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Introduction

The Planning Team

The planning team was made up of the following faculty members:

John Sessions (chair), Forest Engineering

Douglas Brodie, Forest Resources
John Hayes, Forest Science
David Hibbs, Forest Science
Katy Kavanagh, Forestry Extension
David Marshall, Forest Resources
Michael Newton, Forest Science
Arne Skaugset, Forest Engineering

Staff to the team were:

Noel Bachellor, Research Forests
Doug Bateman, Forest Science
Debbie Johnson, Research Forests
Dave Lysne, Research Forests
Ann Rogers, Research Forests
Janet Ross, Research Forests
Brian Sharer, Forest Resources
Jeff Starnes, Research Forests

Charge to the Team

To design a plan that will:

1. Develop the Blodgett Tract as a model research and demonstration forest emphasizing maximization of economic efficiency while meeting public goals for environmental protection, especially fish and wildlife habitat.

2. Demonstrate COPE findings on a larger scale than was used during the COPE studies, with careful documentation of economic costs and returns.

Development History

On September 30, 1997 the Dean formed the team that would develop the Blodgett Tract plan. On November 13 the team had its first meeting in Peavy Hall where it received its charge from the Dean. Subsequently a team field trip was made to the Blodgett Tract on December 1, followed by a meeting in Astoria where the team drafted an action plan and established a Summer 1998 delivery date for the presentation of a draft plan to the Dean.

The team held 10 meetings which occurred on the afternoons of January 15, February 16, March 16, April 24, May 15, June 2, July 2, August 3, 10 and 14. A work-in-progress presentation was made to the Dean and Administrative committee on August 17. In a follow-up email the Dean requested additional information on the sensitivity of the harvest schedule to forest structure goals. Following summer recess, the team had a meeting on October 15 to review the first draft of the planning document and make decisions for completing the written plan. On December 15 -16 the team and staff again visited the Blodgett Tract to review the plan in the field. On April 20, 1999 the plan was delivered to the Dean and Administrative committee.

The Blodgett Planning team , forest staff and guests on field trip.

John Sessions and forest staff at Blodgett Tract.

Mission

Develop the Blodgett Tract as a biologically diverse and sustainable forest to demonstrate efficient timber production under a non-reserve based strategy.

Goals

1. Forest Structure

Upland Areas

1. Manage the uplands intensively for timber production while providing a diversity of high quality, early to mid-successional habitat for terrestrial species.
2. Maintain Douglas-fir as the dominant species coupled with a good representation of western hemlock and western redcedar.

Riparian Areas

1. Provide a diversity of high quality, early seral to mature forest habitat for aquatic and terrestrial species.
2. Manage the riparian zone intensively for habitat and timber yield.

2. Revenue

Provide a dependable supply of revenue to the College of Forestry.

3. Research, Demonstration and Extension

1. Provide opportunities for demonstration and education to show efficient methods for timber production while providing high quality terrestrial and aquatic habitat.
2. Accommodate research proposals that are compatible with the achievement of forest structure and revenue goals.

4. Good Neighbor

Be a good neighbor to the private industrial and state forest neighbors that surround the Blodgett Tract.

Preface

Upslope management philosophy

The Blodgett Forest Plan is designed to provide a variety of habitat conditions for wildlife in the context of an actively and intensively managed forest. Many of the ideas for this plan are derived from observations and findings of the recently completed Coastal Oregon Productivity Enhancement (COPE) program. The plan attempts to provide adequate habitat for the diversity of species using forest habitats ranging from early seral, open habitats to mature forest conditions. This approach hinges on two fundamental strategies: 1) a landscape plan that provides a significant proportion (≥ 20%) of the landscape in older forest habitat with one large contiguous block of habitat (≥ 200 acres) in this condition at any point in time; and 2) maintenance of snags and fallen logs throughout the landscape, with an emphasis on larger structures in the older forest habitat. Other activities, such as management of riparian and upland hardwood patches, will complement these strategies. Limiting the amount of habitat in densely stocked stands that are in the competitive exclusion stage (the stage which has the smallest number of wildlife species associated with it) is implicit to this approach.

Information from the COPE program suggests that thinning can be used to promote development of structural characteristics that are found in older forests (Barbour et al. 1997, Hayes et al. 1997). In addition, while the numbers of a few wildlife species decrease following thinning, COPE studies have not found any species that are extirpated from stands following thinning, and the short-term influences of thinning are negligible or positive for many species (Hayes et al. 1998). Although the long-term effects of thinning on wildlife are less clear, current information suggests that the influences will be positive for species associated with older forest stands (Hayes et al. 1997). These findings were integral to the management plan developed for the Blodgett Tract. Blodgett will be used to demonstrate these findings and may be used to test some of the underlying assumptions and questions behind them.

Dedicating a significant proportion of the Blodgett Forest to the development of older forest conditions will provide habitat for species that use large diameter trees, snags and logs. By allocating a portion of this habitat to a large contiguous block, two functions are served. First, the block should provide better habitat for species using mature forest habitat with large home ranges (e.g., forest carnivores, pileated woodpeckers). In addition, given the relatively short period of time that stands will occur in an older forest condition (as short as 20 years), there is concern that the older forest habitat may not be fully functional prior to its harvest. This is especially a concern for species with limited vagility, such as some species of amphibians and lichens. After the initial acreage goals are achieved for mature forest habitat, the contiguous block of mature forest will move across the landscape as forest management activities proceed. As a consequence, this design should provide relatively short dispersal distances through favorable habitat for species and individuals occupying mature forest habitat that is lost by logging.

The role of dead wood

Dead wood, in the form of snags and fallen logs, is one of the most critical factors influencing the presence and abundance of wildlife species in coniferous forests of Oregon. Snags are used extensively by many species of birds for nesting, foraging, and roosting, by bats for roosting, and by several

other species of mammals, including flying squirrels, martens, and others for den sites. Downed wood is a critical habitat component for a diversity of wildlife species, especially for mammals and amphibians. Wildlife use downed wood for a number of functions, including sites for feeding, reproduction, resting, and cover.

Despite the existing empirical data (see page 30), assessment of the number of logs that should be retained, created, or managed for in stands on the Blodgett tract is problematic for a number of reasons. 1) Response to logs is a multivariate problem and noise resulting from other factors (e.g., previous disturbance history, differences in moisture regimes, processes occurring at larger spatial scales such as the landscape level) have made it difficult to separate the "signal" from the "noise." 2) It is possible to gather a large amount of data on some species that use logs, such as deer mice, but many of these species are of minimal management concern. It is difficult to gather large amounts of data for many of the species of greater management concern because these species may be difficult to study (e.g., salamanders occurring in the interior of decaying logs) or are relatively rare (e.g., some species of forest carnivores). 3) It is difficult to distinguish between use, preference, strong association, and dependence, complicating interpretation of implications of the data that do exist. One function of the OSU Research Forests is to contribute to resolving forest management issues. As a result, rather than establishing a policy of managing for a fixed amount of downed wood in the Blodgett Tract, an adaptive approach will be pursued. This approach will involve active manipulation of levels of downed wood in the forest, and monitoring key biotic responses over time. The intent of this approach is to gain information that can be used to determine future guidelines for management of downed wood on the Blodgett Tract as well as other forest lands in western Oregon.

The role of hardwoods

Hardwoods play a variety of ecological roles in our conifer dominated landscape. COPE found that although the Coast Range is dominated by coniferous forests, deciduous vegetation has been a long-standing source of diversity and productivity that exerts control over succession (Hobbs, in press). As is true for any tree species, each of our hardwood species plays a critical role in the life cycle of a variety of insect and wildlife species. The abundance and diversity of birds is positively correlated with hardwood abundance in landscapes dominated by conifers (Carey et al. 1991, McGarigal and McComb 1992, Hagar et al. 1996).

Alder is best known in this capacity; as a nitrogen-fixing species, it can contribute up to 200 kg/ha/yr. Having scattered alder patches and occasional alder trees within young stands can make very significant contributions to the soil nitrogen pool and so improve general tree growth. Bigleaf maple and other hardwoods have been implicated in improved nutrient cycling in conifer forests. The easily decomposed litter of these species mixes with and hastens the decomposition of the conifer litter, thus increasing the rate of nutrient cycling. Hardwood stands support a very different understory community compared to conifer stands, with a higher number of species that are in an assemblage rarely found in conifer stands.

Riparian management philosophy

Riparian areas are a special part of the Blodgett Tract landscape. COPE found that riparian forests differ from upland forests in their dynamics and ecosystem patterns and require different approaches to ecosystem management (Hobbs, in press). They support a greater diversity of plant species and communities than the uplands. Their hardwood stands and aquatic environments provide habitat to wildlife found infrequently in the uplands. The aquatic system provides habitat for fish and a connectivity for organisms, organic material and sediment beyond the bounds of the Tract itself. For all of these reasons, the riparian area is a focus of attention and special management guidelines. At the same time, many riparian processes and functions are poorly understood so recommendations for management guidelines are based on current knowledge and need to be re-examined as our knowledge base changes.

COPE research results indicated a lack of both conifer and hardwood regeneration in Coast Range

riparian zones (Nierenberg, 1996). These results emphasize the importance of active riparian area management to establish riparian trees directly adjacent to Coast Range streams. COPE studies also showed that large diameter woody debris was required to form high quality aquatic habitat when introduced into Coast Range streams (Skaugset et al., 1994). Simulation of results from COPE plot studies showed that conifer woody debris would grow to a sufficient size to create high quality aquatic habitat sooner in actively and intensely managed riparian zones (Emmingham and Maas, 1994). The Blodgett plan includes active management of riparian areas to establish and grow riparian overstory trees, both conifer and hardwood, to act as a supply of large woody debris to the streams of the Blodgett Tract.

In developing riparian guidelines, we have recognized several principles. 1) Maintenance of in-stream dead wood is essential. In contrast to most existing dead wood guidelines today, our guidelines set standards for dead wood input levels rather than in-stream loading levels or on-bank tree stocking levels. This distinction makes it clear what amount of the trees growing on the bank are needed to meet dead wood goals and how much is in excess of this need and so available to meet other goals. We believe that this approach will result in higher and more consistent dead wood loading through time compared to unmanaged riparian systems or those managed under current ODF regulations. 2) Hardwood types are important riparian forest types. Historically, the streams of the Blodgett Tract had more hardwood forest than conifer. We are reducing this hardwood domination (to a 50/50 hardwood/conifer mix) to increase the production of longer lasting dead wood. 3) In the absence of fire or other large disturbances in riparian areas, natural tree regeneration is usually inadequate to maintain forest cover and stocking in the long run. Therefore, active management for regeneration is required where natural advance regeneration is inadequate. 4) Many riparian goals (e.g., dead wood, wildlife habitat, timber) involve the presence of large trees. Active management of these stands will promote these goals.

Planning team discussing riparian management strategy above Fishhawk Creek.

Research, demonstration and extension

The plan for the Blodgett Tract provides an opportunity for the College of Forestry to demonstrate the findings from the Coastal Oregon Productivity Enhancement (COPE) project and other research efforts through the use of active riparian management and the development of complex forest structures in both the upland and riparian areas. These demonstrations will be used by the College's extension program.

Formal research studies currently installed on the tract will help us better understand the growth and development of actively managed conifer and hardwood forests with different treatments. Over time the College hopes to attract more research on some of the fundamental habitat issues that the management strategies in this plan attempt to address.

Income stream

The College of Forestry needs a high and dependable flow of revenue to support forest operations, research, demonstration and other college programs. A moderate amount of period to period fluctuation has been permitted in Blodgett harvest schedules since the Blodgett Tract represents only a portion of total revenue, and operations will not necessarily be conducted at the Blodgett Tract for each year of the five year planning period.

The 8000 thinning and regeneration harvest planning prescriptions used in the analysis were selected to control the rate at which stands can be moved towards the large tree goal by moderate to heavy thinning regimes and to provide thinning revenue during time spans when final harvest rate is low. Special prescriptions were developed for stands with windthrow concerns. The regenerated stand prescription uses precommercial thinning to quickly achieve large tree goals in the second rotation facilitating harvest of current stands.

Native American Use

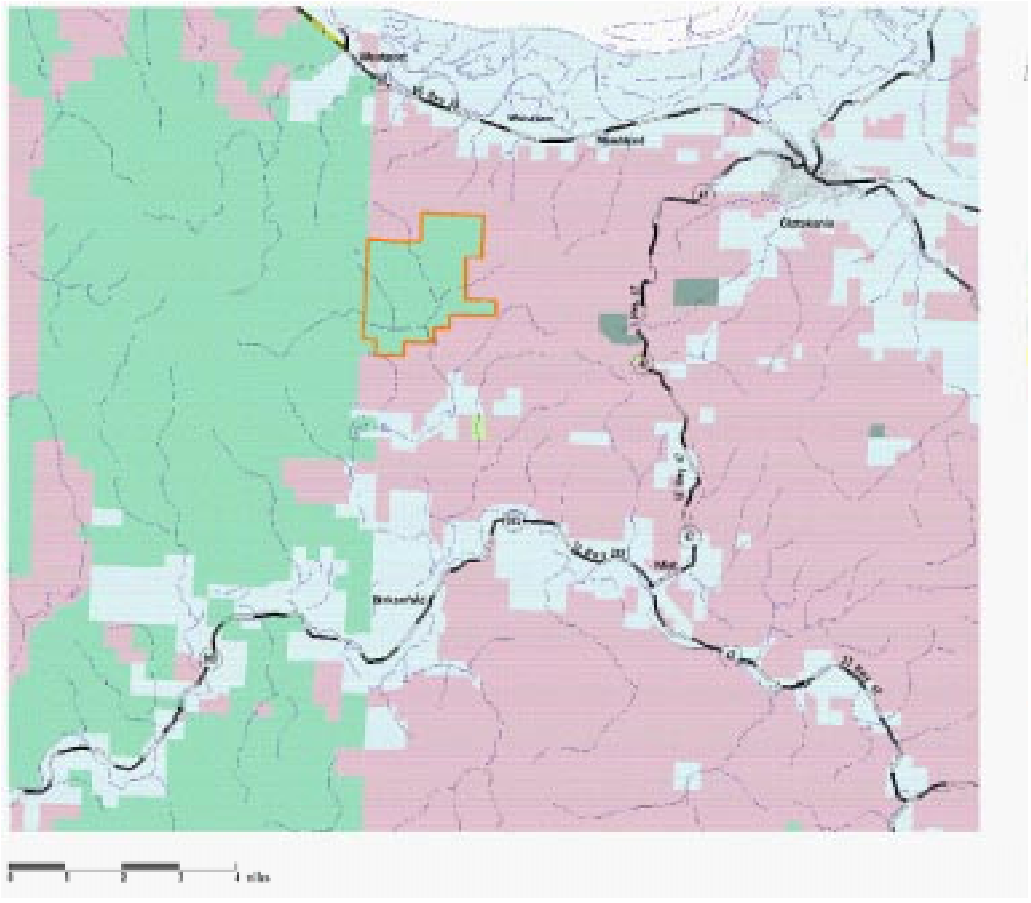
Location

The Blodgett Tract is a 2,440 acre forest located in Columbia County about four miles south of the Columbia River in the upper Nehalem basin. The western boundary of the tract is the Clatsop County line which is also the eastern boundary of the Clatsop State Forest. The other three sides of the tract are surrounded by private industrial forest lands.

State forest lands in the north coast region are actively managed by the Oregon Department of Forestry to maintain patches of different habitat types across the landscape. These patches may contain remnant old growth trees, snags, residual live trees, down wood and multi-layered canopies.

While the structure of individual stands in this management strategy will change constantly, the range of stand structures and their relative abundance across the landscape are expected to remain reasonably stable. Silvicultural treatments include thinning and regeneration harvest. Private industrial forest lands in the North Coast are generally managed under 40-60 year rotations that end in regeneration harvests. Harvests that occur on private and state lands must comply with the Oregon Forest Practices Act.

Information about the management of Oregon's State forest lands and the text of the forest practice rules can be found at http://www.odf.state.or.us/.




Location of Blodgett Tract in Western
Astoria
Blodgett
CLATSOP
COLUMBIA
WASHINGTON
Portland
TILLAMOOK
McMinnville
Blodgett

History

The Blodgett Tract is in the homeland of the Clatskanie Indians whose territory included the Upper Nehalem drainage and the headwaters of the Klaskanine and Clatskanie Rivers. The Clatskanie spoke Athapaskan, lived in lodges of split cedar poles covered with bark and furnished with rush mats. They intermarried with their Chinookan and Salish neighbors along the Columbia River.

The Clatskanie primarily occupied the densely forested uplands and associated small prairies where they could subsist on abundant deer, elk, edible roots and berries. When they occupied lowland areas they seem to have used the Nehalem River valley, and occasionally the south shore of the Columbia River between the mouth of the Clatskanie River and Scappoose Creek. The most important documented lowland resource was salmon, but root crops like camas and wapato were probably also important for their subsistence. The Clatskanie used short nosed canoes and their fishing equipment included spears, weirs and traps.

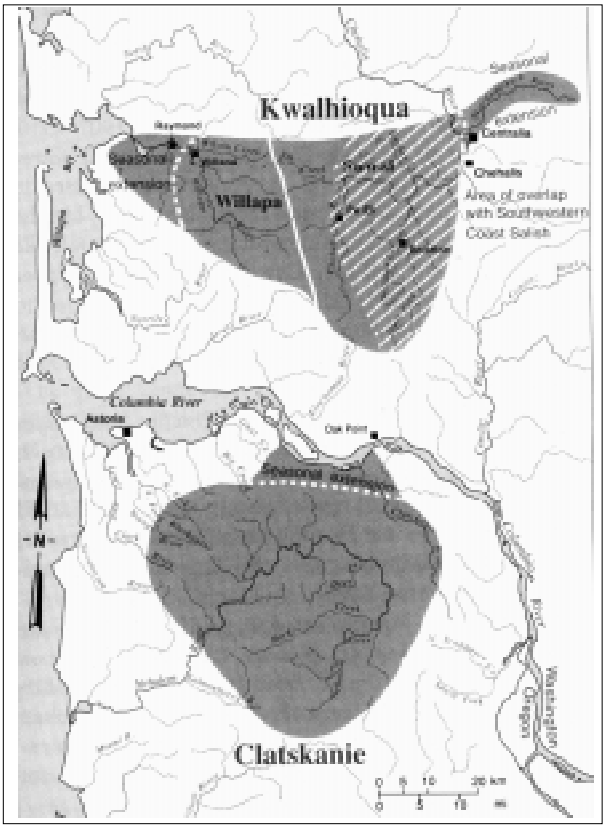


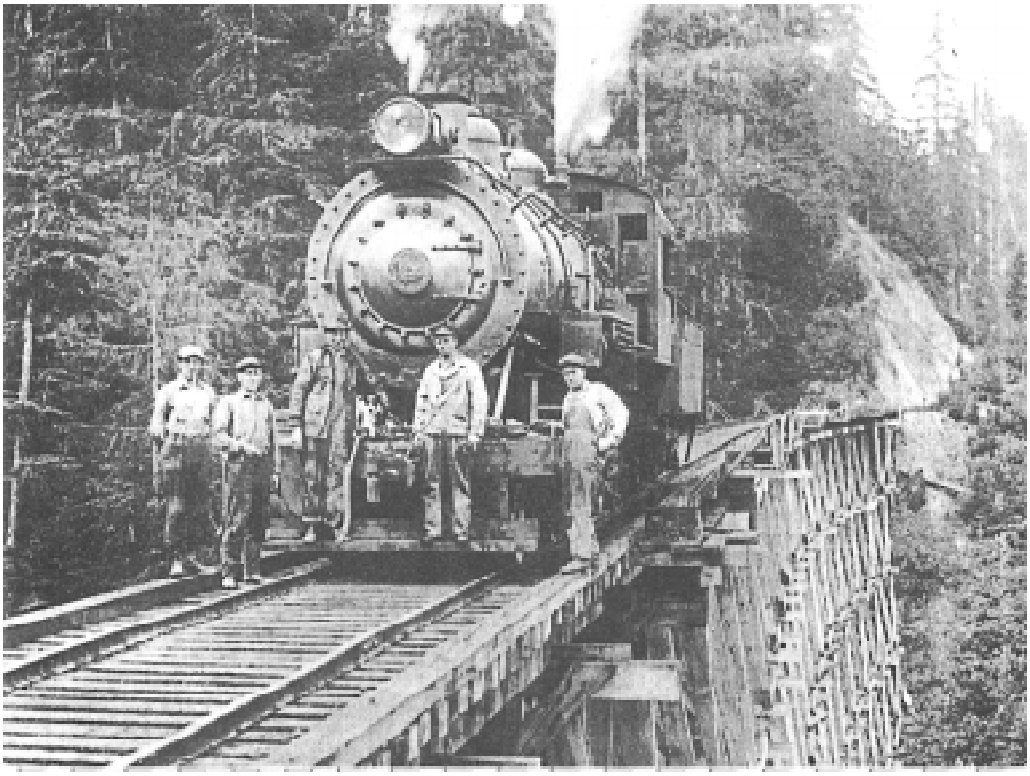
Figure 1. Early 19th century territory of the Clatskanie.

One of the earliest documented encounters between Euro-Americans and the Clatskanie was when they were accused of killing three white men at Fort George (Astoria) in 1811. Such conflict appears to have been typical between the Clatskanie and white settlers. By 1825 diseases substantially reduced their population (one account put the population at 175) and by the 1840's they were considered very nearly extinct. By 1857 the population was reported to be eight. These eight adults signed the Dayton Treaty in 1851 at Tansy Point, Oregon (Krauss, 1990).

Early Euro-American Use

The earliest recorded Euro-American use of Columbia County was by the fur traders from the Hudson's Bay, Northwest and Astoria Companies. Trappers probably exploited the area that would become the Blodgett Tract until the 1830s. After the fur traders, came the homesteaders who established marginally self-sufficient farming communities along the river valleys. The Nehalem River valley was one of the last areas settled in Columbia County. The early settlers were mostly Civil War veterans and their families who probably used the uplands that included the Blodgett Tract occasionally for hunting. These uplands were not intensely used until the construction of the Columbia and Nehalem River Railroad in the early 1900s, which allowed systematic timber harvest between the Nehalem and Columbia Rivers.

Railroad Logging Era



Kerry Line head engineer Whistling Joe Warner (far right) with his crew on Bridge #8 in 1924. Used with permission of the Mist-Birkenfeld Historical Society, Mist, Oregon.

The Kerry Line proceeded from the Columbia River at Kerry, entered a tunnel at the top of the hill (part of this tunnel lies on the Blodgett Tract), and came out in the Nehalem Valley. Construction of the line was completed by 1914 and a major camp associated with the railroad logging activities called "Horseshoe Camp" was established along the banks of Fishhawk Creek (Labbe and Goe, 1995) on the Blodgett Tract. As many as ten camps were along the line. The Kerry Company operated the line to serve their own needs, as well as those of other operators. By 1927, 145 million board feet of 300 to 500 year old timber was removed from 2060 acres of the Blodgett Tract (approximately 70 MBF/acre) (Voorhies 1952).

Acquisition by OSC

After the land was harvested, the Oregon State College School of Forestry was contacted by the Blodgett Timber Company. In 1928 John W. Blodgett wrote:

> *"It has been my unpleasant experience to witness the vanishing of the white pine industry in my native state, Michigan. The result has been the abandonment of prosperous sawmill villages, farms, and various community enterprises, combined with the consequent decrease in general industrial activities, with their large accompanying payrolls. I cannot but be impressed by the fact that Oregon, a state in which I have long been interested, is headed directly toward a like condition unless it profits by Michigan's sad experience and formulates and follows some sound definite policy with a view to keeping the cut over lands producing timber...*
>
> *With the thought in mind of aiding and expediting the gathering and correlating of data necessary to the formulation of a sound reforestation program for Western Oregon, I am glad to offer your college a compact tract of about 2400 acres of cut-over land to be used for such experimental forestry purposes. It bore a heavy stand of the finest yellow fir, so there can be no doubt of its adaptability for such use..."*

George Peavy (Dean of the School of Forestry) then examined the property and he concluded in his remarks to Earl B. Tanner of the Blodgett Timber Company, "Now that I have been over the Columbia County tract with you I am prepared to recommend definitely the acceptance of the area by the College if and when Mr. Blodgett decides to offer it to the Board

of Regents. I believe that the tract is admirably suited to the purpose proposed by Mr. Blodgett, viz., research work in reforestation (Peavy 1928)." The land was transferred to the school in 1929.

Management under OSC (later OSU)

In October, 1934 (7 years after harvest was completed), an escaped slash fire burned most of the tract. All but small islands of the existing reproduction were destroyed (Mason, 1938).

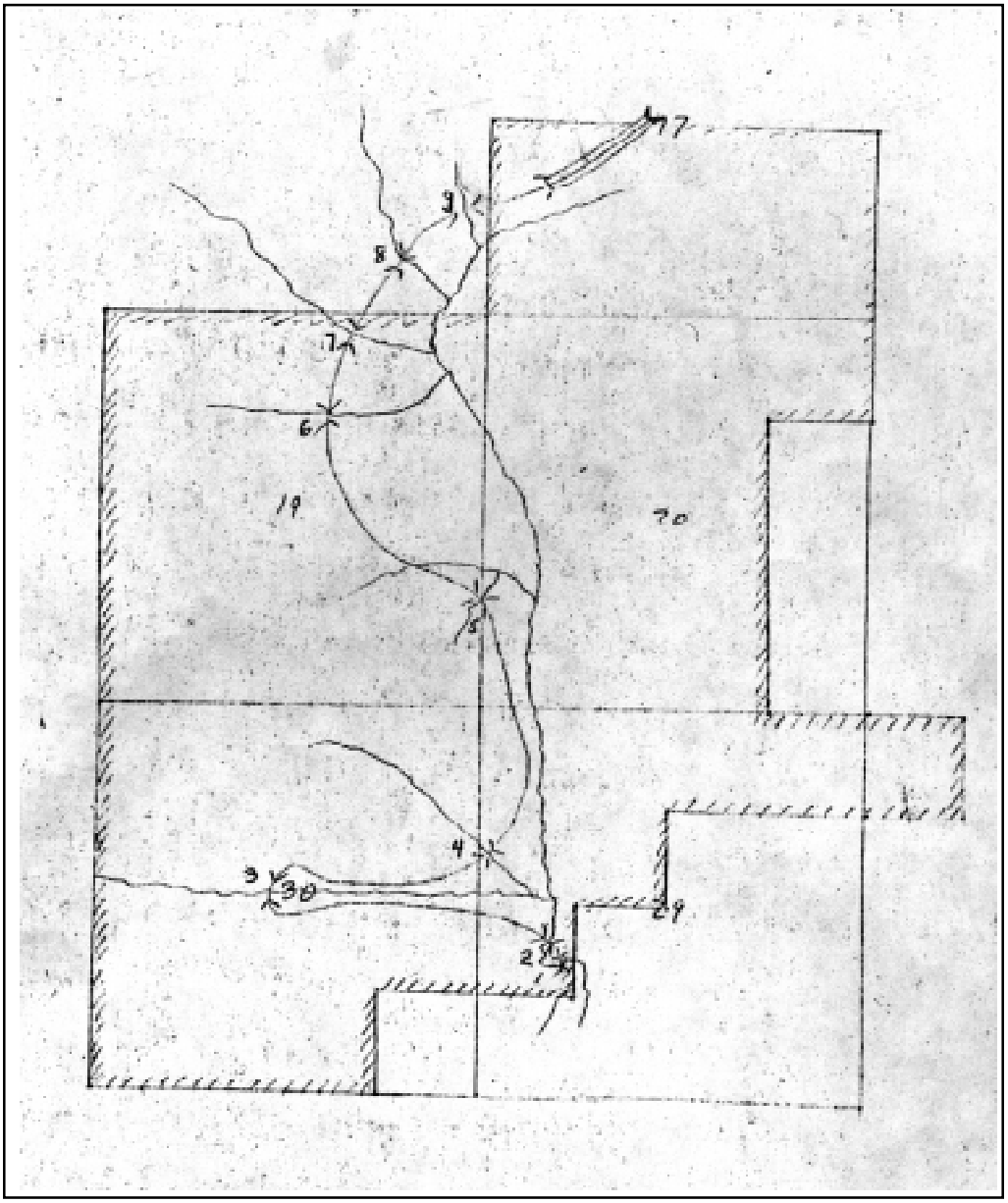
Early management focused on reforestation and fire protection. This included the installation of a 25-man fire protection crew under the direction of the School of Forestry in 1940. The "Tunnel Lookout" was established as part of the overall fire management of this area of the coast range.

Little reforestation research was ever conducted on the tract and in 1942 the Blodgett Company became concerned that the School of Forestry was "not living up to the spirit of the transaction." The company felt that the tract was not being used to provide technical information and that it should be turned over to the Oregon State Forestry Department. Paul Dunn (Dean of the School of Forestry) states in 1943 that "There is no question that this area and the other lands have not been used to the fullest extent." In 1943, George Peavy (President of OSC) wrote that there was a desire to exchange the land for property more readily accessible to Corvallis, but World War II put these plans on hold.

In 1959 the School of Forestry entered a cooperative agreement with the State Board of Forestry which gave the State Board management control of the Blodgett tract with 25% of the revenue from the tract going to the state and 75% to the school. This agreement resulted in occasional timber harvest activities until 1980 when the agreement was terminated. Direct management of the Blodgett Tract reverted then to the College of Forestry.

Between 1986 and 1996 24 MMBF were removed through thinning and clearcut harvests by the College of Forestry Research Forests.

The Blodgett Tract in 1942



1940 sketch of the railroad grades and trestles.

Current Forest Condition

Vegetation

Information on the vegetation for the plan is provided by a stand level inventory of the tract. This inventory consists of a grid of 1200 permanent sample plots (one plot per 2 acres) that were installed on the tract in 1983. A portion of these plots are remeasured each year. This inventory was designed to provide training opportunities for students, as well as data for management planning, research and demonstration opportunities and growth and yield research.

Table 1. Existing forest inventory. (MMBF)

Age Class	Tot. D-fir	Tot. Hemlock
0-20	0.02	0.01
21-40	0.34	0.30
41-60	6.21	4.35
61-80	41.24	21.89
81-120	2.74	2.55
Total	50.55	29.11

Measurements from the nested fixed and variable radius plots are stored in a database that provides information on stand structure and volume that is used to develop and evaluate silvicultural prescriptions (Marshall, Johnson, and Hann, 1998). For this plan, all stands on the tract were inventoried between 1983 and 1997 and grown to current conditions using the SMC version of the ORGANON inventory projection program (Hann, 1995).

The upland conifer stands are predominantly Douglas-fir and western hemlock with a small amount of western redcedar and Sitka spruce. Riparian areas are dominated by red alder that in some areas is mixed with Douglas-fir, western redcedar and Sitka spruce.

There are approximately 50.6 MMBF of Douglas-fir, and 29.1 MMBF of western hemlock in the upland and lowland stands in the age classes listed in Table 1.

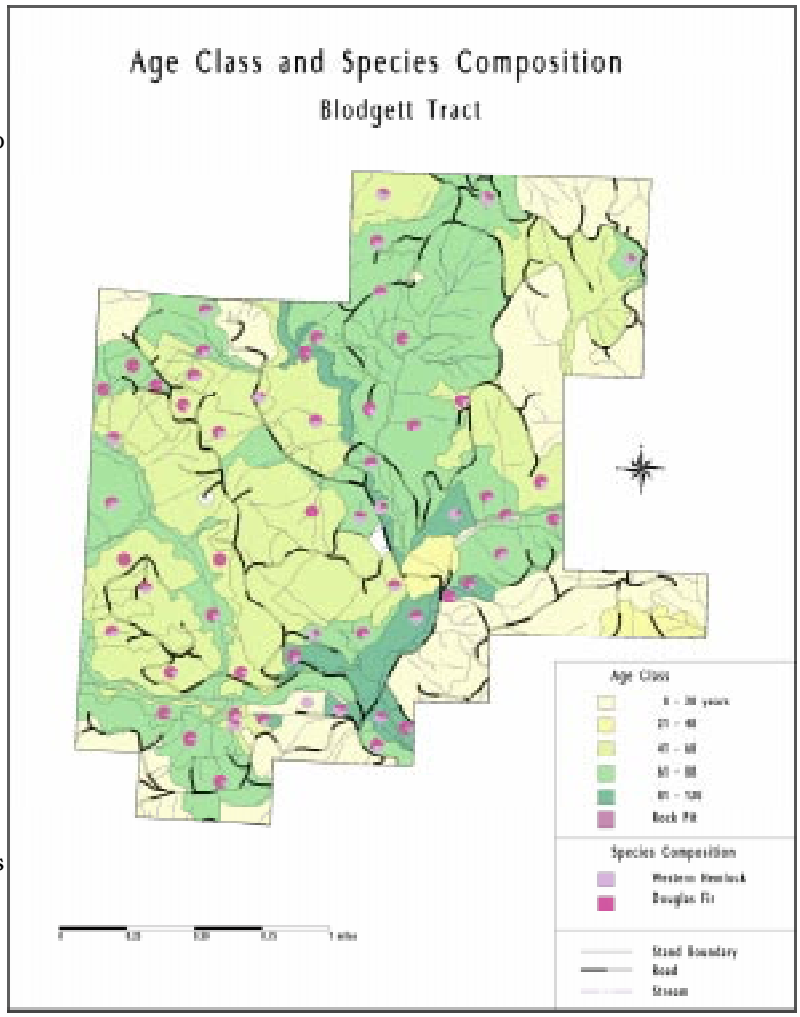


Figure 2. Current age class distribution.

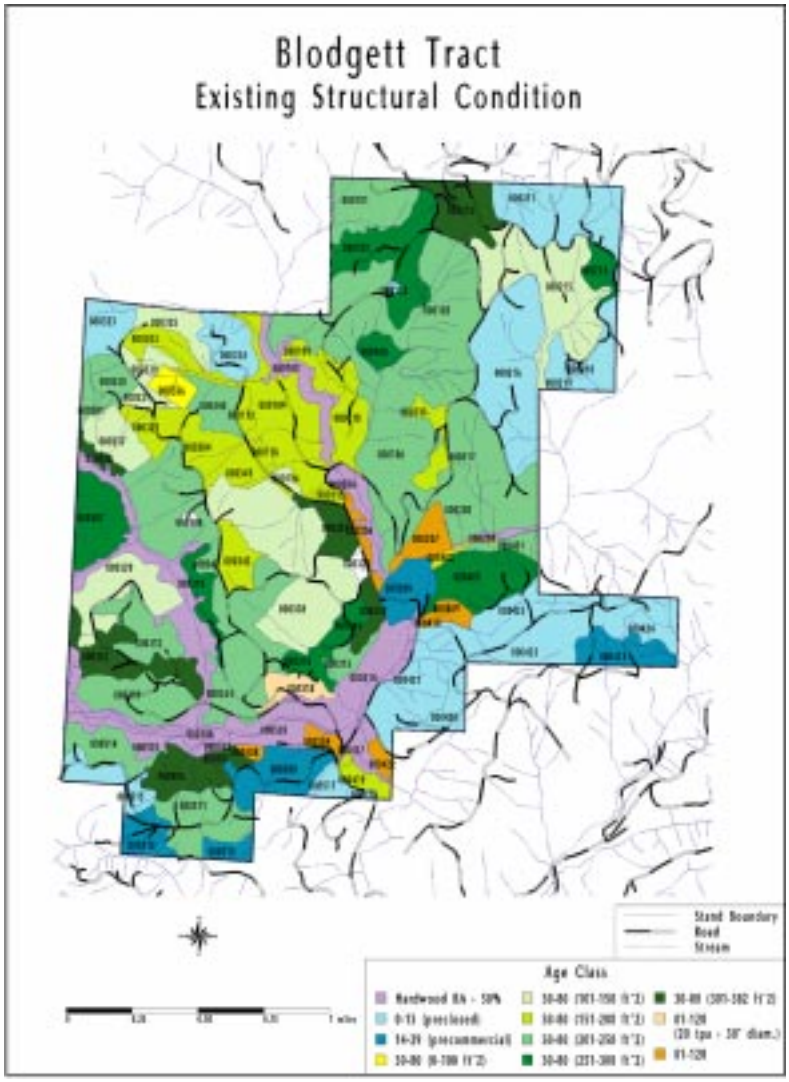


Figure 3. Existing stand structural condition.

Wildlife

Sensitive vertebrates

Northern spotted owls

The Blodgett Tract has areas that may be suitable for spotted owl nesting, roosting and foraging. There is a large amount of dead wood to help support prey populations, and some areas of the forest have trees with nesting platforms that have resulted from bear damage and ice storms.

The tract has been surveyed every year since 1990 for spotted owls. Responses were recorded in 1990, 1994 and 1998. These birds were not located in the follow-up surveys. As a result of this survey work the Research Forest believes that there are no active spotted owl sites on the property at this time. Annual surveys are planned to continue.

Marbled murrelets

Surveys for murrelets were completed in 1995 and 1996 on units that were scheduled for harvest. No murrelets were observed. There are very few suitable nest trees for murrelets on the tract, so these surveys have not been continued.

Fish

The Fishhawk drainage system was identified as an Aquatic Diversity Area by the American Fisheries Society (AFS), Essential Salmonid Habitat by Division of State Lands (DSL), a Source Watershed by the Oregon Department of Fish and Wildlife (ODFW) and a Core Salmon Area (CSA) for coho salmon in the Oregon Plan.

When ODFW surveyed the Fishhawk drainage in 1996 they found an adult abundance of > 30 coho/mile which is considered very good for the Nehalem Basin. Based on Tom Nickelson's coho model, there are >2000 smolts/mile predicted on the main Fishhawk Creek system. McCoon Creek has > 21,000 smolts/mile predicted.

Habitat on our portion of Fishhawk Creek is generally regarded as fair to good. There is adequate shade, but few big conifers in the riparian area to contribute dead wood in the future. The desired volume of woody debris exists, but it is mostly distributed in smaller (>3m x 0.15m) single pieces rather than large key pieces (10m x 0.6m) in complex debris jams. There is less than the desired percent gravel and greater than desired percent silt, sand and organics.

The high percentages of silt and sand are mainly due to the incompetent bedrock which underlies the forest and a legacy of throughfills found in old railroad grades. Only two throughfills exist on the forest but numerous throughfills are located on the

surrounding ownerships with many located upstream of the Blodgett Tract. The throughfills on the forest will be monitored by forest staff and they will be managed on a case-by-case basis.

The geology of the Blodgett Tract is such that the frequency of mass wasting is not likely to be influenced by vegetative cover. The major source of controllable erosion from ongoing forest management is roads. Maintenance and reconstruction of existing roads is a high priority and the construction of new roads will be in such a manner that chronic accelerated erosion is minimized. These activities will take place within the framework of the Oregon Forest Practice Rules and will be technically and economically feasible.

Baseline temperature data was collected for Fishhawk, the North Fork of Fishhawk and two of its tributaries, Trestle, and Wrongway Creeks, because these are tributaries of the Nehalem River which is considered water quality limited for temperature by the Department of Environmental Quality. Maximum stream temperatures were below the 64 degree State water quality standard on all of the days and all stream locations monitored. The planned management activities are unlikely to influence the range of temperatures occurring in fish-bearing streams on the Blodgett Tract.

Geology

The Blodgett Tract is located predominantly within the Fishhawk watershed and drains into the Nehalem River, however the northernmost part of the tract occupies the ridge between the Nehalem and Columbia River watersheds and a small portion of the forest drains into the Columbia River. Most of the tract is drained by the Fishhawk, North Fork Fishhawk, Trestle and Wrongway Creeks.

The Tract is underlain by marine sedimentary rock. The rock is composed of tuffaceous silts and sands that were derived from sand and volcanic debris from landmasses to the east, and were laid down when this area was shallow sea. There are intrusions of basalt in the sedimentary rock that were intruded when the rock was still submarine. These basalt intrusions show up in road cuts on an irregular basis. The sandstone is very incompetent and thus weathers easily. This is evidenced by an almost complete lack of bedrock outcrops on the forest, including the road cuts.

The terrain that has developed on the Blodgett Tract, has for the most part, gentle, rounded and short slopes. This is a legacy of the incompetent and easily weathered bedrock. For the Tract, 74% of the area has a slope less than 35%, 23% is between 36 and 60% and only 3% of the area is greater than 60% slope. Risk of a landslide greatly increases for slopes greater than 60%. Slopes 80% and greater represent terrain at high risk for debris slides. There is virtually no high risk terrain in the Blodgett Tract, which means that the tract does not support the classic debris flow/debris avalanche morphology. The tract tends to have deeper rotational-slump landslide features or earthflows as opposed to debris flows. The only shallow-translational slides observed were small features that are classed as debris slides with the slide deposit remaining at the foot of the landslide scarp that did not transition into debris flows or avalanches. The only debris avalanche observed on the tract was initiated at a large throughfill from an old, abandoned railroad grade off of the tract. The terrain does show evidence, both on the tract and immediately adjacent to it, that earthflows and rotational slumps dominate mass movement processes.

The soils on the Blodgett Tract are comprised predominantly of two series. They are the Scaponia-Braun series and the Tolke series. Both of these are deep, 40-60 inches to bedrock, well-drained, loamy soils. These soils, in combination with the abundant moisture, annual precipitation for the tract is 60-110 inches, give the tract its high site class and high productivity. The Braun series is a mesic Dystic Eutrochrept, the Scaponia series is a mesic Umbric

Figure 4. Predictive map for cultural resource areas.

Dystrochrept, and the Tolke series is a mesic Andic Dystrochrept.

Cultural Resources

Three types of cultural sites may, or are known to occur on the Blodgett tract.

Railroad grades

Railroad grades include the Kerry Mainline and numerous spurs. These grades can be classified as:

a. completely destroyed, only archival references
b. converted to roads
c. still visible with ties removed
d. visible with ties in place

Logging camp

a. Horseshoe Camp is identified as a site by the USGS. It was occupied for many years while this area was logged and the railroad operated.

Native American Sites

No Native American sites have been recorded between the Columbia River and Nehalem drainage and only a few sites have been recorded on each of these drainages. The low number of sites recorded may be a function of the small number of surveys that have been conducted in this part of the state to identify cultural resources.

The likely areas for Indian sites at the Blodgett Tract are those areas with slopes less than 5%, because people usually prefer camping on level ground, and within one quarter of a mile from water (see Figure 5.). Other factors, such as the concentration of resources, are unknown at this time but also would have influenced site location. According to this model, Horseshoe Camp may have a prehistoric component, however predictive models are poor tools in archaeology because human behavior is difficult to include.

Approximately 240 acres of the tract has been surveyed for cultural resources.

Desired Future Condition

The Blodgett Forest will be actively managed to provide diverse structural conditions suitable for a variety of animal and plant species, while at the same time providing revenue from these management activities for the College of Forestry. These conditions will range from open, "early seral" to mature forest, but not old growth.

Using active management, rather than a reserve strategy, to move contiguous blocks of the Blodgett Forest towards mature forest characteristics is the central approach to the Blodgett Forest Plan. Through active management we will accelerate the development of large trees and some other structural components of mature forest while meeting the revenue goal, using thinning techniques suggested by COPE results.

Riparian areas along large perennial streams will be managed to develop stands that alternate between hardwood dominated and conifer types. The hardwood type is dominated by alder but may contain conifers or other hardwoods. The conifer type is dominated by Douglas-fir, redcedar, hemlock and Sitka spruce and may contain some hardwoods.

Recognizing the dynamics of riparian forests from COPE studies, riparian areas along intermittent streams will be managed to develop like the upland stands, but will contain hardwoods where they occur naturally.

Natural hemlock regeneration under thinned stand.

Planning Process

Choice of Stand Types and Management Units

The Blodgett Forest is broken into stand types that generally represent areas of homogenous overstory species composition and stocking. The stand types were developed from 1:12,000 color aerial photographs, type designations made by field crews along transects spaced 330 feet apart, and extensive field reconnaissance. There are 79 stand types that are represented in the harvest scheduling analysis.

Management units were constructed by engineers on the forest staff who used slope class information built from a 7 meter DEM that was developed from recent and historic aerial photos, existing and proposed road locations, stream information, logging patterns used in previous entries, and field reconnaissance. The boundaries of these units were designed to ensure that solutions from the harvest scheduling simulation could be feasibly logged and are intended to provide a framework for the development of logging plans. There are 103 management units.

The identification of management units led to a classification of areas that have special logging issues associated with them. Forest staff decided that some units could not be thinned in the first entry because of operability issues. The staff also identified units that would be more expensive to log because artificial anchors would be required.

In riparian stands that flank the large perennial streams, prescriptions were developed that emphasized either conifer or hardwood management. Approximately 50% of perennial stream length is planned to be in stands dominated by hardwoods and 50% in stands dominated by conifers with no more than approximately 1000' of stream length in a given type. Stands on opposite sides of a stream may be different types. To accommodate these prescriptions, the riparian stands were divided into smaller units so that each 1000' segment could be represented in the harvest schedule.

The stand types (both the upland and riparian areas) were intersected with the management units to create subunits, so that the stand differences within the management units could be recognized in the yield projections that were developed for the harvest scheduling analysis. This created the base set of 200 harvest scheduling units.

Prescription Development

Upland Stands

The upland forest, which lies above the break in slope beyond the influence of past floodwaters, occupies about ninety percent of the Blodgett Tract. Eighty-six percent of the upland forest area supports mixed Douglas-fir and hemlock forests that are over 60 years old.

Existing Stands

Fifteen percent of the forest greater than 50 years old has been designated as unsuitable for thinning. These stands will be clearcut harvested.

Background on thinning prescriptions

Using knowledge gained from thinning studies in COPE, the silviculture subcommittee of the forest planning team designed a set of thinning prescriptions to accelerate the development of the thinnable forest towards the large tree goal. These prescriptions were modeled in ORGANON using a sample set of stand types that represented the range of existing site and stocking characteristics. The results were presented to the planning team and feedback from

team members was used to modify the prescriptions. This process was repeated several times and after 43 prescriptions were modeled we were able to draw the following conclusions:

1. There was a significant amount of variability in the response of different stand types to different treatment regimes, which convinced us that modeling these types of treatments with stand level inventory data was very important.

2. In general, the treatment regimes for existing stands with the lower basal area or RDI thinning targets in the first thinning entry met the large tree goal earlier than other treatment regimes and favored the development of understory conifers which were identified as important habitat features for some wildlife species. These treatment regimes also created the greatest threat for catastrophic windthrow from severe winter and spring storms, and produced the lowest total volume.

3. The treatment regimes that involved no thinning, or relatively light thinnings produced the highest total volume over a 100 year planning period, but took significantly longer to reach the large tree target and did not favor understory growth.

4. It took longer to reach the large tree target when thinning proportionally throughout the diameter classes than it did when thinning from below.

5. Although many different treatment regimes were suggested and modeled, the results for any given stand followed only a few different general trajectories.

Discussions that weighed the benefits of maintaining high levels of growing stock through light thinnings (which produced more volume over time with less windthrow risk) against moving to lower levels using heavy thinnings (which produced big trees faster and potentially more complex understories) led to a classification of the 200 harvest scheduling units into high and low windthrow risk. "High" risk units were those with slopes exposed to the south/ southwesterly winter storm winds and that had never been thinned before, as well as units on more moderate exposures that are adjacent to clearcuts that could channel winds into them.

It was then decided that on the areas with high windthrow risk and stands with existing heavy basal areas, not more than 40% of the basal area will be removed in the first entry, and the residual basal area will always be near or above 150 ft^2. The subsequent entry will occur after about 15 years and may go down to a minimum basal area target of 120ft^2. Areas with lower windthrow risk will have heavier thinnings in the first entry (down to 110-120 ft^2 residual basal area), with an additional entry after 15 years to 120 ft^2.

It was also decided that we would thin from below even though this would create stands that are more structurally uniform because we can meet our big tree goal faster than thinning proportionally through the diameter classes. Understory structure will be provided by the shrub and hemlock seedling layer that develops between thinning entries. (See figure 6 on page 34.)

Future Stands

The future stands were modeled the same way as the existing stands, except that a pre-commercial thinning from below to an SDI of 110 occurs two years after crown closure (which happens when the stand is about 14 years old).

Riparian stands

Prescription Development

Recognizing the role of disturbance in riparian forest from studies in COPE, the silviculture subcommittee considered three different kinds of riparian situations. Each will have a different management regime that is based on the characteristics of the stream. The terms large, medium, small, perennial, and intermittent stream are as defined in ODF Forest Practice Rules Chapter 629, Division 640 and maps created by ODF from these regulations.

Stream types

Figure 5. Stream class map.

1. Large and medium perennial streams (size L and M)
These streams have specific associated riparian stands mapped in the plan. Approximately 50% of these stands are to be hardwood dominated; approximately 50% of these stands are to be conifer dominated.

2. Small perennial streams and intermittent streams (size S)
The forests around these streams are managed at the same time as the surrounding units. Small perennial and intermittent streams can be subdivided into two categories:

2a. Not prone to land slides and debris flows that can deliver significant amounts of gravel and wood to fish-bearing streams.

2b. Prone to land slides and debris flows that can deliver significant amounts of gravel and wood to fish-bearing streams.

The following characteristics are considered indicative of unstable conditions:

- Any active landslide
- Uniform or planar slopes steeper than 80%
- Headwalls, concave or convergent slopes steeper than 70%
- Valley inner gorges with side-slopes steeper than 60%
- Any marginally stable site identified as high risk by the ODF geotechnical specialists

Benda and Sias (1998) provide guidance on predicting conditions that will lead to debris flows entering fish-bearing streams.

Management Regime=

Large and medium perennial streams
The silvicultural approach used in this riparian type is the same as in the upland stands. An active approach is taken to regeneration and density management. Regeneration is by clearcut except for trees left to meet dead wood goals (see below). Through density management, large trees, which contribute to structural diversity, will develop earlier.

1. Alder stands will be planted with at least 500 seedlings per acre (see Ahrens et al. 1992). One or two pre-commercial thinnings, depending on stocking level (large amounts of natural regeneration require two thinnings), will be made before age 20 to reduce density to 180 stems per acre. The first thinning should occur between age 8 and 12.

2. Conifers will be managed as in the upland prescription. Hemlock, because of its low resistance to wood rotting fungi and the negative effect it has on understory vegetation, is the least desirable species to plant and maintain. Douglas-fir, western redcedar and Sitka spruce may be planted here.

3. Mixing conifers and hardwoods (from natural regeneration of one group into plantations of the other) has habitat benefits for some organisms and so may be practiced; however, success depends on paying careful attention to the competitive balance among species.

4. As in the upland stands, a riparian stand must attain and maintain a condition where the average diameter of the 20 largest trees per acre is equal to or greater than 30" for conifers and 16” for hardwoods for 20 years before a regeneration harvest can be made.

Wood Delivery to Streams

There are no precedents for setting silvicultural goals pertaining to maintenance of dead wood levels in streams. The Blodgett Tract appears to have adequate logs and rootwad structure in the main stream channels. The guidelines in the Blodgett plan are a first approximation of a level of availability and provision for placement in streams to maintain wood at existing levels or higher.

There are several important works from which the following guidelines were derived. Murphy and Koski (1989) observed that 84% of the dead wood falling into Alaska streams came from within 33 feet of the bank. McDade (1987) observed the same relationship in first, second and third-order streams in Oregon, but with 73% coming from within 50 feet. Murphy and Koski (1989) also reported that it was the larger pieces that led to greater longevity in streams and more stable structures. Thus, it appears that the primary source of local dead wood is very close to the stream itself. Obviously, the additional wood from debris avalanches originates further away from the stream, but these events occur infrequently on the Blodgett Tract.

Levels of wood desirable are arguable. Whereas opinions vary as to whether there is ever enough, there are reports of levels found in old growth stands. We postulate that these represent the upper levels of historic conditions. Specifically, in a COPE study by Van Sickle and Gregory (1990) dead wood input was estimated at 1.5-15 pieces per 1000 feet per decade. Wood volume involved ranged from 17 to 235 ft^3 per 1000 feet/ decade, depending on probability of treefall in that reach of Cascades old-growth. Murphy and Koski (1989) observed a range of 44-137 total pieces of wood per 1000 feet in Alaska, with an average longevity of some 160 years, or 2-10 pieces per decade, about the center of the range reported by Van Sickle and Gregory (1990). Allowing for variation in study conditions, we assume that a reasonable input average from old growth would range around 300 ft^3/1000 ft/decade of stream. To compensate for flood losses and inefficiency in placement, we determined that allocation of 600 ft^3/1000 ft/decade would more than meet the dead wood needs relative to standards for old growth.

Managed Douglas-fir on site II ground will have a height of some 170 feet in 100 years and diameter of over 33" in stands being managed for mature forest features, with 20 trees/ac being in those size classes for about a fifth of their life spans. A stand with 240 square feet per acre would have the 20 large trees plus a greater number of smaller trees, and support some 14,000 ft^3 /ac and average a mean annual increment of about 200 ft^3 /ac (adapted from McArdle et al, 1961). Growth of such stands in stream buffers would require intensive management. However, a streamside stand 33 feet wide on each side would grow 3000 ft^3 /decade. Dedication of 20 percent of this over a 100 year period for woody debris is therefore our calculation of the type of buffer management that will meet woody debris requirements.

Most of the above trees will fall toward the stream naturally because of the tendency to fall downhill (Hibbs and Sullivan, unpublished data). Thus, it is anticipated that the dead wood levels will be maintained. However, at the time of each entry to these stands for silvicultural treatment, an inventory of the stream protected by these adjacent stands will reveal the degree to which these trees are currently needed to augment supplies.

Hardwoods are a special case. Productivity and ultimate size are less than that of conifers. We set a target for hardwood areas that is 50% of the conifer target to account for this reduced productivity.

Marcia Humes placing stream temperature gauges in Fishhawk Creek.

5. Trees that are leaning over the water or that are within 20 feet of bank-full-width should not be harvested (although these trees will also count toward meeting dead wood goals if left during a regeneration harvest). Thinning should be practiced to maintain rapid diameter growth. In this 20 foot zone, active regeneration should be practiced when stocking levels drop below 15% RDI. For purposes of bank stability, a large alder or cedar component is desirable in this zone in all stands. Logging machines should not enter this zone and logs passing over it must be fully suspended.

6. Six hundred cubic feet of conifer volume per 1000 feet of stream per decade in conifer stands (300 cubic feet of hardwoods in hardwood stands) will be dedicated to in-stream woody debris. This means that at the time of thinning and regeneration harvest, a proportion of the standing volume is allocated to woody debris. In a thinning, this material is felled toward the stream. In a regeneration harvest, this material is left standing until it falls by itself. Selection of leave trees should favor larger but not necessarily better timber quality trees of the more rot-resistant species. The remainder may be removed as logs.

7. To meet these goals, a survey of the stream must be done prior to each operation to determine how much wood has entered the stream and the near-stream (20') surface since the last entry through wind throw or other means. This can be deducted from the leave requirement. Leave requirements should be met as close to the stream as possible. To count in a dead wood survey, a piece of wood must (1) be at least 10 feet long, have a large end diameter of at least 10 inches in small streams and 14 inches in medium and large streams, and either be in the stream or have a major part of its length within 10 feet of the high water mark or (2) be a standing tree previously designated as a leave tree to meet dead wood requirements.

8. At some points in a rotation, the long-term average of 600 cubic feet/1000 feet/decade may not be met because the trees will be too small. Shortages at one point in a rotation will be made up at a later time.

Small perennial and intermittent streams

Management is the same as along large perennial streams except that (1) the 50/50 hardwood/conifer rule does not apply and (2) the dead wood goal is to provide 150 cubic feet per 1000 feet per decade. No logging machines are allowed in this zone (except during in-stream enhancement projects), and logs

passing over it must be fully suspended. Herbicide application rules will follow ODF stream regulations.

1. Stable small perennial and intermittent streams
This is a 20 foot zone on either side of the stream. Trees may be harvested in this zone, but shrub, herb and duff layers on the stream bank within this zone must be protected during logging. Disturbance is permitted to enhance tree regeneration. No logging machines are allowed in this zone and logs passing over it must be fully suspended.

2. Unstable small perennial and intermittent streams that can deliver significant amounts of gravel and wood to fish-bearing streams
This is a 20 foot zone on either side of a stream and extends from the location of instability to the fish-bearing stream. The goal in this zone is to maintain a high stocking level of larger conifer trees (24" plus) so that debris flows, if they occur, will carry wood as well as sediment into the fish-bearing stream. Periodic regeneration and thinning will be needed to maintain this stocking of large trees (hemlock is not desirable). Thus, periodic regeneration harvests in this zone are necessary. No more than 50% of the length of a zone should be regenerated in any two decade period. At the time of regeneration harvest, 25% of the standing volume should be dropped into and left in the channel. No logging machines are allowed in this zone and logs passing over it must be fully suspended. Few of these streams exist at Blodgett.

Forest Health Considerations

Abiotic and biotic disturbances are a part of the Blodgett forest ecosystem. While it is recognized that biotic and abiotic disturbances are important in maintaining ecosystem biodiversity, poor management practices can result in unintended outbreaks and loss beyond an acceptable level. Acknowledging potential disturbances and incorporating them into management strategies and planning is an integral component of maintaining forest health.

Wind

The thinning prescriptions and placement across the landscape were designed to develop wind-firmness over time and minimize catastrophic windthrow risks.

Fire

The frequency, intensity and distribution of fire varies considerably over the Pacific Northwest. The Blodgett Tract is located in the coastal mountain range of the Tsuga Heterophylla zone. Agee (1983) describes the natural fire regime of this zone as episodic rather than cyclical as specific fire return intervals are difficult to quantify. Fires in this zone are usually high intensity stand replacement fires, characterized by occasional crown fires or severe surface fires. Fire regimes are a function of temperature and moisture patterns, ignition patterns such as lightning and human origin, vegetation characteristics such as fuel loading and adaptations to fire. Catastrophic fires in this region suppress the natural successional pattern which would result in hemlock dominant climax rather than the more common Douglas-fir dominant stands represented in much of this area. Fires in these regimes are associated with drought years and east wind weather conditions in late summer and fall that decrease humidity and are combined with a combustion source. In the Columbia Gorge, where topographic features are lower or absent, there is a much stronger trend for fire spread to the west. These fires may stop only at stand type boundaries or under extreme conditions when fuels are exhausted at barriers such as rock outcroppings or streams. Young stands in this region may be subject to frequent surface fire re-burns until crown closure occurs (Agee 1983,1990). Fire impact will be minimized with an aggressive fire suppression policy.

Pathogenic fungi and insects

Biotic disturbances include pathogenic fungi and insects. The major pathogenic fungi include stem rots, root rots and needle diseases. Stem rots are usually associated with wounding and stumps so they will be of particular concern in thinned stands. Care to minimize wounding should be encouraged in all forest operations. This includes the type of equipment used, season of harvest and species selection. Where unacceptable amounts of root rot occurs, non-susceptible species (red alder or western

redcedar) should be selected for and/or planted. Needle diseases have the greatest potential to impact future management of Douglas-fir on the Blodgett Tract. Ten miles to the west, management of Douglas-fir is being discouraged by an extensive outbreak of Swiss needle cast (*Phaeocryptopus gaeumannii*). The impact on Douglas-fir growth is serious enough to stimulate some landowners to switch to management of alternative species including western hemlock, cedar, Sitka spruce and alder. While this disease is not yet widespread on the Blodgett Tract, it is present in the young plantations and should be carefully monitored. Monitoring should include a baseline aerial survey conducted in the spring just prior to budbreak, followed by field surveys on a limited basis. Insects of concern include Sitka spruce tip weevil (*Pissodes strobi*), Douglas-fir beetle (*Dendroctonus pseudotsugae*) and hemlock looper (*Lambdina fiscellaria lugubrosa*). With the exception of Sitka spruce tip weevil, none of these species are currently causing major impacts. In the past, hemlock looper has caused massive defoliation in hemlock stands in neighboring Clatsop County resulting in widespread mortality. In general, the damage was associated with mature stands and is not expected to be as much of a problem in the Blodgett Tract due to the younger age of the forest and the species mix. Douglas-fir beetle is only damaging following major windthrow. The downed trees provide good rearing habitat and allow populations to reach a level where successful attacks are made on standing Douglas-fir. Salvaging downed wood usually controls these outbreaks. Sitka spruce tip weevil is an endemic insect that caused top death on virtually all young spruce trees resulting in a potential loss of competitive vigor and stem deformity. Forest staff should consider planting Sitka spruce weevil resistant stock, if it becomes available.

The list of diseases and insects here is not intended to be an exhaustive review but to encourage recognition, education of forest staff, careful monitoring and adaptation of management strategies. Current and future abiotic and biotic disturbances should be monitored with systematic reporting, record keeping and incorporated in silvicultural prescriptions.

Prescribed burning

Prescribed burning can be used as a resource management tool when managers evaluate the historical role of fire and are familiar with the ecological responses of vegetation and structure in the system. Controlled use of fire to achieve specific forest management objectives can provide beneficial responses. Such management objectives include control of competing vegetation, creation of seedbeds and planting spots and overall improvement in the efficiency of silvicultural prescriptions by removing impediments to reforestation.

The use of fire as a management tool can have many impacts, both beneficial and negative. Negative impacts include visual and health impacts on air quality, site quality, and wildlife habitat. Other impacts include possible soil disturbance and compaction from mechanical piling, effects on soil productivity from intense burns creating hydrophobic soils and risk of soil erosion. Prescribed burning may also entail increased costs under circumstances of escape due to containment costs and liability. Fire may play an important role in both the creation and loss of dead wood, affecting wildlife habitat and nutrient recycling. In addition, higher merchantability standards in recent years leave less logging residue in the harvest unit than in previous decades.

With these objectives in mind, active fire protection will be practiced to protect resources on the forest, as well as addressing liability concerns from adjacent landowners. Protection includes keeping roads and access open and development of detailed wildfire response plans for efficient containment. Prescribed fire will primarily be used to achieve specific management objectives such as creation of planting spots, and overall improvement in the efficiency of silvicultural operations. Slash burning is the preferred method of disposing of logging residues and other woody debris and vegetation that would otherwise impede reforestation methods as well as create fire liability risks.

Mechanical site preparation or broadcast burning decisions will be formed on a unit by unit basis. Burn plans will be developed ensuring consideration and protection for all forest goals stated previously in

the plan including down woody debris and snag levels and soil productivity. The burn plan will describe the unit to be treated, objectives to be achieved, pre and post burn monitoring requirements, fuel and weather conditions needed to meet objectives, funding sources and limitations, burning and containment procedures and personnel and equipment needs. In addition, consideration of air quality and visibility standards, and assessments of risk of escape and resulting consequent damage will be addressed. In Oregon, burn plans are required for all prescribed burning on forestlands during fire season.

Exotic Species

Populations of exotic species that have become established on the Blodgett Tract should be maintained at low levels because these species can invade and dominate parts of ecosystems changing the way they function for endemic species within these systems. False brome (*Brachypodium sylvaticum*), English holly (*Ilex aquifolium*), Scotch broom (*Cytisus scoparius*), Himalaya blackberry (*Rubus discolor*), English Ivy (*Hedera helix*) and other species can displace native plants that other native species depend on.

Exotic vascular plant species should be managed during harvest, site preparation, conifer release and roadside maintenance. If persistent exotic understory species are identified during the preparation work for these operations, they should be controlled. In the case of harvest units, treatment should occur before the unit is logged. Shrubs and perennial herbs should be killed with systemic chemicals. If exotic plants appear in young plantations, their removal should be planned as a part of the regular release program.

In general, invasive exotics (like false brome) should be controlled before they become epidemic. Toward this end, personnel who are working on other projects at the tract, who are appropriately licensed and trained to apply herbicides, should be equipped with hand spraying equipment and instructions to spot spray exotics that they notice where practical.

Exotic fauna should be managed by minimizing their habitat consistent with the other goals of the plan.

Cultural Resources

The plan assumes that cultural sites and objects, and antiquities of local, regional and national significance will be protected.

To protect these resources:

1. A professionally supervised cultural resource inventory program will be conducted at the tract and project level in compliance with applicable state and federal historic preservation legislation (see www2.cr.nps.gov/laws/36cfr61.utm). The surveys will be conducted according to an inventory plan and research design agreed to by the Research Forest and the State Historic Preservation Office (SHPO). Based on this database, the Research Forests will develop and maintain a tract-wide cultural resource overview based on summaries of the cultural resource information. This overview (especially of the railroads) will make it easier to develop management plans that will eliminate the need to consult with SHPO on a continuing basis.

2. Cultural resource properties located during inventory will be evaluated by a professional archaeologist/historian to determine their eligibility for listing on the National Register of Historic Places.

3. In concert with inventories and site evaluations, the Research Forests will develop management plans for the various classes of prehistoric and historic resources found on the tract.

4. Protection of cultural resources will be coordinated with the SHPO and the Advisory Council on Historic Preservation as required by state and federal historic preservation laws and regulations.

5. Protection of Native American cultural resources will be coordinated with the tribes. This coordination will include (but not necessarily be limited to) notification to tribes of activities and potential impacts in areas of known concerns. Opportunities for tribal involvement in research of sites with known tribal affiliations will be made.

6. Cultural resources may be developed for scientific and educational purposes to the extent that the integrity of the resource is maintained.

Transportation System

The plan currently assumes that the transportation system will:

1. Provide cost effective access for all-season log hauling and administrative traffic.

2. Protect watershed and fishery resource values.

This will involve:

1. Developing road management objectives for all existing and proposed roads.

2. Integrating road management objectives with long-term logging and stand tending needs and with soil and watershed management objectives.

3. Developing an annual road maintenance plan in accordance with the road management objectives.

Since we know that the existing transportation system will require investment to provide for all-season log hauling and that more investment is required on some portions of the system to allow timber harvest than others, over the next year (1999/2000) the forest staff will complete road management planning so that these costs can be disaggregated by road segment. In addition, the staff will suggest a new set of logging costs and harvest revenues that reflect the seasonal fluctuations that are known to occur. A transportation component to the scheduling model will then be developed that can incorporate this new information into the systems that the model uses to search for the best timing and combination of harvest units.

Determining Levels of Dead Wood

SRS is a computer model based on data presented by Neitro et al. (1985) that is designed to assess the number of snags needed to provide habitat for a variety of densities of primary cavity-nesting birds (birds that excavate their own cavities for nest sites). The model is based on limited data for some species. In addition, some of the assumptions concerning secondary-cavity users (species that use cavities excavated by other species) and number of snags necessary to meet foraging needs of specific primary cavity-nesting birds are questionable (Hayes and Hagar in press), and thus likely underestimate the number of snags necessary to meet habitat needs for these cavity-users. However, it provides a valuable estimate for assessing wildlife needs for number of snags, as long as it is recognized that estimates are likely to be underestimates.

We used SRS to determine initial management guidelines for snags in the Blodgett Tract. These estimates should be revisited as new information becomes available. For mature forest habitat, management goals were based on a goal of providing habitat for 80% of the maximum potential population levels for primary cavity-nesting birds. For this population level, SRS suggests maintaining 256 snags per 100 acres exceeding 15 inches DBH. Of these, 66 should be greater than 17 inches DBH and 5 of

Snags in "Rowley Salvage" harvest unit.

these should be greater than 25 inches DBH. We opted to emphasize large snags in this habitat type, and thus increased the guidelines for largest snags to at least 20 snags greater than 30 inches in diameter per 100 acres. We slightly increased the number of snags greater than 17 inches in diameter to 75 per 100 acres. For the remaining stands in the Blodgett Tract, numbers of snags approximate numbers suggested by SRS to provide habitat for 60% of maximum population levels (192 snags greater than 15 inches DBH, of which 50 exceed 17 inches DBH, of which 4 exceed 25 inches DBH per 100 acres). However, as we are focusing our larger diameter snags on stands providing mature forest habitat, our guidelines are for 200 snags per 100 acres exceeding 15 inches in diameter.

A number of studies (e.g., Hayes and Cross 1987) and a plethora of anecdotal observations and field observations indicate that large downed wood is used more than smaller logs. Although diameter and length are often confounded, long length of material generally appears to be of much less importance than large diameter (although this generality should not be taken to the extreme). Increased size has been shown to result in both quantitative (amount of use by a particular species) and functional (number and type of species using the dead wood and number of functions served by the dead wood) increases in use.

One of the most comprehensive studies examining the response of small mammals to forest characteristics is Carey and Johnson (1995). Carey and Johnson examined small mammal communities in the Olympic Peninsula, southern Washington Cascades, Oregon Cascades, and Oregon Coast Range. The results indicate that forest floor characteristics and understory vegetation strongly influenced small mammal communities, with two factors (dead wood and prevalence of shrub cover) playing primary roles. Carey and Johnson state "our empirical data suggest that 15-20% cover of dead wood on the forest floor, well distributed across the site, would be adequate for most small mammals, whereas 5-10% cover would not allow the mammals to reach their potential abundances." Carey and Johnson indicate that tall (1-2 m) stumps from large trees, can help provide the dead wood needs of the stand. While contributing to the needs, however, stumps are structurally very different from logs, and can provide only a part of the solution to the dead wood needs of small mammals.

Butts (1997) found a linear relationship between ensatina (a species of amphibian) captures and dead wood volume. In spring, there appears to be a threshold around 90 m^3/ha (ca. 1300 ft^3/ac), below which this species did not occur. Although a similar relationship was obtained during her fall trapping, no obvious lower threshold existed, though some stands with up to ca. 130 m^3/ha (ca. 1850 ft^3/ac) dead wood had no ensatina captures, whereas all stands with greater volumes had ensatina captures.

Thompson (1996) found core areas of home ranges of red-backed voles had a mean log volume of ca. 240 m^3/ha (ca. 3400 ft^3/ac), whereas random sites had a mean log volume of 120 m^3/ha (ca. 1700 ft^3/ac). Differences between core areas and random were greatest for soft logs, and less pronounced for hard logs. For managing for red-backed voles, Thompson recommended retaining 236 m^3/ha of logs in patches on 20% of the area and sufficient logs in intervening areas to provide for cover and movement corridors.

Before thinning

10 years after thinning.

Figure 6. An example of the change in forest structure over time.

Goal Achievement

Forest Structure

Achievement of the forest structure goal will be measured by the time it takes to achieve the structural and connectivity goals. To meet these goals we should:

1. Develop a mosaic of stands with at least 20% of the forest at any time having at least 20 trees per acre with an average DBH of at least 30 inches. Once achieving this size criterion, maintain stands in this size class for a minimum of 20 years. One contiguous block at least 200 acres in size will be in this mature forest condition at any point of time.

2. Develop some level of species and structural diversity. One approach to achieving these goals is to conduct commercial thinnings in a way that allows for the survival and improved growth of some under and mid-story trees. Generally, these are shade tolerant species that have regenerated naturally as older plantations become more open through density dependent mortality or commercial thinning.

Operationally, assisting these younger trees requires 1) controlled felling to protect some patches of regeneration, 2) heavier thinning above retained patches of younger trees, and 3) precommercial thinning of the younger trees if their density is high.

Gains from this management are retention of more shade tolerant species, development of a vigorous mid-story, and creation of a more structurally diverse overstory through variable levels of thinning.

3. Maintain hardwood patches within 1000 feet of any point in the forest. Hardwoods will propagate themselves following harvest operations at the Blodgett Tract. Most will resprout after cutting, and alder readily seeds in on sites with soil disturbance. Thus, it is reasonable to expect that there will be enough hardwood natural regeneration to meet stocking goals. The location of the natural regeneration will be identified and protected to maintain these species in the forest.

4. Ensure that snags in a range of decay states are present throughout the forest land base. In the 20% of the forest having at least 20 trees per acre with an average DBH of at least 30 inches, at least 250 snags per 100 acres exceeding 15 inches DBH in a range of decay states should be present, of which at least 75 snags will exceed 17 inches DBH, of which at least 20 snags will exceed 30 inches DBH. The remaining 80% of the forest should have at least 200 snags per 100 acres exceeding 15 inches DBH.

5. Move towards maintaining approximately 50% of the large and medium perennial stream length in stands dominated by hardwoods and 50% in stands dominated by conifers. No stand should occupy more than about 1000 feet of stream length. Stands on opposite sides of a stream do not need to be the same type. The type of a stand may change between rotations provided that the general balance between hardwoods and conifers is maintained. These stands should be operationally defined management units and may extend beyond the riparian area into the upland.

6. Management of dead wood will lead to variable levels on the forest floor, with averages determined in an adaptive management strategy. Recruitment will be done as needed during harvest where deficiencies occur.

7. Representative legacy structures will be maintained across the forest. (A subcommittee of the McDonald-Dunn Forest Advisory committee is currently developing a definition for legacy structures which should be inserted here after it has gone through the appropriate review process.)

Net Revenue

Achievement of the net revenue goal will be measured by the size, timing and fluctuation of harvest revenues.

Research, Demonstration and Extension

Research and demonstration work that is conducted on the Blodgett Tract should be compatible with the forest plan. Proposals for new projects must be submitted to the Research Coordinator and be accompanied by a plan that includes an explanation of the project's compatibility with the forest plan and harvest schedule. Research plans will not be accepted without sunset clauses and approval from the forest director.

Good Neighbor

We will consult periodically with the neighbors who surround our property to understand whether they have special concerns about our use of their roads or needs that we can accommodate. We have agreed with our neighbors to:

1. Maintain locked gates with signs posted that outline the rules for day use entry by recreational users.
2. Coordinate hunting access, fire prevention, haul routes and associated road maintenance.

Harvest Schedule

A harvest scheduling model was developed to help determine the timing and treatment choices that move the forest to the structure and revenue goals. This model identifies which management prescription to assign to each management unit that is consistent with structural goals, wind risk, logging feasibility and revenue goals. Approximately 8000 combinations of treatment and timing choices were developed for the harvest scheduling model to choose from.

The harvest scheduling model uses a two-phase simulated annealing heuristic. Simulated annealing is a technique for solving combinatorial problems which has been used in a range of industries including several large applications in forest planning. The first phase of the harvest scheduling model determines the fastest possible way to reach and maintain the big-tree goal of 500 acres meeting the large tree criterion. The second phase then adds the results from the first phase as a constraint so that any solution to the second phase must reach the big-tree goal in the time determined in the first phase. The second phase of the scheduling model then adjusts the assignment of prescription choices to even out the net revenue while maintaining big tree acreage and connectivity. The second phase also incorporates a thinning goal to provide a relatively constant thinning program to demonstrate increased diameter growth through thinning.

A 100 year planning horizon was used with 5-year planning periods. Harvest units that the staff is currently planning were fixed in the harvest schedule.

Net revenue is represented as a goal while achievement of the big tree acreage and connectivity are represented as constraints. Relative emphasis on period revenue is achieved by varying the target revenue per period and the relative emphasis on reaching the revenue goal. All solutions must meet the forest structure constraints and arrive at the big tree goal at the earliest time.

Assumptions

Log Price and Harvest Costs

Log Prices

Table 2. Log prices used in harvest scheduling analysis.

Log Grade	Douglas-fir	Hemlock
#2 saw	590	475
#3 saw	530	430
#4 saw	445	355

The Oregon Department of Forestry log prices (Table 2) for domestically processed logs (delivered to a mill; "pond value") 1998 1st quarter were used in our model because they seemed to fit the current log price trend better than our most recent historical prices.

Harvest Costs

Stump-to-mill logging costs were developed for skyline and tractor logging systems. Costs include: fell, delimb, buck, yard, load, and haul. Separate costs were developed for thinning and clearcutting.

Skyline costs for thinning

Skyline yarding costs ($/MBF net Scribner) were computed using the USDA Forest Service Region 6 skyline appraisal model. The model computed $/MBF costs by first calculating hourly owning and operating

Table 3. Skyline stump to mill costs for thinning harvest units

Log MBF	Log Size	Volume Cut Per Acre				
		3	5	10	15	20
0.07	8"x34'	339.90	273.42	224.93	206.92	198.25
0.13	10"x34'	285.47	218.97	169.29	152.45	146.33
0.17	12"x34'	272.49	210.95	161.25	144.44	135.76
0.24	14"x34'	270.64	204.13	153.92	137.63	128.95
0.34	16"x34'	266.80	200.30	150.61	133.78	125.12

costs ($204.65) then dividing by hourly production rates as log volumes were varied between 70 and 340 board feet, and as cut volumes were varied between 3 and 20 MBF per acre. Felling, loading and haul costs were then added to the yarding costs.

Production rates for motor manual felling in thinnings were calculated using a production equation developed from Oregon State University studies conducted at Hebo and Yachats (1996, Kellogg, L.D., G.V. Milota and M. Miller, Jr.). The felling production rate in thinnings was then divided into an hourly owning and operating cost of $37.02. Loading costs were calculated by dividing the hourly owning and operating costs of $60.00 by the yarding production rate. An experienced haul cost of $1.02/MBF/mile was used.

Assumptions:

Yarding equipment and crew: three-drum yarder with 50 foot tower for thinning, diesel powered slack-pulling carriage, tail tree rigging, radios, landing tractor, fire truck, 2 pick-up trucks, 6-person yarding crew excluding a loader operator, acres/skyline road = 1.9 for thinning, acres/landing = 3.1 for thinning, road change time= 1.8 hours, landing change time =2.4 hours, 47.8 effective minutes/hour, average lateral distance= 45 feet, average slope yarding distance=467 feet (from sample of 9 map profiles from Blodgett assuming 45% slope and 50% rectangular settings, payload=7500 pounds, sale size: 1 mmbf, overhead=15% on fell, buck, yard, and load, profit and risk on fell, buck, yard, and load=12%.

Haul costs were computed for an average haul of 41 miles.

Table 4. Skyline Stump to mill costs for clearcut harvest units

Log MBF	Log Size	Volume Cut Per Acre	
		40	60
0.13	10"x34'	139.17	134.81
0.17	12"x34'	124.71	120.31
0.24	14"x34'	118.79	114.39
0.34	16"x34'	113.99	109.62
0.45	18"x34'	111.5	107.13

Skyline costs for clearcutting

Costs for clearcutting were calculated in the same manner as described for skyline thinning; however, a larger 70 foot tower with a more powerful yarder and carriage increased hourly owning and operating cost to $251.58. Setting size was increased to 7.5 acres, acres per skyline road was decreased to 1.4 acres to account for fan shaped settings, and payload was increased to 10,000 pounds. Felling costs were calculated using a regression equation for larger tree sizes expected in regeneration cuts (Edwards, 1992).

Skyline Costs for Units That Require Artificial Anchors

In areas where there are inadequate stump or tree anchors for guylines or skyline, additional costs were added to include an extra rigging slinger, tipping plate anchors and installation gear, and an additional tractor. In thinnings, the additional costs ranged from $4.20 to $18.19 per MBF as cut volume per acre was varied between 20 MBF and 3 MBF, and when log size averaged 130 board feet. Additional costs in clearcuts ranged from $3.93 to $7.80 per MBF as cut volume per acre was varied between 60 MBF and 40 MBF, and when log size averaged 130 board feet. Additional costs in clearcuts ranged from $2.96 to $4.87 per MBF as cut volume per acre was

Table 5. A comparison of costs with and without artificial anchors

MBF cut/acre	3	10	20
With anchors	$303.66	$178.13	$150.53
Without anchors	$285.47	$163.29	$146.33
difference	$18.19	$8.84	$4.20

Logger working in "Wrongway" harvest unit.

varied between 60 MBF and 40 MBF, and when log size averaged 170 board feet.

Tractor Logging Costs

Stump to mill logging costs for tractor were assumed to be 85 percent of the stump to mill logging costs for skyline.

Road Construction, Reconstruction and Maintenance Costs

It was assumed that road costs would average $50 per MBF for this analysis. Road costs will be refined after a transportation plan is built for the Blodgett Forest over the next year.

Sale Preparation and Administrative Costs

Sale preparation and administrative costs excluding office overhead costs are estimated to be $17.57/ MBF on clearcut harvest units and $42.20/ MBF on thinning harvest units. Sale preparation and administration costs are higher for a thinning sale, because more acres must be designed, laid out and treated for the same volume; logging production rates for thinnings are generally lower, and sale administration is more intense.

Assumptions:

Sale preparation and administrative costs for clearcutting: Sale size 1.9 MMBF, staff person days for field layout = 33, mileage = 3,600 (11 round trips @ 300 miles per trip plus 6 overnights at 50 miles per overnight), per diem for 23 person days on overnight trips @ $30 for food and $41.00 motel each = $1633, contract cruising = $988.40. Staff time for log sale and logging services contract preparation including skyline analysis, road design, map making, and appraisal = 23 days, OSU purchasing cost for postage = $60, contract Proctor and CBR test = $500. Staff time for Oregon Department of Forestry Forest Practice Notice and Written Plan = 6 days, Silviculture prescription 0.5 days, archeology survey and documentation = 6 days. Sale administration = 2.5 person days per week for 4 months plus 8 person days for prospective purchaser show-me trips, bid awards, and close out inspections = 51 person days, mileage for 26 round trips @ 300 miles each = 8000 miles, per diem for 9 overnights and 16 days = $850, accountant office time @ 1.5 days per week for 5 months = 33 days. Office overhead is not included.

Sale preparation and administrative costs for thinning: Assumptions are the same as above except for the following: acres treated will be approximately 3-4 times greater than clearcutting for the same volume. Some sample marking of cut or leave trees will be necessary. Therefore, staff person days for field layout associated travel and per diem will increase by a factor of 3.5. Contract cruising will increase by a factor of 2. Sale administration will increase to 4 days per week due to greater complexity and care required. Logging production will be reduced; therefore, contract term will increase and sale administration months will increase to 8 months. Accountant time will increase to 9 months.

Reforestation Costs

Eight year old plantation.

Mechanical site preparation or broadcast burning will be made on a unit by unit basis. The decision will be made post-logging based on the amount of slash, number of planting spots, mountain beaver (*Aplodontia rufa*) populations and proximity to fishbearing streams. Excavator piling will cost $125 to $175 per acre. The cost for broadcast burning will be $200 to $400 per acre.

In riparian hardwood conversion units most of the standing hardwoods will be killed using herbicides (hack and squirt) to open up the stand for regeneration if the hardwoods are not logged. The cost of this treatment will be $30 to $50 per acre.

All clearcut harvest units will receive chemical site preparation. The cost of aerial application will be $120 to $130 per acre. The cost of ground-based application will be $140 to 170 per acre.

Planting will cost $200 to $250 per acre ($120 to $140 per acre for seedlings and $80 to $110 per acre for labor).

Follow up treatments may include grass control ($80 to $125 per acre) or basal treatment of hardwood sprouts ($75 to $100 per acre).

Many harvest units will require mountain beaver control which will cost $75 to $100 per acre.

Precommercial thinning will occur when plantations are around 15 years old and is expected to cost $100/acre.

For the purposes of the harvest scheduling model we have chosen an average discounted reforestation cost of $500 per acre for all treatments.

Defect and breakage

It was assumed that defect will average 3% of the gross volume and that an additional 2% would be left on the ground from breakage, so all yields were reduced by 5% in the harvest scheduling analysis.

Harvest Schedule Results

Following the Administrative Committee's November 16 meeting where seven alternative harvest schedules were presented and discussed, the Dean endorsed the big tree, non-reserve based strategy developed by the planning team. He requested some refinement of the alternative that emphasized income during the first fifteen years of the plan while reaching the structural goals of the plan as quickly as possible. This refinement would concentrate on smoothing revenue during out-periods of the plan. Given this direction, the team developed the harvest schedule shown on page 41 which meets the forest structural targets within 15 years and maintains the desired forest structure during the remaining 80 years of the 100 year planning horizon. The harvest schedule demonstrates the feasibility of achieving the non-reserve based strategy, but should not be considered the only way to do so. It does provide one

sequence of harvest treatments that can achieve the planning goals. As operational experience is gained during the first period of the plan, this plan will undoubtedly be refined and modified. The planning infrastructure developed during the preparation of this plan should facilitate plan updates.

Forest Structure

The desired forest structure of a minimum of 500 acres of forest with stands where the expected largest 20 trees equal or exceed an average of 30 inches is estimated to be achieved within 15 years (see page 42). By this time, the goal of maintaining a contiguous block of at least 200 acres of these large trees is also achieved. This contiguous block of stands of large trees in the north of the Blodgett Tract shifts slowly over the remaining 80 years of the planning horizon and by the end of the planning horizon has developed conditions which bridge the north and south areas of the Blodgett Tract.

Harvest Volumes

During the first five-year period the harvest activity (page 40) is divided almost equally between clearcuts (249 acres) and thinnings (247 acres). This is a relatively intense period of activity and provides a harvest of about 3.2 million board feet per year. Almost the same number of acres is projected for harvest in the second five-year period with a somewhat lower harvest volume. Reducing the rate of harvest would not affect the time to reach the desired forest structure goals, but would provide a larger number of acres with large trees.

Income

The harvest schedule provides approximately $0.9 million of net revenue annually during the first 5 years of the plan and $0.7 million annually during the following ten years of the plan. The present net value of the harvest schedule is approximately $15 million at a 4% discount rate. This present net worth is approximately 70-75% of the present net worth that could be realized in the absence of landscape goals and if harvest age throughout the tract could be as low as 60 years.

Monitoring

Monitoring is an essential component of the Blodgett Forest Plan, and funds for its successful execution should be made available from revenues generated by the Research Forests.

The Research Forests staff will be responsible for monitoring or contracting services to monitor activities on the Blodgett Forest to ensure that activities and actions are compatible with the forest plan. A monitoring plan should be developed that is consistent with the framework and philosophy of the one currently under development for the McDonald/ Dunn Forest. This plan should encompass, but not be limited to, the following activities.

1. Compile a list of forest practices and operations.

2. Document costs of goal achievement. Procedures toward this end will be developed by the staff working with appropriate faculty during the first five years of plan implementation.

3. Inventory tree frequency distributions, by species and diameter.

4. Inventory amount, decay class, and distribution of dead wood.

5. Inventory the distribution and amount of different plant communities and their developmental stages.

6. Compile actual harvest levels and growth rates for stands.

7. Compile a list of sensitive species actually or potentially using the forest.

8. Assess use of plant communities by selected species.

9. Determine issues of interest and concern to neighbors and public.

10. Assess the location and spread of Swiss needle cast and exotic plants.

Sensitive species monitoring

The Research Forests staff will be responsible for monitoring or contracting services to monitor status of sensitive species on the Blodgett Forest. Protocols should be consistent with guidelines established by the U.S. Fish and Wildlife Service and National Marine Fisheries Service.

Response of biotic communities to dead wood

It is generally accepted within the scientific community that dead wood on the forest floor is an important component of wildlife habitat. However, specifics concerning the amount, distribution, size, and decay classes of dead wood that should be retained to provide for particular wildlife populations remain elusive. The Blodgett Forest initially will manage dead wood in an adaptive framework, in which different levels of dead wood will be retained or created in stands, and the response of selected wildlife species will be monitored through time. Final establishment of standards and guidelines for the Blodgett Forest will be based on data collected on the forest and on complementary data collected from other areas.

Communication and Decision Making

In order to communicate the essence of the plan in a manner that can be quickly understood by our faculty, students, neighbors and visitors, a brochure will be developed from this plan for distribution. This brochure will summarize the key elements of the plan in a concise, understandable manner and will also be highlighted on the Blodgett Forest Web site. In addition, a field guide will be written for the forest staff.

As a part of our annual meeting with the faculty and students in the College of Forestry, we will include our summary of past and future operations on the Blodgett Tract as they relate to goal achievement.

Interpreting and Revising the Forest Plan

The Forest Advisory Committee that is currently in place for McDonald/Dunn Forest will provide oversight for interpreting and revising the Blodgett Tract plan. This group may at times wish to seek involvement from a representative of the Clatsop State Forest and any interested neighboring private landowners.

The Forest Advisory Committee should meet periodically to review the activities that have taken place, the monitoring data that has been collected, and the achievements that show progress towards the goals in the plan. This review will help the staff understand if their interpretation of the plan is consistent with the Advisory Committee's interpretation and will determine if the experience and data presented warrant any changes to the plan.

It is at this meeting that:
1. Members of the forest staff can bring forward topics for clarification and information that supports changes to the plan. The committee then will decide if more information or a broader range of expertise should be brought in to evaluate these ideas and concerns.

2. Staff will show how harvest volumes realized compare to inventory, how the revenue generated compares to revenue predicted, and how they have decided to approach harvest schedule implementation for the period.

3. The results of any monitoring data that has been collected that either supports or raises questions about our management methods will be presented. A part of this presentation will naturally focus on how forest structures are evolving compared to those that we seek to achieve through this forest plan.

4. Staff will present a summary that shows how the work that has been completed in the past and activities that are proposed for the future relate to goal achievement.

This committee will then draft proposed changes to the plan for the Dean's review. The original text of the plan, the changes that have been approved and the most current version of the plan will reside on the Web (to ensure that there is no confusion over versions).

If assistance is needed before the annual meeting to implement the plan, staff members will seek the advice of those members of the faculty that are the most interested and knowledgeable about the outcome of the question that is being raised.

Fishhawk Falls

Demonstration and Extension Activities

Under the proposed Blodgett Tract Management plan, opportunities will evolve to demonstrate silvicultural and management techniques in Pacific Northwest coastal forests. Many of these techniques were learned during COPE. This plan represents a unique array of management and silvicultural activities in a forested landscape dominated by economic objectives coupled to short harvest rotations. In the near term, management techniques in riparian areas to maintain and enhance fish habitat; road construction and maintenance alternatives; and outputs from 85+ year rotations with intermediate harvests will be of particular interest. However, it needs to be recognized that development of a demonstration area requires careful planning through the formulation, implementation and assessment of the management plan. Adding demonstration and educational programs onto an ongoing program may not be successful and may be reflected in missed opportunities.

Potential Audience

Resource Professionals

Northwest Oregon and southwest Washington are heavily dominated by actively managed forestland. The professionals that participate in this land management range from foresters and loggers to fish biologists and hydrologists. The major employers are private industry and state agencies. In a recent survey conducted by the College of Forestry Extension Program, it was apparent that this audience wants localized, relevant one-day training and educational opportunities that assist them in making better management decisions. The Blodgett Tract would provide an excellent opportunity for the land managers and resource professionals to obtain such training. The Blodgett Tract is within a 3-hour drive, from Corvallis, OR, Hood River, OR, Olympia, WA and Raymond, WA.

General Public

The proximity of the Blodgett Tract to the Portland Metro area offers the chance to involve the "metro-public" in forest management activities. Day trips by local school children; hiking clubs, environmental organizations, and the public are just a few potential opportunities. In addition, there are several local groups such as watershed councils and local community leaders who have a direct interest in learning more about forest management practices.

Develop Partnerships

There are numerous opportunities for the Blodgett Tract to develop partnerships with several other forestry and educational groups located in the region. Several potential cooperators in education/demonstration programs are listed:

Oregon Forest Resources Institute (OFRI)
OSU Extension
Local Schools
Youth
Vocational Education
Oregon Trout
Fishhawk Lake Association
Magness Tree Farm
World Forestry Center
Oregon Small Woodlands Chapters in Columbia, Washington and Clatsop Co.
Tree Farm Association
Upper Nehalem Watershed Council
Oregon Department of Forestry

Facilities

To have a successful educational program there eventually needs to be an infrastructure to support public attendance. The minimal requirements are

shelter from the rain/sun, restrooms and running water. As things develop, plans could be made for overnight accommodations, cooking and indoor classroom space.

Personnel

Involvement of local educational professionals is critical to the success of this program. These professionals would come from Clatsop Community College, Oregon Department of Forestry and OSU Extension. Extension would be at the center of the program. In addition, an on-site OSU Forester would play a very beneficial role in linking the research, management and educational programs.

Fishhawk Creek

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