Communications, March-May 1996

Galloway, Kenneth, Hood River County Department of Forestry. Personal Communication, March 14, 1996

Garrett Crowley, Susan, editor, Legacy: A Centennial Celebration of Hood River and the Columbia Gorge, Hood River News, 1995

Hood River News, Hood River Fact Books, 1991, 1994. Hood River, Oregon.

(ICB) McGinnis, Wendy and Christensen, Harriet, The Interior Columbia Basin: Patterns of Population, Employment and Income Change (Draft Report), Prepared for the Eastside Ecosystem Management Project, Portland, Oregon, 1996.

Kiyokawa, Randy. Parkdale, Oregon, Personal Communication, May 1996

Krussow, Patricia. Historian, Personal Communication, March 1996

Leion, Gregg, Associate County Planner, Hood River County, Personal Communication, April 1996

Mejer, Dr. Jan, Sociologist, Whitman College, Personal Communication, February 1996.

Moisey, Lisa W., The Relationship Between Population Growth and Forest Conversions to Residential and Commercial Land-Uses. Report prepared for the Eastside Ecosystem Management Project. September 1994.

Morse, Kathleen and Anderson, Randall, Tourism In The Columbia River Gorge, A Profile of Visitors, Accomodations, and Economic Impacts. (Report). Washington Sea Grant Program, University of Washington, Seattle.

Nagler, Michael, Orientation Report: Hood River County Department of Planning and Community Development. February 1996.

Nagler, Michael, Director - Hood River County Department of Planning and Economic Development, Personal Communications, March-May 1996.

Nelson, Thom, Hood River Grower-Shipper Association, Personal Communications, March 14 and May 9, 1996

(OTD) Oregon Tourism Division, Economic Development Department, Oregon Visitor Profile, Salem, Oregon, April 1995.

(OTD) Oregon Tourism Division, Economic Development Dept., 1992 Economic Impacts and Visitor Volume in Oregon. Salem, Oregon, 1993.

Ortman, Tom, Mt. Hood National Forest Supervisor's Office, Gresham Oregon, Personal Communication, April 1996.

Oregon Tourism Division, Tourism In Oregon, 1995-7 Marketing Plan. Salem, Oregon. 1995

OBC, (Oregon Business Council), Oregon Values and Beliefs: Summary. Portland Oregon, 1993.

Schmidt, Craig, Director of Hood River County Chamber of Commerce, Personal Communication, March 1996.

US Bancorp and Northwest Policy Center, University of Washington, The 1996 Portrait, Regional Economic Review and Outlook, Portland, Oregon, 1996.

# *TRANSPORTATION REPORT*

## *EAST & MIDDLE FORKS OF THE HOOD RIVER WATERSHED ANALYSIS*

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June 6, 1996

## *Introduction.*

Travel management provides the public with a full and diverse spectrum of opportunities for travel to and within the national forest. The Mt. Hood National Forest Access and Travel Management (A&TM) Plan exists to serve the needs of both the recreation and commercial users. The forest manages a travel system that allows a broad range of opportunities consistent with the Desired Future Conditions (DFC) set forth in the Mt. Hood National Forest Land and Management Plan (Forest Plan). The forest A&TM objective is to have travel ways that are needed and used. Travel ways must be both efficient and effective towards their intended use. Travel ways must also be interactive with transportation existing off forest. As a result, partnerships with other agencies, private and organizations should assist in providing funds and services to maintain these routes.

The Forest Plan has included Standard and Guidelines (S&G) for A&TM in each management area. This A&TM plan consists of mainline system roads that are the backbone of the travel infrastructure. They typically receive high use and are "through" roads. They provide access to population centers, major recreation areas, and/or interior trail and road systems. Other travel ways are non-mainline routes needed for administration or low density use.

## *Roads*

### *a) Reference condition.*

The road network as it now exists began during the reference period. Horse and wagon widened routes established Native American. Box culverts, fords and some bridges either existed or were constructed by the pioneers. After W.W.II, the introduction of efficient heavy construction equipment and the demand for timber to support the country's building boom allowed the harvest of areas within the Middle and East Forks of the Hood River. Road construction required only limited engineering design. Not until the early 1960s did the introduction of engineers into the Forest Service incorporate specifications for road alignment and construction. Specifications, details, gradation of aggregate and compaction soon became construction requirements. Drainage was designed to withstand 50 year flood events. The volume of timber harvest adequately financed a maintenance crew in the 1980s of sometimes six permanent and six seasonal workers on the east-side of the Mt. Hood National Forest. This workforce annually cleared culverts, bladed road surfaces and brushed roadsides.

The purpose of road construction primarily was for timber extraction. Many of the recreation roads and trails built the result of revenue generated from the sale of timber. Mineral pits development needed to supported the demand for specified aggregate required more improved roads. Pre 1950's roads were mostly native surface. Surface types started changing in the mid 1960's and early 1970's. Reconstruction restored and/or realigned existing roads that helped accommodate more traffic as roads changed from a single lane road with turnouts to a double lane paved road. Both the Forest Service and other public agencies paved major arterial timber haul forest roads for long-term economy.

Culvert installation and aggregate surfacing started to prevail. The higher designed roads increased the need for more maintenance. As mainline roads became paved and surface types went from native to aggregate, traffic management strategy "encouraged" traffic and provided a higher degree of driver comfort, convenience and safety. The Federal Highway Safety Act of 1977 required a higher degree of maintenance activities resulting in increased construction and reconstruction costs. Roads built with better designed drainage required improved yearly maintenance. Some were reconstructed to a higher maintenance level (ML) than necessary. Increased use of native surface roads and multi-year timber sales required more than normal maintenance because of the minimal drainage and lack of improved surfacing. Road use during the wet seasons compounded maintenance requirements. As timber sale volumes decreased, the appropriated maintenance dollars also reduced.

Reconstruction changed the native/aggregate roads to aggregate/paved roads respectively. Most live streams needing a 48" culvert or greater called for a culvert design. The prevailing road design criteria for the Hood River Ranger District during the 1960's and 1970's was as follows:

- Width: 12'-14' minimum road width
  - * Grade: Maximum 10% grade for ML 4's;
  - * Maximum 12% grade for ML 2's and ML 3's
- Cut slopes: ML 2's, ML 3's, ML 4's: Maximum 1:1 (0.25:1 in rock)
- Fill slopes: Maximum 1.5:1
- Culverts: Maximum 250' spacing between ditch relief pipes and/or relief ditches.
  Culvert size was determined by evidence of an existing drainage. Substitutes were made for convenience of pipe on hand. 18" culverts were used when no drainage was evident. The Forest Service Standard used the Manning's Formula (average velocity of uniform flow) when drainage was evident.

### *b) Current Conditions.*

The current condition of the road network is a result of retrenchment from timber harvest and the decline of road management funding. Apportioned maintenance dollars for the east side has consistently declined since 1990. As a result, road conditions have deteriorated either because of their reduced maintenance or service levels. Major tactics taken to stretch maintenance funds have been:

- Limit roadside brushing
- As needed culvert cleaning compared to previous routine scheduled maintenance
- As needed blading and shaping or deferred maintenance until future timber reconstruction
- Obliteration of roads less that 0.5 miles or identified as no longer needed
- Reduction of road maintenance crews to one permanent and three seasonal workers
- Conscientiously allowing asphalt surface roads to return to aggregate
- Travel restrictions during wet seasons (Fall and early Spring)

The main-line routes of travel within the East and Middle Fork Hood River Watersheds are Road 44 Dufur Mill, Road 3512 Cloud Cap, Road 3550 Bennett Pass, Road 4410 Lookout Mountain, Road 17 Long Prairie, Road 3540 Pocket Creek and Road 3555 Mt. Hood Meadows. Hood River County maintains State Highway 35 and the 3510 Cooper Spur road.

Most existing roads are still single lane with turnouts constructed for traffic associated with timber sale activities. These roads are maintained to their approved Traffic Service Level(TSL) and Maintenance Level(ML). Road densities are an indicator of the degree of human impact. Tables C1 and C2 illustrate the density of road constructed within the subwatersheds. Generally, 2.5 miles per square mile is the Forest Plan ceiling for forest management. Tables C3 and C4 display the current and projected total road lengths within the watershed by surface type.

Table C1 - East Fork Hood River Watershed Road Density by Subwatershed.

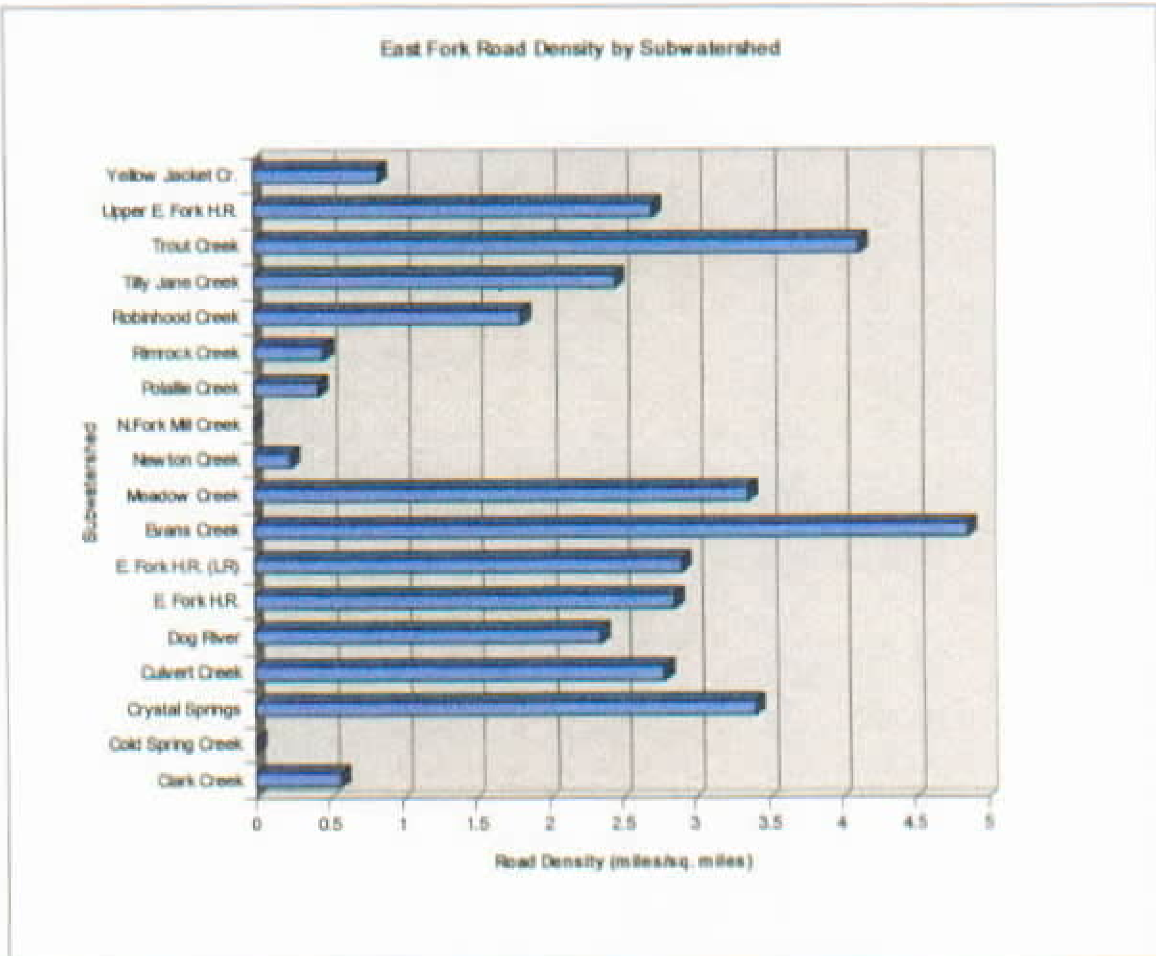



Table C2 - Middle Fork Hood River Watershed Road Density by Subwatershed.

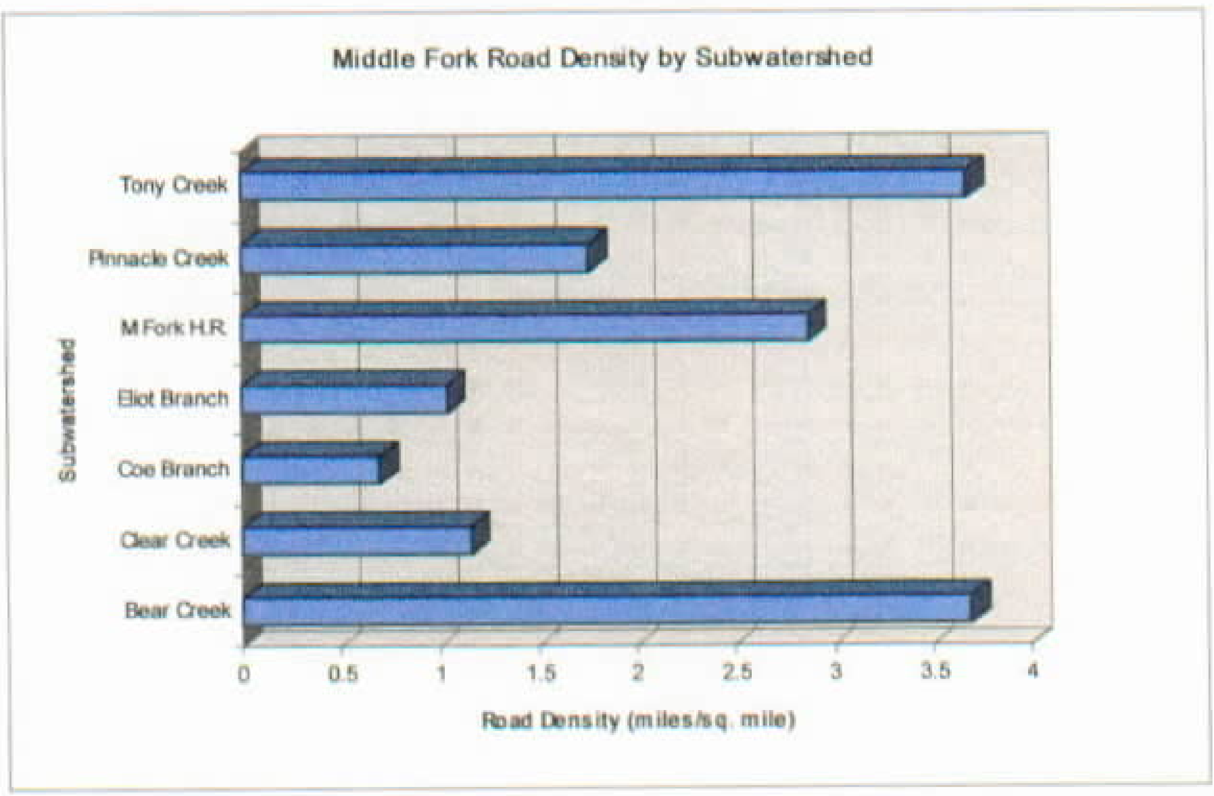


Table C3 - Middle Fork Hood River Watershed Road Lengths.

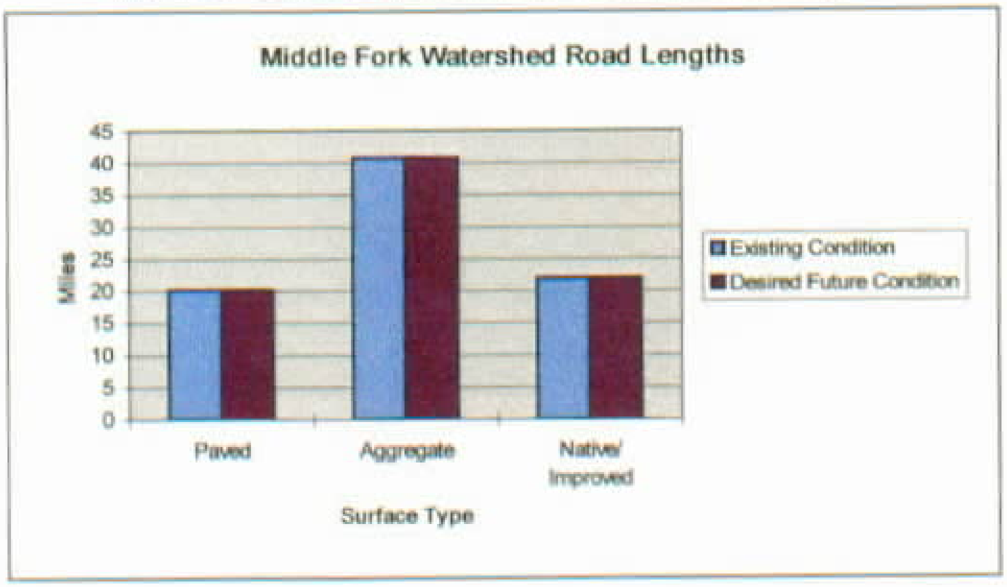
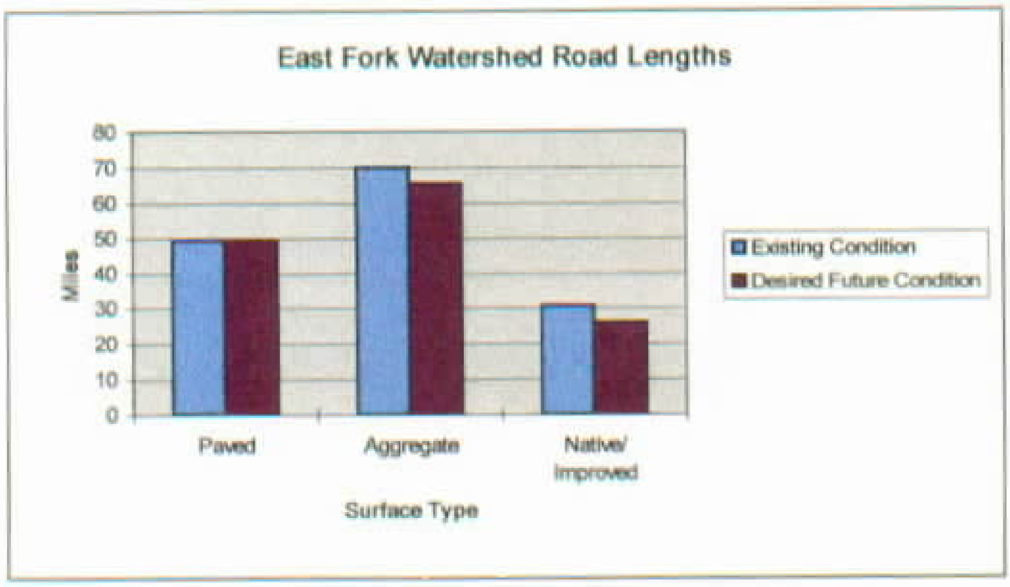



Table C4 - East Fork Hood River Watershed Road Lengths.




### *c) Road Construction Techniques Essential to Future Resource Protection.*

Rain flushing and air dispersal are the two major opportunities for roads to contribute sediment into streams. Rain flushing of fines normally affects only the top 1/2 - 1" of the surface. Traffic brings fines to the top of the road surface during extremely wet periods through the action of "pumping". This effect replaces the amount of previously dispersed fines lost during surface erosion. The gravy brown discoloration of the water within a wheel track illustrates the effects of "pumping". The effects of "pumping" contaminates the integrity of the base aggregate that provides the strength of the road.

Crush resistant rock reduces the amount of fines produced through road use. Spot grading of surfaces should reestablish a 2-4 percent cross slope primarily to get the water off the road. Gravel with established grass at the margins of the traveled way reduces sediment production by over 84 percent.

Logging traffic on an unsurfaced traveled way can increase sediment production by a factor of 1.9. Sediment production from an unsurfaced traveled way in border-zone materials with rutted surfaces will produce 2.08 times the yield of a smooth surface. The placement of a 6" lift of 1.5 inch minus crushed rock reduces sediment production by 70 percent. Two inches of crushed rock (1 1/2 inch minus, placed on a road built in sandy loam soil shows no sediment reduction. An 8 inch lift of 1 1/2 inch minus reduces sediment production by 97 percent. Additionally, the use of hard crushed rock minimizes the erosion of the gravel surface on a highly erodible subgrade material.

Dust oil and bituminous surface treatments reduce sediment production from unsurfaced roads by 85 percent and 96 percent respectively. Dust oil releases volatile chemicals into surface runoff and breaks down easily under heavy traffic. Bituminous surface treatment is initially expensive.

### *d) The Effect of Road Construction on Sedimentation*

The partitioning of total road sediment production is about 60 percent from fill-slope, 25 percent from travel ways, and 15 percent from the cut-slope and ditch.

i) Fill-slope. Minimizing fill-slope surface erosion depends on the timing of application of the control measure, the type of treatment, the rate of application for mulch treatments, the inherent erodibility of the soil, the slope gradient and whether the road is in-sloped. Sediment production from fill-slopes over time shows that run-off rates in unconsolidated material are initially high and exponentially decrease over time.

Six potential treatments for soil erosion on fill slopes:

- Straw with asphalt
- Straw with a net or mat
- Straw alone
- Erosion control mats
- Wood chips or rock
- Hydro-mulch

Seeding alone does little to control erosion until germination and growth of the new plants. This growth will occur only if the seed remains on the slope. Filtered windthrows are cost-effective methods that incorporate erosion control into forest road construction. For most mid-slope forest roads, only those fill-slopes near stream crossings have a high potential to contribute erosion material to streams. The longest average transport distances for materials are from rills formed in sloped material and those below relief culvert outflows or whose flow combines with culvert flow paths. Generally, a distance of 175 ft between the culvert outfall and the nearest live water to prevents 80 percent of the relief culverts from contributing sediment to streams.

ii) Cut-slopes. Dry raveling during the summer months occurs on cut-slopes especially with non-cohesive soils. Banks slough when soils are saturated; especially during spring snow-melt. This may produce larger sediment than dry non-cohesive soils. Dry-seeding produce good stands of grass if slopes construction is a 1:1 (H:V) or more gentle gradient. Straw mulch applied with a tackifier is substantially more effective in reducing cut-slope sediment production than just straw mulch. Mulched cut-slopes reduce erosion of bare slopes by 98 percent while Hydro-mulching is not effective on steep cut-slopes.

iii) Roadside Ditch. Clean ditch water increases the capacity to detach soil from the wetted area and transports it to the stream crossing. The most common erosion control treatment for roadside ditches is a rock blanket or rip rap armoring.

### *e) 1996 Flood Damage*

The east side of the Mt. Hood National Forest experienced severe flooding during the winter of 1995-96 as a result of heavy rains and snow pact melt below the 3000' level. The peak flow experienced generally was a 30 year or less event. Major damage occurred to portions of the transportation network. An estimated total of $1.26 million in required repairs are identified for the East-side. The East and Middle Forks sustained $19 and $130 thousand respectively.

Significant destruction occurred as a result of the drainage structures inability to pass debris and water. In most cases, culverts and ditchlines were adequately designed to accept the rate of flows. The deferred maintenance primarily contributed to the cause of the failures. Nearly all inspections of the road failures after the flood revealed either ditchlines containing excessive vegetation. In some cases, debris potential upstream of the drainage structures were unstable. In all cases, the sustained overland flows saturated these critical areas and jeopardized their integrity. Better maintained passages would have allowed a quicker recovery to acceptable soil strength

The Mt. Hood is experiencing a continuous reduction of maintenance funds for road drainage. The frequency and number of failures are increasing. The district can expect these types of incidents to continue until roads are closed, obliterated, or maintenance requirements begin to meet appropriated maintenance funding.

### *f) Pit Maintenance*

Table C5 represents the existing mineral extraction opportunities in the East and Middle Fork watersheds of the Hood River. Traditionally, these sources provide base course rock for forest road construction. Most sites have not been used in the past six years and currently provide either limited pit-run or oversize material for stream rehabilitation and road barriers. Waste and overburden material from local construction projects is placed in these locations.

**Table C5 - Existing Mineral Extraction Opportunities**

| T.R. Sec. | Quarry Name | Rock Type | Current Use | C.Y. Remain | Size (acre) | Future Use |
|---|---|---|---|---|---|---|
| 03S10E05 | Robinhood | Basalt | Developed/mixed | 150000 | 6 | Close/Restore |
| 01S09E.16 | Bear Creek | Andesite | Closed/Mixed Use | 75000 | | |
| 01S09E.16 | N/A | N/A | Depleted/Borrow | 1000 | N/A | |
| 01S09E.20 | Dollar | Andesite | Developed/Base Course | 500000 | 13 | Maintain for extraction and wasting |
| 01S09E.21 | Cot | Not Recorded | Not Recorded | 150000 | 2 | |
| 01S09E.28 | Clear Creek | Not Recorded | Not Recorded | 40000 | 3 | Maintain for limited extraction and wasting. Close with completion of fish rehabilitation project (1998) |
| 01S09E.28 | N/A | Andesite | Terminated/Mixed Use | 10111 | N/A | |
| 01S09E.28 | N/A | Andesite | Depleted/Wasted Area | 1000 | N/A | |
| 01S09E.23 | Boomer Creek | Not Recorded | Potential/Unknown | 10000 | N/A | |
| 01S09E.31 | Vista | Andesite | Developed | 25000 | N/A | |
| 03S10E05 | Cooper Spur | Andesite | Developed/Mixed | 10000 | 3 | |
| 01S10E27 | Shellrock | Andesite | Developed/Mixed | 27000 | 2.3 | Maintain for extraction and limited wasting |
| 02S10E07 | N/A | Andesite | Developed/Mixed | 40000 | N/A | |
| 02S09E01 | N/A | Andesite | Developed/Mixed | 40000 | N/A | |
| 01S09E36 | Evans Creek | Andesite | Developed/Mixed | 2000000 | 4 | Land Exchange with Hood River County |

The most active sites within the watersheds are Dollar, Clear Creek and Shellrock pits. They have adequate access and can provide sufficient long term base course rock. Clear Creek and Dollar pits provide oversize shot rock adequate for use with instream rehabilitation and road barrier projects. These pits contain non-plastic material requiring the addition of a binder to maximize its road construction potential. Dollar and Shellrock locations are outside riparian reserves and present no resource damage potential. Clear Creek is within the flood plain and is susceptible to stream course migration. It has recently provided sufficient pit-run and limited non-specified 3" and smaller aggregate for local construction projects. The obliteration of the portion of Forest Service Road 2820 at the pit site has allowed some stockpiling of waste and recovered base rock.

Potential resource problems exist at Robinhood Pit which neighbors the East Fork of the Hood River. Rains and melting snows transport sediment to the stream. District direction is to close the quarry and restore it to a self-maintaining equilibrium. This site is as a possible location to put a maximum of 90,000 c.y. of waste material from proposed reconstruction of Highway 35 at "The Narrows."

The cost effectiveness of processing specified rock from any of these pits, rather than purchase from a commercial source requires a need of at least 5000 cubic yards. This is equivalent to 2.6 miles of (10" depth) level 3 road construction or 6.4 miles of level 2 (4" depth) construction. Spot-rocking would not support the mobilization of a crusher to the pit. The Hood River A&TM plan does not project any new construction or major reconstruction at this time. Roads identified for obliteration are having their running surface recovered and stockpiled for road maintenance. The current road maintenance budget does not permit the development of stockpile material. The recommended pit management plan should maintain Dollar and Shellrock pits as active sites. Other pits should be closed and be restored as funds and projects become available.

### *g) Highway 35*

The Oregon Department of Transportation (ODOT), Hood River County and the cities of Hood River and Cascade Locks are currently preparing a countywide transportation plan. The primary purpose of the effort is to identify issues and objectives for the Hood River Transportation Plan. The findings and recommendations of this study will play an important part in the transportation routes through the East and Middle Forks of the Hood River.

The Hood River-Mt. Hood Summit (Highway 35) Corridor is a major recreation corridor and provides access to rural communities in the upper Hood River Valley. As part of the Mt. Hood Loop, Highway 35 (Mt. Hood highway) connects US 26 and I-84. The corridor functions in the East and Middle Fork watersheds by providing:

- Primary access to Cooper Spur Ski Area and other east side recreation facilities
- Alternative routes from the Portland to Mt. Hood Meadows Ski area and other recreation destinations.
- Truck routes serving lumber mills, orchards and fruit shippers
- Scenic Byways for that portion within the Mt. Hood National Forest

The automobile is the primary mode of transportation in the watersheds. Recreational travel is predominately found on Highway 35 during the weekends. In the winter, weekend travel on Highway 35 is mostly towards snow-based recreation facilities. Highway 35 is the main vehicular route through the East Fork of the Hood River. The Oregon Department of Transportation (ODOT), is the state roading agency responsible for the maintenance of this Byway. This roadway has the greatest potential for reoccurring resource damage within the East Fork Watershed. Primarily, its major influence is its affect on hydrologic conditions. State maintenance crews continue to battle with the effect of seasonal rock fall along "The Narrows" portion north of the Highway 35 and the FSR 44 intersection. ODOT, in it's Hood River transportation plan, identifies this corridor as a major access to recreational opportunities in the upper Hood River valley. Highway 35 is also a redundant link between I-84 and Highway 26. It supports traffic to Mt. Hood Meadows (MHM) and provides through access during I-84 closure. This was the case during the flooding of 1996. Key issues surrounding Highway 35 corridor are:

- No additional expansion in highway capacity, except for climbing/passing lanes and turning lanes
- Promotion of Highway 35 as an alternative to Highway 26 for access to Mt. Hood ski areas and other winter and summer recreation activities
- Protection of the corridor's scenic values
- Addressing safety problems at Mt. Hood Meadows main access road
- Promotion of the use of Highway 35 as a bicycle route

One of the most important facility management techniques to preserve the function of the highway is access management. This regulates the number, spacing, type and location of driveways, intersections and traffic signals. The Oregon Highway Plan (OHP) classifies Highway 35 of statewide importance. The management of this byway is to insure it maintains adequate capacity and serviceable conditions.

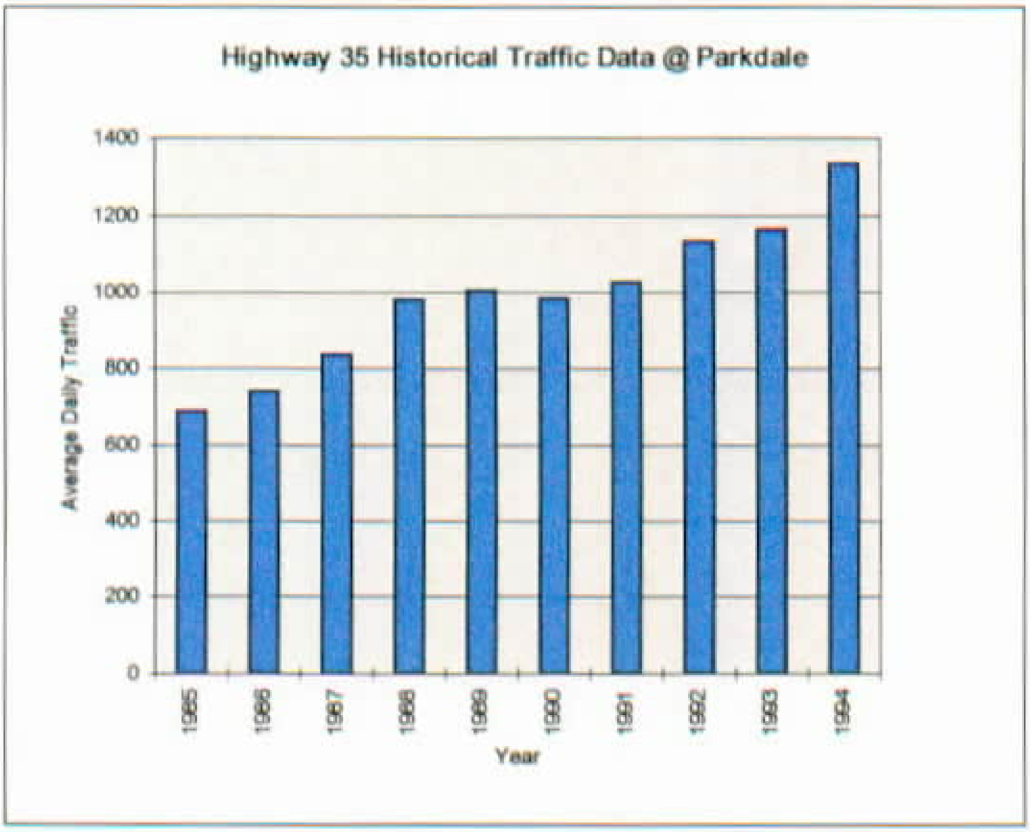
The OHP establishes six access management categories ranging from full control for freeways to partial control for regional or district highways. Generally, the highest potential access category is consistent with existing or planned adjacent land uses. Highway 35 is a Category 4 facility. For the urban portions of the highway, the roadway improvements should provide a minimum distance of 1/4 mile between public roadway intersections and a minimum distance of 500 ft between driveways. The rural portions of Highway 35 should be improved to provide a minimum distance of one mile between public roadway intersections and a minimum private driveway spacing of 1200 ft. Congestion is not currently a problem on Highway 35. Forecasts expect only 3 percent of Highway 35 to experience any congestion in the next twenty years. The US Forest Service, in cooperation with the MHM Ski Area and US Federal Highways, is preparing preliminary designs for an overpass that will improve current congestion at the ski area intersection during winter weekends.

Transportation improvements in the corridor must consider potential environmental, energy, social and economic impacts. The State considers Mt. Hood "Loop" one of the most important recreational drives in Oregon. It has been nominated as an Oregon and National Scenic Byway under the respective Scenic Byway Programs. Highway 35 is a major access road for many popular recreation sites on the forest including Mt. Hood Meadow Ski Area, Cooper Spur Ski Area, Cloud Cap Inn Historic site, several campgrounds and snow-parks.

Road management and maintenance activities can contribute to improve scenic quality along Highway 35. Activities such as clearing brush, erosion control, construction of turnouts, ditch cleaning, etc. can be done to achieve an aesthetically acceptable result. Road management and maintenance activities should be integrated with other viewshed objectives to give the traveler the safest and most enjoyable experience possible. Planning for maintenance and construction for this section of Highway 35 is generally the responsibility of ODOT. Essentially ditches should not dominate the roadside view. Allowing plant cover to grow on the ditch sides and bottom will improve its appearance. Ditch cleaning should be done as infrequently as needed to avoid a raw "scalped" appearance. Seasonal blowdown should be cleaned so that the roadway is open to traffic without causing damage to roadside vegetation and to quickly restore scenic quality along the roadside. Brushcutting maintains driver sight-distance while protecting the scenic quality of roadside trees and shrubs. Mechanized brushcutters sometime leave the roadside with a "battered" appearance. Hand pruning tools are necessary in some area to avoid this problem. Mowing should be infrequent and as narrow as necessary for safety. Wider mowed areas in some areas promote a more natural appearance of the edge between forest and roadway.

In 1994, average daily traffic (ADT) on Highway 35 ranged from 1,800 vehicles near its junction with US 26 to 7,200 vehicles near its interchange with I-84. North of the Mt. Hood Meadows Ski Area access road recorded the lowest volumes of traffic (1,000 ADT). Traffic volumes on highways in the county are steadily increasing. Average daily traffic volumes on Highway 35 increased 103 percent from 1984 to 1994. This resulted in an annual growth rate of 7.1 percent. For Highway 35, the highest travel month is July with about 140 percent of the average daily traffic. The lowest traffic volumes occur in April with about 71 percent of the ADT. Traffic volumes during the winter recreation months are only slightly less that the annual average, reflecting relatively high winter use.

Table C6 - Highway 35 Historical Traffic Data at Parkdale, OR.



recommended pit management plan should maintain Dollar and Shellrock pits as active sites. Other pits should be closed and be restored as funds and projects become available.

### *g) Highway 35*

The Oregon Department of Transportation (ODOT), Hood River County and the cities of Hood River and Cascade Locks are currently preparing a countywide transportation plan. The primary purpose of the effort is to identify issues and objectives for the Hood River Transportation Plan. The findings and recommendations of this study will play an important part in the transportation routes through the East and Middle Forks of the Hood River.

The Hood River-Mt. Hood Summit (Highway 35) Corridor is a major recreation corridor and provides access to rural communities in the upper Hood River Valley. As part of the Mt. Hood Loop, Highway 35 (Mt. Hood highway) connects US 26 and I-84. The corridor functions in the East and Middle Fork watersheds by providing:

- Primary access to Cooper Spur Ski Area and other east side recreation facilities
- Alternative routes from the Portland to Mt. Hood Meadows Ski area and other recreation destinations.
- Truck routes serving lumber mills, orchards and fruit shippers
- Scenic Byways for that portion within the Mt. Hood National Forest

The automobile is the primary mode of transportation in the watersheds. Recreational travel is predominately found on Highway 35 during the weekends. In the winter, weekend travel on Highway 35 is mostly towards snow-based recreation facilities. Highway 35 is the main vehicular route through the East Fork of the Hood River. The Oregon Department of Transportation (ODOT), is the state roading agency responsible for the maintenance of this Byway. This roadway has the greatest potential for reoccurring resource damage within the East Fork Watershed. Primarily, its major influence is its affect on hydrologic conditions. State maintenance crews continue to battle with the effect of seasonal rock fall along "The Narrows" portion north of the Highway 35 and the FSR 44 intersection. ODOT, in it's Hood River transportation plan, identifies this corridor as a major access to recreational opportunities in the upper Hood River valley. Highway 35 is also a redundant link between I-84 and Highway 26. It supports traffic to Mt. Hood Meadows (MHM) and provides through access during I-84 closure. This was the case during the flooding of 1996. Key issues surrounding Highway 35 corridor are:

- No additional expansion in highway capacity, except for climbing/passing lanes and turning lanes
- Promotion of Highway 35 as an alternative to Highway 26 for access to Mt. Hood ski areas and other winter and summer recreation activities
- Protection of the corridor's scenic values
- Addressing safety problems at Mt. Hood Meadows main access road
- Promotion of the use of Highway 35 as a bicycle route

One of the most important facility management techniques to preserve the function of the highway is access management. This regulates the number, spacing, type and location of driveways, intersections and traffic signals. The Oregon Highway Plan (OHP) classifies Highway 35 of statewide importance. The management of this byway is to insure it maintains adequate capacity and serviceable conditions.

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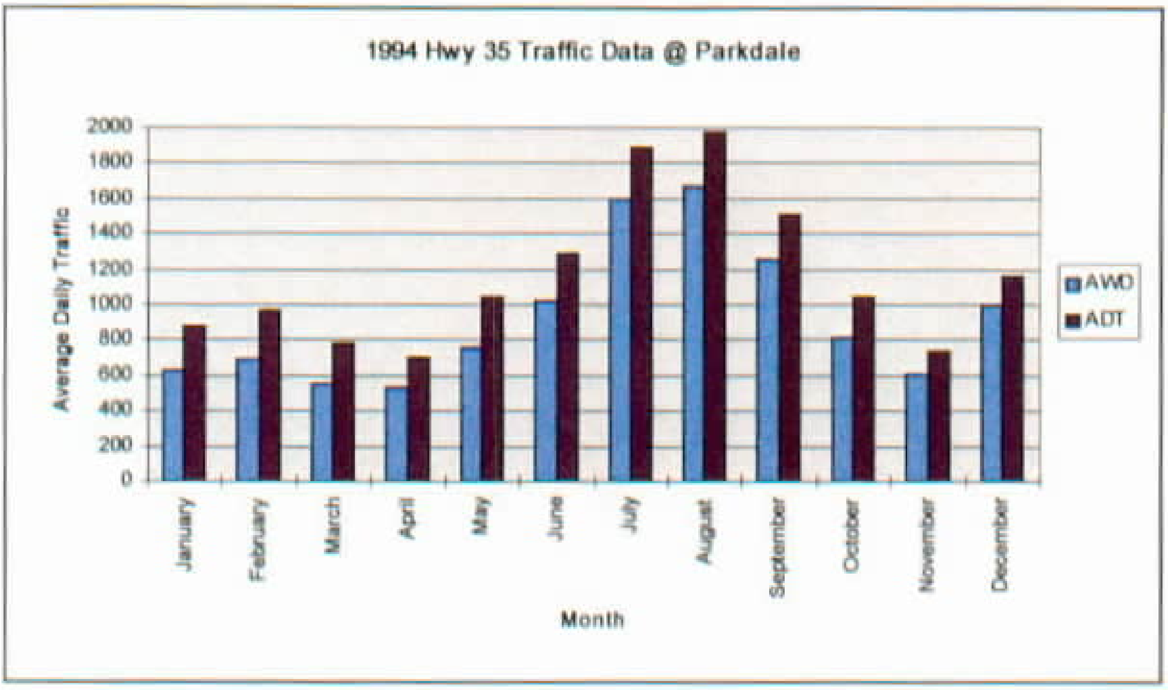


A significant proportion of Highway 35 does not meet current design standards for horizontal alignment, grade, or roadway width. About 60 percent of the roadway includes horizontal curves with design speeds less that the prevailing speed limit. Similarly, about 46 percent of the roadway includes grades that significantly affect truck speed. Nearly one half of the highway has shoulder widths that are less than current six feet minimum standard. The superelevation in highway camber heading southbound from Mt. Hood Meadows is dangerous in icy weather. The undermining of the highway by the East Fork of the Hood River is a continuous problem. Rockfall and erosion from the cut bank of the road contributes to safety concerns. The approach on to Highway 35 from the Odell highway does not allow adequate acceleration for the southbound traffic. There is limited ability to relocate the roadway in "The Narrows" section near Sherwood campground. Raising the grades near agricultural lands creates frost pockets that adversely impacts the orchards along the highway.

The primary maintenance objectives of the state are to: maintain the roadway surface at 90% fair/better by the year 2010 and develop a rockfall management program that addresses rockfall problems near Parkdale and in "The Narrows" portion to the highway. The state wants to address drainage problems including those that affect the function and condition of the roadway along Clark Creek, water ponding and lack of appropriate drainage systems for older sections of the highway.

The 1994 accident rate on Highway 35 from its intersection with US 26 to Mt. Hood-Parkdale was more that twice the state average for primary systems, rural non-freeways. This is due to hazardous driving conditions during inclement weather and sharp horizontal curves particularly at the Mt. Hood Meadows' access road. Several intersections on Highway 35, i.e., at the Odell, also experience safety problems due to lack of visibility, steep grades, or other factors. Seasonal migration of large animals causes vehicular accidents. Opportunities exist for more automated signs to inform motorists of delays from congestion accidents, or upcoming hazards.

## Other Transportation

### a) Air Service

There are four airports in the county of Hood River. Privately operated Hanel Airport, located near Highway 35 south of Odell, is the closest air facility to the two watersheds. Only one improved helicopter landing site exists within the watersheds. The watershed contains several military flight corridors. Units of the Oregon Air National Guard, especially the 304th ARRS, routinely use these flight routes for training and rescue operations. A small but growing following of para-glider recreationists launches from Bald Butte. They typically soar within the Highway 35 corridor and land on private land near the Hood River Ranger office.

### *b) Bicycles*

Highway 35, as well as most state highways in the area, should provide facilities for the general needs of bicyclists. Highway 35 had been designated a statewide bicycle route. Because of this designation, Highway 35 receives priority funding for cycle-related improvements. Current bicycle facilities on Highway 35 have a combination of shared roadways and shoulders. The county's Draft Bicycle Plan identifies a number of proposed improvements to bicycle facilities. Opportunities exist to widen or pave the shoulder above Sherwood Campground, improve signing and adding/improving bike lanes or widening shoulders as part of planned highway reconstruction. There are conflicts with autos and truck traffic as well as a lack of bicycle facilities.

### *c) Pedestrian*

Pedestrian facilities within the watersheds are minimal. Mainline routes have at most a paved shoulder. The abundance of trails allows recreationists an opportunity to walk in secluded forests to gain a wilderness experience. Congestion at campgrounds, trailheads and crossings at peak times causes safety concurs.

### *d) Public Transit*

The Hood River County Transit District coordinates public transit service within the county. The District provides demand-responsive services countywide including a shuttle to Mt. Hood Meadows Ski Area on weekends and holidays during the ski season. There is a lack of public awareness of available services for mass transit and the insufficient demand does not support these services. The creation of a multi-modal transportation center at Hood River may improve the use of public readership from the metropolitan areas to and through the watersheds.

### *e) Rail Service*

The Mt. Hood railroad branch-line runs south from Hood River alongside the Highway 35 corridor. The majority of revenues for the railroad come from providing tourist excursions to Parkdale, with the balance of operating revenues derived from hauling freight (primarily wood products). Constraints to providing an increase in rail opportunities to the watersheds include the low demand for freight movement. The recent rural growth has created a potential safety risk for at-grade crossings. Again, the lack of an intermodal center at Hood River discourages continuous travel and affects the rail versus truck shipping rates.

### *f) Truck Freight*

Truck volumes on Highway 35 as well as other roadways in the county are low. In 1992, average daily truck volumes on Highway 35 were 499. During the same year, 400,000 net tons of freight, consisting mostly of fresh fruit and wood products are transported. Conflicts do occur between farm vehicles and autos in the upper valley. During winter conditions, inadequate chain-up areas cause congestion on the lower section of Highway 35. Chain-up areas near Pocket and Clark Creek quickly become filled on snowy winter weekends.

### *g) Water Transportation*

Generally there are no navigable streams in either watershed. There does appear to be an increase in kayak use on the lower reaches of the East Fork. Laurance Lake provides for non-motorized watercraft. Tributaries to Laurance Lake are not navigable.

### *h) Connectivity and Appropriate Travel Times*

Good connectivity among communities and other key locations is a goal to the Oregon Transportation Plan. Highway 35 connects the Columbia River Gorge to Mt. Hood and Central Oregon. The increasing congestion associated with tourism/recreation is at issue. The Mt. Hood Meadows Master Plan identifies mitigation measures available to reduce this winter congestion on Highway 35. Physical constraints on capacity expansions and geometric improvements limit highway improvements. The potentials for landslides along the Gorge make the Highway 35 corridor a redundant route for east-west traffic.

## *Transportation Concerns*

### *a) Natural Resources*

The transportation system is responsible for being environmentally responsible and encourages consideration of natural resources. Highway 35 runs through special management areas for deer and elk winter range (B10) and habitat of the Northern Spotted Owl as well as other critical wildlife habitat. The East Fork has an impact on the anadromous fish as well as sensitive habitats and migration routes from big game to local slow moving mollusk and small home-range animals. Transportation improvement projects must rectify negative impacts by considering adequate signs for big game viewing areas, construction of elevated highways versus fill and removal/modification of barriers to fish passage.

### *b) Water Quality/Quantity*

Roads and highways within the watershed traverse or parallel numerous creeks and rivers. Transportation facilities affect water quality principally through pollutants and sediment loading of surface runoff from paved and aggregate surfaces. There is also the potential for contamination of ground water from motor vehicle fuel or hazardous toxic cargo spills. Sand and gravel used for snow and ice control enters the waterway. Multiple river crossing increase sedimentation to these areas.

### *c) Sanding*

The effect of sanding for winter transportation safety within the East and Middle Forks of the Hood River is observed primarily on Highway 35, the access roads to the Mt. Hood Meadows and Hood River Meadows ski areas and their respective parking lots. Hood River County conducts sanding along roads in the upper valley during snowfall. The amount of material applied to these roads has been limited due to the increased costs of material, lack of availability and the reduction in highway maintenance funds. Generally only curves, steep grades and historically accident prone locations are heavily sanded. The access roads and parking lots associated with the ski area receive a disproportionately large sanding effort.

The Oregon Department of Transportation places approximately 1000 c.y. of aggregate a year on the portion of Highway 35 from Parkdale to Bennett Pass. The rate of application is generally 0.75 c.y./mile and varies with location and snow conditions. This is generally equivalent to a total of 0.1" of sanding material on Highway 35 through the winter season. The state normally applies sand on Highway 35 either at known dangerous locations during a snowfall or throughout the system after the storm. The "footprint" of the effects of sanding initially cover the road surface. Material removal from the road surface is either through plowing, blown off the road by traffic as the surface returns to bare pavement or brushed off to the shoulder in the spring. The propensity for deposit of sanding material is out to 25' from the edge of road and caused by the accumulation of material retained in the scraper bank. The next 25' is that deposit from the plow and blower that made it over the scraper bank. Plows traveling a high speed can throw snow this distance. The area out to 75' from the edge of road has sand deposits left from the blower only. This equipment is used when the plow is unable to push the snow over the scraper bank. The sand is recovered, when possible, at bridge crossings and stream side locations such as The Narrows.

The same amount (1000 c.y.) is used to sand the 3.6 miles of access roads to Mt. Hood Meadows Hood River Meadows (FSRs 3555 and 3545) and the 19.3 acres of parking area. This equates to an annual placement of 0.4 inch of sand. The location of the East Fork headwaters of the Hood River is adjacent to the parking lots and accepts much of the material during the spring thaw.

The Forest Service prohibits the state from using the White River sand pit, which has for years been the primary source of sanding material for their needs. This material was dense graded lava ash that was porous and susceptible to abrasion into smaller fines. The recent move to Columbia River Basalt now requires an open-graded 3/8"-#10 chip that is more dense and less prone to movement erosion within the ditchline.

As a result these changes in sanding techniques and the materials used, the detrimental effects of sanding to the stream characteristics are within the parameters of desired future conditions. The limited sanding locations maintain public safety without depositing an excessive amount of material in the ditchline.

# *REFERENCES CITED*

Burroughs, E. R. *Predicting Onsite Sediment Yield from Forest Roads,* Intermountain Research Station, US Department of Agriculture, US Forest Service, Moscow, ID 83843.

Burroughs, E. R. *Reduction of Soil Erosion on Forest Roads,* Intermountain Research Station, US Department of Agriculture, US Forest Service, Moscow, ID 83843, 1989.

Elliot, W. J. *A Tool for Estimating Disturbed Forest Site Sediment Production,* Intermountain Research Station, US Department of Agriculture, US Forest Service, Moscow, ID 83843, 1993.

Foltz, R. B. *The Effect of Aggregate Quality on Sediment Production from a Forest Road,* Intermountain Research Station, US Department of Agriculture, US Forest Service, Moscow, ID 83843, 1994.

Foltz, Randy B. *Traffic and No-Traffic on an Aggregate Surfaced Road: Sediment Production Differences,* Intermountain Research Station US Department of Agriculture, US Forest Service, Moscow, ID 83843, 1996.

Mt. Hood National Forest, Hood River Ranger District, Access and Travel Management Implementation Guide,. 1993.

Mt. Hood National Forest, *State Highway 35 Viewshed Management Guide,* Hood River Ranger District, 1991.

Mt. Hood National Forest, Hood River Ranger District, Access and Travel Management Guide. 1993.

Oregon Department of Transportation, "Traffic Counts", 1985-1994.

Oregon Department of Transportation, *Hood River Transportation Plan Preliminary Issues and Objectives,* April 1996.

# RECREATION REPORT

## *EAST & MIDDLE FORKS OF THE HOOD RIVER WATERSHED ANALYSIS*

Prepared by: Kevin Slagle, Recreation Planner
Hood River Ranger District
Mt. Hood National Forest
June 18, 1996

## *Wilderness*

Use in the Mt. Hood Wilderness has increased significantly over the last 10 years. Elk Meadows, Cloud Cap/Cooper Spur area, Gnarl Ridge, and the Timberline Trail, especially Cloud Cap to Elk Cove all exceed standards for encounters (an indicator of solitude). The number of encounters on Eliot Glacier, and the demand for outfitter guide activities associated with ice climbing are above standards. Demand seems to be growing at a steady rate. It is likely that the numbers of users will be restricted within the next decade to conform with wilderness standards. This will displace probably 1/3 to 1/2 of the estimated 8,000 RVD's in the portion of the Mt. Hood Wilderness within the East and Middle forks to other recreation areas in the Badger wilderness, or in trails outside wilderness, perhaps in the East Fork Drainage.

Climbing on north side routes seems to be fairly constant over the recent years, and currently within standards. We do not have real accurate data on this, but are continuing to collect. If the South Side climb on Mt. Hood is regulated, it is likely that more climbers will attempt the north side routes (Cooper Spur, Sunshine mostly), thereby decreasing the outstanding opportunities for solitude and risk there.

The Mt. Hood Wilderness provides opportunities in the primitive and semi-primitive end of the spectrum, and is designated to do so throughout time. No other areas are so reserved, and will continue to experience increased use, given current Forest Plan direction.

The Wilderness provides the only opportunities in the drainages to experience alpine and sub-alpine zones, and to experience and study ecosystems in a near natural state.

Mt. Hood also provides the only opportunities for climbing, ice climbing, glacier travel, and ski-mountaineering within the drainages.

## *Rock Climbing*

Rock Climbing. A unique opportunity for rock climbing exists at Pete's Pillars (a.k.a. Pete's Pile) just above Polallie Creek, on the East Side of the East Fork. If Hwy. 35 is widened through the narrows, the rock formation may be damaged, removed, or the access made difficult. Safety of motorists may also restrict opportunities if the highway is widened. The closest easily accessible rock climbing opportunity is Horsethief, near Dallesport. Pete's Pillars is not yet popular, but may become very popular in the next decade.

## *Nordic Skiing*

Nordic Skiing: Opportunities for Nordic skiing have been increased by timber harvest in the area, expansion of the Teacup System, an expansion of the Mount Hood Meadows system. Demand for traditional Nordic touring appears to be flat or declining in the last 5 years, with an adequate supply in these drainages. Demand for quality groomed track Nordic, and backcountry touring and telemarking seems to be growing. An opportunity of combining Mount Hood Meadows and Teacup Systems exists.

## *Developed Ski Areas*

### *Mt. Hood Meadows Ski Area*

Mt. Hood Meadows is the second largest ski area in Oregon with 360,000 skier visits during the 94/95 season. Summer use of the area is limited to ski camps, dispersed users, and the restaurant. An SEIS will be issued this summer to consider expansion of the PAOT, permit area, and a summer use program. A decision on the expansion is expected in the fall of 1996.

### *Cooper Spur Ski Area*

The Cooper Spur Ski Area may go through expansion. Only a small portion of the land designated available for development in the Forest Plan is currently developed. Though many ideas for expansion have been proposed in the last 10 years, a master plan has not been initiated.

### *Cloud Cap/Tilly Jane Historic District*

A management Plan for the Historic District is currently being written. A summary of the DFC for the various buildings and campgrounds is below.

#### *General*

The potential for attracting more people to the area to appreciate the historic district, and participate in events at the amphitheater is recognized in the management plan. The draft management plan proposed that events and group camps be encouraged in the area.

#### *Legion Cook Shed*

Offer for adoption by volunteer or permittee (Outfitter/Guide is currently interested). Continue to use for winter shelter open to public 50-75% of time. Expand summer use in conjunction with the amphitheater.

#### *A-Frame*

Continue use as winter shelter, and operation by Majestics under volunteer agreement. Available for public use 75% of time. Expand summer use.

#### *Tilly Jane Cabin*

Continue use as winter destination shelter, operated by Oregon Nordic Club under Volunteer Permit. FS to operate as a GT rental in the summer.

#### *Cloud Cap*

Continue as Special Use to Crag Rats. Expand interpretation and public use as outlined in Master Plan prepared by Crag Rats.

#### *Cloud Cap Saddle Campground*

Delineate and improve sites as funds allow. Replace Toilet as funds allow. Move to concession site in 1997.

#### *Tilly Jane Campground*

Restore to original 26 campsites, all as walk-in from the current parking. Place under concession in 1997. Replace damaged toilet, as well as adding two toilets. Delineate campsites and walking paths. Manage vegetation and traffic to restore understory and provide more light in the campground.

## *Trails*

Use has continued to increase in mountain biking, and hiking. Our most popular trails, Tamanawas in particular, are overcrowded on many weekends, decreasing the quality of the experience. Mountain biking use has increased dramatically over the past decade, and the quality of the trails is decreasing, owing to a large part to their design (being for hiker and horse use), and the volume of use. Recently implemented seasonal closure of trails, and hardening of selected areas should help to alleviate the problems, but the large numbers of bikers will continue to place wear and tear on trails.

Strategy for Trails in the East Fork/ Middle Fork area, based on the Hood River Access and Travel Management Plan:

### ***Build two new mountain bike/horse/hike trails near Laurance Lake***

Two new trails have been designed for mountain bikes and horses in the Laurance Lake area, but funding for trails construction in the region has been severely cut. The trails were scheduled to be built in 96 and 97, but funding is now uncertain. Construction of these trails would decrease demand on the trails near Hwy. 35, and should be available for a summer long use season due to resilient soils. Most trails in the Hwy. 35 area will be subject to seasonal closure to protect the integrity of the tread in powdery soils.

### ***Build two new trails in the East Fork***

Another proposed trail is from Robinhood campground to Elk Mountain area. This would be a popular route from Robinhood, and other proposed campgrounds in the drainage. The trail would be open for hikers only.

Another proposed trail would loop with the east fork trail from Robinhood to Sherwood, on the east side of the Highway. The trail would be open to hikers and mountain bikers.

***Reconstruct trails in the East Fork***

Additional work is needed on three trails in the East Fork watershed as a result of storm damage or heavy use. The Dog River Trail will require reconstruction to make it able to withstand heavy mountain bike use. Reconstruction of the Polallie Trail Bridge that was destroyed as a result of the 1996 flood. The East Fork Trail #650 was also damaged during the 1996 flood and will be relocated and reconstructed.

***Restore access to Zigzag Trail.***

The bridge to the Zigzag Trail was made inoperative when the river shifted in the winter of 95/96. A new bridge should be installed, or the trail rerouted from the highway bridge to the south of Polallie Campground.

***Build two new trails in the Cloud Cap/Tilly Jane Historic District***

Build two short trails to Wallalute Falls, and the Falls on Polallie Creek. This would be very popular and ease the demand on Tamanwas trail.

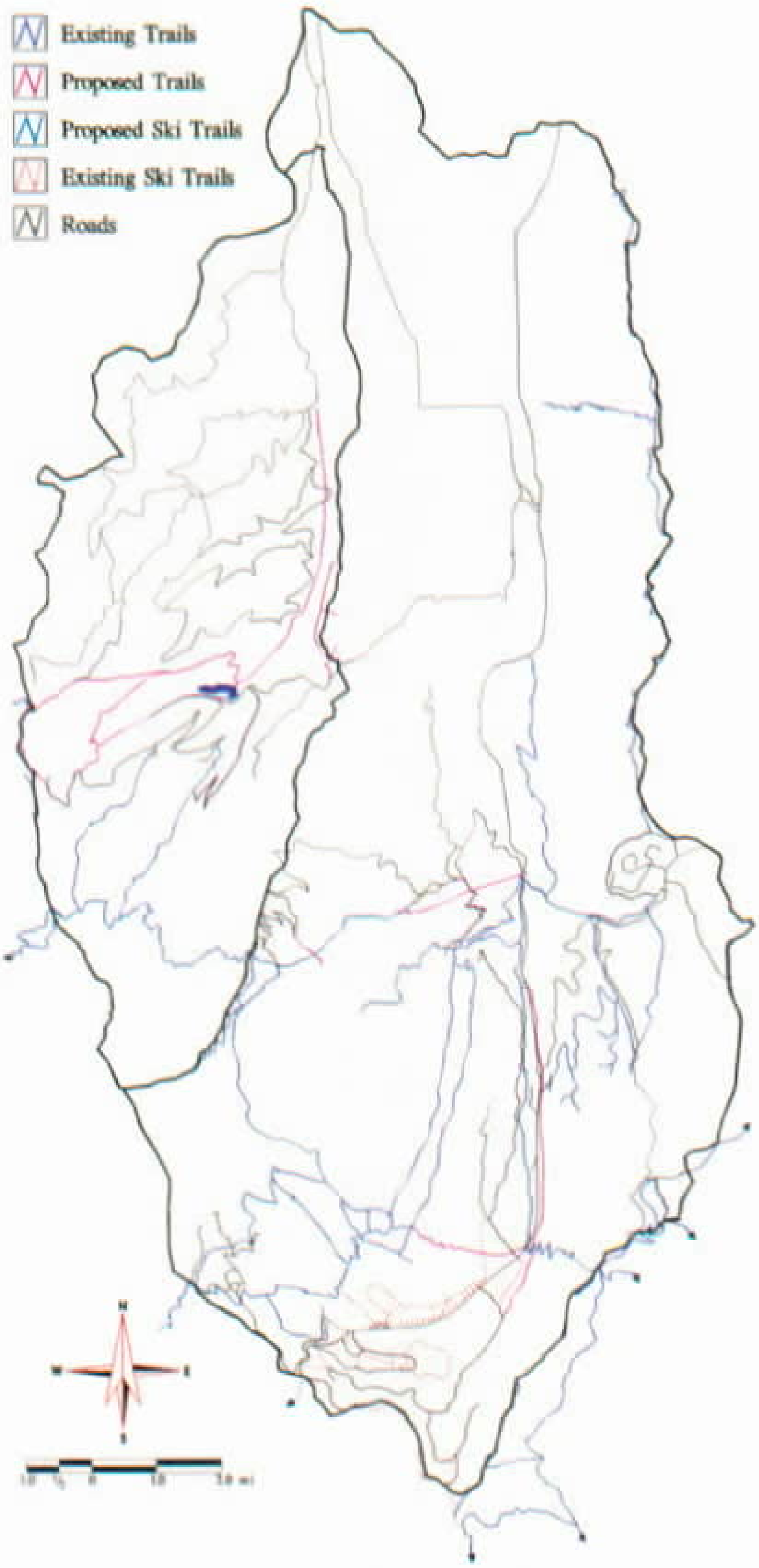


Figure 1. - East Fork and Middle Fork Trail System (Existing & Proposed).

## *Camping*

### *Laurance Lake Area*

Camping used to occur along Clear Branch, and around the Kinnikinnick area. Due to concerns about Bull trout, and water quality in Clear Branch, the road has been closed at Kinnikinnick. A pit toilet, and some tables exist there now, but camping is non-fee, and largely unregulated.

#### *Proposed Strategy*

A proposed strategy for the area would be to upgrade the toilets at Kinnikinnick, and place a toilet at Clear Creek. Twenty fee sites, and five picnic sites could be developed at Kinnikinnick, and 5-10 "bike-in" sites up Clear Creek. This proposed strategy would require additional analysis and an Environmental Assessment to determine whether the proposal is consistent with the Aquatic Conservation Strategy (ACS) in the Northwest Forest Plan.

Trail head parking for the planned Laurance Lake loops could be near Kinnikinnick, near the Dam, or further east.

### *Hwy. 35 Corridor*

#### *Current Situation*

Developed camping is at or near capacity for the peak use season. Facilities at Robinhood and Sherwood, the only two developed campgrounds in the study area, are old, worn out, and not designed for modern vehicles.

Any further increase in use will continue to degrade the facilities, and degrade the user experience. Little opportunity exists for expansion of current facilities, and Forest Service Recreation Construction funding for development of a new campgrounds is highly unlikely.

Dispersed camping is very popular within the East Fork Drainage. Many user created roads and campsites exist between the highway 35 and the East Fork. These sites continue to expand over time in number and in size. Many roads and sites have been blocked off, but are often circumvented by users within a short time. The dispersed sites are having a negative effect on water quality from human waste, petroleum products, and erosion caused by roads, and loss of riparian vegetation. Many sites are greater than 1,000 square feet, and are located immediately adjacent to the river.

#### *The Next Decade and Beyond*

The demand for camping and day use is expected to increase as the population of the Portland metro area increases, and the population of "the Loop", and "the Gorge", as a regional, National, and International destination increases. The demand for developed sites is expected to more than double in the next decade. If mare developed sites were available now, they would be full on most weekends. Dispersed camping demand is also rising, as more people discover the joys of dispersed camping, and as more and more roads and traditional dispersed campsites are closed because of lack of maintenance funds, and resource concerns.

#### *A Proposed Strategy for Camping and Day Use for the East Fork*

A proposed strategy for providing camping opportunities and mitigating resource impacts for the East Fork area includes:

- Close the area between Hwy. 35 and the river, from Polallie to Pocket Creek Snow Park (or Bennett Pass) to dispersed camping, except for 15-20 sites designated by carsonite posts, and parking spots.
- Establish information Kiosks at Polallie, and Bennett Pass to inform people of regulations, and opportunities as they enter the area.
- Convert Nottingham to a Developed Fee site with toilets, but no potable water away from the East Fork Hood River.
- Develop a day use site at Polallie, and at the Tamanawas Trailhead.
- Develop two walk-in campsites with about 15 sites each at Tamanawas and old road 630.
- Use Little John as an Industrial camp, and Group Use site.
- Complete restoration/reconstruction of Robinhood.

*Details of the Proposed Strategy*

The proposed strategy outlined below would require additional analysis and an Environmental Assessment to determine whether the proposals are consistent with the Aquatic Conservation Strategy (ACS) in the Northwest Forest Plan.

- ***Close the area between Hwy. 35 and the river, from Polallie to Pocket Creek Snow Park (or Bennett Pass) to dispersed camping, except for 15-20 sites designated by carsonite posts, and parking spots.***

  This would greatly reduce impacts on the riparian area, as well as provide some dispersed camping opportunities, in a managed setting. The designated spots could easily be monitored for increase in size, or vandalism to barriers. People unfamiliar with the area would also be able to disperse camp in desirable spots. Information on dispersed "no-trace" camping could be placed on the entry Kiosks, and in a brochure (I have an example from BLM in Moab).

- ***Establish information Kiosks at Polallie, and Bennett Pass to inform people of regulations, and opportunities as they enter the area.***

  This Kiosk could serve winter as well as summer visitors. It could include a map of the camping, picnicking, and trail opportunities. Dispersed camping regulations and suggestions could be on the board.

- ***Convert Nottingham to a Developed Fee site with toilets, but no potable water.***

  Another possibility for increasing the number of developed sites in the area would be to convert Nottingham to a developed site through re-design, and the installation of toilet facilities. Approximately 10-15 car camp sites could be accommodated in the currently disturbed area. Sites would be located back from the water. The area would receive more attention and care as a developed site.

  Current policy allows charging for sites without water. If developed sites contain a picnic table, fire ring, parking spur, toilet, and garbage service they can be a charge campground.

- ***Develop a day use site at Polallie, and at the Tamanawas Trailhead.***

  Day use (picnic) sites currently exist only at Robinhood and Sherwood campgrounds. The addition of these two sites would greatly enhance opportunities. The Toilet at Tamanawas could also serve the proposed walk-in campground.

- ***Develop two new walk-in campsites with about 15 sites each at Tamanawas and old road 630.***

  One opportunity would be to develop 10-15 sites at the East Fork/Tamanawas trail head, by having campers cross the bridge to sites on the west side of the river, located outside of the riparian zone. A day use area could be developed at the trail head, with toilets shared by all users on the east side of the river. The trail head could be paved, and parking capacity expanded by designating parking spaces.

  Another opportunity exists across the river from the 630 road. A single log bridge could be placed across the river, and 10 to 20 campsites could be located on the rehabilitated roadbed on the west side of the river. Toilets could be located on the east side of the river, along with a few drive in campsites.

  Although not all campers like walk-in sites, the unique character, and good recreation opportunities would draw tent campers currently using the Robinhood and Sherwood camps. The walk-in camps established at Lost Lake in 1992 have been very popular. Both locations would be on mountain bike trails, and would allow "bike-in" camping.

- ***Use Little John as an Industrial camp, and Group Use site.***

  This would eliminate the camping of industrial campers (contractors, loggers, etc.) from the dispersed sites. Toilets and a shelter area available at Little John (a winter snowplay hill). Occupation by contractors, and group users (like archery events), would help deter vandalism.

- ***Complete restoration/reconstruction of Robinhood***

  A Restoration/reconstruction plan exists for Robinhood that would accommodate modern camping vehicles, and reduce impacts to the riparian area.

***Management of Camping and Day Use in the Highway 35 Corridor***

The above mentioned developed fee campground opportunities could easily be incorporated into the concession contract currently in place in the East Fork, and would enhance the contract through economy of scale. Currently about 15% of gross receipt are available through the GT contract for heavy maintenance of the recreation sites. We are also charging for parking at day use to cover costs of toilet and garbage service. The day use areas could also be incorporated into the concession contract.

The Polallie trail head should be moved to the west side of Highway 35 to provide safer access to the East Fork and Elk Meadows Trails, and allow day use parking at Polallie. The entry Kiosk could also be located here so people would not have to cross traffic.

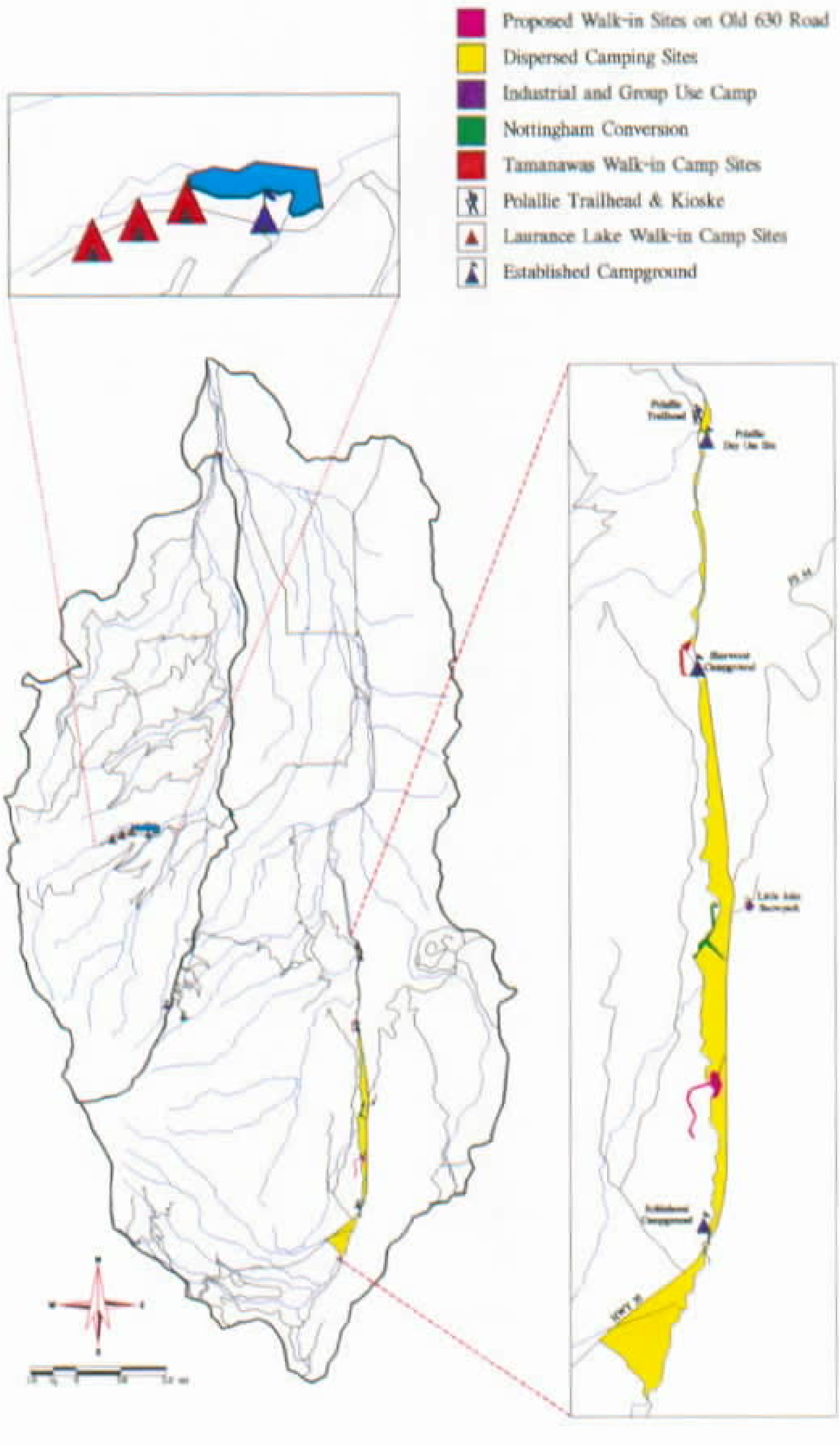


Figure 2. - Strategy for Camping at Laurance Lake and the Highway 35 Corridor.

# *FIRE REGIMES & FIRE HISTORY REPORT*

## *EAST & MIDDLE FORKS OF THE HOOD RIVER WATERSHED ANALYSIS*

Prepared by: Heidi Hubbs, Assistant Fire Management Officer
Hood River Ranger District
Mt. Hood National Forest
May 24, 1996

## *Historic Vegetation / Fire History*

### *Patterns*

It is difficult to assess the pattern of past fire events in the Middle and East Fork watersheds due to the amount of settlement and agricultural activity within the watershed. Settlement first began in the watershed in the mid 1800's. At that time much of the watershed was forested or open forested stands.

Settlement, even today, is confined to the lower, mid valley portion of the watersheds.

The mid to higher reaches of the watershed are primarily forested with about half the area's forests originating between 1850 and 1935, and the other half since that period. These areas were the result of a combination of logging and burned areas. Many of the burned areas appear to be the result of fires set to clear roads and travel systems, plus burning in the lower portion of the watershed for agriculture and homestead sights.

Remnant older stands are found scattered throughout the watersheds and are frequently associated with riparian areas and wetlands. Other riparian areas, primarily intermittent streams and in the upper reaches of the watershed, were completely burned over except for some scattered individual trees.

A wildfire patch size and early seral percentage was derived for the early 1900s using the mid 1930s panoramic photographs taken from lookout location on the Forest. During this process it was difficult determining natural caused fires from agricultural related events. In getting this information for the watersheds an area was used in the upper valley furthest from areas of settlement and detached from most trail systems. (Figure 1.) From this information we determined about 12 percent of the wildfires, 3401 total acres (average patch size of 62 acres), in the East Fork watershed were thought to have been natural starts for the period around 1900. This does not mean that a higher percentage would not have occurred had human intervention not managed stands to such a high degree. It also does not mean that these figures are fully representative of the entire watershed. Wildfire patches in the watershed , outside of the sample area, were found to be much larger, ranging in size well over 1000 acres. Under natural conditions in these watersheds, fire patch sizes in the lower valley would have been smaller and fire scars would have dominated the upper ridge areas not the lower valley as was the case. This is due to natural fire starts being lightning generated and occurring predominantly on ridge tops and mid-elevation levels.

It should also be noted that open stands to the East along Surveyor Ridge are thought to have been maintained during presettlement by Native Americans using the area. During the late 1800s to early 1900s these stands are thought to have been managed by fires set for the clearing of agriculture land.

### *Suppression*

Fire suppression on National Forest System Lands within the watershed began in the late 19th century. Historic fire records have not been compiled and analyzed at this time to give accurate data of ignition starts for the two Watersheds. It is assumed due to present day observations, that lightning strikes were common in the upper ridges at the south end of the East Fork Watershed bordering Mt. Hood and even more so on the southwest ridge tops of the Middle Fork Watershed. These fires undoubtedly started on the ridge tops and worked their way into the valley bottoms. It is unknown what patch size was developed by these fires, but due to the stand types present (Fire Groups 6 & 8), they had the potential of reaching 1000+ acres in size.

## *Fire Regimes*

The Mt. Hood National Forest has been divided into eleven fire ecology/fire regime groups based on vegetation(plant associations), fire frequency, and fire behavior (Evers et al., 1994).

### *The Middle Fork Watershed contains four of these groups; four, six, eight, and ten.*

Fire Group Four includes the moistest grand fir associations. This group can appear quite low in steep narrow canyons along perennial streams and in cool, moist air drainage's. This group experiences little fire and often serves as fuelbreaks to ground and surface fires. Fires in these stands produce a mosaic of seral communities. These stands have fire return intervals ranging from 70 to 200 years.

Fire Group Six are the cool, moist lower subalpine stands which incorporate the wetter portion of the transition zone on the eastside and only at the higher elevations. That is, in areas of heavy snowpacks, short growing seasons, frequent frost, and cold, moist soils. Fires within these stands tend to be large (1000 + acres). Fire history information is scarce but is estimated at a return interval of 170 to 430 years.

Fire Group Eight includes most of the western hemlock and Pacific silver fir plant associations found in the mid-Columbia. It reflects a warm, moist climate to the west, gradually shifting to a cooler and drier climate to the east. Recent fire history of these stands suggest that most fires are either very small (less than 10 acres) or very large (greater than 1000 acres). Mid-sized fires are not unknown but appear to depend on a combination of dry conditions and light to moderate winds. Fire frequencies range from 50 to 200 plus years in western hemlock associations and 170 to 300 years in Pacific silver fir associations.

Fire Group Ten occurs above the climatic limits of Douglas-fir and many area above lodgepole pine. Sites are generally cold, moist, rocky or sandy, snowbound, unproductive, and otherwise resist the start and spread of fires. Although thunderstorms may be common, sufficient rain usually reaches the ground to greatly restrict the start and spread of fires. If fires do occur in these stands they tend to be small, less than 1000 acres and confined to single drainage's. Fire return intervals for these stands range from 200 to 300 years or longer, with a slow vegetation recovery due to harsh conditions.

### *The East Fork watershed contains eight fire regime groups; one, two, three, four, five, six, eight and ten.*

Fire Group One appears on western to southern aspects at mid to low elevations. These are the hot, dry pine/oak/Douglas fir stands. This fire group is often associated with fire group two. These stands climax to Douglas-fir communities. Fires maintain these stands in an open Ponderosa pine/Oregon white oak community with frequent, low intensity fires. The expected fire return interval is 5 to 25 years, with an average of 10 years. Stands with a high Douglas-fir seral component can go as long as 45 years between fire returns. Oregon white oak is a declining stand type due to Douglas-fir replacement.

Fire Group Two is found in the same general elevation as group one and higher on the slopes. These stands are predominantly Douglas-fir and grand fir with a mix of ponderosa pine and Oregon white oak as a minor species. Fire frequency range from 5 to 45 years.

Fire Group Three generally moister than Fire Group Two, but still very dry. Common seral conifers include ponderosa pine, Douglas-fir, lodgepole pine, western larch, with some Oregon white Oak. These stands are dependent on high intensity stand replacement fires plus low intensity ground fires. Fire generated patch size range from a low end of 10 acres to the high being greater than 1000 acres. Historically fire would have generated patch sizes of 10 to 1000 acres. Fire return intervals are 25 to 100 years.

Fire Group Four includes the moistest grand fir associations. This group can appear quite low in steep narrow canyons along perennial streams and in cool, moist air drainage's. This group experiences little fire and often serves as fuelbreaks to ground and surface fires. Fires in these stands produce a mosaic of seral communities. These stands have fire return intervals ranging from 70 to 200 years.

Fire Group Five consists of high elevation plant associations east of the Cascade crest where huckleberries and beargrass are the major understory plants. This group, coupled with Fire Group Six comprise transitional forests between eastside and westside. Fire Group Five occupies drier, colder sites than Group Six. There is minimal stand fire history information available on these high elevation areas, at best we estimate a return interval of 200 to 270 years.

Fire Group Six incorporates the wetter portion of the transition zone on the eastside and only at the higher elevations. That is, in areas of heavy snowpacks, short growing seasons, frequent frost, and cold, moist soils. Fires within these stands tend to be large (1000 + acres). Fire history information is scarce but is estimated at a return interval of 170 to 430 years.

Fire Group Eight includes most of the western hemlock and Pacific silver fir plant associations found in the mid-Columbia. It reflects a warm, moist climate to the west, gradually shifting to a cooler and drier climate to the east. Recent fire history of these stands suggest that most fires are either very small (less than 10 acres) or very large (greater than 1000 acres). Mid-sized fires are not unknown but appear to depend on a combination of dry conditions and light to moderate winds. Fire frequencies range from 50 to 200 plus years in western hemlock associations and 170 to 300 years in Pacific silver fir associations.

Fire Group Ten occurs above the climatic limits of Douglas-fir and many area above lodgepole pine. Sites are generally cold, moist, rocky or sandy, snowbound, unproductive, and otherwise resist the start and spread of fires. Although thunderstorms may be common, sufficient rain usually reaches the ground to greatly restrict the start and spread of fires. If fires do occur in these stands they tend to be small, less than 1000 acres and confined to single drainage's. Fire return intervals for these stands range from 200 to 300 years or longer, with a slow vegetation recovery due to harsh conditions.

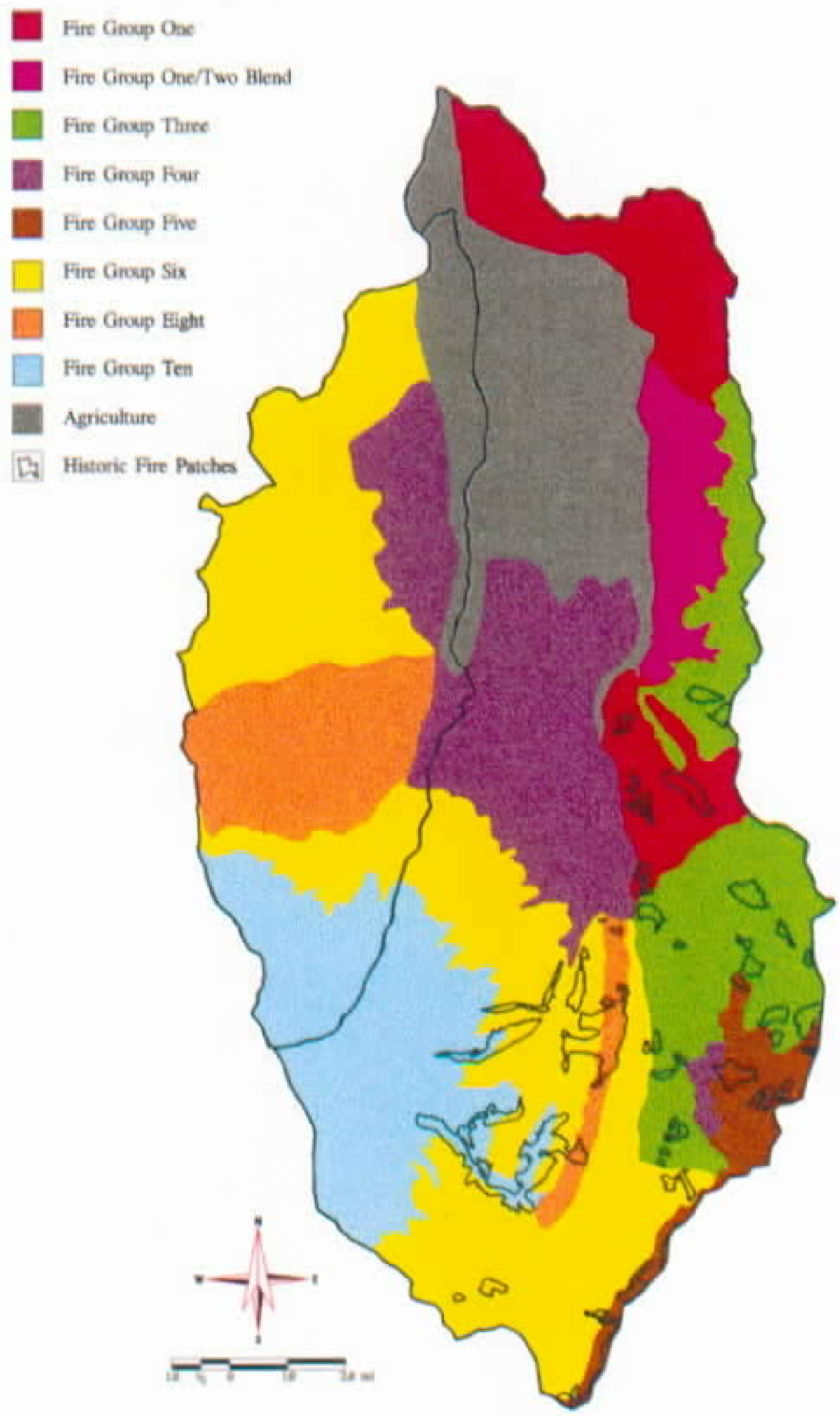


Figure 1. Fire Groups and Early Seral Fire Patches ~ 1900.

# *GEOLOGY REPORT*

## *EAST & MIDDLE FORKS OF THE HOOD RIVER WATERSHED ANALYSIS*

Prepared by: Doug Anderson, Geologist
Mt. Hood National Forest S.O. Geotech Division
April 8, 1996

## *INTRODUCTION*

The Middle and East Fork of the Hood River Watershed extend length-wise from the peak of Mt.Hood down the northeasterly flank into the Columbia River. The widest area of the hydrologic boundaries of these two sub-watersheds of the Hood River cover the land between Blue Ridge in the west to the peak of Shellrock Mountain and Rim Rock in the east. The headwaters drain radially off Mt. Hood and then run to the north where they spill into the Columbia River. The Middle and East Forks combine two miles before the West Fork enters the main stem of the Hood River. At this point, it is about 11.5 miles to the Hood River's confluence with the Columbia River.

The watershed is dominated by the large stratovolcanic cone of Mt. Hood. The cone was constructed of relatively recent lava flows and pyroclastic flow deposits on an eroded platform of older volcanic rocks. Mt. Hood has undergone considerable glacial erosion. The glaciers that remain high on its flanks are mere remnants of what they once were. Beyond the base of the Mt. Hood volcano the older volcanic rocks form lower elevation ridges and drainages. The upper Hood River valley is another major feature of this watershed. The valley was partially created by faulting along the east edge of the valley by down-dropping of the west side of the fault. This north-south oriented fault is called the Hood River Fault. The steep eastern valley wall is called the Hood River Escarpment. The valley floor is underlain by pyroclastic-flow and debris flow deposits from Mt. Hood.

This watershed contains many areas of steep slopes that are conducive to landslides. The long steep gradients present on the sides of Mt. Hood allow mass-wasting events to gain size and destructive force prior to reaching gentler slopes. The Polallie Debris Flow of 1980 is an example of the type of catastrophic debris flow that can occur after initiation by a medium sized landslide. These types of debris flows will be discussed in detail later in this report.

## *GEOLOGY*

The geology of the Middle and East Forks of the Hood River is complex. The geologic mapping has been compiled by the Mt. Hood National Forest S.O. Geotech Division from Sherrod and Scott (1995), Korosec (1987), and Beaulieu (1977). There are forty geologic units mapped in these watersheds. Fourteen geologic units are surficial deposits, and twenty-six geologic units are bedrock units. These units will be addressed in two categories, surficial and bedrock units, from relatively youngest to oldest deposits.

### *Geologic Units*

#### *Surficial Units*

G — GLACIAL ICE: Four glaciers are located near the peak of Mt.Hood. The glaciers are named Eliot, Coe, Newton/Clark, and Langille.

Qal — ALLUVIUM: Unconsolidated gravel, sand, and silt deposits that have been eroded from up-valley bedrock and glacial deposits. Found primarily along the Clear Branch, Pinnacle Creek, Coe Creek headwaters, Eliot Branch, Lower Middle Fork, Newton Creek, Clark Creek, Meadows Creek, Robinhood Creek, all of East Fork, upper portion of Baldwin Creek, Hood River Meadows, and Elk Meadows.

Qcc — CINDER CONES: Unconsolidated pumice-like ejecta that forms a cone at the angle of repose. The deposits are not resistant to weathering because of the vesicular nature of the deposit. There are nine cinder cones in all. One is located on the upper portion of the Parkdale lava beds. The others are grouped around the watershed. Two are no more than a mile south of Red Hill on Blue Ridge. Six are located adjacent to the Dog River between Lookout Mountain and Brooks Meadow to the north.

| | |
|---|---|
| Qhdl | DEBRIS AVALANCHE DEPOSIT OF LADD CREEK: Poorly-sorted boulders to pebbles in a white to reddish-brown matrix of sand, silt, and clay. Forms a sheet-like deposit that originated by debris avalanche from the upper north flank of Mt. Hood. The deposit is mapped in one area near Elk Cove. This is a remnant of the original deposit that has not been eroded by adjacent glacial streams. About 4000 years old. |
| Qdf | DEBRIS FLOW DEPOSITS: Poorly-sorted cobbles, pebbles, and boulders in a matrix of reddish-brown silts, clays, and sands. These flows were intermittent. Found primarily along the eastern slopes of the Upper Hood River Valley adjacent to the Parkdale Ranger Station. Another small deposit can be located along the eastern slope near the town of Winans. The deposits range from 0 to 400 feet thick locally. |
| Qhpc | POLALLIE PYROCLASTIC FLOW AND DEBRIS FLOW DEPOSITS: Poorly-sorted boulders, cobbles, and pebbles in a gray matrix of sand and ash. Includes minor debris-avalanche deposits of hydrothermally altered material. Found primarily on the steep slopes of Mt. Hood. These deposits do not extend beyond the Routson County Campground near the 2400 foot level on the East Fork of the Hood River. About 15,000 to 20,000 years old. |
| Qhc | OLDER PYROCLASTIC FLOW AND DEBRIS FLOW DEPOSITS: Poorly-sorted boulders, cobbles, and pebbles in a gray matrix of sand. These deposits are overlain by lava flows of Qha which separate the younger overlying Polallie flows from the older pyroclastic and debris flow deposits. Found primarily on the valley floor of the Upper Hood River Valley from the headwaters of Crystal Springs to the Middle and East Forks confluence with the main stem of the Hood River. The deposit is older than 570,000 years. |
| Qt | TALUS DEPOSITS: Unconsolidated deposit of blocky to platy coarse grained detritus. Typically forms at the base of cliffs facing south or west. Usually unvegetated, but some talus slopes in the lower elevations of the watershed are partially vegetated. Three talus deposits are found on the west side of Lookout Mountain, one deposit surrounds the peak of Shellrock Mountain, another deposit lies adjacent to Perry Lake, and the others occupy the slopes of Clear Branch drainage from its headwaters to the confluence with the Middle Fork of the Hood River. These deposits have developed over the last two million years. |
| Qf | ALLUVIAL FAN DEPOSITS: Well-sorted, sand to cobble size with some boulders deposited at the base of moderate to steep slopes. Primarily a water transported deposit. Found along the base of the east facing slopes of Blue Grass Ridge and at the confluence of Ash Creek and Tilly Jane Creek with the East Fork of the Hood River. These deposits have accumulated over the last two million years. |
| Qca | COLLUVIAL AND ALLUVIAL SLOPE DEPOSITS: Poorly-sorted deposits that form sheets and fans on lower parts of valley walls. Deposited by small streams and various other slope processes. Particle size decreases down slope into the alluvium valley floors. These deposits are mapped in the following areas: the north and west facing slopes of the headwaters of the East Fork of the Hood River, the west facing slope of the East Fork between Culvert Creek and Sherwood Campground, 0.5 miles east of Red Hill, along the side slopes of the Clear Branch drainage, and surrounding the western tributary of Bear Creek. These deposits have accumulated over the last two million years. |
| Qgnt | GLACIAL TILL DEPOSITS OF NEOGLACIAL AGE: Forms steep, sharp-crested, unvegetated to forested moraines that lie within one mile of present glaciers. These terminal moraines mark the furthest advance of the Late-Fraser glacial period. These till deposits are about 12,000 years old. |
| Qg | GLACIAL DEPOSITS: Very poorly-sorted pebbles, cobbles, and boulders in a light gray matrix of silt and sand. In this area, the deposits mainly occur as ground and lateral moraines. They are found in three spots, one is near the headwaters of Clear Branch and the other two can be located along the slopes of the Tony Creek drainage near the confluence of its two tributaries. These deposits have developed over the last two million years. |

Qget GLACIAL TILL DEPOSITS OF EVANS CREEK AGE: Poorly-sorted pebbles, cobbles, and boulders forming shallow sloped moraines that may mark the extent of the 20,000 year old glacial advance of the Early-Fraser Glaciation. These deposits can mostly be found surrounding the steep slopes of Mt. Hood, but they reach as far north as Laurance Lake.

Qoe GLACIAL OUTWASH DEPOSITS OF EVANS CREEK AGE: Poorly to well sorted pebbles, sand, and silts in a delta-like lobe that usually occupies the lower portions of a glacial valley. This deposit developed between 12,000 and 20,000 years ago during the Fraser Glaciation. In this watershed there is one deposit mapped as an outwash unit. This deposit is found near the headwaters of Evans Creek on the northeast side of Mt. Hood.

***Bedrock Units***

Qbp BASALTIC ANDESITE OF PARKDALE: The source of this basaltic andesite lava flow is a small cinder cone located 1.5 miles below Laurance Lake. The flow extends approximately 4 miles to the north. This lava flow is between 6500 to 7000 years old.

Qbap BASALTIC ANDESITE OF THE PINNACLE: Olivine-bearing, slightly porphyritic lava flows. These flows were erupted from The Pinnacle which has been partially eroded by headward erosion of glaciers. About 130,000 to 160,000 years old.

Qbac BASALTIC ANDESITE OF CLOUD CAP: Generally these lava flows contain less olivine than The Pinnacle lava flows. Formed a small volcanic vent whose lava overlies Qha and is surrounded by Qhpc. Found below the terminus of the Eliot Glacier. About 580,000 to 600,000 years old.

Qap ANDESITE OF PERRY LAKE: Fine to medium grained andesite lava. Erupted from an unknown vent location near Red Hill and flowed down Bear Creek. The lava flows overlie Qbr, so they are younger than 780,000 years.

Qbdr BASALTIC ANDESITE OF DOG RIVER: Medium-gray porphyritic lava that erupted from cinder cones on the Hood River escarpment near the headwaters of the Dog River. Flowed northwest toward the Hood River Valley and northeast down the South Fork of Mill Creek. The lava is distinguished by pale-gray plagioclase phenocrysts, which probably contain glass inclusions. These lavas are younger than 780,000 years.

Qbr BASALTIC ANDESITE OF BLUE RIDGE: Comprised mostly of basaltic andesite flows, but a few are basaltic in composition. Erupted from vents located on Blue Ridge. The lava flows are dated between 780,000 to 1.3 million years old.

Qha ANDESITE AND DACITE LAVA: Cone building flows and domes. Forms much of the radial ridges of Mt. Hood that extend as far as 7.5 miles from the summit. These deposits were erupted over the last two million years.

Qbas BASALTIC ANDESITE OF STUMP CREEK: Lava flows on the distal northwest flank of Mt. Hood. The vent location is unknown. These lava flows were erupted in the last two million years.

Qhpl ANDESITE AND DACITE FLOWS AND DOMES: These lava flows extend as far as two miles from the summit of Mt. Hood. They were flows were erupted in the last two million years.

Qall ANDESITE OF LAURANCE LAKE: One or two lava flows of slightly porphyritic andesite. The andesite has phenocrysts of olivine, clinopyroxene, and amphiboles. These flows cap the ridge north of Laurance Lake. They probably erupted from a vent near Vista Ridge. Thickness of the unit ranges from 200 to 500 feet. These flows were deposited in the last 2 million years.

Qvmh ANDESITE OF MT. HOOD: Light to medium-gray andesite and basaltic andesite flows. Erupted from the peak of Mt. Hood. These flows can be found primarily along the west side of Surveyors Ridge near Parkdale. These flows were deposited in the last two million years.

QTb OLIVINE BASALT: Moderately porphyritic basalt or basaltic andesite located north of Tilly Jane Creek and along the Hood River escarpment near the headwaters of Dog River. The age of these flows range from 780,000 to 5.2 million years old.

| | |
|---|---|
| QTa | ANDESITE LAVA FLOW: This flow is believed to be an intracanyon lava flow with an unknown vent location. It is located north of Hood River Meadows on the southeast face of Mt. Hood. The age of this lava flow is between 1.6 to 1.8 million years old. |
| QTvbh | BASALT OF BOOTH HILL: Gray basalt flows and flow breccia erupted from a cluster of cones at Booth Hill. These flows are block jointed and deeply weathered. These lava flows were deposited in the last 5.2 million years. |
| Tlma | ANDESITE OF LOOKOUT MOUNTAIN: Moderately porphyritic two-pyroxene andesite. Includes interlayered olivine basalt flows in the lowest parts. Found adjacent to Lookout Mountain along the east and west canyon walls of the upper East Fork of the Hood River. About 2.7 to 3.3 million years old. |
| Tlmb | BASALT AND BASALTIC ANDESITE OF LOOKOUT MOUNTAIN: Lava flows and tuff breccia of basalt and basaltic andesite. The exposure is at the southwest and east end of Blue Grass Ridge. About 3.3 to 5 million years old. |
| Tlmd | DACITE OF LOOKOUT MOUNTAIN: Slightly porphyritic orthopyroxene bearing dacite and rhyodacite. This unit underlies the Tlma lava flows. The unit is located along the east and west canyon walls of the East Fork of the Hood River. Approximately 3.3 to 5.2 million years old. |
| Trbg | ROCKS OF BARLOW RIDGE AND GUNSIGHT BUTTE: Consists of mostly basalt to dacite lava flows, but minor volcaniclastic strata is present. Found surrounding Gunsight Butte on the southeastern canyon wall of the East Fork of the Hood River. About 4 to 5.5 million years old. |
| Tatc | ANDESITE OF TUMBLE CREEK: Slightly to moderately porphyritic lava flow which is exposed along the East Fork of the Hood River near Polallie Creek. Approximately 650 feet thick. The age of this deposit ranges from 2 to 5.2 million years old. |
| Tvmf | VOLCANICLASTIC ROCKS OF MIDDLE FORK: Tuff breccia, conglomerate, and sandstone. Nearly 250 feet thick in the gully northeast of Laurance Lake. This unit is widely distributed in the northwest portion of the watershed area. About 2 to 5.2 million years old. |
| Tia | INTRUSIVE ANDESITE: Platy to blocky, very fine grained to medium-grained lava that has formed a plug. The intrusive is found on the peak of Shellrock Mountain. The relative age was determined to be older than 5.2 million years. |
| Tdm | DACITE OF MILL CREEK BUTTES: Hornblende dacite domes at the headwaters of the South Fork of the Mill Creek. However, in this area the unit is primarily composed of volcaniclastic deposits adjacent to the main domal mass. Approximately 5.9 to 6.4 million years old. |
| Td | DALLES FORMATION: Andesitic to dacitic volcaniclastic rocks composed of block and ash deposits and monolithologic lahar beds in the area east of Upper Hood River Valley. The Missoula Floods have reworked the toe of this deposit adjacent to the Columbia River. About 7.6 to 7.9 million years old. |
| Taef | ANDESITE OF EAST FORK: Slightly to moderately porphyritic two-pyroxene andesite lava flows and tuff breccia. These flows overly Tcr and are distributed along the upper reaches of the East Fork of the Hood River. Approximately 6.9 to 8.3 million years old. |
| Tafv | ANDESITE OF FIVE MILE BUTTE: Slightly to moderately porphyritic two-pyroxene andesite. Found near Bottle Prairie on the eastern edge of the watershed boundary. Approximately 7.5 to 8.5 million years old. |
| Tcr | COLUMBIA RIVER BASALT FORMATION: Composed of a number of basalt lava flows that erupted from dike swarms in the Columbia Plateau and Blue Mountains in eastern Oregon. Found as far south as the Robin Hood Campground on the East Fork of the Hood River. Mostly found underlying Td formation. Approximately 14 to 18 million years old. |

These geologic units can be divided into nine general categories:

Glacial Ice: G;
Alluvium: Qal and Qoe;
Talus: Qt;
Cinder Cones: Qcc;
Glacial Till: Qg and Qget;
Slope Deposits: Qf, Qca, Qdf, and Qhdl;
Unconsolidated Material: Qhpc, Qhc, and Qgnt;
Weak Rock: QTvbh, Tlmb, Tvmf, Tdm, Td, Taef, and Tcr south of Polallie Creek;
Resistant Rock: Qbp, Qbap, Qbac, Qap, Qbdr, Qbr, QTb, QTa, Qha, Qbas, Qhpl, Qall, Qvmh, Tlma, Tlmd, Trbg, Tatc, Tia, Tafv, and Tcr north of Polallie Creek;

Slope classes have been used to further subdivide the nine general categories into sixteen landform types.

## *LANDFORM TYPES*

The landform types (Figure 1.) are depicted using the relative strength of geologic unit, slope gradient, and drainage density. The sixteen landform types are described below.

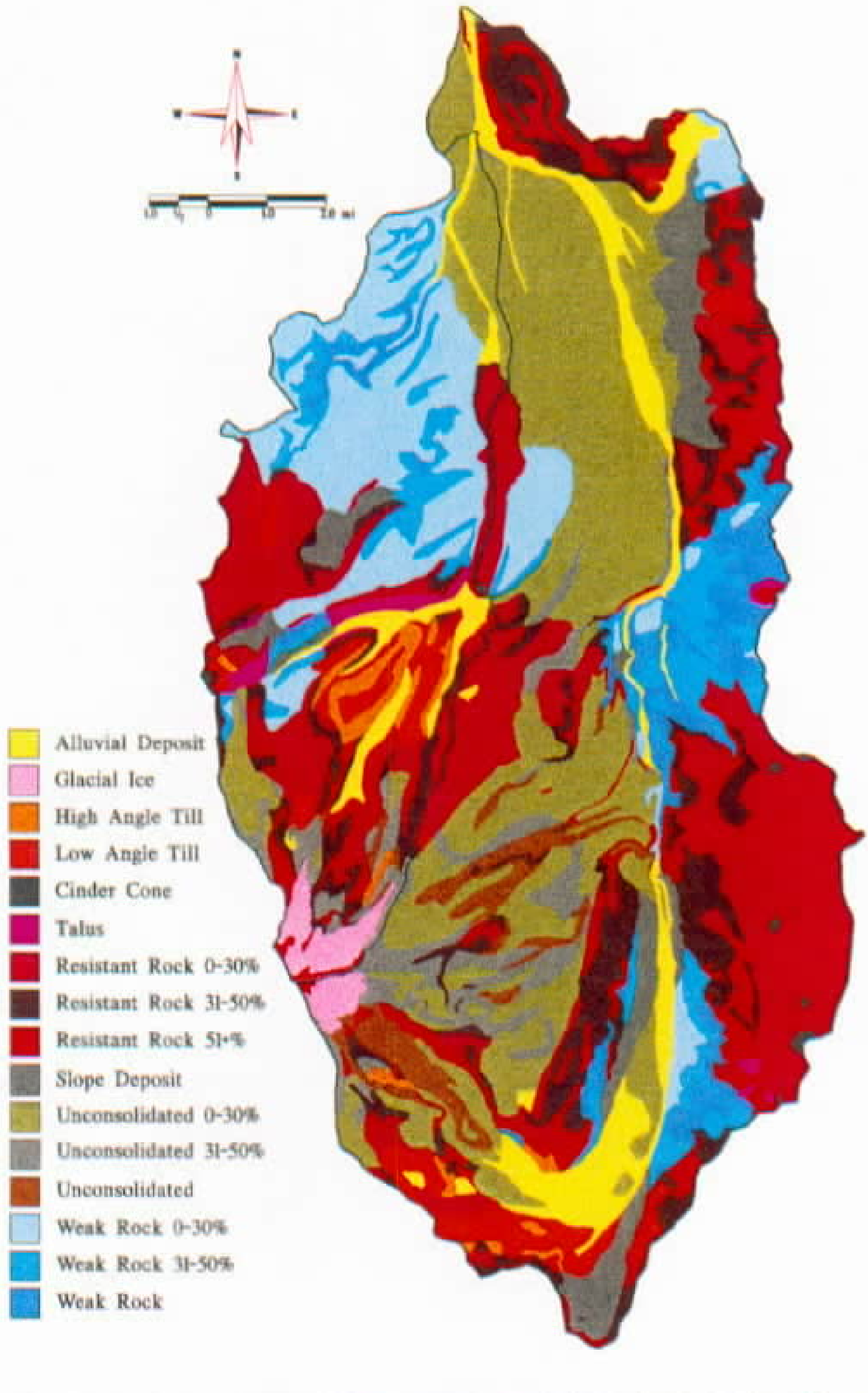


Figure 1. - Geologic Landforms of the East Fork & Middle Fork Hood River Watersheds.

*GLACIAL ICE (G):* The four glaciers are Coe, Langille, Eliot, and the Newton/Clark glacier which are found near the peak of Mt.Hood. Slope gradients rarely exceed 40%, but typically range between 15-30%.

*ALLUVIUM DEPOSITS (AD):* Occurs throughout the watersheds, but found primarily along the East Fork, Coe Branch, Middle Fork, Clear Branch, Trout Creek, Baldwin Creek, and an older terrace at the headwaters of Evans Creek. These types of deposits have a slope range between 0-15%.

*TALUS DEPOSITS (Qt):* Tend to be located on steep south or west facing slopes. Occur along Clear Branch Creek near Laurance Lake, around the peak of Shellrock Mountain, and on the Hood River escarpment northwest of Lookout Mountain. The slopes of these deposits range from 30-80%, but typically are 50-70%.

*CINDER CONE DEPOSITS (Qcc):* There are nine cones total with one located on the upper portion of the lava beds, two on Blue Ridge, and six are located on the top of the Hood River escarpment between the East Fork and Dog River. Generally these deposits slopes range between 0-40%, but typically are from 15-30%.

*LOW ANGLE TILL DEPOSITS (LAT):* The low angle till is usually located on the lower portions of the slopes. Primarily found along the north facing walls of the Upper East Fork, but is also located sporadically from Ghost Ridge to File Butte. The slopes do not tend to exceed 30%.

*HIGH ANGLE TILL DEPOSITS (HAT):* The high angle till is usually found plastered against the steeper side slopes of the drainages that were once glaciated. Found primarily in spots near the headwaters of the East Fork and also located sporadically between Strahan Ridge and File Butte to the north. These deposits are likely remnants of past glaciation that have not been heavily eroded. The slopes generally exceed 31%.

*SLOPE DEPOSITS (SD):* Occurs as far south as the Pocket Creek area and is primarily identified along the slopes and banks adjacent to the East Fork Hood River. Located sporadically from the headwaters to the confluence with the main stem Hood River. The slopes range between 5-40%.

*UNCONSOLIDATED MATERIAL-GENTLE SLOPES (UMGS):* These deposits mantle the surface of the watershed where glacial and fluvial processes have not yet eroded them. This landform type dominates the Upper Hood River Valley and the eastern flanks of Mt. Hood. The slopes do not exceed 30%.

*UNCONSOLIDATED MATERIAL-MODERATE SLOPES (UMMS):* This landform type is primarily found near and along drainages where the slope breaks from a gentle slope to a steeper moderate slope class. These areas can be located sporadically around the flanks of Mt. Hood and as far north as the Middle and East Fork confluence. These slopes range from 31-50%.

*UNCONSOLIDATED MATERIAL-STEEP SLOPES (UMSS):* Usually found along the slopes of steep glacial valleys or deeply incised drainages like Polallie Creek. The largest area given this landform type can be found in the Clark and Newton drainages immediately below the Newton/Clark Glacier. These slopes exceed 51%.

*WEAK ROCK-GENTLE SLOPES (WRGS):* Primarily occurs in the northwest portion of the watershed near File Butte, but a number of smaller polygons are found east of the East Fork of the Hood River. This landform type has slopes that do not tend to exceed 30%.

*WEAK ROCK-MODERATE SLOPES (WRMS):* Concentrated in the drainages of the File Butte Area and the smaller spots east of the East Fork of the Hood River. These slopes range between 31-50%.

*WEAK ROCK-STEEP SLOPES (WRSS):* Generally occur around Tony Creek, Shellrock Mountain, west of Lookout Mountain, and at the Dog River's confluence with the East Fork of the Hood River. Resistant bedrock overlies the weak rock east of the East Fork of the Hood River. These slopes are seldom lesser than 51%.

*RESISTANT ROCK-GENTLE SLOPES (RRGS):* This landform type dominates the area east of the East Fork of the Hood River. It is also identified throughout the northwest portion of the watershed. The slopes generally do not exceed 30%.

*RESISTANT ROCK MODERATE SLOPES (RRMS):* The largest area is found along the east facing slope of Bluegrass Ridge. Otherwise, the landform type is found in smaller spots throughout the watershed area, but generally concentrated near drainages. The slopes range from 31-50%.

*RESISTANT ROCK-STEEP SLOPES (RRSS):* Mostly found along the eastern escarpment of the Hood River Valley Graben. It is also identified along Gnarl Ridge from the Newton/Clark Glacier to beyond Elk Mountain. Tend to see one or more of the following dominant processes in these areas: vertical faults, fluvial erosion, and/or glacial erosion. These slopes usually exceed 51%.

## *MASS-WASTING RATINGS*

The relative mass-wasting and relative sediment delivery potentials are derived using the landform type map, geologic intuition, and personal communication with knowledgeable people in these two watersheds. The following tables represent relative landslide potential by landform type and relative sediment delivery potential by landform type. The reference to "Inner Gorge Failures" refers to the smaller bank and slope failures usually caused by the rivers or creeks undermining of the bank or slope. These failures probably account for the largest sediment delivery to streams due to the proximity to drainages.

The following explains the abbreviations used in Table 1. DF/DS Pot. is the debris flow/debris slide potential. S/EF Pot. is the slump/earthflow potential. RF/RS is the rock fall/rock slide potential. Among the types of mass wasting mentioned the DF/DS is by far the most common in these watersheds. See the tables below for the relative ratings by landform type.

**Table 1. - Relative Ratings for Landslide Potential by Landform Type.**

| Landform Type | DF/DS Pot. | S/EF Pot. | RF/RS Pot. | Inner Gorge Failures |
|---|---|---|---|---|
| G | L | VL | M | M |
| AD | L | L | VL | H |
| Qt | L | L | H | L |
| Qcc | L | L | L | VL |
| LAT | L | VL | L | L |
| HAT | M | L | M | M |
| SD | H | M | L | H |
| UMGS | L | VL | VL | L |
| UMMS | M | L | L | M |
| UMSS | H | M | M | H |
| WRGS | L | L | L | L |
| WRMS | M | M | M | M |
| WRSS | H | H | H | H |
| RRGS | L | VL | L | L |
| RRMS | M | L | M | M |
| RRSS | H | L | H | H |

Note: The relative rating scale for landslide potential is rated from least likely to occur to most likely to occur. Scale: VL-L-M-H-VH

Table 2. - Relative Rating for Sediment Delivery by Landform Type.

| Landform Type | Relative Sediment Delivery Rating |
|---|---|
| Glacial Ice (G) | L |
| Alluvium Deposits (AD) | H |
| Talus Deposits (Qt) | L |
| Cinder Cone Deposits (Qcc) | L |
| Low Angle Till Deposits (LAT) | M |
| High Angle Till Deposits (HAT) | H |
| Slope Deposits (SD) | H |
| Unconsolidated Material-Gentle Slopes (UMGS) | M |
| Unconsolidated Material--Moderate Slopes (UMMS) | H |
| Unconsolidated Material--Steep Slopes (UMSS) | H |
| Weak Rock--Gentle Slopes (WRGS) | L |
| Weak Rock--Moderate Slopes (WRMS) | M |
| Weak Rock--Steep Slopes (WRSS) | H |
| Resistant Rock--Gentle Slopes (RRGS) | L |
| Resistant Rock--Moderate Slopes (RRMS) | M |
| Resistant Rock--Steep Slopes (RRSS) | H |

Note: This table ignores the sediment delivery from "Inner Gorge Failures." These sediment delivery ratings are based on DF/DS, S/EF, RF/RS potentials to deliver sediment to adjacent drainages. The relative rating scale ranges from lowest probability to deliver to highest probability to deliver sediment to drainages. Scale: L-M-H

### *Mass-Wasting Discussion*

These watersheds have a broad spectrum of characteristics that contribute to landslides. The first is the amount of annual precipitation which ranges from a wet 170+ inches per year on the peak of Mt. Hood to between 30 to 40 inches a year in the Hood River Valley. The second is the abundance of weak rock and unconsolidated material in these watersheds. These areas are concentrated on the flanks of Mt.Hood and the Hood River escarpment. The third characteristic is the high incision of drainages and the adjacent steep slopes. The abundance of unconsolidated landslide source material at the headwaters of some confined drainages plays a role in continued debris flow activity. The problem is that the steep slopes are composed of the easily erodible unconsolidated material, usually above timberline; therefore, the rate of stream headward erosion is high. In addition, colluvial hollows develop in the headwaters of steep drainages throughout these watersheds. These sites are responsible for continuous activity not specific to any one process. This is because the unstable conditions at the site tend to outlive the stabilizing effects of a single event. In fact, the site itself may be considered a relatively permanent feature on the landscape. For example, a colluvial hollow acts as a receptacle for debris. As it fills, the instability increases while the water needed for failure decreases and eventually triggers a landslide. When the landslide occurs and the hollow is flushed, it returns to more stable conditions. However, if the upslope source of debris has not been depleted, the hollow will start to fill again. In most environments, the filling and flushing of colluvial hollows takes a long time. But, on Mt. Hood and other stratovolcanoes, the process is rapid, and landslides occur again and again at the same site. The study of colluvial hollow flushing rates in selected drainages could provide a future forecasting technique for potentially dangerous debris flows.

The lack of time to complete an air photo landslide inventory sent us searching for a timely alternative to evaluate these watershed's mass-wasting capabilities. The Benda-Cundy Debris Flow Model was chosen to model the incised drainages that were composed of one or more of the four landform types that were rated high for debris flow potential. The four landform types are slope deposits (SD), unconsolidated material-steep slopes (UMSS), weak rock-steep slopes (WRSS), and resistant rock-steep slopes (RRSS). The debris flow model is strictly based on channel gradient, incision of the channel, and the tributary junction angle. The slope classes used in developing this debris flow model are listed in the table below:

| SLOPE CLASS | COLOR CODE | PHYSICAL PROCESS ZONE |
|---|---|---|
| >36% | (red) | initiation and scour zone |
| 36-18% | (yellow) | scour zone |
| 18-6% | (green) | transportation zone |
| <6% | (end of green line) | deposition zone |

Initiation (which occurs when an initial landslide enters the drainage and transforms into a debris flow) can only take place when the drainage slopes are in excess of 36%. The debris flow will also scour in this zone if the initial landslide has entered the drainage upstream.

According to the model, the scour zone contains slopes between 36% and 18%. In this zone the debris flow will erode and entrain the loose material in the drainage channel. This is the zone where the debris flow can increase volume by magnitudes, dependent on the length of the scour zone, the amount of loose material available, and the cross-sectional area of the drainage.

The transportation zone is the area where the debris flow causes no net erosion or deposition. This zone's slopes range from 18% to 6%. However, damage could be high in this zone because the debris flow has grown to its largest volume and is being transported down slope.

The deposition zone is where the slopes of the drainage fall below 6% or the drainage carrying the debris flow enters a larger ordered stream at an angle greater than 70 degrees. When the debris flow deposits at the confluence of the larger ordered stream, there is a possibility of a short-term damming of the larger ordered stream, like the Polallie Debris Flow of 1980. This could cause an additional hazard to human-life, structures, and fish habitat downstream similar to the dam break flood of the Polallie event in 1980. There is some potential for this type of occurrence, but generally the flood plains of the larger ordered streams tend to be broad. Thus, the width of the flood plain and the potential size of a debris flow deposit from the drainage would be the determinant criteria for assessing the possibility of a debris flow damming a larger ordered stream. In most cases, the larger ordered stream will move laterally in the flood plain around the debris flow deposit.

In an effort to try to group drainages, we have developed a set of criteria that separates the drainages modeled. In addition, we have put together some educated guesses for ranges and frequencies for these selected drainages. The drainages fell into three types of debris flow hazard ratings. They are identified and briefly discussed below:

## *DEBRIS FLOW HAZARD RATING AND BRIEF EXPLANATION*

Type I. Polallie-type drainages that could have an initiation slide in the range of 1000 to 5000 cubic yards. Type I drainages have an abundance of erodible material in the channel, a long channel at a steep enough gradient to scour, an angle greater than 70 degrees to the larger ordered stream, and a narrow flood plain of the larger ordered stream which, in effect, would not allow the larger ordered stream to divert around the debris flow deposit. Therefore, a subsequent damming and dam break could occur. Type I drainages are of the highest hazard, with the potential to develop catastrophically large debris flows. Polallie Creek, North Fork of the Cold Spring, and the Tilly Jane Creek qualify under the criteria mentioned above. The East Fork of the Hood River runs at an angle greater than 70 degrees to these tributaries and the flood plain is very narrow in this reach of the river, so it is likely that the river could be dammed by a substantial debris flow deposit. In addition, there are large alluvial fans at the base of these drainages, implying that debris flows have occurred in the near past at a frequency which is hard to determine. The lack of forested vegetation in the channel and the time interval necessary to revegetate such an area have been used to produce a range of frequency for debris flows. The Type I hazard drainages could potentially have debris flows at intervals of 30 to 50 years.

Type II. These type drainages could produce initial landslides in the ballpark of 1000 to 5000 cubic yards. These drainages tend to be intermediate in length and the length of the scour zone is not long enough to entrain catastrophic volumes of material. These drainages can be characterized by their periodic release of debris flows that will probably not dam the larger order rivers they enter. In most cases, as discussed earlier, the flood plain is broad and the larger ordered stream will find its way around the debris flow deposits rather than damming and creating an additional hazard downstream. The Type II drainages are Coe Branch, Eliot Branch, Compass Creek, Newton Creek, Engineers Creek, Hellroaring Creek, Culvert Creek, Cat Creek, Rimrock Creek, and Birdie Creek with its main tributary. The frequency of debris flows in these channels is probably in the neighborhood of 30 to 40 years. Many of the debris flows in these drainages will stop in a depositional part of a stream rather than continuing on to the larger ordered stream. For instance, Coe Branch, Compass Creek, and the

Eliot Branch would meet all the requirements for a (Type I) hazard drainage, but according to the model they would not reach the larger ordered stream where a damming process could result.

Type III. These drainages are not usually susceptible to initiations larger than 2000 cubic yards. Type III drainages are generally short in length, steep, and generally do not have reaches capable of accumulating an abundance of material in the channel. According to knowledgeable people in these watersheds, the Type III hazard drainages are considered shorter-interval debris flow streams than the others. The recurrence interval is assumed to be somewhere in the range of 20 to 30 years. The steepness of these drainages probably do not allow for an abundance of entrainable material to sit in the channels, so when the landslide initiates, enters the stream channel, and transforms into a debris flow it is not entraining an abundance of earlier deposited channel material. Therefore, catastrophic volumes are not likely to be produced by these drainages. Events like the 1964-1965 and 1996 flood can make (Type III) drainages much more problematic in affecting structures downstream. All other drainages modeled by the Benda-Cundy that have not been mentioned to this point, either under (Type I) or (Type II) drainage hazards, fall into the (Type III) category.

## *OTHER COMMENTS*

In this study, one limitation back of using the debris flow model was that we were completely dependent on the topographic map to measure slope gradients when realistically the measurements out on the ground may vary from the topographic map. The Bendy-Cundy Debris Flow Model has properties it ignores in order to simplify the methods of applying the model to different areas. For example, the model assumes the initial landslide has the following characteristics:

1. Cohesionless
2. Material is saturated
3. Saturated Unit Weight is at least = 1.9 g/cu.cm
4. Angle of internal friction = 38 degrees
5. Slope has to be at least 36% to initiate a slide

Also, the Benda-Cundy model ignores the following components:

1. Size of the initial failure
2. Rhealogical properties of debris flows
3. Momentum of the debris flow
   A. beyond the > 70 degree confluence
   B. severe stair-step drainages

Furthermore, focusing on the areas modeled during this study is not meant to imply that no other mass-wasting can occur in the drainages not modeled by the Benda-Cundy Debris Flow Model. In fact, the probability of debris flows is higher in the areas where the model was used, but it should not be misconstrued that these areas are the only with potential for failure and subsequent downstream damage in the future. In addition, the landform types and their mass-wasting ratings should not be used for site specific management, but this information should not be overlooked for larger area planning within the watershed. The intention of this report is to summarize the general geology, general landform types, and potential mass-wasting properties and problem areas of these watersheds.

## *CONCLUSION*

The Middle and East Fork Hood River watersheds are unique in character and are dramatic in their changes from south to north and from west to east. Normal volcanic hazards and glacial activity are associated with these large watersheds and have shaped the landforms and present day drainages. Overall, and in general, the area east of the Hood River escarpment appears to be of greater relative stability than the area to the west of the escarpment. The abundance of unconsolidated material above timberline, the erodibility of the unconsolidated material, and the number of confined drainages have proven to be the foremost contributors to catastrophic debris flows originating on the upper flanks of Mt.Hood. In general, the relative probability of debris flows in drainages decreases north of the Clear Branch confluence with the East Fork of the Hood River. The Benda-Cundy Debris Flow Modeling is one step in trying to categorize potentially hazardous debris flow prone drainages.

## *REFERENCES*

Beaulieu, J.D. (1977). "Geologic Hazards of Parts of Northern Hood River, Wasco, and Sherman Counties, Oregon." D.O.G.A.M.I. Bulletin 91. pp 1-65.

Benda, L. and Cundy, T.W. (1990). "Predicting deposition of debris flows in mountain channels." Canadian Geotechnical Journal. no. 27. pp. 409-417.

Gallino, G.L. and Pierson, T.C. (1985). "Polallie Creek Debris flow and Subsequent Dam-Break Flood of 1980, East Fork Hood River Basin, Oregon." U.S.G.S. Water Supply Paper 2273. pp. 1-22.

Korosec, M.A. (1987). "Geologic Map of the Hood River Quadrangle, Washington and Oregon." D.N.R. Open File Report 87-6. pp. 1-42.

Sherrod, D.R. and Scott W.E. (1995). "Preliminary Geologic Map of the Mount Hood 30- by 60-Minute Quadrangle, Northern Cascade Range, Oregon." U.S.G.S. Open File Report 95-219. pp. 1-35.

Note: Precipitation data was taken from the State of Oregon and Mt. Hood National Forest annual precipitation maps. In addition, we would like to thank the knowledgeable people of the Parkdale Ranger District who helped identify historically problematic areas and offered fresh ideas on how to present the information in order to make it most useful to the watershed team. Specifically, we would like to thank the following for taking time from their busy schedule to help: Kent Crossley, Mike Brunfelt, Rick Ragan, Diane Lehman-Turck, Jon Martens, Denice Lee, and Dave Hanken.

# *SOIL & HYDROLOGY REPORT*

## *EAST FORK & MIDDLE FORK OF THE HOOD RIVER WATERSHED ANALYSIS*

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May 24, 1996

## *Riparian Area Habitat*

### *Processes Affecting Riparian Areas*

Erosion processes which naturally influence the East and Middle Fork riparian and aquatic habitats are complex and varied. The proximity of the basins to the glaciated Mt. Hood bring with it physical processes which together form varied and changing channels and associated riparian ecosystems. The following will address natural physical processes as they relate to riparian ecosystems within the Middle and East Fork Basins. Riparian ecosystems will be defined here to include all aquatic life in the stream and adjacent vegetation in the flood prone area of a stream. This portion of the analysis will attempt to better understand what the riparian ecosystems were like historically as shaped by physical processes. Further analysis will look at how human management in the basins changed the riparian ecosystems function by changing physical structure of the mainstem and tributary riparian areas.

### *Riparian Area Gain and Loss*

Riparian habitat for anadromous salmonids within the Cascades has commonly revolved around large woody material, clean spawning gravel and pools for rearing and resting habitat. Where these habitats existed historically is complex. The large size of old growth trees in the Cascades which could find their way into streams and rivers often produced habitat in gradients and stream discharges which would not hold smaller sized wood material. Lower gradient reaches could have been more likely areas where if trees fell in they would stay on site and smaller debris or trees which moved downstream during floods would accumulate.

Valley width, sediment supply and transport, bedrock constraints, are types of geologic scale realities which play a role in where and how much wood related habitat can exist in a given location. The wood related habitat created on top of the larger geologic scale events is a small piece of a much larger process of water driven erosion and deposition occurring within watersheds. This is true in the East and Middle Forks. There is agreement that wood related riparian habitat is less today than it was prior to European settlement. However, little historical information on the instream physical structure of the Middle and East Forks is available.

To determine where large areas of wood related mainstem habitat may have historically occurred, a cadre of district fish biologists, hydrologists and silviculturists looked at large scale geologic and geomorphic character of the watersheds. The potential for large wood input, tree size, valley form, discharge, stream type, mass wasting, glacial melt water were physical elements examined. The elements affecting habitat were analyzed using available data, field knowledge, and professional judgment. The goal of the cadre was to determine likely areas one would have found large volumes of wood related mainstem riparian habitat and what part glacial stream systems played in the development of anadromous fisheries within each basin. The following explains the rationale and assumptions used to determine overall habitat questions and conclusions made. As more knowledge is gained in the basin, the same rationale assumptions, and conclusions may be changed. This is the beginning of that process.

### *Large Wood Input*

It was concluded that old growth sized wood was available along most all stream reaches and tributaries. Some reaches following disturbance would not have any available wood at some point in history, but had the capability to grow it in the future. Wood entered riparian areas by wind throw, river bank undercutting, landslides, and debris torrents. Streams with active debris torrent potential probably had less wood over time due to more frequent disturbances. Windthrow and bank failure near streams and rivers was assumed to occur in all streams and reaches where trees could grow. Landslide activity which reached streams and rivers and stopped, would deposit large volumes of wood material in one location.

### ***Mass Wasting Influence on Aquatic Habitat***

Landslides and debris flows have had a large affect on the East Fork of the Hood River and to a lesser extent to the Middle Fork of the Hood River. Catastrophic landslides and debris torrents need steep drainages, unstable geology, and precipitation events to release and carry slides down valley. All of these characteristics are found in drainages within the East and Middle Forks of the Hood River. Most of the material making up the unstable geology within the East and Middle Forks of the Hood River are steep glacial moraines and valley walls composed of Polallie aged (12,000-15,000 year old) eruptive material. The material is composed of poorly-sorted well-graded mixtures of boulders, coarse and fine dacite material and volcanic ash. This material exists on steep slopes within the Coe Creek, Eliot Creek, Clear Branch Creek subwatersheds of the Middle Fork and the Polallie Creek, Newton Creek, Clark Creek, Cold Springs Creek, Tilly Jane Creek subwatersheds within the East Fork of the Hood River. On slopes between 25 and 45 degrees, landslides and subsequent debris torrents are possible within these subwatersheds.

Impacts to down stream aquatic resources following a slide release can vary. Slides occurring in narrow steep valleys have the potential to become debris torrents which obliterate riparian areas and valley wall vegetation as they move down stream bottoms. Debris torrents continue down stream bottoms until energy is dissipated from a widening stream bottom or the water debris mixture becomes too dry or wet to sustain movement. Landslides and debris torrents which carry large trees and debris from steep tributary streams down to the valley floor and stop can create complex habitat for aquatic resources. Generally, the debris torrent tributary riparian areas are obliterated but deposition zones can greatly increase riparian complexity and total biomass quality downstream. Therefore, one cannot generalize on the damage and impacts caused by all landslides and debris torrents to fishery resources.

It was concluded that tributaries more susceptible to catastrophic disturbances would naturally have less wood related habitat and developed riparian ecosystems over time. These risk areas were identified through the geologic landslide and debris torrent analysis. Polallie Creek is a good example of a naturally low wood component system due to the high catastrophic disturbance regime within the watershed. Glacial tributaries are also naturally lower than streams within more stable watersheds due to debris torrent potential. In general, high risk debris torrent drainages have less wood due to instream burial of wood following debris torrent and the obliteration of riparian areas over time. These riparian areas would be less likely to grow large trees and have the complex wood related habitat due to the larger frequency of catastrophic disturbance over time. High risk debris torrent locations and runout zones are identified in the geology report.

### ***Fluvial Response to Wood Input***

Once wood delivery occurs in riparian areas does it go anywhere? Wood size, stream size, and stream type play a role in determining the affects of wood delivery to a stream or river. Wood size was classed into Large (>24" dbh) Medium (24"-8" dbh) and Small (< 8 " dbh). All wood sizes were assumed to be as long as the tree height related to the diameter size classes. Small sized class included branches and smaller sized wood material that enters riparian ecosystems. The size classes were used to establish common ground for discussion in order to determine whether wood was transported by each stream or stream reach upon entering a stream in the East and Middle Fork Basins. The cadre's definition for transport was whether the wood moved downstream during a bankfull discharge.

Stream types and discharge change as one moves down stream. The ability of streams and rivers to transport material generally increases as one moves downstream. The cadre determined all wood is transportable in the small to medium categories in all streams and reaches that could be used by anadromous fish. It was determined that large class wood movement occurred in the mainstem reaches of the Middle and East Forks.

If Large sized wood was moving through the system on the mainstems and not the tributaries the next step was to determine what mainstem stream reaches the large wood may be deposited in, following bankfull discharges. It was assumed that these areas would, accumulate large volumes of large wood over time, and hold and trap smaller sized material behind the larger wood. In order to determine areas of wood deposition the geologic and geomorphic character of the Middle and East Forks was examined.

***Basin wood deposition reaches on the Mainstems and Tributaries.***

Four potential mainstem concentrations were identified by the cadre. The mainstem locations were areas where stream velocity and energy are dissipated. In general these locations have very wide flood prone areas and are lower in gradient than the upstream reaches capable of transporting large, medium and small sized wood material. It was concluded that both the East and Middle Forks were capable of producing large quantities of wood related habitat. Locations where wood habitat is likely to develop on the mainstem Middle and East Forks, if large trees are available, are located in Figure 1.

The cadre also concluded that tributary streams to the mainstems had large volumes of wood and provided rearing and spawning habitat for anadromous salmonids. Tony Creek, Clear Branch, lower Dog River and the upper valley tributaries to the East Fork were likely high quality, high use streams for salmonids. Non-glacial tributary streams would have been important rearing areas during the high glacial sediment loading which takes place in late summer in both basins. Little is known on impacts glacial systems have on anadromous fisheries within the basins.

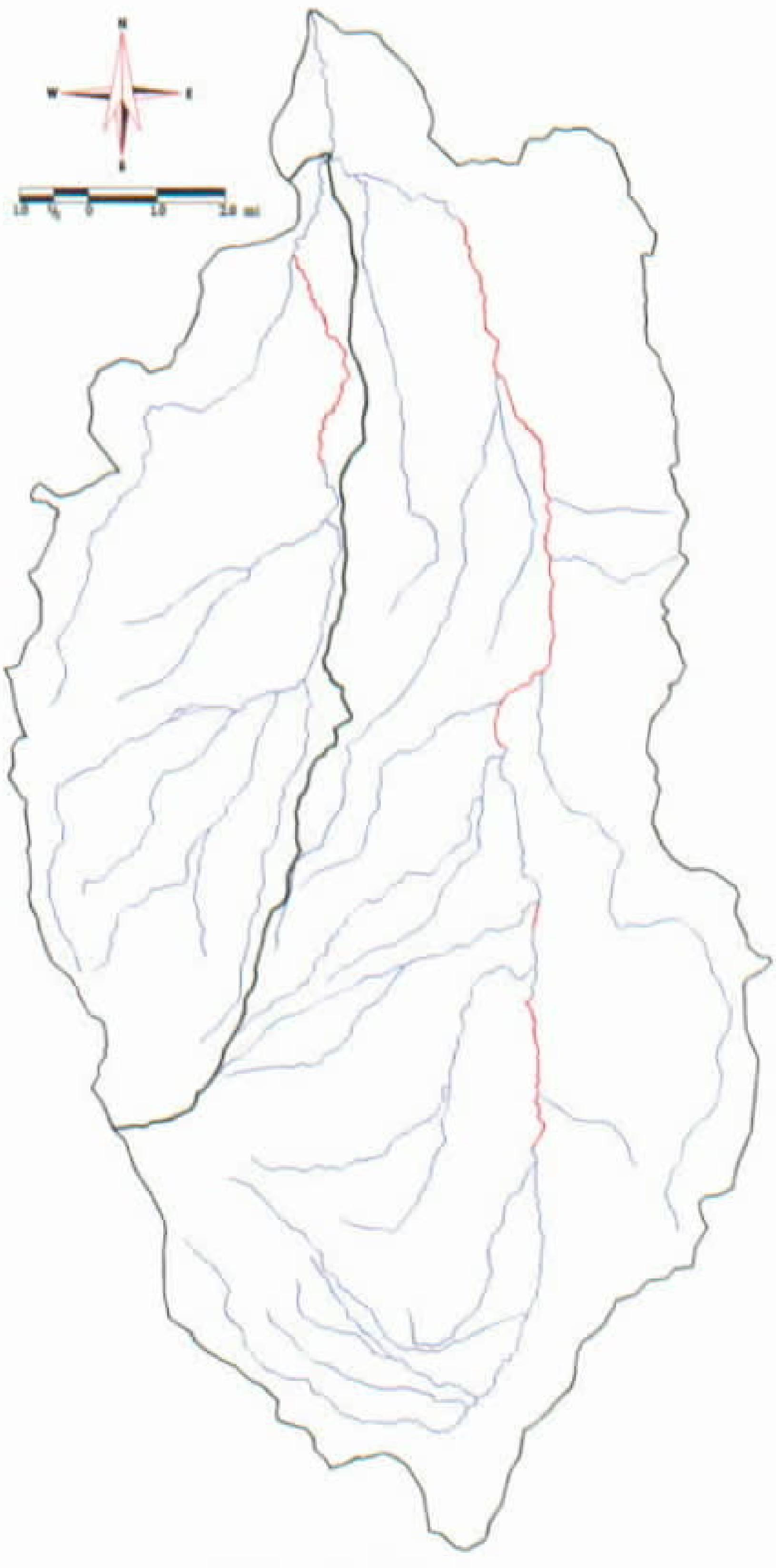


**Figure 1. Locations of Mainstem Habitat Development (red stream segments). If Large Sized Wood was Available to the Riparian Ecosystems.**

### *Glacial Influence*

The Middle and East Forks of the Hood River have four glacial subwatersheds which drain approximately one third of the total glacial ice on Mt. Hood. Eliot Creek originates on Eliot glacier and Coe Branch drains both Langille and Coe glaciers. Both Eliot and Coe Branch drain into the Middle Fork of the Hood River. Newton and Clark Creeks are tributaries to the East Fork.

There has been some question on the influence of glacial melt and sediment load regarding anadromous fish runs within the Middle Fork and East Fork watersheds. This is important from a historical perspective when looking at the possible historical carrying capacity for anadromous fish runs and when those runs may have occurred. It was felt that these questions needed to be addressed when looking at habitat.

To address the influence of glacial sediment on the Middle and East Fork Basins, non glacial basin sediment levels would need to be understood. The goal was to obtain a general idea of the influence each individual glacial stream had on the system as a whole and whether non glacial streams would dilute the sediment influence substantially downstream. The following analysis is intended to be used as a discussion point in the synthesis process to begin to shed light on the glacial questions regarding local fisheries. It was not intended to firmly establish sediment contributions and loads, but instead get a better understanding of how the glaciers in the basins may be influencing the fishery resource.

In order to get a general understanding on what may be going on with glacial sediment loading, glacial sediment needed to be estimated and compared to potential background sediment estimates in non-glacial streams. To get an idea of background sediment contributions in the region, which could be used for the Middle and East Forks, Tom Pearson of the USGS was contacted. Data and personal communication with Tom Pearson made available the large amount of stream sediment data and research undertaken following the eruption of Mt. St. Helens. Data from the watersheds draining Mt. St. Helens were gathered. In addition, recent data was collected for the Green, Muddy and Toutle Rivers (Pearson, unpublished). St. Helens data was used to compare average sediment contributions for North Pacific Columbia River Basins compiled by Leopold and Dunne. In order to calculate average sediment contributions for non-glacial sediment, an average sediment load was used for all basins within the Middle and East Forks of the Hood River. A ton per square kilometer background estimate was determined using the USGS and Dunne/Leopold data.

This analysis is proposed as a method to examine glacial ice effects to individual stream systems and how they interact with each other. It is understood that using one estimated background sediment load for each subwatershed is highly suspect. Within glacial systems, terrace and valley wall deposits are composed of the same material which was measured coming from glacial ice. Assumed subwatershed erosion rates could be much higher in the glacial basins due to reworked glacial material occurring below the glacier ice. However, in order to compare glacial system sediment production rates, glacier-free land sediment rates had to be assumed equal. It is important to understand the limitations of this analysis. It was intended to be used for a general understanding of how the glacial sediment may affect the fisheries resources within the East Fork and Middle Fork Watersheds. Glacial systems and individual watersheds are unique. The extrapolations and assumptions made in the following analysis are very limited. Research needed to come up with data to draw scientific conclusions regarding sediment in the East and Middle Forks would be extensive. It is hoped that this exercise will shed light on the complex nature of the erosive processes occurring in these subwatersheds.

After a reasonable background estimate for non glacial land was determined, glacial sediment estimates were derived and based on a Ph.D. dissertation undertaken by Lundstrum on Eliot Glacier, during 1988. A small portion of the research looked at the sediment derived from glacial melt occurring under the glacier. Sediment discharge relationships were determined during half the melt season (July-Mid October) just below Eliot glacier. It was felt by Lundstrum that his measurements underestimated by half actual sediment transported by Eliot Glacier. Total sediment moved by Eliot creek was calculated using Lundstrums data.

By doubling the estimated sediment load calculated by Lundstrum and dividing by total glacier ice acreage, a ton per glacier acre ice of sediment was determined for the 1988 melt season on Eliot glacier. Total acres of ice were determined for Newton, Clark, Coe, and Langille glaciers from geologic maps of glacial ice. The calculated ton per acre ice number from Eliot Glacier was applied to the remaining glaciers in the watersheds. The background basin sediment production rate estimated from St. Helens and Dunne/Leopold data added to the glacier melt contribution from the Lundstrum data, enabled the comparison of each glacial system within the East and Middle Forks of the Hood River. The comparison of glacial contributions to each other, the Green River WA, and average North Pacific sediment production are identified in Chart 1.0.

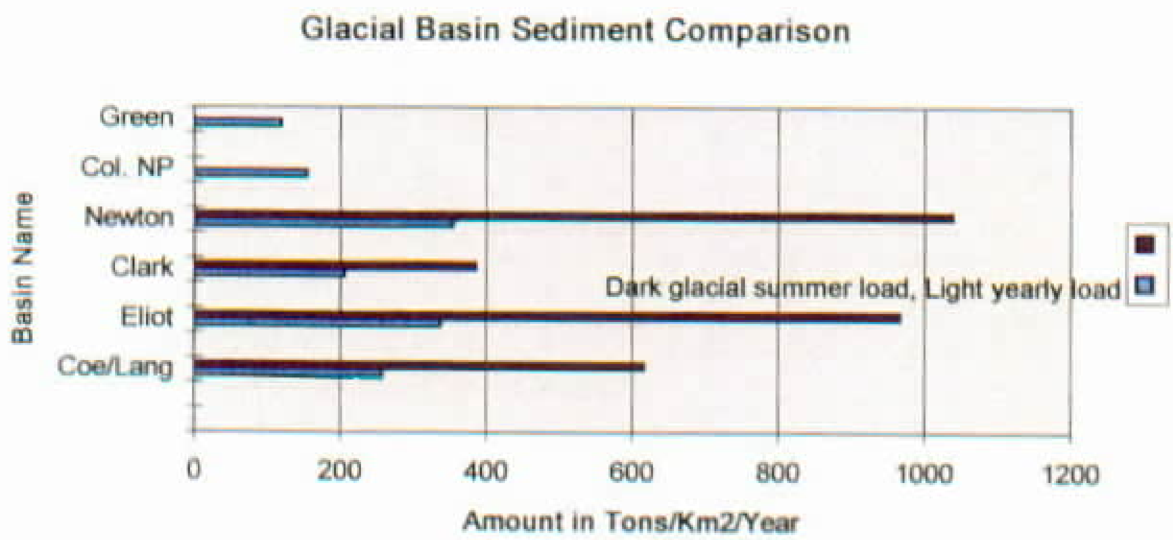



Chart 1.0. Chart showing yearly loads (light) and summer concentration loads of glacier melt expanded to last all year (dark). The expanded (dark) sediment loads are for comparison purposes only. Chart shows comparison of Newton, Clark, Eliot, and Coe/Langille glacier loads compared to the Green River WA (non-glacial) and Columbia North Pacific average loads calculated by Dunne and Leopold in tons/km$^2$/year.

## *Glacial Results*

The analysis indicated that Newton Creek in the East Fork and Eliot Creek in the Middle Fork contribute larger volumes of sediment than Clark and Coe Branch Creeks in the respective drainages. Between the Middle and East Forks glacial influence is different. In the East Fork dilution decreased the glacial sediment percentage of contributions as one moves down stream. The Percent of total basin sediment derived in Coe Branch was 46%. Eliot (62%), Newton (64%), were the highest and Clark (30%) was the lowest. At the confluence of the East and Middle Forks, the East Fork is estimated to be 5.2% glacial over the year. Above Dog River estimates were 10.5% glacial. Above Robinhood Creek estimates were 23% glacial over the year. On the Middle Fork at the confluence of the East Fork, the yearly glacial sediment load was 23%. Just below Eliot Creek the Middle Fork was 36 % Glacial. Dilution rates can be seen in Figure 2.

## *Glacial Discussion*

If glacial sediment reduces fish carrying capacity the sizable reduction in East Fork glacial melt influence during the summer would seem to indicate the East Fork may have been able to support more fish in the mainstem than the Middle Fork, in its mainstem. It is likely that non glacial tributaries were more important from a fall spawning fishery standpoint in the Middle Fork than in the East Fork of the Hood River. This tends to correlate with the known historical and current fishery data. Loss of the major spawning habitat from Laurance Lake dam would seem to put an emphasis on the East Fork for future increases in mainstem carrying capacity from a spawning and rearing habitat standpoint. Chinook and Coho smolts found in the East Fork Irrigation Ditch indicates there is likely successful late summer/fall spawning occurring in the East Fork of the Hood River or its tributaries.

Little is known on the threshold for spawning or rearing in glacial systems. Coe Branch of the Middle Fork has documented cases of bull trout in it during the summer. No known populations exist in Eliot Creek. If the high sediment loads within Eliot preclude a fishery but not in Coe Branch, downstream glacial influences historically may not have been great enough to prevent development of large anadromous fish runs. This may have been more true in the East Fork than in the Middle Fork of the Hood River.

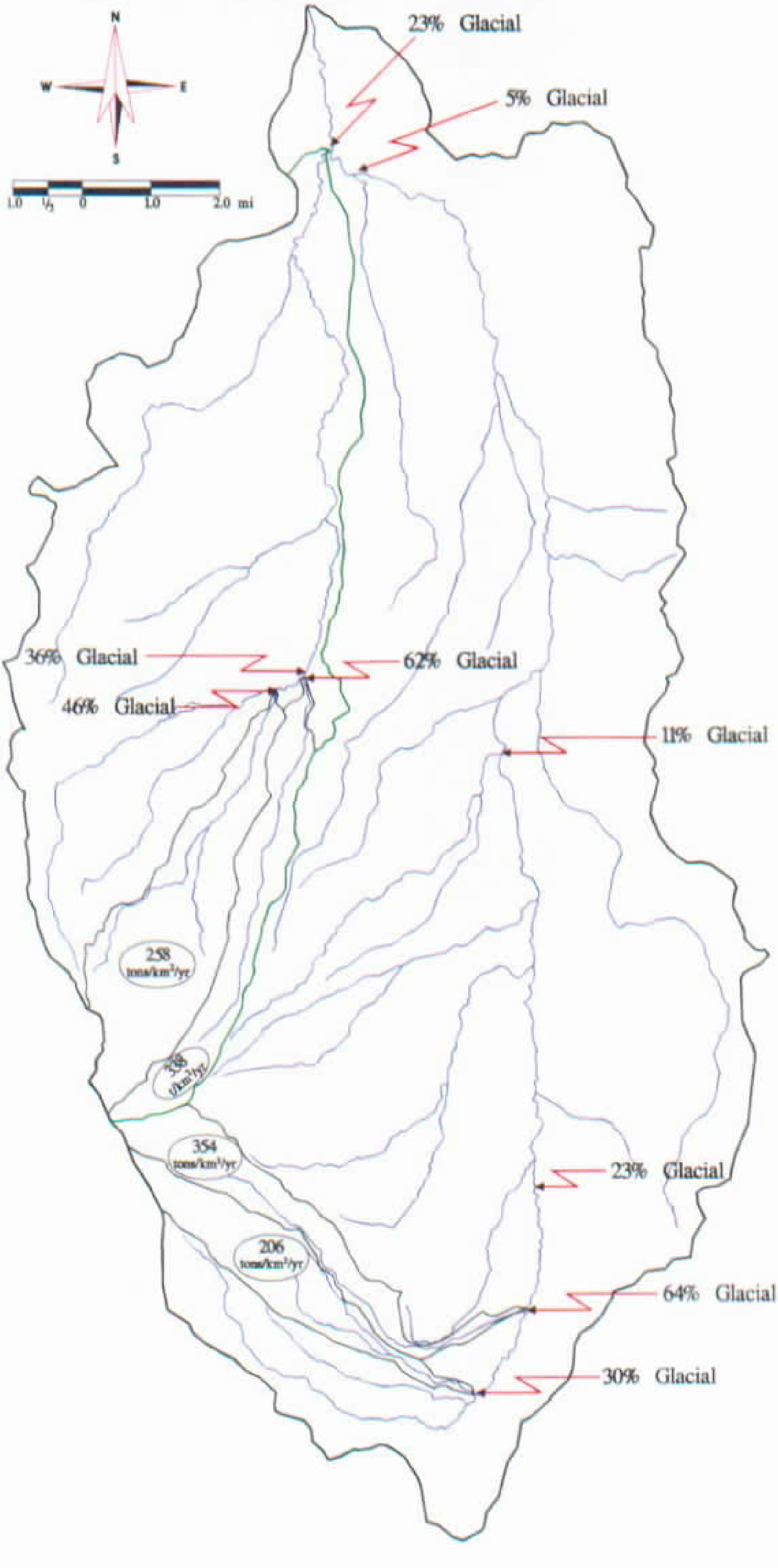



Figure 2. Glacial Percentage Contributions and Dilution Rates, Within the East Fork and Middle Forks of the Hood River.

### *Basin Wide Habitat Conclusions*

Following analysis, the cadre concluded that the lower basin mainstems and tributaries were likely areas where historical habitat was greatest and most likely to develop. It was determined that it is likely that large volumes of wood created a very wide wetland stream complex on the lower East and Middle Forks of the Hood River. However, due to European settlement, these areas over time have been the most altered physically. Riparian areas above the valley floor have also been altered physically but this occurred later in time and has been less extensive in scope. The areas most altered are areas with the easiest access. Habitat which existed historically still occurs today in areas with poor access. Most of these areas are within National Forest wilderness areas or stream reaches where no harvest activity has taken place. Riparian lands within Forest Service, county, and private have been altered to varying degrees. Complete logging and wood removal within the East Fork on Forest Service land between Robinhood and Sherwood campgrounds has been documented in 1979. This type of activity has likely occurred over time in other areas. The original habitat structure within the mainstem and tributary channels revolved around large wood. Harvest, and removal of this wood to confine streams into one channel in order to increase the amount of farm land, build roads, or harvest and remove timber has been documented. Evidence of channel downcutting and floodplain abandonment or aggrading stream reaches point to streams and rivers out of balance with their stable bed form. Activities that created loss of original stream stability and instream habitat have occurred basin wide and have not been limited to any one land ownership.

Historically, large wood potential was substantially larger than is possible today. Instream wood and large conifer forests were extensive in the riparian ecosystems. Today riparian ecosystems have much more alder than occurred historically. Riparian clearing and harvest of the large trees which naturally grow in riparian areas likely occurred at the turn of the century. The occurrence of alder following conifer harvest often retards the development of conifers following original harvest in riparian areas. The structural habitat we believe capable of supporting historic populations of anadromous fish in the East and Middle Fork basins no longer exists today. What the current riparian ecosystems in the Middle and East Forks can support today is unknown. Any improvements in structural habitat similar to what likely occurred historically would increase local potential carrying capacity. The structural habitat component addressed by the cadre is only one aspect of the anadromous life cycle. Fish passage, irrigation conflicts, ocean conditions, water quality, and instream nutrients are all components which can reduce anadromous fish populations and are addressed in other portions of the watershed analysis.

## *Cumulative Affects Analysis*

### *Aggregate Recovery Percentages of Sub-basins (ARP)*

Cumulative affects analysis from management related activities on forested lands can piece together management affects over several years which individually may not impact the land but as a whole increase the risk for future impacts if they have not occurred already. One way to determine hydrologic recovery following management activity is by determining the Aggregate Recovery Percent (ARP). The ARP was devised to estimate the ability of a managed sub-watershed to absorb rain on snow events without significantly increasing peak flows in the sub-watershed. Rain on snow events occur when heavy warm rain falls on a moist wet snowpack The snow pack then quickly melts adding to the warm rain runoff. The high runoff and supersaturated soils increases the risk for slides and debris torrents. Management activities which increase peak flows and runoff can substantially increase the risk for slides and debris torrents. ARP is a mathematical model which puts numerical value on the risk of increasing peak flows that can lead to associated watershed damage.

The model was formulated on the Willamette National Forest and modified for use on the Mt. Hood National Forest. The model used for the East and Middle Fork of the Hood River sub-basins assumes that a timber stand with a 50 year site index of 80 will be totally recovered by 36 years of age. The model applies to third and fourth order streams form 1500-4000 feet in elevation. The elevation used on this analysis assumed rain on snow up to 6500 feet in elevation. Several rain on snow events have occurred up to 6500 feet in elevation within the Middle and East Forks of the Hood River (Ragan, personal communication). The ARP model originated on the H.J. Andrews experiment forest on the West Side Cascade environment. The model measures potential increase on the rain on snow precipitation events which occur in the cascades. Rain melting a previous snow pack quickly increases total runoff which can increase erosion activity and stream bank stability from ephemeral, intermittent, and perennial streams.

The ARP model is one way of measuring the impact of timber harvest and the increase of recovery as replanted stands grow to maturity. This model does not include all of the factors involved in measuring impact risk and recovery potential involving timber harvest. The assumptions used in this model for the Middle and East Fork analysis are as follows:

- Natural openings are fully recovered;
- Management created openings of any kind are subject to more snow accumulation and runoff during a rain on snow event than a natural stand of forested land.
- A created opening is fully recovered when there is a minimum of 70% crown closure and a diameter at breast height of eight inches.
- Stands with a closed canopy intercept snow, reducing snow pack development.
- A closed canopy stand insulates a snow pack during rain storms and warm winds, resulting in a slowed snow melt.
- Roads, parking lots, roof tops and other types of permanently cleared forested lands are unrecovered.
- Forested lands converted to deciduous vegetation are considered unrecovered. Rain on snow events occur when deciduous trees have no insulative or interceptive capabilities. The snow accumulation and rain on snow melt is assumed to be that which would occur in a clear-cut.
- The model uses stand harvest dates to determine the percent of a drainage in the recovered state. This is the aggregate recovery percentage (ARP). Each harvest date or age class area is weighted by the percentage of land it occupies in the drainage. By determining the hydrologic condition of a subbasin in relation to its unaltered state, one can determine the risk for management related erosion and mass wasting which could occur. In general, an ARP over 75% is considered recovered (Christner, 1982).
- The Mt. Hoods' Forest Plan Standards prohibit reductions in recovery percentages below 65% in all Forest Service managed subbasins.
- Aggregate recovery percentages between 65 and 75 may or may not be a problem depending on the geomorphic character of the watershed. Stable soils, geology, and stream channels would be able to absorb a lower recovery better than a naturally unstable watershed. Areas of instability are generally site specific and it is up to local field hydrologists to determine what a recovery percentage means to individual subbasins and locally unstable areas. The model was used in the analysis to compare basins and land use on peak flows and watershed damage risk. Road densities were also calculated to determine potential sediment impacts which can contribute to basin sediment budgets Both road densities and ARP can be seen in Table 2.

***ARP Results***

Road densities and recovery conditions varied. The most unrecovered subwatersheds were Trout Creek and Evans Creek with ARP's of 50.1 and 41.1 respectively. Tony Creek and lower East Fork are also unrecovered. Their ARP's of 66.8 and 68.1 respectively indicate they are at risk for erosive events caused by management activities. Dog River (ARP 76.9), Bear Creek (ARP 76.4), and Crystal Springs Creek (ARP 79.2) are basins which are at or just above what is considered recovered. The remaining basins within the East and Middle Forks are well above the recovery threshold and pose little risk to peak flow related erosion hazards. In most basins high road densities closely correlated with lower recovery percentages. The exception to this trend was Meadows subbasin. This is due to the small size of the basin coupled with the Mt. Hood Meadows Ski area development. The ARP for Meadows Subbasin was 88.1. (See Figure 3.)

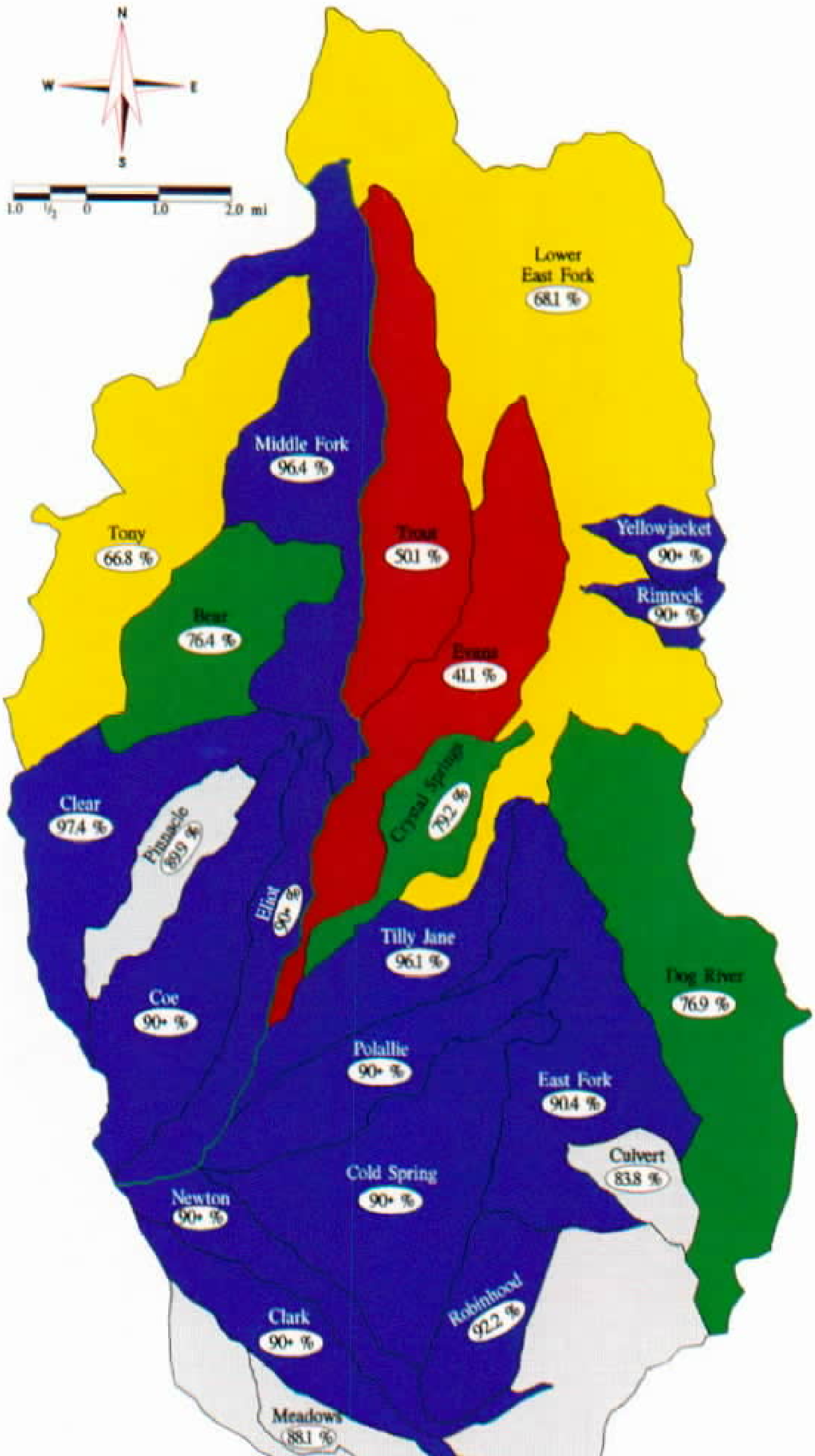



Figure 3. Aggregate Recovery Percentages (ARP)
for Subwatersheds Within the East Fork & Middle Fork of the Hood River.

Table 1. Miles of road, miles per square mile of road, and ARP for subwatersheds within the East Fork and Middle Fork of the Hood River.

| Subwatershed | Miles of Road | Miles / $Mi^2$ | ARP |
|---|---|---|---|
| East Fork of the Hood River | | | |
| Upper East Fork Hood River | 34.44 | 2.70 | 89.60 |
| Meadows Creek | 5.84 | 3.40 | 88.10 |
| Clark Creek | 2.07 | 0.60 | 99.00 |
| Newton Creek | 0.80 | 0.25 | 99.00 |
| Robinhood Creek | 5.93 | 1.90 | 92.20 |
| East Fork Hood River | 26.19 | 2.90 | 90.40 |
| Culvert Creek | 4.53 | 2.80 | 83.80 |
| Cold Spring Creek | 0.12 | 0.01 | 99.00 |
| Polallie Creek | 1.99 | 0.40 | 99.00 |
| Tilly Jane Creek | 11.04 | 2.50 | 96.10 |
| Lower East Fork Hood River | 76.55 | 2.90 | 68.10 |
| Crystal Springs | 10.05 | 3.50 | 79.20 |
| Dog River | 30.07 | 2.40 | 76.90 |
| Rimrock Creek | 0.47 | 0.50 | 90.00 |
| Yellowjacket Creek | 1.14 | 0.90 | 90.00 |
| Evans Creek | 39.6 | 4.90 | 41.10 |
| Trout Creek | 30.47 | 4.10 | 50.10 |
| Middle Fork of the Hood River | | | |
| Clear Branch | 7.56 | 1.20 | 97.40 |
| Pinnacle Creek | 4.46 | 1.80 | 89.90 |
| Coe Branch | 4.62 | 0.70 | 99.00 |
| Eliot Branch | 3.98 | 1.10 | 99.00 |
| Middle Fork Hood River | 27.42 | 2.90 | 96.40 |
| Bear Creek | 20.30 | 3.70 | 76.40 |
| Tony Creek | 37.52 | 3.70 | 66.80 |

## *East Fork and Middle Fork Forest Soils*

The basins within the analysis have a wide range of parent material, precipitation and resulting soil development on Forest Service Land. Most of the soils on the East Fork tend to have a deep ash mantle with occasional rock outcrops. In general, ashy soils tend to have high water holding capacity, are compacted easily, have low inherent fertility and erode easily on slopes greater than 30%.

Soils in the upper East Fork and west of Highway 35 are more unstable and poorly developed due to more frequent mass wasting events. Drainages east of Highway 35 tend to be more stable and have slightly more developed soils. Organic matter and fertility are generally greater west of Highway 35 due to greater precipitation which rapidly decreases as one moves to the east. The entire Upper East Fork Basin has low soil temperatures and short growing seasons. Aspect and growing season are more favorable west of Highway 35.

Upper Middle Fork soils are composed of soils similar to those in the East Fork west of Highway 35, except with very ashy valley bottoms and ridge tops with high rock content. Most of these soils are within basins originating at the top of Mt. Hood. Soils within the Bear Creek, Tony Creek basins are more rocky well drained soils with little ash and glacial material. Soils in Tony and Bear Creek exhibit low soil fertility due to short growing season and high rock content. Soil stability is high due to the high rock content and gentle terrain.

To get an idea of both soil erosion hazard and soil resiliency within the study area the SRI (Soil Resource Inventory) soil groups were placed into categories for soil resiliency and soil erosion hazard. This was accomplished by the zone soil scientist and hydrologist. Understanding of the Soil Resource Inventory, local knowledge, and professional judgment were used to determine groupings. To address soil productivity, a general discussion on productive areas within the analysis area will be included.

## *Soil Resiliency*

Soil resiliency is defined as the capability of a site to recover following disturbance, natural or management related. Criteria used when assigning relative ratings include, compaction hazard, aspect, soil depth, precipitation range, slope, length of growing season and local knowledge. The 1979 Soil Resource Inventory (SRI) map units were used to delineate and categorize resiliency. This information was then stratified into low medium and high categories and mapped using the SRI cells in the Forest GIS system.

The results indicated in Table 3 show that there are no large areas of low soil resiliency within the Middle Fork Basin. Areas of high resiliency were in Bear and Tony Creeks. This is due primarily to low compaction hazards, favorable aspects, and adequate precipitation.

Within the East Fork Basin, Robinhood, Clark, Newton, and Upper East Fork were areas that had high percentages of the basin within the low resiliency category. This is primarily due to short growing seasons (frost pockets, low soil temperatures).

Table 2. **Percentage of each basin within low medium and high soil resiliency categories.**

| Subwatershed | High (%) | Medium (%) | Low (%) |
|---|---|---|---|
| East Fork of the Hood River | | | |
| Upper East Fork Hood River | 5 | 43 | 52 |
| Meadows Creek | 5 | 72 | 23 |
| Clark Creek | 9 | 49 | 42 |
| Newton Creek | 26 | 20 | 54 |
| Robinhood Creek | 12 | 17 | 71 |
| East Fork Hood River | 20 | 71 | 9 |
| Culvert Creek | 10 | 73 | 17 |
| Cold Spring Creek | 3 | 58 | 39 |
| Polallie Creek | 9 | 59 | 32 |
| Tilly Jane Creek | 14 | 79 | 7 |
| Lower East Fork Hood River | 2 | 59 | 39 |
| Crystal Springs | 74 | 26 | 0 |
| Dog River | 7 | 93 | 0 |
| Rimrock Creek | 5 | 87 | 8 |
| Yellowjacket Creek | 3 | 68 | 29 |
| Evans Creek | 68 | 26 | 6 |
| Trout Creek | 46 | 54 | 0 |
| Middle Fork of the Hood River | | | |
| Clear Branch | 35 | 53 | 12 |
| Pinnacle Creek | 30 | 61 | 9 |
| Coe Branch | 23 | 50 | 27 |
| Eliot Branch | 30 | 52 | 18 |
| Middle Fork Hood River | 70 | 29 | 1 |
| Bear Creek | 72 | 28 | 0 |
| Tony Creek | 80 | 20 | 0 |

## *Soil Erosion Hazard*

Soil erosion hazard is based on expected losses of surface soil when all vegetative cover, including litter, is removed. Criteria used when assigning relative ratings include evaluations of climate, slope gradient, soil texture and structure, permeability, hydrologic characteristics, and local knowledge. The 1979 Soil Resource Inventory (SRI) map units were used to delineate and categorize soil erosion hazard. This information was then stratified into low, medium, and high erosion hazard categories and mapped using the SRI cells in the Forest GIS system.

The results indicated in Table 4. show that within the Middle Fork Basin, there are no large basin wide areas of high surface erosion hazard soils. This is due primarily to the rocky well drained nature of the soils and gentle terrain. There are areas of high erosion hazard within all sub-basins except Bear and Tony Creek. They are generally localized on steep slopes and in riparian areas.

The East Fork has four sub-basins with a large percentage of the drainage in the high soil erosion category. They include Clark Creek, Newton Creek, Rimrock Creek and Yellowjacket Creek. This is due primarily to steep slopes, harsh growing conditions, and general lack of soil structure and strength.

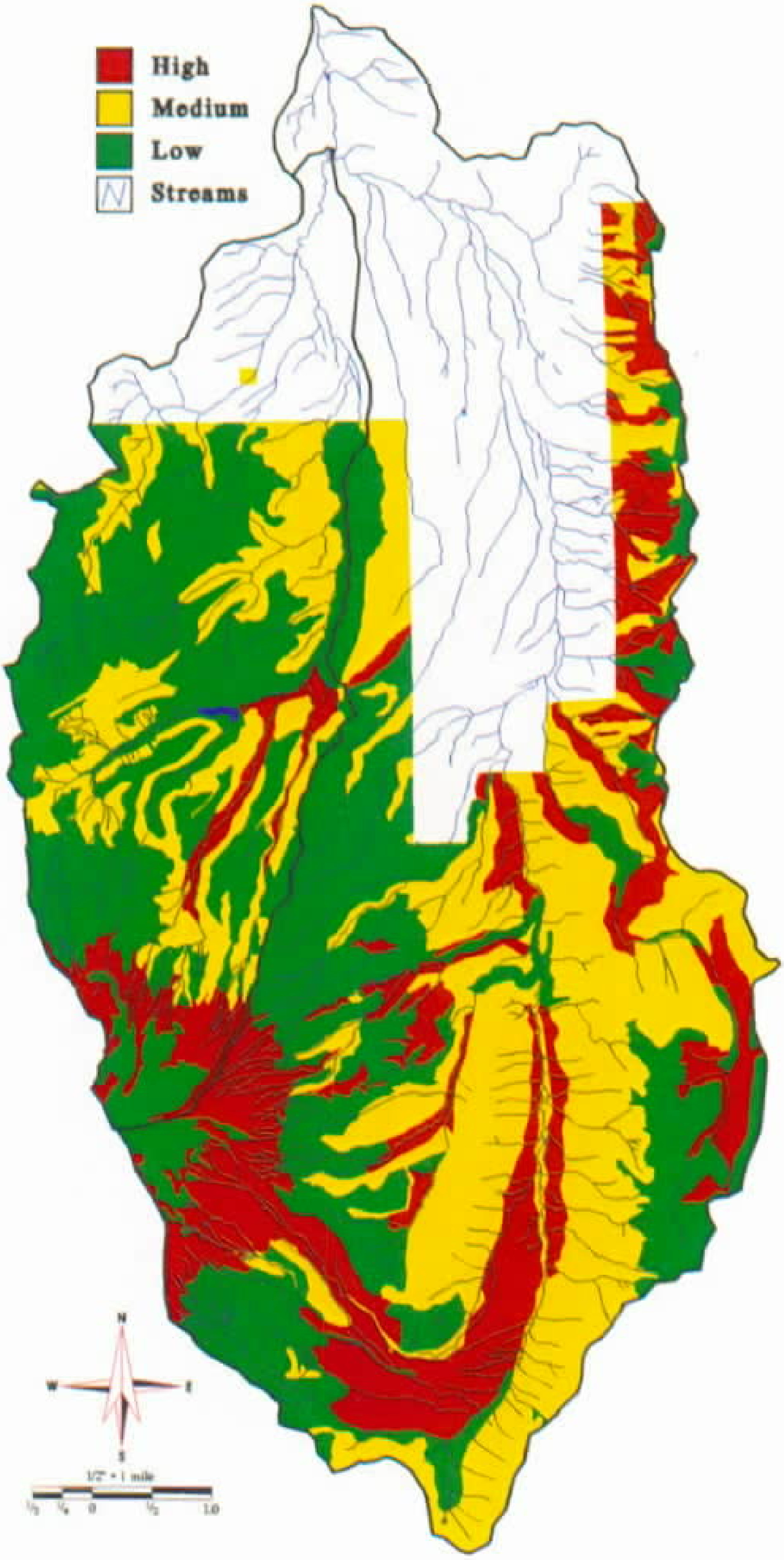



Figure 1.3. - Soil Erosion Hazard in East and Middle Fork Hood River Watershed

Table 3. Basin percentages of low, medium, and high potential for soil erosion.

| Subwatershed | Low (%) | Medium (%) | High (%) |
|---|---|---|---|
| East Fork of the Hood River | | | |
| Upper East Fork Hood River | 28 | 48 | 24 |
| Meadows Creek | 48 | 6 | 48 |
| Clark Creek | 32 | 14 | 54 |
| Newton Creek | 28 | 4 | 68 |
| Robinhood Creek | 21 | 59 | 20 |
| East Fork Hood River | 25 | 32 | 48 |
| Culvert Creek | 21 | 74 | 5 |
| Cold Spring Creek | 46 | 32 | 22 |
| Polallie Creek | 43 | 18 | 39 |
| Tilly Jane Creek | 68 | 25 | 7 |
| Lower East Fork Hood River | 14 | 71 | 15 |
| Crystal Springs | 90 | 10 | 0 |
| Dog River | 27 | 42 | 31 |
| Rimrock Creek | 5 | 25 | 70 |
| Yellowjacket Creek | 20 | 12 | 68 |
| Evans Creek | 80 | 14 | 6 |
| Trout Creek | 41 | 58 | 1 |
| Middle Fork of the Hood River | | | |
| Clear Branch | 72 | 24 | 4 |
| Pinnacle Creek | 70 | 29 | 1 |
| Coe Branch | 42 | 27 | 31 |
| Eliot Branch | 47 | 28 | 25 |
| Middle Fork Hood River | 52 | 42 | 6 |
| Bear Creek | 64 | 36 | 0 |
| Tony Creek | 79 | 21 | 0 |

### *Soil Productivity*

Within the East Fork Basin, the most productive sites are located within riparian areas not associated with recently active debris torrents and mid elevation deep ashy soils generally between 2500 - 4000 feet in elevation. Debris torrent activity tends to obliterate entire riparian areas by either removing soil and vegetation or burying them as the debris torrent moves downstream. Most of the recently active drainages associated with debris torrents are associated with glaciated watersheds or glacial derived material in steeply incised watersheds with unstable headwalls (See Geology Analysis). Ashy soils are considered good for rooting mediums due to loamy textures and higher water holding capacities. Lower productivity sites within the East Fork are generally associated with short growing seasons, low organic matter, and sub basins associated with recent debris torrent activity.

Within the Middle Fork Basin the most productive sites are riparian areas not associated with debris torrent activity. As with the East Fork riparian soils, flood waters in the Middle Fork Basin deliver nutrient rich sediment and organic matter to the soil adjacent to streams. The remaining areas have lower productivity due to rocky, cold soil conditions.

## *References*


Christner, Jere. 1881. Changes in Peak Streamflows from Managed Areas of the Willamette National Forest. USDA Forest Service, Willamette National Forest, Eugene, Oregon.

Dinehart, R.L. 1986. Sediment Data For Streams Near Mount St. Helens, Washington - Volume 2. Water Years 1981-83. USGS Open file report 85-632. Vancouver, Washington.

Dinehart, R.L. 1992. Sediment Data For Streams Near Mount St. Helens, Washington - Volume 3. Water Years 1984-87. USGS Open file report 91-219. Vancouver, Washington.

Driedger, Carolyn and Kennard, Paul M. 1986. Ice Volumes on Cascade Volcanoes: Mt. Rainier, Mt. Hood, Three Sisters, and Mt. Shasta. USGS Professional Paper 1365, 28 pages.

Dunne, T., and Leopold, L.B. 1978. Water in Environmental Planning. W.H. Freeman and Company, New York.

Gallino, G.L. and Pierson T.C. 1985. Polallie Creek Debris Flow and Subsequent Dam-Break Flood of 1980, East Fork Hood River Basin, Oregon. United States Geological Survey Water-Supply Paper 2273.

Grant, G.E. and Swanson, F.J. 1995. Morphology and Processes of Valley Floors in Mountain Streams, Western Cascades, Oregon. USDA, Forest Service, Pacific Northwest Research Station, Corvallis, Oregon.

Howes, Steve. 1979. Soil Resource Inventory. Forest Service USDA, Pacific Northwest Region, Mt. Hood National Forest.

Lundstrum, S.C. 1992. The Budget and Effect of Superglacial Debris On Eliot Glacier, Mount Hood, Oregon. University of Colorado PhD Thesis.

Pierson, Tom. Personal communication and Unpublished USGS sediment data form Mt. St. Helens.

Ragan, Richard, and Butts, Jennie. 1991. Summary of Hydrological Recovery Model. USDA Forest Service, Hood River Ranger District, Mt. Hood National Forest, Unpublished.

# *WATER QUALITY REPORT*

## *EAST & MIDDLE FORKS OF THE HOOD RIVER WATERSHED ANALYSIS*

by Daniel Newberry, Hydrologist
Hood River & Barlow Ranger Districts

**Data of three types is analyzed in this document: water temperature throughout the basin from all sources; water quality information from two stations in the Mt. Hood Meadows permit area; and miscellaneous non-USFS water quality data.**

## *Water Temperature*

High water temperature is a concern in these watersheds primarily because of its impact on fish, both anadromous and resident. Several studies have reported delays in spawning for a variety of anadromous fish species (as reported in Meehan, 1992) because of increased water temperature. The USFWS reported that steelhead fry require temperatures in the range 7.2-15.0°C, that smolting ceases at temperatures in the range 14-18°C, that oxygen uptake becomes difficult at 20°C and that 23.9°C represents the lethal upper limit (Barnhart, 1986). Human land uses, including timber harvest, livestock grazing, road building, and residential and commercial development, have been known to increase stream temperatures, primarily through the removal of riparian vegetation which provides stream shading.

Several sources of water temperature data exist in the East and Middle Fork Hood River (EHFR & MFHR) watersheds. The Hood River Ranger District has continuous thermograph data at several sites for summer months for 1994 and 1995, primarily on National Forest land. The Confederated Tribes of Warm Springs (CTWS) has thermograph data spanning between two and six years on the EFHR at Trout Creek crossing, on MFHR above Red Hill Road, and on the mainstem Hood River at Powerdale dam (all on non-Federal land). Mt. Hood Meadows, Inc. (MHM), maintains two water quality stations within their National Forest special use permit boundary. Water temperature from these two sites is available for 1992-present. The Oregon Dept. of Fish & Wildlife has records of point samples spanning several years. Table 1 contains a description of the temperature monitoring data analyzed in this report.

Graph 1 displays the 7-day average high temperature (7AH) during the summer months at three sites along the EFHR. The water temperature at the MHM station (River Mile 27.2) is exceptionally cool, reflecting the influence of snowmelt from a perennial snowpack. The 7AH temperature at the National Forest boundary is below both the Mt. Hood forest plan standard of 14.4°C and the Oregon state standard of 17.8°C during all four summer months. The average maximum daily temperature at the Trout Creek station (RM 3.7) exceeds the 17.8°C threshold for all four months (and also for May, which is not shown on this graph). The values listed for the Trout Creek Crossing station are for the average maximum daily temperature, not the 7AH value, which was not available for analysis. The 7AH values are likely to be 1-2° higher than the listed values. The July and August values, 21.0°C and 21.5°C, are above the threshold for oxygen uptake difficulty for steelhead discussed earlier (Barnhart, 1986). There are two likely causes for the high temperatures in the lower EFHR watershed. The first is the substantial water withdrawal to the East Fork Irrigation Ditch (RM 9.2) 5.5 miles upstream from the monitoring station, which has occasionally diverted 100% of the EFHR during the low flow season. Second is the lack of riparian shade along much of the river channel due partially to human land use which has removed a substantial portion of the riparian forest.

**TABLE 1. - Water Temperature Records Analyzed**

| Stream | Location | Years of Record | Agency |
|---|---|---|---|
| East Fork HR | Mt. Hood Meadows | 92-95 | MHM |
| Mitchell Creek | Mt. Hood Meadows | 92-95 | MHM |
| East Fork HR | NF Boundary/Routson Park | 94-95 | USFS |
| Robinhood Creek | Confluence w/EFHR | 94-95 | USFS |
| Dog River | Confluence w/EFHR | 94-95 | USFS |
| Middle Fork HR | Red Hill Rd | 94-95 | USFS |
| Bear Creek | Confluence w/MFHR | 94-95 | USFS |
| Clear Branch | Above Laurance Lake | 93-95 | USFS |
| Clear Branch | Below Laurance Lake | 93-95 | USFS |
| East Fork HR | Trout Creek Crossing | 92-95, 90 (Jul-Dec) | CTWS |
| West Fork HR | Above Dee, Rd 13 Xing | Jul 90-95 | CTWS |
| Hood River Main | Powerdale Dam | Jul 90-95 | CTWS |

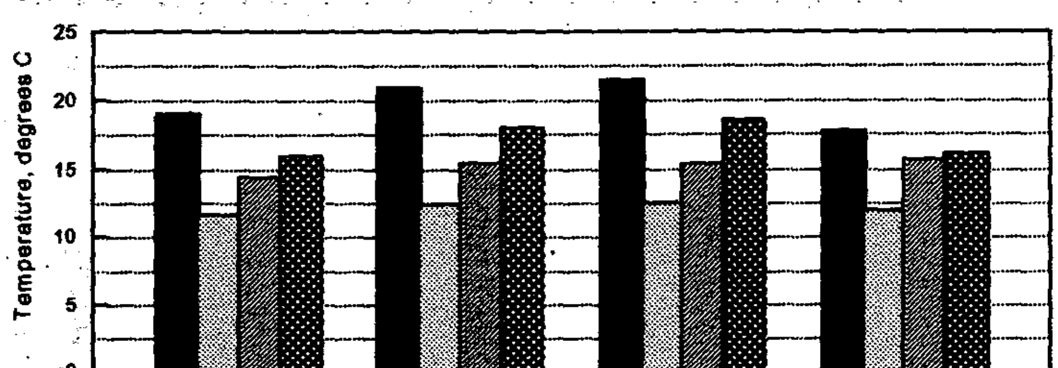
## GRAPH 1: 7-Day Avg High (7AH) Water Temperature
### East Fork Hood River At MHM, NF Bdy, Trout Creek Xing


| Month | JUN | JUL | AUG | SEP |
|---|---|---|---|---|
| MHM | 10.2 | 12.9 | 13.4 | 11.5 |
| NF Bdy | 12.9 | 15.0 | 14.4 | 12.9 |
| Trout Crk Xing | 19.1 | 21.0 | 21.5 | 17.8 |

MHM: 92-95 (RM 28.2); NF Bdy: 94&95 (RM 14.9); TCX: 92-95,90:Jul-Sep (RM 3.7)

To put these temperatures into a basin-wide perspective, consider water temperature values at the four sites monitored by CTWS: EFHR (RM 3.7, elev 1040'), MFHR (RM 4.5, elev 1600') West Fk HR (RM 4.5, elev 1350'), and the HR Mainstem at Powerdale dam (RM 4.5, elev 200'). These values are displayed in Graph 2. The temperatures at the EFHR station are higher than those at the WFHR or the mainstem stations. Because of differences in landforms among the watersheds and the monitoring locations, it is not possible to determine how much of the temperature differences here are natural and how much are human-caused. This comparison is presented here to document that of the three forks of the Hood River system, the hottest temperatures are contributed by the EFHR. To further determine the impact of irrigation on water temperature in the East Fork, a strategy would be to place additional temperature monitoring stations immediately above and below the point of diversion.

## GRAPH 2: Avg Daily Maximum Water Temperature
### East Fk, Middle Fk, West Fk, Mainstem Hood River

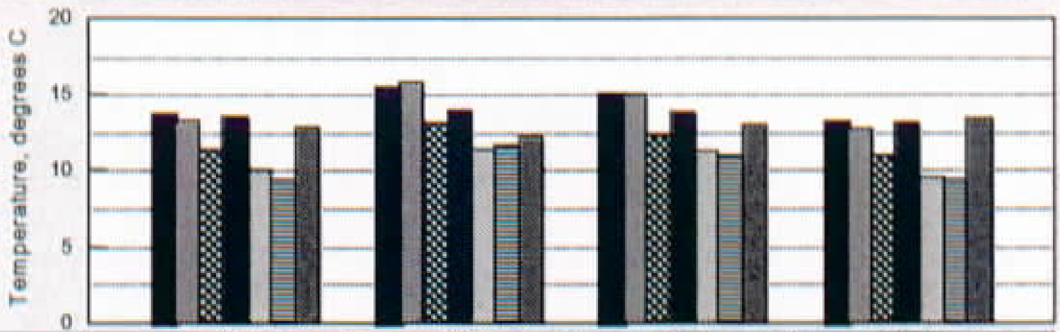



| Month | JUN | JUL | AUG | SEP |
|---|---|---|---|---|
| East Fk HR | 19.1 | 21.0 | 21.5 | 17.8 |
| Mid Fk HR | 11.7 | 12.4 | 12.5 | 11.9 |
| West Fk HR | 14.4 | 15.4 | 15.4 | 15.7 |
| HR Main | 16.0 | 17.9 | 18.5 | 18.1 |

EFHR: Trt Crk Xing (RM 3.7); MFHR: Rd 16 (RM 4.4) WFHR: Above Dee (RM 4.3); HR Main: Powerdale Dam (RM 4.5)

Graph 3 contains the maximum monthly temperatures for National Forest locations. Of these streams, Robinhood Creek and the section of Clear Branch below Laurance Lake appear to have temperature regimes noticeably altered by human management. Robinhood Creek contains several miles of bufferless stream channel as a result of past timber harvesting. Because this area is a frost pocket, regeneration has proven difficult. Not only are maximum daily temperatures high on Robinhood Creek, but the diurnal range is far higher than those recorded by other streams with similar geomorphic characteristics in the Hood River subbasin. In a stream without perennial snowmelt or glaciers in its watershed, high diurnal temperature fluctuations are characteristic of a lack of stream shade.

GRAPH 3: Monthly Maximum Water Temperatures
Various Sites, East & Middle Fk Watersheds ('94&'95 Avg)



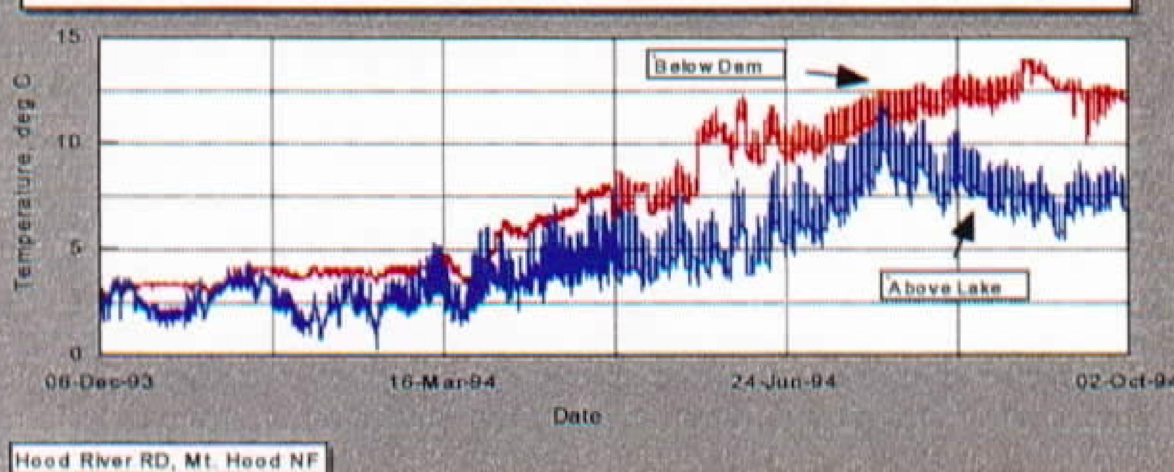

| Month | JUN | JUL | AUG | SEP |
|---|---|---|---|---|
| East Fk HR | 13.8 | 15.6 | 15.2 | 13.3 |
| Robinhood Crk | 13.3 | 15.9 | 15.1 | 12.7 |
| Dog River | 11.4 | 13.2 | 12.3 | 11.0 |
| Middle FK HR | 13.5 | 14.0 | 13.8 | 13.1 |
| Bear Crk | 10.0 | 11.5 | 11.3 | 9.8 |
| Clear Br Above | 9.4 | 11.7 | 11.0 | 9.4 |
| Clear Br Below | 12.9 | 12.2 | 13.0 | 13.5 |

The temperature regime below Laurance Lake is outside the range of natural conditions in several ways. First, the hottest temperatures occur in September, after other streams have begun to cool. This coincides with the spawning period for Bull Trout. Second, the diurnal range is significantly narrower than that at the upstream Clear Branch location. The absolute temperatures during the summer months are several degrees Celsius higher below Laurance Lake than above the lake, but it is not clear how much is natural warming and how much is human-caused. Continuous readings for the Clear Branch sites are displayed separately in Graph 4.

Unknown is why the temperatures below the dam are so high given that the outflow is presumed to be taken from far below the lake surface, where the water should be significantly cooler than the temperature currently measured one quarter mile downstream. Perhaps the unvegetated section of stream immediately below the dam is responsible for the elevated temperature or perhaps there is a leakage of warmer water from the top of the lake into the outflow. Spot temperatures taken immediately below the dam throughout the summer would help answer this question.

The temperature regimes on Bear Creek, Middle Fork Hood River, and Dog River appear to be the least affected by human management. An important data gap is how much water temperature on Dog River is impacted by the municipal water withdrawal by the city of The Dalles.

GRAPH 4: Water Temperature - Clear Branch
Above and Below Laurance Lake - Water Year 1994



In summary, the following trends appear to hold for summer water temperatures in the East and Middle Forks Hood River watersheds:

- Headwater reaches are a source of year-round cold water.
- The East Fork mainstem below the National Forest boundary, probably beginning with the diversion at the East Fork Irrigation District Ditch, displays summer temperatures high enough to be causing biological damage to anadromous fish.
- Robinhood Creek and Clear Branch immediately below Laurance Lake both display temperatures that appear to be elevated because of human management.
- Monitoring needs: discovering the reason for high temperatures measured one-quarter mile below Laurance Lake on Clear Branch; determining temperature suitability for Bull Trout on Compass Creek and Coe Branch, where reported Bull Trout sightings have occurred; documenting the temperature regime on the East Fork immediately above and below the East Fork Irrigation Ditch.

## *Water Quality Trends in the Mt. Hood Meadows Permit Area*

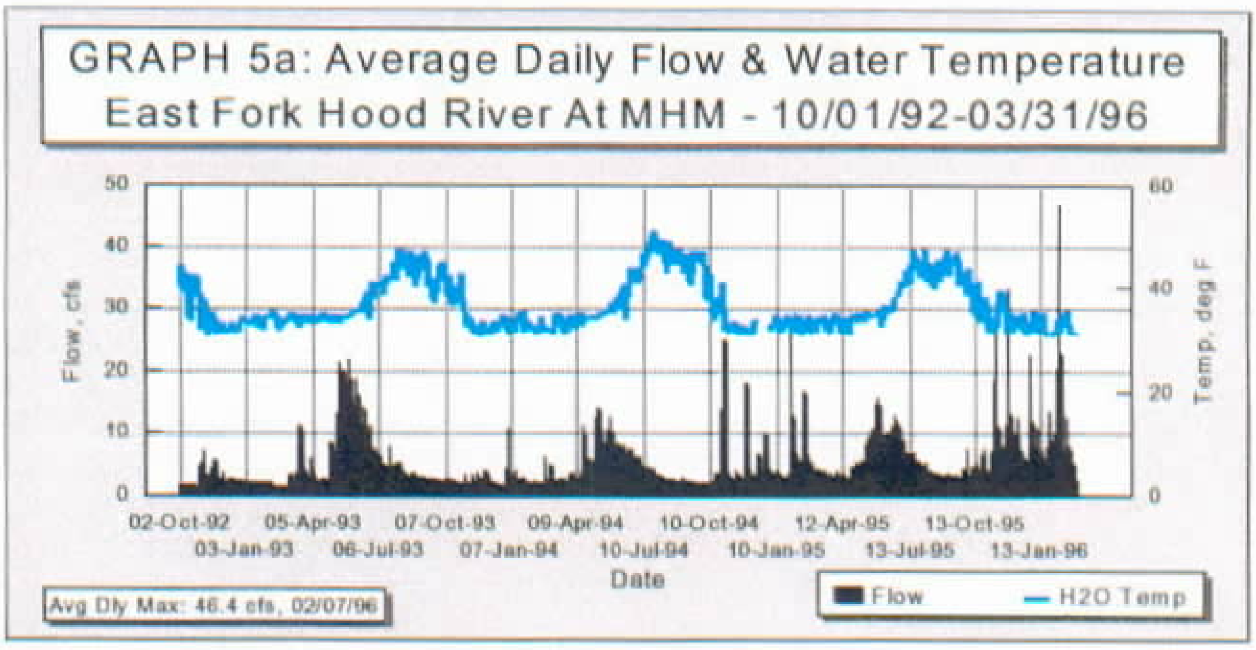
In response to frequently asked questions pertaining to hydrology and water quality within the Mt. Hood Meadows (MHM) permit area, that permittee installed two water quality data logger stations in 1991. Data collected includes: flow, water temperature, air temperature, precipitation, turbidity, suspended sediment, conductivity, and sewage treatment plant discharge. One station, intended as a control, is on Mitchell Creek. The other, draining an area most likely to be impacted by human management, is on the East Fork Hood River (RM 27.2), immediately downstream from a wastewater treatment plant. Because substantial fine-tuning of the equipment occurred in the first year of operation, only three and one-half years of data have been analyzed here. Though four years may seem like a long period of time for some types of monitoring, it is a relatively short period of record for a complex and highly variable alpine environment. For this reason, results drawn from this analysis should be considered trends rather than as conclusions.

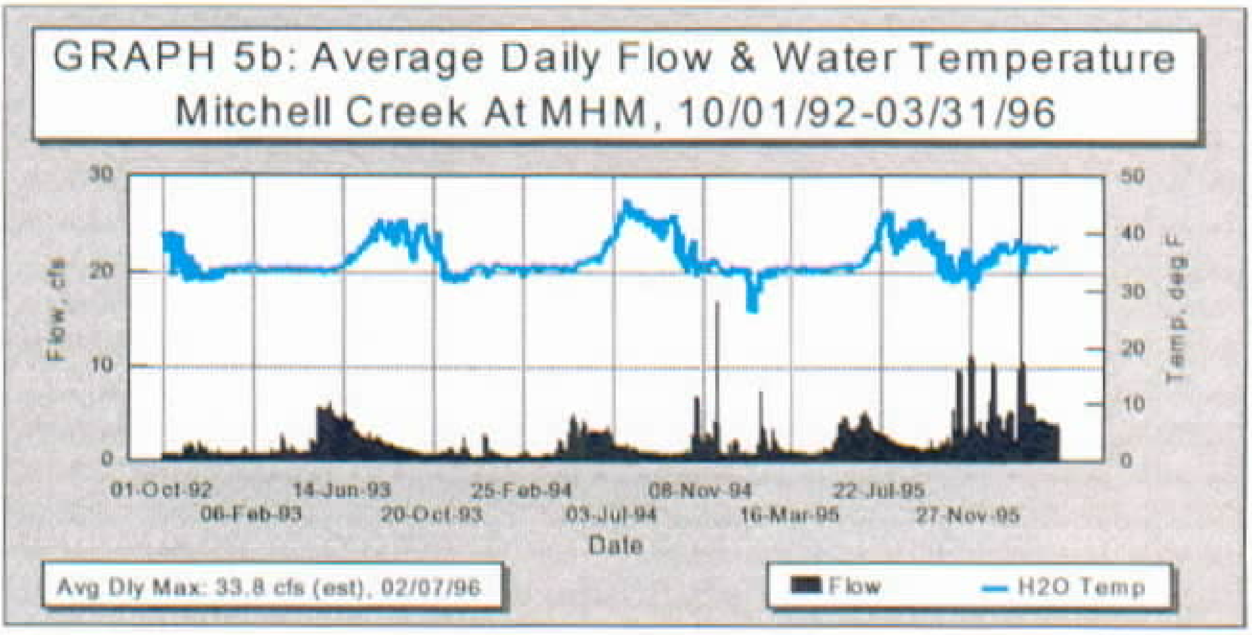
### *Flow Regime*

What is striking from the streamflow patterns of the four water years of record is the high variability both in the absolute amount of flow and in its temporal patterns. Graphs 5a and 5b display average daily streamflow and water temperature for the period from Oct 1, 1992 (the beginning of "water year" 1993) through March 31, 1996 for the EFHR and Mitchell Creek, respectively. As expected, the annual high *sustained* flow occurs during the snowmelt season beginning in late spring. The greater part of snowmelt typically begins in about the beginning of May and lasts 7-8 weeks. In two of the four years of record, rainstorms, most of which occurred on top of a substantial snowpack, produced flows in excess of the snowmelt peak. During each of those years, this phenomenon occurred at least three times. It is thus possible that instead of being spread evenly throughout time, rain-caused peakflows are clumped together during wetter years. The highest flows on record occurred during the much-publicized February, 1996 storm that caused flooding throughout much of the Pacific Northwest. That high flow at the East Fork station was estimated at 57.7 cfs, approximately 18% higher than the next highest storm, and on Mitchell Creek was estimated at 37.2 cfs, approximately 56% higher than the next highest storm. Because the great volume of water during that storm overflowed the weir, an estimate was made for the peak flow and was based on the shape of previous hydrographs (pattern of the rise and fall of water during a storm event over time at a given location).

### *Sediment and Turbidity*

Turbidity measurements are taken hourly and suspended sediment daily at both stations. During intense storms, sediment samples are taken more frequently, sometimes as often as every half-hour. Unfortunately, the turbidimeter has a range of 0-100 NTUs, and this range is typically exceeded during high flow events. For this reason, it has been impossible to analyze the full relationship between turbidity and suspended sediment at high flows. If a good turbidity/sediment relationship could be developed, then a reasonably accurate sediment budget for suspended sediment could be developed.




An analysis of existing data with turbidity less than 100 NTUs did not reveal such a relationship. Several linear regression analyses were performed, comparing these variables under various conditions: types of events (rain, rain-on-snow, snowmelt) and different parts of the hydrograph (rising limb, falling limb). There would appear to be three possible explanations for the lack of association and correlation in these variables. First, the equipment has malfunctioned. Second, the relationship is random. Third, the natural variation is so great that it masks the relationship. The answer is likely a combination of equipment failure and natural variation. There are several instances of the turbidimeter changing suddenly by an order of magnitude and staying in the new range for a few days and reverting back to the former range for an extended period of time. This suggests equipment malfunction. Natural variation is also highly likely here. What is typically observed in hydrologic phenomenon, is that the larger the watershed under observation, the more the effects of localized incidents are masked or averaged by the larger whole. A flood occurring only in the Hood River Valley would likely not be discernible in the flow records at the mouth of the Columbia River.

A similar regression study was undertaken to determine if a relationship exists between suspended sediment and flow. The answer would appear to be yes, though there appears to be quite a bit of natural variation and isolated cases of possible equipment malfunction. For this study, eighteen months of sediment data was studied on both the EFHR and Mitchell Creek. Time constraints prevented an analysis of the entire period of record. Visual scatter plots confirm a relationship between flow and suspended sediment in a fashion consistent with hydrologic theory: the greater the flow, the higher the sediment concentration and load. The variables appear to be independent and normally distributed, two additional assumptions required in linear regressions.

The highly variable nature of the hydrology of the East Fork headwaters supports this "masked relationship" theory. Many of the observed data points are assumed to be "outliers." When applied to sediment this suggests that sediment moves in these basins unevenly, in pulses. Because no significant bank erosion or scour has been observed during the period of record in the stream channels draining these stations, it is assumed that the primary sediment sources are one or more of the following: naturally unvegetated areas, human-disturbed areas, and aolian (wind-deposited). There are two primary soil types in these basins. The first, occurring below tree line, is SRI type 379, a gravely loam. Though listed in the Mt. Hood NF Soil Resource Inventory (Howes, 1979) as having a low erosion potential, it is sensitive to disturbance. The SRI lists this soil type as having a "low" suitability for recreation area development and a "moderate" soil and site damage susceptibility. The other primary soil type occurs in the higher unvegetated areas, but is not mapped by the SRI. From visual inspections this soil has little to no development or structure and is highly susceptible to erosion.

One important trend emerging from the sediment data, is that the highest sediment loads occurred during fall rainstorms prior to the development of a new snowpack. This suggests that rainsplash erosion on unvegetated or disturbed areas is a cause of significant erosion in the Mt. Hood Meadows permit area. To minimize erosion and sediment delivery to streams, it is thus crucial to minimize ground disturbance and revegetate disturbed areas as quickly as possible.

The division between natural and human-caused erosion and sedimentation is unclear. A comparison of eighteen months of data of suspended sediment between the control basin, Mitchell Creek, and the "managed" basin, the East Fork site, revealed an approximate parity between the annual sediment load *per unit land area.* Because of the difference in basin size and landform characteristics between the two drainages, it is not clear if any conclusions can be drawn from this comparison, other than to say that the natural sediment load is very high in both basins. It is more likely that a difference would be noticed in the year following the beginning of a major construction project, but since most larger projects were initiated prior to the period of record or outside these drainage areas, this theory is as yet untested.

One example that supports the theory that specific management activities may be discernible from the records occurred in June, 1995. A Hood River valley resident reported a noticeable increase in the turbidity of the upper East Fork during the final week in that month. Subsequent investigation discovered the likely source: an upstream culvert had plugged and washed away part of a road. The data record revealed a sharp spike in the suspended sediment concentration coincident with this report. Roads and culverts are likely responsible for a large part of the human-caused sediment load in these basins, as they are in most forested watersheds. Visual inspection of roads and culverts in the Mt. Hood Meadows permit area revealed several instances of erosion from road surfaces and immediately beneath culverts, where inadequate energy dissipation material had been placed. An increased number of water bars on road surfaces and larger diameter material at culvert outfalls would reduce those sources of human-caused erosion and sedimentation.

An additional source of management-caused sediment in streams at Mt. Hood Meadows Permit Area is the road maintenance practice by the Oregon Department of Transportation (ODOT). To enhance road safety, ODOT frequently applies sand/gravel to Road 3555. This sediment ultimately ends up in the East Fork Hood River and in Stringer Meadows. Not only does this increase the sediment load in the East Fork, but it alters the timing of sediment delivery, and the additional sand/gravel is from a geologic source not native to the Upper East Fork subwatershed.

## *Conductivity*

Conductivity, or the ability of a liquid to conduct electric current, is measured at both stations. Conductivity is usually used as a surrogate for the concentration of dissolved ions in water, though the specific ions are unknown without further tests. MacDonald *et al* (1991), through a literature review, reported a conductivity range of 2-42 μmhos/cm for melted snow in the western United States and a range of 30-1500 μmhos/cm for potable water. Streams emanating from forested areas in the Pacific Northwest had concentrations at the low end of this scale. The large sustained sudden changes in conductivity measured at the MHM permit areas suggest equipment problems, failures, or inaccuracies. Conductivity meters require periodic maintenance. Several trends are noticeable, though:

- Conductivity, beginning with spring snowmelt and continuing until the onset of fall rains, is inversely related to flow, displaying a dilution effect. The dilution effect was also reported by Gosz (1977) though in that case it was exhibited for the entire year.
- With the onset of fall rains, the conductivity increases sharply over a period of two months and usually remained high during the winter.

- The conductivity on the East Fork was substantially higher than that on Mitchell Creek. This trend is questionable due to potential equipment inaccuracies.
- Conductivity changes on the East Fork could be traced directly to releases from the waste water treatment plant.

## *Permitted Point Source Discharges*

The National Pollution Discharge Elimination System (NPDES) under the Clean Water Act is a permit system intended to control point sources of pollution in the waters of the United States. There are three NPDES permits outstanding in the East Fork/Middle Fork watersheds:

**TABLE 2. - Current NPDES Permits in the East/Middle Fork Watersheds**

| Permittee | Receiving Waters | Facility Type |
|---|---|---|
| Mt. Hood Meadows | East Fork HR | Domestic Wastewater Treatment |
| Parkdale Sanitary District | Trout Creek | Domestic Wastewater Treatment |
| Dee Forest Products | East fork HR | Pulp, paper, hardboard manufacture |

The permitted constituent in the discharge from the wastewater treatment plants is Biological Oxygen Demand (BOD). BOD is defined as "the amount of oxygen consumed by living organisms (mainly bacteria) while utilizing the organic matter in the waste" (Dunne and Leopold, 1978). No information is available at this time concerning the operation of the Parkdale facility. The majority of the usage at the MHM facility occurs during the winter months when biological activity is low and has a batched release system to reduce the concentration of wastewater release. Specific impacts to the biota are not known at this time, though several years of macroinvertebrate monitoring has been conducted by Hood River RD personnel. The macroinvertebrate study results and analysis are currently several years overdue from a laboratory contractor.

Several discharge constituents are permitted at the Dee Forest Products facility, including BOD, thermal discharge (in non-contact cooling water), total suspended solids (TSS), and pH. In addition, monitoring and reporting are required for the following constituents: flow, settleable solids, floating solids, oil and grease, phenols, copper, and arsenic. Various bioassays are also required. Documents from Oregon DEQ (1994a & 1994b) revealed that this facility has been charged and fined recently for violations of its NPDES permit, including discharge from unauthorized outfalls, improper operation of permitted outfalls, failure to take required samples for two pollutants, and failure to record samples. The civil penalty levied was for the amount of $7200. Because high summer temperature was identified as a cause for concern earlier in this document, and because of thermal discharge to the East Fork by Dee Forest Products, it is worth presenting rough estimates of possible impacts to summer water temperature at this point in the East Fork. Table 3 displays these results, using a thermal mass balance calculation for the displayed variables. In this worst case sensitivity analysis a range was presented for three variables. First flow in the East Fork Hood River was varied, using 20, 40, and 60 cfs. Twenty cfs is the minimum required by the water right for the East Fork Irrigation District. Second, the time over which the maximum daily effluent flow was varied, assuming one, two, and three work shifts (i.e. spread out over 8, 16, & 24 hrs/day). Third, the effluent temperature was varied for two cases: 80°F, the maximum permitted temperature, and 100°F, a value in excess of the permit.

**TABLE 3. - Temperature Mass Balance Sensitivity Analysis for Thermal Input into East Fork Hood River from Dee Forest Products**

| Effluent=80°F | Daily Flow over 24 hrs | Daily Flow over 16 hrs | Daily Flow over 8 hrs |
|---|---|---|---|
| EFHR Flow=20 cfs | 71.2 | 71.7 | 72.2 |
| EFHR Flow=40 cfs | 71.0 | 71.2 | 71.5 |
| EFHR Flow=60 cfs | 70.9 | 71.1 | 71.2 |
| | | | |
| **Effluent=100°F** | **Daily Flow over 24 hrs** | **Daily Flow over 16 hrs** | **Daily Flow over 8 hrs** |
| EFHR Flow=20 cfs | 72.4 | 73.9 | 75.3 |
| EFHR Flow=40 cfs | 71.6 | 72.4 | 73.2 |
| EFHR Flow=60 cfs | 71.3 | 71.9 | 72.4 |

(all temperatures expressed in degrees Fahrenheit)

## *Agricultural/Silvicultural Chemical Use*

Within the Hood River Valley, including the EFHR/MFHR watersheds, are many thousands of acres in agricultural land uses. There are no known studies addressing the environmental impact of agricultural chemicals in the Hood River subbasin. It is beyond the scope of this analysis, and in this time frame, to do an in-depth study. Some preliminary statistics and issues are identified here to aid future analyses. The effects on the aquatic ecosystem most likely to impact the Hood River subbasin are:

### *Pesticides and pesticide metabolites entering stream channels through groundwater, and to a lesser extent, from direct deposition.*

Pesticides in the Hood River Valley are applied primarily via aerial sprays. Likely impacts are some level of stress to aquatic biota directly, and indirectly through impacts to the aquatic food chain. It is important to note that past chemical inputs are almost certainly still affecting the aquatic system. Though no water quality studies of agricultural chemicals are available in the Hood River subbasin, there is available information from a recent study on the Yakima River basin in the state of Washington. Like the Hood River subbasin, the Yakima basin has a high density of agricultural land, including fruit production, with a similar history of pesticide use spanning several decades. In this study conducted from 1988 to 1991, Rinella (1994) found DDT and its metabolites in groundwater, surface water, and soil draining agricultural areas. The levels of these substances in aquatic organisms was in the range of 1-10 ng/l (ng=$10^{-9}$ g). This is in excess of USEPA limits, *even though that chemical had been banned almost twenty years prior to the study*. There is a reasonable likelihood that DDT and other persistent chemicals discovered in the Yakima study continue to move in and through the Hood River groundwater and aquatic systems. Because of differences in climate, geology, and landform, the absolute numbers from that study are probably not comparable.

Silvicultural pesticides are used in the EFHR watershed and other areas of the Hood River subbasin, primarily the aerial application of *Bacillus Thuringensis* (Bt) and Carbaryl (Sevin) for insect management, and herbicides in power corridors. Bt has been the chemical used on National Forest land in the past ten years, and primarily for the suppression of the Western Spruce Budworm. Prior to the banning of DDT, that chemical was used by the U.S. Forest Service for insect suppression.

DATA GAPS: Biodegradability statistics/studies on specific pesticides in use; toxicology studies of these chemicals on various aquatic biota; amount and timing of pesticide applications in the various watersheds in the Hood River subbasin (including forest/silvicultural chemicals); water quality studies focused on agri-chemicals.

### *Additional nutrient inputs from agriculture (and secondarily from livestock production) to the aquatic ecosystems.*

Likely inputs are increased levels, and changes in species abundance, of algae; reduced dissolved oxygen levels.

DATA GAPS: Nutrient & Dissolved Oxygen levels in affected and unaffected streams; fertilizer use statistics for the Hood River Valley.

**TABLE 4a. - Irrigated Acres, Hood River Valley, by Irrigation District**
(Hood River News, 1991)

| | |
|---|---|
| Middle Fork I.D. | 6,700 |
| East Fork I.D. | 9,000 |
| Mt. Hood I.D. | 900 |
| Dee I.D. | 6,000 |
| Farmer's I.D. | 1,120 |
| Total Irrigated Acres | 23,720 |

TABLE 4b. - Acres in Fruit Production, Hood River Valley
(Hood River News, 1991)

| | |
|---|---|
| Pears | 9,500 |
| Apples | 4,000 |
| Cherries | 700 |
| Total, Fruit Production | 14,200 |

TABLE 5. - Pesticide Use Within Hood River County, 1987
(Reinhold et al, 1989)

| Common Name | Trade Name | Pounds Used | Common Name | Trade Name | Pounds Used |
|---|---|---|---|---|---|
| 2,4-D | Weedone 170, 2,4-D | 5100 | Fosamine | Krenite | 460 |
| 2,4-DP | Weedone 170 | 96 | Glyphosate | Roundup | 2300 |
| Amitraz | Mitac | 16000 | Malathion | | 1100 |
| Amitrole | Amizol | 930 | Methidathion | Supracide | 1800 |
| Atrazine | Aatrex, Atratol | 850 | Methyl parathion | | 40 |
| Azinphos methyl | Guthion | 23000 | Morestan | Penncap M | 11000 |
| Cabaryl | Sevin | 6300 | NAA | | 420 |
| Chlorpyrifos | Lorsban | 1500 | Oil | NAA-200 | 430000 |
| Copper | Kocide 101 | 2300 | Oryzalin | | 6200 |
| Cyhexatin | Plictran | 13000 | Oxamyl | Surflan | 1400 |
| DNOC | Elgetol | 3700 | Paraquat | Vydate | 2300 |
| Dalapon | Dowpon | 270 | Parathion | Gramoxone | 2000 |
| Diazinon | | 1500 | Phosalone | | 1600 |
| Dicamba | Banvel | 13 | Phosmet | Zolone | 9200 |
| Dichlobenil | Casoron | 170 | Simazine | Imidan | 7700 |
| Dinocap | Karathane | 1500 | Streptomycin | Princep | 16000 |
| Diuron | Darmex, Direx | 3300 | Sulfometuron | Agri-strep | 19 |
| Dodine | Cyprex | 8700 | Sulfur | Oust | 56000 |
| Endosulfan | Thiodan | 7200 | Terbacil | | 1000 |
| Ethion | | 1100 | Tridimefon | Sinbar | 2700 |
| Fenvalerate | Pydrin | 12000 | Triclopyr | Bayleton | 420 |
| | | | Ziram | Garlon 4 | 57000 |

## *Miscellaneous Water Quality Information*

In the USEPA "Storet" database are records for a series of grab samples taken during the 1970s and 1980s on a variety of Hood River valley streams. The majority of these appear to have been targeted at determining the level of fecal coliform and *e. coli*. Results indicate that many samples on Trout Creek, East Fork Hood River, and the Hood River, were in excess of USEPA water quality standards, with the highest values being on Trout Creek and on the East Fork at the confluence of Trout Creek. It was not clear from the database whether or not the East Fork values at that confluence included flow from Trout Creek. Also unknown is if this problem exists today or if the source was identified or mitigated.

One possible source of the coliform is residential septic effluent in the Trout Creek subwatershed. In a mixed land use watershed in Connecticut, Newberry (1993) found that the highest density of nitrate concentration was traced to medium density residential areas. Medium density is defined as single family houses on plots ranging in size from one to five acres. This density of housing exists in part of the Trout Creek subwatershed. The conclusion in that study was that the high nitrate levels were due to a high density of septic tanks in that land use type. Higher density housing areas would be connected to a centralized wastewater treatment plant, and the ecosystem would better be able to assimilate effluent from low density housing. If those patterns and processes hold in the Trout Creek subwatershed, perhaps the coliform movement and assimilation into the soil-water system is similar to that of nitrate in the Connecticut study. No report has been found that analyzes any of the Storet data. An additional source of coliform, as yet unexplored, is the high level of dispersed (unregulated) camping in the National Forest on both the East Fork Hood River and on Laurance Lake.

## *REFERENCES*


Barnhart, R.A. 1986. Species profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates (Pacific Southwest). Steelhead. USFWS Bio Rep. 82 (11.60), TR EL-8204. 21 p.

Behnke, R.J. 1992. Native Trout of Western North America. American Fisheries Society Monograph No. 6.

Dunne, T, and L. Leopold. 1978. Water In Environmental Planning. W.H. Freeman & Co. New York.

Gosz, James R. 1977. Effects of Ski Area Development and Use on Stream Water Quality of the Santa Fe Basin, New Mexico. Forest Science 23(2): 167-179.

Hood River News. 1991. Hood River County Fact Book. Hood River News. Hood River, OR.

Howes, Steve. 1979. Soil Resource Inventory. Mt. Hood National Forest. Gresham, OR.

MacDonald, Lee H., *et al.* 1991. Monitoring Guidelines to Evaluate Effects of Forestry Activities on Streams in the Pacific Northwest and Alaska.

Meehan, W.R. 1991. Influence of Forest and Rangeland Management on Salmonid Fishes and Their Habitats. American fisheries Society Special Publication No. 19.

Newberry, Daniel G.S. 1993. An Event Based Study of Nitrate Loading on the Mill River, Hamden, CT. Unpublished Master's Research, Yale University.

Oregon Dept. of Environmental Quality. 1994a. Notice of Noncompliance ER-B-94-024: Letter from Walter West, ORDEQ, to Bob Brewer, Dee Forest Products, Inc. ORDEQ. Bend, OR.

Oregon Dept. of Environmental Quality. 1994b. "DEQ Fines Dee Forest Products For Discharging Waste Into the Hood River Without a Permit," a News Release, Aug 1, 1994. ORDEQ. Bend, OR.

Rinehold, John W., *et al.* 1989. Oregon Pesticide Use Estimates for 1987. Oregon State University Extension Service. Corvallis, OR.

Rinella, Joseph F. 1994. Persistence of DDT and its Metabolites in the Yakima River System, 1988-91. USGS Circular #1090. US Geological Survey. Portland, OR.

USDA National Agricultural Statistics Service. 1994. Agricultural Chemical Usage: 1993 Fruits Summary. USDA-NASS. Washington.

# *FISHERIES REPORT*

## *EAST & MIDDLE FORKS OF THE HOOD RIVER WATERSHED ANALYSIS*

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May 31, 1996

## *Historic Conditions (pre 1900)*

### *Introduction*

Fisheries data for the Hood River Basin prior to 1900 is essentially non-existent. Historical records, anecdotal information, and assumptions based on documented conditions at present and from 1900 to the present were used to provide the following fisheries historical perspective.

### *Fish Presence and Distribution*

Anadromous fish species known to occur within the East and Middle Forks of the Hood River included steelhead trout *Oncorhynchus mykiss irideus*, coho salmon *O. kisutch*, sea-run cutthroat trout *O. clarki*, and Pacific lamprey *Entosphenus tridentatus*. In addition, spring chinook salmon *O. tshawytcha* could have resided in the East and Middle Fork Hood River subwatersheds. Resident fish species indigenous to the subwatersheds were cold water fish such as rainbow trout *O. mykiss*, cutthroat trout, bull trout *Salvelinus confluentus*, and sculpin *Cottus spp*. Other fish residing in the Columbia River and mainstem Hood River that could have resided within either the East Fork or Middle Fork watersheds include suckers *Catostomus spp*., mountain whitefish *Prosopium williamsoni*, and northern squawfish *Ptychocheilus oregonensis*.

Distribution of the above species is based primarily on mid-century Oregon State Game Commission (OSGC) reports and some limited historic information. Steelhead trout were present in the East Fork Hood River at least as far up as Cold Springs Creek but there were no known barriers above that point that would have precluded them from migrating further upstream. In the Middle Fork Hood River, steelhead likely journeyed as far upstream as Clear Branch above Pinnacle Creek. Use of major tributaries to either the Middle Fork or East Fork is possible but unknown except for Dog River (OSGC 1963).

Coho salmon also resided in both the East and Middle Forks of the Hood River but upper limits of distribution are unknown. Coho spawning was documented during the mid-1960's in Clear Branch within the stream reach now inundated by Laurance Lake (Oregon Department of Fish and Wildlife, unpublished data) so use prior to 1900 is likely. Coho have been seen in Dog River but use of the East Fork above that point is unknown.

Sea-run cutthroat trout were found in both East and Middle Fork watersheds but upper limits of distribution and use of tributaries is unknown. Light to moderate use of Hood River system streams, presumably tributaries to each of the main forks, is mentioned by OSGC in a 1963 basin investigation report. Pacific lamprey are also noted in the same report as residing in the East and Middle Forks but specific locations are not given.

Spring chinook may have used either the East Fork or Middle Fork but actual distribution and abundance is unknown. Currently, spring chinook are found mostly in the West Fork and mainstem Hood River. It is questionable whether spring chinook were able to ascend the West Fork prior to passage improvements at Punchbowl Falls (1957) and Moving Falls (1985) (USFS 1995).

Resident rainbow and cutthroat trout were likely found throughout both East and Middle Fork drainage's. Natural barriers, including steep gradient, affected distribution by limiting or preventing access to some tributaries. Genetically pure populations of cutthroat trout exist today in some tributaries indicating species segregation for whatever reason; perhaps a migration barrier forming after colonization. Distribution of bull trout before the turn of the century is not known. Certainly, they were present in the Middle Fork and its upper tributaries and, based on current information, at least some were migrating to and from the Columbia River. Some streams in the Middle Fork subwatershed that to our knowledge currently do not support bull trout, such as Bear Creek, very likely harbored bull trout in the past. Although speculative, East Fork Hood River subwatershed may have contained bull trout because some tributaries have suitable habitat.

Aside from sculpin, which probably were found throughout both watersheds, other non-game fish such as suckers likely did not extend far upstream into either subwatershed.

Although accurate numbers of anadromous salmonids ascending the Hood River are not known it is safe to say that present numbers are less, far less, than during the 19th century. During the mid to late 1800's habitat loss was already occurring throughout the Columbia Basin due to mining, logging, and agriculture (including irrigation withdrawals). Commercial fishing played a large role in the decline of salmon and steelhead within the Columbia Basin, thus affecting the Hood River watershed. By 1883 the catch of salmon in the Columbia totaled 42 million pounds, still leaving enough fish to fully populate streams. However, by 1900 there were over 100 fishwheels on the Columbia catching many thousands of pounds a day and stocks could not recover from this rate of harvest. Resident trout were not immune as one historical record mentions harvesting Dolly Varden (i.e., bull trout) and salmon was common with weir traps across small streams in the mid-Columbia area.

## *Historic Conditions (1900 - present)*

### *Introduction*

From a fisheries standpoint the period beginning in 1900 to the present day was one of great loss both in numbers of fish and in habitat quantity and quality. Commercial fishing in the Columbia continued unabated until the early 1900's with less desirable species keeping the total harvest up after more desirable species were reduced. Fishwheels were banned in Oregon in 1926 and in Washington in 1934 but other forms of fishing such as dip and gill netting continued. Bonneville Dam was completed in 1938 which has likely affected Hood River anadromous fish runs but to an unknown degree. Habitat loss and/or alteration continued from logging, agriculture and associated activities such as road building.

### *Habitat Alteration-Timber Harvest*

From 1900 - 1910 large scale logging took place throughout the Gorge with much of the virgin Douglas fir harvested. Until relatively recently, logging practices were aimed at harvesting the maximum amount of trees and little, if any, thought was given to other resources and/or future consequences. Riparian areas were harvested and wood removed from streams. Roads were built to access timber stands but not closed or obliterated after use, leaving them open for increased traffic and potential failure. Post harvest revegetation efforts have not always been successful in some frost prone riparian areas -- in terms of survival of planted species.

Splash damming was practiced on the East Fork and perhaps other streams as well. One long time Hood River valley resident (Mary Leasure) recounted how, as a child around the year 1930, she went to see the "big, long salmon" below a splash dam built across the East Fork near Alexander Road (river mile 6.0). The salmon could not pass over the dam. When the logs and impounded water were released, the instream and riparian habitat and fish undoubtedly suffered from what were essentially man-made debris torrents.

More recently, timber harvest within the Mt. Hood National Forest has reduced the quality of fish habitat within and along several streams. In the Middle Fork subwatershed Tony and Bear Creek subwatersheds have had the most harvest (and associated road building). Clear Branch was relatively intact prior to the turn of the century but some of the riparian area along Clear Branch above Laurance Lake burned in a fire in 1917 and was subsequently salvage logged. Harvest levels increased between 1950 and 1980 and stream cleanout was part of some sales in the late 60's and early 70's, both in Clear and Coe Branches. In the East Fork large woody debris (LWD) was removed from the river between Sherwood Campground and Robinhood Campground (river miles 18.8 - 22.5) in 1979 while the area was salvage logged. Removal of LWD from streams was a common practice until the early 1980's. The result of LWD removal, riparian harvest, roads, and upland logging has been a reduction in habitat complexity, increased peak flows, and riparian areas that will not produce large trees for decades.

### *Agriculture*

By 1900, Hood River was already known for its fruit production and much of the lower valley had been converted to agriculture. Increased agriculture affected fisheries habitat in several ways. First and foremost, large tracts of coniferous forest were replaced with orchards and farmland. Riparian areas were reduced in width and species composition changed from conifer dominated to deciduous trees such as alder. High flow events exhibited greater destructive power because large trees had been removed and narrower riparian areas were unable to adequately slow water. Streams downcut and channels became more incised, isolating them from their historic flood prone areas. Stream channelization also occurred and altered habitat by decreasing stream length and thereby increasing stream gradient, stream power, and erosion.

Another effect of agriculture on fish and fish habitat was irrigation withdrawals. Besides directly impacting fish passage (discussed below), irrigation withdrawals reduced available habitat downstream from diversions due to less water in the stream channel. Less water in the channel can affect upstream and downstream migration, increase water temperatures, and decrease the amount of suitable spawning and rearing habitat for salmonids. Major irrigation diversions in the two watersheds include East Fork Irrigation District, established in 1895, and Middle Fork Irrigation District (MFID) which was established in the mid-1900's. Other irrigation companies, such as the Glacier Ditch Company (1910-1953), are now defunct but were in operation early in the century. Glacier Ditch Company water rights were transferred to MFID when the company dissolved.

Use of pesticides, herbicides and the like have resulted in fish kills twice in 1963 (OSGC 1963) and very likely at other times we have no records of. Sublethal effects to fish, such as disease, are also possible from chemical applications within the lower valley. Degree of impacts would have depended on timing of the application related to amount of water in the streams and run timing of salmonids. Pesticides can also impact macroinvertebrate populations thus effecting food availability for fish.

### *Roads*

Although difficult to quantify the effects of roads, road maintenance and road building have likely decreased the quantity and quality of fisheries habitat within the East and Middle Fork watersheds. Of major importance within the two watersheds is Highway 35, and its effects upon the East Fork Hood River, and the many forest and county roads primarily built to access timber stands for harvest. East Fork Hood River was straightened and generally shoved to one side of the valley or the other when Highway 35 was built. This alteration profoundly affected the stream and riparian area function, especially below Dog River. Unable to meander across the flood plain, East Fork is now constrained into a single channel where it borders the highway and as a result has a steeper gradient with fewer slow water areas. The problem is exacerbated by removal of LWD, as mentioned above, which could have helped slow water velocities and increase the amount of spawning and rearing habitat.

Most forest roads pose a different problem, although some roads cause similar effects as described above. The relatively large amount of roads in some subwatersheds, such as Bear, Tony, Trout, and Evans Creeks , and portions of the East Fork, increase the drainage network by intercepting subsurface flow as well as overland flow. One effect of this is increased erosion and fine sediment input to streams. Though not measured, and in the case of glacial influenced streams may not be measurable, increased fine sediment can impact fish and fish habitat by covering eggs and fry in spawning redds thereby reducing survival (Cordone and Kelly 1961; Reiser and White 1988; Waters 1995), filling pools and other slow water areas reducing the amount of rearing habitat (Waters 1995), and impact primary production (i.e., fish food) by reducing numbers of available macroinvertebrates or by complete shifts in taxa present (Waters 1995). Impacts in the East and Middle Fork drainage's are likely more pronounced in clear water tributaries where fish and other organisms have not evolved around natural glacial sediment regimes.

### *Altered Up and Downstream Fish Passage*

Man-caused barriers or impediments to fish passage have played a large role in determining current fisheries conditions within the East and Middle Fork watersheds. In general, passage diversions have been of two types: mainstem dams that have partially or completely blocked upstream and downstream migration, and unscreened (or poorly screened) irrigation diversions that trap downstream migrating anadromous salmonids preventing them from reaching the Columbia River. Powerdale Dam, Laurance Lake Dam, and the now removed Hines Dam are examples of the former whereas East Fork Ditch and irrigation diversions on Coe and Eliot Branches are examples of the latter.

Powerdale Dam, located at river mile 4.5 on the Hood River mainstem and built in 1909, has been a passage impediment to both up and downstream passage since its construction. Fish ladders were incorporated into the original structure were not 100% efficient (OSGC 1963). Besides being a physical barrier to upstream migration, the reduced flows in the river channel below the dam due to diverted water for power production at times slowed or halted adult migration from the powerhouse to the dam (3.2 miles). Downstream migrants have been trapped in the penstock due to poor screening.

Probably the greatest impact to migratory fish runs in the East and Middle Forks of the Hood River from 1907 to the mid-1960's was Hines Dam, located just downstream from the confluence of the Middle and East Forks of the Hood River, on the Mainstem Hood River (just upstream from the Dee Mill). This dam was a concrete structure with a wooden fish ladder built in 1916, that was too small and steep for proper fish passages (OSGC 1963). The fish ladder leaked and when damaged by flows it was sometimes several years before repairs were made. When such gaps in passage occurred, entire year classes of fish were unable to ascend to their native spawning grounds and run strength was diminished.

Laurance Lake Dam, completed in 1969, isolated the upper 2.75 miles of Clear Branch and all of Pinnacle Creek from the rest of the Middle Fork subwatershed as upstream fish passage was not built into the dam. The area flooded by Laurance Lake may have been the most productive coho and steelhead spawning reach within the entire Middle Fork subwatershed. Bull trout above the dam were also cut off from those migrating from elsewhere in the Middle Fork subwatershed or the Columbia River. Isolating this small population of bull trout has several potential ramifications including reducing genetic variability and the increased possibility of a catastrophic event wiping out the population. Downstream passage was theoretically possible when water was spilled over the dam but spill did not occur every year and little is known concerning juvenile bull trout migration behavior and whether they would be at the right place at the right time to be carried downstream by spill water. The intake for irrigation and penstock water is located near the bottom of the lake and although screened the size of the screen may not be small enough to prevent juvenile bull trout or other fish from being carried out of the reservoir.

Unscreened irrigation diversions impacted anadromous fish runs by diverting juveniles migrating downstream to the ocean. The percentage of fish diverted into irrigation canals is usually proportional to the percentage of streamflow diverted. Some resident fish were undoubtedly trapped as well but impacts to resident fish populations were likely less severe and of a local nature. Irrigation diversions with the biggest impacts within the East and Middle Fork watersheds included East Fork Ditch, Farmers Irrigation District (FID) diversion on the mainstem Hood River, Powerdale Dam (previously discussed), and small diversions on Coe and Eliot Branches. For anadromous fish, East Fork Ditch and FID diversion were the biggest impacts. East Fork Ditch was never properly screened and based on fall "rescue" attempts to recover anadromous salmonids from the ditch there were hundreds to thousands of juvenile steelhead and salmon trapped every year. The FID diversion was screened prior to 1963 but fiber deposits from the Dee Mill caused breaks in the screen and slime growth also contributed to inoperation (OSGC 1963). Diversions from Coe and Eliot Branches affected both up and downstream migration of bull trout, especially Coe Branch. These diversions were not screened until 1988 and upstream passage was not incorporated until 1996 (in Coe ditch only). Estimates of the number of fish trapped are unknown.

### *Fish harvest*

Commercial and sport harvest, especially within the ocean and Columbia River, continued and likely affected the size of fish runs within the Hood River Basin. Indiscriminate fisheries such as gill nets and fish wheels harvested all types of fish and could not target specific runs or species.

### *Fish stocking*

Stocking of hatchery reared anadromous and resident salmonids can be a benefit in terms of providing sport fishing opportunities and can also help rebuild or augment indigenous or naturally spawning populations if done correctly. Stocking within the East Fork and Middle Fork was conducted for both reasons and in the case of providing angler opportunity has clearly been successful. Success of past stocking efforts to increase numbers of anadromous salmonids is difficult to gauge since stocking was sporadic and other factors such as ocean conditions and harvest complicate the issue. Given that anadromous fish stocks in general declined since 1900, stocking in and of itself was not enough to halt the downward trend.

Stocking of hatchery reared salmonids can also negatively affect indigenous fish stocks in a variety of ways including increased competition for food and space (Bachman 1984), altering run timing of anadromous fish stocks, reducing the number of indigenous salmonids (Vincent 1987), introducing disease (Goede 1986, 1994), and diluting the gene pool or genetic contamination (Waples et al. 1990). There is some evidence to suggest that stocking of hatchery trout increases the catch of wild trout due to increased angling pressure (Moring 1993). Given the amount of information in the literature concerning impacts that stocking has on indigenous populations it is not unreasonable to assume some of the above impacts may have occurred in the East Fork and Middle Fork. However, specific examples are not documented and effects over the long term are unknown.

Trout and salmon have been stocked into the East and Middle Fork watersheds since the 1950's (Table 1) by Oregon Department of Fish and Wildlife (ODFW). Stocking occurred prior to the 1950's by the state or Oregon and/or private individuals but no records are available. Resident rainbow trout have been the most extensively stocked fish within the two subwatersheds followed by winter steelhead. Hatchery rainbows in the East Fork are descendant from a fall spawning stock to minimize interbreeding with indigenous stock. Past inventory data indicates most of these fish were either captured or left the system within one month after release (James Newton, ODFW, personal communication). East Fork Hood River and Laurance Lake are the most popular recreational fishing sites within the two subwatersheds and hence have received the majority of rainbow trout introductions. Very few coho salmon and summer steelhead have been stocked in either subwatershed.

The majority of anadromous fish stocked in both East and Middle Fork Hood River were from brood stock indigenous to other parts of Oregon. These fish were not adapted to local conditions so survival and affects upon indigenous stocks varied and probably depended on the degree of stocking effort. Indigenous populations in streams that were only stocked a few times, such as Dog River and Bear Creek, likely were not impacted as much as streams heavily stocked such as East Fork Hood River. Since 1992, only indigenous Hood River stock have been released in the East Fork and Middle Fork as part of the Hood River supplementation program.

Cutthroat trout interbreeding with rainbow trout has occurred in Pinnacle Creek (Gregg and Allendorf 1995) but it is not known whether the rainbow trout are from hatchery origin. Cutthroat trout in Clear Branch above Laurance Lake probably also show signs of interbreeding but these fish have not been sampled for genetic analysis. Other cutthroat trout populations in tributaries to the East Fork Hood River (Emil Creek, Dog River, Robinhood Creek, Pocket Creek, and Bucket Creek) do not show signs of hybridization (Gregg and Allendorf 1995) so introduced and/or indigenous rainbow trout have not interbred with these fish.

Brook trout *Salvelinus fontinalis* are known to inhabit the Cold Springs drainage and have been seen in Tilly Jane and Ash Creeks. The origin of these brook trout is unknown. Brook trout are not native to the western United States but have been stocked into many waterbodies throughout the West, especially in high mountain lakes. No brook trout are known to inhabit any streams within the Middle Fork Hood River subwatershed where bull trout occur. Brook trout and bull trout can interbreed resulting in hybrids (Markle 1992). These two species also compete with one another for food and space (Ratliff and Howell 1992).

Table 1. Fish stocked within the East Fork and Middle Fork Hood River watersheds from ODFW records. Anadromous fish released were all juveniles except where noted. Years released in *(bold)* indicates indigenous fish released as part of the Hood River Production Plan.

| Stream / Lake | Species Stocked | Brood Stock | Years Released |
|---|---|---|---|
| **East Fork Hood River Watershed** | | | |
| East Fork Hood River | StS | Hood R., Big Cr. | 1957,<br>1968 (adults only) |
| | StW | Unknown, Big Cr., Hood R. | 1962-1963,<br>1967 (adults only)<br>1978, 1987-1991,<br>1992-present. |
| | Coho | Unknown, Sandy R. | 1968 and 1970 (adults only) |
| | SRCt | Nestucca R., Alsea R., Big Cr. | 1974-1978,<br>1985-1987 |
| | RB | Hood R., Oak Springs, Willamette R., Roaring R., Diamond L., Deschutes R. | 1954-1977,<br>1979-1987 |
| Polallie Creek | RB | Unknown, Hood R., Willamette R., Roaring R. | 1954-1955,<br>1968, 1970 |
| Dog River | StW | Klaskanine R., Big Cr. | 1985-1986 |
| Evans Creek | StW | Big Cr., Klaskanine R. | 1986-1987 |
| | RB | Unknown, Hood R., Oak Springs, Roaring R. | 1954-1956,<br>1970 |
| Trout Creek | RB | Unknown, Hood R., Oak Springs, Roaring R. | 1954-1956,<br>1970-1971 |
| **Middle Fork Hood River Watershed** | | | |
| Middle Fork Hood River | StW | Unknown, Big Cr., Klaskanine R., Hood R. | 1962-1963,<br>1985-1988,<br>1990-1991, 1993 |
| | Coho | Unknown | 1968 (adults only) |
| | RB | Unknown, Hood R., Oak Springs, | 1954-1958 |
| Clear Branch | StW | Unknown, Klaskanine R., Big Cr. | 1963, 1985-1987 |
| | Coho | Unknown | 1966 (adults only) |
| | RB | Unknown | 1954, 1957 |
| Laurance Lake | StW | Unknown, Alsea R., Foster Res., Big Cr. | 1969, 1970, 1972,<br>1974, 1976 |
| | RB | Willamette R., Oak Springs, Diamond L., Roaring R., Deschutes R. | 1978-1981,<br>1983-present |
| Bear Creek | StW | Unknown, Big Cr. | 1966, 1986 |
| | StW | Big Cr. | 1966 (adults only) |
| Tony Creek | StW | Unknown, Klaskanine R., Big Cr. | 1962, 1985-1987 |

Species Key: StS - Summer steelhead trout; StW - Winter steelhead trout; Coho - Coho salmon; SRCt - Sea run cutthroat trout; RB - Resident rainbow trout

There has been a declining trend in numbers of steelhead, hatchery and indigenous, passing over Powerdale Dam from 1992--1995. This trend may be attributable to such factors as ocean conditions and harvest or may be a natural cyclic trend. As the HRRP is fully implemented, all other factors being equal, the hope is these numbers will rise.

## *Current Conditions*

### *Anadromous and Resident Fish Life History Summary*

The following life history descriptions are designed to give the reader a general overview of habitat requirements, run timing and distribution of salmonids and other fish indigenous to the East and Middle Fork watersheds. Three anadromous fish stocks within the Hood River system, spring and fall chinook salmon and summer steelhead trout, are not discussed here because few, if any, of these fish ascend the East or Middle Fork Hood River. For a more complete overview of these stocks refer to the West Fork Watershed Analysis (USFS 1995) or the Hood River Production Master Plan (O'Toole and ODFW 1991).

Winter steelhead trout: The current run of winter steelhead in the Hood River system is a mix of hatchery and indigenous fish with indigenous fish comprising about 50-70% of the total run (Table 2). Winter steelhead have been sporadically stocked or supplemented in the Hood River since 1962 (Table 1). Winter steelhead are found in both the East and Middle Forks of the Hood River but, based on radio-telemetry data, relatively few travel as far as the Mt. Hood National Forest (Olsen et al. 1995, 1996). Adult migration into the Hood River for each year class begins in December and is completed in May or June the following calendar year. Peak migration for indigenous fish is in April and May; hatchery fish peak earlier in the year and are considered an early run stock. Repeat spawners comprise approximately 3-8% of the total run. As part of the Hood River Production Plan (HRPP), only indigenous steelhead are allowed to pass over Powerdale dam to spawn and the numbers of steelhead are declining. Hatchery fish are kept and then released near the mouth of the Hood River to provide increased opportunities for sport fishermen.

Winter steelhead spawning locations are unknown although there is likely some spawning in the mainstem East and Middle Forks. Spawning duration is likely late spring - early summer. Juveniles stay in the system for two to three years and outmigrate in the spring.

Coho salmon: Coho salmon indigenous to the Hood River system are likely extinct. The current run is less than 100 adults (Table 2) and appears to be composed of hatchery strays from other river systems. These fish are spawning naturally however. Although coho were stocked in the East and Middle Forks of the Hood River in the late 1960's, there has been no stocking since then.

Adult coho enter the Hood River in September and are all past Powerdale Dam by early November. Adults have been tracked by radio as far upstream as Dog River in the East Fork and ascend the Middle Fork as well although not as far as the Mt. Hood National Forest. Adults spawn in the fall. Young coho emerge from the gravel the following spring and outmigrate during their first year of life in spring, summer and fall.

Sea run cutthroat trout: Little is known concerning sea run cutthroat trout in the Hood River. Very few fish passed over Powerdale Dam from 1963-1971 (Table 2) and no adult fish have ascended the Hood River since 1993. This stock is likely at a very depressed level. Hatchery smolts were released into the Hood River system sporadically in the past (Table 1).

Sea run cutthroat enter the Hood River from August through December and spawn the following late winter/early spring. Young emerge in late spring, reside in cold water streams, and outmigrate as smolts in the spring and early summer as age 3+ and 4+ fish. Limited information suggests that most sea run cutthroat in the Hood River are found in the mainstem, East Fork and tributaries to those streams.

Rainbow and cutthroat trout: Resident rainbow and cutthroat trout are found throughout both the East and Middle Forks of the Hood River and are indigenous to the basin. Basic life history patterns are the same for both species: adults spawn in the spring and young emerge from the gravel during early summer. Most of these fish likely stay in their natal streams their entire lives although movement up and downstream is probable and movement to other streams is certainly possible. Resident trout, like all salmonids, require clean, cold water to thrive but can tolerate some fluctuations in temperature and water quality if not too severe.

As discussed above, rainbow trout have been extensively stocked in parts of the watershed, particularly East Fork Hood River and Laurance Lake. Although stocked to provide increased angling opportunities, some of these fish are not caught, survive the following winter, and can compete for food and space with indigenous trout. Interbreeding is possible but unlikely as these stocked trout are fall spawners. Genetically pure populations of indigenous rainbow trout may exist in either subwatershed but have not been described. Rainbow trout in the East and Middle Forks are considered to be the coastal variety *O. m. irideus* but the interior form (i.e., redband trout) *O. m. gairdneri* have been found in North Fork Greenpoint Creek in the West Fork Hood River subwatershed, indicating possible presence in either the East or Middle Fork subwatershed. Resident cutthroat trout have never been stocked into the Hood River system.

Bull trout: Bull trout are USDA Forest Service, Region 6 and State of Oregon sensitive species. In 1994, the United States Fish and Wildlife Service (USFWS) determined bull trout were warranted for listing as threatened or endangered but precluded due to higher priority species. One reason bull trout were precluded was due to the fact that conservation and rehabilitation efforts were already underway by local, state and federal agencies. Of the populations of bull trout in Oregon, bull trout in the Hood River may be at the most risk of extinction because of low population numbers and relatively small distribution area. Genetic analysis conducted on bull trout collected above and below Laurance Lake dam indicate fish from each location are genetically identical (ODFW, unpublished data). However, bull trout in the Hood River watershed are genetically unique when compared to other populations sampled throughout Oregon. For a complete summary of existing bull trout information pertaining to the Hood River refer to Pribyl et al. (1996).

Bull trout have been found in Clear Branch above and below Laurance Lake dam, Pinnacle Creek, Coe Branch, Compass Creek (a tributary to Coe Branch), and have been captured at Powerdale Dam in the mainstem Hood River (see below). One bull trout was seen in the mouth of Bear Creek but no additional sightings are documented. Several bull trout have been found in Evans Creek and one was seen at the mouth of Wisehart Creek (Bill Stanley, MFID, personal communication); both streams are tributaries to the East Fork Hood River. The fish in Evans Creek are thought to have arrived via irrigation canal from Eliot Branch. The Wisehart Creek sighting was a single incident and where this fish came from or was going is unknown. Middle Fork Hood River is considered a travel corridor for bull trout migrating upstream and may be used for rearing at certain times of the year (see below).

Hood River bull trout may exhibit up to three different life histories or migration patterns (Pribyl et al. 1996). One group of bull trout lives in Clear Branch, Pinnacle Creek and Laurance Lake above the dam. These fish spawn in Clear Branch, and possibly Pinnacle Creek, in the fall and at other times of the year, live in Laurance Lake (adfluvial). The young bull trout emerge from the gravel in spring, spend an undetermined amount of time in the creek, and then migrate into the lake until they reach sexual maturity. Repeat spawning is probable but not documented. Pinnacle Creek contains suitable habitat for spawning, and juveniles have been found there, but adult spawning activity has not been documented.

Bull trout above Laurance Lake dam are essentially cut off from the rest of the watershed. Upstream passage over the dam is provided via an upstream migrant trap at the base of the dam that was built in the summer of 1996. Downstream passage is possible via spill over the dam but whether bull trout actually make it over the dam is not known. Depending on the water year, MFID may not spill at all and in other years the timing of the spill may not coincide with downstream migration. Little is known about juvenile bull trout migration timing and behavior. Bull trout are usually found near the bottom of streams and if that is where they position themselves during outmigration then they may not be able to "find" the spill outlet at the top of the dam. ODFW has set up a smolt trap in Clear Branch a short distance downstream from the dam to try to determine if bull trout are outmigrating. One six inch bull trout was captured during the spring of 1996 while water was being spilled but one fish is not enough to say successful outmigration over the dam is occurring.

A few (<20) adult bull trout migrating upstream from the Columbia River are captured at Powerdale Dam each spring (Table 2), usually May - July, suggesting a fluvial (spawning in small streams and rearing in larger streams) population that ascends the Hood River to spawn but then rears in the Columbia River. It is unclear whether these fish are successfully spawning and if so where. All fish passing Powerdale Dam are tagged and tagged bull trout have been seen in Clear Branch below Laurance Lake and in Coe Branch. One pair was observed spawning in Clear Branch below the dam in 1992 but whether they were successful is unknown. High fall water temperatures and lack of suitable spawning habitat below the dam may limit or preclude successful spawning there. Spawning in Coe Branch is possible, even though it is a glacial stream, based on successful bull trout spawning in a glacial stream within the Metolius River watershed (Brian Lampman, Confederated Tribes of the Warm Springs Reservation of Oregon, personal communication).

The third life history pattern fishery managers suspect bull trout utilize in the Hood River is also fluvial but these fish apparently rear in the Middle Fork, Hood River mainstem or some other tributary and then ascend smaller tributaries to spawn. This belief is based on snorkeling surveys in Clear Branch below the dam and in Compass Creek as well as MFID records for passing fish over Coe Branch diversion. In all of these locations adult bull trout have been observed that have not been tagged, indicating they never passed over Powerdale Dam. Where these fish reside when not spawning, is unknown.

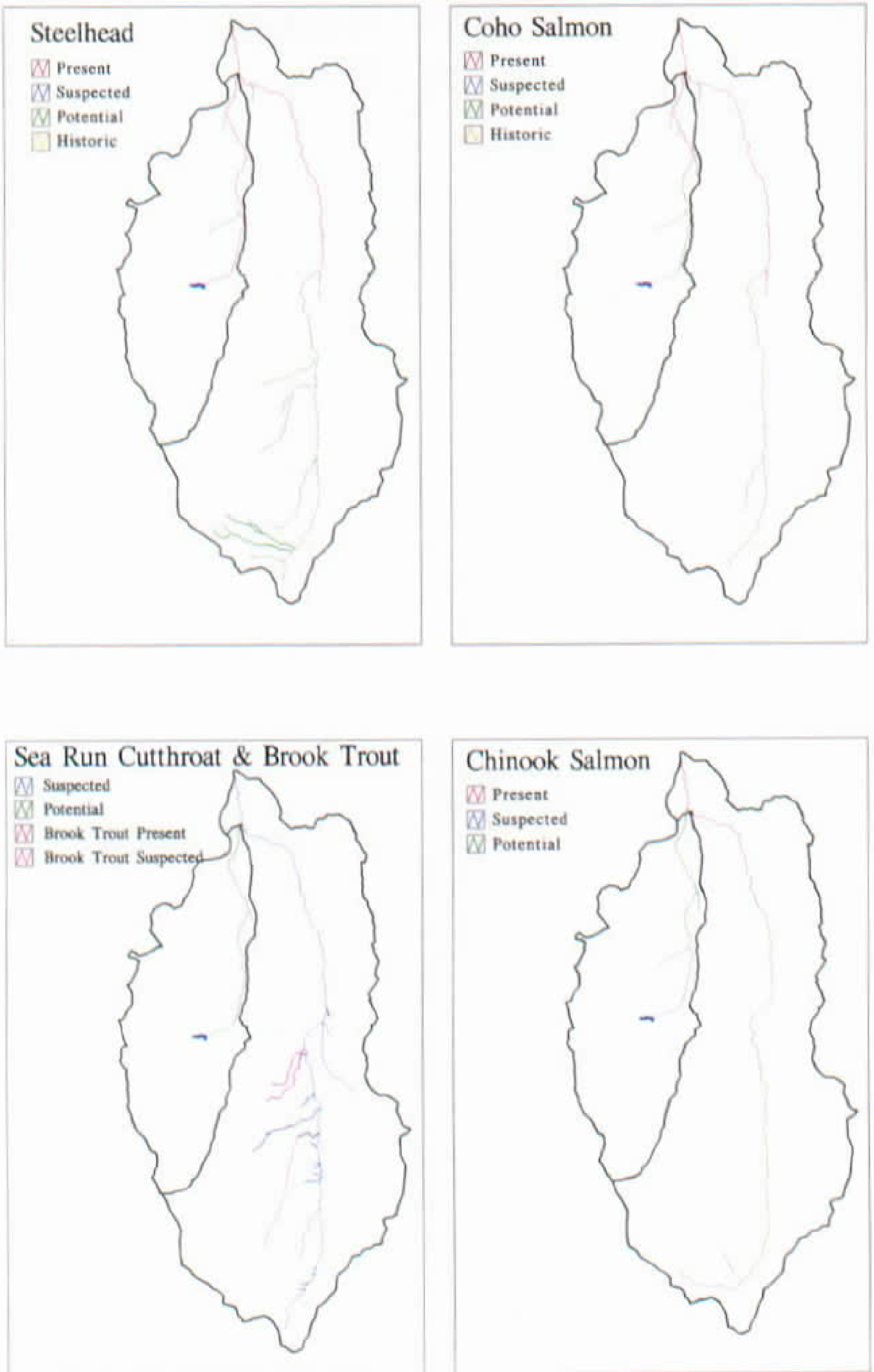


Figure 1a - Distributions of Winter Steelhead, Coho Salmon, Sea Run Cutthroat, Brook Trout, and Chinook Salmon.

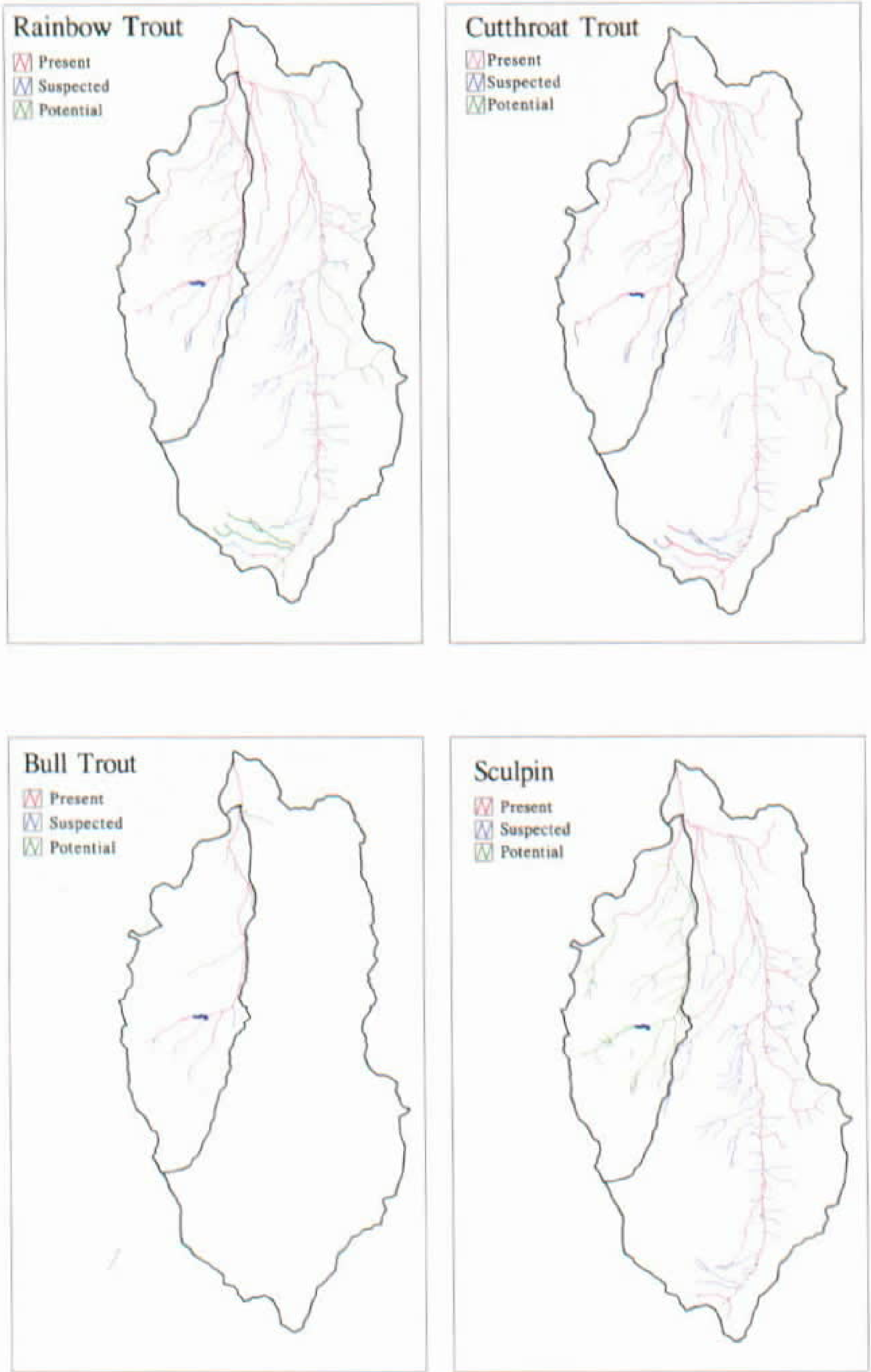


Figure 1b - Distributions of Rainbow Trout, Cutthroat Trout, Bull Trout, and Sculpin.

Table 2. Counts of adult anadromous salmonids and bull trout over Powerdale Dam in the Hood River from 1963-1971 and 1992-present. Counts for years 1963-1971 are not complete because fish were counted at only one of two ladders at the dam and/or ladders were inoperable. Only anadromous salmonids that migrate primarily to the East and/or Middle Fork of the Hood River are included. Numbers in parentheses for winter steelhead are counts of indigenous fish returning that year.

| Year | Winter Steelhead | Coho Salmon | Sea-run Cutthroat Trout | Bull Trout |
|---|---|---|---|---|
| 1963 | 1,456 | 143 | 37 | 6 |
| 1964 | 1,317 | 346 | 17 | 9 |
| 1965 | 995 | 130 | 27 | 3 |
| 1966 | 2,024 | 330 | 57 | 1 |
| 1967 | 978 | 257 | 101 | 12 |
| 1968 | 870 | 285 | 134 | 9 |
| 1969 | 1,434 | 174 | 177 | 6 |
| 1970 | 504 | 282 | 18 | 0 |
| 1971 | 715 | 299 | 45 | 1 |
| | | | | |
| 1992 | 1,016 (678) | 103 | | 6 |
| 1993 | 649 (396) | 33 | | 2 |
| 1994 | 581 (377) | 56 | 0 | 11 |
| 1995 | 318 (193) | 51 | 0 | 11 |

### *Stream Survey Information summary*

Stream survey information from 1989 to 1995 (Table 3) shows a wide range of in-stream habitat parameters for the East Fork and Middle Fork Hood River subwatersheds. Values displayed in the table are for comparative purposes only because much of the information is likely now outdated as a result of the February 1996 flood, particularly amounts of LWD. No streams met the Mt. Hood National Forest LRMP standard for primary pools but several stream reaches did meet PACFISH standards for total pools. The LRMP does not have a standard for all pools. Total woody debris numbers ranged from 0 pieces per mile to over 300 pieces per mile. Categorizing amounts of wood by vegetative type stream order or channel type may be a better method of determining the range of natural conditions but that level of analysis was not completed.

Some streams and/or reaches have a dominant sand substrate, particularly Meadows and Bucket Creeks. These streams should be monitored to validate these findings and, if accurate, try to discover the source of this fine sediment.

Table 3. Summary of *riparian* survey data for streams within the East Fork and Middle Fork Hood River subwatersheds. Streams were surveyed from 1989 to 1995 using the Hankin and Reeves methodology. Information given below is for Mt. Hood National Forest lands only. For total woody debris (WD) and pools, numbers in (*bold*) indicate reaches meeting PACFISH standards whereas shaded numbers indicate reaches meeting the Mt. Hood National Forest Land and Resource Management Plan.

| STREAM NAME | Year Surveyed | Reach | Reach Length Map mi. | Average Gradient | Dom Substrate | Width to Depth Ratio | Rosgen Channel Type | Valley Form | Average Bankfull Width | Average Wetted Width | SWD/mile d > 12" | LWD/mile d > 24" | Total WD | Pools/mile all depths | Primary Pools/mile |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EAST FORK HOOD RIVER SUBWATERSHED | | | | | | | | | | | | | | | |
| EAST FORK HOOD RIVER | 1995 | 1 | 2.1 | 3.5 | SB | >12 | B2 | | 60.0 | 31.6 | 3.5 | 0.5 | 4.0 | 7.9 | 8.4 |
| EAST FORK HOOD RIVER | 1995 | 2 | 0.4 | 3 | CO | >12 | C3B | | | 30.2 | 0.0 | 0.0 | 0.0 | 16.6 | 11.0 |
| EAST FORK HOOD RIVER | 1995 | 3 | 11.1 | 3 | GR | 27.8 | B4/FB | | 30.8 | 24.6 | 14.7 | 8.6 | **23.3** | 15.8 | 6.2 |
| EAST FORK HOOD RIVER | 1995 | 4 | 0.4 | 9 | CO | 12.9 | B3A | | 15.5 | 16.1 | 5.7 | 0.0 | 5.7 | 42.9 | 8.6 |
| E. BR. EAST FORK HOOD RIVER | 1991 | 1 | 0.2 | 12 | SA | | | 4 | | 3.3 | 24.0 | 16.0 | **40.0** | 0.0 | 0.0 |
| E. BR. EAST FORK HOOD RIVER | 1991 | 2 | 0.3 | 20 | SA | | | 4 | | 1.7 | 15.7 | 39.3 | **55.0** | 0.0 | 0.0 |
| W. BR. EAST FORK HOOD RIVER | 1991 | 1 | 0.1 | 21 | BR | | | 4 | | 3.8 | 21.2 | 5.3 | **26.4** | 0.0 | 0.0 |
| W. BR. EAST FORK HOOD RIVER | 1991 | 2 | 0.3 | 43 | SA | 7.9 | | 3 | 10.0 | 6.3 | 46.4 | 33.1 | **79.5** | 13.3 | 0.0 |
| W. BR. EAST FORK HOOD RIVER | 1991 | 3 | 0.1 | 30 | SA | 22 | | 4 | 33.0 | 3.4 | 5.3 | 5.3 | 10.6 | 0.0 | 0.0 |
| SF CANYON TRIB | 1992 | 1 | 0.1 | 6 | CO | | | | | 4.3 | 17.1 | 5.7 | **22.8** | 22.8 | 0.0 |
| SF CANYON TRIB | 1992 | 2 | 0.2 | 12 | SA | 28.5 | | | 94.6 | 6.2 | 62.7 | 34.2 | **96.8** | 68.3 | 0.0 |
| SF CANYON TRIB | 1992 | 3 | 0.4 | 23 | BR | 4.8 | | | 7.2 | 5.6 | 33.0 | 41.8 | **74.8** | 48.4 | 0.0 |
| SF CANYON TRIB | 1992 | 4 | 0.8 | 21 | SB | | | | | 8.6 | 3.0 | 4.4 | 7.4 | 1.5 | 0.0 |
| SF CANYON TRIB 2 | 1992 | 1 | 0.1 | 12 | BR | 7.6 | | | 6.8 | 2.2 | 21.5 | 0.0 | **21.5** | 43.1 | 0.0 |
| SF CANYON TRIB 2 | 1992 | 2 | 0.7 | 27 | SA | 5.9 | | | 4.4 | 2.2 | 4.7 | 0.0 | 4.7 | 9.3 | 0.0 |
| MEADOWS CREEK | 1995 | 1 | 2.2 | 3.5 | CO | 19.9 | B3 | | 13.9 | 11.6 | 30.6 | 10.5 | 41.1 | 75.9 | 7.1 |
| MEADOWS CREEK | 1995 | 2 | 0.3 | 2 | SA | 9.5 | E6B | | 9.5 | 6.4 | 3.9 | 2.0 | 5.9 | 59.2 | 7.9 |
| MEADOWS CREEK | 1995 | 3 | 0.6 | 20 | SA | 5.7 | A6A+ | | 6.0 | 3.9 | 13.0 | 7.4 | **20.4** | 20.4 | 0.0 |
| BUCKET CREEK | 1991 | 1 | 0.5 | | SA | 10.2 | | 3 | 13.2 | 4.5 | 56.5 | 49.5 | **106.0** | 17.7 | 0.0 |
| BUCKET CREEK | 1991 | 2 | 0.2 | | SA | | | 2 | | 5.5 | 18.8 | 14.1 | **32.9** | 0.0 | 0.0 |
| BUCKET CREEK | 1991 | 3 | 0.7 | | SA | 6.3 | | 3 | 10.9 | 3.5 | 13.4 | 8.9 | **22.3** | 3.6 | 0.0 |
| CAT CREEK | 1991 | 1 | 0.3 | 2 | SA | | | 10 | | 5.5 | 26.0 | 0.0 | **26.0** | 15.2 | 2.2 |
| CAT CREEK | 1991 | 2 | 0.8 | 12 | BR | 13.8 | | 5 | 10.4 | 6.1 | 90.8 | 78.5 | **169.3** | 18.4 | 0.0 |

| STREAM NAME | Year Surveyed | Reach | Reach Length Map mi. | Average Gradient | Dom Substrate | Width to Depth Ratio | Rosgen Channel Type | Valley Form | Average Bankfull Width | Average Wetted Width | SWD/mile d > 12" | LWD/mile d > 24" | Total WD | Pools/mile all depths | Primary Pools/mile |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CAT CREEK | 1991 | 3 | 0.7 | 23 | CO | 7.2 | | 3 | 4.3 | 3.4 | 49.4 | 21.6 | 71.0 | 6.2 | 0.0 |
| CLARK CREEK | 1992 | 1 | 2.6 | 6 | GR | 4.6 | | 10 | 22.5 | 6.2 | 134.8 | 9.8 | 144.5 | 2.4 | 2.0 |
| CLARK CREEK | 1992 | 2 | 1.4 | 5 | CO | | | 3 | | 4.5 | 67.6 | 9.3 | 77.0 | 0.0 | 0.0 |
| CLARK CREEK | 1993 | 1 | 1.5 | 12 | SB | 11.3 | A2 | 2 | 43.0 | 8.4 | 0.0 | 8.1 | 8.1 | 0.0 | 0.0 |
| NEWTON CREEK | 1989 | 1 | 1.2 | 3 | CO | 10 | | 10 | 20.0 | 10.5 | 48.9 | 6.4 | 55.4 | 4.6 | 1.8 |
| NEWTON CREEK | 1989 | 2 | 2.8 | 5 | CO | 12 | | 8 | 24.0 | 13.3 | 1.4 | 0.5 | 1.9 | 4.3 | 0.0 |
| POLALLIE CREEK | 1994 | 1 | 3 | 8 | CO | 11.0 | B3A | 3 | 12.5 | 11.4 | 1.9 | 3.1 | 5.0 | 11.6 | 0.6 |
| COLD SPRING CREEK | 1989 | 1 | 1.4 | 9 | SB | 9.8 | | 2 | 29.3 | 17.7 | 72.4 | 48.8 | 121.2 | 20.5 | 14.9 |
| COLD SPRING CREEK | 1989 | 2 | 5.1 | 5 | CO | 10.8 | | 5 | 29.4 | 10.6 | 93.2 | 84.4 | 177.6 | 16.8 | 5.3 |
| NF COLD SPRING CREEK | 1989 | 1 | 1.3 | 4 | CO | 7 | | 3 | 21.0 | 10.5 | 57.7 | 6.7 | 64.5 | 30.7 | 1.5 |
| SF COLD SPRING CREEK | 1989 | 1 | 0.8 | 8 | GR | 8 | | 3 | 34.3 | 3.8 | 52.3 | 61.7 | 114.1 | 30.3 | 0.0 |
| CULVERT CREEK | 1989 | 1 | 1.3 | 5 | GR | 6.3 | | 10 | 12.7 | 6.6 | 63.8 | 47.2 | 110.9 | 38.9 | 0.8 |
| CULVERT CREEK | 1989 | 2 | 0.6 | 10 | GR | 40.8 | | 2 | 45.5 | 5.0 | 128.2 | 70.4 | 198.6 | 28.1 | 0.0 |
| ENGINEERS CREEK | 1989 | 1 | 2.3 | 10 | GR | 8.1 | | 2 | 13.4 | 6.4 | 111.2 | 81.3 | 192.5 | 71.5 | 2.9 |
| HELLROARING CREEK | 1989 | 1 | 1.2 | 10 | GR | 7.5 | | 3 | 10.0 | 5.6 | 96.1 | 89.0 | 185.1 | 31.5 | 1.6 |
| HEATHER CREEK | 1992 | 1 | 0.3 | 17 | BR | 3.5 | | | 4.2 | 8.0 | 33.3 | 4.5 | 37.8 | 7.6 | 0.0 |
| HEATHER CREEK | 1992 | 2 | 0.6 | 18 | CO | | | | | 2.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| MITCHELL CREEK | 1989 | 1 | 3 | 10 | GR | 6.1 | | 2 | 22.3 | 5.2 | 57.4 | 55.4 | 112.8 | 37.5 | 0.0 |
| POCKET CREEK | 1994 | 1 | 0.7 | 7 | | 12.5 | B3A | 3 | 14.3 | 10.2 | 39.1 | 33.5 | 72.7 | 54.5 | 1.4 |
| POCKET CREEK | 1994 | 2 | 0.4 | 5 | | 12.0 | C4B | 5 | 8.8 | 8.4 | 56.0 | 61.6 | 117.5 | 92.4 | 0.0 |
| POCKET CREEK | 1994 | 3 | 0.2 | 10 | | 5.5 | B4 | 4 | 7.4 | 7.8 | 64.8 | 80.1 | 144.9 | 83.9 | 0.0 |
| POCKET CREEK | 1994 | 4 | 0.4 | 31 | | 9.0 | A3A+ | 1 | 7.7 | 4.5 | 53.5 | 45.1 | 98.6 | 36.6 | 0.0 |
| PUPPY CREEK | 1989 | 1 | 2.7 | 10 | GR | 6.1 | | 3 | 10.3 | 4.2 | 109.6 | 47.0 | 156.6 | 36.3 | 0.0 |
| RIMROCK CREEK | 1991 | 1 | 0.2 | 5 | | | | 10 | | 5.5 | 0.0 | 0.0 | 0.0 | 32.7 | 0.0 |
| RIMROCK CREEK | 1991 | 2 | 1.1 | 5 | SA | 16.5 | | 3 | 7.7 | 4.1 | 68.5 | 35.9 | 104.4 | 24.8 | 0.9 |
| RIMROCK CREEK | 1991 | 3 | 0.5 | 28 | GR | 3.5 | | 3 | 2.8 | 2.1 | 35.3 | 20.8 | 56.1 | 8.3 | 0.0 |
| ROBINHOOD CREEK | 1994 | 1 | 1 | 4 | | 15.4 | C4B | 5 | 15.4 | 11.4 | 43.8 | 31.6 | 75.4 | 92.6 | 4.0 |
| ROBINHOOD CREEK | 1994 | 2 | 0.7 | 3 | | 15.5 | B4 | 4 | 12.5 | 10.8 | 53.5 | 61.9 | 115.4 | 105.5 | 0.0 |

| STREAM NAME | Year Surveyed | Reach | Reach Length Map mi. | Average Gradient | Dom Substrate | Width to Depth Ratio | Rosgen Channel Type | Valley Form | Average Bankfull Width | Average Wetted Width | SWD/mile d > 12" | LWD/mile d > 24" | Total WD | Pools/mile all depths | Primary Pools/mile |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ROBINHOOD CREEK | 1994 | 3 | 0.3 | 3 | | 12.0 | E4 | 8 | 18.0 | 6.1 | 27.3 | 6.8 | 34.1 | 102.3 | 3.3 |
| ROBINHOOD CREEK | 1994 | 4 | 0.3 | 4 | | 7.0 | C4B | 5 | 5.0 | 6.6 | 61.0 | 61.0 | 122.0 | 105.0 | 0.0 |
| YELLOWJACKET CREEK | 1991 | 1 | 0.1 | 34 | | | | | | 3.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| YELLOWJACKET CREEK | 1991 | 2 | 0.4 | 31 | SA | 15.1 | | 3 | 13.4 | 3.6 | 41.1 | 4.1 | 45.2 | 28.7 | 0.0 |
| YELLOWJACKET CREEK | 1991 | 3 | 0.3 | 25 | CO | 9.2 | | 5 | 7.7 | 4.3 | 28.6 | 78.8 | 107.4 | 14.3 | 0.0 |
| YELLOWJACKET CREEK | 1991 | 4 | 0.3 | 14 | | | | 4 | | 2.2 | 58.3 | 265.8 | 324.2 | 6.5 | 0.0 |
| MIDDLE FORK HOOD RIVER SUBWATERSHED | | | | | | | | | | | | | | | |
| MIDDLE FORK HOOD RIVER | 1994 | 1 | 0.7 | 3 | GR | 31.0 | C3 | 5 | 42.8 | 20.5 | 15.7 | 24.8 | 40.5 | 7.8 | 5.2 |
| MIDDLE FORK HOOD RIVER | 1994 | 2 | 4.1 | 5 | GR | 18.6 | B2 | 4 | 30.6 | 22.2 | 7.3 | 10.9 | 18.2 | 17.6 | 8.7 |
| BEAR CREEK | 1993 | 1 | 1.6 | 4 | CO | 10.4 | B3 | 4 | 22.4 | 13.3 | 78.4 | 109.5 | 187.8 | 65.0 | 9.9 |
| BEAR CREEK | 1993 | 2 | 1.3 | 4 | SB | 6.3 | B2A | 3 | 12.8 | 6.3 | 17.2 | 20.4 | 37.6 | 50.5 | 0.0 |
| TONY CREEK | 1989 | 1 | 2.4 | 6 | CO | 10.2 | | 3 | 34.2 | 11.6 | 0.0 | 82.1 | 82.1 | 37.4 | 9.4 |
| TONY CREEK | 1989 | 2 | 1.3 | 7 | CO | 9.6 | | 3 | 27.0 | 8.1 | 0.0 | 133.2 | 133.2 | 39.3 | 1.5 |
| CLEAR BRANCH | 1990 | 1 | 1.1 | 4 | CO | 8 | | 5 | 29.6 | 54.5 | 124.0 | 41.3 | 165.4 | 21.5 | 13.2 |
| CLEAR BRANCH | 1990 | 2 | 0.9 | | SA | | | 9 | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| CLEAR BRANCH | 1990 | 3 | 4.9 | 9 | CO | 9.2 | | 4 | 34.8 | 10.3 | 89.6 | 43.4 | 133.0 | 7.6 | 6.5 |
| PINNACLE CREEK | 1994 | 1 | 2.9 | 8 | CO | 7.8 | | 5 | 25.8 | 9.6 | 45.3 | 14.0 | 59.2 | 5.6 | 3.4 |
| COE BRANCH | 1993 | 1 | 1 | 5 | CO | 10.0 | B3A | 3 | 32.0 | 14.7 | 16.0 | 89.2 | 105.2 | 73.2 | 10.3 |
| COE BRANCH | 1993 | 2 | 1.8 | 3 | CO | 16.0 | B3 | 4 | 30.0 | 20.2 | 13.3 | 43.7 | 57.0 | 18.2 | 10.8 |
| COE BRANCH | 1993 | 3 | 0.6 | 17 | CO | 8.5 | A3A+ | 1 | 30.0 | 17.1 | 4.1 | 94.9 | 99.0 | 11.2 | 7.1 |
| COE BRANCH | 1993 | 4 | 2.2 | 17 | LB | | C2B | 5 | | 18.1 | 7.0 | 45.6 | 52.6 | 0.9 | 0.0 |
| COMPASS CREEK | 1995 | 1 | 1.1 | 9 | CO | 16.6 | B3A | | 15.8 | 16.5 | 0.6 | 0.3 | 0.9 | 29.3 | 7 |
| COMPASS CREEK | 1995 | 2 | 0.3 | 15 | GR | 9.7 | A3 | | | 16.0 | 0.0 | 0.0 | 0.0 | 30.2 | 13 |
| COMPASS CREEK | 1995 | 3 | 0.6 | 9 | GR | 18.3 | B4A | | 16.5 | 15.9 | 0.0 | 0.0 | 0.0 | 21.2 | 14 |
| COMPASS CREEK | 1995 | 4 | 0.8 | 12 | GR | 10.2 | A4A+ | | 15.0 | 11.5 | 0.0 | 0.0 | 0.0 | 20.3 | 0.0 |
| ELIOT BRANCH | 1994 | 1 | 3.7 | 11 | CO | 14.5 | B3A | 3 | 18.7 | 10.7 | 11.5 | 6.0 | 17.5 | 17.2 | 6.7 |
| ELIOT BRANCH | 1994 | 2 | 1.4 | 18 | SB | 22.0 | A2A+ | 2 | 28.5 | 13.3 | 0.0 | 0.0 | 0.0 | 5.4 | 5.4 |

### *Current Management Activities/Improvements*

HRPP: The Confederated Tribes of the Warm Springs (CTWS), ODFW and Bonneville Power Administration (BPA) are collaborating on a large scale supplementation project designed to restore natural runs of spring chinook salmon and winter and summer steelhead trout in the Hood River watershed. Using state of the art collection and hatchery facilities, the plan is to collect adult steelhead and salmon throughout the year, artificially spawn the adults, and raise the young until ready to outmigrate whereupon they will be released into the wild. Only indigenous summer and winter steelhead will be selected for propagation, eventually phasing out non-native hatchery stock from the watershed. Since indigenous spring chinook are extinct, Deschutes River stock will be used to create a naturally reproducing, but non-native, run. Harvest and escapement goals are outlined in the Hood River Production Plan (O'Toole and ODFW 1991). Once these goals are met and the fish populations appear stable the hope is that further supplementation efforts will be unnecessary. A comprehensive monitoring and evaluation effort has been implemented and will continue throughout the length of the project.

Fish passage: Improvements in both up and downstream passage are either completed or planned for virtually every remaining irrigation and hydropower passage impediment in each subwatershed. The major irrigation diversion left unscreened is the East Fork Ditch. East Fork Ditch Company is planning to install a new type of "screen" in the East Fork Ditch in time for the 1997 irrigation season. This screen design is untested in this area so performance is unknown. The Eliot Branch diversion is not screened for downstream passage, and no upstream passage is provided. MFID attempted to screen the diversion in 1996 with little success due to excessive sediment and debris. MFID plans to rebuild the Eliot Branch diversion structure in the future and at that time will consult with the proper agencies concerning up and downstream passage design.

Upstream passage improvements are underway at Powerdale dam as part of the HRPP and should result in improved upstream passage. Tests conducted to determine effectiveness of downstream migrant screens at the Powerdale facility indicate poor screen performance. As a result, Pacificorp is planning to design and install new screens in the future.

An upstream migrant adult trap was built at the base of Clear Branch Dam during the summer of 1996. This trap gives ODFW and USFS the option of passing adult bull trout (and other fish) over the dam. The agencies have agreed to monitor the trap, with help from MFID personnel, from late summer through mid fall. Adult bull trout captured will be measured, weighed and tagged (if not already tagged at Powerdale) and released downstream from the trap. If the same adult is captured three times in the trap it will be placed above the dam after the third capture. Downstream passage over the dam is still a concern. It is hoped that ongoing downstream migrant trapping will provide information concerning passage success or failure as well as run timing to help guide future management decisions.

Bull Trout Conservation Plan: A bull trout conservation plan is in preparation for the Hood River watershed and should be completed by summer 1997. The plan is a cooperative effort between federal, state and local agencies as well as some private individuals and corporations (PacifiCorp, MFID). ODFW is taking the lead on writing the plan with funding provided by the USFWS. The plan will cover current population status, limiting factors affecting production, and will suggest projects and management actions to restore bull trout populations in the watershed.

## *Literature Cited*

Bachman, R.A. 1984. Foraging behavior of free-ranging wild and hatchery brown trout in a stream. Transactions of the American Fisheries Society 113:1-32.

Cordone, A.J., and D.W. Kelley. 1961. The influence of inorganic sediment on the aquatic life of streams. California Fish and Game 47:189-228.

Goede, R.W. 1986. Management considerations in stocking of diseased or carrier fish. Pages 349-355 *in* R.H. Stroud, editor. Fish culture in fisheries management. American Fisheries Society, Bethesda, Maryland.

Goede, R.W. 1994. Aquaculture/disease/wild fish. Pages 176-180 *in* R.W. Wiley and W.A. Hubert, editors. Wild trout and planted trout: balancing the scale. Wyoming Game and Fish Department, Laramie.

Gregg, R., and F.W. Allendorf. 1995. Systematics of *Oncorhynchus* species in the vicinity of Mt. Hood. Preliminary Report to the Oregon Department of Fish and Wildlife, Portland, Oregon.

Lichatowich, J.A.,L.E. Mobrand, R.J. Costello, T.S. Vogel. 1996. A History of Frameworks Used in the Management of Columbia River Chinook Salmon. Prepared for US Department of Energy, Bonneville Power Administration, Environmental Fish and Wildlife, Portland, Oregon. Contract #DE-AM79-92BP25105.

Markle, D.F. 1992. Evidence of bull trout x brook trout hybrids in Oregon. Pages 58-67 *in* Howell, P.J. and D.V. Buchanan, editors. Proceedings of the Gearhart Mountain bull trout workshop. Oregon Chapter of the American Fisheries Society, Corvallis.

Moring, J.R. 1993. Effect of angling effort on catch rate of wild salmonids in streams stocked with catchable-size trout. North American Journal of Fisheries Management 13:234-237.

Olsen, E.A., R.A. French, and A.D. Ritchey. 1995. Hood River and pelton ladder evaluation studies. Annual Progress Report of Confederated Tribes of the Warm Springs Reservation and Oregon Department of Fish and Wildlife (Projects 88-29, 89-29-01, 89-053-03, 89-053-04, 93-019; contract numbers DE-BI79-89BP00631, DE-BI79-89BP00632, DE-BI79-93BP81756, DE-BI79-93BP81758, DE-BI79-93BP99921) to Bonneville Power Administration, Portland, Oregon.

Olsen, E.A., R.A. French, and A.D. Ritchey. 1996. Hood River and pelton ladder evaluation studies. Draft Annual Progress Report of Confederated Tribes of the Warm Springs Reservation and Oregon Department of Fish and Wildlife (Projects 88-29, 89-29-01, 89-053-03, 89-053-04, 93-019; contracts DE-BI79-89BP00631, DE-BI79-89BP00632, DE-BI79-93BP81756, DE-BI79-93BP81758, DE-BI79-93BP99921) to Bonneville Power Administration, Portland, Oregon.

Oregon State Game Commission. 1963. The fish and wildlife resources of the Hood Basin, Oregon and their water use requirements. Progress Report of the Oregon State Game Commission (Federal Aid to Fish Restoration, Fisheries Stream Flow Requirements, Project F-69-R-1, Job Number 1) to State Water Resources Board, Salem, Oregon.

O'Toole, P., and Oregon Department of Fish and Wildlife. 1991. Hood River production master plan. Final Report of the Confederated Tribe of the Warm Springs Reservation and the Oregon Department of Fish and Wildlife (Project 88-053, Contract DE-B179-89BP00631) to Bonneville Power Administration, Portland, Oregon.

Pribyl, S., C. Ridgley, and J. Newton. 1996. Bull trout population summary, Hood River subbasin. Draft Report of the Oregon Department of Fish and Wildlife and the United States Forest Service, The Dalles and Parkdale, Oregon.

Ratliff, D.E., and P.J. Howell. 1992. The status of bull trout populations in Oregon. Pages 10-17 *in* Howell, P.J. and D.V. Buchanan, editors. Proceedings of the Gearhart Mountain bull trout workshop. Oregon Chapter of the American Fisheries Society, Corvallis.

Reiser, D.W., and R.G. White. 1988. Effects of two sediment size-classes on survival of steelhead and chinook salmon eggs. North American Journal of Fisheries Management 8:432-437.

United States Forest Service. 1996. West Fork Hood River watershed analysis. Mt. Hood-Parkdale, Oregon.

Vincent, E.R. 1987. Effects of stocking catchable-size hatchery rainbow trout on two wild trout species in the Madison River and O'Dell Creek, Montana. North American Journal of Fisheries Management 7:91-105.

Waples, R.S., G.A. Winans, F.M. Utter, and C. Mahnken. 1990. Genetic approaches to the management of Pacific salmon. Fisheries (Bethesda) 15(5):19-25.

Waters, T.F. 1995. Sediment in streams: sources, biological effects and control. American Fisheries Society Monograph 7.

# *WILDLIFE REPORT*

## *EAST & MIDDLE FORKS OF THE HOOD RIVER WATERSHED ANALYSIS*

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June 6, 1996

## *Interesting aspects of the Watersheds*

### *East Fork*

The topography of the East Fork watershed is unique in that it is defined by a distinct north-south drainage (main stem East Fork); relatively rare in the undulating Cascade Range. The eastern edge of this drainage, Surveyor's Ridge, is a prominent landscape feature, extending for about 20 miles. At a landscape scale, this 20 mile north-south ridge complex stands out. As a result, this ridgeline takes on a unique and important aspect for wildlife use: this is one of the only known raptor migration corridors in the Cascade system, and may be used by a large majority of the northwestern raptor species in their annual migrations south.

Compared to other watersheds on the Forest, the East Fork watershed has an average to above average number of wetland/meadow complexes. The majority of these areas are within the Pocket Creek, Bluegrass Ridge, and Mt. Hood Meadows areas. On the Mt. Hood National Forest, these areas provide the best summer range for deer and elk species, this side of the Cascade range. These areas also provide unique habitat for a number of aquatic and riparian associated species.

There is still a large amount of late seral habitat within the East Fork watershed. The amount of late seral forest remaining, and the distribution of this is relatively similar to historic (pre-logging) conditions. This is relatively unusual for most watersheds on the Forest; as is the fact that much of the late seral remaining is also located outside of wilderness areas. This watershed also contains some of the most contiguous mature/late seral forests on the east side of the Mt. Hood NF.

There is a large amount of agriculture/non-Forest land located within this watershed. Much of the area that is now agriculture or non-Forest land, probably historically consisted of lower elevation mature and late seral forest, with a braided stream network throughout. Lower elevation (below 3,000 feet) lands in the watershed are now mainly either agricultural, or managed as shorter rotation forests. In addition, the stream and riparian complexity in these lower elevation areas has been significantly reduced. Linkage for riparian and/or late seral associated species below 3,000 feet is severely limited in this watershed.

This watershed supports the highest elevation owl pair on the Forest, with an activity center located at 4,600 feet in elevation near the Mt. Hood Meadows area.

### *Middle Fork*

In contrast to the East Fork watershed, the Middle Fork watershed contains the lowest amount of late seral habitat on the Mt. Hood NF. This watershed has experienced significant alterations of late seral abundance and distribution mainly due to timber harvest and human induced fires. Given the levels and distribution of these acres, there have been and continue to be significant impacts to the relative abundance, distribution, and connectivity of late seral associated wildlife species within this watershed, and hence, around the north side of Mt. Hood. The watershed is one of the more fragmented watersheds on the Forest.

A large portion of the watershed is comprised of non-Federal ownership, and is managed mainly for shorter rotation timber production and agriculture. Again, similar to East Fork, lower elevation lands in the watershed tend to be mainly within these non-Federal acres. Linkage for late seral and/or riparian associated species below 3,000 feet in elevation is severely restricted to non-existent. Due to current condition of the Federal land base (not much late-seral), as well as the distribution of land ownership within the watershed, this watershed stands out as having significant impacts/concerns regarding species associated with late-seral and/or riparian habitat.

An important feature of the watershed is an area called the "Lava beds". Located along the eastern edge of the watershed, and approximately five miles long and 1/2 mile wide, this feature was created by lava outflow, creating a large rocky area with very little tree growth dispersed throughout. This area may contain some unique wildlife habitat (bats, small mammals), and stands out as a distinct landscape component when assessed at the Forest scale.

## *Species of interest/concern - Both Watersheds*

The general lack of late seral habitat, and distribution of this habitat, is such that presence of late seral associates is limited within the Middle Fork watershed. Utilizing the Forest's SCCA database, it is estimated that habitat is not present for species in the late seral, large home range guild in Middle Fork: northern goshawk, spotted owl, pileated woodpecker, wolverine, marten, fisher. However, there are four spotted owl pair activity centers in Middle Fork, and wolverine, goshawk, pileated woodpecker and marten have all been documented (the latter 3 have been noted in the Cloud Cap/Tilly Jane area, on the border with the East Fork watershed). However, the continued existence of these species over the next 10 to 20 years cannot be assured. This would indicate that these species are using less than optimal habitat within their home range. It is likely though, that they are scarce to non-existent throughout much of the watershed.

### *Extirpated species*

Four species which most likely existed within the watersheds are no longer present within the watersheds, or surrounding area: wolf, condor, grizzly bear, and mountain goat.

The grey wolf and grizzly bear were two major predators thought to exist historically within the watersheds. Both species have been extirpated since around the turn of the century. Removal of these large predators from the watersheds has most likely had ecosystem impacts, as the genetic integrity of prey animals (deer, elk, etc.) may be compromised, as the predatorial pressure both wolf and bear may have placed upon prey populations is not suitably replaced by hunting. (Bear/wolf were likely to remove older, younger, diseased, sick, weaker, less adaptable animals from the population. Hunting does not tend to replicate predators roles). Although habitat, including adequate prey, for both of these species is currently present within the watersheds, social values may impede any attempt at restoring these species as ecosystem components.

Mountain goats may have existed within the watersheds. Reports indicate that mountain goats may have at one time been within the Cascade Range. Currently, mountain goats exist within Washington, and mountain goat skeletal remains have been found in northern California. Mountain goats may have played an important role in subalpine ecosystems, particularly with regards to a determination of dominant plant species, as well as their general abundance. Goats may have selected for forage certain species which may have thrived, or been reduced, depending upon their response to being foraged. Certainly, one would expect that plant composition and abundance would be different in an environment where goats are an integral part of the ecosystem. The likelihood of goat reintroduction is medium. Goats were reintroduced into portions of the Columbia Gorge in the 1970's and 80's, with unsuccessful results. A full assessment of impacts to native plants would be warranted before proceeding with this type of project.

California condor once roamed the Columbia Basin. It is not known whether or not condors would have been nesting within either watershed, but given their large home ranges, they were most likely at least foraging in both watersheds. Reintroduction of this species into the watersheds is unlikely within the near future, and is dependent upon the success of the overall condor recovery program. If captive bred birds are able to survive in the wild, condors may be able to be released into the Columbia Basin.

### *Sensitive species*

Black rosy finch: This species may exist along the alpine/subalpine ecotypes around Mt. Hood. Within Oregon, the black rosy finch is only known within high elevations in the Eagle Cap Wilderness Area portion of the Wallowa Mountains, and on Steens Mountain. They summer in snow fields and adjoining edges and rocks, feeding along receding snowline on seeds, nesting in rocky crevices. This species may not be present on Mt. Hood. A very similar species, the gray-crowned rosy finch, has been documented in habitat on Mt. Hood, similar to the habitat the black rosy uses in the Wallowas and Steens. Surveys for this species have not determined presence.

Wolverine: This species, naturally low in numbers and with a very large home range, was and still is an occupant of the watershed. Some recent unconfirmed sightings of this species are known within the watershed, mainly in the higher elevations. Wolverine use of the watershed has most likely dramatically changed. Pre-1900, the main stem of East Fork, including the Upper Valley area (Parkdale) probably provided some excellent foraging and resting habitat. Reproductive habitat, around the 4,000 foot level and above, on Mt. Hood, was also probably quite good, as the human use of these areas was probably at a reduced level from current numbers. Highway 35, and the development off Forest of agricultural lands have probably altered the flow of this species within the watershed. Reproductive habitat, particularly within the Mt. Hood Wilderness within this watershed, is still very viable.

Cope's giant salamander: There are no documented occurrences within the watersheds. However, there is habitat present, and most likely this species exists. Adult forms of this species are rare, and as of 1993, only 3 individuals have been described. Species occurrence (all known stages of life forms) is up to 3,200 feet in elevation in small rocky streams. Habitat for this species on Forest is limited by elevational constraints. There are many known locations within the lower reaches of Bear Creek. Most of the lower elevation lands within the watersheds are off Forest, and have been altered due to agricultural development and human settlement.

### *Species of concern / interest*

Cascades Fox: This native fox is not well known, and documentation of this animal as a species appears conflicting. Older Oregon Wildlife books refer to this inhabitant of the Cascades, but more recent information does not mention them. This higher elevation native fox is a likely inhabitant of both watersheds. Surveys have not documented any fox in the upper elevation areas surrounding Mt. Hood, but these surveys are limited. Historic records/observations indicate occurrences of foxes at a few locations in the mid to upper areas around Mt. Hood.

Pine marten: A likely, abundant inhabitant of the East Fork watershed, this species is linked to moderate levels of down logs, mainly in mature/late seral stands. Pine martens have been documented within the East Fork, and are most likely very well dispersed north-south, east-west. Much of the Mt. Hood Meadows area, particularly the unfragmented late seral forests surrounding the ski areas, is excellent habitat for this species, as is some of the habitat along bluegrass ridge and the Cooper Spur/Tilly Jane area. Within the Middle Fork, this species is most likely very rare, mainly due to the overall lack of mature/late seral habitat both on and off Forest. This lack of late seral habitat in the Middle Fork watershed creates a significant connectivity/linkage barrier for this species (as well as other late seral associates) through the watershed, and around the north side of Mt. Hood.

Deer/elk: A readily observable component of the East Fork watershed, deer and elk populations flow throughout the ecosystem. The East Fork watershed provides the best summer range for these species, mainly in the Pocket, Meadows, and Elk Mountain/Bluegrass Ridge areas. Excellent habitat is provided in these areas, although some portions of these areas are impacted negatively by human intrusion (roads, trails, Mt. Hood Meadows). Species migrate through the watershed in spring and fall, moving along Bluegrass ridge and the lower portion of the Cooper Spur area, crossing Highway 35 and moving eastward over Gumjuwac Saddle and the upper portions of Puppy Creek and Dog River. For watersheds east of the Cascades on the Mt. Hood NF, this watershed plays an important role in providing good quality forage habitat and migration flows. Highway 35 may impact species movement some, and individuals are lost annually due to road-kill. Harassment of these species through road access, as well as poaching is significant. The Middle Fork watershed is also important for deer and elk population stability, in particular, portions of the Cloud Cap/Tilly Jane Historic Area by providing for summer forage and rearing grounds. Movement from this area tends to go down towards the confluence of Doe Creek and the East Fork, and on over up Dog River and Puppy Creek. Additionally, deer and elk move through the northern portion of Forest in Middle Fork, moving through the watershed to higher elevations such as Red Hill. Impacts to deer and elk in this watershed mainly occur due to harassment and poaching.

Mollusk species from the NW Forest Plan: Probably the area of most likely occurrence or diversity of the multiple species of mollusks listed in the NW Forest Plan is near the wetland/meadows areas, particularly within or adjacent to Mt. Hood Meadows. Habitat diversity for the array of species is rather good, and the overall wet characteristics of this area lend it to being good habitat. Surveys have not been conducted for any of the NW Forest Plan species (identification keys are still not developed!). Additional areas of medium to higher potential include the Bluegrass ridge area, where seep and springs are readily apparent.

## *East Fork*

### *Threatened and endangered species:*

The northern spotted owl is an integral ecosystem component within this watershed, with 15 activity centers dispersed throughout. Spotted owl habitat is generally well dispersed, and abundant, with the largest percentages occurring in the upper portion of the watershed. Along the eastern edge of this watershed, it is likely that there is more spotted owl habitat than historic levels, mainly due to the exclusion of fire which has built up a well developed understory/second and third canopy layers. This is most prominent along the northeastern edge of the watershed, within the Forest boundary, where five pairs are located in areas which most likely, historically, more open pine stands. The array of activity centers throughout the watershed helps to provide a strong east/west linkage across the Forest, around the south side of Mt. Hood. Of concern for spotted owls and other late seral associates is the northwestern portion of the watershed, where land ownership and habitat management have created an area with limited late seral structure. This constriction of habitat creates a barrier of flow and connectivity for late seral associated species, around the north side of Mt. Hood.

Peregrine falcons are not known to currently exist within the watershed, although medium to high quality habitat is present. Five cliff complexes were identified by aerial reconnaissance as potentially being able to support nesting peregrine falcons, based on the quality of nesting substrate and predatorial protection. None of these sites have had surveys completed to determine absence or presence of falcons-surveys are being conducted this year. Three of the five sites are located adjacent to Highway 35, and therefore, their potential for occupancy may be impaired due to the sporadic disturbances associated with the traffic on this highway. The other two sites have trails in close proximity to them. The two trails are not hikable until April-May of each year, but use at that time may cause nesting birds to disperse, should birds be present at the cliff site. Therefore, all five potential cliff sites in this watershed have had some sort of impact to their suitability, based on road or trail proximity and associated disturbance. The likelihood of successful return of peregrines to this watershed is most likely minimal due to these disturbances. Of the five sites, Rimrock and Polallie have the highest likelihood for early season use by peregrines, and will be monitored on an annual basis. Should peregrines be discovered, trail closures and other mitigations to prevent disturbance will be assessed.

Bald eagles were most likely an integral component of this watershed. Occasional observations of this species have been made in the recent past, but based on the time of the year of these observations, it is thought that they are migrating or dispersing through the area. The East Fork currently lacks an adequate prey base to support a nesting pair, although historically abundant resident and anadromous fish probably supported more than one pair in the middle and lower portions of the watershed. High quality habitat was most likely present in the lower portion of the watershed, with a braided stream network, and large diameter trees providing adequate nesting structure. A reduction in anadromous fish runs, removal of riparian habitat in the Upper Valley (Parkdale area), and development of Highway 35 along the mainstem of the East Fork have all contributed to the demise of this species in the watershed.

### *Sensitive species*

Harlequin duck: This watershed provides great habitat for harlequin duck. There are known occurrences of this species from above Robinhood campground, to below Toll Bridge park. The quantity of this species in the watershed stands out when compared to other watersheds in the Forest. It is expected that additional pairs of this species would have historically occurred off Forest also, in the lower portions of the watershed. The abundance of this species in the watershed may indicate an abundance of aquatic invertebrates (prey for the ducks), be associated with the proximity to the Columbia River (access from their wintering waters of the Pacific Ocean), or other factors.

Larch Mountain salamander: The northwest portion of the watershed provides habitat for this terrestrial salamander. Larch Mountain salamanders require forested rocky/talus fields with at least 40% canopy closure. In this part of their range, up to 3,400 feet in elevation is considered suitable habitat. A documented occurrence of this species was made below Rimrock, within the past 10 years. Surveys for this species have not been extensive in this watershed, and the likelihood for more sites exists, particularly along the eastern slope of the watershed.

Sandhill Crane: This species is not known within the watershed, although formal surveys have not been conducted. Marginal habitat for this species exists in the upper portion of the watershed, particularly the Mt. Hood Meadows and Pocket creek areas. These meadow complexes may be too high in elevation to support this species, and lower elevation sites (Horsethief Meadow, for example) too impacted by noise/disturbance. The highest potential sites may have been off-Forest in the lower portions of the watershed, where a braided stream network designed by flat topography created some wetland/meadow areas. Habitat like this, is no longer present in those lower elevations.

Painted Turtle/Pond turtle: Oregon's only two native turtle species are in dramatic trouble. Habitat for these two species includes lower elevation lakes, ponds, wetlands with abundant vegetation and a lack of non-native predators (bullfrogs, for example). Known populations of the pond turtle (which used to inhabit the Willamette Valley) occur only within the Columbia Gorge. It is very likely that the East Fork watershed provided excellent habitat for this species, within the Upper Valley area. The braided network of streams, good riparian vegetation, and most likely abundant wetland areas, have been altered due to agriculture conversion and human settlement. A pond turtle was discovered near the Toll Bridge park area within the past 10 years, and may represent a vestige, or may have been dropped off there. If individuals or populations of these species exist within the watershed, they are most likely very disjointed and incapable of linkage/connectivity.

## *Middle Fork*

### *Threatened and Endangered Species*

Spotted owl: Only four spotted owl activity centers exist within the Middle Fork watershed. This is one of the lowest numbers of owl pairs within a watershed in the Mt. Hood National Forest. Habitat for this species is fragmented, and low in abundance. This species historically had much more habitat in the watershed. This watershed provides an integral connectivity link around the north side of Mt. Hood for this and other late seral species due to being the only Federally owned land around the north side of Mt. Hood, and the only tract of land which has some linkage across the Hood River Valley. Unfortunately, the general lack of late seral habitat means that although the connectivity linkage is critical, it is also tenuous to non-existent for late seral associates.

Peregrine falcon: Only one area within the watershed appears capable of supporting a pair of peregrine falcons (The Pinnacle). During an aerial survey of the watershed, no other cliff locations were identified as having potential to support peregrines. This location may or may not have been occupied in the past. It received a "high" potential rating for the cliff substrate and protection from mammalian predators. Also, given the location just inside the Mt. Hood Wilderness, there is a low likelihood of disturbance impacts to the site. This site is still very suitable, compared with historic conditions, and may support peregrine pairs in the future. Surveys are being conducted this year.

Bald eagles: Bald eagles may have existed within the watershed in historic times, most likely in the northern part of the watershed, along the Middle Fork main stem. Currently, habitat is not present for this species, due to a lack of an adequate prey base as well as a general lack of nesting structure (large diameter trees, in an older/mature/late seral forest) within the northern reaches of the watershed. Compared with the East Fork watershed, this watershed probably had lower numbers of bald eagles along the main stems.

### *Sensitive species*

Harlequin duck: There are no known locations of Harlequin duck within the watershed, although habitat is present. Surveys would most likely discover some pairs of this species along the main stem of the Middle Fork, most likely south of the Forest boundary. Harlequin abundance in this watershed is expected to be average to below average, due to the general condition of the riparian areas (lacking adequate late seral structure nearby).

Larch Mountain salamander: There is probably very little, if any. larch mountain salamander habitat within the watershed, as there is very little forested talus/rocky areas below 3,400 feet in elevation. This species was most likely a minor component of the ecosystem in the past, and may or may not play a role in the watershed currently. Habitat for this species may be mainly located off Forest.

Sandhill Crane: This species is not known within the watershed, and habitat for this species is not readily apparent. The highest potential sites may have been off-Forest in the lower portions of the watershed, where a braided stream network designed by flat topography created some wetland/meadow areas. Habitat like this, is no longer present in those lower elevations.

Painted Turtle/Pond turtle: The Middle Fork watershed may have provided some habitat for these species in the northern end, off Forest. Current habitat is non-existent within the watershed, due to agriculture conversion and human settlement.

## *Issues of relevance: past, current, and future trends*

There are a few key/important issues relevant to wildlife within the Watersheds.

### *Connectivity of late seral habitat, and mature and late seral associated species around the north side and through the Hood River valley, to provide linkage between eastside and westside late seral associates.*

This is by far the number one wildlife issue of relevance pertaining to the two watersheds. Historically, a linkage or continuity of forested habitat, and at least some mature to late seral forest existed from the Cascade crest down to the Hood River valley, and up into the East Fork. This continuity or linkage provided habitat for late seral species, and allowed population links around the north side of Mt. Hood. With the development of agriculture in the greater valley, and increased Euro-American presence, the distribution of the forested landscape became permanently altered. The valley started to become a dispersal/connectivity barrier for late seral associates. This barrier to movement and absence of late seral associates became more pronounced with the human created fires proceeding up Middle Fork, and timber harvest on the Federal land base. Timber harvest further reduced the amount and distribution of late seral habitat at mid to low elevations on the north side of Mt. Hood. Also, late-seral stand characteristics, like large snags and down logs are relatively low within this watershed, even in younger and middle aged stands. This is primarily due to the large fires in Middle Fork, harvest practices, and snagging. Species dependent on these ecosystem elements are of concern as this area provides little to no habitat (see Guilds / Species list, below.)

This trend has continued for at least the past 150 years through current time. The Forest Service land base in Middle Fork, where the main connectivity problem lies, continues to decrease. In the past 1-3 years, six square miles of Forest Service land have been traded out of the land base. The traded land will most likely be managed on a 60-80 year rotation length, and precludes opportunity for management of Late seral associates. Therefore the present trend has continued to exacerbate the connectivity problem.

The future trends will be mixed. Through the Landscape Analysis and Design (LAD) process, the watershed team determined that it was vital to attempt to develop some connectivity/linkage for late successional species within the Middle Fork watershed. Emphasis areas were identified, and a strategy for management designed. Development of stands with late seral characteristics though, will take time. Therefore, habitat for some late seral associates will continue to be absent/in reduced acreages for many years into the future, on Forest Service land. Through time though, if the intent of the LAD can be carried out, there should be an evolution of late seral structure and connectivity, at mid to higher elevations around Mt. Hood. Off Forest, the trend will be towards a further reduction in late seral habitat, and potential for connectivity. The future trend for non-Federal land will be towards absence of late seral structure/habitat and connectivity, as timber harvest, agricultural development, and human settlement increase.

This trend, including the trend on Forest Service land, will result in a landscape devoid of late seral habitat, species, and connectivity at lower elevations. The big scale trend, above and beyond the Middle Fork/East Fork watershed scale, will be an overall loss of late seral habitat, species and connectivity at lower elevations (3,000 feet or less) throughout the Hood River valley. At middle to higher elevations, the trend will be to promote more linked late seral structure, but with the overall idea that the levels and distribution of this type of habitat (and hence species dependent upon late seral habitat) will never resemble pre Euro-American settlement. Connectivity around Mt. Hood for species dependent upon lower elevation late seral habitat will be absent, and for mid-elevation late seral connectivity, will be tenuous at best. Higher elevation late seral connectivity will be retained and promoted.

On Forest Service land in the Middle Fork watershed, 4 100 ac spotted owl LSRs were established around existing/known activity centers. In addition, riparian reserve widths in this watershed, particularly within the central portion of the watershed, were recommended to be enlarged, with the intent of helping to develop better east/west connectivity. Management emphasis areas/connectivity areas were also identified, as a design tool to help promote late seral characteristics.

Designing strategies to move timber stands towards late seral characteristics faster will be incredibly complicated. One factor adding complication is the fact that the majority of harvested stands within the Middle Fork do not have late seral habitat components retained post harvest: namely snags and down logs. When these stands were harvested, much of the down material and snags were felled and removed or burned up. Without these remnant characteristic within the stands, development of late seral features will be much more difficult.

### ***Habitat connectivity for riparian/aquatic wildlife species particularly within the Middle Fork Watershed, has been impacted by human uses.***

The integrity of aquatic and riparian systems has been severely compromised by past and ongoing management of the watershed. The most significant impacts have occurred off-Forest, and have their origin at least 100-150 years ago: human settlement in the lower portions of the East Fork watershed, and vegetation management and agricultural development within both East and Middle Forks.

The lower portion of East Fork was most likely a very complex braided stream network, with well developed side channels, wetlands, wetland/meadow complexes. Habitat diversity and hence species presence was diverse. This area also provided for late seral and riparian connectivity up the East Fork (and then over the Surveyors Ridge). This area, which is now Parkdale, Mt. Hood and other Upper Valley communities, was an integral part of east/west and north/south connectivity. Agricultural development and human settlement has changed the continuity of the landscape here, reducing the complexity of the stream network, and altering riparian vegetative composition. This trend, which started 100-150 years ago, with Euro-American settlement, has continued to this day, and will continue into the future. Riparian vegetation continues to be removed, stream complexity continues to be reduced. In this portion of the watershed, there is a general overall lack of habitat for riparian species dependent upon older age forests, or forests with structural diversity. Amphibian numbers and diversity are most likely low. Harlequin duck occurrence is sporadic, and centered on protected areas such as State or County Parks, or areas where some streamside structural diversity continues to exist. Pond and Painted turtle presence has been significantly reduced due to the draining or development of wetlands. Bald eagles would have been most prominent in this section of the watersheds, but habitat is currently lacking, and predicted to continue to be absent into the future.

Vegetation management (Timber harvest) in the Middle Fork watershed has also had significant/relevant impacts to riparian associated species. Many of the riparian areas, both on and off-Forest have had high levels of harvest. In the past, buffering Of streams was not a routine practice. With the advent of the Northwest Forest Plan, and tighter State Forest Practices Act, buffering of streams during timber harvest will occur. The trend in the future is that timber/forest land in the two watersheds will see riparian habitat protection; and that riparian areas harvested in the past will develop into older age forests, providing integral connectivity linkages for a multitude of wildlife species. The trend on agricultural and other land will be removal of additional riparian habitat.

Since riparian areas are so integral to wildlife movement and connectivity, the trend of habitat degradation on lower portions of the two watersheds has had and will continue to have significant impacts on species presence and connectivity both within the two watersheds, and at the greater, province level scale. Coupling riparian impacts up with the overall lack of late seral habitat in the lower portions of the two watersheds points to the overall conclusion that there are significant dispersal problems around the north part of Mt. Hood for late seral associated species. The problem is twofold: there is a general lack of late seral riparian habitat both on and off-Forest in the lower portions of the watershed. This means reduced connectivity for late seral species. There is also, just in general, an overall lack of late seral habitat in the upland areas, meaning that late seral species are low in number to non-existent. To restore the overall functionality of the ecosystem, both upland and riparian late seral habitat must be restored: need to have intact, older riparian areas as pathways for dispersal/migration, and enough late seral habitat in the uplands to insure the presence of these species within the ecosystem. Overall it doesn't matter if you have the riparian habitat, but not enough late seral habitat overall to even support species presence.

Riparian connectivity has also been compromised in other manners also. Cumulatively the impacts are severe, particularly in the lower watershed.

Much of the wildlife species flow through the East Fork is most likely to occur along ridge lines and through valleys. Highway 35 bisects what appears to be a major connectivity link. The impacts the presence and operation of the highway have upon wildlife are unknown, but can be inferred. Highway 35 impacts are two fold: the direct impact development of the highway has had upon riparian vegetation (first through the removal of that vegetation for development of the highway, second for continued maintenance of the highway, including the removal of any brush encroachment, and hazard tree, including snag removal). Also, there is an indirect impact by having roads located adjacent and in close proximity to a major north/south riparian corridor.

Species likely to be most impacted include those with smaller home ranges, dependent upon larger diameter trees. These type of species readily rely on riparian areas for their connectivity across the landscape. Absence of habitat due to construction of Highway 35, as well as direct mortality from roadkill impede the ability of these types of species to have unbroken connectivity (species in this group include amphibians, shrews, and squirrels).

Amphibians disperse primarily after wet periods in the late spring and early fall, and are extremely susceptible to mortality along highway 35 during this time period. Highway 35 alone, however, does not impede any of these species ability to disperse, but does compromise it.

Water diversions, mainly off-Forest, also impede connectivity of riparian and aquatic wildlife species. The diversions in East Fork tend to be almost total, as summer progresses, and in doing so, alters the habitat for aquatic wildlife directly, through removal of water. In addition, those species that can move with the water, and end up in irrigation ditches, find that the ditches lack the structural diversity contained in typical streams. This absence of structure can mean an absence of a food source, resting area, or reproductive habitat. Riparian species may be directly impacted by stream diversions, following the new water course instead of the stream network. The new ditch may have a lack of prey species for some riparian associates (bats for instance), due to factors described above. All of the impacts associated with stream diversions occur at the lower end of the watershed, and cumulatively add to the overall riparian connectivity problem.

Impacts to water quality, described elsewhere in technical input by the District Hydrologist, also can affect the quality and distribution of riparian and aquatic wildlife. Some of these factors include: oil and petrochemical introduction via roads, hydroelectric generation, agri-chemicals, wastewater, dispersed camping impacts (mainly the Nottingham area, but anywhere where fecal matter directly enters the stream course), and herbicide use along powerline corridors. Overall impacts are unknown, but intuitively, depending upon the point source, can result in localized degradation of habitat or elimination of species. Most of these impacts occur in the lower portion of the watershed, but Highway 35 also serves as a point of entry. Amphibians show signs of being extremely impacted by toxins within water, and may be the most impacted wildlife species impacted by these factors.

Recreation use in general also adds to the general riparian and aquatic impacts within the two watersheds. The development of Mt. Hood Meadows Ski Area surrounding and on top of a major wetland/meadow system in the upper portion of the East Fork watershed has most likely impacted the integrity of higher elevation wetland/meadows complexes surrounding Mt. Hood. It appears that the majority of the wetland/meadow complexes in the East Fork watershed are within Mt. Hood Meadows, and most are impacted somehow by recreational development (skiing, but also, hiking, parking lots, camping, mountain biking). Much of the impacts are direct: placement of parking lots on top of or adjacent to wetland complexes, altering the function of the wetland, or removal of the adjacent vegetation; although some may be considered indirect: mountain biking and hiking in proximity to Stringer Meadows, emphasizing human presence surrounding the large Stringer meadow network, and impacting species presence there. Noise is a major component of impact to the functionality of these complexes, areas where a diversity of species uses would be expected. Human presence and noise generated in proximity may impact the diversity of species present, or alter their time of usage. Measurement of these indirect impacts is difficult. Measurement of the direct impacts (parking lots, etc.) could still be accomplished through surveys for species diversity and abundance in less impacted wetland/meadows and comparing with results of surveys in areas where impacts are noticeable (both direct and indirect). Certainly, we know enough to say that the character, and use of these areas have changed from historic times, and the diversity of species may have been altered also. Impacts of snow area grooming, and hence delayed run off would be important to measure, as would impacts to wetland/meadow and stream features due to salting of ski runs.

***The general health of the forest ecosystem has been compromised. Integral ecosystem components (species and habitat are diminished or lacking). Impacts upon the food chain, and general genetic health are unknown.***

Within the past 100 years, the ecosystem of the two watersheds has lost two major, large carnivores: grizzly bear and wolf. These species played an integral role in the health of the ecosystem, mainly by limiting prey species numbers. Their role as hunters helped keep a genetically superior stock of prey species (deer, elk, small mammals, etc.). Their absence may have skewed the genetics of these species, especially deer and elk, since human hunting does not remove the same type of animals that large carnivores would. The impact upon the prey species, and in turn the ecosystem, may not be able to be measured, but through time we may become aware of what impact the removal of these checks and balances have had upon the ecosystem.

The general absence of late seral species and habitat, habitat for primary and secondary early seral nesters, good quality riparian habitat for salamanders and bats in the northern part of the watersheds may have significant long term impacts. Long term presence of these species within the watershed may be tenuous. Long term connectivity for these species across the Hood River Valley, and on over to the "eastside" of the Forest may be unable to be achieved through time.

## *Information on "guilds"*

### *Guilds/species lists*

Approximately 265 vertebrate, non-fish species occur or have the potential to occur within both watersheds. In order to more efficiently assess the current condition and desired trend for all of the species, an attempt has been made to "guild" them, by lumping species into a similar group of species. The attributes defining how to "lump" individual species are: home range size, tree size/seral stage, and spatial array/habitat needs for each. The following lists species by the various guilds, and indicates how much suitable habitat is available for each guild. In addition, an attribute is listed indicating whether the individual species is linked to down logs ("log"), or large diameter snags ("snags") for reproduction.

KEY: * = In Middle Fork, likely not in East Fork

** = In East Fork, likely not within Middle Fork

| Guild | Species | Snag / Log | Middle Fork Acres | East Fork Acres |
|---|---|---|---|---|
| LAKEA (Aquatic Habitats of Lakes) | | | 52 | 2 |
| | Clark's Grebe** | | | |
| | Western Grebe** | | | |
| | American Wigeon | | | |
| | Tundra Swan | | | |
| | Ruddy Duck | | | |
| | Horned Grebe | | | |
| | Greater Yellowlegs | | | |
| LAKEARO (Aquatic & Terrestrial Open Habitats of Lakes) | | | 7 | 0 |
| | Spotted Frog | | | |
| LKRVA (Aquatic Habitats of Lakes & Rivers) | | | 4,700 | 10,000 |
| | Northern Pintail | | | |
| | Northern Shoveler | | | |
| | Green-Winged Teal | | | |
| | Blue-Winged Teal | | | |
| | Gadwall | | | |
| | Lesser Scaup | | | |
| | Common Goldeneye | | | |
| | Cope's Giant Salamander | | | |
| | Common Loon | | | |
| | Herring Gull | | | |
| | Bullfrog | | | |
| LKRVARF (Aquatic & Terrestrial Forested Habitats of Lakes & Rivers) | | | 3,300 | 8,200 |
| | Wood Duck | Snag | | |
| | Barrow's Goldeneye | Snag | | |
| | Belted Kingfisher | | | |
| | Pacific Giant Salamander | | | |
| | Hooded Merganser | Snag | | |
| | Common Merganser | Snag | | |
| | Pacific Water Shrew | Log | | |
| | Water Shrew | Log | | |
| LKRVARG (Aquatic & Terrestrial, All Stages of Lakes & Rivers) | | | 4,700 | 10,150 |
| | Great Blue Heron | | | |
| | Ring-Necked Duck | | | |
| | Bufflehead | | | |
| | Beaver | | | |
| | Bald Eagle | | | |
| | River Otter | | | |
| | Osprey | Snag | | |
| | Double-Crested Cormorant | | | |
| | Pied-Billed Grebe | | | |
| LKRVARO (Aquatic & Terrestrial Open Habitats of Lakes & Rivers) | | | 1,100 | 1,260 |
| | Cinnamon Teal | | | |
| | Mallard | | | |
| | Canada Goose | | | |

| Guild | Species | Snag / Log | Middle Fork Acres | East Fork Acres |
|---|---|---|---|---|
| | Painted Turtle** | | | |
| | Western Pond Turtle** | | | |
| | American Coot | | | |
| | Water Vole | | | |
| **LKRVRO (Terrestrial Open Habitats of Lakes & Rivers)** | | | 1,600 | 2,560 |
| | Spotted Sandpiper | | | |
| | Red-Winged Blackbird | | | |
| | Killdeer | | | |
| | Common Snipe | | | |
| | Common Yellowthroat | | | |
| **RIVA (Aquatic Habitat of Rivers)** | | | 3,500 | 5,200 |
| | Tailed Frog | | | |
| **RIVARF (Aquatic & Terrestrial Forested Habitats of Rivers)** | | | 3,300 | 8,200 |
| | American Dipper | | | |
| | Harlequin Duck | | | |
| | Cascade Torrent Salamander | | | |
| **RIVARG (Aquatic & Terrestrial, All Stages of Lakes & Rivers)** | | | 2,200 | 4,700 |
| | Green-Backed Heron | | | |
| | Ring-Billed Gull | | | |
| **RIVRF (Terrestrial Forested Habitats of Rivers)** | | | 800 | 0 |
| | Dunn's Salamander* | | | |
| **RIVRO (Aquatic & Terrestrial Open Habitats of Rivers)** | | | 205 | 0 |
| | Yellow-Breasted Chat* | | | |
| **SPCL (Special Habitat Needs)** | | | | |
| | Northern Harrier | | | |
| | Marsh Wren** | | | |
| | Peregrine Falcon | | | |
| | Sandhill Crane | | | |
| | Cliff Swallow | | | |
| | Barn Swallow | | | |
| | House Mouse | | | |
| | Western Small-Footed Myotis | | | |
| | Bushy-Tailed Woodrat | | | |
| | Pika | | | |
| | House Sparrow | | | |
| | Larch Mountain Salamander | | | |
| | Townsend's Big-Eared Bat | | | |
| **TLC (Terrestrial, Large Home Range, Contrasting Habitats)** | | | 2,250 | 8,600 |
| | Golden Eagle | | | |
| | Red-Tailed Hawk | | | |
| | Great Horned Owl | | | |
| | Turkey Vulture | Log | | |
| | Elk | | | |
| | Great Gray Owl | Snag | | |
| **TLGG (Terrestrial, Large Home Range, Generalist)** | | | 21,200 | 47,800 |
| | Coyote | | | |
| | American Crow | | | |
| | Common Raven | | | |
| | Mountain Lion | | | |

| Guild | Species | Snag / Log | Middle Fork Acres | East Fork Acres |
|---|---|---|---|---|
| | Bobcat | Log | | |
| | Black Bear | Log | | |
| | Gray Fox | Log | | |
| TLMLT (Terrestrial, Large Home Range, Mosaic of Large Trees) | | | 0 | 9,200 |
| | Northern Goshawk | | | |
| | Pileated Woodpecker | Snag | | |
| | Wolverine | | | |
| | Marten | Snag, Log | | |
| | Fisher | Snag, Log | | |
| | Northern Spotted Owl | | | |
| | Barred Owl | | | |
| TLMO (Terrestrial, Large Home Range, Mosaic of Open) | | | 4,000 | 1,000 |
| | Rough-Legged Hawk | | | |
| | Red Fox | Log | | |
| TMC (Terrestrial, Medium Home Range, Contrasting Habitats) | | | 1,600 | 5,750 |
| | Big Brown Bat | Snag | | |
| | American Kestrel | Snag | | |
| | Silver-Haired Bat | Snag | | |
| | California Myotis | Snag | | |
| | European Starling | Snag | | |
| | Barn Owl | Snag | | |
| TMGG (Terrestrial, Medium Home Range, Generalist) | | | 21,200 | 47,800 |
| | Cooper's Hawk | | | |
| | Sharp-Shinned Hawk | | | |
| | Northern Saw-Whet Owl | Snag | | |
| | Long-Eared Owl* | | | |
| | Common Nighthawk | | | |
| | Northern Flicker | Snag | | |
| | Western Rattlesnake | Log | | |
| | Virginia Opossum | | | |
| | Porcupine | Log | | |
| | Hoary Bat | | | |
| | Wild Turkey | Log | | |
| | Long-Tailed Weasel | Log | | |
| | Mink | Log | | |
| | Long-Eared Myotis | Snag | | |
| | Long-Legged Myotis | Snag | | |
| | Yuma Myotis | Snag | | |
| | Black-Tailed and Mule Deer | | | |
| | Gray Jay | | | |
| | White-Headed Woodpecker | Snag | | |
| TMMLT (Terrestrial, Medium Home Range, Mosaic of Large Trees) | | | 1,000 | 13,200 |
| | Black-Backed Woodpecker | Snag | | |
| | Three-Toed Woodpecker | Snag | | |
| TMMO (Terrestrial, Medium Home Range, Mosaic of Open) | | | 4,200 | 2,800 |
| | Merlin | | | |
| | Striped Skunk | | | |
| | Western Spotted Skunk | Log | | |

| Guild | Species | Snag / Log | Middle Fork Acres | East Fork Acres |
|---|---|---|---|---|
| TMPO (Terrestrial, Medium Home Range, Patches of Open) | | | 2,330 | 5,500 |
| | Rosy Finch | | | |
| | Mountain (Nuttail's) Cottontail** | | | |
| TSC (Terrestrial, Small Home Range, Contrasting Habitats) | | | 1,700 | 4,900 |
| | Cassin's Finch | | | |
| | Olive-Sided Flycatcher | | | |
| | Lewis' Woodpecker | Snag | | |
| | Flammulated Owl | Snag | | |
| TSGG (Terrestrial, Small Home Range, Generalist) | | | 21,000 | 47,800 |
| | Northwestern Salamander | | | |
| | Long-Toed Salamander | | | |
| | Mountain Beaver | Log | | |
| | Oregon Slender Salamander | Log | | |
| | Cedar Waxwing | | | |
| | Ruffed Grouse | Log | | |
| | Western Toad | | | |
| | Hermit Thrush | | | |
| | Pine Siskin | | | |
| | Purple Finch | | | |
| | Swainson's Thrush | | | |
| | Rubber Boa | Log | | |
| | Vaux's Swift | Snag | | |
| | Band-Tailed Pigeon | | | |
| | Sharptail Snake | Log | | |
| | Western Wood-Pewee | | | |
| | Evening Grosbeak | | | |
| | Steller's Jay | | | |
| | Yellow-Rumped Warbler | | | |
| | Black-Throated Gray Warbler | | | |
| | Blue Grouse | | | |
| | Ringneck Snake | Log | | |
| | Northern Alligator Lizard | Log | | |
| | Southern Alligator Lizard | Log | | |
| | Hammond's Flycatcher | | | |
| | Ensatina | Log | | |
| | Western Skink | Log | | |
| | Northern Pygmy Owl | Snag | | |
| | Varied Thrush | | | |
| | Dark-Eyed Junco | | | |
| | Snowshoe Hare | | | |
| | Red Crossbill | | | |
| | Song Sparrow | | | |
| | Creeping Vole | Log | | |
| | Brown-Headed Cowbird | | | |
| | Ermine | Log | | |
| | Townsend's Solitare | Log | | |
| | Clark's Nutcracker | | | |
| | Western Screech-Owl | Snag | | |
| | Mountain Chickadee | Snag | | |

| Guild | Species | Snag / Log | Middle Fork Acres | East Fork Acres |
|---|---|---|---|---|
| | Chestnut-Backed Chickadee | Snag | | |
| | Deer Mouse | Log | | |
| | Black-Headed Grosbeak | | | |
| | Pine Grosbeak | | | |
| | Rufous-Sided Towhee | Log | | |
| | Western Tanager | | | |
| | Hairy Woodpecker | Snag | | |
| | Raccoon | Snag | | |
| | Pacific Treefrog | | | |
| | Red-Legged Frog* | | | |
| | Cascades Frog | | | |
| | Ruby-Crowned Kinglet | | | |
| | Golden-Crowned Kinglet | | | |
| | Western Gray Squirrel | Snag | | |
| | Western Fence Lizard | | | |
| | Coast Mole | | | |
| | Rufous Hummingbird | | | |
| | Red-Breasted Nuthatch | Snag, Log | | |
| | White-Breasted Nuthatch | Snag | | |
| | Dusky Shrew | Log | | |
| | Vagrant Shrew | | | |
| | Golden-Mantled Ground Squirrel | Log | | |
| | Red-Naped Sapsucker | Snag | | |
| | Chipping Sparrow | | | |
| | Red-Breasted Sapsucker | Snag | | |
| | Brush Rabbit | | | |
| | Yellow-Pine Chipmunk | | | |
| | Tree Swallow | Snag | | |
| | Douglas' Squirrel | Snag | | |
| | Rough-Skinned Newt | | | |
| | Violet-Green Swallow | Snag | | |
| | Townsend's Chipmunk | Log | | |
| | Winter Wren | Log | | |
| | American Robin | | | |
| | Nashville Warbler | | | |
| | Warbling Vireo | | | |
| | Solitary Vireo | | | |
| | Wilson's Warbler | | | |
| | Pacific Jumping Mouse | Log | | |
| | Mourning Dove | | | |
| TSGOS (Terrestrial, Small Home Range, Generalist, Open & Small Tree) | | | 17,000 | 28,900 |
| | Yellow Warbler | | | |
| | Willow Flycatcher | | | |
| | Northern Oriole | | | |
| | Ash-Throated Flycatcher | Snag | | |
| | Black-Capped Chickadee | Snag | | |
| | Fox Sparrow | | | |
| | Bewick's Wren | Log | | |

| Guild | Species | Snag / Log | Middle Fork Acres | East Fork Acres |
|---|---|---|---|---|
| | House Wren | Log, Snag | | |
| **TSGSL (Terrestrial, Small Home Range, Generalist, Small & Large Tree)** | | | 13,800 | 36,000 |
| | Brown Creeper | Snag | | |
| | Western Red-Backed Vole | Log | | |
| | Hermit Warbler | | | |
| | Townsend's Warbler | | | |
| | Downy Woodpecker | Snag | | |
| | Williamson's Sapsucker | Snag | | |
| **TSMO (Terrestrial, Small Home Range, Mosaic of Open Patches)** | | | 6,700 | 11,200 |
| | Scrub Jay | | | |
| | California Quail | | | |
| | American Goldfinch | | | |
| | Brewer's Blackbird | | | |
| | Northern Shrike | | | |
| | Loggerhead Shrike | | | |
| | Mountain Quail | | | |
| | Common Poorwill | Log | | |
| | Green-Tailed Towhee | | | |
| | Bushtit | | | |
| | Calliope Hummingbird | | | |
| | Western Kingbird | | | |
| **TSMST (Terrestrial, Small Home Range, Mosaic of Small & Large Tree)** | | | 4,700 | 8,900 |
| | Acorn Woodpecker | Snag | | |
| **TSPLT (Terrestrial, Small Home Range, Patches of Large Trees)** | | | 1,600 | 13,300 |
| | Pacific Slope Flycatcher | | | |
| | Cordilleran Flycatcher | | | |
| | Northern Flying Squirrel | Snag | | |
| | Shrew-Mole | Log | | |
| | Trowbridge's Shrew | Log | | |
| **TSPO (Terrestrial, Small Home Range, Patches of Open)** | | | 6,400 | 10,100 |
| | American Pipit | | | |
| | Racer | | | |
| | Dusky Flycatcher | | | |
| | Horned Lark | | | |
| | Yellow-Bellied Marmot | | | |
| | Lincoln's Sparrow | | | |
| | Long-Tailed Vole | Log | | |
| | Townsend's Vole | | | |
| | MacGillivray's Warbler | | | |
| | Savannah Sparrow | | | |
| | Lazuli Bunting | | | |
| | Ring-Necked Pheasant | | | |
| | Heather Vole | Log | | |
| | Gopher Snake | | | |
| | Say's Phoebe | | | |
| | Mountain Bluebird | Snag | | |
| | Western Bluebird | Snag | | |

| Guild | Species | Snag / Log | Middle Fork Acres | East Fork Acres |
|---|---|---|---|---|
| | California Ground Squirrel | | | |
| | Western Meadowlark** | | | |
| | Western Pocket Gopher | | | |
| | Northwestern Garter Snake | | | |
| | Common Garter Snake | Log | | |
| | Northern Pocket Gopher | | | |
| | Orange-Crowned Warbler | | | |
| | Western Jumping Mouse | | | |
| | Golden-Crowned Sparrow | | | |
| | White-Crowned Sparrow | | | |

Enclosed on the following pages (Figures 1-4) are maps showing two of the guilds described in the above section: TMMLT and TLMLT. These are two of the three "large tree" guilds. Species listed in these guilds require late seral/large tree habitat, in medium sized blocks. The blocks may be either inter-connected, or within proximity to one another, such that the individual species can maintain all of their life requirements within their home range.

Within Middle Fork, the TLMLT guild (terrestrial species with large home ranges, requiring a mosaic of late seral/large tree habitat) has no suitable habitat; meaning that the spatial array and the size of the remaining large trees patches is such that they are considered inadequate, through Forest database modeling, to support any species within this guild. The TMMLT (terrestrial species with medium home range sizes, requiring a mosaic of late seral/large tree habitat) guild fares a bit better, but not by much. Only 1,000 acres of suitable habitat exists for species in this guild, within the watershed, due to the spatial array of remaining late seral habitat, and size of those patches.

Results of modeling runs on 1954 data indicate that East Fork was comprised of at least 20-25% of the watershed as suitable habitat for the TMMLT guild, and about 15% suitable for the TLMLT guild. This is in sharp contrast to the current situation (see maps, enclosed).

This issue becomes relevant, when adjacent watersheds are analyzed: late seral/large tree habitat is scarce and patchy around the north side of Mt. Hood. (The same can be said around the south side).

Species dependent upon large logs or snags are in critical shape throughout the watershed also. The above list indicates those species dependent upon logs/snags for nesting (a separate table could be made for those dependent upon logs/snags for foraging or resting). Because of the history of this watershed, there are connectivity concerns for those species dependent upon large trees (listed in the guilds above as TSPLT, TMMLT, and TLMLT), as well as those linked to snags/logs (also listed in the above table). Strategies for the desired future condition of this watershed should take into account species specific habitat needs for those species).

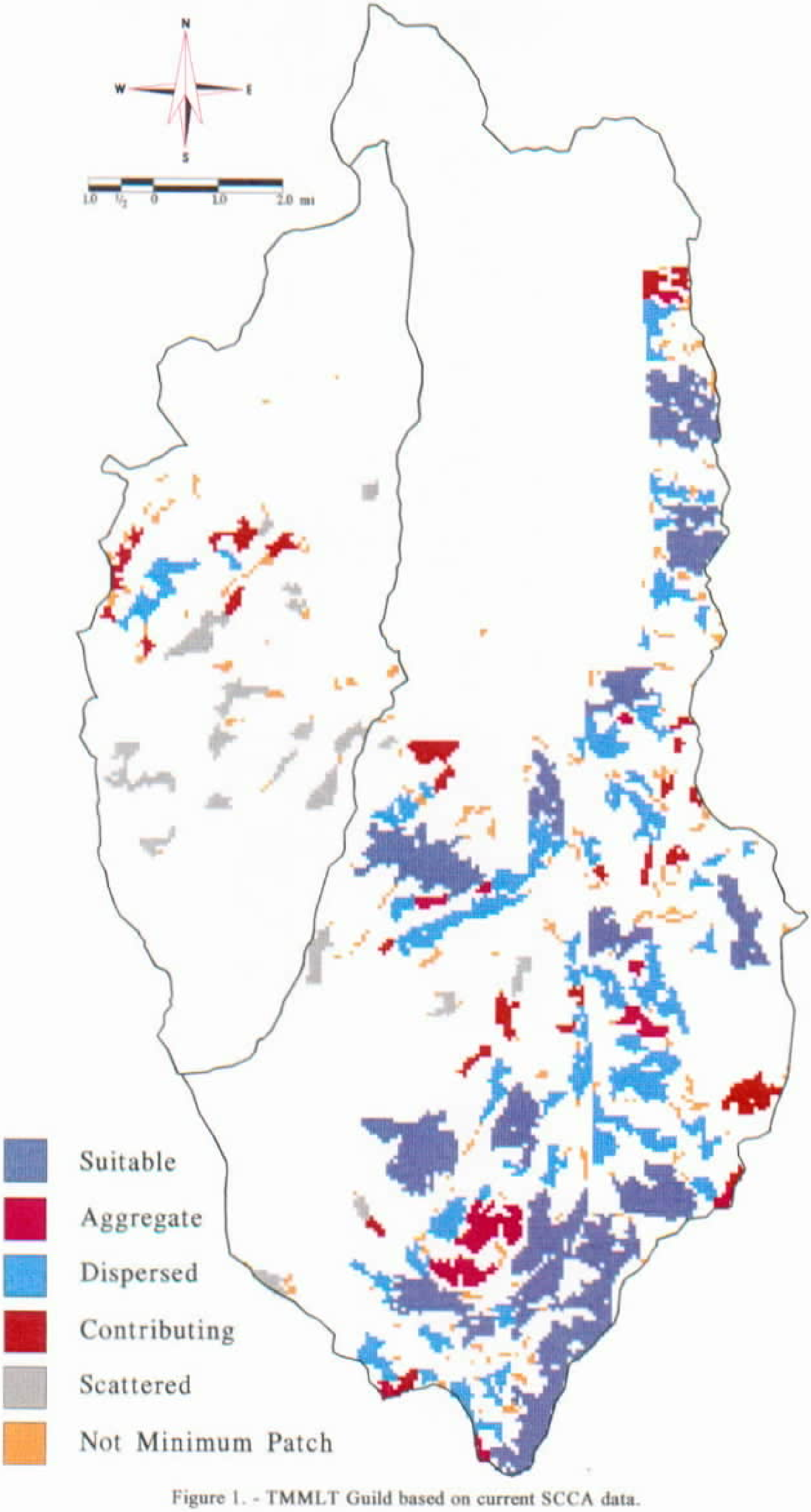


Figure 1. - TMMLT Guild based on current SCCA data.

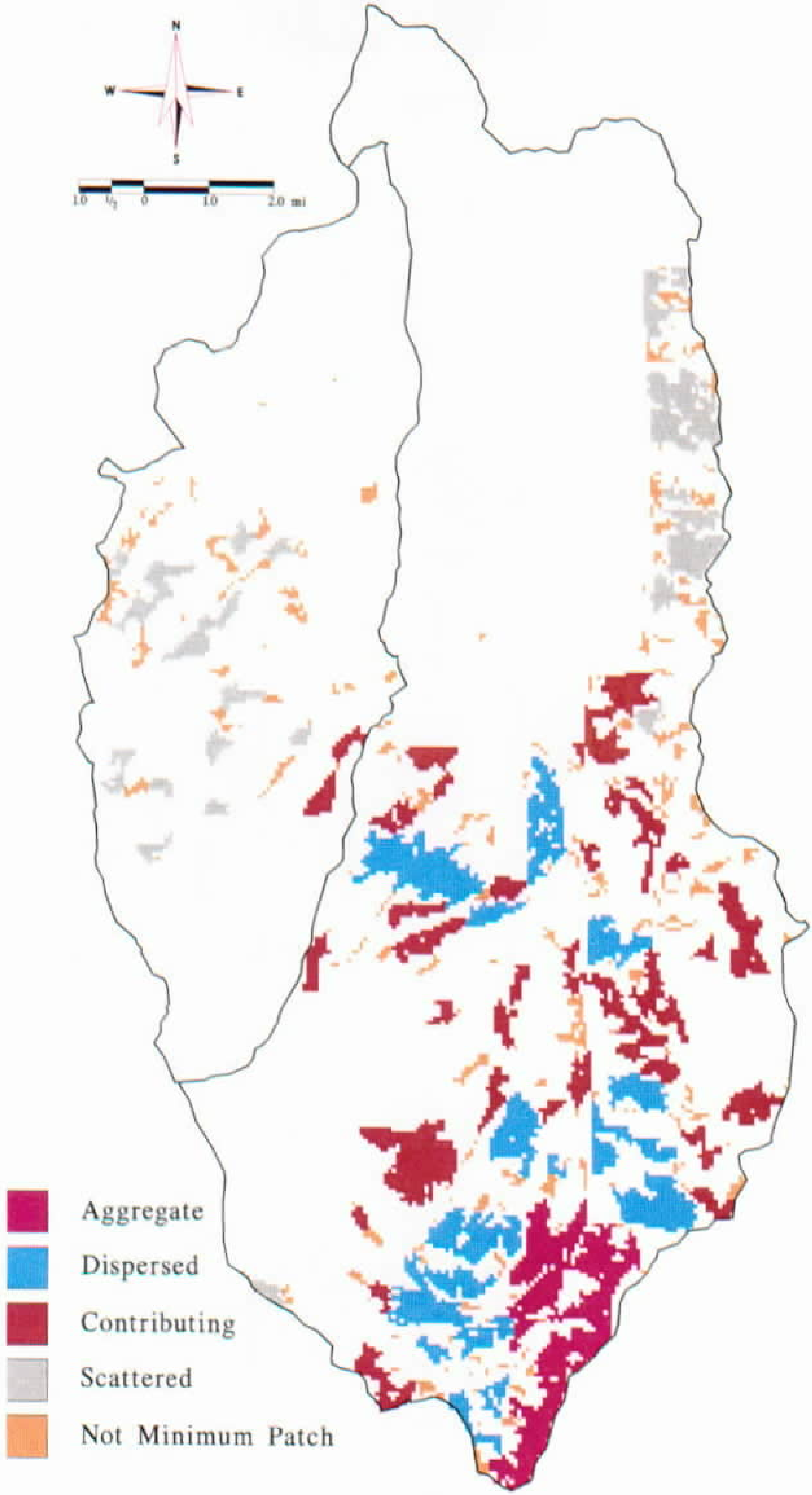


Figure 2. - TLMLT Guild based on current SCCA data.

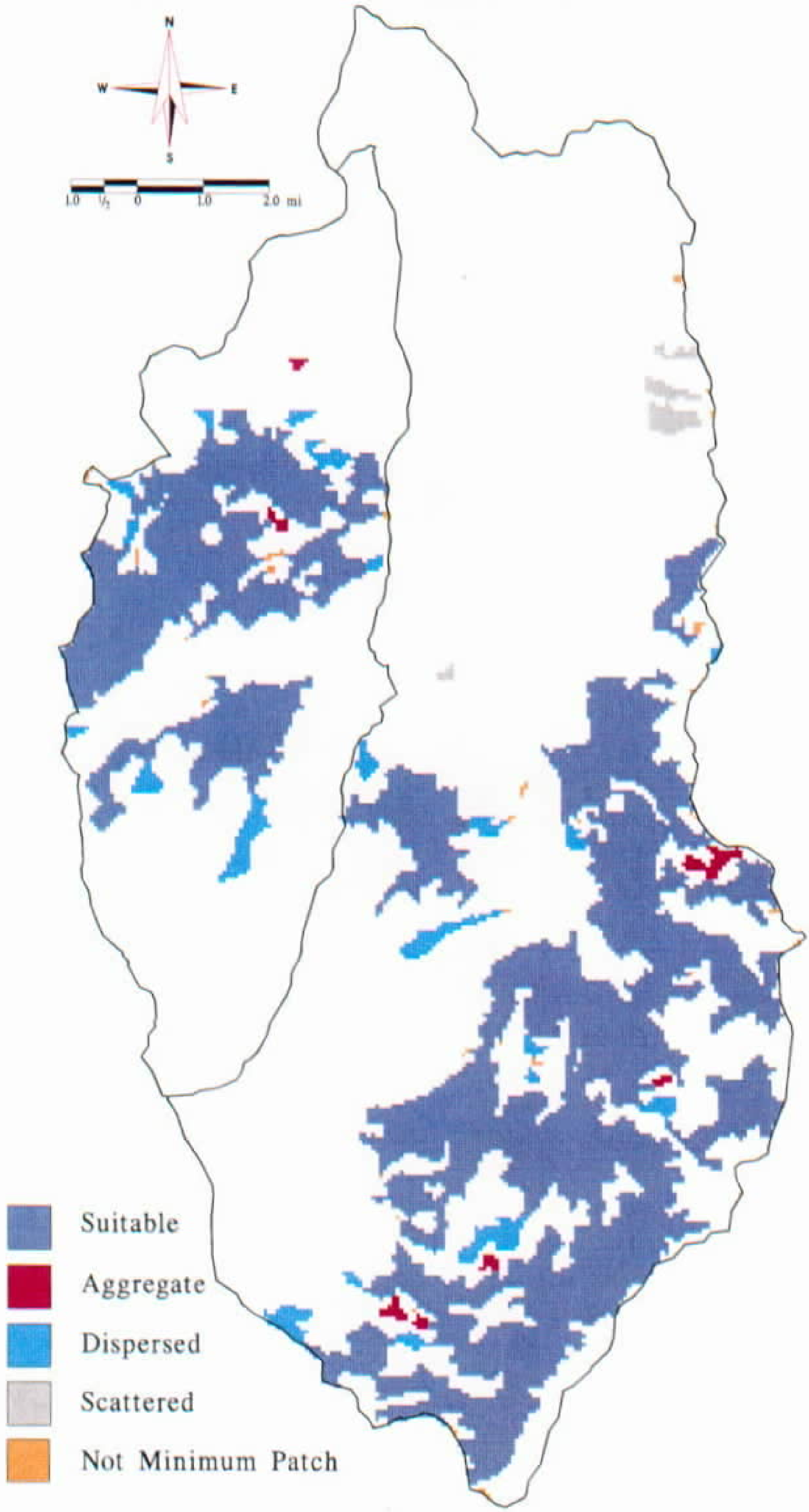


Figure 3. - TMMLT Guild based on modeled SCCA data (projected to 1954.)

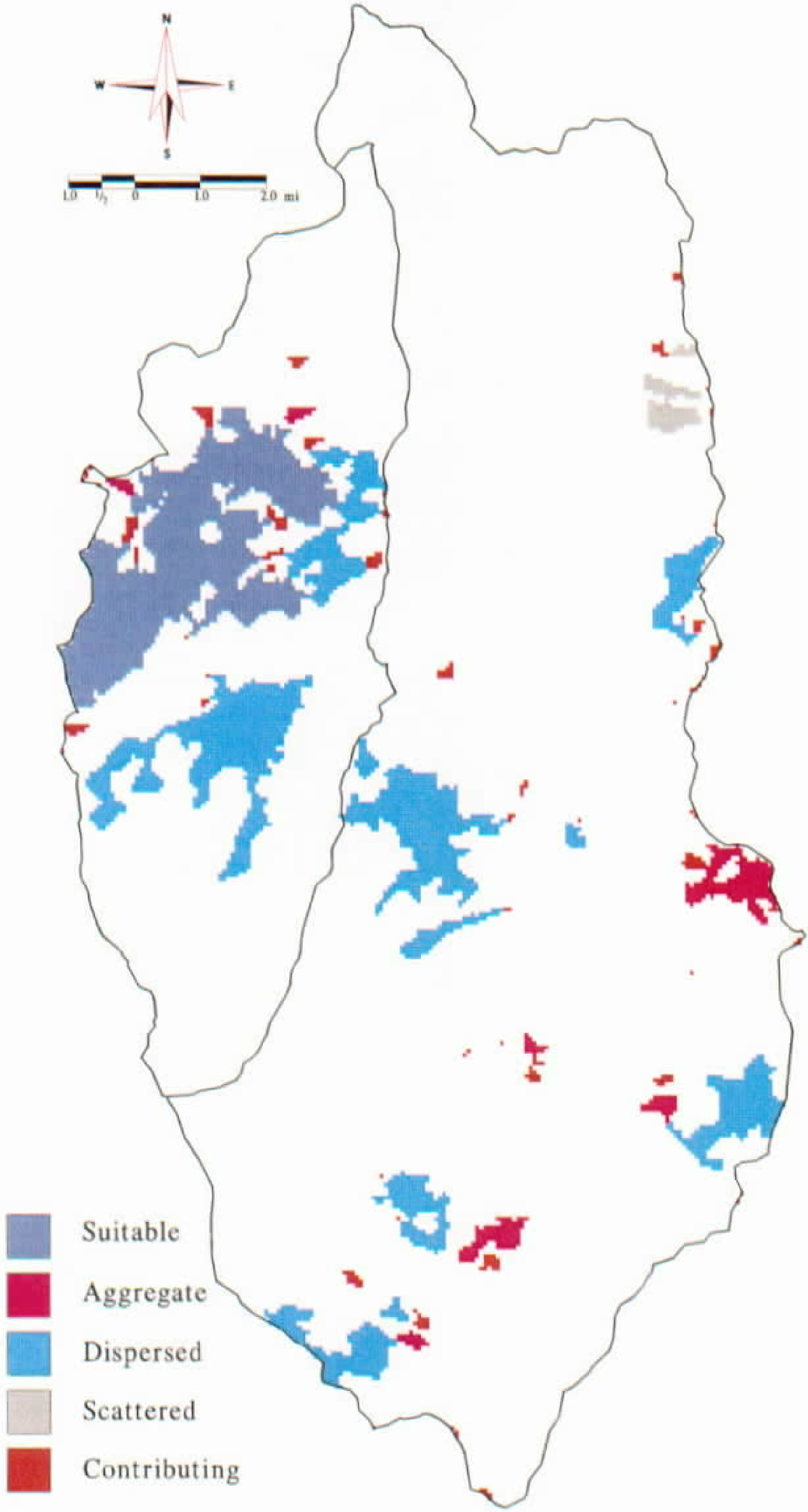


Figure 4. - TLMLT Guild based on modeled SCCA data (projected to 1954.)

## *Restoration opportunities*

Restoration should focus mainly on correcting the "issues of relevance" described above, as well as tackling any opportunities described under the "species" write up above.

Overall, the most needed restoration of the watersheds has to do with the establishment of late seral characteristics/stands in the northern part of Middle Fork and East Fork (FS lands), in a linked manner, so as to provide enough habitat for retention of late seral/large home range species, as well as promote their connectivity around the north side of Mt. Hood. Emphasis areas, including Riparian Reserves much wider than interim widths, have been identified to work within, to promote long term late seral connectivity. Silvicultural and vegetation management which can help promote late seral structure faster than if these stands were left alone must be utilized. Development of these kind of characteristics, within the emphasis areas is imperative and must proceed immediately. This lack of linkage, and lack of late seral species is a serious problem for maintaining late seral species' genetic variability across the larger landscape (from the Crest to Surveyor's Ridge and east). All of the remaining restoration recommendations to follow are far less in importance than this proposal.

Remaining restoration projects/opportunities are listed in order of priority.

1. A cooperative effort to establish a broader land base of late seral lower elevation habitat needs to be pursued. Partnerships with Hood River County and other land ownerships within Middle and East Forks to develop a joint strategy on connectivity and harvest emphasis and potential could go a long way in helping to contribute to the restoration of late seral components and connectivity within and across the watersheds. This strategy may still pursue or advocate levels of timber harvest experienced today, but would focus on how to rotate those harvest areas so as to provide a forested link at lower elevations. Management could emphasize thinnings and other practices designed to help create late seral characteristics while producing wood products.
2. Riparian restoration within the lower portions of the East Fork could be actively pursued. Working with other agencies and interested publics, stream and riparian structure could be developed in some areas, with the overall goal of providing for some riparian and late seral linkage.
3. Riparian enhancement on Forest is also of importance, particularly within the Middle Fork watershed. Development of late seral structural characteristics, including placement of large down logs is needed in many of the creek systems. Older cull decks could be used to place partially decayed logs within the riparian system.
4. Additional road closures within the Middle Fork watershed would help to promote greater wildlife security. Deer and elk are frequently poached in this area. A reduction of roads would not only assist the vigor of these species, but also species which prey or scavenge them. Many of these closures were identified through the LAD process.
5. A healthy ecosystem has all of its components. Therefor the reintroduction of wolf, condor, grizzly bear and mountain goat should be assessed. While there are some social limitations to the success/pursuit of some of these ideas, they all further the concept of restoration.
6. A long term goal of restoration within the watershed should be to see the return of bald eagles. Projects which actively pursue the return of anadromous fish and other prey species to the watershed, in an abundance to support bald eagles, should be initiated. This goal will take long term commitment and planning to be successful.
7. Because many of the older harvest units, particularly within Middle Fork, lack snags and down logs, primary and secondary cavity nesters associated with early seral stands may be low. In turn, as the stands begin to develop into mature stands, a new set of species (cavity nesters associated with late seral stands) will also remain low. Creation of large diameter snags along the edge of some of these older units would benefit some early seral cavity nesters (this would not maximize the benefits-ideally, snags would be created in the middle or dispersed throughout the openings), as well as those species associated with older seral stages, particularly as the harvested area grows up. Down logs should also be placed within these older harvest units, mainly to benefit small mammals, amphibians, fungi and other plants, as well as insects. These benefits will be both in the short and long run, as the stands continue down their path of development.

# *SILVICULTURE REPORT*

## *EAST & MIDDLE FORKS OF THE HOOD RIVER WATERSHED ANALYSIS*

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Reviewed by: Bruce Holmson, Certified Silviculturist
Hood River Ranger District
Mt. Hood National Forest
May 27, 1996

## *Introduction*

This assessment is not prescriptive but is written as an overview of the vegetative character that exists (See Figure 1) and the general silvicultural objectives and systems that should be considered based on management direction and the watershed analysis.

The challenge to the operational Silviculturist in prescribing site specific management actions will be to maintain a landscape view of the long term design for the watersheds. It will be imperative to keep abreast with resource inventories, vegetative structural development, and landscape changes resulting from natural events.

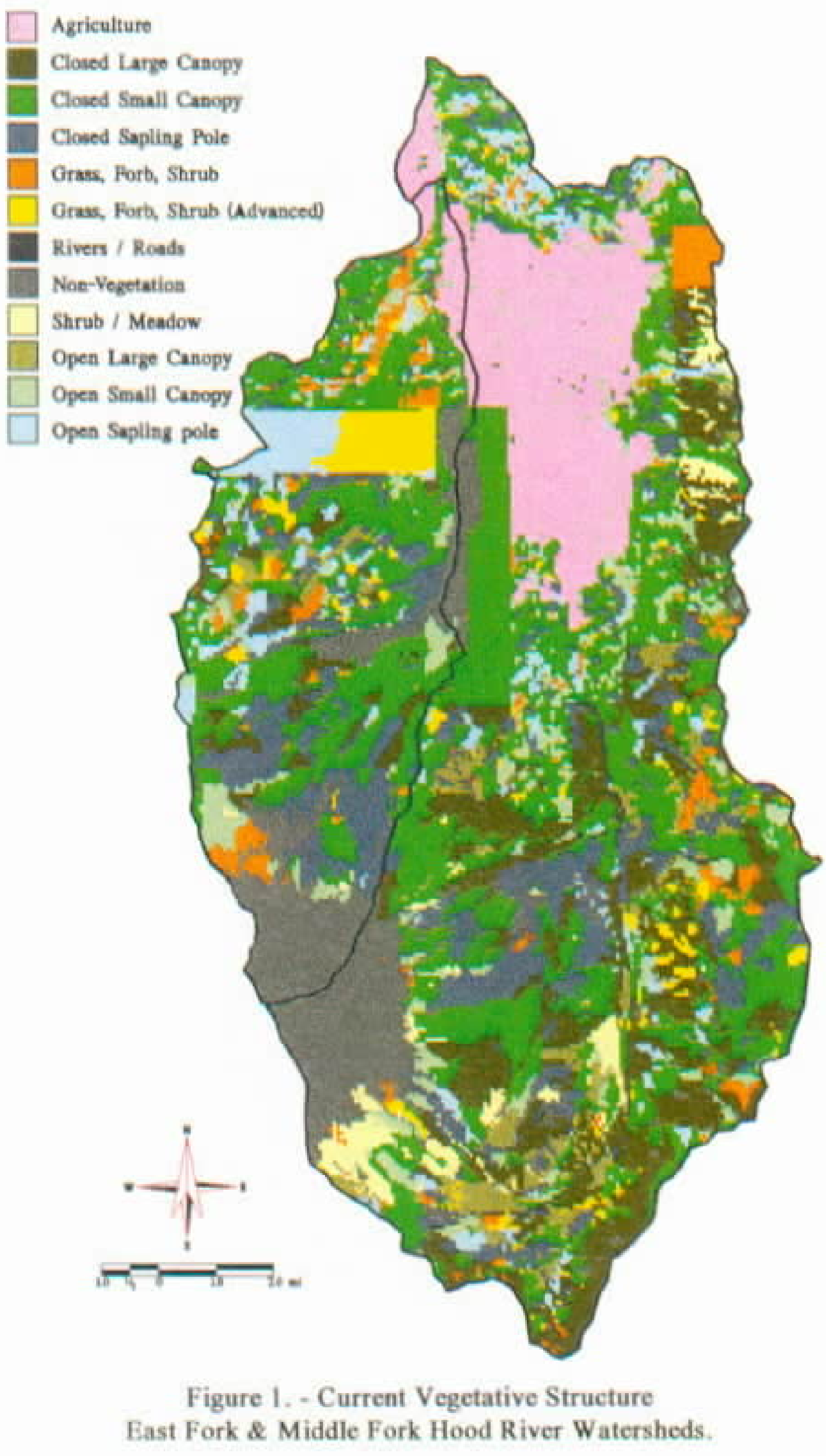


Figure 1. - Current Vegetative Structure
East Fork & Middle Fork Hood River Watersheds.

## *Management Direction*

The foundation for management direction is the Mt. Hood National Forests Land and Resource Management Plan (MHFP) and the Northwest Forest Plan (NWFP).

The MHFP divides the watershed into areas of "programmed harvest" (B and C Allocations) and "non-programmed harvest" (A Allocations), and further portioned into resource management focus. Aside from the Mt. Hood Wilderness, "non-programmed harvest" areas may have vegetation management actions conducted where appropriate. Lands deemed Unsuitable for Timber Harvest by the MHFP were considered through this analysis and found to be reasonable as depicted on the current Land Suitability ARC layer for the watersheds. Probable Sale Quantity (PSQ), projected by the MHFP, was not verified through this analysis process.

The NWFP designations overlay the MHFP land allocations within the watersheds with areas of Congressionally Withdrawn, Administratively Withdrawn, Riparian Reserves, Late-Successional Reserves, and Matrix designations (Note: Capitalized Matrix denotes NWFP designation). Generally, the NWFP designations take precedence over the MHFP allocations but both must be considered to determine management guidelines. A Reconciliation Document was prepared in 1995 by the Mt. Hood planning team to establish a crosswalk between the two planning directions. The reconciliation document offers guidance for determining the allocation hierarchy but the individual plans need to be researched for specific Standards and Guides.

Riparian Reserves were proposed as part of watershed analysis based on the NWFP designation guidelines and expanded where local knowledge suggested the potential need for increased resource protection. The decision to adopt these proposed reserves will need site specific analysis.

In addition to the two forest planning documents, a viewshed management guide was developed in 1991 for the Highway 35 scenic viewshed. This guide offers a comprehensive documentation of vegetative management that will support viewshed management. A particular report in the document, prepared by Nancy Diaz, offers guidance for the best suited vegetative species (trees, shrubs and forbs) for particular zones within the East Fork watershed adjacent to Highway 35.

## *Watershed Analysis - Vegetation Management Objectives*

The watershed analysis team, specialists, and stewards collaborated to develop a desired future condition for the vegetative landscape of the two watersheds. Design cells were delineated that incorporated both Mt. Hood and Northwest forest planning direction with a perceived picture of the future condition of the vegetative landscape.

The general theme of the design cells proposed a future landscape composed primarily of stands with late-seral like structure, spatially connected and temporally shifting, and intermixed with patches composed of a variety of development stages. The management objective for the development of this late-seral mosaic is to support connective habitat for terrestrial species, support aquatic resources, and manage the forest in a diverse healthy condition.

Over the projected interim period (approximately 10 years), this long range theme suggests that silvicultural objectives for the two watershed would focus on development of species diversity, vertical structure and size class differentiation in the vast young stand components (generally less than 21" diameter) that presently make up the basic forest matrix.

### *Design Cells & Interim Period Management Objectives*

Late-seral Terrestrial Corridors - Late-seral like stand structures would be developed from multiple entries beginning at early stand ages. Silvicultural systems that support multi-species management and variable stocking levels would be practiced on most areas. Even aged management would be practiced on a more limited basis where necessary to ensure desired species composition and stand vigor. Riparian reserve corridors are viewed as integral connective habitat in a north/south configuration but are in need of support from the upland areas to maintain continuity east/west across the watersheds. Of particular importance is the lower elevation connective habitat. Very little is available below 3500 feet on national forest lands and much of the late-seral habitat that historically existed there has been removed.

Riparian Reserves - Implement stand maintenance to ensure quality habitat for aquatic and terrestrial species. Creative silviculture and economics will be needed to ensure that these multi-resource objectives are met. Upland harvests can be timed along with riparian treatments to make operating costs more reasonable but timber harvest alone should not be expected to bear the total economic burden. Other resources benefiting from stand treatments should be considered as funding sources for at least partial operation costs. This idea follows with the notion that silvicultural treatments prescribed to manage riparian forests may not always include timber removal. Proposed riparian reserves will need to be validated through site specific project, NEPA processes.

**Viewshed** - Areas will be managed to meet Highway 35 Viewshed Management Guide recommendations. In the interim period, no late-seral stands are anticipated for harvest removal except where needed to address forest health concerns. Along the eastside of the upper East Fork Watershed, maintain late-seral connectivity for terrestrial species between the riparian headwalls and the upper ridge and north-south along this slope between the White River and Surveyors Ridge LSRs. Silvicultural objectives in these upland areas should focus primarily on young stand development and maintenance. Two bottom land design cells (located within the large riparian reserve area of the upper East Fork) will be managed as viewshed but with particular emphasis on maintaining an adequate large tree component that acts as a buffer against glacial stream debris flows in these areas.

**Special Emphasis Watershed** - The upper drainage of the Clear Branch is the only portion of these watersheds identified as this design cell. No vegetative management action is foreseen in this area over the interim period.

**Timber Emphasis/Matrix** - Generally in the long run, even-aged management is foreseen as the predominant silvicultural system for these areas. Within the interim period, no harvest of late-seral stands is foreseen except where forest health concerns exist. Stand management should focus on development of young forests to improve structural character in support of future management. The long term plan for management of these areas should blend well with adjacent design cell management. The File Butte design cell was established with a special management focus on developing a terrestrial species connective habitat corridor between Bear Creek and Tony Creek drainages. Young stand management in the interim throughout the File Butte corridor should support late-seral like structural development.

### *Late-Successional Picture*

The landscape vegetation of the two watersheds can best be described in an ecological frame as a matrix of small tree forests (1" to 21" diameter) interspersed with clumped patches of young forest openings (seedlings/saplings), large tree forests (> 21" diameter), meadow complexes, and rocky areas (See Figure 2).

In the conceptual future, a late-successional like forest is perceived to be a biological link throughout the watersheds. Considering the young forest matrix that presently exists, a scheme of variability in stand structure, composition, and stocking levels will need to be implemented through combinations of even and uneven aged management.

A picture of these late-successional like forests could be viewed in several ways depending on climate, elevation, soil type, and plant association type. Models can be located within the watershed that would offer a picture of the end product of management for late-successional forests. Field identification and verification will need to be conducted to establish these example areas for each Design Cell type. These areas should be documented as base line blueprints for monitoring management implementation outcomes. With structure as the focus, generally, a view could include a large tree component (16" dia. to 21"+) occupying at least 20% of the canopy cover with at least one and maybe two other understory canopy layers clumped or spaced to accumulate an additional 40 to 60% cover. Species composition in all stand layers can vary due to the abiotic and biotic differences that occur across the watersheds.

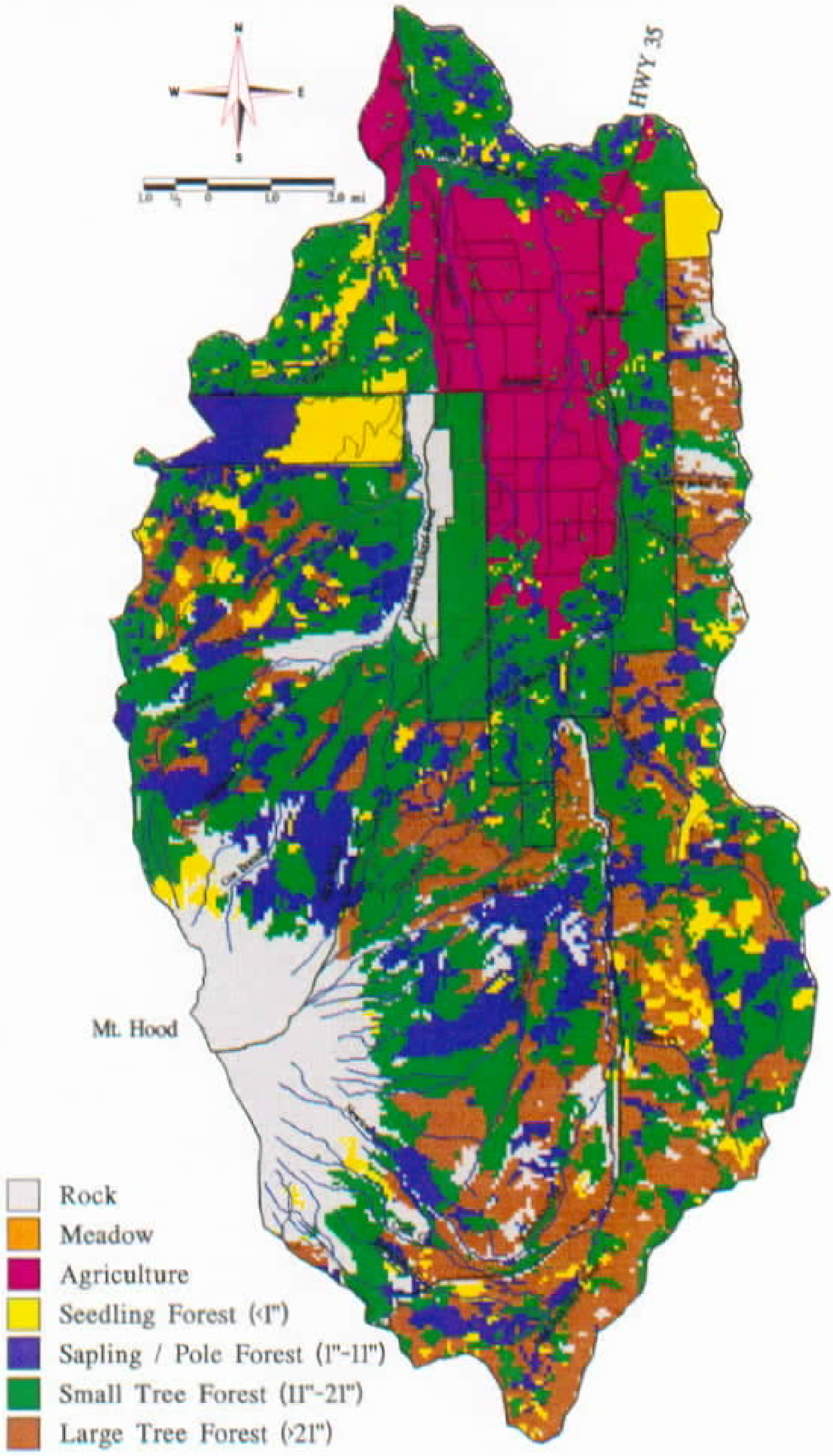


Figure 2. - Current Vegetative Seral Stages
East Fork & Middle Fork Hood River Watersheds.

## *Stand Level Management*

### *Abiotic Environment*

Through the watershed analysis process, reports and spatially descriptive maps were developed to support a landscape scale understanding of the geology, soils, hydrology and climate of the two watersheds. It should be realized that these analyses are an overview. Site specific project planning will need a more definitive scrutiny from each discipline.

### *Biotic Environment*

The forested biota of the two watersheds spans elevations of approximately 6000 feet at timberline on the flanks of Mt. Hood to the valley floor near Dee at approximately 700 feet. As a result of these elevation differences and the transitional zone (east/west) location of the watersheds, 13 different conifer species and at least 3 commercial hardwood species exist as natural stand components.

Size classes and stocking levels vary widely. Differences have been generated by the influence of climate and site quality coupled with natural and management related disturbances. Human generated fire has influenced a large portion of the lower slopes stand development. Large stand replacement fires occurred before the turn of the century. Agricultural development has had a profound effect on the quantity of low elevation late-seral forest that once occupied the watersheds.

### *Silvicultural Systems*

Even and uneven aged management will be utilized to develop the desired future conditions described by forest planning direction and specific resource needs.

Due to the transitional sites found in these watersheds, most uneven-aged treatments will require variations from the standard approach. Careful consideration of the silvics for desired species within the plant association they are growing will need to be incorporated in prescribed silvicultural systems. "A Regional Guide to Uneven-aged Management", developed by the eastside forests in 1992, offers a variety of options and cautions for consideration. Papers within the document discuss topics such as stocking standards, individual and group selection, the stand aggregation approach, effects on species composition, tree selection, and timber sale contract suggestions.

Even-aged management will still be used within the watersheds but to a lessor degree than conducted in recent years. There will be stand types that require Silvicultural systems such as shelterwood, commercial thinning, or clearcutting to manage for insect/disease activity and/or desired species composition.

### *Management Applications*

#### *Introduction*

Rather than describe prescriptions for specific areas, in this section it seems more logical to offer suggestions of the types of stand character that were perceived by the landscape design and how silvicultural systems may be applied to support that development.

As described in earlier sections, it is imperative that silvicultural planning, implementation, and most importantly monitoring of management actions be conducted at the delineated stand level. The puzzle cannot be formed unless we are playing with an understanding of all the pieces. Additionally, silvicultural planning for all stands within an individual interim design area (IDA) should be sorted out prior to any implementation to build a context of treatment flow across the landscape.

Over the interim period (10 years), stand management will be concentrated on the sapling/pole (4.5 ft. tall to 11" dia.) and the small tree stands (11" dia. to 21" dia.). Although not actually known, it is perceived that a large portion of these stands are fairly uniform in structure. That is to say, they have developed as single-cohort stands with minimal differentiation of crown levels and diameter classes. The remaining areas can be categorized as multi-cohort stands with overstocked understories and potential forest health concerns. Both even and uneven aged silvicultural systems will be utilized to manage these stands.

#### *Uneven-Aged Management*

Within the single-cohort stands, an aggregated disturbance management action is a possibility. Group selection and low thinning of suppressed/intermediate trees will allow light to the forest floor and stimulate regeneration of an understory. Special care should be taken to select the preferred species and most vigorous growers of the stand as leave trees. The larger of these trees will generate the upper stratum of the structurally developed forest and will also be the seed trees for the understory. The development of an intermediate canopy layer may or may not be possible with these first entries. Where the opportunity exist, again maintain the most vigorous trees. Planting may be necessary to support desired species composition in the understory.

Multi-cohort stands should be approached differently. Late-seral structural elements are potentially already established in these stands. The stand aggregation approach (See "A Guide for Uneven Aged Management", 1992) suggests that individual stand stratum would be managed separately based on differences between desired outcome and existing conditions.

This approach may offer an easy way to inventory and prescribe for treatment of these stands. With any treatment process considered, care must be taken to support appropriate species development. First hand knowledge of local species silvics is imperative to the long-term success of these treatments. If the stand is very young, lower canopies can be managed by utilizing existing tolerant species but development of fast growing desirable intolerants is suggested early on. Where overstory gaps are created and an established understory, utilize pre-commercial thinning to create wide openings to establish or support development of existing intolerants. Maintenance of the gaps in these stands will be as important as the overstory management.

With either of these uneven aged silvicultural systems, careful use of management by the numbers is strongly suggested. Utilizing reverse J curve and q-ratios models for stem and diameter distributions can be misleading and should only be used as guides at best. Some of these stands are marginally suited for uneven aged management. In "Forest Stand Dynamics" Oliver and Larson reference Davis, 1966 as stating a "good diameter distribution is determined by the biology of the forest and the purposes of management and not by mathematics."

### *Even-Aged Management*

Within these east/west transitional watersheds, it is essential to consider even-aged silvicultural systems as a management option. Stands with insect, disease or potential forest health concerns may not fit well within uneven-aged management systems. Additionally, timber producing lands (C-1/Matrix) may be better served in the long run with even-aged systems. The reduced late-seral stand component that presently exists within these areas is causing a shift in management focus to commercial/pre-commercial thinning treatments at least in the interim period. Generally, the long range management projection for these areas could utilize even-aged systems. Special consideration must be given to stand connectivity between other design cells when scheduling rotational harvest areas.

### *Monitoring*

Monitoring the outcome of silvicultural system implementation must be planned for at the time prescriptive activities are developed. A design for monitor sampling should be, where possible, incorporated as part of the treatment. Sample areas should be installed as part of the presale activities. Follow-up sampling and analysis of findings are tools necessary for adaptive long term landscape management. Future stand management entries in support of the landscape design should utilize previous treatment monitoring results as a purpose and need for further action. A system should be developed that would identify sample areas within the automated data base to ensure tracking.

## *Vegetation - Knowledge & Tracking*

### *Background*

A sound understanding of the existing vegetation patterns, based on site specific data collection, is not presently known. However, generalized vegetation information is available from several sources. Stand exams have been conducted in some areas over the past 10 years but not on a comprehensive basis. Broad scale aerial photo interpretation (MOMS contract, 1984 image) is available for national forest lands and satellite imagery spectral interpretation (ISAT contract, 1988 image) is available for the entire watersheds area. Additionally, a TRI harvest activity layer has been maintained for the district in MOSS (recently converted to ARC) recording harvest areas and harvest type from 1947 thru 1995.

### *Current Vegetation Layer*

**Objective** - To establish a baseline data base that reasonably depicts the existing vegetative landscape, can be updated in the near future with site specific information, and would meet the needs for this iteration of watershed analysis.

**What Data Exists** - The SCCA database (a PARADOX table) was acquired from the Mt. Hood Supervisors office planning department and clipped to the East Fork and Middle Fork watershed boundaries. In a nutshell, the data base includes 30 meter pixel UTM coordinate data records with data fields for 6th field watersheds, MOMS stand information, several SCCA interpretations of MOMS, and Mt. Hood Forest Plan allocation information. The data base was enhance by the addition of ISAT stand information, current stand typing polygons (delineated primarily by Cheryl Sonnabend for stand examinations), and Special Habitats (rock, talus, meadows, wetlands) type calls by Kevin Francis. The data base resides on the watershed analysis Gateway PC as C:\GIS\NEWDATA\WA96MST.db and should be updated annually as information is gathered.

Developed Current Vegetation Layer - Utilizing the database described above, two new fields were generated (labeled ALLSTRUC and ALLSERAL) to incorporate the best information into an entire coverage of the watersheds.

1. ALLSTRUC, structural categories generated from size class and crown cover delineations, is constructed from:
   - ISAT information for off forest lands,
   - MOMs (SCCA) information for national forest lands vegetated areas,
   - Special Habitats type calls for the Current stand type polygon,
   - Other nonvegetated lands as a combination of ISAT and SCCA, and
   - TRI harvest areas categorized by year and type of activity.
2. ALLSERAL, seral stage based on size class only, is constructed from combinations of the ALLSTRUC field.

Verification - Minimal field verification was done for the developed current vegetation layer. However, an office review of mapped coverages at 1:24000 scale was conducted by district resource personnel and found to be a reasonable approximation of the current vegetation.

## *Vegetation Layer Management*

**Objective** - To maintain the most accurate stand level information available in an automated database system enabling GIS spatial analysis in support of planning, implementation, and most importantly monitoring of management actions directing long term stand development.

**Database management must be updated annually to ensure validity.** The current vegetation layer described above is at best a good depiction of the vegetative structure that exists on the landscape today. The interpretations utilized were founded on older photography and typing specifications that covered a very large scale resolution. As completed, site specific stand examination information should be injected into the database. Individual stand structural components would be edited for data records and then database generated fields could be updated accordingly.

**Reformat the existing database to accurately represent stand level delineations.** Because of the differing data bases that were joined to create this layer it was necessary to transform some of the data into pixel (raster) format. This is not the best way to maintain the database. Better clarity of spatial analysis, consistency of data manipulation, and efficiency of computer analysis space can all be improved by moving the database into a polygon (vector) format. Conversion of the database is possible, at least on forest, by utilizing the so called VEGIS polygons (Current Stand Typing) presently linked as a data field. Due to database initiation problems the VEGIS system, planned as the corporate vegetation database, will not be on line soon if at all. Conversion of the existing WA96MST database back to polygon format would require a considerable amount of editing to ensure polygon to associated data integrity but, as a result, the long run maintenance, management and outputs should require only minimal annual attention.

**Current stand typing delineations should be utilized as the basic prescription unit.** In 1995, stand typing was conducted using 1989, 1:12,000 aerial photos for the East Fork watershed and transferred to ortho-quads. For the Middle Fork watershed, the stand types delineated as part of the MOMs contract were used. Areas within the wilderness were bulked together as a combination of TRI and MOMS calls. All stand typed areas were edge matched and input into GIS with unique identification numbers. Verification and editing of stand boundaries could occur through the stand examination process, field visits, and site specific silvicultural prescription development. ***Stand boundary changes should not be proposed randomly but only with full commitment to update the associated spatial and tabular data bases.*** This statement is key to the monitoring of future stand development.

## *References*

Forman, R.T.T. & M. Godron, 1986. Landscape Ecology. John Wiley & Sons, Inc., 1986.

Oliver C.D. & B.C. :Larson. 1990. Forest Stand Dynamics. McGraw-Hill Inc., 1990

USDA Forest Service, Pacific Northwest Region, 1992. Uneven-aged Management Desk Guide.

USDA Forest Service, 1991. State Highway 35 Viewshed Management Guide. MT. Hood N.F., Hood River District

U. of W., College of Forest Resources, 1987. Streamside Management, Forest and Fisheries Interactions. Institute of Forest Resources, 1987.

# *SURVEY & MANAGE PLANT REPORT*

## *EAST & MIDDLE FORKS OF THE HOOD RIVER WATERSHED ANALYSIS*

Prepared by: Susan Nugent, District Botanist
Hood River Ranger District
Mt. Hood National Forest
June 10, 1996

**This report is in response to request for information regarding Survey and Manage plant species in the East Fork and Middle Fork of the Hood River Watershed. A summary is provided on page 2.**

## *BACKGROUND INFORMATION, DEFINITIONS, STANDARDS AND GUIDELINES*

The 1994 Record of Decision (ROD)/Standards and Guidelines for Management of Habitat...Within the Range of the Northern Spotted Owl identifies 354 plant species (see ROD Table C3 pp C-49 through C-61) to be protected through survey and management standards and guidelines. The measures apply to all land allocations (ROD C-4, paragraph 4).

The term "Survey and Manage" refers to species that are listed in the FSEIS Appendix J2, and ROD Table C3, vascular and non-vascular plant species. Survey and Manage species include rare, locally endemic, and "at risk" plants that are associated with late-successional and old-Growth forests within the range of the Northern Spotted Owl.

Standards and guidelines on pages C-4 and C-5 of the ROD describe four components (or "Survey Strategy") to be applied to species identified in Table C3, and the implementation schedule for each component. The first and highest priority is "Manage Known Sites" (Survey Strategy 1). Survey strategies 2 and 3 also include direction to "Manage Sites". Activities that are scheduled for implementation in 1995 and later must include management provisions for known sites (ROD C-4, paragraph 5).

The ROD directs field surveys to be conducted in all projects proposed for implementation in 1999 and later (pg. C-5). If any Survey and Manage species are found incidentally within the planning area prior to 1996, they will be protected according to REO management provisions.

## *SUMMARY*

### *Species Suspected to Occur in Both EFWS and MFWS*

The attached table at the end of this report lists Survey and Manage fungi, lichens, mosses, and liverworts (non-vascular plants), and vascular plants that are suspected to occur in the East Fork and Middle Fork watersheds of the Hood River. The list also includes a brief description of habitat and range/distribution of each species; more detailed information for each species can be found in FEIS Appendix J2 pages 83-292.

### *Documented Sites*

There are 12 documented sites of Survey and Manage non-vascular plant species in the EFWS (11 fungi and 1 lichen species). Of these 11 fungi species 6 are documented in a late-successional forest at the edge of Horsethief Meadows, and 5 are documented from Cloud Cap and Tilly Jane (1 of these species also occurs in the Clark Creek drainage and edge of the Hood River Meadows). One Survey and Manage lichen species is known to occur along the stream near Tamanawas Falls Trail.

There are no known sites of Survey and Manage mosses, liverworts, or vascular plant species in the EFWS. There are no known sites of Survey and Manage plants (vascular or non-vascular) in the Middle Fork of the Hood River watershed (MFWS).

### *Mitigation Measures - Management Opportunities*

Mitigation measures (from Appendix J2) and a brief description of habitat are given for each species in survey strategy component 1, 2, or 3 (Manage Known Sites). Please see page L-4 for recommended mitigation measures to identify a Mycological Special Interest Area to "...protect type locality" for fungi Gastroboletus subalpinus at Cloud Cap. Also see page L-5 for recommendations regarding a rare site for lichen species Leptogium rivale.

### *Field Surveys and Undocumented Sites*

The following Survey and Manage species have been reported by field personnel over the years and need to be relocated, verified, and formally documented:

| Species | Common Name | General Location |
|---|---|---|
| **Fungi:** | | |
| **Cantharellus cibarius,** | Yellow chanterelle | EF/MF Watershed |
| **Cantharellus subalbidus,** | White chanterelle | EF/MF Watershed |
| **Gomphus floccosus,** | Scaly chanterelle | Clear Branch Dam |
| **Hydnum repandum (Dentinum repandum),** | Hedgehog | Horsethief Mdws |
| **Sparassis crispa,** | Cauliflower mushroom | EF/MF Watershed |
| **Vascular Plants:** | | |
| **Allatropa virgata,** | Candycane plant | EF/MF Watershed |

## *INSUFFICIENT INFORMATION*

Several knowledgeable specialists in the scientific community were consulted during research for this document (see References). Without exception these individuals stressed that the information currently available on habitat types, distribution range, geographic extent, and ecology of fungi, lichens, and bryophytes (mosses and liverworts), is not at all conclusive. There is a paucity of information available for these groups, due in part to the lack of actual field surveys and expertise. Therefore the data in this report should only be used as a preliminary analysis of base information to be expanded upon prior to actual field verification surveys.

Only 8 of 24 Survey and Manage mosses and liverworts (bryophytes) are described in FSEIS Appendix J2. I found only two texts that discuss a few of the remaining 16 species, and there are fewer local bryophyte experts to consult. This represents a significant information gap regarding late-successional and old-growth related bryophytes. Based on limited information there is potential habitat in the EFWS and MFWS for at least 16 Survey and Manage bryophytes.

The information in this document should not be used exclusively to determine whether or not a species has potential to occur in the East Fork and Middle Fork of the Hood River Watershed, or on the Mt. Hood National Forest.

/s/ J. Susan Nugent
District Botanist

## *SURVEY AND MANAGE SPECIES DOCUMENTED IN THE EAST FORK (EFWS) AND MIDDLE FORK (MFWS) OF THE HOOD RIVER WATERSHED*

| | Survey Strategy | Location |
|---|---|---|
| **Fungi** | | |
| Middle Fork: No known sites | | |
| East Fork: | | |
| Albatrellus ellisii | 3 | Horsethief Mdw Edge |
| Clavariadelphus ligula | 3,4 | Horsethief Mdw Edge |
| Clavariadelphus truncatus | 3,4 | Horsethief Mdw Edge |
| Gastroboletus rubra | 1,3 | Cloud Cap & T. Jane |
| Gastroboletus subalpinus * | 1,3 | Cloud Cap |
| Gastroboletus turbinatus | 3 | Tilly Jane |
| Helvella maculata | 1,3 | Horsethief Mdw Edge |
| Rhizopogon evadens v. subalpinus | 1,3 | Cloud Cap & T. Jane |
| Thaxterogaster pinque | 3 | Cloud Cap, T. Jane, Clark Cr., HR Mdw |
| Sarcodon imbricatus | 3 | Horsethief Mdw Edge |
| Sarcodon fuscoindicum | 3 | Horsethief Mdw Edge |
| *See page 6 for Appendix J2 recommended mitigation - Mycological Special Interest Area | | |
| **Lichens** | | |
| Middle Fork: No known sites | | |
| East Fork: | | |
| Leptogium rivale | 1 | Clear Cr. from Tamanawas Falls Tr. |
| **Mosses and Liverworts (Bryophytes)** | | |
| Middle Fork: No Known sites | | |
| East Fork: No known sites | | |

## *FSEIS APPENDIX J2 MITIGATION MEASURES FOR KNOWN SITES*

Habitat requirements, impacts, mitigation measures, and other information are discussed in greater detail in Appendix J2, (see pages identified below under "Potential Impacts and Mitigation Measures"). The range and geographic extent of the following species is included briefly in the attached table of Survey and Manage species suspected to occur in the EFWS and MFWS.

### *Fungi*

1. Uncommon ecto-polypore Albatrellus ellisii has been found in the EFWS near Horsethief Meadows. At this site it grows in thick organic duff under a forest dominated by mature Western red-cedar, vine maple, and scattered cottonwood.

Potential Impacts and Mitigation Measures: A. ellisii is within a riparian reserve buffer that surrounds Horsethief Meadows. The riparian reserve should provide adequate protection for this species although the forested habitat is also within harvest areas of the matrix. Appendix J2-174, "...[for] localized populations, provide buffer zones which will maintain habitat and microclimate."

2. Club coral fungi Clavariadelphus ligula and Clavariadelphus truncatus have also been found in the EFWS near Horsethief Meadows. Both species grow at this site in well developed humus under a forest dominated by mature Western red-cedar, vine maple, and scattered cottonwood. Both species are typically associated with late-successional mixed conifer.

**Potential Impacts and Mitigation Measures:** Both species are within a riparian reserve buffer that surrounds Horsethief Meadows. The riparian reserve should provide adequate protection for this species although the forested habitat is also within harvest areas of the matrix. Appendix J2-215, "Treatment of leave trees and areas in matrix is most critical. Scattered leave trees will not create adequate litter layer for these species." "Retain or create suitable habitat [late successional forest with well-developed litter layer]."

3. Rare bolete Gastroboletus rubra is documented on Mt. Hood at 5400' near Cloud Cap and at 5200' near Tilly Jane. It is a rare endemic known only in the North Cascades of Washington, south to Willamette Pass. This species is closely associated with old-growth hemlock as an ectomycorrhizal fungi that requires well-developed humus layers.

**Potential Impacts and Mitigation Measures:** G. rubra is host-specific to mountain hemlock which is important in maintaining the survival of this species. Many known sites are protected by wilderness areas and national parks although some are in heavily used recreational areas (Appendix J2-109).

Appendix J2-110, "Survey suitable habitat to find additional populations."

"Develop management guidelines to protect populations form adverse impacts."

"Establish buffers around known locations...". "Monitor for recreation impacts." NOTE: Survey protocols and management guidelines are currently being developed by the REO for this species.

4. Bolete Gastroboletus subalpinus is documented at Cloud Cap on Mt. Hood at 5400'. This site is the northernmost end of the recorded range of G. subalpinus. The habitat at Cloud Cap is a mix of high-elevation conifers including a large percentage of whitebark pine. G. subalpinus is endemic to the Oregon Cascades and northern Sierras of California.

**Potential Impacts and Mitigation Measures:** Appendix J2-102, "Species may be impacted by recreational use, camping, trampling and soil compaction (most known localities are in campgrounds)." "Survey to delineate boundaries around known populations, establish buffer around known locations to provide for adequate protection of population. Establish a Mycological Special Interest Area to protect type locality [Cloud Cap]. Survey suitable habitat to find additional populations. Monitor populations for recreation impacts. Develop management guidelines to protect populations." Refer to Mt. Hood National Forest Standards and Guidelines, Four-152-155 for Special Interest Area management implications. NOTE: Survey protocols and management guidelines are currently being developed by the REO for this species.

5. Bolete Gastroboletus turbinatus is documented on Mt. Hood at 5200' near Tilly Jane where it grows in old-growth forested stands of high-elevation mixed conifer including mountain and western hemlock. It is also associated with Engelmann spruce. G. turbinatus requires thick humus development and an abundance of coarse, large woody debris.

**Potential Adverse Impacts:** Impacts may be caused by heavy recreational use, trampling and soil compaction. Appendix J2-104, "Continued preservation of suitable habitats will eliminate risk of extirpation".

6. Rare Cup Fungi Helvella maculata has been found in the EFWS in a riparian area at the edge of Horsethief Meadows. At this site it grows in thick organic duff under a forest dominated by mature Western red-cedar, vine maple, and scattered cottonwood.

**Potential Impacts and Mitigation Measures:** H. maculata is within a riparian reserve buffer that surrounds Horsethief Meadows. The riparian reserve should provide adequate protection for this species although the forested habitat is also within harvest areas of the matrix. Appendix J2-201, "Protect known sites by establishing adequate buffer around population to maintain appropriate habitat and microclimate."

7. Rare False Truffle Rhizopogon evadens var. subalpinus is documented in the EFWS at 5400' near Cloud Cap and 5200' near Tilly Jane where it is found in a mix of high-elevation conifers. This species typically occurs in upper mid-elevations to timberline and is an ectomycorrhizal fungus of mountain hemlock, true firs, and possibly other Pinaceae.

**Potential Adverse Impacts:** Appendix J2-134, "Protection of high-elevation old-growth mountain hemlock and true firs should adequately minimize the risk of extirpation of these species." "...establish buffer around known locations to provide for adequate protection of population."

8. Tooth Fungi Sarcodon fuscoindicum and Sarcodon imbricatus have been found in the EFWS near Horsethief Meadows. Both species grow at this site in well developed humus under a forest dominated by mature Western red-cedar, vine maple, and scattered cottonwood, and are mycorrhizal with conifers and hardwoods.

**Potential Impacts and Mitigation Measures:** Both species are within a riparian reserve buffer that surrounds Horsethief Meadows. The riparian reserve should provide adequate protection for this species although the forested habitat is also within harvest areas of the matrix. Appendix J2-176, "Determine distribution of populations relative to late-successional reserves and matrix allocation. Within harvest areas of the matrix, aggregate leave trees, maintain amounts of coarse woody debris that are representative of the natural stand conditions, minimize site disturbance."

9. False truffle Thaxterogaster pinque is documented in the EFWS at 5400' near Cloud Cap, 5200' near Tilly Jane, near 5000' in Clark Creek drainage, and near 4400' at Hood River Meadows. It is ectomycorrhizal with true firs only at mid- to high elevations, and requires thick humus development and an abundance of coarse, large woody debris.

**Potential Adverse Impacts:** In recreation areas this species is potentially subject to trampling soil compaction. Appendix J2-104, "Continued preservation of suitable habitats will eliminate risk of extirpation".

## *Lichens*

1. Aquatic Lichen Leptogium rivale occurs in the EFWS along Cold Springs Creek near Tamanawas Falls above 4000', where it grows on rocks in the stream. This site is currently the only known site of this species on the Mt. Hood National Forest. L. rivale typically grows at lower elevations where has been documented at 2 sites at H.J. Andrews, 1 site on the Gifford Pinchot N.F., and 1 site in Montana. This species is also typically found in higher order streams that experience greater stream flow fluctuations and flooding. It also provides habitat for aquatic invertebrate populations and are valuable indicators of water quality.

**Potential Adverse Impacts:** Heavy sediment, poor water quality caused by any type of pollutant, and loss of old-growth forested riparian micro-climate negatively impact this species. Northwest Forest Plan Appendix J2-243 states "This species should be inventoried for when conducting watershed analysis and known sites should be protected and buffered as needed. The percentage of the watershed that is harvested should be evaluated due to the sensitivity of these species to siltation. No herbicide should be used after timber harvesting, with limited piling and slash burning."

# *SURVEY AND MANAGE SPECIES SUSPECTED TO OCCUR IN THE EAST FORK (EFWS) AND MIDDLE FORK (MFWS) OF THE HOOD RIVER WATERSHED*

## *CODES USED IN THE ATTACHED TABLE*

The attached table format is similar to the ROD Table C-3 on pages 49 to 61, with fungi groups listed first, lichen groups second, bryophytes third, and vascular plants last. Additional columns were added to incorporate habitat information and known range and/or geographic extent. Appendix J2, pages 83-247, provided a large percent of the information available regarding species range and geographic extent. The following key identifies codes used to expedite and condense this document.

S = Suspected Occurrence
D = Documented Occurrence
*D = Documented AND a specimen is preserved in the MHNF herbarium
R = Reported but not formally documented

Survey Strategies: 1 = Manage Known Sites; 2 = Survey Prior to Activities and Manage Sites; 3 = Conduct Extensive Surveys and Manage Sites; 4 = Conduct General Regional Surveys

| Watersheds | Occurrence |
|---|---|
| EF- East Fork | D - Documented sites on MHNF |
| MF- Middle Fork | S - Suspected to occur, habitat present |
| | n - Not likely to occur |
| | ? - Unknown, inadequate info. |
| | X = Added after Appendix J2 |

MHNF- Mt. Hood National Forest

Trees and Shrubs

ABAM - Abies amabilis (Pacific silver fir)
ABCO - Abies concolor (White fir)
ABGR - Abies grandis (Grand fir)
ABLA2 - Abies lasiocarpa (Subalpine fir)
ABPR - Abies procera (Noble fir)
ACCI - Acer circinatum (Vine maple)
ARsp.- Arctostaphylos (Manzanita)
CACH - Castanopsis chrisophylla (Chinquapin)

PIAL - Pinus albicaulis (Whitebark pine)
PICO - Pinus contorta (Lodgepole pine)
PIEN - Picea engelmannii (Engelmann spruce)
PILA - Pinus lambertiana (Sugar pine)
PIMO - Pinus monticola (Western white pine)
PISI - Picea sitchensis (Sitka spruce)
PIPO - Pinus ponderosa (Ponderosa pine)
PSME - Pseudotsuga menziesii (Douglas-fir)

QUGA - Quercus garryana (Oregon white oak)
TABR - Taxus brevifolia (Pacific yew)
THPL - Thuja plicata (Western redcedar)
TSHE - Tsuga heterophylla (Western hemlock)
TSME - Tsuga mertensiana (Mountain hemlock)

SURVEY AND MANAGE SPECIES SUSPECTED TO OCCUR IN THE EAST FORK (EFWS) AND MIDDLE FORK (MFWS) OF THE HOOD RIVER WATERSHED

| SPECIES | SURV STRAT | EF | MF | HABITAT | KNOWN GEOGR. RANGE or EXTENT |
|---|---|---|---|---|---|
| FUNGI | | | | | |
| MYCORRHIZAL FUNGI | | | | | |
| BOLETES | | | | | |
| **Gastroboletus subalpinus** | 1, 3 | D | S | above 4500', ecto-michorrizal w/pines | Endemic Ore. Casc. & N. Sierras |
| **Gastroboletus turbinatus** | 3 | D | S | mid-high elev. w/true firs, PIEN/PISI, TSHE/ TSME, w/abundant large woody debris, humus | WA to N. CA, WA/OR Coast Range, Sisk. Mts., Klam. Mts., N. ID, MI, Mexico |
| BOLETES LOW ELEVATION | | | | | |
| **Boletus piperatus** | 3 | S | S | low-mid elev forests, requires course woody debris in Douglas-fir | Unknown |
| **Tylopilus pseudoscaber** | 1, 3 | ? | ? | low elev, moist hab., often w/Sitka spruce. | PNW coast endemic |
| RARE BOLETES | | | | | |
| **Boletus haematinus** | 1, 3 | S | S | high elev silver fir | Cal. north to Wash |
| **Boletus pulcherrimus** | 1, 3 | S | S | low-mid elev conifer | Cal. to Canada, north to Olympics |
| **Gastroboletus imbellus** | 1,3<br>1, 3 | S<br>S | S<br>S | upper mid elev (5000') w/ABAM, ABGR, PSME, TSHE, TSME, possibly ectomycorrhizal w/pine | locally endemic to Willamette NF(WNF) Ollalie Trail & Lamb Butte Scenic |
| **Gastroboletus rubra** | 1, 3 | D | S | upper mid-high elev. w/mature TSME and developed humus layer. | endemic to WA N. Casc. south to Willamette Pass OR |
| FALSE TRUFFLES | | | | | |
| **Nivatogastrium nubigenium** | 1, 3 | S | S | mid-high elev. in mature forests w/abundant lg. coarse woody (relies on mammals for dispersal) | Casc. Mts. of CA, N. to Mt. Adams, & north ID. |
| **Rhizopogon abietis**<br>**R. atroviolaceus**<br>**R. truncatus** | 3<br>3<br>3 | S<br>S<br>S | S<br>S<br>S | high elev. mixed conifer (true firs, pines, PSME, TSME), in moderate to dry sites. | E. Canada, E. USA N. Rockies, Strawberry Mts. OR, Casc. & Klam. Mts. |
| **Thaxterogaster pinque** | 3 | D | S | only mid-high elev. true firs, w/ thick humus, lg. crs. woody | Casc. Mts. S. of Canada border to N Sierras, Sisk. Mts OR, Klam. Mts. CA |

| SPECIES | SURV. STRAT | EF | MF | HABITAT | KNOWN GEOGR RANGE or EXTENT |
|---|---|---|---|---|---|
| UNCOMMON FALSE TRUFFLES | | | | | |
| **Macowanites chlorinosmus** | 1, 3 | ? | ? | low elev. PISI, PSME, TSHE w/lg. crs. woody | endemic OR coast & Coast Ranges |
| RARE FALSE TRUFFLES | | | | | |
| **Alpova alexsmithii** | 1, 3 | S | S | mid to upper mid elev. w/true firs, TSHE, and possibly pines. | endemic to Casc. Mts. & British Columbia Coast Rng |
| **Alpova olivaceotinctus** | 1, 3 | ? | ? | a single site known in the range of N. Spotted owl w/Shasta fir | Unknown |
| **Arcangeliella crassa**<br>**A. lactarioides** | 1, 3<br>1, 3 | ?<br>? | ?<br>? | mid to high elev. montane forests w/ Abies spp. and /or TSME. | Western OR, N. CA Mts. Shasta/Lassen |
| **Destuntzia fusca**<br>**D. rubra** | 1, 3<br>1, 3 | S<br>S | S<br>S | low to lower-mid elev. in variously mixed true firs, TSHE, PSME, oaks, pines, redwood | Mendocino Cnty. CA & Willamette N.F. (WNF), Linn Cnty. |
| **Gautieria magnicellaris** | 1, 3 | S | S | high elev. w/TSME and true firs | WNF, Klamath NF, Mt. Wash. Wildns., NE USA, Germany, Czechoslovakia |
| **Gautieria otthii** | 1, 3 | S | S | mid to upper-mid elev. ectomychorrizal w/ Pinaceae | N. CA, Sisk. Mts, OR Centr. Cascades Europe, Alaska |
| **Leucogaster citrinus** | 1, 3 | S | S | low to high elev. w/ PSME, TSHE, CACH, manzanita, tanoak, or in stands w/lg. woody | Mendocino Cnty. CA north to Linn & Benton Counties |
| **Leucogaster microsporus** | 1, 3 | S | S | mid elev. w/PSME or in stands w/abundant legacy of crs. woody | Slopes of W. Casc. Mts., N. Casc. & Coast Range OR, to S. Casc. of WA |
| **Macowanites lymanensis** | 1, 3 | ? | ? | mid elev. old-growth TSME/ABPR forest | Lyman Lake, Wenatchee NF |
| **Macowanites mollis** | 1, 3 | S | S | mid elev. mature to old-growth PSME, Pines | Mt. Rainier NP, Larch Mt., MHNF |
| **Martellia fragrans** | 1, 3 | S | S | mid-high elev. old-growth TSME/Abies spp | S. OR, N. CA, & ID |
| **Martellia idahoensis** | 1, 3 | S | S | mid-upper mid elev. w/ true firs & Pinacea | Coast Range SNF, Cascade Range, WNF N. ID |
| **Martellia monticola** | 1, 3 | S | S | mid-high elev. old-growth TSME/Abies spp. | Central to North Oregon Cascades |

| SPECIES | SURV. STRAT. | EF | MF | HABITAT | KNOWN GEOGR. RANGE or EXTENT |
|---|---|---|---|---|---|
| **Octavianina macrospora** | 1, 3 | S | S | Mt. foothills in PSME/ TSME old-growth forest | former Twin Brdgs. forest Camp |
| **Octavianina papyracea** | 1, 3 | ? | ? | coastal mixed PSME/ TSME/PISI forest in a fog belt | Humboldt Co, CA |
| **Rhizopogon brunneiniger** | 1, 3 | S | S | low-high elev. dry old growth PSME/TSME/fir/ pine forest | N. OR Cascades & coast ranges, & N. CA |
| **Rhizopogon evadens var. subalpinus** | 1, 3 | D | S | upper mid elev. TSME/ fir/pine forest near timberline | N. CA to WA & ID |
| **Rhizopogon exiguus** | 1, 3 | S | S | moist-dry mature to old-growth PSME/TSME low-mid elev. forest | Cascade Mt., WA & coast ranges of Or |
| **Rhizopogon flavofibrillosus** | 1, 3 | S | S | mid-upper mid elev. mature to old-growth mixed conifer forest | N. CA, Siskiyou Mts, & central Cascades of OR |
| **Rhizopogon inquinatus** | 1, 3 | S | S | mid-upper mid elev. mature to old-growth PSME forest | S. Santiam River, WNF, & ID |
| **Sedecula pulvinata** | 1, 3 | ? | ? | mid-high elev. old-growth TSME/Abies spp. | Mt. Shasta to Yuba Pass, CA & CO |
| UNDESCRIBED TAXA, RARE TRUFFLES & FALSE TRUFFLES | | | | | |
| **Alpova sp. nov. Trappe #9730**<br>**Trappe #1966**<br>**Arcangeliella sp. nov. #Trappe 12382** | 1,3<br><br>1, 3 | ?<br><br>? | ?<br><br>? | mid-high elev. mature to old-growth PSME/ PILA/ARsp/PIAI/ ABMASH forest | Siskiyou Mts. of southwestern OR |
| **Arcangeliella sp. nov. #Trappe 12359** | 1, 3 | ? | ? | mature to old-growth PISI/TSME/PSME coastal fog belt forest | Lane, Lincoln, & Tillamook counties OR |
| **Chamonixia pacifica sp. nov. #Trappe 12768** | 1, 3 | ? | ? | upper mid elev. old-growth PSME/TSME/PISI/ ABAM forest | N. coastal OR & N. Cascades of WA |
| **Elaphomyces sp. nov. #Trappe 1038** | 1, 3 | ? | ? | mature to old-growth PISI/TSME/PSME coastal fog belt forest | Lane, Lincoln, & Tillamook counties OR |
| **Gastroboletus sp. nov. #Trappe 2897** | 1, 3 | ? | ? | mid-high elev. mature to old-growth PSME/ PILA/ARsp/PIAT/ Shasta fir | Siskiyou Mts. of southwestern OR |
| **Gastroboletussp. nov. #Trappe 7515** | 1, 3 | S | S | high elev. old-growth TSME forest | Crater Lake National Park |
| **+Gastrosuillus sp. nov. #Trappe 7516** | 1, 3 | S | S | high elev. mature to old-growth true fir & coniferous forest | Klamath NF, OR |

| SPECIES | SURV. STRAT | EF | MF | HABITAT | KNOWN GEOGR. RANGE or EXTENT |
|---|---|---|---|---|---|
| +Gastrosuillus sp. nov. #Trappe 9608 | 1, 3 | ? | ? | upper mid elev. mature mixed conifer forest w/ PILA | Lassen NF, CA |
| Gymnomyces sp. nov. #Trappe 4703 & #5576 | 1, 3 | ? | ? | upper mid elev mature ABPR forest. | Siuslaw NF, OR Coast range of OR |
| Gymnomyces sp. nov. #Trappe 5052 | 1, 3 | S | S | high elev. mature to old-growth TSME/ABAM forest | Phlox Pt., Mt.Hood NF, OR |
| Gymnomyces sp. nov. #Trappe 1690 & #1706, 1710 | 1, 3 | S | S | upper mid elev. mature to old-growth ABGR/ ABPR/ABAM/TSME forest | W. OR Cascades, Willamette NF (WNF) |
| Gymnomyces sp. nov. #Trappe 7545 | 1, 3 | S | S | high elev. mature to old-growth true fir & coniferous forest | Klamath NF, OR |
| Hydnotrya sp. nov. #Trappe 787, 792 | 1, 3 | S | S | upper mid elev. old-growth ABAM/TSME forest | Mt. Jefferson, WNF |
| Hydnotrya subnix sp. nov. #Trappe 1861 | 1, 3 | S | S | old-growth ABAM forest | Gifford Pinchot NF WA |
| Martellia sp. nov. #Trappe 311, 649 | 1, 3 | S | S | high elev. mature to old-growth TSME/ABAM forest | Phlox Pt., Mt.Hood NF, OR |
| Martellia sp. nov. #Trappe 1700 | 1, 3 | S | S | upper mid elev. mature to old-growth ABGR/ ABAM/PSME/TSME forest | Willamette NF, OR |
| Martellia sp. nov. #Trappe 5903 | 1, 3 | S | S | upper mid elev. old-growth ABAM/TSME forest | Mt. Jefferson, WNF |
| Octavianina sp. nov. #Trappe 7502 | 1, 3 | S | S | upper mid elev. mature to old-growth ABGR/ ABAM/PSME/TSME forest | Willamette NF, OR |
| Rhizopogon sp. nov. #Trappe 9432 | 1, 3 | ? | ? | mid-high elev. mature to old-growth PSME/ PILA/ARsp/PIAT/Shasta pine) forest | Siskiyou Mts. of southwestern OR |
| Rhizopogon sp. nov. #Trappe 1692, 1698 | 1, 3 | S | S | upper mid elev. mature to old-growth ABGR/ ABAM/PSME/TSME forest | Willamette NF, OR |
| Thaxterogaster sp. nov. #Trappe 4867, 6242 & #7427, 7962, 8520 | 1, 3 | ? | ? | mature to old-growth PISI/PSME/TSME coastal fog belt forest | Lane, Lincoln, & Tillamook counties OR |
| Tuber sp. nov. #Trappe 2302, 12493 | 1, 3 | ? | ? | same as above | same as above |
| **RARE TRUFFLES** | | | | | |
| Balsamia nigra | 1, 3 | ? | ? | low elev. mature xeric pine/oak forest | Sierra Nevada Mts, CA to Yamhill Co, OR |

| SPECIES | SURV STRAT | EF | MF | HABITAT | KNOWN GEOGR. RANGE or EXTENT |
|---|---|---|---|---|---|
| Choiromyces alveolatus | 1, 3 | S | S | mid-high elev. old-growth TSME/Abies spp. forest | Mt. Hood, OR to Yuba Pass, CA |
| Choiromyces venosus | 1, 3 | S | S | low elev. w/coniferous deciduous or mature PSME forest | Springfield, OR & Europe |
| Elaphomyces anthracinus | 1, 3 | S | S | mature PIPO forest | W. Europe, E. North America, & E. OR Cascades |
| Elaphomycep subviscidus | 1, 3 | S | ? | mid elev. mature to old-growth pine forest | Central to S. OR Cascades |
| RARE CHANTERELLE | | | | | |
| Cantharellus formosus | 1, 3 | S | S | coniferous & mixed forest | N. CA, OR, & WA |
| Polyozellus multiplex | 1, 3 | S | S | intermittent streams montane fir forest | N Sierras, CA & Cascades, OR & WA |
| CHANTERELLE | | | | | |
| Cantharellus cibarius<br>C. subalbidus<br>C. tubaeformis | 3,4 | R<br>R<br>S | R<br>R<br>S | coniferous & mixed forest<br>late-successional forest | N. CA, OR, & WA |
| CHANTERELLES - GOMPHUS | | | | | |
| Gomphus bonarii<br>G. clavatus<br>G. floccosus<br>G. kauffmanii | 3<br>3<br>3<br>3 | S<br>S<br>R<br>S | S<br>S<br>R<br>S | late successional west conifer forests<br>" (& w/hemlock in east<br>" N. America) | throughout region especially N. CA |
| UNCOMMON & RARE CORAL FUNGI (App. J2, pp 163, 164) | | | | | |
| (Ramaria spp.) | (1,3) & (3) | S | S | w/TSHE, Abies, Picea, Pinup, Pseudotsuga, & Taxus | N. CA, OR, WA Overall distribution of individual spp., unknown. |
| PHAEOCOLLYBIA (App. J2, p. 166) | | | | | |
| (Phaeocollybia spp) | (1,3) | S | S | low elev. to montane, w/conifers, moist hab. (prefers low elev.) | Distribution and frequency currently under study. |
| UNCOMMON GILLED MUSHROOMS (App. J2, p. 168) | | | | | |
| (Catathelasma sp.,<br>Cortinarius spp.,<br>Dermocybe sp.,<br>Hebeloma sp.,<br>Hygrophorus spp.,<br>Russula sp.) | (1,3) & (3) | S | S | ectomycorrhizal in low elev. to montane, w/conifers | Distribution and range of individual species is unknown. Some may be PNW endemics. |

| SPECIES | SURV. STRAT | EF | MF | HABITAT | KNOWN GEOGR RANGE or EXTENT |
|---|---|---|---|---|---|
| **RARE GILLED MUSHROOMS** | | | | | |
| **Chroogomphus loculatus** | 1, 3 | S | S | upper mid-elev (5000') w/ABAM, ABGR, PSME, TSHE, TSME. | local endemic, type locality Ollalie Trail, WNF |
| **Cortinarius canabarba**<br>**C. rainierensis**<br>**C. variipes**<br>**Tricholoma venenatum** | 1, 3<br><br>1, 3<br>1, 3<br>1, 3 | S<br><br>S<br>S | S<br><br>S<br>S | The range of elev. and host species are unknown. All require diverse coniferous forests w/heavy hummus layer and crs. woody. | Overall ecology and distribution are not well known for these species. |
| **Cortinarius verrucisporus** | 1, 3 | S | S | high elev. montane, w/ conifers & true firs, hypogeous (fruits underground) | CA and OR |
| **Cortinarius wiebeae** | 1, 3 | S | ? | (same as above) | Local endemic/MHNF only known site |
| **UNCOMMON ECTO-POLYPORES** | | | | | |
| **Albatrellus ellisii**<br>**A. flettii** | 3 | ?<br>? | ?<br>? | coastal old-growth & mixed hardwood forest | WA, OR, N. CA, Rocky Mts., NE. US & Europe |
| **RARE ECTO-POLYPORES** | | | | | |
| **Albatrellus avellaneus**<br>**A. caeruleoporus** | 1, 3 | ?<br><br>? | ?<br><br>? | coastal old-growth & mixed hardwood forest | WA, OR, N. CA, Rocky Mts., NE. US & Europe |
| **TOOTH FUNGI** | | | | | |
| **Hydnum repandum**<br>**H. umbilicatum**<br>**Phellodon atratum**<br>**Sarcodon fuscoindicum**<br>**S. imbricatus** | 3 | R<br>S<br>S<br><br>D<br>D | R<br>S<br>S<br><br>S<br>S | late-successional & second growth conifer & hardwood forest | Widespread in N. America & Europe |
| **RARE ZYGOMYCETES** | | | | | |
| **Endogone acrogena** | 1, 3 | S | S | low elev. mesic old-growth PSME/TSME forest | W. Cascades from Mt. Rainier to Whitechuck Rv. |
| **Endogone oregonensis** | 1, 3 | S | S | low elev. old-growth PSME/PIPI/TSME coastal forest | Suislaw NF, OR |
| **Glomus radiatum** | 1, 3 | S | S | mature to old-growth Coastal Redwood/Alaska cedar mesic wet forest | OR & WA Cascades, N. CA, & NE. US |

| SPECIES | SURV. STRAT. | EF | MF | HABITAT | KNOWN GEOGR. RANGE or EXTENT |
|---|---|---|---|---|---|
| SAPROBES (DECOMPOSERS) | | | | | |
| UNCOMMON GILLED MUSHROOMS (App. J2 p. 179) | | | | | |
| Species are collectively grouped. See App. J2 p. 179 | (1,3) & (3) | S | S | low-mid elev. conifer ecosystems; on PISI, recently fallen logs, or decomposed logs | N. CA, OR, & WA |
| RARE GILLED MUSHROOMS | | | | | |
| Clitocybe subditopoda<br>C. senilis | 1, 3 | S<br>S | S<br>S | low-mid elev. moist late successional forest, large logs in later stages of decay | WA, OR, & CA |
| Neolentinus adherens | 1, 3 | S | S | low-mid elev. moist late successional forest, large logs in later stages of decay | Olympic Natl. Park |
| Rhodocybe nitida | 1, 3 | S | S | low-mid elev. moist late successional forest, large logs in later stages of decay | WA, OR, & CA |
| Rhodocybe speciosa | 1, 3 | S | S | low-mid elev. moist late successional forest, large logs in later stages of decay | Mt. Rainier Natl. Park to Barlow Pass |
| Tricholomopsis fulvescens | 1, 3 | S | S | low-mid elev. moist late successional forest, large logs in later stages of decay | Mt. Hood area, Mt. Rainier Natl. park Mt. Baker-Snoq. NF |
| NOBLE POLYPORE (Rare and Endangered) | | | | | |
| Oxyporus nobilissimus | 1, 2, 3 | S | S | late-successional forest on Abies spp. esp. A. procera | OR & WA Cascades |
| BONDARZEWIA POLYPORE | | | | | |
| Bondarzewia montana | 1, 2, 3 | S | S | late-successional high elev. forest on associate w/Abies | Pacific Northwest, W. NV, & ID |
| RARE RESUPINATES AND POLYPORES | | | | | |
| Aleurodiscus farlowii | 1, 3 | S | S | on wood, humus, litter stumps, & dead roots | WA, OR, & N. CA |
| Dichostereum granulosum | 1, 3 | S | S | (same as above) | (same as above) |
| Cudonia monticola | 3 | S | S | duff layer of mature conifer forest | WA, OR, & N. CA |
| Gyromitra californica<br>G. esculenta<br>G. infula<br>G. melaleucoides<br>G. montana (syn. G. gigas) | 3,4 | S<br>S<br>S<br>S<br>S | S<br>S<br>S<br>S<br>S | decaying matter in soil & rotten wood in older forest (except G. esculenta which prefers second growth) | Northwestern N. America & Europe |

| SPECIES | SURV. STRAT. | EF | MF | HABITAT | KNOWN GEOGR. RANGE or EXTENT |
|---|---|---|---|---|---|
| Otidea leporina<br>O. onotica<br>O. smithii | 3 | S<br>S<br>S | S<br>S<br>S | conifer duff in moist-wet late-successional mid-low elev. conifer forest | Unknown |
| Plectania melastoma | 3 | S | S | late-successional to old-growth conifer forest duff | NE. & NW. North America & Europe |
| Podostroma alutaceum | 3 | S | S | mature conifer & mixed conifer/hardwood forest duff | Pacific Northwest |
| Sarcosoma mexicana | 3 | S | S | late-successional & old-growth high elev. forest | Coastal OR & CA |
| Sarcosphaera eximia | 3 | S | S | conifers & Fagaceae pp on chalky soils | Pacific Northwest, CA, Rockies, NE. U.p. & Europe |
| Spathularia flavida | 3 | S | S | duff layer of mature conifer forest | OR, WA, & N. CA |
| RARE CUP FUNGI | | | | | |
| +Aleuria rhenana | 1, 3 | S | S | late successional conifer forest liter | San Francisco to Mt. Rainier |
| +Bryoglossum gracile | | S | S | mossy, wet, alpine / Subalpine montane conifer forest | artic & alpine N. America & Europe |
| Gelatinodiscus flavidus | 1, 3 | S | S | needles, cones, & twig of high elev. Alaska Yellow cedar | BC, Olympic Penn., OR & WA Cascades, & Central OR |
| Helvella compressa<br>H. crassitunicata<br>H. elastica<br>H. maculata | 1, 3 | S<br>S<br>S<br>S | S<br>S<br>S<br>S | low-mid elev. riparian & wet late succession forest | temperate forested area of N. America |
| Neournula pouchetii | 1, 3 | S | S | late-successional Thuja and Tsuga forest | N. OR & WA |
| Pithya vulgaris | 1, 3 | S | S | high elev. Abies forest | BC, WA, ID, & OR |
| Plectania latahensis | 1, 3 | S | S | upper montane, subalpine conifer forest | OR, WA, ID, & BC |
| Plectania milleri | 1, 3 | S | S | montane, subalpine conifer forest | OR, WA, ID, & BC |
| Pseudaleuria quinaultiana | 1, 3 | ? | ? | low elev. wet late-successional conifer forest on wood or soil | Olympic Peninsula, coastal WA & OR |
| CLUB CORAL FUNGI | | | | | |

| SPECIES | SURV. STRAT. | EF | MF | HABITAT | KNOWN GEOGR. RANGE or EXTENT |
|---|---|---|---|---|---|
| Clavariadelphus ligula | 3,4 | D | S | cool/cold moist late-successional hardwood or conifer forest, increases in frequency w/increasing lat. & elev., need well-developed litter layer | Pacific Northwest BC, AK, Midwest, & eastern N. America |
| C. pistilaris | | | | | |
| C. truncatus | 3,4 | S | S | | |
| C. borealis | 3,4 | D | S | | |
| C. lovejoyae | 3,4 | S | S | | |
| C. sachalinensis | 3,4 | S | S | | |
| C. subfastigiatus | 3,4 | S | S | | |
| | 3,4 | S | S | | |
| **JELLY MUSHROOM** | | | | | |
| *Phlogoitis* helvelloides | 3,4 | S | S | riparian zones, upper headwater seeps, & intermittent streams w/large woody debris | Pacific Northwest, Northwest, Midwest & Rockies |
| **BRANCHED CORAL FUNGI** | | | | | |
| Clavulina cinerea | 3,4 | S | S | late-successional forest w/well-developed liter layer | Pacific Northwest & elsewhere |
| C. criptata | | S | S | | |
| C. ornatipes | | S | S | | |
| **MUSHROOM LICHEN** | | | | | |
| Phytoconis ericetorum | 3,4 | S | S | large woody debris in well lit forest w/alt. high/low moisture, increases northward | CA to artic, coast to subalpine elev. |
| **PARASITIC FUNGI (App. J2 p. 212)** | | | | | |
| SPECIES are collectively grouped. pee App. J2 p. 212. | 3 | S | S | late-successional moist forest on a host fungus | Pacific Northwest, distribution and ecology unknown. |
| **CAULIFLOWER MUSHROOM** | | | | | |
| Sparassis crispa | 3 | D | S | low-mid elev. old-growth conifer forest on large roots, esp. PSME | Pacific Northwest & N. CA |
| **MOSS DWELLING MUSHROOM (App. J2 p. 216)** | | | | | |
| SPECIES are collectively grouped. See App. J2 p. 216. | 3 | S | S | late-successional moist forest, closely associated with & dependent upon mosses | Pacific Northwest, Olympic Peninsula |
| **CORAL FUNGI** | | | | | |
| Clavicorona avellanea | 3 | S | S | low-mid elev. moist late-successional forest on large roots | Pacific Northwest |
| **LICHENS** | | | | | |
| **RARE FORAGE LICHENS** | | | | | |
| Bryoria tortuosa | 1, 3 | S | S | low-mid elev, coastal on conifers, inland in pine/oak wet regimes | Central Cal. to Brit. Col., Cascades |

| SPECIES | SURV. STRAT. | EF | MF | HABITAT | KNOWN GEOGR. RANGE or EXTENT |
|---|---|---|---|---|---|
| RARE LEAFY LICHENS | | | | | |
| **Hypogymnia duplicata** | 1, 2, 3 | ? | ? | low elev wet, foggy, windy coast & maritime sites on conifers | Ore. to Alaska |
| **Tholurna dissimilis** | 1, 3 | S | S | subalpine fog zone on stunted TSME, canopy of old-growth PSME | Montane areas of Ore. & Wash. |
| RARE NITROGEN FIXING LICHENS | | | | | |
| **Dendriscocaulon intricatulum** | 1, 3 | S | S | low-mid elev wet, boreal, riparian, late-successional forest | Southern Wash. to southeast Alaska |
| **Lobaria hallii** | 1, 3 | S | S | low-mid elev wet, foggy forest on large dia. hardwoods & on shrubs | Central Coast Cal. to N. Alaska |
| **Lobaria linita** | 1, 3 | S | S | old-growth PSME & moist fir forest | N. Ore. to southeast Alaska, Idaho |
| **Nephroma occultum** | 1, 3 | ? | ? | pristine old-growth approx. 400 yrs old | Willamette NF to Brit. Col. |
| **Pannaria rubiginosa** | 1, 3 | S | S | bases of trees in mature forest | Salem, Ore. & Mt. Rainier, Wash. |
| **Pseudocyphellaria rainierensis** | 1, 3 | S | S | old-growth forest on trunks of PSME | Cascades of Wash. and Ore. |
| NITROGEN FIXING LICHENS | | | | | |
| **Lobaria oregana** | 4 | S | S | open 200 yr. old-growth & Coast forests on conifers | Pacific Northwest Cascades |
| **Lobaria pulmonaria** | 4 | S | S | moist, hardwood, old-growth forest & swamps | Pacific Northwest Cascades |
| **Lobaria scrobiculata** | 4 | S | S | old-growth forest from 140-200 yrs old | Pacific Northwest Cascades |
| **Nephroma bellum** | 4 | S | S | open old-growth & along roadsides | Pacific Northwest Cascades |
| **Nephroma helveticum** | 4 | S | S | N. Coast, montane forests & foothill woodlands & valleys | Pacific Northwest Cascades |
| **Nephroma laevigatum** | 4 | S | S | low elev. Coast & old-growth forests | Pacific Northwest Cascades |
| **Nephroma parile** | 4 | S | S | moist coniferous & deciduous old-growth forests | Pacific Northwest Cascades |
| **Nephroma resupinatum** | 4 | S | S | low-mid elev. Coast & montane coniferous shady forests | Pacific Northwest Cascades |
| **Pannaria leucoptictoides** | 4 | S | S | low-elev. open Coast & old-growth forest | Pacific Northwest Cascades |
| **Pannaria mediterranea** | 4 | S | S | old-growth forest from 140-200 yrs old | Pacific Northwest Cascades |
| **Pannaria saubinetii** | 4 | S | S | old-growth forest from 140-200 yrs old | Pacific Northwest Cascades |

| SPECIES | SURV STRAT. | EF | MF | HABITAT | KNOWN GEOGR. RANGE or EXTENT |
|---|---|---|---|---|---|
| **Peltigera collina** | 4 | S | S | low-mid elev. Coast, montane, & old-growth forests | Pacific Northwest Cascades |
| **Peltigera neckeri** | 4 | S | S | old-growth forest from 140-200 yrs old | Pacific Northwest Cascades |
| **Peltigera Pacifica** | 4 | S | S | old-growth forest from 140-200 yrs old | Pacific Northwest Cascades |
| **Pseudocyphellaria anomala** | 4 | S | S | low-mid elev. Coast, montane, & old-growth forests | Pacific Northwest Cascades |
| **Pseudocyphellaria anthrapsis** | 4 | S | S | low-mid elev. open, coniferous old-growth forest | Pacific Northwest Cascades |
| **Pseudocyphellaria crocata** | 4 | S | S | old-growth forest from 140-200 yrs old | Pacific Northwest Cascades |
| **Sticta beauvoisii** | 4 | S | S | old-growth forest from 140-200 yrs old | Pacific Northwest Cascades |
| **Sticta fuliginosa** | 4 | S | S | low elev. Coast & moist coniferous old-growth forests | Pacific Northwest Cascades |
| **Sticta limbata** | 4 | S | S | low-mid elev. Coast & old-growth forests | Pacific Northwest Cascades |
| PIN LICHENS (See App. J2, pp 234, 235) | | | | | |
| SPECIES grouped collectively; all have potential to occur in MHNF watersheds. Three species listed below, from the pin Lichen group, have special information | | | | | |
| **Calicium adaequatum**<br>**C. viride**<br>**Stenocybe clavata** | 4<br><br>4<br>4 | S<br><br>S<br>S | S<br><br>S<br>S | sheltered microsites w/high atmospheric humidity provided by old-growth forest conditions, substrate and texture specific | Pacific Northwest & N. Europe<br><br>Endemic to the Pacific Northwest |
| RARE ROCK LICHENS | | | | | |
| **Pilophorus nigricaulis** | 1, 3 | S | S | talus rock patches w/in old-growth forest w/ low fire frequency | coastal Ore., Wash. & Brit. Col. |
| **Sticta arctica** | 1, 3 | ? | ? | rock outcrop in foggy wet Coast forest | coast range of Ore |
| RIPARIAN LICHENS | | | | | |
| **Cetrelia cetrarioides** | 4 | ? | ? | low-mid elev. foggy, riparian forest on older hardwood trees | coastal Ore. to Alaska |
| **Collema nigrescens** | 4 | S | ? | low-mid elev. foggy riparian forest mostly on QUGA | Pacific Northwest to Alaska (to Equador) |
| **Leptogium burnetiae var. hirsutum** | 4 | S | S | low-mid elev. foggy riparian forest on older hardwood trees | Pacific Northwest & N. Europe |
| **Leptogium cyanescens** | 4 | S | S | low-mid elev. foggy riparian forest on older hardwood trees | Equador to Alaska including Ore. |
| **Leptogium saturninum** | 4 | S | S | low-mid elev. boreal riparian forest on older hardwood trees | Pacific Northwest (mostly Canada) |

| SPECIES | SURV. STRAT | EF | MF | HABITAT | KNOWN GEOGR. RANGE or EXTENT |
|---|---|---|---|---|---|
| **Leptogium teretiusculum** | 4 | S | S | low-mid elev. foggy riparian forest on older hardwood trees | Pacific Northwest & Montana |
| **Platismatia lacunosa** | 4 | S | S | low-mid elev. moist forest on deciduous & hardwood trees | Central Ore. to south-central Alaska |
| **Ramalina thrausta** | 4 | S | S | low-mid elev. boreal forest on hardwood & coniferous trees | Ore., Wash., Idaho Mont., Cal., & Brit. Col. |
| **Usnea longissima** | 4 | S | S | low-mid elev. wet coniferous/hardwood forests and swamps | Northwest Cal. to Alaska |
| AQUATIC LICHENS | | | | | |
| **Dermatocarpon luridum** | 1, 3 | S | S | low-mid elev. streams | Ore., Brit. Col., Colo., & Virginia |
| **Hydrothyria venosa** | 1, 3 | S | S | mid-high elev. clear, cold streams in pristine old-growth | Central Cal. to central Brit. Col. |
| **Leptogium rivale** | 1, 3 | S | S | low-mid elev. streams | Oregon & Montana |
| RARE OCEANIC INFLUENCED LICHENS | | | | | |
| **Bryoria Pseudocapillaris** | 1, 3 | no | no | PISI forests, open sand dunes on coast | Oregon coast |
| **Bryoria spiralifera** | 1, 3 | no | no | pantropical areas, on peninsulas & headlands | Northern Cal. |
| **Bryoria subcana** | 1, 3 | no | no | coastal bays & streams | Ore., Cal., Alaska |
| **Buellia oidalea** | 1, 3 | ? | ? | low-elev. dry coastal oak forest | Mexico to Brit. Col. |
| **Erioderma sorediatum** | 1, 3 | no | no | stabilized dunes in old PISI & PICO forest | Oregon coast |
| **Hypogymnia oceanica** | 1, 3 | ? | ? | coast & maritime microclimates in old-growth forest | Inland & Coast Oregon |
| **Leioderma sorediatum** | 1, 3 | no | no | stabilized dunes in old PISI & PICO forest | Oregon coast |
| **Leptogium brebissonii** | 1, 3 | no | no | stabilized dunes in old PISI & PICO forest | Oregon coast |
| **Niebla cephalota** | 1, 3 | no | no | promontories of land along windswept coasts | coastal p. Cal. to maritime N. Wash. |
| **Pseudocyphellaria mougeotiana** | 1, 3 | no | no | coastal old-growth PISI forest | Oregon coast |
| **Telopchiptes flavicans** | 1, 3 | ? | no | dry uplands & prairies, on coast shrubs | Equador to Oregon coasts |
| **Usnea hesperina** | 1, 3 | no | no | broken dune PICO forest | Oregon coast |
| OCEANIC INFLUENCED LICHENS | | | | | |
| **Cetraria californica** | 1, 3 | no | no | scrubby dune areas on old-growth PICO | S. Cal. to southeast Alaska coasts |

| SPECIES | SURV STRAT | EF | MF | HABITAT | KNOWN GEOGR. RANGE or EXTENT |
|---|---|---|---|---|---|
| **Heterodermia leucomelos** | 1, 3 | no | no | on large PISI in forested headlands | p. Cal. to N. Wash. coasts |
| **Loxospora sp nov "corallifera"** | 1, 3 | no | no | old-growth conifers on immediate coast | Pacific Northwest coasts |
| **Pyrrhospora quernea** | 1, 3 | no | no | old-growth conifers on immediate coast | p. Cal. to N. Wash. coasts |
| *ADDITIONAL LICHENS (Added after Appendix J2)* | | | | | |
| **Cladonia norvegica** | 1, 3 | ? | ? | unknown (inadequate info.) | unknown |
| **Heterodermia sitchensis** | 3 | ? | ? | unknown (inadequate info.) | unknown |
| **Hygomnia vittiata** | 3 | ? | ? | unknown (inadequate info.) | unknown |
| **Hypotrachyna revoluta** | 3 | S | S | high elev. open forest | N. Cal., W. Ore. & W. Wash. |
| **Ramalina pollinaria** | 3 | no | no | low elev. N. Coast forest with sandstone outcroppings | W. Ore. & W. Wash. |
| **Nephroma isidiosum** | 3 | ? | ? | unknown (inadequate info.) | unknown |
| BRYOPHYTES | | | | | |
| **Antitrichia curtipendula** | 4 | R | R | low-mid elev. old-growth forest canopies | N. Cal. to N. Ore. west of Cascades |
| **Bartramiopsis lepcurii X** | 1, 3 | S | S | old-growth forest | Pacific Northwest, esp. Wash. |
| **Brotherella roellii X** | 1, 3 | S | S | low-mid elev. old-growth forest on rotting logs | Wash. Cascades |
| **Diplophyllum albicans X** | 1, 3 | ? | ? | coastal old-growth TSME/PISI forest | unknown |
| **Diplophyllum plicatum** | 1, 2 | ? | ? | coastal PISI forest | W. Ore. & W. Wash. |
| **Douinia ovata** | 4 | S | S | low-mid elev. foggy old-growth forest w/ ridges & rock outcrops | Pacific Northwest Cascades and coast |
| **Encalypta brevicolla var. crumiana X** | 1, 3 | S | S | foggy rock outcropping shaded by old-growth forest | Mountains of Ore. & Wash. |
| **Herbertus aduncus X** | 1, 3 | S | S | high elev. old-growth forest | N. coast & Cascade of Ore. & W. Wash. |
| **Herbertus sakurali X** | 1, 3 | ? | ? | foggy rock faces in old-growth forest | N. coast range of Ore. |
| **Iwatsukella leucotricha X** | 1, 3 | ? | ? | bark in old-growth forest | N. coast range of Ore. |
| **Kurzia makinoana** | 1, 2 | S | S | low-elev. old-growth forest | Ore. & Wash. old-growth |
| **Marsupella emarginata var aquatica** | 1, 2 | S | S | mid-high elev. stream splash zones | Oregon Cascades |
| **Orthodontlum gracile X** | 1, 3 | - | - | old-growth redwood forest | N. Cal. & southwestern Ore. |

| SPECIES | SURV. STRAT. | EF | MF | HABITAT | KNOWN GEOGR. RANGE or EXTENT |
|---|---|---|---|---|---|
| **Plagiochila satol X** | 1, 3 | S | S | old-growth forest on cliffs, rocks, & bark | Pacific Northwest |
| **Plagiochila semidecurrens var. crumniana X** | 1, 3 | ? | ? | foggy cliffs & shaded rocks | Oregon coast range |
| **Pleuroziopsis ruthenica X** | 1, 3 | S | S | low-elev. shrub thickets, old-growth swamps, stream edges | Wash. |
| **Ptilidium californicum** | 1, 2 | S | S | conifers in old-growth forest | N. Cal. to Wash. |
| **Racomitrium aquaticum X** | 1, 3 | S | S | shaded moist rocks & streambanks of old-growth forest | unknown |
| **Radula brunnea X** | 1. 3 | ? | ? | foggy rock walls in old-growth forest | N. coast range of Ore. |
| **Scouleria marginata** | 4 | S | S | splash zone of streams | Pacific Northwest endemic |
| **Tetraphis geniculata X** | 1, 3 | S | S | low-mid elev. old-growth forest on shaded, moist wood | N. Cal. to W. Wash |
| **Tritomaria expectiformis** | 1, 2 | S | S | old-growth forest on moist shaded rocks | Ore. & Wash. old-growth |
| **Tritomaria quinquedentata X** | 1, 3 | S | S | old-growth forest on moist shaded rocks | Ore. & Wash. old-growth |
| VASCULAR PLANTS | | | | | |
| **Allotropa virgata** | 1,2 | R | R | 1500'-5000' elev. under closed canopy ABAM, ABGR, PICO, PSME requires association w/fungus & vasc. plnts(saprophytic) | east slopes Casc. range to coast, BC to CA, disjunct in ID & MO. |
| **Arceuthobium tsugense** | The Regional Ecosystem Office removed this species from the Survey and Manage List in 1995 | | | | |
| **Aster vialis** | 1, 2 | no | no | low elev. w/mid-successional conifers, thriving in edge habs. or in canopy openings | endemic to OR, Lane, Linn, & Douglas Counties (Willamette Valley) |
| **Bensoniella oregana** | 1, 2 | no | no | 3000'-5000' elev. w/ mixed evergreen & white fir, meadow/strm | coast Range OR, CA Douglas, Josephine, Curry, Roseburg Counties, (Sisk.NF) |
| **Botrychium minganense** | 1, 2 | S | S | variable elev. w/THPL and/or ACCI, ACMA variable moist habs. | Endemic to North America, difficult taxonomically |
| **Botrychium montanum** | 1, 2 | S | S | between 3200' & 4100' (MHNF) in deep shade old-growth THPL, seeps | Endemic to western North America |
| **Clintonia andrewsiana** | 1, 2 | - | - | coastal redwood forest | California coast |

| SPECIES | SURV. STRAT. | EF | MF | HABITAT | KNOWN GEOGR. RANGE or EXTENT |
|---|---|---|---|---|---|
| **Coptis asplenifolia** | 1, 2 | ? | ? | from 360'-3600' w/ABAM TSHE, THPL, in cool, wet, shady habitats | OR coast Rng., WA Cascades, Olympic peninsula |
| **Coptis trifolia** | 1, 2 | S | S | perimeters of small wetlands/swamps w/PSME | Disjunct in OR (MHNF), East. OR (Geographic Extent) |
| **Corydalis aquae-gelidae** | 1, 2 | no | no | 1220'-4260' on gravel bars in cold perennial streams w/high canopy | Gifford Pinchot NF Mt. Hood NF, Salem BLM |
| **Cypripedium fasciculatum** | 1, 2 | ? | no | 1300'-5300' in 60-100% shade by numerous plnt communities | Western US |
| **Cypripedium montanum** | 1, 2 | S | no | broad range of habs., presence of specific symbiotic fungi | All Cascade provinces, (Hood River, Wasco Cnty) |
| **Galium kamtschaticum** | 1, 2 | S | S | Seeps w/conifers and west Cascades riparian associated species | Circumboreal Olympic & West. WA Casc. provinces |
| **Habenaria orbiculata** | 1, 2 | S | S | mesic-dry mossy forest w/deep litter in TSHE and lower ABAM zones | uncommon, wide-spread, W. WA Casc. provinces (Geographic extent) |
| **Pedicularis howellii** | 1, 2 | no | no | 4200'-6300' in mixed conifer/shrub, edge of openings or damp shade | Endemic to the Siskiyou Mts. |
| **Scoliopus biglovei** | 1, 2 | - | - | low elevation Redwood forest | Endemic to CA, Sisk. NF, Six Rivers NF |

## *REFERENCES*


Arno, S F. and R. P. Hammerly. 1977. Northwest Trees: Identifying & Understanding the Region's Native Trees. The Mountaineers, Seattle.

Arora, D. 1979. Mushrooms Demystified. Second Edition. Ten Speed Press, Berkley.

Bovey, R. B., J. E. Marsh and D. H. Vitt. 1988. Mosses, Lichens & Ferns of Northwest North America. University of Washington Press, Seattle.

Cole, M. and M. E. Hale Jr. 1988. Lichens of California. University of California Press, Berkley.

Hale, M. E. 1979. How to Know the Lichens. Second Edition. Wm. C. Brown Co, Dubuque.

Hickman, J. C. 1993. The Jepson Manual, Higher Plants of California. University of California Press, Berkeley.

Hitchcock, C. L. and A. Cronquist. 1973. Flora of the Pacific Northwest. University of Washington Press, Seattle.

Lawton, E. 1971. Moss Flora of the Pacific Northwest. Hattori Botanical Laboratory, Nichinan, Japan.

USDA Forest Service, USDI Bureau of Land Management. Final Supplemental

Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl. Appendix J-2. February 1994.

USDA Forest Service, USDI Bureau of Land Management. Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl (ROD). April 1994.

USDA Forest Service. Sensitive Plants of Mt. Hood National Forest. May 1994


## *PERSONAL COMMUNICATION SOURCES:*

Forestry Sciences Laboratory (PNW): 6-7-94 and 6-6-96, Michael Castellano, mycologist. (Data base list of J2 and C3 fungi species in Oregon and Washington). ph. 503-750-7329 (fax).

Oregon Natural Heritage Program: 6-8-94 and 4-26-96, John A. Christy, mosses and liverworts, (C-3 bryophytes habitat and potential for occurrence on the MHNF). ph. 503-228-3153 (fax).

Oregon Natural Heritage Program: 6-8-94, David H. Wagner, liverworts. (Synopsis of liverworts on the Oregon Natural Heritage Program list).

USDA Forest Service, Siuslaw National Forest, Corvallis OR, 6-15-94, Linda Geiser, lichen specialist. (R/E C-3 coastal lichen species, habitat types and potential for occurrence on the MHNF) ph. 503-750-7000

Oregon Natural Heritage Program: 6-6-94, Sue Vrilakas, data base contact. (C3 species on the Oregon Natural Heritage Data Base List of Rare, Threatened, and Endangered [species] of Oregon). ph. 503-228-3153 (fax).

US Fish and Wildlife, Oregon State Office. 3/1/96, John Davis (Regarding C3 Lichens and Bryophytes having potential for occurrence on Mt. Hood above 4200'). ph. 503-231-6179.

USDA Forest Service, Mt. Hood National Forest Herbarium, Gresham OR, 6-14-94 and 4-26-96 Mark Boyll, Ecologist. (List of lichen specimens in the MHNF Herbarium). ph. 503-666-0700

USDA Forest Service, Mt. Hood National Forest, Zig-Zag/Columbia Gorge Ranger Districts, 6-15-94, Molly Sullivan, District Botanist. (Species inventory list of fungi in Old Maid Flats, 109 species). ph. 503-622-5622

## *REFERENCES - REPORTS FOR USFS, AND OFFICIAL DOCUMENTS*


Oregon Natural Heritage Program: 6/8/94, David H. Wagner, liverworts. (Synopsis of liverworts on the Oregon Natural Heritage Program list).

USDA Forest Service, USDI Bureau of Land Management. Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Rangeof the Northern Spotted Owl. Appendix J-2. February 1994.

USDA Forest Service, USDI Bureau of Land Management. Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl (ROD). April 1994.

USDA Forest Service. Sensitive Plants of Mt. Hood National Forest. May 1994

# *ETHNO-BOTANICAL REPORT*

## *EAST & MIDDLE FORKS OF THE HOOD RIVER WATERSHED ANALYSIS*

Prepared by: Susan Nugent, District Botanist
Hood River Ranger District
Mt. Hood National Forest
June 30, 1996

**This document focuses on historic use of plant species that are found in East Fork (EFWS) and Middle Fork (MFWS) Hood River Watersheds. The attached table emphasizes plants that are noted in references as having current and past use by local Native Americans of the mid-Columbia area and the Confederated Tribes of Warm Springs. Sahaptin (language of the Tribes of Warm Springs) names are given for species of the names were found in references. Occasionally more than one species may have the same native name. For purposes of this document the actual uses of each plant are not discussed.**

**Many of these species also have current use as "special forest products".**

**The following are a few management considerations that should be integrated during development of plans for the East Fork and Middle Fork Watersheds.**

## *MANAGEMENT*

### *Treaty Rights*

The 6,500,000 acre range of the Mid-Columbia Native Americans, prior to the forming of reservations, included the lands north and east of Mt. Jefferson to the Columbia River. The lands extended north along the crest of the Cascades to Mt. Hood and down across the Hood River Valley to the Columbia River. These traditional use lands (including the EFWS and MFWS of the Hood River Watershed), exclusive of current reservation boundaries, were ceded to the U.S. Government in the 1855 Treaty With The Tribes Of Middle Oregon. Special rights to fishing, hunting, gathering roots and berries, and pasturing stock "...in unclaimed lands, in common with citizens", are provisions of the treaty. The Confederated Tribes of Warm Springs should be included in the planning process for all USFS projects.

### *Restoration Opportunities of Traditional Use Areas*

The most prominent cultural plant in both the EFWS and MFWS is huckleberry (Vaccinium spp.) In the EFWS the southeast side of Mt. Hood near Hood River Meadows, Mt. Hood Meadows Permit Area, and Bennett Pass are noted as being traditional huckleberry picking areas. In the MFWS the Red Hill area provides huckleberry picking opportunities. These Huckleberry picking areas could be improved to support traditional levels of gathering. Restoration could be achieved by planting additional huckleberries in accessible areas along roads, trails, and openings; and by burning, cutting back or thinning trees from existing huckleberry patches in Hood River Meadows, Mt. Hood Meadows Permit Area, Bennett Pass, and Red Hill areas. The tribal council should be contacted to extend an invitation to help identify additional areas for huckleberry habitat enhancement in the EFWS and MFWS.

### *Important Traditional Plants of the Tribes of Warm Springs:*

A Warm Springs report titled "The Preservation and Management of Cultural Plants on the Warm Springs Indian Reservation; A Proposal", by botanist R. Helliwell, outlines a strategy for management of cultural plants. In addition to management recommendations the report identifies five root plants that are currently among the most important cultural foods, Camas (Cammassia quamish), Bitteroot (Lewisia rediviva), Biscuit root (Lomatium cous), Canby's desert parsley (Lomatium canbyi), Indian carrot (Perideridia gairdneri). Of these species, Indian carrot has been documented most often in the East Fork and Middle Fork Hood River watersheds.

Helliwell's report begins..."Families have long had favorite areas for collecting roots; areas they return to year after year. However the Reservation is to large and varied for any single family or person to be familiar with the entire range of cultural plant populations, therefore, as the plants of a favorite area are depleted the people may not know where to turn. This is the manner in which traditions die." The Hood River Ranger District can assist the Confederated Tribes of Warm Springs in maintaining tradition by restoring and enhancing selected areas needed to cultivate viable populations of cultural plants.

In a 1988 Warm Springs Reservation (WSIR) report there are 56 plant species recognized as important to the tribes. The list of species was compiled under the guidance of the Warm Springs Culture and Heritage Committee. Species from the 1988 Warm Springs list, that can be found in the EFWS and MFWS, are italicized in the attached table of species.

## *Table of Species*

The attached list identifies plants by common, Latin, and Sahaptin names (Warm Springs, Yakima, and Umatilla Native Americans). Uses are divided into three components:

**(*) Native American Cultural Foods (Warm Springs, Yakima, Umatilla)**
This group includes important root and berry plants, vegetable and flour/grain plants.

**(+) Native American Medicinal, Ceremonial, or Traditional Use**
Includes species that have non-food uses such as basket weaving and dipnet cordage, long-house and ceremonial purification, cooking utensil materials, dyes, hair and skin tonics, internal and external medicines, traditional potions and "smokes".

**( ) General Historic Use (Edible/Medicinal) and Special Forest Products**
This group includes species that have been used historically by pioneers, and presently are considered to be "Special Forest Products" that are collected for private use and commercial purposes.

**Italicized Names identify "Important Traditional Plants of the WSIR" (1988 WSIR report).**

| Common Name | Scientific Name | Warm Springs Sahaptin |
|---|---|---|
| TREES | | |
| +Fir, silver | Abies amabilis | patúšwai |
| +Fir, grand | Abies grandis | patúšwai |
| +Fir, subalpine | Abies lasiocarpa | patúšwai |
| +Fir, noble | Abies procera | patúšwai |
| +Alder | Alnus rubra, A. sinuata | psuuní |
| +Chinquapin/chestnut | Castanopsis crysophylla | |
| *+*Hawthorn* | *Crataegus douglasii* | *snm-aašu* |
| +Western larch | Larix occidentalis | xatawas/kimíla |
| +Engelmann spruce | Picea engelmannii | |
| *Pine, whitebark | Pinus albicaulis | nɨník-aaš |
| +Pine, lodgepole | Pinus contorta v. latifolia | kalám-kalam |
| *+Pine, ponderosa | Pinus ponderosa | táp'aaš |
| +Douglas fir | Pseudotsuga menziesii | pat'átwi |
| Pacific yew | Taxus brevifolia | wawanins |
| +Cedar | Thuja plicata, Chamaecyparis nootkatensis | nank |
| +Hemlock | Tsuga heterophylla, T. mertensiana | waqutqut-yáy |
| +Quaking aspen | Populus tremuloides | niní |
| +Black cottonwood | Populus tricocarpa | xpxp |
| **Garry oak/White oak* | *Quercus garryana* | *č'unips* |
| SHRUBS | | |
| +Maple | Acer circinatum, A. glabrum v. douglasii | twanúwaaš |
| +Big leaf maple | Acer macrophyllum | šq̓ɨmš |
| **Serviceberry* | *Amalanchier alnifolia* | *ččáa* |
| +Kinnikinnick | Arctostaphylos uva-ursi, A. Nevadensis | ɨlɨ́k |
| *+Oregon-grape* | *Berberis aquifolium* | *ɬk̓áwk̓aw* |
| | *B. nervosa, B. repens* | *ɬk'auk'au* |
| +Snowbrush ceanothus | Ceanothus velutinus | wíčak̓x̣ |
| +Rabbitbrush | Chrysothamnus nauseosus, C. viscidiflorus | psx̣ú |
| +Western pipsissewa | Chimaphila umbellata | tanux̣it-pamá |
| +Pacific dogwood | Cornus nutallii | |
| +"Red willow"/dogwood | Cornus stolonifera | lucʼaní, luʼca-ní |

| Common Name | Scientific Name | Warm Springs Sahaptin |
|---|---|---|
| _*+Wild hazelnut_ | _Corylus cornuta_ | _kkúuš_ |
| *+Hawthorne | Crataegus douglassii | šnḿ-aašu |
| *+Salal | Gaultheria shallon | niq'ul |
| +Ocean spray | Holodiscus discolor | piłwayč-pamá |
| +Juniper | Juniperous occidentalis | puuš |
| +*Black twinberry | Lonicera involucrata | miya waxmi tkwátat |
| +Fools huckleberry | Menziesia ferruginea | |
| Devil's Club | Oplopanax horridum | šqapqápnu-waaš |
| +Mock-orange | Philadelphus lewesii | sáxi |
| +Bitter cherry | Prunus emarginata | ɨsníps |
| _*Chokecherry_ | _Prunus virginiana_ | _tḿš / tḿšaš_ |
| +Cascara | Rhamnus purshiana | att'itas |
| +Sumac | Rhus glabra | tantɨ́t |
| _*Currant, gooseberry_ | _Ribes aureum,_ | _xń_ |
| | _R. cereum, R. lacustre, R. sanguineum_ | _pínus-aaš_ |
| _+*Rose_ | _Rosa nutkana, R. gymnocarpa_ | _šk'apašwai_ |
| _*Thimbleberry_ | _Rubus parviflorus_ | _atunatúna_ |
| *+Salmonberry | Rubus spectabilis | |
| _*Blackberry_ | _Rubus ursinus, Rubus spp._ | _wisík_ |
| _+Willow_ | _Salix exigua, Salix spp_ | _t́xš_ |
| _*Elderberry_ | _Sambucus cerulea_ | _mt'paaš_ |
| *+Sitka Mountain ash | Sorbus sitchensis | iłbaumax̣ |
| +Snowberry | Symphoricarpos mollis, S. albus | sax̣i-wáakuł |
| +Spiraea | Spiraea densiflora, Spiraea betulifolia | sax̣isax̣iwáakuł |
| *Black huckleberry | Vaccinium alaskaense | wíwnu |
| _*Dwarf huckleberry_ | _V. caespitosum_ | _wiwlúwiwlu_ |
| *Mountain huckleberry | V. deliciosum | ililmuk |
| ?Bog blueberry | V. occidentale | |
| _*Blue huckleberry_ | _V. ovalifolium, V. membranaceum_ | _wíwnu_ |
| *Cranberry | V. oxycoccos | yuxpas |
| *Red huckleberry | V. parvifolium | lúča-luča, wíwnu |
| *Grouseberry | V. scoparium | ník'uł |
| +Highbush cranberry | Viburnum edule | |
| FORBS | | |
| _+Yarrow_ | _Achillea millefolium_ | _wápnwapn_ |
| +Vanilla leaf | Achlys triphylla | čltpamá |
| +Maidenhair fern | Adiatum pedatum | |
| +Horsemint | Agastache urticifolia v. urticifolia | |
| _*Wild onion_ | _Allium acuminatum, Allium spp_ | _šámamui_ |
| Anemone | Anemone deltoidea, A. oregana | |
| Pussytoes | Antennaria luzuloides | ik ikáwas |
| +Arnica | Arnica cordifolia, A. latifolia, A. mollis | |
| _+Indian Hemp/dogbane_ | _Apocynum sibiricum, A. androsaemifolium_ | _tx̣ws_ |
| Wild ginger | Asarum caudatum | |
| _*Balsamroot sunflower_ | _Balsamorhiza careyana, B. sagitatta_ | _púšxaš_ |
| _*"Buttons"_ | _Brodiaea hyacinthina, B. howellii_ | _sɨ'x̣ws_ |
| _*Cat's ears_ | _Calochortus macrocarpus, C. subalpinus_ | _nunás_ |

| Common Name | Scientific Name | Warm Springs Sahaptin |
|---|---|---|
| **+Scarlet paintbrush** | Castilleja miniata, C. parviflora | nawinała |
| **+Cohosh** | Cimicifuga laciniata | |
| **Thistle** | all Circium species | qut-qút |
| ***Indian potato** | Claytonia lanceolata | anipáš |
| **+Clematis** | Clematis ligusticifolia | tamqikskúla |
| **Queencup/Beadlily** | Clintonia uniflora | |
| **Goldenthread** | Coptis laciniata | |
| **+Bunchberry dogwood** | Cornus canadensis | |
| **Bleeding heart** | Dicentra formosa | |
| **Foxglove** | Digitalis purpurea | |
| ***+Woodfern** | Dryopteris austriaca | |
| **Fireweed** | Epilobium angustifolium | |
| **+Horsetail** | Equisetum spp | siikʷ-siikʷ |
| **Stork's bill** | Erodium cicutarium | |
| ***Avalanche/Fawn lily** | Erythronium grandiflorum, E. montanum, E. oregonum | |
| ****Wild strawberry*** | ***Fragaria vesca v. bracteata, F. virginiana v. platypetela*** | ***suspán*** |
| ****Yellowbell/Choc. lily*** | ***Fritillaria pudica, F. lanceolata*** | ***skní*** |
| **Bedstraw** | Galium triflorum, Gallium spp | tišx̱panú, lust̓a-lúst̓a |
| **Old man's whiskers** | Geum triflorum | suspan-wáakut |
| **+Gum plant** | Grindelia spp | |
| ***Cow's parsnip** | Heracleum lanatum | tx̱u |
| **Hawkweed** | Hieracium albiflorum, H. albertinum | |
| **St. Johnswort** | Hypericum perforatum | |
| **+Oregon Iris** | Iris tenax | |
| ***Lovage** | Ligusticum canbyi, L. grayi | áyun |
| ***Tiger lily** | Lilium columbianum | paanát |
| ***+*Skunk cabbage*** | ***Lysichitum americanum*** | ***watiptíp*** |
| ***Indian celery & roots** | Lomatium canbyi | lúkš |
| | L. dissectum | čalúkš |
| | L. grayi (L. suskdorfii) | áyun/latítlatit |
| | L. macrocarpum | puła |
| | L. nudicaule | xamsí |
| | L. piperi | mámn |
| | L. triternatum (formerly used as food) | |
| **+Tallcup lupine** | Lupinus caudatus | wapiuat̓á |
| ***+Wild mint*** | ***Mentha arvensis*** | ***šuxwašúxwa*** |
| ***False dandelion** | Microseris troximoides | mič̓úna |
| **+Mountain monardella** | Monardella odoratissima | waas |
| ***+Miner's lettuce** | Montia perfoliata, M. parvifolia, M. siberica | |
| ***Yellow pond lily** | Nuphar polysepalum | kalamát |
| **Oregon oxalis** | Oxalis oregana | |
| **+Penstemon** | Penstemon humilis, P. euglaucas | |
| ****Indian carrot/yampah*** | ***Perideridia gairdneri*** | ***sawítk*** |
| **+Spreading phlox** | Phlox diffusa | mccpła |
| **Plantain** | Plantago major | |
| ***Knotweed** | Polygonum bistortoides | k̓usí-k̓usi |
| **Self Heal** | Prunella vulgaris v. vulgaris | |

| Common Name | Scientific Name | Warm Springs Sahaptin |
|---|---|---|
| +Bracken fern | Pteridium aquilinum | č'aláča |
| Yerba buena | Satureja douglassii | |
| *Stonecrop | Sedum stenopetalum, S. oregonum | kɨ́tu wayx̣ti-ɬá |
| False Solomon's seal | Smilacina racemosa, S. stellata | |
| Goldenrod | Solidago canadensis v. salebrosa | |
| Twisted stalk | Streptopus amplexifolius | |
| Dandelion | Taraxacum officinale, Taraxacum spp | |
| Foamflower | Tiarella trifoliata v. unifoliata | |
| +Salsify | Tragopogon dubius | |
| +Trillium | Trillium ovatum | sapanicá |
| **Cattail* | *Typha latifolia* | *šč'iu* |
| Nettle | Urtica dioica v. lyallii | alaˀála |
| +Valerian | Valeriana sitchensis | |
| +False helibore | Veratrum californicum, V. viride | mimún |
| Mullein | Verbascum thapsus | wasikayk-lá |
| Wild violet | Viola glabella, v. orbiculata | |
| *Mule's ears | Wyethia amplexicaulis | piipii (piipípi) |
| +Beargrass | Xerophyllum tenax | yai |
| GRASS/SEDGE/RUSH | | |
| *Bluebunch wheatgrass | Agropyron spicatum | waskú |
| *Bromes | Bromus carinatus, B. vulgaris | waskú |
| *Idaho fescue | Festuca idahoensis | waskú |
| +Sedge | Carex spp | |
| *Parry's Rush | Juncus parryi | |
| LICHENS | | |
| **Black tree lichen* | *Bryoria fremontii* | *k'unč* |
| *+Wolf lichen* | *Letharia vulpina* | *támkɨmkɨ* |
| +Lung lichen | Lobaria pulmonaria | |

## *REFERENCES*

Castleman, Michael. 1991. The Healing Herbs. Rodale Press, Emmaus PA.

French, Kathrine, and Hajda, Yvonne. 1995. "An Ethnographic Study of the Mt. Hood National Forest, Oregon." Archaeological Investigations Northwest, Inc. Report No. 86

French, David, and French, Katherine. 1989 "Warm Springs Sahaptin Medicinal Plants", A Summary (Preliminary Version) Reed College, Portland OR.

Helliwell, Richard. 1988 "Forest Plants of The Warm Springs Indian Reservation"

Helliwell, Richard. 1989 "Important Traditional Plants of the Warm Springs Indian Reservation" Warm Springs Culture and Heritage Program

Helliwell, Richard. 1988 "Preliminary Plant Term List: Warm Springs Sahaptin, Wasco, and Paiute"

Helliwell, Richard. 1987 "The Preservation and Management of Cultural Plants on the Warm Springs Indian Reservation; A Proposal"

Hitchcock, C.L., and Cronquist A. 1973 Flora of the Pacific Northwest. University of Washington Press, Seattle WA.

Hunn, Eugene S., and French, David H. 1981 "Lomatium: A Key Resource for Columbia Plateau Native Subsistence" Northwest Science Magazine, Volume 55 #2, May 1981, pp 87-94

Hunn, Eugene S. 1990 Nch'i-Wana, "The Big River": Mid Columbia Indians and Their Land. University of Washington Press, Seattle.

Hutchens, Alma R. 1991 Indian Herbology of North America. Shambhala, Boston & London

Kirk, Donald R. 1970. Wild Edible Plants of Western North America. Naturegraph Publishers, Happy Camp, CA.

Lewis, W.H., and Elvin-Lewis, M.P.H. 1977 Medical Botany: Plants Affecting Man's Health. A Wiley-Interscience Publication, New York.

Mahar, Michael J. 1953 "Ethnobotany of the Oregon Paiutes of The Warm Springs Reservation" A Thesis to the Division of History and Social Science, Reed College

Martin, Gary J. 1995 Ethnobotany. A People and Plants Conservation Manual. Chapman and Hall, London

Moore, Michael. 1993 Medicinal Plants of the Pacific West. Red Crane Books, Sante Fe NM

Murdock, George P. 1980 "The Tenino Indians". Ethnology 19:129-149

Turner, Nancy J., et al. Thompson Ethnobotany: Knowledge and Usage of Plants by the Thompson Indians of British Columbia. Memoir No. 3, Royal British Columbia Museum. pp 70-76

Zukar, Hummel, Hogfoss. 1983 Oregon Indians: Culture, History, & Current Affairs. Western Imprints, The Press of the Oregon Historical Society.

USDA Forest Service, 1989. "Rural Development Opportunities in Special Forest Products", Cooperative Forestry, Washington DC

USDA, Hopkins, William E., and Rawlings, Robert C. 1985 Major Indicator Shrubs and Herbs on National Forests of Eastern Oregon. USDA Forest Service, Pacific Northwest Region, R-6-TM-190-1985

USDA, Lesher, Robin D., and McClure, Richard H. Jr. 1986 Major Indicator Shrubs and Herbs on National Forests of Western Oregon and Southwestern Washington. USDA Forest Service, Pacific Northwest Region, R6-TM-229-1986

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# *NOXIOUS WEED REPORT*

## EAST & MIDDLE FORKS OF THE HOOD RIVER WATERSHED ANALYSIS

Prepared by: Heather Laub, Botanist
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Mt. Hood National Forest
May 20, 1996

Of the four issues identified, noxious weeds predominantly relate to the one dealing with the quantity and distribution of late-seral habitat and its affected dependent species. Native plant communities in the East and Middle Forks of the Hood River watersheds are in jeopardy from the invasion and expansion of noxious weed populations. Of the state list of noxious weeds, these watersheds contain 12 designated weeds (Noxious Weed Policy and Classification System, 1995).

| Common Name | Scientific Name |
|---|---|
| Bull Thistle | Cirsium vulgare |
| Canada Thistle | Cirsium arvense |
| Diffuse knapweed | Centaurea diffusa |
| Meadow knapweed | Centaurea pratensis |
| Scotch broom | Cytisus scoparius |
| Spotted knapweed | Centaurea maculosa |
| St. Johnswort | Hypericum perforatum |
| Tansy ragwort | Senecio jacobaea |
| Yellow starthistle | Centaurea solstitialis |
| Yellow toadflax | Linaria vulgaris |
| Purple loosestrife | Lythrum salicaria |
| Houndstongue | Cynoglossum officinale |

These weeds have been found along all of the major roadways and are present in most of the timber sale units harvested within the last 20 years (Noxious Weed Survey and Inventory, 1993). Currently, the invasion rate of noxious weeds is greater than control efforts mainly due to insufficient funding at both the state and federal levels.

Noxious weeds can reduce plant community's capability to produce forest products such as herbs, mushrooms, and wood by out-competing the native plants. These weeds have been proven to hoard nutrients and moisture, secrete allelopathic substances, produce vast amounts of seeds, spread vegetatively, and create generally unfavorable conditions for the growth of other plants. Some plants not classified as "noxious" weeds also warrant control due to their aggressive growth in sensitive areas such as Bird's foot trefoil (*Lotus corniculatus*) in the Mount Hood and Hood River Meadows area.

A priority for control in the East Fork watershed are the populations of Spotted and Diffuse knapweeds (*Centaurea maculosa and C. diffusa*) on Surveyor's ridge which are degrading habitat for the sensitive plants *Arabis sparsiflora* var. *atrorubens* and *Lomatium watsonii*. High recreation volume tends to continue the spread of these weeds along the roads and trails. The powerlines near Bald Butte also provide a corridor for the spread of noxious weeds. Herbicides have been used in the powerline corridor in the past and the effects on the noxious weed populations and on the nearby sensitive plants are unstudied.

The forest noxious weed program is an integrated approach using a variety of control techniques that include biological, manual, mechanical, prescribed fire, and cultural treatments. Currently, biological control agents have been released for Tansy ragwort (*Senecio jacobaea*), Scotch broom (*Cytisus scoparius*), Spotted knapweed (*Centaurea maculosa*), and St. Johnswort (*Hypericum perforatum*). The Hood River Ranger District has contracted Hood River County to do annual inventories, and manual and mechanical control of their noxious weeds. By regulation, herbicides are used only when other methods are ineffective because of their possible negative impacts to human health and to forest ecosystem balance. Highway 35, FS roads 1700 and 4400, and Horsethief Meadows have been selected for herbicide application and are being included in an amendment to the Environmental Assessment for the Management of Noxious Weeds for the Mount Hood National Forest.

Sources of continuing infestation include rock quarries, trails open to horse use, and uncertified seed and straw used for erosion control. Transportation of rock from a weed infested quarry can spread a weed problem into newly disturbed sites such as landings and roads. Eradication of noxious weeds in rock quarries leads to prevention which is the most effective means of control. The feed and manure of horses can carry noxious weed seeds along trail systems and into remote areas where control may be difficult. New noxious weed populations include Houndstongue (*Cynoglossum officinale*) and Yellow starthistle (*Centaurea solstitialis*) which were found for the first time last year on forest land in the East Fork watershed and they pose an immediate threat of spread into the watersheds if not taken care of promptly (Work Report for Hood River County Weed and Pest Control, 1995).

The presence of noxious weeds can also be tied into the issue of declining fish populations in the watersheds via their negative impacts on riparian areas. Bull thistle (*Cirsium vulgare*) and Purple loosestrife (*Lythrum salicaria*) are species which thrive in riparian habitats and have the ability to choke out native plants, fish, and wildlife species. They can be spread by any recreation activity which takes a person from one stream to another such as fishing. Currently, there are no documented sites of Purple loosestrife (*Lythrum salicaria*) on National Forest System Lands, however, it is present in Trout Creek just outside the forest boundary. It has also been found in Neal Creek (Mainstem Hood River Watershed), and along the East Fork Irrigation District Canal. Control of these species poses a problem due to the sensitivity of riparian areas to herbicides.

## *REFERENCES*

Managing Competing and Unwanted Vegetation Final Environmental Impact Statement. USDA Forest Service. Pacific Northwest Region. November 1988.

Survey and Inventory of Noxious Weeds on Mount Hood National Forest conducted by Jerry Igo. 1993.

Work Reports for Hood River County Weed and Pest Control. 1993-1995.

Environmental Assessment for the Management of Noxious Weeds. Mount Hood National Forest. 1994.

Noxious Weed Policy and Classification System. Oregon Department of Agriculture Noxious Weed Control Program. 1995.

W.O. Amendment 2000-95-4 to Forest Service Manual 2080. Noxious Weed Management. 1995.

# R6 SENSITIVE PLANT SPECIES REPORT

## EAST & MIDDLE FORKS OF THE HOOD RIVER WATERSHED ANALYSIS

Prepared by: Susan Nugent, District Botanist
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Mt. Hood National Forest
June 20, 1996

**Attached is a table of R6 Sensitive Plants, and other species of concern, that are known or suspected to occur in the East Fork (EF) and Middle Fork (MF) of the Hood River watersheds. Information regarding management and restoration of documented sites/species in the EF and MF is summarized on pages 3, 4, and 5. Forest Service policy and Mt. Hood National Forest Plan standards and guidelines regarding management of R6 Sensitive Plants follows on page 6.**

## DEFINITIONS AND CRITERIA

The following are acronyms and ranking criteria used in the attached table:

USFS - Regional Forester's List of Region 6 Sensitive plants, specific to the Mt. Hood National Forest (1994 list). Includes species on the Oregon Natural Heritage Data Base List of Rare, Threatened, and Endangered Plants of Oregon (ONHDB).

ONHDB - Oregon Natural Heritage Data Base, December 1995. Although many of the species on the ONHDB list are not included in the Regional Forester's List of Sensitive Plants, the USFS is encouraged to inventory for ONHDB species in order to keep track of population trends and threats to habitat.

List Categories:

1. Taxa that are threatened with extinction or presumed extinct throughout their entire range.
2. Taxa that are threatened with extirpation or presumed extirpated from the state of Oregon.
3. Species for which more information is needed before status can be determined, but which may be threatened or endangered in Oregon or throughout their range.
4. Taxa which are of conservation concern, but are not currently threatened or endangered. This includes taxa which are very rare but are currently secure, as well as taxa which are declining in numbers or habitat but are still too common to be proposed as threatened or endangered.

## LIVERWORTS, MOSSES, LICHENS

Documented (D) and suspected (S) to occur in the East Fork (EF) and Middle Fork (MF) of the Hood River watershed.

| EF | MF | SPECIES | USFS | ONHDB 95 |
|---|---|---|---|---|
| Liverworts: | | | | |
| S | S | Anastrophyllum minutum | | 3 |
| S | S | Chiloscyphus gemniparus | | 1 |
| S | S | Gymnomitrion concinnatum | | 3 |
| S | S | Herbertus aduncus | | 3 |
| S | S | Marsupella concinnatum | | 3 |
| S | S | Marsupella condensata | | 3 |
| S | S | Nardia japonica | | 3 |
| Mosses: | | | | |
| S | S | Conostomum tetragonum | | 3 |
| S | S | Polytricum sphaerothecium | | 3 |
| Lichens: | | | | |
| D | S | Lecanora pringlei | | 3 |
| S | D | Usnea sphacelata | | 2 |

## *VASCULAR PLANTS*

Documented (D) and suspected (S) to occur in the East Fork & Middle Fork Hood River watersheds.

| EF | MF | SPECIES | USFS | ONHDB 95 |
|---|---|---|---|---|
| D | – | Agoseris elata (susp) | R6 Sens. | 2 |
| S | – | Allium campanulatum | | 4 |
| D | – | Arabis furcata | | 4 |
| D | – | Arabis sparsiflora var. atrorubens | R6 Sens. | 2 |
| S | S | Botrychium minganense | R6 Sens. | 2 |
| S | S | Botrychium montanum | R6 Sens. | 2 |
| S | S | Botrychium lunaria | R6 Sens. | 2 |
| S | – | Botrychium pinnatum | R6 Sens | 2 |
| D | S | Calamagrostis brewerii | R6 Sens. | 2 |
| S | S | Calochortus longebarbatus var. longebarbatus | R6 Sens. | 1 |
| S | S | Carex livida | R6 Sens. | 2 |
| S | – | Chaenactis nevii | | 4 |
| S | – | Collomia larsenii | | 4 |
| S | – | Coptis trifolia | R6 Sens. | 2 |
| S | – | Cypripedium montanum | | 4 |
| S | – | Delphinium nuttallii | | 3 |
| S | S | Diphasiastrum complanatum | R6 Sens. | 2 |
| S | – | Hackellia diffusa var. cottoni | | 4 |
| S | S | Huperzia occidentalis | R6 Sens. | 2 |
| S | S | Lewisia columbiana var. columbiana | R6 Sens. | 2 |
| D | – | Lomatium watsonii | R6 Sens. | 2 |
| S | S | Lycopodium annotinum | | 4 |
| S | S | Penstemon barrettiae | R6 Sens. | 1 |
| S | D | Phlox hendersonii | R6 Sens. | 2 |
| S | S | Potentilla villosa var. parviflora | R6 Sens. | 2 -- ex |
| S | – | Scheuchzeria palustris var. americana | R6 Sens. | 2 |
| -- | S | Streptopus streptopoides | R6 Sens. | 2 |
| S | S | Suskdorfia violacea | R6 Sens. | 2 |
| D | S | Synthyris stellata | | 4 |
| S | S | Vaccinium oxycocus | | 4 |
| S | S | Utricularia minor | R6 Sens. | 2 |

## *SUMMARY – R6 Sensitive Plants – Management and Restoration*

There are four R6 Sensitive Plants that are have been documented in the East Fork of the Hood River watershed: Agoseris elata (tall agoseris), Arabis sparsiflora var. atrorubens (sickle-pod rockcress), Calamagrostis breweri (Brewer's reedgrass), and Lomatium watsonii (Watson's lomatium). The known sites of these species in the EF have all been affected by past management activities and have potential for habitat restoration (see FW-175).

Three of the above species (and one "inventory" species on the Oregon Natural Heritage Data Base List) grow along Surveyor's Ridge; the following impacts are currently affecting those species.

### *Impacts and Potential Restoration – Surveyor's Ridge:*

1. Noxious weeds - Napweed is encroaching on habitats in open grassy meadows and gravelly slopes along Surveyor's Ridge. Noxious weeds are displacing sensitive plants and their habitat along the ridge. Areas of dense noxious weed infestation are in ruts made by off-road use ("jeep-tracks" and ATVs), soil disturbance by cattle, horses, and people who use Bald Butte

including the trailhead parking area to Surveyor's Ridge Trail (and Surveyor's Ridge Trail), and the horse camp on road 17.

2. **Recreation and/or Powerline Maintenance** - There is evidence of off-road compaction, soil displacement, and vegetation damage to a sensitive plant site under the powerlines near Bald Butte.
3. **Recreation** - There is an undeveloped road that leads to the top of Bald Butte, where there is a sensitive plant site. Hang-gliders and recreationists use the road to reach the summit. There is evidence of compaction by off-road use and camping in sensitive plant habitat.
4. **Cattle** - There is evidence of manure concentrations and trampling in sensitive plant habitat along Surveyor's Ridge. The area of highest concern is near Bald Butte.

**Potential Restoration** - Handpull weeds in areas of highest concern. Decompact soils in habitat. Install a barrier to discourage off-road use. Omit habitat areas from open range grazing allotments. Conduct an intensive public awareness campaign by providing educational material at the trailhead that discusses the above problems, potential solutions, and pertinent restoration projects in the area.

Details for restoration will be developed on a site-specific basis and should be coordinated at an interdisciplinary level. Input from a range specialist and a representative from BPA should be included in restoration plans.

### *Impacts and Potential Restoration - Brooks Meadow:*

1. **Past Management Practices** - There is one known site of a R6 Sensitive Plant in Brooks Meadow. Currently this area is within The Dalles Watershed and is provided protection by law. However, past management activities allowed a road (with aggregate) to be constructed through the meadow. The drainage of the meadow appears to have been diverted by the road. The meadow is also being encroached upon by conifers.

**Potential Restoration** - There may be potential for restoration of the meadow by removing the road. A detailed plan should adequately address the benefits of mechanical vs. natural restoration. The reintroduction of fire should also be analyzed for potential restoration. A detailed restoration plan should be developed by an interdisciplinery team that includes a fire ecologist.

### *Impacts and Potential Restoration - Mt. Hood Meadows*

1. **Recreation** - There are several known sites of a R6 Sensitive Plant in the Mt. Hood Meadows Permit Area. This is the only known location for this plant in the EF and MF of the Hood River watershed. There are pedestrian impacts along the Timberline trail that are not directly related to ski area development activities. Pedestrian impacts are of highest concern near the junction of Timberline Trail and Umbrella Falls Trail where the trail crosses through a wide seep area. Erosion and devegetation is exacerbated when pedestrians walk around the wet area in order to avoid the mud.
2. **Past Management Practices** - The Texas Ski Lift was installed in the 1970's and removed in 1995. A known site at the old location of the Texas Lift needs an intensive revegetation plan to restore it to a more natural condition. Past impacts to this site include devegetation, soil compaction, erosion and the elimination of habitat by construction of a road and ski terminal structure.

**Potential Restoration** - A detailed restoration plan should be developed by an interdisciplinery team with input from an alpine ecologist and landscape architect. The plan should address decompaction of soils, rerouting of streams, rock crossings at trail junctions, and mimicking the natural composition of plant communities in the vicinity of revegetation projects.

## *FS SENSITIVE SPECIES POLICY AND MANAGEMENT DIRECTION*

A. "Habitat for threatened, endangered, and sensitive plants and animals shall be protected and/or improved", (FW-175).

B. "Avoid actions which may cause a species to become threatened or endangered.", (FSM 2670.12-3)

C. "Avoid or minimize impacts to species whose viability has been identified as a concern.", (FSM 2670.32-2)

D. "If impacts cannot be avoided, analyze the significance of potential adverse effects on the population or its habitat within the area of concern and on the species as a whole. (The line officer, with project approval authority, makes the decision to allow or disallow impact, but the decision must not result in loss of species viability or create significant trends toward Federal listing.), (FSM 2670.32-4)

The Following Tables and Figures contain information about the East Fork and Middle Fork Hood River Watersheds, acreage breakdowns, and Forest Plan allocations. The information provides a reference for land managers on specific watershed characteristics.

Table 1. - Breakdown of Subwatersheds Acreage.

| Subwatershed | Private Land (Acres) | National Forest Land (Acres) | Total Acres |
|---|---|---|---|
| East Fork Hood River Watershed | | | |
| Upper East Fork Hood River | | 8,088 | 8,088 |
| Meadows Creek | | 1,112 | 1,112 |
| Clark Creek | | 2,263 | 2,263 |
| Newton Creek | | 2,071 | 2,071 |
| Robinhood Creek | | 2,078 | 2,078 |
| East Fork Hood River | 94 | 5,728 | 5,822 |
| Culvert Creek | | 1,028 | 1,028 |
| Cold Spring Creek | | 5,819 | 5,819 |
| Polallie Creek | | 2,898 | 2,898 |
| Tilly Jane Creek | 386 | 2,495 | 2,881 |
| Lower East Fork Hood River | 14,083 | 2,693 | 16,776 |
| Crystal Springs | 1,149 | 729 | 1,878 |
| Dog River | 262 | 7,870 | 8,132 |
| Rimrock Creek | 154 | 462 | 616 |
| Yellowjacket Creek | 164 | 701 | 865 |
| Evans Creek | 4,026 | 1,168 | 5,194 |
| Trout Creek | 3,991 | 721 | 4,712 |
| Total East Fork Watershed Acres | 24,309 | 47,924 | 72,233 |
| Middle Fork Hood River Watershed | | | |
| Clear Branch | | 4,172 | 4,172 |
| Pinnacle Creek | | 1,621 | 1,621 |
| Coe Branch | | 4,214 | 4,214 |
| Eliot Branch | | 2,457 | 2,457 |
| Middle Fork Hood River | 4,025 | 2,084 | 6,109 |
| Bear Creek | | 3,519 | 3,519 |
| Tony Creek | 3,540 | 3,008 | 6,548 |
| Total Middle Fork Watershed Acres | 7,565 | 21,075 | 28,640 |
| Total Acres Within Both Watersheds | 31,874 | 68,999 | 100,873 |

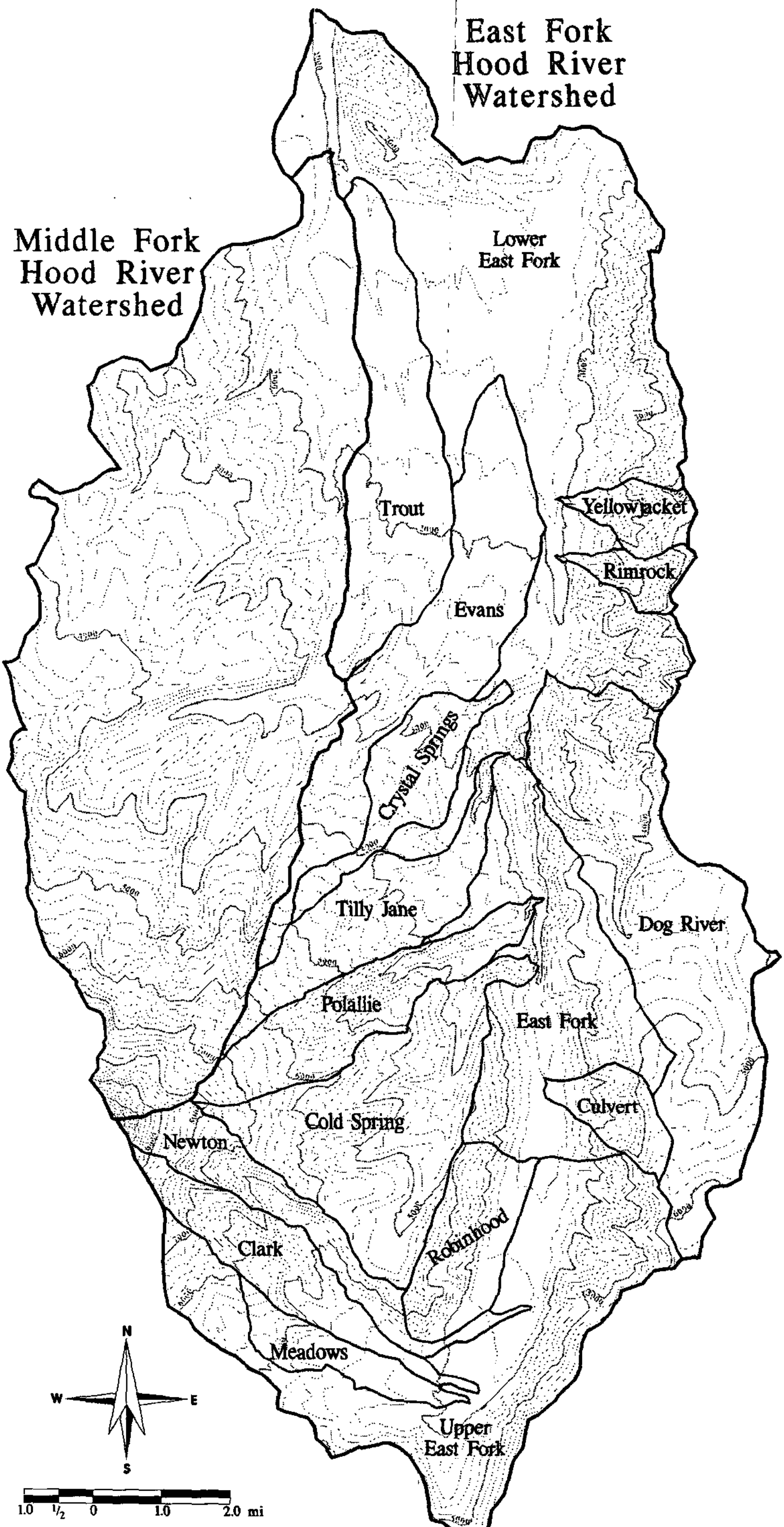


Figure 1. - East Fork Hood River Subwatersheds

Table 2. - Highlighted Characteristics of the East Fork Hood River Subwatersheds.

| Subwatershed | Physical & Human Characteristics | Geomorphological Characteristics |
|---|---|---|
| Upper East Fork Hood River | **Physical Features:** Mt. Hood, Umbrella Falls, Bennett Pass, Sahalie Falls, Gumjuwac Saddle, Gunsight Butte, Surveyors Ridge.<br>**Elevational Range:** 3320' - 7900'<br>**Infrastructure:** Mt. Hood Meadows Ski Area (portion) & Lodge, Highway 35, Robinhood Campground.<br>**Road mi/mi$^2$:** 2.72<br>**Human Uses:** riving for scenery, Nordic and Downhill skiing, Snowmobiling, Hiking & Mt. Bike Riding, Timber Harvest, Subsistence, Gathering, Hunting, Dispersed Camping, Climbing, Mountaineering, Backpacking. | **Hydrology:** Headwaters of the East Fork of the Hood River. Non-glacial. Rain-on-snow zone. Origin - spring on the southeastern slopes of Mt. Hood. Mt. Hood Meadows Waste Water Treatment Facility.<br>**Stream mi/mi$^2$:** 3.79<br>**Vegetation:** Alpine & Subalpine in higher elevations on Mt. Hood transitioning to Pacific Silver fir stands along the eastern portion of the subwatershed.<br>**Special Habitats:** Stringer Meadows, Horsethief Meadow, peregrine falcon cliff sites. |
| Meadows Creek | **Physical Features:** Mt. Hood.<br>**Elevational Range:** 3880' - 6040'<br>**Infrastructure:** Mt. Hood Meadows Ski Area (portion) and lower parking lot, Highway 35, State gravel storage area.<br>**Road mi/mi$^2$:** 3.38<br>**Human Uses:** Driving for scenery, Nordic and Downhill skiing, Snowmobiling, Hiking & Mt. Bike Riding, Berry Picking, Hunting, subsistence, climbing, mountaineering, backpacking. | **Hydrology:** Non-glacial. Rain-on-snow zone. Origin - spring(s) and snow pack on the southeastern slopes of Mt. Hood.<br>**Stream mi/mi$^2$:** 3.74<br>**Vegetation:** Subalpine in higher elevations on Mt. Hood transitioning to moist site Hemlock / Pacific Silver fir stands near the confluence with the East Fork Hood River.<br>**Special Habitats:** Hood River Meadows, Teacup Lake. |
| Clark Creek | **Physical Features:** Mt. Hood, Newton Clark Glacier.<br>**Elevational Range:** 3840' - 10,280'<br>**Infrastructure:** Mt. Hood Wilderness (portion), Mt. Hood Meadows Ski Area (portion), Highway 35.<br>**Road mi/mi$^2$:** 0.58<br>**Human Uses:** Driving for scenery, Nordic and Downhill skiing, Hiking, Timber Harvest. | **Hydrology:** Glacial (one of two glacial streams in East Fork Hood River Watershed). Rain-on-snow zone. Origin - Newton Clark Glacier.<br>**Stream mi/mi$^2$:** 4.46<br>**Vegetation:** Alpine & Subalpine in higher elevations on Mt. Hood transitioning to moist site Hemlock / Pacific Silver fir stands near the confluence with the East Fork Hood River.<br>**Special Habitats:** Krumholtz |
| Newton Creek | **Physical Features:** Mt. Hood, Newton Clark Glacier, Gnarl Ridge, Lamberson Butte, Elk Mountain.<br>**Elevational Range:** 3600' - 11,235'<br>**Infrastructure:** Mt. Hood Wilderness (portion), Highway 35.<br>**Road mi/mi$^2$:** 0.25<br>**Human Uses:** Driving for scenery, Nordic skiing, Hiking, Climbing, Mountaineering, Backpacking. | **Hydrology:** Glacial (one of two glacial streams in East Fork Hood River Watershed). Rain-on-snow zone. Origin - Newton Clark Glacier.<br>**Stream mi/mi$^2$:** 3.09<br>**Vegetation:** Alpine & Subalpine in higher elevations on Mt. Hood transitioning to moist site Hemlock / Pacific Silver fir stands near the confluence with the East Fork Hood River.<br>**Special Habitats:** |

| Subwatershed | Physical & Human Characteristics | Geomorphological Characteristics |
|---|---|---|
| Robinhood Creek | Physical Features: Elk Mountain, Bluegrass Ridge.<br>Elevational Range: 3320' - 5608'<br>Infrastructure: Robinhood Quarry.<br>Road mi/mi$^2$: 1.83<br>Human Uses: Hiking, Nordic Skiing. | Hydrology: Non-glacial. Rain-on-snow zone. Origin - spring on the southeastern slopes of Mt. Hood near Elk Mountain.<br>Stream mi/mi$^2$: 3.71<br>Vegetation: Moist site Hemlock / Pacific Silver fir stands near the confluence with the East Fork Hood River.<br>Special Habitats: Springs |
| East Fork Hood River | Physical Features: Bluegrass Ridge.<br>Elevational Range: 2360' - 5388'<br>Infrastructure: Highway 35, Forest Service road 44, Sherwood Campground, Little John Snow Park, Nottingham Dispersed Campsite, Routson County Park Campground.<br>Road mi/mi$^2$: 2.87<br>Human Uses: Driving for scenery, Camping, Snowmobiling, Hiking & Mt. Bike riding, Hunting. | Hydrology: Non-Glacial. Rain-on-snow zone. Origin - continuation of East Fork Hood River.<br>Stream mi/mi$^2$: 2.84<br>Vegetation: Primarily mid-elevation riparian vegetation. Uplands range from Pacific Silver fir & Grand fir stands to open rocky & talus slopes with some Ponderosa pine stands.<br>Special Habitats: Horkelia Meadow, peregrine falcon cliff sites. |
| Culvert Creek | Physical Features: Surveyors Ridge.<br>Elevational Range: 3190' - 5860'<br>Infrastructure: Highway 35, Forest Service road 44.<br>Road mi/mi$^2$: 2.80<br>Human Uses: Driving for scenery, Snowmobiling. | Hydrology: Non-Glacial. Rain-on-snow zone. Origin - Spring on eastern slopes of East Fork Hood River Watershed.<br>Stream mi/mi$^2$: 2.61<br>Vegetation: Tending towards the dry site stands of Grand fir, Douglas fir, and Ponderosa pine.<br>Special Habitats: |
| Cold Spring Creek | Physical Features: Mt. Hood, Lamberson Butte, Elk Mountain, Bluegrass Ridge, Tamanawas Falls.<br>Elevational Range: 2960' - 8580'<br>Infrastructure: Mt. Hood Wilderness (portion).<br>Road mi/mi$^2$: 0.01<br>Human Uses: Hiking, Dispersed Camping, Horse Camping. | Hydrology: Non-Glacial. Rain-on-snow zone. Origin - springs on eastern slopes of Mt. Hood.<br>Stream mi/mi$^2$: 3.16<br>Vegetation: Alpine & Subalpine types in the higher elevations on Mt. Hood transitioning to Pacific Silver fir stands near the confluence with the East Fork Hood River.<br>Special Habitats: Elk Meadows. |
| Polallie Creek | Physical Features: Mt. Hood, Cooper Spur.<br>Elevational Range: 2840' - 8580'<br>Infrastructure: Mt. Hood Wilderness (portion), Cloud Cap / Tilly Jane Historic Area (portion), Cooper Spur Ski Area (portion), Highway 35.<br>Road mi/mi$^2$: 0.44<br>Human Uses: Driving for scenery, Hiking. | Hydrology: Non-Glacial. Rain-on-snow zone. Origin - springs on northeastern slopes of Mt. Hood. History of debris torrents.<br>Stream mi/mi$^2$: 4.48<br>Vegetation: Alpine & Subalpine types in the higher elevations on Mt. Hood transitioning to Pacific Silver fir stands near the confluence with the East Fork Hood River.<br>Special Habitats: peregrine falcon cliff sites. |

| Subwatershed | Physical & Human Characteristics | Geomorphological Characteristics |
|---|---|---|
| Tilly Jane Creek | **Physical Features:**<br>**Elevational Range:** 2360' - 7080'<br>**Infrastructure:** Mt. Hood Wilderness (portion), Cloud Cap / Tilly Jane Historic Area (portion), Tilly Jane Campground, Cloud Cap Inn, Cooper Spur Winter Sports Area (portion) & Lodge.<br>**Road mi/mi$^2$:** 2.47<br>**Human Uses:** Hiking, Downhill skiing, Camping, Mt. Bike Riding, Horse Riding, Off-Road-Vehicles, Human habitation, Sight seeing. | **Hydrology:** Non-Glacial. Rain-on-snow zone. Origin - springs on northeastern slopes of Mt. Hood.<br>**Stream mi/mi$^2$:** 3.97<br>**Vegetation:** Alpine & Subalpine types in the higher elevations on Mt. Hood transitioning to Pacific Silver fir & Grand fir stands near the confluence with the East Fork Hood River.<br>**Special Habitats:** |
| Lower East Fork Hood River | **Physical Features:** Shellrock Mountain, Bald Butte, Surveyors Ridge, Middle Mountain (portion), Dee, Wide upper Hood River Valley.<br>**Elevational Range:** 760' - 4444'<br>**Infrastructure:** Highway 35, Toll Bridge County Park, Bonneville Power Administration transmission line corridor, Hood River Ranger Station (USDA Forest Service), East Fork Irrigation District, Extensive Road Network, Dee Waste Water Treatment Facility, Three communities: Parkdale, Mt. Hood, and Dee.<br>**Road mi/mi$^2$:** 2.92<br>**Human Uses:** Driving for scenery, Irrigation diversion & ditch, Camping & picnicking, Human habitation, Fruit orchards, Industry (Lumber manufacturing, Fruit Production, etc.) Intensive timber management on non-federal lands, Grazing on Long Prairie Allotment. | **Hydrology:** Non-Glacial. Rain-on-snow zone. Origin - continuation of the East Fork Hood River. The confluence of East Fork and Middle Fork to form the Main Stem Hood River.<br>**Stream mi/mi$^2$:** 2.97<br>**Vegetation:** Primarily drier sites of Lodgepole pine, Grand fir, Douglas fir, and Ponderosa pine. Extensive fruit orchards and other agriculture in valley bottom.<br>**Special Habitats:** Surveyors Ridge Late-Successional Reserve, Larch Mountain Salamander habitat, peregrine falcon cliff sites. |
| Crystal Springs | **Physical Features:** Weygandt Canyon, Crystal Spring.<br>**Elevational Range:** 2200' - 5000'<br>**Infrastructure:** Cloud Cap Tilly Jane Historic Area (portion), Highway 35, Crystal Springs Water District Diversion.<br>**Road mi/mi$^2$:** 3.42<br>**Human Uses:** Driving for scenery, Human habitation, Domestic Water Supply. | **Hydrology:** Non-Glacial. Rain-on-snow zone. Origin - spring on the northeastern slopes of Mt. Hood.<br>**Stream mi/mi$^2$:** 2.60<br>**Vegetation:** Primarily drier sites of Lodgepole pine, Grand fir, and Douglas-fir.<br>**Special Habitats:** |

| Subwatershed | Physical & Human Characteristics | Geomorphological Characteristics |
|---|---|---|
| Dog River | **Physical Features:** Lookout *Mountain* (portion), Surveyors Ridge. **Elevational Range:** 2080' - 6400' **Infrastructure:** Highway 35, Forest Service road 44, Badger Wilderness (portion), The City of The Dalles Watershed (portion), The City of The Dalles water diversion & aqueduct. **Road mi/mi$^2$:** 2.36 **Human Uses:** Driving for scenery, Hiking, Snowmobiling, Municipal Water Supply (the City of The Dalles). | **Hydrology:** Non-Glacial. Rain-on-snow zone. Origin - spring on slopes of Lookout Mountain. **Stream mi/mi$^2$:** 2.01 **Vegetation:** Subalpine fir & Pacific Silver fir in upper elevations transitioning to drier type Grand fir, *Douglas-fir & Ponderosa pine.* **Special Habitats:** High Prairie, Cooks Meadow, Brooks Meadow. |
| Rimrock Creek | **Physical Features:** Rim Rock, Surveyors Ridge. **Elevational Range:** 1880' - 4280' **Infrastructure:** Highway 35, Private Hydro-power diversion. **Road mi/mi$^2$:** 0.48 **Human Uses:** Driving for scenery, Grazing on Long Prairie Allotment, Domestic Water, Human Habitation. | **Hydrology:** Non-Glacial. Rain-on-snow zone. Origin - spring below crest of Rim Rock along Surveyors Ridge. **Stream mi/mi$^2$:** 3.68 **Vegetation:** Primarily drier site Douglas fir & Ponderosa pine. **Special Habitats:** Surveyors Ridge Late-Successional Reserve, Rimrock area & meadows, Larch Mountain Salamander habitat, peregrine falcon cliff sites. |
| Yellowjacket Creek | **Physical Features:** Surveyors Ridge. **Elevational Range:** 1800' - 4160' **Infrastructure:** Highway 35. **Road mi/mi$^2$:** 0.85 **Human Uses:** Driving for scenery, Grazing on Long Prairie Allotment, Human Habitation. | **Hydrology:** Non-Glacial. Rain-on-snow zone. Origin - spring below crest of Surveyors Ridge. **Stream mi/mi$^2$:** 4.05 **Vegetation:** Primarily drier site Douglas fir & Ponderosa pine. **Special Habitats:** Surveyors Ridge Late-Successional Reserve. |
| Evans Creek | **Physical Features:** Ghost Ridge, Hutson Gulch. **Elevational Range:** 1560' - 5840' **Infrastructure:** Cloud Cap Tilly Jane Historic Area (portion), Toll Bridge Park Picnic Area, Middle Fork Irrigation Districts Hydro-power Generation Facility, Extensive Road Network. **Road mi/mi$^2$:** 4.87 **Human Uses:** Human habitation, Fruit orchards and Other Agriculture, Intensive timber management on non-federal lands. | **Hydrology:** Non-Glacial. Rain-on-snow zone. Origin - springs on northeastern slopes of Mt. Hood. **Stream mi/mi$^2$:** 2.74 **Vegetation:** Moist sites of Lodgepole pine, Pacific Silver fir, and Hemlock, transitioning to drier sites of Douglas-fir & Grand fir. Extensive fruit orchards. **Special Habitats:** |

| Subwatershed | Physical & Human Characteristics | Geomorphological Characteristics |
|---|---|---|
| **Trout Creek** | **Physical Features**: Parkdale Lava Beds.<br>**Elevational Range**: 1040' - 3080'<br>**Infrastructure**: Parkdale Lava Beds Geological Area, Parkdale Waste Water Treatment Facility, Lava Beds Tree Nursery, Bonneville Power Administration transmission line corridor, Extensive Road Network, Middle Fork Irrigation Districts Hydro-power Generation Facility.<br>**Road mi/mi$^2$**: 4.14<br>**Human Uses**: Human habitation, Fruit orchards, Intensive timber management on non-federal lands. | **Hydrology**: Non-Glacial. Rain-on-snow zone. Origin - spring.<br>**Stream mi/mi$^2$**: 2.35<br>**Vegetation**: Primarily Douglas-fir & Grand fir stands. Extensive fruit orchards.<br>**Special Habitats**: Parkdale Lava Beds Geological Area. |

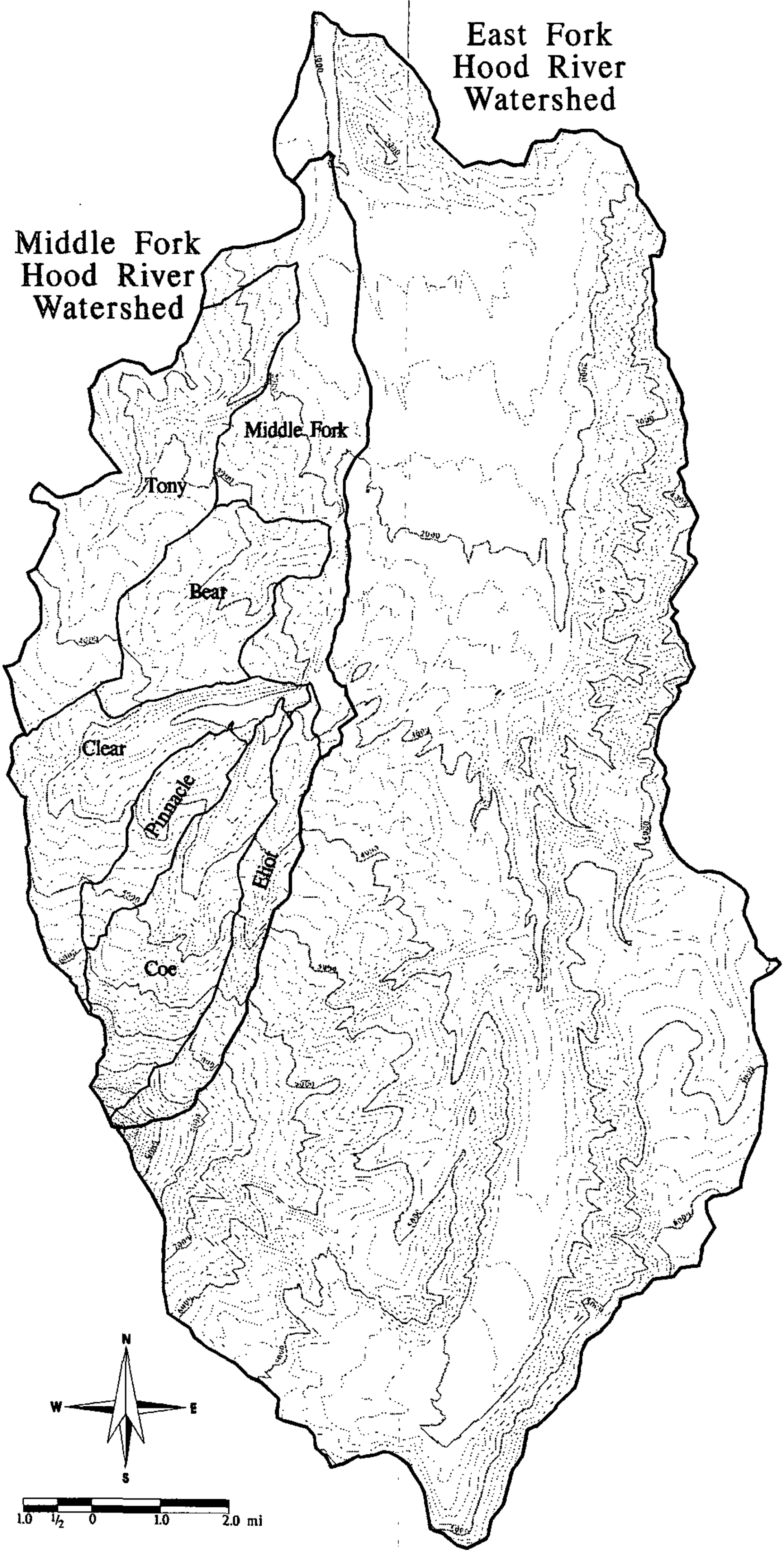


Figure 2. - Middle Fork Hood River Subwatersheds

Table 3. - Highlighted Characteristics of the Middle Fork Hood River Subwatersheds.

| Subwatersheds | Physical & Human Characteristics | Geomorphological Characteristics |
|---|---|---|
| **Clear Branch** | **Physical Features:** Mt. Hood, Barrett Spur, Wyeast Basin, The Pinnacle, Vista Ridge, Perry Lake.<br>**Elevational Range:** 2640' - 7280'<br>**Infrastructure:** Mt. Hood Wilderness (portion), Kinnikinnick Campground, Clear Branch Dam, Middle Fork Irrigation District Diversion.<br>**Road mi/mi²:** 1.16<br>**Human Uses:** Fishing, Picnicking, Hiking, Irrigation diversion & ditch. | **Hydrology:** Non-Glacial. Rain-on-snow zone. Origin - springs on the northern slopes of Mt. Hood.<br>**Stream mi/mi²:** 3.87<br>**Vegetation:** Alpine & Subalpine in higher elevations on Mt. Hood transitioning to Pacific Silver fir stands along the eastern portion of the subwatershed.<br>**Special Habitats:** Perry Lake, Laurance Lake Reservoir. |
| **Pinnacle Creek** | **Physical Features:**<br>**Elevational Range:** 2920' - 6000'<br>**Infrastructure:** Mt. Hood Wilderness (portion), Kinnikinnick Campground.<br>**Road mi/mi²:** 1.80<br>**Human Uses:** Picnicking, Hiking, Nordic Skiing. | **Hydrology:** Non-Glacial. Rain-on-snow zone. Origin - spring on northern slope of Mt. Hood.<br>**Stream mi/mi²:** 2.54<br>**Vegetation:** Alpine & Subalpine in higher elevations on Mt. Hood transitioning to Pacific Silver fir stands along the eastern portion of the subwatershed.<br>**Special Habitats:** |
| **Coe Branch** | **Physical Features:** Mt. Hood, Pulpit Rock, Coe Glacier, Langille Glacier, Stranahan Ridge, Inspiration Point.<br>**Elevational Range:** 2760' - 10,700'<br>**Infrastructure:** Mt. Hood Wilderness (portion), Middle Fork Irrigation Diversion & Ditch.<br>**Road mi/mi²:** 0.70<br>**Human Uses:** Middle Fork Irrigation Diversion (Coe / Eliot ditch), Camping, Hiking, Climbing, Ice Climbing, Nordic Skiing. | **Hydrology:** Glacial (one of two glacial streams in Middle Fork Hood River Watershed). Rain-on-snow zone. Origin - Coe Glacier. The confluence of Coe and Clear Branch to form the Middle Fork Hood River.<br>**Stream mi/mi²:** 3.32<br>**Vegetation:** Alpine & Subalpine in higher elevations on Mt. Hood transitioning to Grand fir / Douglas fir stands along the eastern portion of the subwatershed.<br>**Special Habitats:** Elk Cove, Dollar Lake. |
| **Eliot Branch** | **Physical Features:** Mt. Hood, Eliot Glacier, Langille Crags, Wallalute Falls, Ghost Ridge.<br>**Elevational Range:** 2640' - 11,040'<br>**Infrastructure:** Mt. Hood Wilderness (portion), Cloud Cap Tilly Jane Historic Area (portion), Cloud Cap Saddle Campground.<br>**Road mi/mi²:** 1.00<br>**Human Uses:** Middle Fork Irrigation Diversion (Coe / Eliot ditch), Camping, Ice Climbing, Hiking, Backpacking, Back-Country Skiing, Nordic Skiing, Snowmobiling, Hunting. | **Hydrology:** Glacial (one of two glacial streams in Middle Fork Hood River Watershed). Rain-on-snow zone. Origin - Eliot Glacier.<br>**Stream mi/mi²:** 3.08<br>**Vegetation:** Alpine & Subalpine in higher elevations on Mt. Hood transitioning to Grand fir / Douglas fir stands along the eastern portion of the subwatershed.<br>**Special Habitats:** |

| Subwatersheds | Physical & Human Characteristics | Geomorphological Characteristics |
|---|---|---|
| Middle Fork Hood River | **Physical Features:** Parkdale Lava Beds, Trout Creek Ridge.<br>**Elevational Range:** 960' - 3400'.<br>**Infrastructure:** Parkdale Lava Beds Geological Area, Bonneville Power Administration transmission line corridor, Middle Fork Irrigation Districts Hydro-power Generation Facility.<br>**Road mi/mi²:** 2.90<br>**Human Uses:** Human habitation, Fruit orchards and Other Agriculture, Intensive timber management on federal & non-federal lands, Mt. Bike Riding. | **Hydrology:** Non-Glacial. Rain-on-snow-zone. Origin - Clear Branch, Pinnacle Creek, Coe Branch, Eliot Branch.<br>**Stream mi/mi²:** 2.88<br>**Vegetation:** Primarily drier site Grand fir, Douglas-fir & Ponderosa pine. Extensive fruit orchards in lower elevations.<br>**Special Habitats:** Parkdale Lava Beds Geological Area. |
| Bear Creek | **Physical Features:** File Butte.<br>**Elevational Range:** 2020' - 4450'<br>**Infrastructure:**<br>**Road mi/mi²:** 3.70<br>**Human Uses:** Hunting, Mt. Bike Riding, Intensive timber management on federal & non-federal lands. | **Hydrology:** Non-Glacial. Rain-on-snow zone. Origin - springs.<br>**Stream mi/mi²:** 2.50<br>**Vegetation:** Primarily Douglas-fir & Grand fir.<br>**Special Habitats:** |
| Tony Creek | **Physical Features:** Blue Ridge, File Butte.<br>**Elevational Range:** 1260' - 4880'<br>**Infrastructure:** Bonneville Power Administration transmission line corridor.<br>**Road mi/mi²:** 3.67<br>**Human Uses:** Human habitation, Fruit orchards and Other Agriculture, Intensive timber management on federal & non-federal lands, Irrigation and Domestic Water use. | **Hydrology:** Non-Glacial. Rain-on-snow zone. Origin - springs.<br>**Stream mi/mi²:** 2.65<br>**Vegetation:** Primarily Pacific Silver fir stands.<br>**Special Habitats:** Batts Meadow. |

## *Mt. Hood National Forests Land and Resource Management Plan*

Management direction outlined in the Mt. Hood National Forest's Land and Resource Management Plan is divided into two general categories: *Forestwide* Standards and Guidelines, and *Management Prescriptions* (Standards and Guidelines) for "Management Areas" (MAs). Management Areas are grouped into categories referred to as land allocations.

### *"A" Allocations*

The Middle Fork Hood River and East Fork Hood River watersheds contain four of the twelve "A" land allocations (A2, A4, A9, A11). With the exception of A2 Wilderness, these MAs allow timber harvest to occur as a tool to accomplish primary goals but do not include regulated timber production. In some cases, timber salvage is also allowed.

The Management Goals for these MAs, as outlined in the Mt. Hood National Forests Land and Resource Management Plan, are as follows:

A2 - Wilderness "Promote, perpetuate and preserve the wilderness character of the land; protect watersheds and wildlife habitat; preserve scenic and historic resources; and promote scientific research, primitive recreation, solitude, physical and mental challenge, and inspiration."

A4 - Special Interest Area "Protect and, where appropriate, foster public recreational use and enjoyment of important historic, cultural, and natural aspects of our national heritage. Preserve and provide interpretation of unique geological, biological, and cultural areas for education, scientific, and public enjoyment purposes."

A9 - Key Site Riparian Area "Maintain or enhance habitat and hydrologic conditions of selected riparian areas, notable for their exceptional diversity, high natural quality and key role in providing for the continued production of riparian dependent resource values."

A10 - Developed Recreation Sites "Provide a range of high quality outdoor recreational opportunities for concentrated recreational use at readily accessible, appropriately designed developed sites."

A11 - Winter Recreation Areas "Provide areas for high quality winter recreation (and associated summer) opportunities including: downhill skiing, Nordic skiing, snowmobiling, and snowplay within a natural appearing forest environment."

## *"B" Allocations*

The Middle Fork and East Fork contain seven of the twelve "B" land allocations (B2, B3, B5, B6, B7, B9, B10, B12). These Management Areas have primary goals other than timber production; however, timber production is recognized as a secondary goal. Regulated timber harvest is a planned output.

The Management Goals for these MAs, as outlined in the Mt. Hood National Forests Land and Resource Management Plan, are as follows:

B2 - Scenic Viewsheds "Provide attractive, visually appealing forest scenery with a wide variety of natural appearing landscape features. Utilize vegetation management activities to create and maintain a long term desired landscape character."

B3 - Roaded Recreation "Provide a variety of year-round recreation opportunities in natural appearing roaded settings. A secondary goal is to maintain a healthy forest condition through a variety of timber management practices."

B5 - Pileated Woodpecker / Pine Marten Habitat Area "Provide Forestwide mature or old growth forest habitat blocks of sufficient quality, quantity and distribution to sustain viable populations of pileated woodpecker and pine marten. A secondary goal is to maintain a healthy forest condition through a variety of timber management practices."

B6 - Special Emphasis Watershed "Maintain or improve watershed, riparian, and aquatic habitat conditions and water quality for municipal uses and/or long term fish production. A secondary goal is to maintain a healthy forest condition through a variety of timber management practices."

B7 - General Riparian Area "Achieve and maintain riparian and aquatic habitat conditions for the sustained, long-term production of fish, selected wildlife and plant species, and high quality water for the full spectrum of the Forest's riparian and aquatic areas. A secondary goal is to maintain a healthy forest condition through a variety of timber management practices."

B9 - Wildlife / Visual Area "Provide high quality rearing habitat for elk and other wildlife species while supplying Forest visitors with views of a wide variety of natural appearing landscape features, including meadows, lakes, and valleys. A secondary goal is to maintain a healthy forest condition through a variety of timber management practices."

B10 - Deer and Elk Winter Range "Provide high quality deer and elk habitat for use during most winters. Provide for stable population of mule deer and Rocky Mountain elk on the eastside and blacktailed deer and Roosevelt Elk on the westside of the Cascades. Secondary goals are to maintain a healthy forest condition through a variety of timber management practices and to provide dispersed summer and developed recreation opportunities."

B12 - Backcountry Lakes "Protect or enhance the recreation, fish and wildlife, or scenic values of designated lakes. A secondary goal is to maintain a healthy forest condition through a variety of timber management practices."

## *"C" Allocation*

The Middle Fork and East Fork contain lands within the "C" land allocation (C1). This Management Area has a primary goal of timber production. Regulated timber harvest is a planned output. A myriad of other resource values will also be realized.

The Management Goals for this MA, as outlined in the Mt. Hood National Forests Land and Resource Management Plan, are as follows:

C1 - Timber Emphasis. "Provide lumber, wood fiber, and other forest products on a fully regulated basis, based on the capability and suitability of the land. A secondary goal is to enhance other resource uses and values that are compatible with timber production."

Table 4.'- Mt. Hood Forest Plan Land Allocations by subwatershed. These are primary land allocations that do not account for overlapping allocation acres.

| Subwatershed | Private Land (Acres) | "A" Land Allocations (Acres) | "B" Land Allocations (Acres) | "C" Land Allocations (Acres) | Total Acres |
|---|---|---|---|---|---|
| East Fork Hood River Watershed | | | | | |
| Trout Creek | 3,991 | {A4} 665 | {B2} 56 | | 4,712 |
| Evans Creek | 4,026 | {A4} 260 | {B2} 410 | {C1} 498 | 5,194 |
| Yellowjacket Creek | 164 | | {B2} 692 | {C1} 9 | 865 |
| Rimrock Creek | 154 | | {B2} 462 | | 616 |
| Dog River | 262 | {A2} 200<br>{A4} 35<br>{A9} 69 | {B2} 2,689<br>{B6} 2,578<br>{B10} 129 | {C1} 2,170 | 8,132 |
| Crystal Springs | 1,149 | {A4} 178 | {B2} 526 | {C1} 25 | 1,878 |
| Tilly Jane Creek | 386 | {A2} 133<br>{A4} 658<br>{A11} 1,036 | {B2} 668 | | 2,881 |
| Polallie Creek | | {A2} 2,125<br>{A4} 12<br>{A11} 289 | {B2} 472 | | 2,898 |
| Cold Spring Creek | | {A2} 5,508 | {B2} 311 | | 5,819 |
| Culvert Creek | | | {B2} 1,021<br>{B6} 7 | | 1,028 |
| Robinhood Creek | | {A2} 2<br>{A9} 17 | {B2} 1,315<br>{B9} 744 | | 2,078 |
| Newton Creek | | {A2} 1,839<br>{A11} 2 | {B9} 230 | | 2,071 |
| Clark Creek | | {A2} 618<br>{A5} 2<br>{A11} 1,381 | {B9} 262 | | 2,263 |
| Meadows Creek | | {A4} 104<br>{A11} 479 | {B9} 465<br>{B12} 64 | | 1,112 |
| Upper East Fork Hood River | | {A2} 109<br>{A4} 37<br>{A9} 240<br>{A11} 1,136 | {B2} 2,390<br>{B6} 2<br>{B9} 4,078<br>{B12} 94 | {C1} 2 | 8,088 |
| East Fork Hood River | 94 | {A2} 2<br>{A11} 20 | {B2} 5,563<br>{B6} 96 | {C1} 47 | 5,822 |
| Lower East Fork Hood River | 14,083 | | {B2} 2,676<br>{B6} 2 | {C1} 15 | 16,776 |
| Total East Fork | 24,309 | 17,156 | 28,002 | 2,766 | 72,233 |
| Middle Fork Hood River Watershed | | | | | |
| Tony Creek | 3,540 | | {B2} 13 | {C1} 2,995 | 6,548 |
| Bear Creek | | | {B2} 1,356<br>{B6} 3 | {C1} 2,160 | 3,519 |
| Clear Branch | | {A2} 941 | {B2} 14<br>{B3} 467<br>{B6} 2,550 | {C1} 200 | 4,172 |
| Coe Branch | | {A2} 3,326 | {B2} 10<br>{B3} 8 | {C1} 870 | 4,214 |
| Pinnacle Creek | | {A2} 588 | {B3} 3<br>{B6} 2 | {C1} 1,028 | 1,621 |
| Eliot Branch | | {A2} 1,376<br>{A4} 366 | {B2} 8<br>{B3} 15<br>{B10} 15 | {C1} 677 | 2,457 |
| Middle Fork Hood River | 4,025 | {A4} 489 | {B2} 1,132<br>{B3} 57<br>{B10} 25 | {C1} 381 | 6,109 |
| Total Middle Fork | 7,565 | 7,086 | 5,678 | 8,311 | 28,640 |
| Total Both Watersheds Combined | 31,874 | 24,242 | 33,680 | 11,077 | 100,873 |

Note: B7 General Riparian was not a mapped allocation and therefore the acres associated with this allocation are included in the other allocations acreage in the above table.

## *Northwest Forest Plan*

Management direction outlined within the Northwest Forest Plan is divided into seven Land Designations. Further, Tier 1 Key Watersheds, Tier 2 Key Watersheds, and non-Key Watersheds overlay portions of all six categories of designations and matrix.

The East Fork and Middle Fork Hood River watersheds are classified as non-Key Watersheds and contain five of the Northwest Forest Plan Land Designations.

Management Goals for these Land Designations are briefly described as follows:

### *Congressionally Reserved Areas*

These lands have been reserved by Congress for specific land allocation purposes. These two watersheds contain portions of two Congressionally Reserved Areas: Mt. Hood Wilderness and Badger Wilderness. The Management Goals contained in the Mt. Hood National Forest's Land and Resource Management Plan for A2 Wilderness are consistent with the objectives of this land allocation.

### *Late Successional Reserves*

Late-Successional Reserves are identified with an objective to protect and enhance conditions of late-successional and old growth forest ecosystems, which serve as habitat for late-successional and old-growth forest related species including the northern spotted owl. Limited stand management is permitted, subject to review by the Regional Ecosystem Office. The East Fork Hood River Watershed contains a portion of the Surveyor's Ridge Late-Successional Reserve (LSR). A LSR Assessment was completed by the Barlow Ranger Districts, Miles Creeks Stewardship Team in the winter of 1996. Both watersheds contain 100-acre LSRs.

### *Administratively Withdrawn Areas*

Administratively Withdrawn Areas are identified in current Forest and District Plans or draft plan preferred alternatives and include recreation and visual areas, back country and other areas where management emphasis precludes scheduled timber harvest. In the Middle Fork and East Fork Hood River Watersheds this includes five "A" land allocations: A4 Special Interest Area, A5 Unroaded Recreation, A9 Key Site Riparian Areas, A10 Developed Recreation Sites and, A11 Winter Recreation Areas. The Management Goals contained in the Mt. Hood National Forest's Land and Resource Management Plan are consistent with the objectives of this land allocation.

### *Riparian Reserves*

As a key element of the Aquatic Conservation Strategy, the Riparian Reserves provide an area along all streams, wetlands, ponds, lakes, and unstable and potentially unstable areas where riparian-dependent resources receive primary emphasis. Riparian Reserves are important to the terrestrial ecosystem as well, serving, for example, as dispersal habitat for certain terrestrial species. In the Middle Fork and East Fork Hood River Watersheds this allocation overlays: A9 Key Site Riparian Areas, B5 Pileated Woodpecker/Pine Marten Habitat Area, B7 General Riparian Areas and, B12 Backcountry Lakes, as well as all wetlands and some unstable and potentially unstable areas. In some areas the Riparian Reserves include upland habitat (B2 Scenic Viewsheds, B3 Roaded Recreation, B6 Special Emphasis Watersheds, B9 Wildlife / Visual Area, B10 Deer and Elk Winter Range, and C1 Timber Emphasis). This is intended to form a dispersal corridor and, in most cases, include the 100-acre LSRs (Known Spotted Owl Activity Centers).

### *Matrix*

The Matrix consists of those federal lands outside the six categories of designated areas listed in the Northwest Forest Plan. In the Middle Fork and East Fork Hood River Watersheds this allocation overlays: B2 Scenic Viewsheds, B3 Roaded Recreation, B6 Special Emphasis Watersheds, B9 Wildlife / Visual Areas, B10 Deer and Elk Winter Range and, C1 Timber Emphasis areas.

**Table 5. - Northwest Forest Plan Acres**

| Northwest Forest Plan Designations | National Forest Acres |
|---|---|
| Congressionally Reserved Areas | 12,883 |
| Late Successional Reserves | 8,117 |
| Administratively Withdrawn Areas | 5,404[1] |
| Riparian Reserves | 18,460 |
| Matrix | 29,661 |
| Total Northwest Forest Plan Acres | 74,525 |

Administratively Withdrawn acres include private inholdings within National Forest Administrative Boundary.

# GLOSSARY

# *GLOSSARY OF TERMS*

## *A*

**Activity** - Actions, measures, or treatments that are undertaken that directly or indirectly produce, enhance, or maintain forest outputs and rangeland outputs, or achieve administrative and environmental quality objectives. Forest Service activity definitions, codes, and units of measure are contained in the Management Information Handbook (FSM 1309.11).

**Activity Center** - The nest site of a breeding pair of spotted owls or primary roost area of a territorial individual spotted owl.

**Adaptive Management** - The process of implementing policy decisions as scientifically driven management experiments that test predictions and assumptions in management plans, and using the resulting information to improve the plans.

**Adjacency Requirements** - Management restrictions to regulate the creation of harvest openings. An opening created by harvest must "close" through a new timber stand growing to a certain height before another harvest unit can be placed next to it. This requirement has led to the "staggered setting" approach to timber harvest in which clearcut units, usually of 20-60 acres, are scattered over the landscape.

**Administratively Withdrawn Areas** - Areas removed from the suitable timber base through agency direction and land management plans.

**Airshed** - A geographical area that, because of topography, meteorology, and climate, shares the same air.

**Allowable Sale Quantity (ASQ)** - The gross amount of timber volume, including salvage, that may be sold annually from a specified area over a stated period in accordance with management plans of the Forest Service or Bureau of Land Management. Formerly referred to as "allowable cut."

**Alluvial** - Originated through the transport by and deposition from running water.

**Amenity** - An object, feature, quality, or experience that gives leisure or is pleasing to the mind or senses. Amenity value is typically used in land use planning to describe those resource properties for which market values (or proxy values) are not or cannot be established.

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

**Appropriate Suppression Response** - The planned strategy for suppression action (in terms of kind, amount, and timing) on a wildfire which most efficiently meets fire management direction under current and expected burning conditions. It may range in objective from prompt control to one of containment or confinement.

**Appropriated Funds** - Funds from the U.S. Treasury, which Congress has authorized the Forest Service to obligate. This is the sum operational, capital investment, and backlog costs.

**Aquatic Ecosystems** - Stream channels, lakes, marshes or ponds, etc., and the plant and animal communities they support.

**Aquatic Habitat** - Habitat that occurs in free water.

**At-Risk Fish Stocks** - Stocks of anadromous salmon and trout that have been identified by professional societies, fish management agencies, and in the scientific literature as being in need of special management consideration because of low or declining populations.

## *B*

**Basin or River Basin** - A USGS classification which is composed of a river system and its tributaries. For this analysis the Hood River Basin includes the West Fork, Middle Fork, East Fork, and mainstem Hood River and their tributaries.

**Beneficial Use** - In water use law, reasonable use of water for a purpose consistent with the laws and best interest of the people of the state. Such uses include, but are not limited to, the following: instream, out of stream, and ground water uses, domestic, municipal, industrial water supply, mining, irrigation, livestock watering, fish and aquatic life, wildlife, fishing, water contact recreation, aesthetics and scenic attraction, hydropower, and commercial navigation.

**Best Management Practices (BMP)** - Methods, measures, or practices designed to prevent or reduce water pollution. Not limited to structural and nonstructural controls, and procedures for operations and maintenance. Usually, BMPs are applied as a system of practices rather than a single practice.

**Biological Control** - Biological control is the use of parasites, predators, or disease pathogens (bacteria, fungi, viruses, and others) to suppress pest populations.

**Biological Diversity** - The variety of life forms and processes, including a complexity of species, communities, gene pools, and ecological functions.

**Biological Growth Potential** - The average net growth attainable in a fully stocked natural forest stand. (36 CFR 2193)

**Biological Opinion** - The document resulting from formal consultation that states the opinion of the Fish and Wildlife Service or National Marine Fisheries Service as to whether or not a federal action is likely to jeopardize the continued existence of listed species or results in destruction of adverse modification of critical habitat.

**Biological Potential** - The maximum amount of sustainable wood fiber obtainable by application of intensive management (timber) practices to acres classified as commercial forest land. The needs of other forest uses are not incorporated.

**Biomass** - The total quantity (at a given time) of living organisms of one or more species per unit of space (species biomass), or the total quantity of all the species in a biotic community (community biomass).

**Block (of forest, habitat)** - Geographic area of trees or vegetation that is distinct from surrounding conditions. Block size may vary greatly.

**Blowdown** - Trees felled by high winds.

## *C*

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

**Canopy** - A layer of foliage in a forest stand. This most often refers to the uppermost layer of foliage, but it can be used to describe lower layers in a multistoried stand.

**Canopy Closure** - The degree to which the canopy (forest layers above one's head) blocks sunlight or obscures the sky. It can only be accurately determined from measurements taken under the canopy as openings in the branches and crowns must be accounted for.

**Capability** - The potential of an area of land to produce resources, supply goods and services, and allow resource uses under an assumed set of management practices at a given level of management intensity. Capability depends upon current conditions and site conditions such as climate, slope, landform, soils and geology, as well as the application of management practices, such as silviculture or protection from fire, insects, and disease. (36 CFR 219.3)

**Catastrophic Event** - A large-scale, high-intensity natural disturbance that occurs infrequently.

**Categorical Exclusion** - A decision to exclude an action from the need to document the environmental analysis in an Environmental Assessment or EIS. It is based on the responsible official finding that the action will have no significant effect on the human environment, individually or cumulatively. If there is any uncertainty regarding effects; appropriate documentation of the analysis is required.

**Causal Mechanism** - Processes and related causes of change to conditions.

**Cavity Excavator** - A wildlife species that digs or chips out cavities in wood to provide a nesting, roosting, or foraging site.

**Cavity Nester** - Wildlife species, most frequently birds, that require cavities (holes) in trees for nesting and reproduction.

**Chargeable Timber Volume** - Timber removed from regulated forest land that contributes to the allowable sale quantity.

**Chemical Control** - A method to control insect populations or tree disease through the use of applied chemicals.

**Class I (air quality ) Areas** - Special areas (e.g., National Parks, certain wilderness areas) protected for their air quality related values.

**Clearcutting** - A cutting method by which a new age class is created. The harvesting in one cut of all trees in an area for the purpose of creating a new, even-aged stand. The area harvested may be a group or patch, stand, or strip large enough to be mapped or recorded as a separate age class in planning for sustained yield.

**Climax** - The culminating stage in plant succession for a given site where the vegetation has reached a highly stable condition.

**Closed Sapling Pole** - Sapling and pole stand that are characterized by a closed tree canopy and minimal little ground cover. Tree closure will exceed 60 percent and often reaches 100 percent.

**Cluster** - An area that contains habitat capable of supporting three or more breeding pairs of spotted owls with overlapping or nearly overlapping home ranges.

**Coarse Woody Debris (CWD)** - Portion of a tree that has fallen or been cut and left in the woods. Usually refers to pieces at least 20 inches in diameter. FEMAT

**Code of Federal Regulations (CFR)** - The listing of various regulations pertaining to management and administration of the National Forest.

**Cohort** - A distinct aggregation of trees originating from a single natural disturbance or regeneration cutting.

**Commercial Forest Land (CFL)** - Land that is producing, or is capable of producing, crops of industrial wood and (1) has not been withdrawn by Congress, the Secretary of Agriculture, or the Chief of the Forest Service; (2) land where existing technology and knowledge is available to ensure timber production without irreversible damage to soil productivity or watershed conditions; and (3) land where existing technology and knowledge, as reflected in current research and experience, provides reasonable assurance that adequate restocking can be obtained within 5 years after final harvesting.

**Commercial Thinning** - The removal of generally merchantable trees from an even-aged stand, usually to encourage growth of the remaining trees.

**Commercial Tree Species** - Conifer species used to calculate the commercial forest land allowable sale quantity. They are typically utilized as saw timber and include species such as Douglas-fir, hemlock, spruce, fir, pine, and cedar.

**Community Stability** - A community's capacity to handle change without major hardships or disruptions to component groups or institutions. Measurement of community stability requires identification of the type and rate of proposed change and an assessment of the community's capacity to accommodate that level of change.

**Component** - Physical or biological features ("pieces") of an ecosystem (e.g., water, plant species, soils, and people).

**Condition** - The state of historical, current, or potential elements. May be a quantitative or qualitative descriptor.

**Conferencing** - Informal discussion or correspondence consultation that takes place between the U.S. Fish and Wildlife Service and another federal agency when it is determined that a proposed federal action may jeopardize the continued existence of a species proposed as threatened or endangered or result in adverse modification of proposed critical habitat.

**Congressionally Withdrawn Areas** - Areas that require Congressional enactment for their establishment, such as National Parks, Wild and Scenic Rivers, National Recreation Areas, National Monuments, and Wilderness.

**Connectivity** - The extent to which conditions among (but not limited to) LS/OG forest areas provide habitat for breeding, feeding, dispersal, and movement of (but not limited to) LS/OG-associated wildlife and fish species.

**Conservation** - A process or means of achieving recovery of viable populations.

**Conservation Strategy** - A management plan for a species, group of species, or ecosystem that prescribes standards and guidelines that if implemented provide a high likelihood that the species, groups of species, or ecosystem, with its full complement of species and processes, will continue to exist well-distributed throughout a planning area, i.e., a viable population.

**Consultation** - A formal interaction between the U.S. Fish and Wildlife Service and another federal agency when it is determined that the agency's action may affect a species that had been listed as threatened or endangered or its critical habitat.

**Consumptive Use** - Those uses of a resource that reduce its supply.

**Contiguous Habitat** - Habitat suitable to support the life needs of species that is distributed continuously or nearly continuously across the landscape.

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

**Corridor** - A tract of land through which a species must travel to reach habitat suitable for reproduction and other life-sustaining needs.

**Council on Environmental Quality (CEQ)** - An advisory council to the President established by the National Environmental Policy Act of 1969. It reviews Federal programs for their effect on the environment, conducts environmental studies, and advises the President on environmental matters.

**Created Opening** - Openings in the Forest created by the silvicultural practices of shelterwood regeneration cutting at the final harvest, clearcutting, seed tree cutting, or group selection cutting.

**Critical Habitat** - For threatened or endangered species, the specific areas within the geographical area occupied by the species (at the time it is listed, in accordance with provisions of Section 4 of the Endangered Species Act) on which are found those physical or biological features essential to the conservation of the species. This habitat may require special management considerations or protecting. Protection may also be required for additional habitat areas outside the geographical area occupied by the species at the time it is listed based upon a determination of the Secretary of the Interior that such areas are essential for the conservation of the species.

**Cull Tree** - Trees of commercial species or commercial species of any size which are not now or/and will never be expected to contain more than 20% sound cubic feet of volume because of damage or defect.

**Cultural Resources** - The cultural foundation of our Nation includes the physical remains or records of districts, sites, areas, structures, buildings, networks, neighborhoods, memorials, objects, artifacts, and events from the human past which have aesthetic, utilitarian, interpretive, scientific, historic or cultural value. They may be historic, prehistoric, or architectural in nature. Cultural resources are an irreplaceable and nonrenewable aspect of our national heritage.

**Cumulative Effects** - The combined effects of two or more management activities. The effects may be related to the number of individual activities, or to the number of repeated activities on the same piece of ground. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

# *D*

**Debris Slide** - A shallow landslide of soil, rock, and organic material that occurs on steep slopes.

**Debris Torrent** - A large debris slide that is changed with water and confined to a steep stream channel. Debris torrents may travel several thousand feet.

**Dendritic, Palmate Drainage Pattern** - A tree-like branching pattern or like the branching pattern of the human palm.

**Developed Recreation Site** - Distinctly defined-designated-area where facilities are provided for concentrated public use; e.g., campgrounds, picnic areas, boating sites, and ski areas.

**Dispersal Habitat** - Habitat that supports the life needs of an individual animal during dispersal. Generally satisfies needs for foraging, roosting, and protection from predators.

**Dispersed Recreation** - Outdoor recreation in which visitors are diffused over relatively large areas. Where facilities or developments are provided, they are primarily for access and protection of the environment rather than comfort or convenience of the user.

**Dispersed Recreation** - Outdoor recreation that takes place outside developed recreation sites or the Wilderness.

**Dissected** - Cut by erosional processes into hills and valleys, or into flat interstream areas and valleys.

**Distribution (of a species)** - The spatial arrangement of a species within its range.

**Disturbance** - A force that causes significant change in structure and/or composition through natural events such as fire, flood, wind, or earthquake, mortality caused by insect or disease outbreaks, or by human-caused events, e.g., the harvest of forest products.

**Diversity** - The variety, distribution, and abundance of different plant and animal communities and species within an area. (See Biological diversity.)

**Domestic Water Source** - A watershed which provides water for human consumption by an individual or individual that does not meet the criteria for a municipal watershed.

**Domestic Water Supply** - Water used for human consumption.

**Dominant** - (a) Exercising the most influence or control. (b) Most prominent, as in position; ascendant. (c) Of, relating to, or being a species that is most characteristic of an ecological community and usually determining the presence, abundance, and type of other species.

**Down Log** - Portion of a tree that has fallen or been cut and left in the woods. Particularly important as habitat for some LS/OG-associated species.

**Draft Environmental Impact Statement (DEIS)** - The draft statement of environmental effects that is required for major federal action under Section 102 of the National Environment Policy Act, and released to the public and other agencies for comment and review.

**Drainage** - An area (basin) mostly bounded by ridges or other similar topographic features, encompassing part, most, or all of a watershed and enclosing around 5,000 acres. (See Subdrainage and Forest watershed.)

**Drainage Pattern** - The configuration or arrangement of stream drainage or other drainage patterns.

**Duff** - Organic matter in various stages of decomposition on the floor of the forest.

**Duff Layer** - The layer of loosely compacted debris underlying the litter layer on the forest floor.

## *E*

**Early Seral Stage Forests** - Stage in forest development that includes seedling, sapling, and pole-sized trees.

**Earthflow** - A mass-movement landform and slow to rapid process characterized by downslope translation of soil and weathered rock over a discrete shear zone at the base, with most of the particles being smaller than sand.

**East-side Forests** - The 12 National Forests in Washington, Oregon, and California that lie partly or wholly east of the Cascade Mountain Range crest: Colville, Deschutes, Fremont, Klamath, Malheur, Ochoco, Okanogan, Shasta-Trinity , Umatilla, Wallowa-Whitman, Wenatchee, and Winema National Forest.

**Ecological Health** - The state of an ecosystem in which processes and functions are adequate to maintain diversity of biotic communities commensurate with those initially found there.

**Ecological Process** - (a) The actions or events that link organisms (including humans) and their environment, such as disturbance, successional development, nutrient cycling, carbon sequestration, productivity, and decay. (b) Flow or cycling of energy, materials, and nutrients through space and time (e.g., waters flow, photosynthesis, large woody debris recruitment, erosion).

**Ecologically Significant** - Species, stands, and forests considered important to maintaining the structure, function, and processes of particular ecosystems.

**Economically Feasible** - Having costs and revenues with a present net value greater than zero.

**Ecosystem** - An ecological system , consisting of living organisms and nonliving components, as well as, flows and other processes, and the links and interrelationships among them from which "systems" properties, such as resilience and ecosystem function, emerge. While an ecosystem can occur on any scale, it is often convenient (for analysis, management, or other purposes) to delineate it as a geographic area, with its boundaries demarcating an area where links within the system are stronger than links with adjacent systems.

**Ecosystem Diversity** - The variety of species and ecological processes that occur in different physical settings.

**Ecosystem Element** - An identifiable component, process, or condition of an ecosystem.

**Ecosystem Function** - (a) The process through which the constituent living and nonliving elements of ecosystems change and interact, including biogeochemical processes and succession. (b) A role of an ecosystem that is of value to society.

**Ecosystem Management** - A strategy or plan to manage ecosystems to provide for all associated organisms, as opposed to a strategy or plan for managing individual species.

**Edge** - Where plant communities meet or where successional stages or vegetative conditions with plant communities come together,

**Edge Contrast** - A qualitative measure of the difference in structure of two adjacent vegetated areas (e.g., "low," "medium," or "high" edge contrast).

**Edge Effects** - The drastically modified environmental conditions along the margins, or "edges," of forest patches surrounded partially or entirely by harvested lands. These conditions may extend 600 feet or more into the forest from the harvest boundary. Only forested areas at substantial distances from the edge (generally, the center of a forest patch of 100 acres or more) provide unmodified interior forest conditions.

**Effective Old-Growth Habitat** - Old-growth forest largely unmodified by external environmental influences (e.g., wind, temperature, encroachment of nonresident species) from nearby, younger forest stands. Also referred to as interior habitat. For purposes of analysis, assumed to be at least 400 feet from an edge with an adjacent stand younger than age class 70.

**Effects** - Environmental consequences as a result of a proposed action. Included are direct effects, which are caused by the action and occur at the same time and place, and indirect effects, which are caused by the action and are later in time or further removed in distance, but which are still reasonably foreseeable. Indirect effects may include population growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.

The terms "Effects" and "Impacts" as used in this statement are synonymous. Effects may be ecological (such as the effects on natural resources and on the components, structures, and functioning or affected ecosystems), aesthetic quality, historic, cultural, economic, social, or health related, whether direct, indirect, or cumulative. Effects resulting from actions may have both beneficial and detrimental aspects, even if on balance the agency believes that the overall effects will be beneficial (40 CFR 1508.8).

**Eligible River** - A river or river segment found, through interdisciplinary team and, in some cases, interagency review, to meet Wild and Scenic River Act criteria of being free-flowing and possessing one or more outstandingly remarkable values.

**Embeddedness** - The degree to which larger particles on the stream bottom (boulders, rubble, or gravel) are surrounded or covered by fine sediment.

**Emigration** - Permanent movement of individuals of a species from a population.

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

**Endemic** - A species that is unique to a specific locality.

**Endemic Plant** - A plant confined to a certain country or region and with a comparatively restricted geographic distribution.

**Environmental Analysis** - An analysis of alternative actions and their predictable short-term and long-term environmental effects, incorporating physical, biological, economic, and social considerations.

**Environmental Assessment (EA)** - A systematic analysis of site-specific activities used to determine whether such activities have a significant effect on the quality of the human environment and whether a formal environmental impact statement is required; and to aid an agency's compliance with the National Environmental Policy Act when no environmental impact statement is necessary.

**Environmental Impact** - The positive or negative effect of any action upon a given area or resource.

**Environmental Impact Statement (EIS)** - A formal document to be filed with the Environmental Protection Agency that considers significant environmental impacts expected from implementation of a major federal action.

**Environmental Protection Agency (EPA)** - An independent agency of the U.S. government (cabinet-level status is pending).

**Ephemeral Stream or Drainage** - A stream or portion of a stream that flows only in direct response to precipitation or snow melt. It receives little or no water from springs and no long-continued supply from snow or other sources. Ephemeral drainages frequently have no permanent or well-defined channels, but follow slight depressions in the natural contour of the ground surface. Streams that contain running water only sporadically, such as during and following storm events.

**Epiphyte** - A plant that grows upon another plant and that is nonparasitic. Most of the plant's necessary moisture and nutrients are derived from the atmosphere.

**Erodible** - Susceptible to erosion.

**Erosion** - The wearing away or detachment of the land surface by running water, wind, ice, or other geological agents, including such processes as gravitation creep.

*Accelerated* - Erosion much more rapid than normal, primarily as a result of the influence or the activities of man.

*Natural* - Wearing away of the earth's surface by water, ice, or other natural agents under natural environmental conditions of climate, vegetation, etc., undisturbed by human activity.

**Established Stand** - A reforestation unit of suitable trees that are past the time when considerable juvenile mortality occurs. The unit is no longer in need of measures to ensure survival but is evaluated for measures to enhance growth.

**Eutrophication** - Well-nourished, and "eutrophication" refers to the natural or artificial addition of nutrients to bodies of water and to the effects of any resulting stimulation of algal growth.

**Evapotranspiration** - Loss of water from a land area through transpiration of plants and from the soil.

**Even-Aged Forest** - A forest stand comprising trees with less than a 20-year difference in age.

**Even-Aged Management** - The application of a combination of actions that results in the creation of forest stands composed of trees of essentially the same age. Managed even-aged forests are characterized by a distribution of stands of varying ages (and, therefore, tree sizes throughout the forest area). The difference in age between trees forming the main canopy level of a stand usually does not exceed 20 percent of the age of the stand at harvest rotation age. Regeneration in a particular stand is obtained in a short period at or near the time that a stand has reached the desired age or size for regeneration and is harvested. Clearcut, shelterwood, or seed tree cutting methods produce even-aged stands. (36 CFR 219.3).

**Extended Rotation** - A period of years that is longer than the time necessary to grow timber crops to a specified condition of maturity. (See Rotation).

**Extended Rotation Age** - A point in time when trees are harvested or planned to be harvested that is beyond the age when harvest ordinarily would occur. (See Rotation age.)

**Extinct Species** - A species that no longer exists.

**Extirpation** - The elimination of a species from a particular area.

# *F*

**Fee Campground** - A fee campground must have as a minimum all of the following: tent or trailer spaces, drinking water, access road, refuse containers, toilet facilities, personal fee collection, reasonable visitor protection, and simple devices for containing a campfire where permitted.

**Fifth-Field Watershed** - A subdivision of a River Basin generally representing a combination of sixth-field watersheds. For this analysis they are the East Fork and Middle Fork of the Hood River.

**Final Environmental Impact Statement (FEIS)** - The final report of environmental effects of proposed action on an area of land. This is required for major federal actions under Section 102 of the National Environmental Policy Act. It is a revision of the draft environmental impact statement to include public and agency responses to the draft.

**Fire Regime** - The characteristic frequency, extent, intensity, severity, and seasonality of fires in an ecosystem.

**Fire Severity** - The degree to which a site has been altered or disrupted by fire. Severity reflects fire intensity and residence time.

**Fire Suppression** - The practice of controlling and extinguishing wild fires.

**Fire Tolerant Species** - Plant species that have evolved to survive low-intensity ground fires.

**Fish-Bearing Streams** - Any stream containing any species of fish for any period of time.

**Fish and Wildlife Service (F&WS)** - A division within the U.S. Department of the Interior.

**Fish Passage** - Passage of fish up or downstream especially over stream obstructions.

**Floodplain** - Level lowland bordering a stream or river onto which the flow spreads at flood stage.

**Food Chain** - Organisms that are interrelated in their feeding habits, each feeding upon organisms that are lower in the chain and in turn being fed on by organisms higher in the chain.

**Forage** - All browse and non-woody plants available to livestock or wildlife for grazing or harvestable for feed.

**Forbs** - Non-woody plants, other than grasses. Term refers to feed used by both wildlife and domesticated animals.

**Forest Canopy** - The cover of branches and foliage formed collectively by the crowns of adjacent trees and other woody growth.

**Forest Ecosystem Management Assessment Team (FEMAT)** - As assigned by President Clinton, the team of scientists, researchers, and technicians from seven federal agencies who created this report.

**Forest Fragmentation** - The change in the forest landscape, from extensive and continuous forests of old-growth to a mosaic of younger stand conditions.

**Forest Land** - Land that is now, or is capable of becoming, at least 10 percent stocked with forest trees and that has not been developed for nontimber use.

**Forest Landscape** - Land presently forested or formerly forested and not currently developed for nonforest use.

**Forest not Suitable for Timber Production** - Forest withdrawn from commercial timber production. (See Reserved land.)

**Forest Plan** - A land management plan designed and adopted to guide forest management activities on a National Forest or Bureau of Land Management District.

**Forest Succession** - The orderly process of change in a forest as one plant community or stand condition is replaced by another, evolving toward the climax type of vegetation.

**Forest Suitable for Timber Production** - Forest identified as appropriate for commercial timber production. Generally, this area equals the forest tentatively suitable for timber production minus further withdrawals to protect fish and wildlife, watersheds, and other resources, to pursue multiple-use objectives reflecting scenic quality, dispersed recreation, and other values, or to avoid situations in which the benefits of timber production are less than the costs.

**Forest Tentatively Suitable for Timber Production** - Total forest minus forests (1) legally withdrawn from production (e.g., Wilderness) or (2) judged too unstable for timber harvest, too difficult to regenerate, or too unproductive.

**Forest Watershed** - The forested drainage area contributing water, organic matter, dissolved nutrients, and sediments to a lake or stream.

**Fragmentation** - The process of reducing size and connectivity of stands that compose a forest.

**Fuel Loading** - The amount of combustible material present per unit of area, usually expressed in tons per acre.

**Fuel Treatment** - The rearrangement or disposal of natural or activity fuels (generated by management activity, such as slash left from logging) to reduce fire hazard.

**Fuels** - Combustible wildland vegetative materials. While usually applied to above ground living and dead surface vegetation, this definition also includes roots and organic soils such as peat.

## *G*

**Genetic Diversity** - The variety within populations of a species.

**Geographic Information System (GIS)** - A computer system capable of storing and manipulating spatial (i.e., mapped) data.

**Geomorphic** - Pertaining to the form or shape of and those processes that affect the surface of the earth.

**Gradient** - Change of elevation, velocity, pressure or other characteristics per unit length.

**Granitic** - Any light-colored, coarse-grained rock formed at considerable depth by crystallization of molten rock.

**Green tree Retention** - A stand management practice in which live trees as well as snags and large down wood are left as biological legacies within harvest units to provide habitat components over the next management cycle. There are two levels:

*High Level* - A regeneration harvest designed to retain the highest level of trees possible while still providing enough disturbance to allow regeneration and growth of the naturally occurring mixture of tree species. Such harvest should allow for the regeneration of intolerant and tolerant species. Harvest design would also retain cover and structural features necessary to provide foraging and dispersal habitat for mature and old-growth dependent species.

*Low Level* - A regeneration harvest designed to retain only enough green trees and other structural components (snag, coarse woody debris, etc.) to result in the development of stands that meet old-growth definitions within 100 to 120 years after harvest entry, considering overstory mortality.

**Group Selection Cutting** - A method of regenerating uneven-aged stands in which trees are removed, and new age classes are established, in small groups. The maximum width of groups is approximately twice the height of the mature trees. Removal of groups of trees, ranging in size from a fraction of an acre up to about 2 acres.

**Guideline** - An indication or outline of policy or conduct that is not a mandatory requirement (as opposed to a standard, which is mandatory).

# *H*

**Habitat** - The place where a plant or animal naturally or normally lives and grows.

**Habitat Diversity** - The number of different types of habitat within a given area.

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

**Hard Snag** - A recently dead standing tree that typically still has an intact top, a high degree of bark cover, and most limbs. Hard snags are required by a number of wildlife species, including cavity nesters.

**Hiding Cover** - Generally, any vegetation used by wildlife for security or to escape from danger. More specifically, any vegetation capable of providing concealment (e.g., hiding 90 percent of an animal) from human view at a distance of 200 feet or less.

**High Severity Fire** - A wildfire event with acute ecological impacts; usually, but not always of high intensity.

**Home Range** - The area that an animal traverses in the scope of normal activities. This is not to be confused with territory, which is the area an animal defends.

**Horizontal Diversity** - The distribution and abundance of plant and animal communities or successional stages across an area of land; the greater the number of communities, the higher the degree of horizontal diversity. This concept is close to, but not exactly the same as, "even-aged management," although each may influence the other. Application of even-aged management, for example, can be designed to accomplish horizontal diversity objectives. See also Vertical Diversity.

**Hundred Year Flood** - Severe flood which, statistically, has a chance of occurring once in a hundred years, or has a 1% chance of occurring each year.

**Hundred Year Floodplain** - The area adjacent to a stream that is on average inundated once a century.

**Hybridization** - The crossing or mating of two different varieties of plants or animals.

**Hydrology** - The scientific study of the properties, distribution, and effects of water in the atmosphere, on the earth's surface, and in soil and rocks.

**Hyporheic Zone** - The area under the stream channel and floodplain that contributes to the stream.

# *I*

**Immigration** - Movement of individuals into a population.

**Impact** - A spatial or temporal change in the environment caused by human activity.

**Inbreeding** - Mating or crossing of individuals more closely related than average pairs in the population.

**Indicator Species** - A wildlife management scheme in which the welfare of a selected species is presumed to indicate the welfare of other species.

**Indicator Species Management** - A wildlife management strategy to produce relatively high numbers of selected wildlife species in particular places for particular purposes.

**Indicators** - Commonly used metrics for description or analysis of ecosystem elements. Example: if fire is an ecosystem component, severity, size frequency, or seasonality are common metrics (indicators) of fire. Example: Vegetative age, size, and composition can serve as a surrogate, or indicator, of woody debris recruitment processes.

**Individual (single) Tree Selection** - See Uneven-Aged Silviculture Systems.

**Infiltration** - The movement of water into the soil through soil surface pores or other openings into the soil.

**Inholding** - Land belonging to one landowner that occurs within a block of land belonging to another. For example, small parcels of private land that occur inside National Forest.

**Inner Gorge** - A stream reach bounded by steep valley walls that terminate upslope into a more gentle topography. Common in areas of rapid stream downcutting or uplift, such as northern California and southwestern Oregon.

**Instream Flows** - A prescribed level (or levels) of streamflow, usually expressed as a stipulation in a permit authorizing a dam or water diversion, for the purpose of meeting National Forest System management objectives.

**Integrate** - (a) To make into a whole by bringing all parts together; unify. (b) To join with something else; unite. (c) To make part of a larger unit: integrated the now procedures into the work routine.

**Integrated Pest Management (IPM)** - A systematic approach that uses a variety of techniques to reduce pest damage or unwanted vegetation to tolerable levels. IPM techniques may include natural predators and parasites, genetically resistant hosts, environmental modifications, and when necessary and appropriate, chemical pesticides or herbicides.

**Integrated Vegetation Management** - See Integrated pest management.

**Intensive Forest Management Practices** - The growth-enhancing practices of release, precommercial thinning, commercial thinning, and fertilization, designed to obtain a high level of timber volume or quality.

**Intensive Timber Production Base** - All commercial forest land allocated to timber production and intensively managed to obtain a high level of timber volume or quality.

**Intensively Managed Timber Stands** - Forest stands managed to obtain a high level of timber volume or quality through investment in growth-enhancing practices, such as precommercial thinning, commercial thinning, and fertilization. Not to be confused with the allocations of "lands available for intensive management of forest products."

**Interdisciplinary Team** - A group of individuals with varying areas of specialty assembled to solve a problem or perform a task. The team is assembled out of recognition that no one discipline is sufficiently broad enough to adequately analyze the problem and proposed action.

**Interim (short-term) Solution** - Actions to be taken in a 2- to 4-year period.

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

**Interspecific** - Occurring among members of different species.

**Intraspecific** - Occurring among members of a single species.

**Inventory River** - A potential wild, scenic, or recreational river identified in the 1982 National Rivers Inventory (NRD published by the National Park Service.

**Irretrievable** - Applies to losses of production, harvest, or use of renewable natural resources. For example, some or all of the timber production from an area is irretrievably lost during the time an area is used as a winter sports site. If the use is changed, timber production can be resumed. The production lost is irretrievable, but the action is not irreversible.

**Irreversible** - Applies primarily to the use of nonrenewable resources, such as minerals or cultural resources, or to those factors, such as soil productivity, that are renewable only over long time periods. Irreversible also includes loss of future options.

**Irreversible or Irretrievable Commitment of Resources** - Effect of an action or inaction that cannot be reversed within a reasonable time.

**Issue** - Issues can be triggering events that prompt an agency to initiate watershed analysis, including management programs, priorities, and potential projects; regulatory requirements; and, concerns people have about the watershed. Issues also can be resource problems, concerns, or other factors highlighted in the Characterization of the watershed or in other steps of the analysis. The scope, intensity, and depth of watershed analyses depend on the important management and resource issues in the watershed.

## *K*

**Key Site Riparian Areas** - Large riparian areas exhibiting high habitat diversity and outstanding capabilities for producing high quality water, excellent fish spawning and rearing habitat, high quality waterfowl breeding, nesting and resting habitat, wildlife cover and diverse plant communities.

**Key Watershed** - As defined by National Forest and Bureau of Land Management District fish biologists, a watershed containing (1) habitat for potentially threatened species or stocks of anadromous salmonids or other potentially threatened fish, or (2) greater than 6 square miles with high-quality water and fish habitat.

# *L*

**Land Allocation** - The specification in forest plans of where activities, including timber harvest, can occur on a National Forest or Bureau of Land Management District.

**Landsat** - A satellite that provides imagery used in remote sensing of forests. Analysis of this imagery produces maps of vegetation condition.

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

**Landscape Diversity** - The size, shape, and connectivity of different ecosystems across a large area.

**Landscape Features** - The land and water form, vegetation, and structures that compose the characteristic landscape.

**Landslide** - The group of slope movements wherein shear failure occurs along a specific surface or combination of surfaces.

**Large Woody Debris** - Logs, tree boles, and root wads greater than 4 inches in diameter.

**Large Woody Material** - Logs on the forest floor in pieces at least 24 inches in diameter at the large end.

**Late-Successional Reserve** - A forest in its mature and/or old-growth stages that has been reserved under each option in this report. (See Old-growth forest and Succession.)

**Late Seral Stage Forest** - Stage in forest development that includes mature and old-growth forest. (See Seral stages.)

**Lava Flow** - A congealed stream of lava.

**Leave Strips** - Generally narrow bands of forest trees that are left along streams and rivers to buffer aquatic habitats from upslope forest management activities.

**Limits of Acceptable Change (LAC)** - Maximum limit of human-caused change allowed in wilderness. Each WRS Class has a set of limits which presupposes that certain areas of wilderness (trails) will be allowed to receive higher levels of use than other areas (trailless), and thus will receive more change or resource impact. LAC's are not a management objective, but a maximum limit.

**Litter** - The uppermost layer of organic debris on the ground under a vegetation cover, i.e. essentially the freshly fallen or only slightly decomposed vegetable material, mainly from foliage but also bark fragments, twigs, flowers, fruits, etc.

**Litter Layer** - The loose, relatively undecomposed organic debris on the surface of the forest floor made up typically of leaves, bark, small branches, and other fallen material.

**Log Decomposition Class** - Any of five stages of deterioration of logs in the forest. Stages range from essentially sound (class 1) to almost total decomposition (class 5).

**Long-Term** - Here, 50 to 100 years and sometimes beyond.

**Long-Term Soil Productivity** - The ability of a soil to sustain a nondeclining yield of a timber crop in perpetuity and retain the potential for the targeted species to be grown at the same stocking level and growth rate after each rotation.

**Long-Term Sustained Yield (LTSY)** - Estimated timber harvest that can be maintained indefinitely, once all stands have been converted to a managed state under a specific management intensity.

# *M*

**Maintenance Levels 1-5** -

*Level 1* - This level is assigned to intermittent service roads during the time management direction requires that the road be closed to motorized traffic.

*Level 2* - This level is assigned where management direction requires that the road be open for limited passage of traffic. Roads in this maintenance level are intended for use by high clearance vehicles and not maintained passenger car traffic.

*Level 3* - This level is assigned where management direction requires that the road be open and maintained for safe travel by a prudent driver in a standard four wheel passenger car.

*Level 4* - This level is assigned where management direction requires the road to provide a moderate degree of user comfort and convenience at moderate travel speeds. Traffic volumes are normally sufficient to require a double lane aggregate surfaced road. Paved surfaces are often used.

*Level 5* - This level is assigned where management direction requires the road to provide a high degree of user comfort and convenience. These roads are normally double lane, paved facilities.

**Managed Forest** - Any forestland that is treated with silvicultural practices and/or harvested. Generally applied to land that is harvested on a scheduled basis and contributes to an allowable sale quantity.

**Management Activity** - An activity undertaken for the purpose of harvesting, traversing, transporting, protecting, changing, replenishing, or otherwise using resources.

**Management Direction** - A statement of multiple-use and other goals and objective, the associated management prescriptions, and standards and guidelines for attaining them. (36 CFR 219.3)

**Management Practice** - A specific activity, measure, course of action, or treatment. (36 CFR 219.3)

**Management Prescription** - Management practices and intensity of management selected and scheduled for application on a specific area to attain multiple-use and other goals and objectives. (36 CFR 219.3)

**Mass Movement** - The downslope movement of the whole mass of loose earth material on a slope face caused by gravity. Includes but is not limited to landslides, rock falls, debris avalanches, and creep. It does not, however, include surface erosion by running water. It may be caused by natural erosional processes, or by natural disturbances (e.g., earthquakes or fire events) or human disturbances (e.g., mining or road construction).

**Matrix** - Federal lands outside of reserves, withdrawn areas, and Managed Late-Successional areas.

**Mature Seral Stage** - See Seral stages.

**Mature Stand** - A mappable stand of trees for which the annual net rate of growth has peaked. Stands are generally greater than 80-100 years old and less than 180-200 years old. Stand age, diameter of dominant trees, and stand structure at maturity vary by forest cover types and local site conditions. Mature stands generally contain trees with a smaller average diameter, less age class variation, and less structural complexity than old-growth stands of the same forest type. Mature stages of some forest types- are suitable habitat for spotted owls. However, mature forests are not always spotted owl habitat, and spotted owl habitat is not always mature forest.

**Mature Timber** - Trees that have attained full development, particularly in height, and are in full seed production.

**Mean Annual Increment of Growth** - The total increase in girth, diameter, basal area, height, or volume of individual trees or a stand up to a given age, divided by that age.

**Mesic** - Pertaining to or adapted to an area that has a balanced supply of water; neither wet nor dry.

**Meta-Population** - A population comprising local populations that are linked by migrants, allowing for recolonization of unoccupied habitat patches after local extinction events.

**Microenvironment** - The sum total of all the external conditions that may influence organisms and that come to bear in a small or restricted area.

**Microhabitats** - A restricted set of distinctive environmental conditions that constitute a small habitat, such as the area under a log.

**Mid Seral Stage** - See Seral stages.

**Minimum Harvest Age** - The lowest age of a forest stand to be scheduled for-final harvest.

**Minimum Management Requirements (MMRs)** - Requirements on forest management mandated by the Regional Office intended to minimally protect resources such as riparian areas and sensitive species of wildlife.

**Minimum Stocking** - Reforestation level lower than target stocking. Does not achieve full site occupancy in young stands but is capable of achieving optimal final harvest yield and reduced commercial thinning yield.

**Minimum Streamflow** - The quantity of water needed to maintain the existing and planned in-place uses of water in or along a steam channel or other water body and to maintain the natural character of the aquatic system and its dependent systems.

**Mitigating Measures** - Modifications of actions that (1) avoid impacts by not taking a certain action or parts of an action; (2) minimize impacts by limiting the degree or magnitude of the action and its implementation; (3) rectify impacts by repairing, rehabilitating, or restoring the affected environment; (4) reduce or eliminate impacts over time by preservation and maintenance operations during the life of the action; or (5) compensate for impacts by replacing or providing substitute resources or environments.

**Mitigation** - Actions to avoid, minimize, reduce, eliminate, or rectify the impact of a management practice.

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

**Movement** - Shifts in locations of animals, which may be two-way such as seasonal movements, or one-way as in a shift to a new breeding territory.

**Multiaged Stand** - A forest stand that has more than one distinct age class arising from specific disturbance and regeneration events at various times. These stands normally will have multilayered structure.

**Multilayered Canopy** - Forest stands with two or more distinct tree layers in the canopy; also called multistoried stands.

**Multiple Use** - Management of the public lands and their various resource values so that they are utilized in the combination that will best meet the present and future needs of the American people. Making the most judicious use of the land for some or all of these resources or related services over areas large enough to provide sufficient latitude for periodic adjustments in use to conform to changing needs and conditions. The use of some land for less than all of the resources. A combination of balanced and diverse resource uses that takes into account the long-tern needs of future generations for renewable and nonrenewable resources, including, but not limited to, recreation, range, timber, minerals, watershed, wildlife and fish, and natural scenic, scientific, and historic values. Harmonious and coordinated management of the various resources without permanent impairment of the productivity of the land and the quality of the environment. This combination is not necessarily the one that will give the greatest dollar return or greatest unit output.

**Multistoried** - Forest stands that contain trees of various heights and diameter classes and therefore support foliage at various heights in the vertical profile of the stand.

**Mycorrhizal Fungi** - Fungi with a symbiotic relationship with the roots of certain plants.

# *N*

**National Environmental Policy Act (NEPA)** - An act passed in 1969 to declare a national policy that encourages productive and enjoyable harmony between humankind and the environment, promotes efforts that will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of humanity, enriches the understanding of the ecological systems and natural resources important to the nation, and establishes a Council on Environmental Quality (f he Principal Laws Relating to Forest Service Activities, Agric. Handbook. 453. USDA Forest Service, 359p.).

**National Forest Management Act (NFMA)** - A law passed in 1976 as an amendment to the Forest and Rangeland Renewable Resources Planning Act, requiring the preparation of forest plans and the preparation of regulations to guide that development.

**National Forest Systems** - All National forest lands reserved or withdrawn from the public domain of the United States, all National Forest lands acquired through purchase, exchange, donation, or other means, the National Grasslands and land utilization projects administered under Title III of the Bankhead-Jones Farm Tenant Act (50 Stat. 525, 7 U.S.C. 1010-1012), and other lands, waters or interests therein which are administered by the Forest Service or are designated for administration through the Forest Service as a part of the system. (16 U.S.C. 1608)

**National Marine Fisheries Service (NMFS)** - A division within the U.S. Department of Commerce.

**National Park Service (NPS)** - A division within the U.S. Department of the Interior.

**National Register of Historic Places** - A formal list established by the National Historic Preservation Act of 1966 of cultural resources worthy of preservation. The Register is maintained by the National Park Service and lists archaeological, historic, and architectural properties.

**Natural Forest** - The condition of a forest environment at any point in time including its associated plant and animal communities, which has been reached essentially through the process of natural succession. This process would include the effects of natural catastrophic occurrences.

**Nocturnal** - Referring to organisms that are active or functional at night.

**Non-Chargeable Timber Harvest** - Timber harvest that is not chargeable to the allowable sale quantity.

**Nonchargeable Volume** - Timber harvest not included in the allowable sale quantity calculations.

**Noncommercial Forest Land** - Land incapable of yielding at least 20 cubic feet of wood per acre per year of commercial species; or land that is capable of producing only noncommercial.tree species.

**Nonforest Land** - Land developed for nontimber uses or land incapable of being 10 percent stocked with forest trees.

**Nonpoint Source Pollution** - Water pollution that does not result from a discharge at a specific, single location (such as a single pipe) but generally results from land runoff, precipitation, atmospheric deposition, or percolation, and normally is associated with agricultural, silvicultural, and urban runoff, runoff from construction activities, etc. Such pollution results in the human-made or human-induced alteration of the chemical, physical, biological, radiological integrity of water.

**Nonsuitable Commercial Forest Land** - Sites that would take longer than 15 years to meet or exceed minimum stocking levels of commercial species. Further classified as suitable woodland.

**Northern Spotted Owl** - One (Strix *occidentalis caurina)* of three subspecies of the spotted owl that ranges from southern British Columbia, Canada, through western Washington and Oregon, and into northwestern California. Listed as a threatened species by the U.S. Fish and Wildlife Service.

**Noxious Plant** - A plant specified by law as being especially undesirable, troublesome, and difficult to control.

**Noxious Weed** - See Noxious plant.

**Nutrient Cycling** - Circulation or exchange of elements such as nitrogen and carbon between nonliving and living portions of the environment. Includes all mineral and nutrient cycles involving mammals and vegetation.

**Nutrient Depletion** - Detrimental changes on a site in the total amount of nutrients and/or their rates of input, uptake, release, movement, transformation, or export.

## *O*

**Obligate Species** - A plant or animal that occurs only in a narrowly defined habitat such as tree cavity, rock cave, or wet meadow.

**Off-Road Vehicle (ORV)** - Any motorized track or wheeled vehicle designed for cross-country travel over natural terrain (e.g., motorcycles, all-terrain vehicles, four-wheeled drive vehicles, and snowmobiles).

**Off-Road Vehicle Designation** -

*Open* - Designated areas and trails where off-road vehicles may be operated subject to operating regulations and vehicle standards set forth in manuals.

*Limited* - Designated areas and trails where off-road vehicles are subject to restrictions limiting the number or types of vehicles, date, and time of use; limited to existing or designated roads and trails.

*Closed* - Areas and trails where the use of off-road vehicles is permanently or temporarily prohibited. Emergency use is allowed.

**Old-Growth Associated Species** - Plant and animal species that exhibit a strong association with old-growth forests.

**Old-Growth Dependent Species** - An animal species so adapted that it can exist only in old-growth forests.

**Old-Growth Forest** - Older forests occurring on western hemlock, mixed conifer, or mixed evergreen sites that differ significantly from younger forests in structure, ecological function, and species composition. Old growth characteristics begin to appear in unmanaged, forests at 175-250 years of age. These characteristics include (1) a patchy multilayered canopy with trees of several age classes, (2) the presence of large living trees, (3) the presence of larger standing dead trees (snags) and down woody debris, and (4) the presence of species and functional processes that are representative of the potential natural community. Definitions are from the Forest Service's Pacific Northwest Experiment Station Research Note 447 and General Technical Report 285, and the 1986 interim definitions of the Old-Growth Definitions Task Group.

**Old-Growth Forest** - A forest stand usually at least 180-220 years old with moderate to high canopy closure; a multilayered, multispecies canopy dominated by large overstory trees; high incidence of large trees, some with broken tops and other indications of old and decaying wood (decadence); numerous large snags; and heavy accumulations of wood, including large logs on the ground. FEMAT

**Old-Growth Seral Stage** - See Seral Stages.

**Oligotrophic** - Lakes having low nutrient supplies which are poor producers of organic matter.

**Optimal Cover** - For elk, cover used to hide from predators and avoid disturbances, including humans. it consists of a forest stand with four layers and an overstory canopy that can intercept and hold a substantial amount of snow, yet has dispersed, small openings. It is generally achieved when the dominant trees average 21 inches diameter at breast height or greater and have 70 percent or greater canopy closure.

**Overmature Stands** - Trees of an age at which they decline in vigor and soundness.

**Overstory** - Trees that provide the uppermost layer of foliage in a forest with more than one roughly horizontal layer of foliage.

**Overstory Removal** - The final stage of cutting where the remaining overstory trees are removed to allow the understory to grow. Overstory removal is generally accomplished 3 to 5 years after reforestation and when adequate stocking has been achieved.

# *P*

**PAOT (Persons-At-One-Time)** - Public recreation measurement term. The number of people in an area or using a facility at one time. Also used as a capacity measurement term indicating the number of people that can use a facility or area at one time.

**Partial Cutting** - Removal of selected trees from a forest stand.

**Particulates** - Finely divided solid or liquid (other than water) particles in the air.

**Patch** - A small (20-60 acre) part of the forest. This tern is often used to indicate a type of clearcutting (patch cuts) associated with the "staggered setting" approach to distributing harvest units across landscape.

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

**Percolation** - The downward movement of water within or through the soil, especially the downward flow of water in saturated or nearly saturated soil.

**Perennial Stream** - A stream that typically has running water on a year-round basis.

**Permanent Road Closure** - Roads closed with the intent to never use them again, action taken to make them impassable and remove them from the transportation system.

**Phenology** - The annual recurrence of plant and animal phenomena that is influenced by seasonal and other environmental changes (e.g., flowering of plants, ripening of fruit).

**Physiographic Province** - A geographic area having a similar set of biophysical characteristics and processes due to effects of climate and geology which result in patterns of soils and broad-scale plant communities. Habitat patterns, wildlife distributions, and historical land use patterns may differ significantly from those of adjacent provinces.

**Pinnate Drainage Pattern** - A feather like pattern with a main stem with perpendicular branching.

**Plant Association** - A plant community type based on land management potential, successional patterns, and species composition.

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

**Plantation Maintenance** - Actions in an unestablished forest stand to promote the survival of desired crop trees.

**Plantation Release** - All activities associated with promoting the dominance and/or growth of desired tree species within an established forest stand.

**Pool / Riffle Ratio** - The ratio of surface area or length of pools to the surface area or length of riffles in a given stream reach; frequently expressed as the relative percentage of each category. Used to describe fish habitat rearing quality.

**Pool Habitat** - That portion of the stream with reduced current velocity, often with water deeper than the surrounding areas, and which is frequently usable by fish for resting and cover.

**Pool Tailouts** - That portion of the pool that is downstream of the deepest part of the pool as the pool becomes shallower and before it becomes a riffle.

**Population** - A collection of individual organisms of the same species that potentially interbreed and share a common gene pool. Population density refers to the number of individuals of a species per unit area, population persistence to the capacity of the population to maintain sufficient density to persist, well distributed, over time. (See Viable population.)

**Population Density** - Number of individuals of a species per unit area.

**Population Dynamics** - The aggregate of changes that occur during the life of a population. Included are all phases of recruitment and growth, senility, mortality, seasonal fluctuation in biomass, and persistence of each year class and its relative dominance, and the effects that any or all of these factors exert on the population.

**Population Viability** - Probability that a population will persist for a specified period across its range despite normal fluctuations in population and environmental conditions.

**Potential Habitat** - A stand of trees of a vegetation type used by spotted owls that is not currently suitable but is capable of growing or developing into suitable habitat in the future. In general, potential habitats are stands in the earlier successional stages of forest types used by spotted owls.

**Potential Natural Community** - The community of plants and wild animals that would become established if all successional sequences were completed without interference by people under present environmental conditions. For forest communities, the potential natural community is an old-growth conifer stand.

**Potential Yield** - The sustainable output of wood fiber available after the needs of other forest uses have been deducted from the Biological Potential.

**Precommercial Thinning** - The practice of removing some of the trees less than merchantable size from a stand so that remaining trees will grow faster.

**Predator** - Any animal that preys externally on others by hunting, killing, and generally feeding on a succession of hosts, i.e., the prey.

**Prescribed Burning** - Controlled fire deliberately set to meet various resource objectives.

**Prescribed Fire** - A fire burning under specified conditions that will accomplish certain planned objectives. The fire may result from planned or unplanned ignitions.

**Prescribed Natural Fire** - The use of unplanned natural ignitions to meet management prescriptions.

**Presuppression** - Activities organized in advance of fire occurrence to ensure effective suppression action and/or to minimize risk to humans and resource damage.

**Preventive Strategy(ies)** - The amelioration of conditions that cause or favor the presence of competing or unwanted vegetation.

**Probable Sale Quantity (PSQ)** - The annual amount of sawtimber likely to be sold outside of Reserves on a sustainable basis under an option.

**Production Potential** - The capability of the land or water to produce a given resource.

**Productive Forest Lands** - Forest lands that are capable of producing crops of industrial wood and have not been reserved or deferred from timber management.

**Programmed Harvest** - The part of the potential timber yield that is scheduled for harvesting. Includes salvage and cull timber volumes. It is based on current demand, funding, and multiple use considerations.

**Proposed Threatened or Endangered Species** - Plant or animal species proposed by the U.S. Fish and Wildlife Service to be biologically appropriate for listing as threatened or endangered, and published in the Federal Register. It is not a final designation.

**Protective Management** - Measures taken by nonfederal entities to conserve spotted owls and their habitat. Measures may include participation in conservation planning (as defined in Endangered Species Act, Section 10) or other actions that benefit owls. Entities may be states, private landowners, Indian tribes, or others.

**Province** - See Physiographic province.

**Public Domain Lands** - Original holdings of the United States never granted or conveyed to other jurisdictions, or reacquired by exchange for other public domain lands.

**Public Water System** - A system providing piped water for public consumption. Such a system has at least 15 service connections or regularly serves at least 25 individuals.

# *R*

**Range (of a species)** - The area or region over which an organism occurs.

**Range Allotment** - A designated area containing land suitable and available for livestock grazing use upon which a specified number and kind of livestock are grazed under an approved allotment management plan. It is the basic management unit of the range resource on National Forest System lands administered by the Forest Service.

**Range Allotment Plan** - A long term operating plan for a growing allotment designed to reach a given set of objectives and meet forest plan standards and guidelines. It is prepared with input from the permittee.

**Ranger District** - An administrative subdivision of the Forest, supervised by a District Ranger who reports to the Forest Supervisor.

**Raptors** - Any predatory bird - such as a falcon, hawk, eagle or owl - that has feet with sharp talons or claws adapted for seizing prey and a hooked beak for tearing flesh.

**Rearing Habitat** - Areas in rivers or streams where juvenile salmon and trout find food and shelter to live and grow.

**Record Of Decision (ROD)** - A document separate from but associated with an environmental impact statement that states the management decision, identifies all alternatives including both the environmentally preferable and preferred alternatives, states whether all practicable means to avoid environmental harm from the preferred alternative have been adopted, and if not, why not.

**Recreation Opportunity** - An opportunity for a user to participate in a preferred activity within a preferred setting, in order to realize those satisfying experiences which are desired.

**Recreation Opportunity Spectrum (ROS)** - Land delineations that identify a variety of recreation experience opportunities categorized into six classes on a continuum from primitive to urban. Each class is defined in terms of the degree to which it satisfies certain recreation experience needs. This is measured based on the extent to which the natural environment has been modified, the type of facilities provided, the degree of outdoor skills needed to enjoy the area, and the relative density of recreation use. The seven classes are:

***Primitive*** - Area is characterized by an essentially unmodified natural environment of fairly large size. Interaction between users is very low, and evidence of other users is minimal. The area is managed to be essentially free from evidence of management restrictions and controls. Motorized use within the are is not permitted.

***Semiprimitive Nonmotorized*** - Area is characterized by a predominantly natural or natural-appearing environment of moderate to large size. Interaction between users is low, but there is often evidence of other users. The area is managed in such a way that minimum on-site controls and restrictions may be present, but subtle. Motorized recreation use is not permitted, but local roads used for other resource management activities may be present on a limited basis. Use of such roads is restricted to minimize impacts on recreational experience opportunities.

***Semiprimitive Motorized*** - Area is characterized by a predominantly natural or natural-appearing environment of moderate to large size. Concentration of users is low, but there is often evidence of other users. The area is managed in such a way that minimum on-site controls and restrictions may be present, but subtle. Motorized recreation use of local primitive or collector roads with predominantly natural surfaces and trails suitable for motor bikes is permitted.

***Roaded Modified*** - A subclass of the Roaded Natural ROS class. Involves areas that are characterized by predominantly natural appearing environments with high evidence of the sights and sounds of humans. Such evidence may not harmonize with the natural environment. Interaction between users may be moderate to high, with evidence of other users prevalent. Resource modification and utilization practices are evident and may not harmonize with the natural environment. Conventional motorized use is allowed and incorporated into construction standards and design of facilities.

***Roaded Natural*** - Area is characterized by predominantly natural-appearing environments with moderate evidence of the sights and sounds of man. Such evidence usually harmonizes with the natural environment. Interaction between users may be moderate to high, and evidence of other users prevalent. Resource modification and utilization practices are evident but harmonize with the natural environment. Conventional motorized use is allowed and incorporated into construction standards and design of facilities.

***Rural*** - Area is characterized by a natural environment that has been substantially modified by development of structures, vegetative manipulation, or pastoral agricultural development. Resource modification and utilization practices may be used to enhance specific recreation activities and to maintain vegetative cover and soil. Sights and sounds of humans are readily evident, and the interaction between users is often moderate to high. A considerable number of facilities are designed for use by a large number of people. Facilities are often provided for special activities. Moderate user densities are present away from developed sites. Facilities for intensified motorized use and parking are available.

*Urban* - Area is characterized by a substantially urbanized environment, although the background may have natural-appearing elements. Renewable resource modification and utilization practices are often used to enhance specific recreation activities. Vegetative cover is often exotic and manicured. Sights and sounds of humans are predominant on site and in nearby areas. Facilities for highly intensified motor use and parking are available with forms of mass transit often available to carry people throughout the site.

**Recreation Visitor Day (RVD)** - A unit for measuring recreation use, with 12 visitor hours in a visitor day. This may consist of one person for 12 hours, 12 persons for one hour, or any equivalent combination of continuous or intermittent recreation use by individuals or groups.

**Recreational River** - See Wild and Scenic River System.

**Recruitment** - The addition to a population from all causes (i.e., reproduction, immigration, and stocking). Recruitment may refer literally to numbers born or hatched or to numbers at a specified stage of life such as breeding age or weaning age.

**Reference Conditions** - Conditions characterizing ecosystem composition, structure, and function, and their variability.

**Reforestation** - The natural or artificial restocking of an area with forest trees; most commonly used in reference to artificial stocking.

**Refugia** - Locations and habitats that support populations of organisms that are limited to small fragments of their previous geographic range (i.e., endemic populations).

**Regeneration** - The actual seedlings and saplings existing in a stand; or the act of establishing young trees naturally or artificially.

**Regeneration Cut or Harvest** - Timber harvest conducted with the partial objective of opening a forest stand to the point where favored tree species will be reestablished.

**Regeneration Period** - The time it takes to reforest an area to adequate stocking following a timber sale.

**Region 6** - A Forest Service administrative unit. The National Forests of Washington and Oregon; the Forest Service's Pacific Northwest Region.

**Regional Ecosystem Office (REO)** - Although the standards and guidelines refer to the Regional Ecosystem Office for reviews and other actions, it is understood that the Regional Ecosystem Office typically recommends to the Regional Interagency Executive Committee (PIEC) who has responsibility for the decisions.

**Regulated Forest** - A forest that comprises an even distribution of age classes or tree sizes, when the growth equals the cut (at the highest level sustainable) and when the level of growing stock remains relatively constant.

**Regulated Harvest** - Harvest that contributes chargeable timber volume to the Allowable Sale Quantity.

**Regulations** - Generally refers to the Code of Federal Regulations.

**Release** - Freeing a tree or group of trees from competition by cutting or otherwise eliminating vegetation that is overtopping or closely surrounding them.

**Removal Cut (Final Cut)** - The removal of the last seed bearing or shelter trees after regeneration is established under a shelterwood method.

**Rescue Effect** - Immigration of new individuals sufficient to maintain a population that might otherwise decline toward extinction.

**Research Natural Area (RNA)** - An area set aside by a public or private agency specifically to preserve a representative sample of an ecological community, primarily for scientific and educational purposes. In Forest Service usage, research natural areas are areas designated to ensure representative samples of as many of the major naturally occurring plant communities as possible.

**Reserved Forest Land** - Productive public forest land withdrawn from timber utilization through stature or administrative regulations.

**Reserved Land** - Federal lands that have been withdrawn from acreage used for timber yields. These lands often have a preservation or protection status. Wildernesses, Research Natural Areas, and National Recreation Areas are examples of reserved lands.

**Resident Trout** - A trout which spends its entire life in fresh water.

**Residual Stand** - The trees remaining standing after some form of selection cutting is performed on a stand.

**Residue** - Material which includes both desired and unwanted vegetative residues which result from an activity or natural event.

**Resource Management Plan (RMP)** - A land use plan prepared by an agency under current regulations in accordance with the Federal Land Policy and Management Act.

**Restoration and Retention Blocks** - Ecological reserves managed to restore or retain old-growth communities and respective plant communities.

**Riffle** - A feature of a stream having swift-flowing, turbulent water; can be either deep or shallow; features are generally cobble or boulder dominated.

**Right-Of-Way** - A permit or an easement that authorizes the use of public lands for specified purposes, such as pipelines, road, telephones lines, electric lines, reservoirs, and the lands covered by such an easement or permit.

**Riparian** - Pertaining to areas of land directly influenced by water. Riparian areas usually have visible vegetative or physical characteristics reflecting this water influence. Streamsides, lake borders, or marshes and wetlands are typical riparian areas.

**Riparian Area** - A geographic area containing an aquatic ecosystem and adjacent upland areas that directly affect it. This includes floodplain, woodlands, and all areas within a horizontal distance of approximately 100 feet from the normal line of high water of a steam channel or from the shoreline of a standing body of water.

**Riparian Ecosystems** - A transition between the aquatic ecosystem and the adjacent upland terrestrial ecosystem. Identified by soil characteristics and distinctive vegetation communities that require free or unbound water.

**Riparian Reserves** - Designated riparian areas found outside the Late-Successional Reserves.

**Riparian Vegetation** - Vegetation growing on or near the banks of a stream or body of water on soils that exhibit some wetness characteristics during some portion of the growing season.

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

**Road** - A general term denoting a way for purposes of travel by vehicles greater than 40 inches in width.

*Forest Arterial Road* - Provides services to large land areas and usually connects with public highways or other Forest arterial roads to form an integrated network of primary travel routes. The location and standard are often determined by a demand for maximum mobility and travel efficiency rather than specific resource management service. It is usually developed and operated for long-term land and resource management purposes and constant service (FSM 7710.51).

*Forest Collector Road* - Serves smaller land areas than a Forest arterial road and is usually connected to a Forest arterial or public highway. Collects traffic from Forest local roads and/or terminal facilities. The location and standard are influenced by both long-term multiresource service needs as well as travel efficiency. May be operated for either constant or intermittent service, depending on land use and resource management objectives for the area served by the facility (FSM 7710.51).

*Forest Local Road* - Connects terminal facilities with Forest collector or Forest arterial roads or public highways. The location and standard are usually controlled by specific resource activity requirements rather than efficiency needs (FSM 771.51).

**Rotation** - The planned number of years between regeneration of a forest stand and its final harvest (regeneration cut or harvest). A forest's age at final harvest is referred to as rotation age. In this report, an extended rotation is 120-180 years, a long rotation 180 years.

**Rotation Age** - The age of a stand when harvested at the end of a rotation.

**Runoff** - The flow or discharge of water from an area, including both surface and subsurface flow.

**Rural Interface Areas** - Areas where Bureau of Land Management lands are adjacent to or intermingled with privately owned lands zoned for lots of 1-20 acres or that already have residential development.

# *S*

**Salmonoid Smolt** - Juvenile fish of the salmon/trout family going through biochemical changes during its migration to the ocean.

**Sanitation Cutting (Salvage)** - The removal of dead, damaged or susceptible trees primarily to prevent the spread of insect pests or diseases and promote forest hygiene.

**Sapling** - A loose term for a young tree no longer a seedling but not yet a pole. It is generally a few feet high and 2-4 inches diameter at breast height, typically growing vigorously and without dead bark or more than an occasional dead branch.

**Saturation Density** - This term relates to the requirement of many wildlife species for living space. This condition is most marked in territorial species. Space is the limiting factor to the further increases of the population density of these species.

**Scarp** - A steep surface on the undisturbed ground at the edge of the landslide. Caused by movement of slide material away from the undisturbed ground.

**Scenic River** - See Wild and Scenic River System.

**Scheduled Timber Harvest** - Timber harvest that is chargeable to the annual Allowable Sale Quantity for the Forest.

**Second-Growth** - Relatively young forests that have developed following a disturbance (e.g., wholesale cutting, serious fire, or insect attack) of the previous old-growth forest.

**Section 7** - The section of the Endangered Species Act that specifies the roles of interagency coordination in accomplishing the objective of species recovery.

**Sediment** - Solid material ad organic, that is in suspension, and is being transported from its site of origin by air, water, gravity, or ice, or has come t rest on the earth's surface either above or below sea level.

**Sediment Yield** - The quantity of soil, rock particles, organic matter, or other dissolved or suspended debris is transported through a cross-section of stream in a given period. Measured in dry weight or by volume. Consists of dissolved load, suspended load, and bed load.

**Seed Tree Cutting** - Removing all mature trees from a stand except for selected seed-bearing trees retained on site to provide a seed source for stand regeneration.

**Selection Cutting** - A method of uneven-aged management involving the harvesting of single trees from stands (single-tree selection) or in groups (group selection) without harvesting the entire stand at any one time. By this method, both regeneration cutting and tending of immature stand components are accomplished at each entry.

**Sensitive Fish Species and Stocks** - Fish species and stocks (genetically distinct populations) of anadromous salmonids identified by the America Fisheries Society's Endangered Species Committee as needing special management considerations to avoid extinction.

**Sensitive Species** - Those species that are recognized by the U.S. Forest Service as needing special management to prevent their being placed on Federal or State T&E lists.

**Seral Stages** - The series of relatively transitory planned communities that develop during ecological succession from bare ground to the climax stage. There are five stages:

***Early Seral Stage*** - The period from disturbance to crown closure of conifer stands managed under the current forest management regime. Grass, herbs, or brush are plentiful.

***Mid-Seral Stage*** - The period in the life of a forest stand from crown closure to first merchantability usually ages 15-40. Due to stand density, brush, grass, or herbs rapidly decrease in the stand. Hiding cover may be present.

***Late-Seral Stage*** - The period in the life of a forest stand from first merchantability to culmination of mean annual increment. This is under a regime including commercial thinning, or to 100 years of age, depending on wildlife habitat needs. During this period, stand diversity is minimal, except that conifer mortality rates will be fairly rapid. Hiding and thermal cover may be present. Forage is minimal.

***Mature Seral Stage*** - The period in the life of a forest stand from culmination of mean annual increment to an old-growth stage or to 200 years. This is a time of gradually increasing stand diversity. Hiding cover, thermal cover, and some forage may be present.

**Sexual Dimorphism** - The differences in size, weight, color, or other morphological characteristics that are related to the sex of the animal.

**Shade-Tolerant Species** - Plant species that have evolved to grow well in shade.

**Sheet Erosion** - The removal of a fairly uniform layer of soil from the land surface by runoff water.

**Shelterwood** - A regeneration method under an even-aged silvicultural system. A portion of the mature stand is retained as a source of seed and/or protection during the period of regeneration. The mature stand is removed in two or more cuttings.

**Short-Term** - For this report, usually 10 years.

**SHPO (State Historic Preservation Officer)** - The official appointed or designated pursuant to Section 101(b)(1) of the National Historic Preservation Act to administer the State historic preservation program or a representative designated to act for the SHPO. Among other duties, the State Historic Preservation Officer advises and assists Federal agencies and State and local governments and cooperates with these agencies and others to ensure that historic properties are considered at all levels of planning and development.

**Significant Disturbance** - When natural recovery would not be expected to take place within a reasonable period of time, there is unacceptable air or water degradation; there is unnecessary or unreasonable injury, loss or damage to National Forest resources.

**Silvicultural Prescription** - A professional plan for controlling the establishment, composition, constitution, and growth of forests.

**Silvicultural System** - A management process whereby forests are tended, harvested, and replaced resulting in a forest of distinctive form. Systems are classified according to the logging method that removes the mature crop and provides for regeneration and according to the type of forest thereby produced. (36 CFR 219.3)

**Silviculture** - The science and practice of controlling the establishment, composition, and growth of the vegetation of forest stands. It includes the control or production of stand structures such as snags and down logs, in addition to live vegetation.

**Single-Tree Selection** - In uneven-aged management, harvest of scattered individual trees. Cutting is repeated at frequent intervals, but only a few trees are removed each time.

**Site Productivity** - The ability of a geographic area to produce biomass, as determined by conditions (e.g., soil type and depth, rainfall, temperature) in that area.

**Sixth-Field Watershed** - A subdivision of the 5th-field watershed generally representing part or all of a surface drainage area, a combination of drainage areas, or a distinct hydrologic feature.

**Size Class** - For purposes of Forest planning, size class refers to the tree stem diameter used for classification of timber in the Forest Plan data base:

***Seedling / Sapling*** - less than 5" diameter
***Pole Timber*** - five to 8" diameter
***Saw Timber*** - greater than 8" diameter

**Slash** - The wood residue left on the ground after timber cutting and/or accumulating there as a result of storm, fire, or other damage. It includes unused logs, uprooted stumps, broken or uprooted stems, branches, twigs, leaves, bark, and chips.

**Slope Failure** - See Mass movement.

**Slope Stability** - The resistance of a natural or artificial slope or other inclined surface to failure by landsliding (mass movement).

**Small Game** - Birds and small mammals typically hunted or trapped.

**Smoke Management** - Conducting a prescribed fire under suitable fuel moisture and meteorological conditions with firing techniques that keep smoke impact on the environment within designated limits.

**Smoke Sensitive Area** - An area identified by the Oregon Smoke Management Plan that may be negatively affected by smoke but is not classified as a designated area.

**Smolt** - A young salmon during it's migration downstream to the sea after hatching.

**Snag** - Any standing dead, partially dead, or defective (cull) tree at least 10 inches in diameter at breast height and at least 6 feet tall. A hard snag is composed primarily of sound wood, generally merchantable. A soft snag is composed primarily of wood in advanced stages of decay and deterioration, generally not merchantable.

**Snag Dependent Species** - Birds and animals dependent on snags for nesting, roosting, or foraging habitat.

**Socioeconomic** - Pertaining to, or signifying the combination or interaction of, social and economic factors.

**Soil** - The unconsolidated mineral and organic material on the immediate surface of the earth.

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

**Soil Displacement** - The removal and horizontal movement of soil from one place to another by mechanical forces such as a blade.

**Soil Productivity** - Capacity or suitability of a soil, for establishment and growth of a specified crop or plant species, primarily through nutrient availability.

**Soil Series** - A group of soils developed from a particular type of parent material having naturally developed horizons that, except for texture of the surface layer, are similar in differentiating characteristics and in arrangement of the profile.

**Source** - An actively breeding population that has an average birth rate that exceeds its average death rate; produces an excess number of juveniles that may disperse to other areas.

**Special Status Species** - Plant or animal species falling in any of the following categories (see separate glossary definitions for each):

Threatened or endangered species
Proposed threatened or endangered species
Candidate species
State listed species
Bureau sensitive species
Bureau assessment species

**Species** - (1) A group of individuals that have their major characteristics in common and are potentially interfertile. (2) The Endangered Species Act defines species as including any species or subspecies of plant or animal. Distinct populations of vertebrates also are considered to be species under the act.

**Species Diversity** - The number, different kinds, and relative abundance of species.

**Stage Classes** - Any distinguishable phase of growth or development of an organism.

**Stand-Replacement Wildfire** - A wildfire that kills nearly 100 percent of the stand.

**Stand-Replacing Event** - A disturbance that is severe enough over a large enough area (e.g., 10 acres) to virtually eliminate an existing stand of trees and initiate a new stand.

**Stand (tree stand)** - An aggregation of trees occupying a specific area and sufficiently uniform in composition, age, arrangement, and condition so that it is distinguishable from the forest in adjoining areas.

**Stand Condition** - A description of the physical proper-ties of a stand such as crown closure or diameters.

**Stand Density** - An expression of the number and size of trees on a forest site. May be expressed in terms of numbers of tree per acre, basal area, stand density index, or relative density index.

**Standards and Guidelines** - The rules and limits governing actions, and the principles specifying the environmental conditions or levels to be achieved and maintained. The primary instructions for land manager. Standards address mandatory actions, while guidelines are recommended actions necessary to a land management decision.

**State Listed Species** - Plant or animal species listed by the state of Oregon as threatened or endangered pursuant to ORS 496.004, ORS 498.026, or ORS 564.040.

**Stocked / Stocking** - The degree an area of land is occupied by trees as measured by basal area or number of trees.

**Stream Buffer** - See Streamside Management Unit.

**Stream Channel Morphology** - The structure or form of a stream channel, as influenced by processes of erosion and deposition of channel materials (gravel, cobbles, sand, soil, etc.).

**Stream Class** - Classification of streams based on the present and foreseeable uses made of the water, and the potential effects of on-site changes on downstream uses. Four classes are defined:

*Class I* - Perennial or intermittent streams that: provide a source of water for domestic uses' are used by large numbers of fish for spawning, rearing or mitigation;' and/or are major tributaries to other Class I streams.

*Class II* - Perennial or intermittent streams that: are used by moderate through significant numbers of fish for spawning, rearing or migration; and/or may be tributaries to Class I streams or other Class II Streams.

*Class III* - All other perennial streams not meeting higher class criteria.

*Class IV* - All other intermittent streams not meeting higher class criteria.

**Stream Discharge** - The volume of water flowing past a point per unit time, commonly expressed as cubic feet per second, million gallons per day, gallons per minute or cubic meters per second.

**Stream Order** - A hydrologic system of stream classification. Each small unbranched tributary is a first order stream. Two first order streams join to make a second order stream. A third order stream has only first and second order tributaries, and so forth.

**Stream Reach** - An individual first order stream or a segment of another stream that has beginning and ending points at a stream confluence. Reach end points are normally designated where a tributary confluence changes the channel character or order. Although reaches identified by the Bureau of Land Management are variable in length, they normally have a range of 0.5 to 1.5 miles in length unless channel character, confluence distribution, or management considerations require variance.

**Stream Scour or Channel Scour** - Erosion of the channel bottom and/or banks caused by high flows or water, loss of channel stability, or debris torrents.

**Stream Structure** - The arrangement of logs, boulders, and meanders which modify the flow of water, thereby causing the formation of pools and gravel bars in streams. Generally, there is a direct relationship between complexity of structure and fish habitat. Complex structure is also an indication of watershed stability.

**Streamflow** - The flow of water, generally with its suspended sediment load, down a well-defined watercourse.

**Streamside Management Unit (SMU)** - An area of varying width adjacent to a stream where practices that might affect water quality, fish, and other aquatic resources are modified to meet water quality goals, for each class of stream. The width of this area will vary with the management goals for each class of stream, the characteristics of the stream and surrounding terrain, and the type and extent of the planned activity.

**Structural Discontinuity** - A surface separating two unrelated groups of rocks, created by faulting.

**Structural Diversity** - The diversity of forest structure, both vertical and horizontal, that provides for a variety of forest habitats for plants and animals. The variety results from layering or tiering of the canopy and the die-back, death, and ultimate decay of trees. In aquatic habitats, the presence of a variety of structural features such as logs and boulders that create a variety of habitat.

**Structural Retention** - Harvest practices that leave physical elements (e.g., green trees, snags, down logs) of LS/OG forests on site after harvest.

**Structure** - The spatial arrangement of the living and nonliving elements of an ecosystem.

**Subdrainage** - A land area (basin) bounded by ridges or similar topographic features, encompassing only part of a watershed, and enclosing on the order of 5,000 acres; smaller than, and part of, a watershed. (See Drainage and Forest watershed.)

**Subpopulation** - A well-defined set of interacting individuals that compose a proportion of a larger, interbreeding population.

**Subspecies** - A population of a species occupying a particular geographic area, or less commonly, a distinct habitat, capable of interbreeding with other populations of the same species.

**Subwatershed** - For this analysis, this is synonymous with 6th-Field Watersheds.

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

**Successional Stage** - A stage or recognizable condition of a plant community that occurs during its development from bare ground to climax. For example, coniferous forests in the Blue Mountains progress through six recognized stages: grass-forb, shrub-seedling, pole-sapling, young, mature, old-growth. (See also Seral.)

**Suitability** - The appropriateness of applying certain resource management practices to a particular area of land, as determined by an analysis of the economic and environmental consequences and the alternative uses foregone. A unit of land may be suitable for a variety of individual or combined management practices. (36 CFR 219.3)

**Suitable Commercial Forest Land** - Commercial forest land capable of sustained long-term timber production.

**Suitable River** - A river segment found, through administrative study by an appropriate agency, to meet the criteria for designation as a component of the National Wild and Scenic Rivers system, specified in Section 4(a) of the Wild and Scenic Rivers Act.

**Superspecies** - Two closely related species that are believed to have diverged relatively recently.

**Supplemental Pair Areas** - Habitat delineated and maintained on nonfederal lands to support spotted owl pairs or territorial singles. Habitat may be managed or reserved from timber harvest; size of the areas varies by province.

**Suppression** - The action of extinguishing or confining a fire.

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

**Surface Runoff** - Water that flows over the ground surface and into streams and rivers.

**Suspended Sediment** - Sediment suspended in a fluid by the upward components of turbulent currents or by colloidal suspension.

**Sustainability** - The ability of an ecosystem to maintain ecological processes and functions, biological diversity, and productivity over time.

**Sustained Yield or Production** - The amount of timber that a forest can produce continuously from a given intensity of management. This implies continuous production. A primary goal is to achieve a balance between incremental growth and cutting.

**Synthesis** - The integration of separate ecosystem elements to understand the whole system; a primary goal of watershed analysis.

## *T*

**Take** - Under the Endangered Species Act, take means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect an animal, or to attempt to engage in any such conduct.

**Talus** - A slope landform, typically covered by coarse rock debris forming a more or less continuous layer that may or may not be covered by duff and litter.

**Target Stocking** - The desirable number of well spaced trees per acre at age of first commercial thinning.

**Targets** - Output accomplishments assigned to the Forest by the Forest Service Regional Forester. A statement used to express planned results to be achieved within a stated period of time.

**Temporary Roads** - Localized roads of limited duration, typically available for generic forest activities during the life of the project for which the road was constructed.

**Tentatively Suitable Forest Land** - Forest land that is producing or is capable of producing crops of industrial wood and: (a) has not been withdrawn by Congress, the Secretary, or the Chief; (b) existing technology and knowledge is available to ensure timber production without irreversible damage to soils productivity, or watershed conditions; (c) Existing technology and knowledge, as reflected in current research and experience, provides reasonable assurance that it is possible to restock adequately within five years after final harvest; and (d) adequate information is available to project responses to timber management activities.

**Terrestrial Habitat** - Land Area; wildlife species that dwell primarily on land, arboreal or aerial.

**Territorial Single** - An unpaired owl that is defending a territory.

**Territory** - The area that an animal defends, usually during breeding season, against intruders of its own species.

**Texture (soil)** - The relative proportion of sand, silt, and clay in a soil; grouped into standard classes and subclasses in the Soil Survey Manual of the U.S. Department of Agriculture.

**Texture of an Ecosystem** - Relative surface smoothness of an ecosystem determined by remote sensing technology, or the distinctiveness of the transition between two distinct ecosystems.

**Thermal Cover** - Cover used by animals to lessen the effects of weather. For elk, a stand of conifer trees that are 40 feet or more tall with an average crown closure of 70 percent or more. For deer, cover may include saplings, shrubs, or trees at least 5 feet tall with 75 percent crown closure.

**Thermoregulation** - The physiological and biological process whereby an animal regulates its body temperature.

**Threatened Species** - Those plant or animal species likely to become endangered species throughout all or a significant portion of their range within the foreseeable future. A plant or animal identified and defined in accordance with the 1973 Endangered Species Act and published in the Federal Register.

**Threshold Phenomenon** - Pattern or trend in population growth rate that exhibits relatively long periods of slow change followed by precipitous increase or response to an environmental gradient.

**Timber Classification** - Forest land is classified under each of the land management alternatives according to how it relates to the management of the timber resource. The following are definitions of timber classifications used for this purpose.

*Nonforest* - Land that has never supported forests and land formerly forested where use for timber production is precluded by development or other uses.

*Forest* - Land at least 10-percent stocked (based on crown cover) by forest trees of any size, or formerly having had such tree cover and not currently developed for nonforest use.

*Suitable* - Commercial forest land identified as appropriate for timber production in the Forest planning process.

*Unsuitable* - Forest land withdrawn from timber utilization by stature or administrative regulation (for example, wilderness), or identified as not appropriate for timber production in the Forest planning process.

*Commercial Forest* - Forestland tentatively suitable for the production of continuous crops of timber and that has not been with drawn from timber utilization.

**Timber Production** - The purposeful growing, tending, harvesting, and regeneration of regulated crops of trees to be cut into logs, bolts, or other round sections for industrial or consumer use. For planning purposes, the term "timber production" does not include production of fuelwood. (36 CFR 219.3)

**Timber Stand** - See Stand.

**Timber Stand Improvement (TSI)** - Measures such as thinning, pruning, release cutting, prescribed fire, girdling, weeding, or poisoning of unwanted trees aimed at improving growing conditions for the remaining trees.

**Toe** - The lower, usually curved, margin of the disturbed material of a landslide pushed over into the disturbed slope.

**Tolerant Species** - Plants that grow well in shade.

**Total Suspended Particulates** - All solid or semisolid material found in the atmosphere.

**Transition Period** - A period of environmental change during which a population increases or decreases to a new stable equilibrium level.

**Transportation System** - Network of roads used to manage Bureau of Land Management lands. includes Bureau-controlled roads and some privately controlled ' roads. Does not include Oregon Department of Transportation, county, and municipal roads.

**Trophic Level** - The level in the food chain at which an organism sustains itself.

**Turbidity** - The degree of opaqueness, or cloudiness, produced in water by suspended particulate matter, either organic or inorganic. Measured by light filtration or transmission and expressed in Jackson Turbidity Units (JTU).

**Twenty-Five Percent Fund Act of 1908** - This act provided that twenty-five percent of all moneys received during any fiscal year from each national forest shall be paid, at the end of each year, by the Secretary of the Treasury to the state in which each national forest is located. This money goes to the counties based on the proportion of the national forest in the respective counties. This payment is in addition to the payments in lieu of taxes made under the Payment in Lieu of Taxes Act of 1976.

## *U*

**U.S. Department of Agriculture (USDA)** - Federal land management agency whose main mission is multiple use of lands under its jurisdiction.

**U.S. Department of the Interior (USDI)** - Federal land management agency whose main mission is multiple use of lands under its jurisdiction.

**Unconsolidated Deposits** - Sediments that are loosely arranged, with particles that are not cemented together. Includes alluvial, glacial, volcanic, and landslide deposits.

**Underburning** - Prescribed burning of the forest floor or understory for botanical or wildlife habitat objectives, hazard reduction, or silvicultural objectives.

**Understocked** - When a plantation of trees fails to meet the minimum requirements for number of well spaced trees per acre.

**Understory** - The trees and other woody species growing under the canopies of larger adjacent trees and other woody growth.

**Uneven-Aged Management** - A combination of actions that simultaneously maintains continuous tall forest cover, recurring regeneration of desirable species, and the orderly growth and development of trees through a range of diameter or age classes. Cutting methods that develop and maintain uneven-aged stands are single-tree selection and group selection.

**Uneven-Aged Silviculture Systems** - The combination of actions that result in the creation of forests or stands of trees, in which trees of several or many ages grow together. Cutting methods that develop and maintain uneven-aged stands are single tree and group selection cutting methods;

*Single Tree Selection Cutting* - The removal of selected trees of all size classes on an individual basis.

*Group Selection Cutting* - The removal of all trees in groups for regeneration purposes. The size of the group will be small enough n area that all subsequent regeneration will be influenced by the surrounding uncut stand. Cuts are generally 0.25-2.0 acres in size.

**Uniform Flow** - A state of steady water flow where the mean velocity and cross sectional area are equal at all sections.

**Unique Ecosystems** - Ecosystems embracing special habitat features such as beaches and dunes, talus slopes, meadows, and wetlands.

**Unregulated Timber Management** - Timber cut from those lands that are not organized to provide sustained yields of timber.

**Unstable and Potentially Unstable Areas** - Lands that need protection to maintain natural disturbance patterns and functions, prevent increased landslide distribution in time and space (rate and frequency), prevent increased delivery of sediment, and maintain landslide-delivered supply of large woody material over several rotations. On-site delineation of unstable and potentially unstable areas considers the probability of landslide-triggering storms within the period of minimum root strength and elevated groundwater (as well as slope adjustment to piping changes), and the probability of channel adjustments that trigger streambank and toeslope failures.

**Uplift** - A structurally high area in the earth's crust, produced by positive, movements that raise or upthrust the rocks.

**Utility Corridor** - A linear strip of land identified for the present or future location of utility lines within its boundaries.

# V

**Vagility** - Capacity of any organism to become widely dispersed.

**Values** - Principles or qualities that are held in high esteem.

**Vertical Diversity** - The diversity in a stand that results from the complexity of the aboveground structure of the vegetation. The more tiers of vegetation or the more diverse the species makeup (or both), the higher the degree of vertical diversity. (See also Horizontal diversity.)

**Viability** - The ability of a wildlife or plant population to maintain sufficient size so that it persists over time in spite of normal fluctuations in numbers; usually expressed as a probability of maintaining a specific population for a specified period.

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

**Viewshed** - The landscape that can be directly seen from a viewpoint or along a transportation corridor.

**Visual Condition** - The visual appearance of a landscape described in terms of the degree of alteration of the natural appearing landscape. These terms are normally used as a summary rating for a large land area, such as a viewshed corridor. Descriptive degrees of alteration are:

*Natural Appearing* - Area appears untouched by man; changes are not visually evident. Generally similar to the Retention VQO.

*Slightly Altered* - Changes may be noticed by the average visitor but do not attract attention. Natural appearance dominates minor disturbances. Generally similar to the Partial Retention VQO.

*Moderately Altered* - Changes are easily noticed by the average visitor and may attract attention. Disturbances are apparent. Generally similar to the Modification VQO.

*Heavily Altered* - Changes are strong and obvious to the average visitor. Changes dominate the landscape but may resemble natural patterns when viewed from a distance of 3 to 5 miles. Disturbances are major. Generally similar to the Maximum Modification VQO.

**Visual Quality Objectives (VQO)** - Categories of acceptable landscape alteration measured in degrees of deviation from the natural-appearing landscape.

*Preservation (P)* - Ecological changes only.

*Retention (R)* - Management activities should not be evident to the casual Forest visitor.

*Partial Retention (PR)* - Management activities remain visually subordinate to the characteristic landscape.

*Modification (M)* - Management activities may dominate the characteristic landscape but must at the same time, follow naturally established form, line, color, and texture. It should appear as a natural occurrence when viewed in foreground or middleground.

*Maximum Modification (MM)* - Human activity may dominate the characteristic landscape, but should appear as a natural occurrence when viewed as background.

*Enhancement* - A short-term management alternative which is done with the express purpose of increasing positive visual variety where little variety now exists.

**Visual Resource** - The visible physical features of a landscape.

**Visual Resource Management (VRM)** - The inventory and planning actions to identify values and establish objectives for managing those values and the management actions to achieve those objectives.

**Vital Rates** - Rates of key demographic functions within a population, such as the birth rate and survival rate.

## *W*

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

**Water Yield** - The measured output of the Forest's streams.

**Watershed** - Any area of land that drains to a common point. A watershed is smaller than a river basin or subbasin, but it is larger than a drainage or site. The term generally describes areas that result from the first subdivision of a subbasin, often referred to as a "fifth-field watershed". The drainage basin contributing water, organic matter, dissolved nutrients, and sediments to a stream or lake.

**Watershed Analysis** - A systematic procedure for characterizing watershed and ecological processes to meet specific management and social objectives. Watershed analysis is a stratum of ecosystem management planning applied to watersheds of approximately 20 to 200 square miles.

**Watershed Restoration** - Improving current conditions of watersheds to restore degraded fish habitat and provide long-term protection to aquatic and riparian resources.

**Well Distributed** - A geographic distribution of habitats that maintains a population throughout a planning area and allows for interaction of individuals through periodic interbreeding and colonization of unoccupied habitats.

**West Side Forests** - The 11 National Forests within the range of the northern spotted owl in Washington, Oregon, and California that lie west of the Cascade crest. They are the Gifford Pinchot, Mendocino, Mt. Baker-Snoqualmie, Mt. Hood, Olympic, Rouge River, Siskiyou, Siuslaw, Six Rivers, Umpqua, and Willamette National Forests.

**Wet Meadows** - Areas where grasses predominate. Normally waterlogged within a few inches of the ground surface.

**Wetlands** - Areas that are inundated by surface water or ground water with a frequency sufficient to support, and under normal circumstances do or would support, a prevalence of vegetative or aquatic life that require saturated or seasonally saturated soil conditions for growth and reproduction (Executive Order 11990). Wetlands generally include, but are not limited to, swamps, marshes, bogs, and similar areas.

**Wild and Scenic River System** - Those rivers or section of rivers designated as such by Congressional action under the Wild and Scenic River Act (Public Law 90-542, 1968), as supplemented and amended, or those sections of rivers designated as wild, scenic, or recreational by an act of the legislature of the state or states through which they flow. Each designated river may be classified and administered under one or more of the following categories:

*Wild River Areas* - Those rivers or section of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.

*Scenic River Areas* - Those rivers or sections of rivers that are free of impoundments with watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

*Recreation River Areas* - Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines. and that may have undergone some impoundment or diversion in the past.

**Wild River** - See Wild and Scenic River System.

**Wilderness** - Areas designated by Congressional action under the 1964 Wilderness Act. Wilderness is defined as undeveloped federal land retaining its primeval character and influence without permanent improvements or human habitation. Wilderness areas are protected and managed to preserve their natural conditions, which generally appear to have been affected primarily by the forces of nature, with the imprint of human activity substantially unnoticeable; have outstanding opportunities for solitude or for a primitive and confined type of recreation; include at least 5,000 acres or are of sufficient size to make practical their preservation, enjoyment, and use in an unimpaired condition; and may contain features of scientific, education, scenic, or historical value as well as ecologic and geologic interest.

**Wildfire** - Any wildland fire that is not a prescribed fire.

**Windfall** - Trees or parts of trees felled by high winds. (See also Blowdown and Windthrow.)

**Windthrow** - A tree or trees uprooted or felled by the wind.

**Winter Range** - The area available to and used by big game through the winter season.

**Woody Material** - Large logs necessary for stream channel and terrestrial stability and maintenance of watershed condition.

## *Y*

**Young Stands** - Forest stands not yet mature, generally, less than 50-80 years old; typically 20-40 years old.

# REVIEWERS COMMENTS

**PLANNING & COMMUNITY DEVELOPMENT**

MICHAEL NAGLER, DIRECTOR

COURTHOUSE
309 STATE STREET, ROOM 101
HOOD RIVER, OREGON 97031-2093

PHONE 541-386-1306
FAX 541-386-9392

August 27, 1996

Kim Titus, District Ranger
Hood River Ranger District
6780 Hwy. 35
Mt. Hood - Parkdale, OR 97140

Dear Ms. Titus:

Thank you for the opportunity to review and comment on the *Draft Watershed Analysis for the East and Middle Forks of the Hood River*. After reviewing portions of the *Draft*, the County Planning Department offers the following comments:

On July 29, 1996, Hood River County mailed you a copy of its *Draft Population Projections Report*. The projections found in that report are based upon historical growth trends as well as information published by Portland State University's Center for Population Research and Census. The draft includes population forecasts through the year 2015. Three alternative forecasts were developed by the County (low, middle and high), using different growth assumptions. The highest annual growth rate is projected by the County is 2.07%. This is based upon the highest growth that the County has experienced in the past. The County's middle forecast, which is proposed for adoption, assumes an annual compounded growth rate of 1.2% to 1.3%; this rate is based upon forecasts developed by Portland State University (PSU) in 1993.

The County Planning Department is concerned by the projected growth rates found in the *Draft Watershed Analysis* (see pages 1-8 and B-4) because they are so different from our own projections as well as those developed by PSU. The *Draft Watershed Analysis* forecasts population growth of between 3.2% and 4.3% annually. These growth rates are far in excess of anything that the County has historically experienced, even during the relatively robust period between 1990 and the present.

While County Planning staff concur that migration to the area will continue to be the primary driver of the area's growth, we also believe the forecasts found in the *Draft Watershed Analysis* are too high. In the course of our population research, we found no published data that would support such high growth forecasts. Our research included review of school district forecasts, Census data, contacts with State agencies, analyses of labor trends (as published by the Oregon Employment Department), and review of population information published by Portland State University.

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Ms. Kim Titus

Another observation made by County staff is that the labor and income figures cited in the *Economic Assessment* section of Appendix B (see page B-7) are inconsistent with the information published in the Oregon Employment Department's *Mid-Columbia Region Labor Trends* (August, 1996 issue). According to the August, 1996 *Labor Trends*, the June jobless rate in 1995 was 13.1%, substantially higher than the 11.9 % figure found in the *Draft Watershed Analysis*.

On the positive side, per capita personal income reported in the August *Labor Trends* is higher than that reported in Appendix B of the *Draft Watershed Analysis* (page B-7). Hood River County ranked 14th in the state in 1994, with per capita income reported at $18,016 rather than the being the "fourth lowest in the state of Oregon" (at $17,181) as stated on page B-7 of the *Draft*. I am enclosing a copy of the August, 1996 *Labor Trends* for your reference. It is probably worth another look into the reasons for these inconsistencies.

Thank you for the opportunity to comment on the draft document. It is obvious that a great deal of effort has gone into its preparation. I hope that the County's comments will be useful. Please feel free to contact me if I can clarify any issues or provide any assistance.

Sincerely,

Gregg Leion

Gregg Leion
Senior Planner

enclosure

Warm Springs, Oregon 97761

September 26, 1996

Kim Titus
USFS Forest Service
Hood River Ranger District
6780 Highway 35
Mt-Hood - Parkdale, Oregon 97041

Re: Draft East Fork & Middle Fork Hood River Watershed Analyses

Dear Kim:

First, we agree with the Oregon Department of Fish and Wildlife (ODFW) in that your Watershed Analysis Team has done a considerable job of compiling a wealth of information. This will be a valuable information source regarding the two watersheds as a whole.

Secondly, the watershed analysis appears to cover the terrestrial and riparian vegetation portions of the federal ownership quite well.

We also agree with ODFW on their noted correction regarding the BPA's funded supplementation project and we ask that this correction be made.

Our staff has two concerns. First, geomorphical, regarding the need to quantify; USFS road interaction with streams and the condition of the stream substrate. Second, we are concerned some of the riparian restorations projects, particularly silvicultural treatments and the amount of restorations projects that can be done in any given reach. ODFW noted in their letter on this Watershed Analysis dated September 17, 1996 that potential habitat improvements can create significant risks to the remnant bull trout population in Clear Branch above Laurance Lake.

Regarding stream substrate and road/stream interaction we are optimistic that the District notes that roads do contrib sediment to streams. However, we ask that quantification of sediment loading from management activities be included in at least future Iterations. We understand that there is some pebble count data on file for these watersheds. Further, we have received watershed analysis from your Forest on the Salmon River and the Oak Grove which have dealt with sediment loading from different road surfaces and indicated their possible impacts on stream systems and ask that your District look at these analysis.

We hope this analysis and future Iterations will assist the Forest in lowering road densities and understanding any current and potential sediment sources (e.g., mass wasting sites, road surfaces, road drainage networks, etc.). Mapping and correcting sediment contribution sites along the transport and drainage system would be helpful to note in future documents in lower sediment loading.

We hope these comments will be useful to the interdisciplinary teams as they conduct future Watershed Analyses within the Forest. The Tribes looks forward to working with the Forest. Please feel free to discuss these comments or any other related issues with me.

Sincerely,

John Kelley

CTWS Natural Resources
Fish Habitat Conservationist

xc:
C. Calica
CTWS Fish & Wildlife Committee
J. Griggs
M. Fritsch
P. O'Tool
J. Weber, CRITFC
Chrono
File

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Oregon

DEPARTMENT OF FORESTRY

STATE FORESTER'S OFFICE

"STEWARDSHIP IN FORESTRY"

1971 - 1996 25 Years Of Improving Forest Stewardship OREGON FOREST PRACTICES ACT

RECEIVED SEP 24

September 20, 1996

**VIA FAX, 541 467-2271**

Kim Titus, District Ranger
Hood River Ranger District
6780 Highway 35
Mt. Hood-Parkdale, Oregon 97041

Dear Ms. Titus:

Thank you for the opportunity to review and provide comment on the Draft East Fork Hood River and Middle Fork Hood River Watershed analysis. The Department appreciates the opportunity to review this analysis as the two watersheds incorporate a mix of federal and non-federal forest land.

It is our understanding that watershed analysis is an information-gathering and analysis process to organize and describe existing information. After reviewing the data gaps listed at the end of the recommendation section, it is our conclusion that the analysis has very limited value for forest management decisions which may effect fish due to the extent of the data gaps. The watershed analysis process should involve identifying critical issues that the Forest Service will face for the analysis area and then develop evaluations of the physical and biological processes that relate to these issues. A helpful approach in this process would be to list identified data gaps with the issues and implement strategies and completion times for addressing these gaps in future iterations of the document.

Perhaps incorporating a set of goals and objectives for this analysis followed by a listing of the identified data gaps within the introductory section of the document would be helpful in setting the readers' expectations. A technique used in the Siuslaw National Forest Mercer/Berry Watershed Analysis that worked well separated the issues into individual chapters with all relevant information pertaining to that issue included in the chapter.

We believe this watershed Analysis has several fatal flaws. Fatal flaws are errors of sufficient magnitude to damage the credibility of a report or analysis so that it is unacceptable.

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Kim Titus
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With regard to this report, the first fatal flaw is the lack of issue identification and development. A second fatal flaw is the lack of proper analysis and inadequate synthesis among the various individual reports and analyses. A third fatal flaw is the use of value-driven statements and the over-reliance upon conjecture to reach conclusions not supported by fact.

There are numerous textual and technical problems (e.g., "steep geology") with the report. Some of these problems are the result of the context that was created as the framework for the report. For example, the use of the "flow" metaphor beginning in Chapter I (page I-4) creates a number of semantic and technical problems through the report that were inadequately handled. The discussion about ecological processes is very weak and mixes physical processes with ecological processes.

We have focused our comments on the above fatal flaws, since these flaws undermine the credibility of the report. Additionally we have addressed three specific concerns we have with: a) how non-federal forest lands are addressed; b) how present, suspected and potential fish use information or lack of information is presented; and c) information pertaining to both natural and non-natural fish blockages that may exist.

**1. Lack of issue identification and development**

The Watershed Analysis lists only four issues. These four issues are not well developed and additional key issues appear to exist.

Issue 2 is not an issue, but rather a possible solution to an issue. (A holistic approach is one possible method of addressing possible broad scale effects of land management activities that may not have been adequately considered in the past.)

Likewise, issue 3 is not stated in a way that describes an issue (though the text describes an issue). This might be better stated as "The quantity and distribution of late-seral stage habitat has placed some late-seral dependent species at risk (loss of viability)." However, the vegetative distribution data does not necessarily appear to support this issue. Indeed, the quantity of mid- to late-seral stage forest has increased for the East Fork. Issues of connectivity may exist, but the analysis does not provide adequate evidence to demonstrate a problem. The fact that several late-seral stage species (pine marten and northern spotted owls) appear to be doing well would argue against some of the report's conclusions on this topic. While the Middle Fork data may show a need for greater concern, the data would appear to indicate that the amount of late-seral stage forest will be greatly increasing as the vast acreage of mid-seral stage forest becomes late-seral.

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September 20, 1996
Page 3

Issue 4 does not reflect the text. This could be better stated as "Demand for recreation is increasing and conflicts among different recreational interests are also increasing." Other recreational issues may exist, i.e., recreational uses are causing some adverse environmental and quality of experience impacts.

Our review of the Analysis indicates that several important additional issues need to be added. These possible issues include:

a. Noxious weeds are spreading (invading the forest at rates greater than control) and displacing native vegetation.

b. Management policy (fire exclusion and timber harvest) is changing forest structure by allowing tolerant species to overstock the understory of many stands (resulting in increased possibility of catastrophic fire or disease and insect epidemics).

c. Instream large woody debris loading is significantly below natural levels due to past management practices.

d. Riparian conditions are degraded (presence of hardwoods increased and large conifers were removed) along some streams.

e. The natural role of beavers may have been reduced (due to beaver removal and land use changes).

f. Snag habitat in created openings was reduced due to past snag removal (for safety, etc.)

Another important issue that could be considered in the context of the analysis is: Changes in federal management strategy have reduced the potential timber supply, causing economic effects including increased pressure for timber harvests on private lands.

**2. Lack of adequate analysis and synthesis among the various individual reports and analyses**

The separate analyses address their topics with varying degrees of effort. For example, the analysis related to "Fire Regimes and Fire History," while fairly concise, includes little analysis and no conclusions or recommendations, while the analysis related to

Kim Titus
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Page 4

wildlife includes a number of conclusions and recommendations. Some of the analyses note the data gaps, while others do not. The level of analysis among the topics needs more consistency.

Some of the analyses appear to miss some important topics. The recreation analysis fails to consider recreational fishing and hunting. We believe these activities are both important within the watershed. Management decisions such as road closures are likely to influence opportunities related to these pastimes. Vegetation patterns will similarly affect numbers and distribution of game species over time.

Similarly, one part of the report identified that beavers may have played a dominant role in the lower basins, yet the wildlife section scarcely mentions the animal.

The various analyses fail to integrate among themselves. For example, all analyses related to vegetation should have expressly considered fire regimes and their effects. The relevant analyses should have described the vegetative changes that will occur under current and planned management. As described earlier, the Middle Fork data would appear to indicate that the amount of late-seral stage forest will greatly increase as the vast acreage of mid-seral stage forest becomes late-seral. What problems and opportunities will this create? Will this transition reduce fragmentation?

Much concern was expressed about the condition of riparian forests and instream woody debris. Given the succession and growth of riparian vegetation, how soon will riparian condition on the national forestlands improve? How certain are you that management of non-federal lands will result in only "even-age short rotation forests" and that the trend in terms of older stand structure is negative? At least for riparian areas under the Oregon Forest Practices Act (FPA), this will not be true. Also snag habitat on non-federal lands should improve over time.

Furthermore, experience with non-industrial owners indicates that many own land for other than timber production and stand ages often are different than "even-age short rotation forests." Many such stands on non-industrial ownerships have components that would be described as mature and should provide dispersal habitat for some late-seral dependent species. How much non-industrial forest is within the basin? Similarly, many industrial owners manage under various harvest regimes. And given trends related to management on private lands to meet the requirements of the federal ESA, alternatives to even-age short rotation forests are likely.

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**3. Value-driven statements and over-reliance upon conjecture to reach conclusions not supported by fact**

Throughout the report, one is left with the impression that the writers were searching for evidence to support their predetermined points of view. Statements in the report suggest that the writers' values dominated their analyses. If these value-driven statements were unintentional, effort should be made to eliminate them from the report. If they were intentional, re-analysis should be directed.

In a glaring example of this problem, the report concludes that:

> *"The habitat associated with the late seral stage of forest development offers the best quality output for all users. The diversity of plant and animal habitat is greatest in these forests; the aesthetic value for recreation users is optimum; and, the highest quality of wood products for commercial markets is possible. Considering these ideas, the ideal forest management would continually produce late seral stage stands rotationally through time, shifting spatially across the landscape."*

The premise that this statement is based upon is false and prejudicial. The scientific understanding is flawed (i.e., the diversity of plant and animal habitat is not greatest in these forests!) and though expressed as an ideal, the outcome is neither achievable nor desirable on many acres within the analysis area. The focus on late-seral stage forest species is likely to create as many problems as the previous focus on timber management did. Such a focus is not consistent with "holistic management."

The report states that "[r]ock quarries provide a breeding ground for noxious weeds which can then be transported unchecked throughout the forest." The mechanisms that result in this outcome are not explained. However, rock quarries provide rock and not breeding grounds. Other consequences of rock quarry development, whether increased sediment delivery to channels or noxious weeds are due to (poor) management decisions (and not the quarry).

In another example, in the wildlife section (appendix J), the author concludes that:

> *"Removal of these large predators [grizzly bears and wolves] from the watersheds has most likely had ecosystem impacts, as the genetic integrity of prey animals (deer, elk, etc.) may be compromised, as the predatorial pressure both wolf and bear may have placed upon prey populations is not suitably replaced by hunting. (Bear/wolf were likely to remove older, younger, diseased, sick, weaker, less adaptable animals from the population. Hunting does not tend to replicate predators [sic] role)."*

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September 20, 1996
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No literature citation is provided to support this statement. However, the statement fails to reflect current understanding of prey/predator relationships or of "genetic integrity."

## Specific Comments

**a) Non-federal forest lands:**

Watershed analysis must evaluate all lands within a watershed. Non-federal lands within these watersheds are denoted as agriculture and forest. Non-federal forestlands are identified as even-aged short rotation stands. There is no information included in this analysis that non-federal forest landowners have a variety of values that they manage their land for and that non-federal forest lands are regulated by the state. Oregon's Forest Practices Act clearly defines the goals and objectives for desired future conditions for riparian areas along waters of the state. The rules describe desired future conditions based upon the characteristics of streamside stands. These rules are designed to achieve and maintain a desired future condition similar to mature forests with an emphasis towards conifer species along fish-bearing streams. The rules also include incentives for the recruitment of large woody debris (LWD) in areas where LWD is currently insufficient. In addition, rules within the FPA require minimum retention of wildlife trees, snags and down large woody debris.

Federal resource managers reviewing this document should be aware of the riparian protection measures that non-federal forest lands have in order to make knowledgeable decisions on federal lands effecting the watersheds. While the goals and objectives of the Northwest Forest Plan and the Mt. Hood National Forest's Land and Resource Management Plan address a wider range of uses than the Forest Practices Act does for non-federal lands, the impact of the Forest Practices Act on fish and fish habitat within the watersheds must be addressed and not ignored or simply stated as "even age short rotation stands."

**b) Present, Suspected, and Potential Fish Use:**

Within the Fisheries appendix the analysis contains GIS representations of present, suspected, potential, and historic fish presence. However, methods and documentation of formal fish presence/absence surveys (as noted in the data gaps) to support current fish presence is not presented. It is difficult to understand without supporting documentation what the difference is between present, suspected, and potential uses. Where the GIS representations indicate fish presence ends, in most instances no

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information is provided to indicate why it ends. Is it because of natural or human caused fish blockages, habitat conditions or something else?

The Oregon Department of Fish and Wildlife and the Oregon Department of Forestry have modified fish presence/absence protocols because appropriate protocol will make a significant difference in identifying fish presence. Using modified protocol a greater number of streams with fish presence have been identified than previously thought.

The Department of Forestry's assumption for fish use is that when a stream is documented to have fish use, it is assumed that the stream has fish use until a natural blockage is documented. Fish use above the natural blockage must be documented to enact FPA riparian protection measures. Some of the text within the document mentions waterfalls. It would be helpful to include a listing of tributaries within the two watersheds that lists the locations of natural blockages.

**c) Natural and Non-Natural Fish Blockages:**

On pages 1-15 and 3-14, it is reported that "up and downstream fish passage improvements are either completed or planned for virtually every remaining passage impediment in the watershed." However, there is no mention of stream crossing structure surveys or surveys for fish passage impediments documented in the report. Most of the discussion in the report on fish passage is based on the mainstem dams and irrigation diversions. Either documenting a fish passage survey conducted within the two watersheds (including tributaries) or including recommendations and criteria for conducting a fish passage survey within the watersheds should be an important element of this watershed analysis.

This is a concern because recent work in Washington and Oregon has identified that culverts are commonly barriers to passage of adult and juvenile fish. Given that many of the streams in the analysis area are high gradient, culverts placed on such streams have a very high probability of being barriers. How many stream crossings with culverts across fish-bearing streams exist on the forest? Have you inventoried them for drop or gradient? We have enclosed the Department of Forestry's guidance for fish passage to help you assess this issue.

**Summary**

The department appreciates the effort the watershed analysis team has put forth to develop this analysis. We hope our comments will be used to establish dialogue to

Kim Titus
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provide information and understanding regarding the Oregon Forest Practices Act. Additionally, we hope that improved coordination on Watershed Analyses can lead to an improved product that is more widely accepted and is more supportive of other state and federal efforts.

Please feel free to contact John Buckman, our forest practices forester in The Dalles (541 296-4626) for information regarding the Forest Practices Act. You can contact Liz Dent, our monitoring coordinator (503-945-7493), for information on monitoring projects the department may have in place within these watersheds (currently conducting riparian monitoring on Tony Creek). We are additionally aware of several changes to your analysis method or other models for watershed analysis that may better serve our joint needs. If you are interested in exploring this topic, please contact George Robison, the department's water issues coordinator at (503) 945-7469.

Sincerely,

Charlie Stone

Charlie Stone
Forest Practices Director

CHS:PCB:na
Enclosure: Fish passage guidance (not included with fax)
cc: Roberta Moltzen, USFS
Tim Keith, ODF, Prineville
Larry Hoffman, ODF, The Dalles
John Buckman, ODF, The Dalles
Dave Stere, ODF, Salem
Liz Dent
George Robison
Paul Bell

MT. HOOD MEADOWS SKI RESORT

SEP 25 1996

September 24, 1996

Kim Titus
District Ranger
HOOD RIVER RANGER DISTRICT
6780 Hwy. 35
Mt. Hood, OR 97041

RE: Draft East Fork Hood River and Middle Fork Hood River Watershed Analysis

Dear Kim:

Please accept this letter as Mt. Hood Meadows Oreg., LTD's comment on the above mentioned document.

1) 1 - 8, Population and Industry: Mt. Hood Meadows should be included as a major industry. Developed winter recreation at Mt. Hood Meadows should be emphasized and characterized as an important social component to the community.

2) 1 - 9, Visitors to the Watershed: Mt. Hood Meadows should be listed as a major attraction and draw for the public to the watershed.

3) 2 - 1, Issue 4: After the statement "The ability to provide additional recreation opportunities are limited by declining federal funds for recreation improvements," language should be added outlining the importance of permittee's and concessionaire's. Language should be added regarding how Mt. Hood Meadows is the largest private investor in recreational services and facilities within the watershed, playing a very important role in providing quality outdoor recreational facilities year round in partnership with the federal government, as a partial solution to the public funding problem.

4) 3 - 17, East Fork #2 Synthesis: In the last paragraph, under the discussion regarding how the recreation demands have not been completely foreseen and funding does not meet the need for further development, language should be added regarding the importance of permittee's and partnerships to attract capital to construct the needed facilities, especially on land allocated for developed recreation (A-11). Also, language should be added regarding the importance of observing population projections and proper master planning to have facilities on line prior to the facilities becoming overburdened by the public. Reference should be given to the critical importance of the Mt. Hood Meadows Master Plan and how this plan will play a crucial role over the next decade in meeting the year round recreational needs of the public.

Mt. Hood Meadows Ski Resort PO Box 470/Highway 35 Mt. Hood, Oregon 97041 (503) 337-2222 FAX (503) 337-2232

Page 2
Ms. Kim Titus

5) 3 - 18, East Fork Issue #4 Synthesis: Again, language should be included regarding the importance of Mt. Hood Meadows as the largest and most popular developed recreation site in the watershed. The permittee/Forest Service partnership is capable of providing additional year round recreational opportunities in a managed environment. Camping, hiking, mountain biking, picnicking, sightseeing, skiing, and interpretive opportunities exist at Mt. Hood Meadows. The permittee has continually requested that the Forest Service allow these services to be expanded which could serve to meet the growing needs of the public for outdoor recreation.

6) 4 - 5, Desired Future Condition, Developed Areas: This is a terribly conflicting message:

> Assumption #1: Developed areas will expand, in most cases, to meet the needs of the users;
> Assumption #2: Restrictions to access and use of developed areas will occur to maintain natural resources.

How can the Forest Service staff function with conflicting direction like this? I suggest that the second assumption read as follows: Mitigation plans, management plans, partnerships, and permittee's will be utilized to provide for high density recreational opportunities while preserving the natural resource's that make the areas attractive to the recreating public.

7) 4 - 7: Under Cooper Spur Ski Area, why lead the reader to believe that a re-evaluation of the land allocation may be appropriate? Just because the current permittee has no plans to expand does not mean that in the future another owner may not be more interested in expanding the area for more recreational opportunities. After the long discussion in several places in the document about how the Forest Service cannot handle the growth and demand for recreation in the watershed, why would the Forest Service limit its ability to expand? I suggest removing this sentence.

8) 4 - 10, Meadows IDA, Recommendations: This section is really weak. Please add additional language regarding the direction and importance of Mt. Hood Meadows in meeting the current and future demand for developed and managed recreation within the watershed.

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Ms. Kim Titus

Under Conceptual Forest add: "It is probable that Mt. Hood Meadows will play a larger and larger role in providing high quality recreational facilities on a year round basis to the greatest number of users within the watershed. Accordingly, planning efforts and resources should be directed towards this due to the suitability of the resort, the A-11 land designation, and the permittee/Forest Service relationship, to meet the growing future demand for recreation."

Under Projects add: "Through the master planning process, follow the previous direction of the Mt. Hood National Forest Land and Resource Management Plan Goals for A - 11 land at Mt. Hood Meadows by expanding the permit area, adding summer recreation, and adding additional high quality facilities for the public."

9) 5 -1, Meadows IDA: Change the sentence that reads "remove gravel and sediment accumulations" to "design and revamp drainage to minimize the deposits of gravel and sediment." I don't think you want us to take a front end loader into the meadow and scoop the gravel out.

10) A - 19: The following sentences are incorrect and should be deleted: "One of the main proponents of the project, Franklin Drake, however, left the corporation to form his own, Mt. Hood Meadows Oregon, LTD, with the backing of a number of Portland businessmen. --- Both the fact that Drake had begun with the group from Hood River and the manner in which the Forest Service Supervisor made the award left many area residents upset with the decision." I can't believe it would even end up in a draft.

To begin with, Franklin Drake was never a part of Hood River Meadows, Inc. He received a prospectus when several hundred where distributed by the Forest Service and submitted an independent proposal to the Forest Service. The statements regarding the Forest Supervisors decision, how he made it, and what the area residents thought are inappropriate, misleading, one sided, and overstated. In reality, several local residents were pleased Mr. Drake obtained the permit as his proposal included high quality facilities and a more substantial future plan for the recreation area. Sure, a few people got bent out of shape, but that is not the full story.

Can't the Forest Service find anything positive to say about the permittee after 30 years of partnership, countless hours of work, and millions of private dollars invested in a resort that is providing substantial benefits for the public?

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Ms. Kim Titus

11) D - 1 through D - 5, Appendix - D, Recreation Report: This entire report is weak with respect to the language regarding Mt. Hood Meadows. Considering the importance, size, and number of people MHM serves, and could serve in the future, I would think more emphasis should be placed on the ski area. Only three sentences regarding Meadows! I can't believe that the Forest Service has no language at all with respect to hiking, mountain biking, or camping at Mt. Hood Meadows. This section should be full of listed opportunities at Mt. Hood Meadows. Lets face it, the Forest Service has no money to develop these facilities, Mt. Hood Meadows wants to develop these facilities, and the Forest Service does not focus on the obvious solution to the problem! This is not a decision document, but it will provide the framework for future decisions. Why not provide support in this document for the ultimate solution to the Forest Service's inability to meet the growing demand for recreation? Please expand this section.

12) J - 8, Wildlife: The second paragraph on this page should be deleted. It is rambling editorial and opinion.

13) L - 33, Sensitive Plants, Impacts and Potential Restoration - Mt. Hood Meadows: Please add the following language under Past Management Practices "R - 6 Sensitive Plants have been observed growing in previously disturbed areas within Mt. Hood Meadows permit area. This leads one to believe that with reasonable efforts to restore species diversity subsequent to facility construction, significant adverse effects to the species as a whole can be eliminated with proper construction techniques and mitigation programs."

---

Overall, I would like to see more emphasis and direction in this document with respect to the importance of the past, current, and future role Mt. Hood Meadows plays in providing recreation to the public within the watershed. As I mentioned above, this is not a decision document, but will provide an important framework for future decision making. Incorporating the above additions and suggestions will make the Watershed Analysis more realistic and objective, thereby better meeting the overall intent as prescribed by the Northwest Forest Plan.

Please feel free to call me with any questions you may have. Thank you.

Page 5
Ms. Kim Titus

Sincerely,
MT. HOOD MEADOWS OREG., LTD

Dave Riley
Vice President
General Manager

Oregon

DEPARTMENT OF FISH AND WILDLIFE

MID-COLUMBIA DISTRICT OFFICE

September 17, 1996

Kim Titus
USDA Forest Service
Hood River Ranger District
6780 Hwy 35
Mt Hood - Parkdale, Oregon 97041

Dear Kim:

This letter is written in response to the draft **EAST FORK AND MIDDLE FORK HOOD RIVER WATERSHED ANALYSES.**

Your Watershed Analysis Team has done a remarkable job of compiling a wealth of information in one document. The final document should be a valuable information source for many different users and uses. For the sake of brevity I will concentrate my comments on fishery-related items or issues that may need to be corrected or revised. There are many good parts to this analysis that I will not specifically address.

In general this watershed analysis appears to be most up to date and accurate for the public lands, while information on those portions of the watersheds located beyond the national forest boundary is somewhat deficient. This plan inequity is likely directly related to resource information availability.

The following comments refer to specific items within the plan that need further consideration.

**Landscape Patterns** page 1-2: There is no mention of natural lakes in this discussion. A good example is Teacup Lake, which was stocked with trout for a number of years.

**Fish and Habitat - East Fork Reference Condition:** Page 3-7, the third paragraph under this heading states that spring chinook probably resided in the East Fork. Unfortunately I am not aware of any data that could substantiate this assumption. It would be safer to say "may" have resided.

**Human Uses - East Fork Current Condition:** Page 3-8, paragraph 4 discusses the construction and reconstruction of Highway 35 along the East Fork Hood River. However, there is no mention of the negative impacts of the highway construction on the river until the list of detrimental management actions is

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presented on page 3-14. In actuality, the confinement of the East Fork Hood River by sections of Highway 35 resulted in significant adverse impacts on the river and likely the associated biota. It appears that the discussion on page 3-8 could be expanded to specifically acknowledge this problem.

**Vegetation - East Fork Current Condition:** Page 3-12, paragraph 1 refers to the USFS removal of all large wood in and adjacent to the stream channel from Robinhood to Sherwood campground. However, on page I-2 (paragraph 5) there is a statement that refers to the removal of the large wood between Sherwood and Nottingham campgrounds. This appears to be an inconsistency that should be addressed or clarified.

**Fish and Habitat - East Fork Current Condition:** Page 3-14, paragraph 2 lists fish stocking as a detrimental management action. I am not aware of any data specific to the East Fork watershed that would substantiate this conclusion. For example the East Fork Hood River has been stocked with catchable size rainbow trout for many years. This stocking has supported an important recreational fishery that has provided many days of recreational experience to a multitude of anglers. These trout originated from a fall spawning hatchery trout stock. Past fish inventory data suggested that fish were either caught by anglers or they left the system within approximately one month. What few hatchery fish that remained in the East Fork likely did not spawn with the native population because of different spawning periods. This is an example of trout stocking that probably had little detrimental affect on the native trout stocks.

Page 3-14, paragraph 3 states that ODFW has been stocking winter steelhead into the Hood System since 1962. This could be interpreted to mean that there has been annual stocking since 1962, when actually there was a significant breaks in winter steelhead stocking.

Page 3-14, paragraph 5 contains a statement that ODFW, CTWS, and BPA are cooperating on a large scale fish supplementation project that includes provisions for providing upstream and downstream fish passage at virtually every fish passage impediment in the watershed. This conclusion is completely inaccurate. Ironically the intent of the Hood River Fish Production Program, which is funded by BPA and implemented by ODFW and CTWS, is to restore the numbers of native Hood River steelhead and re-establish a naturally

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reproducing population of spring chinook salmon with minimal impact on other anadromous or resident fish stocks. It is ODFW policy that fish passage will <u>not</u> be provided over natural fish migration barriers, but we will pursue fish passage at manmade obstructions. It is a high priority to protect fish populations that have evolved over time above natural migration barriers. Page I-15, paragraph 2, also contains this same fish passage statement. Both citations need to be revised.

**East Fork Lower Reaches Non-Federal Ownerships: Page 3-15,** This discussion indicates that human development within and adjacent to the riparian areas has been extensive. There has been a great deal of development adjacent to riparian areas, but many of the off-forest riparian areas are still in good condition as indicated by diverse communities of riparian vegetation. Topography and generally unstable flood plains along the Middle and East forks have precluded structural development along the streams, except for road corridors or crossings. There has been some loss or degradation of riparian plant communities associated with agriculture or livestock grazing practices.

Page 3-16, paragraph 1: includes reference to the removal of the Hines Mill Dam sometime in the 1950's. This structure was removed in June 1966.

Page 3-16, paragraph 2: There have been instances during several dry years that the East Fork Irrigation District diversion from the East Fork Hood River has diverted the entire stream into the irrigation canal. There was no observed surface water flow in the East Fork channel for some distance below the irrigation diversion dam.

East Fork Issue #2, Page 3-17, paragraph 3 refers to the February 1996 flood as a 30 year event. The flow in the mainstem is the flood of record, although the 1964 flood likely had a greater flow, but was not recorded due to a loss of the flow gauge. Therefore it seems that the 1996 flood was easily a 30 year event if not larger.

**Hydrologic Systems - Middle Fork Current Condition:** Page 3-25, paragraph 1 states that a fish trap at the base of Clear Branch Dam will facilitate fish passage above the dam. It is important to clarify that there is no intent to pass all fish entering the trap above the reservoir. In fact passage may only include bull trout, and then only those fish that enter the trap multiple times.

**Middle Fork Issue #1 Synthesis - Fish Populations:** Page 3-27, paragraph 5 quickly skips past the fish passage problems associated with road crossings on Pinnacle Creek. It is apparent that during years with high irrigation demand and low precipitation the combination of the low reservoir level in Laurance Lake and the lower road crossing and culvert on Pinnacle Creek have effectively blocked bull trout passage into Pinnacle Creek. This will likely be a reoccurring problem until this old road crossing is removed. The other road crossings on this stream also appear to delay or block bull trout migrations at some reservoir levels or at some stream flows. These problems should be acknowledged in more detail in this watershed analysis.

**South Middle Fork IDA - Recommendations:** Page 4-12, paragraph 8, indicates that fish habitat improvement with large woody debris is needed in Clear Branch above Laurance Lake. This potential habitat improvement includes significant risks to the remnant bull trout population. This section of stream, which is one of the most important bull trout spawning areas in the Hood River basin has had several habitat restoration projects in recent years that involved the placement of large wood, and closure and scarification of the road bordering the stream. The stream channel and riparian corridor have recovered to varying degrees from these earlier projects. I recommend that this stream be left alone to continue to recover naturally. Re-entering this area with machinery and the associated soil and vegetative disturbance may now be counter productive for the stream and bull trout.

**Conductivity:** Page H-6, paragraph 1, discusses the apparent dilution affect on stream conductivity. However, there is no discussion about the real or potential affects of salting the ski slopes at Mount Hood Meadows on stream conductivity, or water quality in general.

**Historic Conditions - Fish Presence:** Page I-1, paragraph 5, includes a discussion on historical spring chinook presence in the Hood River basin. It is doubtful that Punchbowl Falls (West Fork) was a barrier for adult spring chinook migration, since passage was probably possible during the higher spring flows. Punchbowl Falls, similar to Sherars Falls (lower Deschutes River) likely acted to segregate the spring and fall chinook populations, since fall chinook were unable to negotiate the barrier during the period of low stream flow.

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It should also be noted that the Moving Falls fishway (West Fork) was completed by the Oregon Department of Fish and Wildlife on October 18, 1985 . The Punchbowl Falls fishway was completed by the Oregon Fish Commission in 1957.

**Altered Up and Downstream Fish Passage:** Page I-3, paragraph 1, states that unscreened diversions trap downstream migrants. These unscreened diversion actually reroute the downstream migrants away from the stream channel and into the irrigation distribution system where there is little opportunity to find their way back to the stream. The percentage of fish diverted from a stream is usually directly proportional to the percent of the stream flow diverted.

The East Fork Irrigation District diversion from the East Fork has been unscreened for more than 25 years, but it should have operational screens in place before the 1997 irrigation season. The Middle Fork Irrigation District has screens in place at their Coe and Elliot Branch diversions, which prevent downstream migrant fish from entering the irrigation system.

Page I-3, paragraph 2, briefly discusses the fish passage issues associated with PacifiCorp's Powerdale Dam on the mainstem Hood River. However the discussion fails to mention that ODFW and CTWS have been working with PacifiCorp to correct problems with upstream passage, which recently included reconfiguring the fishway and auxiliary attraction water discharge points to improve adult attraction to the ladder. PacifiCorp is in the process of renewing their FERC license for the Powerdale Project. Studies have documented and PacifiCorp has agreed that the screening of the penstock intake is inadequate and needs to be replaced to meet fish screen criteria. Therefore, there have been problems at this site but fishery agencies and PacifiCorp are aware of these problems and are aggressively moving ahead to correct the problems.

Page I-4, paragraph 1, incorrectly states that the Hines Dam was located on the East Fork Hood River. This dam was located just downstream from the confluence of the East and Middle forks on the mainstem Hood River.

**Fish Stocking:** Page I-5, paragraph 2, discusses the possible origin of brook trout in Cold Springs Creek. I have never seen any documentation that would help answer this question. In this instance it would be more accurate to say the origin is unknown since the only other option is unsubstantiated speculation.

**Table 1**: Page I-6, The value of this table is questionable since it does not accurately reflect all the fish stocking that has occurred within these watersheds. The table does provide some historic fish stocking information, but would be more meaningful if it reflected stocking in the last ten years.

**Current Conditions - Anadromous and Resident Fish Life History:** Page I-7, paragraph 2, Table 1 shows that winter steelhead have not been stocked in the watershed continually since 1962, as the narrative could be interpreted to imply. This wording needs to be clarified to reflect sporadic releases of winter steelhead, but not an annual program.

<u>Searun Cutthroat</u>: Page I-7, should also include the information that no searun cutthroat upstream migrants have been observed or passed upstream at Powerdale Dam since 1993.

<u>Rainbow and Cutthroat Trout</u>: Page I-7, paragraph 2, incorrectly assumes that hatchery trout stocked in these watersheds, if not caught by anglers, remained to spawn with the native trout. Anecdotal information has indicated that hatchery fish stocked in streams within these watersheds (i.e. East Fork) are either harvested or they leave the system. These hatchery rainbow originated from a stock of fall spawning rainbow kept at Oak Springs Fish Hatchery. It is unlikely that these fish, if present in the wild, would sexually mature in the spring to spawn with native trout populations. This analysis should provide the data to substantiate the conclusion that these hatchery trout survive the winter and successfully spawn the following spring with the native trout.

**Figure 1a**: Page I-9, does not accurately reflect coho salmon distribution. For example ODFW has observed juvenile coho salmon in Baldwin Creek. There is also the distinct possibility that other East Fork tributaries support some coho salmon spawning and/or rearing (i.e. Evans, Emil, Griswel and Wishart creeks).

I appreciate the opportunity to review and comment on this draft watershed analyses. I am hopeful that the above comments can be incorporated into the final document.

Sincerely,

James A. Newton
District Fish Biologist

cc: Chip Dale
Mick Jennings
John Kelly

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Oregon

DEPARTMENT OF
FISH AND
WILDLIFE

MID-COLUMBIA
DISTRICT OFFICE

September 19, 1996

Robert Walkowiak
Hood River Ranger District
6780 Hwy 35 South
Mt. Hood-Parkdale, Oregon 97041

Dear Mr. Walkowiak:

Thank you for the opportunity to review the Draft East Fork and Middle Fork Hood River Watershed Analysis. The following comments deal with the wildlife section of the analysis.

In several places (3-15, 3-26, 5-2, J-5) the report refers to bald eagles not being inhabitants of either watershed. It is true that no bald eagle nest sites are known to exist but they are winter residents. Wintering bald eagles typically arrive in November and leave by late April. The majority of the use is along the Columbia River but birds are commonly seen foraging inland looking for carrion in the form of dead livestock, big game and fish.

ODFW has suspected that the Hood River basin also contains a winter roost but has been unable to locate it. It may be in the East or Middle Fork as birds have been seen flying to and from that direction.

Peregrine falcons have been positively identified in the Mt. Hood Meadows area on several occasions. These birds are most likely migrants but recent re-introductions on the Forest may result in increased year round use.

The listing of the wolf and grizzly bear as former inhabitants of the study area is correct, but the idea that there might be room to reintroduce them (pg 5-2) into these ecosystems would not be supported by the Department. There are to many people and not enough space for predators that require such large home ranges.

The narrative on page J-2 & J-8 regarding the genetic health of the big game in the region being inferior because of the lack of predation by wolves and grizzly has no scientific basis and should be removed from the text. Plenty of other predators have successfully replaced them, such as the cougar, black bear, coyote and bobcat.

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ODFW strongly supports the listing of the Mountain Goat as a former resident of this ecosystem. It is very probable that Mt. Goats could be successfully reintroduced. Limited success was experienced in previous transplants. The animals released in the gorge have lasted for 20 years and reproduction was documented. We now know that a minimum of 20 goats need to be released at one time and supplemented in future years with smaller transplants to improve genetic viability. ODFW also contends that Mt. Goats would not be a problem to native plants because these plants evolved with grazing from deer, elk, bear, and Mt. Goats.

In the desired future condition for Meadows IDA (4-10) the Department would like to see a provision that does not support summer use of the ski area. We cannot support Forest direction that encourages increased summer use in this part of the watershed because of the negative impact on wildlife and wildlife habitat. This same provision could be added as a "High" priority on page 5-1 under Meadows IDA recommendations.

If you have any questions about these comment please contact me.

Jim Torland

District Wildlife Biologist
Mid-Columbia District

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United States Department of Agriculture
Forest Service 541-386-2333
Columbia River Gorge National Scenic Area FAX 541-386-1916
902 Wasco Avenue Suite 200 Hood River, OR 97031

File Code: 1950 Date: September 13, 1996

Subject: East Fork, Middle Fork Hood River Watershed Analyses Review

To: Kim Titus, District Ranger

Thank you for the opportunity to review the draft East Fork Hood River and Middle Fork Hood River Watershed Analyses. The document is very well packaged, with clear organization and nice graphics.

Our only substantive comment relates to direction for the Hood River contained in the National Scenic Area Act (PL99-663, November 17, 1986, copy enclosed). Section 13(a) of the Act states that for twenty years from the date of the enactment of the Act, the Hood River "shall be subject to the same restrictions on the licensing, permitting and exempting from licensing and the construction of water resource projects as provided for components of the National Wild and Scenic Rivers System pursuant to section 7(a) of the Wild and Scenic Rivers Act". We interpret this direction to apply to the entire Hood River.

We advise this Wild and Scenic River direction be included in the watershed analyses since it may be relevant to implementation of future river projects. Inclusion would act as a reminder to future project managers.

Please contact Jurgen Hess, Steve Mellor or me for further information on this subject.

Virginia Kelly
VIRGINIA KELLY
Planning Team Leader

Enclosure

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HOOD RIVER COUNTY
FRUIT RECREATION INDUSTRY



FORESTRY DEPARTMENT

KENNETH GALLOWAY, JR.
FOREST MANAGER

918 18th STREET
HOOD RIVER, OREGON 97031

PHONE: (503) 386-6323

August 28, 1996

To: Kim Titus

Subject: East Fork & Middle Fork of Hood River Draft Watershed Analysis Comments

We appreciate the effort in the above project. After reviewing several other plans and proposed laws, one item is deficient in this document. At the end of the document, you need to have a definition of terms. Some of the terms that need to be defined are seral, late seral, rotation, short rotation, noxious weeds, introduced weed problems riparian area and stream blockage to fish (natural & man made).

In much of the plan, discussion on fire, forest stand condition, and historic drainage status is primarily on the last one hundred years. This is not really a fair time frame when the trees in the LSR and frequently mention stand condition contains trees that are 200 and or 350+ years old. Many of those trees survived fires that were more likely caused by lightning and are scattered. The LSR forest stand provides habitat for certain types of wildlife and plant species. However, after the fires, small and large, a level and assortment of wildlife and plant species survived and a new forest grew. It is well documented by biologists, that big game (elk & deer), small mammals, huckleberries and assorted song birds enjoy the snags and survive better in a young forest after a fire or man caused incident, such as logging. It appears that the authors purposely avoided this discussion since it would contradict an agenda to curtail or restrict forest management options.

In Identified Issues (2-1), Issue 3 is not needed if you are truly discussing Issue 2 in a complete format. It is apparent that Issue 3 would be included in bullet one of Issue 2 unless there is a different agenda.

On page 3-11 and others, you address removing in stream large woody material as a past bad management practise. The past removal of woody debris in streams should be clarified in this plan so it is not perceived as random and without support. Under the directive and encouragement of both federal and state fish biologist and hydrologist, during the 1960's and 1970's, removal of large and medium woody debris was promoted with road construction and logging. Only after lengthy research and review of streams did a change in policy happen.

On page 3-14 and others, where possible extinction of the Coho salmon and various runs of steelhead are mentioned, you should clarify that the Hines Dam probably contributed to this. Also, the opportunity to introduce these species, or others, has a better chance of success with the removal of that dam. The final paragraph in that same section on the same page and page 3-16-Upper Reaches is not correct at all. We have not heard of a proposal by the Oregon Department of Transportation to change existing culverts on Highway 35 or Hood River County Department of Public Works on various County roads to remove "passage impediments." Who would pay for this?

On page 3-15 and others, statements are made in reference to non-U.S.F.S. forest land owners and a short rotation. What is a short rotation? Until very recently, the U.S.F.S. rotation was 100 years. I know of some land owners that have 80-90 year rotations, so do you consider that short since it is less than the U.S.F.S.? If a market for large logs does not exist, but a market for small logs does exist, why is short rotation bad, especially if uneven age management and/or thinning and seed tree harvest removals in the plan? We could not agree at this time to a late seral silviculture practice as suggested on page 5-2 until clarified and defined.

On the same page and others, you suggest the reason no Bald Eagles exist has to do with the lack of fish runs. This is an assumed association we believe is an error. With the small number of Osprey nests in the two watersheds, we agree the fish runs are down as Osprey are fish eaters. Bald Eagles do not need strictly fish to survive. The sentence on the pond turtle should have included a statement that the turtle was located in a beaver pond. The removal of the many beaver ponds on tributary streams and the continued agricultural practice, probably had a greater affect on the turtle population than logging.

On page 3-17, how can rock quarries continue a noxious weed infestation? If the weed is treated, the quarry, trails, clearcuts, burned areas, etc. may provide a suitable habitat to encourage germination and growth. The U.S.F.S. refusal to use all the tools available to combat the noxious weed problem is going to allow the problem to get worse. You should endorse, encourage and permit the use of herbicide treatment in these areas instead of the "last resort policy" in Appendix L-29. It would be faster, cheaper and have better results.

On page 3-17, it appears the U.S.F.S. is unable to manage the recreation users in concentrated areas. They could review what has occurred at Tollbridge Park. We have enhanced the riparian areas and are still developing the park. In reference to page 3-19, if your parks are so crowded and degrading so quickly, you again should review what is happening at Tollbridge Park. Why don't you mention in Appendix-D either Tollbridge or Routson County Parks?

On page 4-7, any fire suppression coordination would be with the Oregon Department of Forestry as they are charged with the responsibility of protection of Hood River County and Longview Fibre Co. forest land.

In all of your conceptual forest lands, you seem to avoid the issue of harvest in the LSR's. As we read and understand the desired LSR condition, logging would be desired to maintain, create, and enhance this condition. However, we believe you have made an error in assuming the total U.S.F.S. forest ownership in the study areas should be managed for the LSR status. This is not the desired type of forest for many of the plant and wildlife species.

We have approached the U.S.F.S. on several occasions for the past 15+ years to complete land exchanges in the areas of concern to the U.S.F.S. On page 4-13, we would like to exchange the County ownership of the lava beds. Also, it is our understanding that the Oregon Department of Forestry (ODF) would like to exchange Section 16-T1S-R10E, WM to the U.S.F.S. If this would occur, we would like to exchange our ownership in Section 21-T1S-R10E, WM since this would fit in with your plan. This would support your suggestions on page 5-6. We would consider forest land in the Mt. Defiance or Tony Cr. area.

On page 5-2 and 5-3 we cannot support road obliteration. We can support road closure and in some instances culvert removal to reduce stream blockage problems. Whether for fire suppression, harvest removals, or dirt/low standard roads used as recreational trails, the roads and road beds should remain. It is easier to reconstruct than waste taxpayer money for road destruction and future construction. The strong evidence of big game and mammal use of forest roads should indicate that obliteration also will have a significant affect on their movement.

We have a strong opposition to any Fire or Fuel Management Plan that embraces a "let burn" policy during ODF fire season, usually mid-June through September.

We are concerned that in the Appendix-A, you have not addressed the significant changes in the Oregon Forest Practice Act in reference, to protection of the riparian areas and stream management. You have not addressed or encouraged the approval of the ODF stream monitoring and stream enhancement program. With a third of the watershed non-U.S.F.S. ownership with over half of that forest land being managed, this should be acknowledged.

We have a hard time understanding why Appendix-B even needs to be in the document, but parts of it are grossly wrong. On page B-10, "The County Forest is 32,000 acres; the 1994-5 budgeted revenues were $1,835,400 and increase of $51,000 over the previous year. The 1995-6 budgeted revenues were $2,076,925 and 1996-7 the budgeted revenues were $2,588,625. All of the revenue goes into the County General Fund Budget. About 31% of the County General Fund budget is derived from the sale of timber from the County Forest. NONE goes to the schools or the Road Department. This income to the county has offset the need for additional taxes. Income from timber sales fund or partially fund 17 departments or divisions of county government.
Additional economic benefits from the county timber program include assorted contracts and employment."

On page C-5, I disagree with the reference to the storm of 1996 as a once in a lifetime storm. If you are going to address this storm for any type of comparison, then include the same information for comparison to the Ice Storm of 1971, the Columbus Day Storm of 1962 and the snow storm of 1950-51. These all had a significant impact on the watersheds that should be used for inclusion.

On page H-9, you should clarify where the pesticides are being used and the name of the landowners. It appears as if the County is the only user.

In Appendix I, we feel the extensive amount of work completed by the Oregon Department of Fish and Wildlife on stream surveys should also be included. We consider them as an independent third party. You should also consider possible fish loss due to changes in the climate around Mt. Hood or other significant climatic cycles such as the recent drought.

In Appendix J, we do not feel the various species that have been "extirpated" should be re-introduced. Also, in the previous discussions on the Condor and the Mountain goats, you did not suggest their destruction may have been due to climate.

Sincerely,

Kenneth Galloway, Jr.
County Forest/Park Mgr.

JAMES F. AZUMANO
COUNTY ADMINISTRATOR

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COUNTY OF HOOD RIVER
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HOOD RIVER, OREGON 97031-2093

September 3, 1996

Oregon Water Resources Dept.
158 12th Street NE
Salem, OR 97310

Dept. of Environmental Quality
811 SW Sixth Avenue
Portland, OR 97204-1390

Hood River Ranger District
6780 Highway 35
Mt. Hood/Parkdale, OR 97041

Dear Agencies,

I am writing on behalf of the Hood River County Board of Commissioners to inform you that we have received requests from each of you in a two-week period requesting response and comments on upcoming water proposals/changes. One request came with only a two week response time and the others were short as well. Included are the packets we received. The sheer quantity of data involved makes it nearly impossible to review and intelligently respond so quickly, especially since we have to get educated on the subject to start with.

We ask our Planning Department, local Watershed Group, and often other departments as well to participate in the comment process on issues that will affect them. Each department needs time to review the material, especially Planning who has already closed to the public, at times, in order to complete the current workload. The Watershed Group meets only once a month and, according to their bylaws, have to meet twice before voting and recommending to the Commissioners.

As a rural county, we do not have full time Commissioners. Our Board only meets on the first and third Monday's of each month. They all hold other full time jobs and do not have much time outside of scheduled meetings/worksessions to assess this type of information.

We would request extension from your agencies until April 29, 1997 in order to really evaluate and understand the proposals and their effect on our County. We cannot make on objective evaluation without this time.

We would also encourage you to work together so that you are aware of what the others are doing and how many requests we are getting for an already scarce resource one that is very important to our agricultural economy. We would hope that, in the future, rural Counties with fewer research capabilities could receive a comprehensive consolidated proposal for use of water resources.

Sincerely,

Jim Azumano
*County Administrator*

cc: US & State Senators for Oregon

Oregon

DEPARTMENT OF
FISH AND
WILDLIFE

Mid-Columbia
District Office

August 15, 1996

Kim Titus
Hood River Ranger District
6780 Highway 35
Mt. Hood-Parkdale, Oregon 97041

Dear Kim:

Thank you for the Draft East Fork Hood River and Middle Fork Hood River Watershed Analysis. I received the document on August 7, 1996. You requested comments by August 28, 1996. I will be unable to give this report the time it needs on such short notice.

I would like to request an extension of the review period to October 1, 1996. Thank you for your consideration of this matter.

Regards,

Jim Torland

Jim Torland
District Wildlife Biologist

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