Chapter 5
Habitat Conservation Strategies

5.1. INTRODUCTION

The Habitat Conservation Plan (HCP) combines two approaches to protecting and providing habitat for the covered species. The first approach involves sustainable forest ecosystem management strategies as a coarse filter in managing the forest landscape. The second approach involves specific strategies (a fine filter) for the management of salmonids, northern spotted owls, marbled murrelets, and the other listed and unlisted species (see Tables 1-1, 4-1 or 9-1). Chapters 6 through 9 of the HCP describe the fine filter strategies.

Sustainable forest ecosystem management seeks to emulate many aspects of natural stand development patterns, as well as preserve portions of the forest for biological refugia. The covered lands will be managed to develop a dynamic mosaic of differently developing stands across the landscape, including a relatively stable quantity of early, intermediate, and advanced stand structures. Some stands will be managed for timber production while incorporating habitat structures such as snags and downed wood. Other stands will be managed to develop habitat conditions normally associated with older forests while also producing timber. Finally, a network of stands, referred to as conservation areas, will be maintained in an advanced forest structure condition, or will develop into such, and then will persist on the landscape in a relatively unmanaged state.

This diversity of stand structures will provide for a broad range of ecosystems and wildlife habitats, which will contribute to biological diversity. The structural components associated with the range of stand structures will benefit long-term forest productivity by maintaining the key linkages for nutrient cycling and soil structure. Additionally, the level of diversity should result in a resilient forest that will be resistant to large-scale damage from environmental or human-caused stresses.

Monitoring and adaptive management provide the essential information and approaches that will guide implementation of all strategies in the HCP, and will advise future generations of resource managers on successful long-term sustainable forest ecosystem management, including any changes that may be needed.

5.2. MANAGE FOR A RANGE OF STAND STRUCTURES ACROSS THE LANDSCAPE

Summary of Conservation Measures

- Maintain the range of 40 to 60 percent advanced structure across the forest.
- Maintain the range of 25 to 55 percent of intermediate structure across the forest.
- Maintain the range of 5 to 15 percent of early structure across the forest.
- 50 percent of the forestwide advanced structure will have at least eight trees per acre at 32 inches diameter breast height (DBH) or larger.
- Meet advanced structure targets ranging from 30 to 60 percent in each management basin.
- Only harvest advanced structure in a basin as long as the basin target for advanced structure will be maintained.
    - For basins below the target amount of advanced structure during initial implementation periods, only harvest advanced structure when the basin has reached it advanced structure target.
    - Once a basin has reached its advanced structure target, maintain advanced structure at or above the target level in a basin.

5.2.1. Stand Structure Definitions

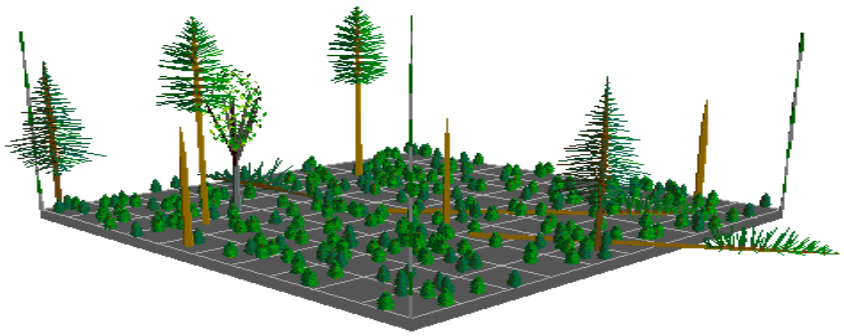
Pacific Northwest forests follow a typical progression of stand establishment and development over time following a major stand-replacement disturbance. Historically, these disturbances resulted from significant windstorm events, large-scale insect and disease outbreaks, and wildfires.

For this HCP, three defined stand structures depict the typical progression of stand development following a natural or human-caused disturbance: early, intermediate, and advanced. This is a simplified model. In reality, a continuum of forest development stages exists, reached by a multitude of pathways. These stand structures apply to all stands regardless of species composition—including pure conifer, mixed conifer/hardwood, and pure hardwood stands.

The processes that develop stand structures are described below. The stand initiation process is represented by the early stand structure. The stem exclusion and early understory re-initiation processes are represented by the intermediate structure. Structural complexity and larger tree size inherent to the advanced understory re-initiation process are characteristic of the advanced stand structure. The term "old growth" is used to describe both a process and a structure. Old-growth stands are included in the advanced stand structure.

The boxes below illustrate how these three representative stand structures might appear following the typical stand disturbance, establishment, and development sequence. In addition, the boxes describe stand characteristics, developmental stages, and the relative structural complexity. At the end of each description, the definition to be used during the first

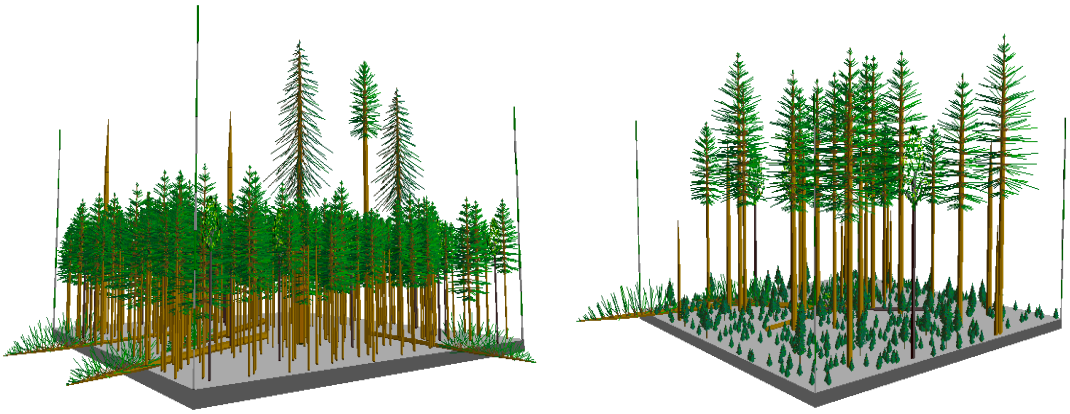
implementation period of this HCP is identified. Currently available data are limited to only a few of the characteristics desired in these structure types. As a result, these surrogate definitions have been developed for use during the first HCP implementation period, and will be re-evaluated thereafter.



EARLY STRUCTURE
Stand Development Process—Stand Initiation

Following a disturbance, an early structure stand develops through the stand initiation process. In the early years of this stage, new plants (trees, shrubs, and herbs) begin growing from seed, sprouts, artificial regeneration, or other means. The site is occupied primarily by conifer or hardwood tree seedlings or saplings. Herbs, shrubs, and/or grasses are widespread and vigorous, covering 20 to 80 percent of the ground. This stage includes first-year regenerated stands, and continues to the stage when the trees approach crown closure. Snags, downed wood, and residual live trees are carried over or recruited from the previous stand.

In the later years of this stage, increasing crown closure shades the ground, and herbs, shrubs, and grasses begin to die out or lose vigor. At this point in development, the stand transitions from an early initiation stage to an intermediate stem exclusion stage. Early structure stands also include stands thinned and/or pruned until the average stand diameter is six inches, and an understory exists that meets the definition of an intermediate structure stand.



INTERMEDIATE STRUCTURE
Stand Development Processes—Stem Exclusion and Understory Re-initiation

As early structure stands develop and transition into the stem exclusion stage, trees fully occupy the site and form a single main canopy layer. The stem exclusion process begins when new trees, shrubs, and herbs no longer appear and existing ones begin to die due to competition for light, nutrients, and moisture. The shrub and herb layers may be completely absent, or may be short and dominated by one or two shade-tolerant species, such as sword fern, Oregon grape, oxalis, or salal. The trees begin to show decreasing diameter growth rate and crown length. Less competitive trees die and root diseases may kill additional trees. As some trees die, snags and downed wood begin to appear in the stand. The surviving trees grow larger, with more variation in height and diameter.

The understory re-initiation process begins when enough light and nutrients become available to allow forest floor herbs, shrubs, and tree regeneration to again appear in the understory. The amount of brush and herbaceous cover is minimal at the beginning, but increases to a substantial part of the stand by the end of the stage. In all understory re-initiation stands, the shrub and herb layers are likely to continue to diversify and maintain or improve their vigor. Adequate light reaches the ground to allow shade-tolerant and intolerant herb and shrub species (e.g., Oregon grape, sword fern, blackberry, huckleberry, twinflower) to flourish. Tree canopies may range from a single-species, single-layered, main canopy with associated dominant, co-dominant, and suppressed trees, to multiple species canopies. However, significant layering of tree crowns has not yet developed in the intermediate structure stands. The least developed stands in this category consist of a single-species, single-layered, main tree canopy with a limited understory of shrubs and herbs. Depending on the intensity and timing of density management activities, stands could shift back and forth between the stem exclusion and understory re-initiation stages over time.

ADVANCED STRUCTURE
Stand Development Process—Understory Re-initiation and Old Growth Processes

The understory re-initiation process continues after sufficient light and nutrients are available to allow herbs, shrubs, and trees to grow and develop in the understory. The new understory may grow very slowly at higher stand densities. The vertical structure of advanced structure stands is more developed than that of intermediate structure stands in the understory re-initiation stage. Tree crowns show significant layering from the tallest trees to the forest floor. Shrub and herb layers are diverse, in terms of species and in vertical arrangement. A mixture of shade-tolerant tree species (e.g., western red cedar, western hemlock, bigleaf maple), intolerant tree species (e.g., Douglas-fir), and shrub and herb species (e.g., vine maple, huckleberry, rhododendron, Oregon grape, prince's pine, oxalis) may be present. The plant community provides a wide range of habitat niches from the forest floor through the canopy. Advanced structure stands that are highly diverse may develop structural characteristics typically linked with older forests or old growth. These stands will not necessarily emulate all of the processes and functions of very old forests. However, they provide habitats for many species commonly associated with older forests.

5.2.2. Desired Future Condition

Conservation Measure 5.1
Provide a Range of Stand Structures Across the Landscape

- Maintain the range of 40 to 60 percent advanced structure across the forest.
  - Twenty or more trees per acre of 18 inches or larger DBH and 100 feet or more in height, of which at least ten overstory trees per acre are at least 24 inches DBH. The quadratic mean diameter is 15 inches or more based on trees of at least 8 inches DBH.
  - Understory trees average 30 feet in height.
  - The basal area of these stands will be at least 150 square feet per acre, and no more than 325 square feet per acre.
  - Conservation areas and mapped marbled murrelet habitat are considered advanced structure regardless of silvicultural characteristics.
- Maintain the range of 25 to 55 percent of intermediate structure across the forest.
  - Average tree diameter of dominant and co-dominant trees is 6 to 18 inches DBH, but may be larger. Tree heights generally range from 40 to 100 feet.
  - Trees dominate the site and form a single main canopy layer. There may be little or no understory development, or the development may include understory trees. Generally, herbs, shrubs, and grasses may cover up to 40 percent or more of the forest floor. The stand does not have significant vertical layering of tree crowns.
- Maintain the range of 5 to 15 percent of early structure across the forest.
  - Average diameter of the largest 40 trees per acre of the new cohort is generally less than or equal to six inches DBH.
  - The trees are seedlings or saplings, usually less than 15 years old. Herbs and shrubs are widespread and vigorous, covering 20 to 80 percent of the ground.

Rationale—The stand structure types are designed to emulate the diversity of stands historically associated with conifer forests in the Coast Range. The percent ranges are selected recognizing that the actual quantity and distribution of early, intermediate, and advanced structure stands are, and have been, highly variable through time. Once a desired array of stand structures is achieved, individual stands on the landscape will continue to change. However, the relative abundance of the different stand structures is expected to remain reasonably stable. At some point in the future, a dynamic balance of stand complexity in a desired array will be achieved, and individual stands will move in and out of the various developmental stages at a relatively consistent rate.

The definitions given for each structure type are based on currently available data. These data are limited to only a few of the characteristics desired in these structure types. As a result, these surrogate definitions have been developed for use during the first HCP implementation period, and will be re-evaluated thereafter.

Conservation areas are considered advanced structure regardless of their silvicultural characteristics because they were identified based on their association with use by covered

species or as sensitive areas. Only very limited management activities are allowed in these areas.

Mapped marbled murrelet habitat areas are considered advanced structure regardless of their silvicultural characteristics because they were identified based on the silvicultural characteristics commonly used by marbled murrelets.

Conservation Measure 5.2
Manage 50 percent of Forestwide Advanced Structure for Larger Trees

- Fifty percent of the forestwide advanced structure will have the following characteristics:
  - 20 trees per acre at least 18 inches DBH and 100 feet or more in height
  - At least 10 of these trees at least 24 inches DBH
  - At least 8 of these trees 32 inches DBH or larger

In conservation areas, once a stand attains these characteristics, it is considered to have met these criteria for the remainder of the term of the HCP.

Rationale—Advanced structure stands will exhibit a range of characteristics as they develop beyond the minimum requirements for advanced classification. A significant percentage of advanced structure stands will contain larger trees and considerable amounts of snags and downed wood. These stands are expected to provide high-quality habitat for northern spotted owls and marbled murrelets based on the characteristics of older forest stands in the Coast Range.

Conservation Measure 5.3
Manage Advanced Structure Stands for Snags and Downed Wood

- Manage stands to be developed into advanced structure with the following characteristics:
  - At least six snags per acre, two of which must be at least 24 inches in diameter, with the remaining four at least 12 inches in diameter.
  - A total of 3,000 to 4,500 cubic feet of downed logs in all decay classes 1 to 5; or 600 to 900 cubic feet per acre of sound downed logs in decay classes 1 or 2.
  - Multiple tree species, including shade-tolerant species; some trees with defects or decadence; and diverse understory vegetation.

Rationale— In addition to large trees, functional advanced structure stands are characterized by elements of diversity, including snags, downed wood, and multiple species. Stands identified in implementation planning for development into advanced structure will be managed as needed to maintain or supplement these elements of diversity.

During implementation planning, field foresters will evaluate each stand's potential and determine how many stands are available to produce the array of stand structures in a basin. The foresters will then decide which stands will be managed for the various stand structures,

and these decisions will be based on the current condition of stands as well as placement on the landscape. Stands with more complex structural development may be managed to continue to produce advanced structure through prescriptions that retain and/or supplement biodiversity components and develop multi-canopied structure. Some intermediate structure stands may be chosen for eventual development into advanced structure if they are adjacent to existing advanced structure and/or conservation areas and have the potential to develop the characteristics associated with advanced structure. Prescriptions for these stands would likely include density management for vigorous growth. It is unlikely that early structure stands will achieve the characteristics of advanced structure during the term of this permit; nevertheless, some of these stands will have early silvicultural treatments such as precommercial thinning that will retain options for developing the stands into advanced structure later in stand development.

Conservation Measure 5.4
Meet Basin Targets for Advanced Structure

- Meet advanced structure targets ranging from 30 to 60 percent in each management basin according to Table 5-1. All acres in conservation areas and acres of mapped marbled murrelet habitat contribute to advanced structure targets, regardless of their silvicultural characteristics.
- Only harvest advanced structure in a basin as long as the basin target for advanced structure will be maintained.
  - For basins below the target amount of advanced structure during initial implementation periods, only harvest advanced structure when the basin has exceeded its advanced structure target.
  - Once a basin has reached its advanced structure target, maintain advanced structure at or above the target level in a basin.

Rationale—For implementation planning purposes, each management basin has a target for advanced structure ranging from 30 to 60 percent (see Table 5-1). These targets were developed considering connectivity of advanced structure for late successional species across the forest, and particularly in basins with northern spotted owls. Implementation plans will identify the location of existing advanced structure stands, as well as the location of stands to be developed into advanced structure to meet or maintain this target. These identified stands will be subject only to silvicultural techniques such as thinning that will move the stands toward their desired future condition. In successive Implementation Plans (IPs), the desired future condition of a particular stand may change based on how that stand contributes to the landscape design.

All acres in conservation areas (see Section 5.3) are considered to contribute to the targets for advanced structure regardless of their silvicultural characteristics. These areas were identified based on their association with use by covered species or as sensitive areas, and only very limited management activities are allowed. As HCP implementation begins, approximately 71 percent of the conservation area acres will have the silvicultural characteristics associated with advanced structure. However, by the end of the permit term, 91 percent of the conservation area acres will have those characteristics. By including all acres in conservation

areas, most basins will exceed their respective target for advanced structure at the beginning of plan implementation. For basins that do not meet the target for advanced structure, regeneration harvest of advanced structure is allowed only when the basin has exceeded its advanced structure target. Once a basin has attained its advanced structure target, advanced structure in that basin will be maintained at or above the target.

Regeneration harvest will occur in both intermediate and advanced structure. Regeneration harvest of advanced structure stands may occur in stands not identified as needed to meet the basin target during the implementation period. Harvest of these stands will occur at a rate that will maintain the basin target for advanced structure over the term of the HCP.

Table 5-1
Target Stand Structures to be Maintained Within Individual Basins on the Elliott State Forest over the Term of the Habitat Conservation Plan

Basin Number	Basin Name	Target Percentage Advanced Structure
1	Mill Creek	50
2	Charlotte-Luder	40
3	Dean Johanneson	50
4	Scholfield Creek	60
5	Big Creek	50
6	Benson-Roberts	60
7	Johnson Creek	60
8	Palouse Larson	50
9	Henrys Bend	30
10	Marlow-Glenn	30
11	Millicoma Elk	50
12	Trout Deer	40
13	Ash Valley	50

The result of the above structure targets, combined with the landscape design standards and guidelines in Section 5.4, will improve the functional arrangement of advanced structure across the landscape.

5.3. ESTABLISH CONSERVATION AREAS TO PROTECT SPECIAL RESOURCES

Conservation Measure 5.5
Establish Conservation Areas

- Manage at least 22,598 acres of the Elliott State Forest in conservation areas where little or no active management occurs.
- Maintain or develop advanced structure within conservation areas.

Conservation areas will have little or no active management. Some expected activities related to forest management include vehicle traffic on forest roads, wildfire suppression and control, road maintenance, minimal road construction, harvest unit guylines or tailholds for nearby harvests, stream rehabilitation work, stream survey work, and animal survey work. Additionally, some trees or snags may be removed for safety reasons in some circumstances, such as when a dead tree is leaning over a forest road. Management activities that further the purpose of the conservation area may also be allowed in some areas, such as management to attain mature forest conditions along streams.

Conservation areas vary by type, each serving different functions. The types of conservation areas are described below.

5.3.1. Types of Conservation Areas

5.3.1.1. Threatened and Endangered Species Core Areas

These conservation areas encompass 11,819 acres of the forest. They are designed to protect specific wildlife habitat for species included in the HCP associated with advanced structure conditions (i.e., northern spotted owl, marbled murrelet, and bald eagle). In most cases, the threatened and endangered cores (T&E cores) are known to be used by one or more of these species. In some cases, these T&E cores are part of, or next to, existing steep, unique, or visual lands (SUVs) (see below). T&E cores are designated across the forest, distributed so that there is at least one in each management basin.

Figure 5-1 shows the distribution of T&E cores and SUVs across the forest.

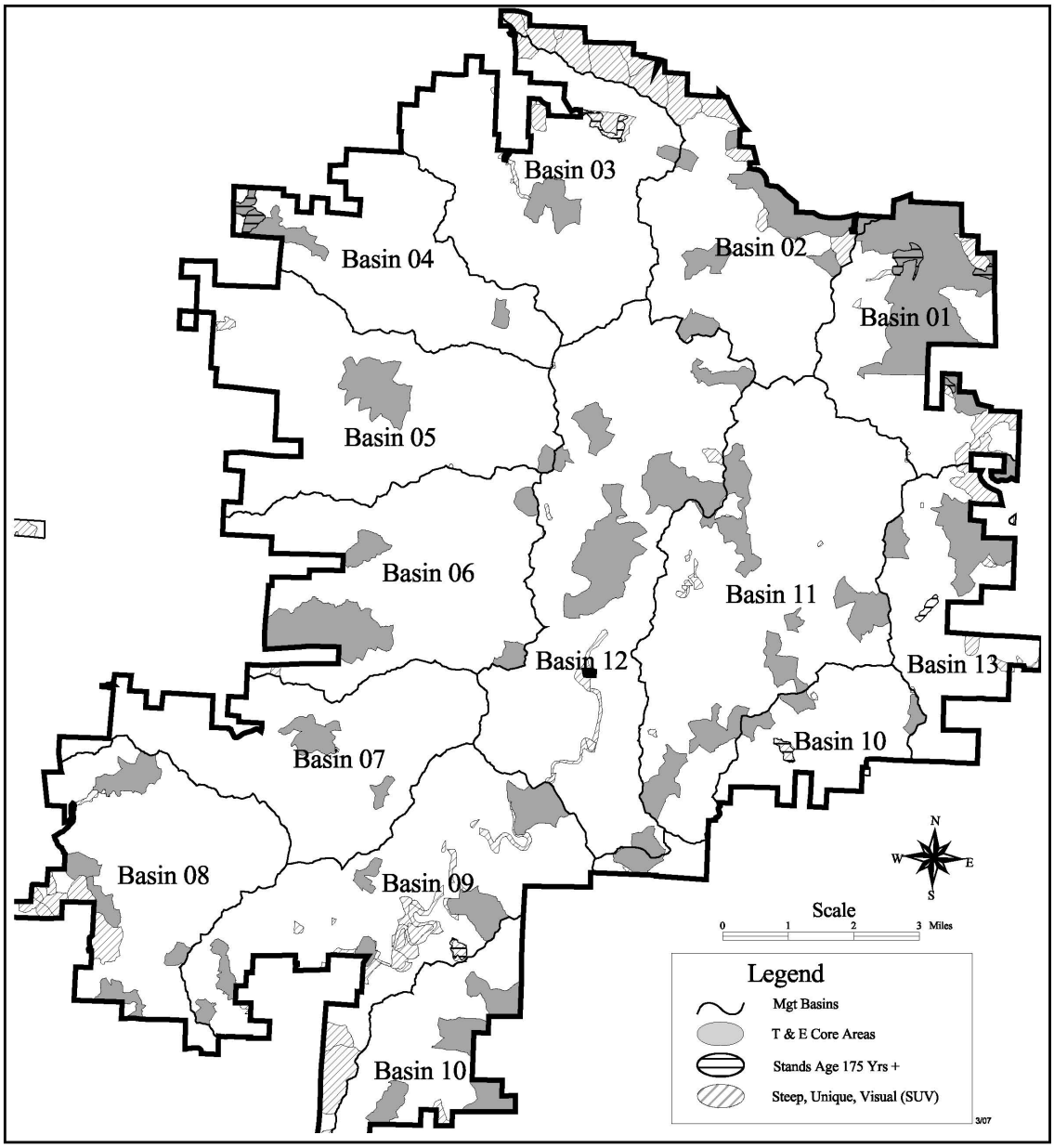


Figure 5-1. Distribution of T&E Cores and SUVs on the Elliott State Forest

Factors considered when determining the location of the T&E core areas include:

- Location of northern spotted owl nest sites or activity centers
- Location of areas receiving concentrated use by northern spotted owls, as measured by telemetry
- Location of stands with documented marbled murrelet occupancy behaviors and/or known nest trees
- Location of bald eagle nest trees
- Location of late successional habitat, including identified marbled murrelet habitat and older, advanced structure stands

Within the Elliott State forest, 48 T&E core areas exist, ranging in size from less than 100 acres to over 2,000 acres, with a median size of 246 acres. Table 5-2 provides specific information about individual T&E core areas. Table 5-3 provides total acreage in the three types of conservation areas and the acreage of overlap between type and the other two.

5.3.1.2. Steep, Unique, or Visual Lands

SUVs will also include lands where little or no management is expected for reasons that may not be associated directly with habitat values. These lands are termed steep, unique, or visual, and they constitute 6,433 acres of the forest. The function of these areas is described in more detail below. Although they are not specific to wildlife habitats, these lands can provide valuable wildlife habitats in addition to their primary function. In 2005, approximately 47 percent of the area within the SUV classification met the criteria for advanced structure.

SUVs include:

- Areas almost exclusively associated with the steep, rocky slopes on either side of major rivers or streams, including the Umpqua River, Mill Creek, and the West Fork Millicoma River. These protected corridors vary in width from 1,000 to 4,000 feet. Slopes affected by public safety considerations fall within this category.
- Areas classified as non-silviculturally capable because they are rocky, boggy or covered by water, or for various other reasons, have little to no commercial value for timber production. Currently, the Elliott State Forest has a few parcels of rocky or swampy lands scattered throughout the forest. Most parcels are less than 5 acres, though a few are as large as 20 acres.
- Areas where scenic values are the primary values to be maintained, including areas buffering recreational areas, highway corridors, river corridors, lakeshores, and other scenic attractions.

Table 5-2
T&E Core Areas—Acres and Presence of Northern Spotted Owl and Marbled Murrelet Sites[1]

Core Area	Basin	Acres	Northern Spotted Owl Activity Centers	Number of Occupied Marbled Murrelet Sites	Mapped Murrelet Habitat (acres)
Barn Gulch	6	146	Benson Creek	0	33
Beaver Headwaters	10 12	211		1	108
Benson Top	6	76		1	8
Big Alder	5	477	Alder Creek	0	194
Big Otter	5 12	97		1	48
Camp Creek	1	120	Upper Mill Creek	0	11
Charlotte Knife	2	116		1	9
Dean Creek	3	263	Dean Creek	1	93
Dry Ridge	6	94		1	28
Elk Forks	11	235		2	130
Elk Pass	10 11	304	West Glenn	5	71
Fish Knife	11 12	831	Panther Creek	4	392
Fourmile Creek	10	174	Fourmile Creek	0	72
Glenn Headwaters	10	67		1	0
Goody Ridge	4	55		1	37
Indian Charlie[2]	2	36		0	25
Joe Buck	12	772		7	285
Johanneson	2 3	89		2	41
Kentuck Ridge	9	55		1	26
Knife Forks	12	139		2	39
Larson Bottom	8	105		2	31
Larson Palouse	8	109		1	43
Larson Point	8	58		1	24

[1] All numbers in this chapter are from District layer maps, unless noted otherwise.
[2] Indian Charlie Core Area contains a bald eagle nest site.

Table 5-2 continued

Core Area	Basin	Acres	Northern Spotted Owl Activity Center	Occupied Murrelet Sites	Mapped Murrelet Habitat
Lockhart Ridge	10	196	Marlow Creek	0	35
Loon Lake East	1	60	Tom Fool	0	0
Lower Johnson	7	214	Johnson Creek	0	59
Lower Mill	1 2	2029	Lower Mill	7	712
Lower Roberts	6	781	Roberts Creek	2	217
Luder Footlog	2	67		1	15
Luder Umpqua	2	454		5	145
Marlow Bottom	10	143		2	41
Marlow Henry	9	257		1	86
Marlow Lockhart	10	206		3	40
Middle Charlotte	2	151		2	61
Middle Deer	12	169		2	70
Millicoma Schumacher	9	56		1	13
Old Maids Cabin	11	275		2	68
Palouse Creek	8	249	Palouse Creek	0	24
Panther Bench	11	38		1	19
Panther Howell	10 11	242		2	103
Right Fork Johnson	7	54		1	13
Salander Creek	13	523	Salander Creek	0	205
Salander Headwaters	13	115		1	41
Schumacher Headwaters	9	71		2	23
Stonehouse Point	9	113		2	55
Sullivan Creek	8	122		2	66
Trout Mouth	9	305		1	126
Wind Ridge	4	300	Wind Creek	0	222
Total Acres		**11,851**			

Table 5-3
Acres in the Three Types of Conservation Areas, and Overlap Among Conservation Area Types

Type of Conservation Area	Total Acres	Acres in Other Types of Conservation Areas		
		T&E Cores	SUVs	Aquatic/Riparian Protection
T&E Cores	11,819	n/a	1,874	1,353
SUVs	6,433	1,874	n/a	753
Aquatic/Riparian Protection	8,578[1]	1,613	912	n/a

[1] Aquatic/ riparian acreage in Conservation Areas is an estimate. This acreage figure will change as additional stream classifications are identified on the ground.

- Areas that the Oregon Department of Forestry (ODF) has determined to be uncommon or unique on the landscape, such as:
  - **Old-growth stands—**This category includes stands over 175 years of age as of 2004. These old-growth stands are rare in the Elliott State Forest because of its fire history. Most of these stands are included in T&E cores; however, a few old-growth stands are not known to have resident northern spotted owls or marbled murrelets, and thus are classified as unique habitat.
  - **Unique forest types—**Two areas contain forest vegetation types that are uncommon on the Elliott State Forest—1) reportedly, a pure stand of myrtle in the Big Creek Basin; and 2) a stand of bottomland hardwoods dominated by big-leaf maple in the Ash Valley Basin.

Timber harvest may take place if compatible with resource values in these areas; however, little active management is expected other than occasional removal of danger trees.

In addition to their primary functions, T&E cores and SUVs may fulfill other functions on the landscape. For example:

- Provide benefits to other species using these habitats, especially those using late-successional habitats
- Provide patches of advanced structure between late-successional reserves on adjacent federal forest lands ("stepping stones")
- Maintain unique or special habitats not necessarily associated with federally listed species
- Contribute to diverse forest conditions on the landscape by providing relatively unmanaged areas across the forest
- Be available as reference areas when testing overall landscape strategies

5.3.1.3. Riparian Management Stream Bank and Inner Zones

This HCP also considers riparian area, stream bank and inner zones (see Section 5.6.2) to be conservation areas. Such linear features constitute 10,419 acres of the forest, and serve several functions: protecting streams and riparian areas from disturbance; filtering sediment from uplands; and supplying food, cover, shade, and large wood. Riparian corridors provide diverse habitats and connectivity throughout the stream network of a watershed. Riparian management areas (RMAs) are embedded in all stand structure types.

No management activities are allowed within 25 feet of either side of fish-bearing and large and medium non-fish-bearing stream channels (stream bank zone). Outside this area to 100 feet (inner zone), the forest will be managed to develop or maintain certain levels of mature forest conditions based on stream classifications. Harvest may only occur within these inner zones, to facilitate the establishment of mature forest conditions. Other activities expected to occur in the stream bank and inner zone include cable yarding corridors, traffic and maintenance on existing roads, wildfire suppression and control, fish and wildlife enhancement projects, and fish and wildlife survey work. See Section 5.6 for more details on RMAs, including activities associated with non-fish-bearing streams. In 2005, approximately 37 percent of the area within riparian management stream bank and inner zones were associated with advanced structure stands.

The conservation area of riparian areas is calculated by measuring from the aquatic zone to 100 feet on all fish-bearing streams and on large and medium-sized non-fish-bearing streams. For small perennial non-fish-bearing streams, the conservation area is measured from the aquatic zone to 50 feet. For small seasonal non-fish-bearing streams, as well as high energy and potential debris flow track streams, the conservation area is measured from the aquatic zone to 25 feet. On all other small seasonal non-fish-bearing streams, there is no conservation area. (See Section 5.6 for stream and zone definitions.)

5.3.2. Stand Structure in Conservation Areas Over Time

All acres in conservation areas are considered advanced structure, even though some stands may not exhibit all of the typical characteristics. This section describes how actual stand structure will likely evolve within the conservation areas over the term of the HCP.

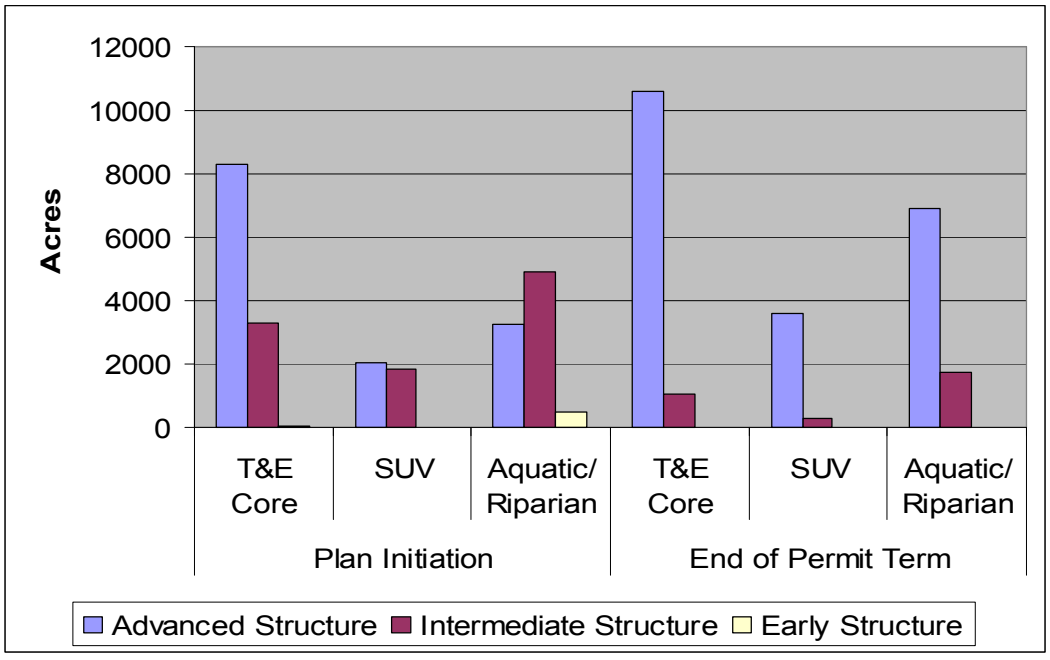
T&E core areas are based on use of these areas by northern spotted owls and marbled murrelets. At the time of selection, approximately 71 percent of the acres within T&E cores have the characteristics associated with advanced structure. Most intermediate structure (with the exception of some younger plantations) within the T&E core areas provides the function of advanced structure by virtue of its juxtaposition with advanced structure and its use by these late seral species. The presence of early structure within T&E core areas is not necessarily a reflection of habitat use, but is the result of a selection process that attempts to create largely circular patches and minimize convoluted edges. In some cases, early structure stands are included within T&E cores because they are surrounded by used habitat. At other times, early structure types are included with other structure types that together compose a

logical harvest setting. In all cases, the presence of early structure is minimized in the designation of T&E core areas. Over time, as early and intermediate structure develop toward more complex stand structure, the T&E core areas will evolve to provide functional patches of advanced structure (91 percent advanced structure).

SUVs contain higher percentages of early structure because these areas were determined by factors other than habitat use (see description of the different types of areas above). At the time of selection, approximately 53 percent of SUVs had the characteristics of advanced structure. However, by the end of the permit term, over 90 percent of SUVs are projected to consist of advanced structure, because of the limited management that will occur in these areas.

At plan implementation, riparian area, stream bank, and inner zones consist of 37 percent advanced structure, 57 percent intermediate structure, and 6 percent early structure. At the end of the permit term, these conservation areas are projected to contain 80 percent advanced structure and 20 percent intermediate structure. However, unlike T&E Cores and SUVs, RMAs are linear features that exist within larger stands rather than larger patches containing a mixture of structure types. The structure classification of these features will be important for species that live in the stream; however, for many other species, these features will functionally have the characteristics of the larger stands in which they are embedded.

Figure 5-2. Acres in Three Structure Types within Conservation Areas at Plan Initiation and as Projected by Modeling at 50 Years



5.3.3. Adaptive Management and Conservation Areas

When large-scale disturbance events such as severe fire or insect and disease outbreaks occur, conservation areas will be evaluated through an adaptive management process to determine if they can still function for their intended purpose. Active management, including salvage, may be applied if the evaluation indicates that it would help restore the conservation area's function faster. Salvage of downed wood in T&E cores would occur only to facilitate the maintenance or development of advanced structure, one of the conservation measures for these areas.

Vegetation will be retained or managed within the stream bank and inner zones of fish-bearing and large and medium non-fish-bearing streams to achieve mature forest condition with the goal of protecting aquatic and riparian resources. Salvage of downed wood in these areas would occur only to facilitate the establishment of mature forest conditions, and only in consultation with the Oregon Department of Fish and Wildlife (ODFW), as well as the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS).

Monitoring data gathered throughout the forest will be evaluated over time, as well as research information from a variety of sources. If the USFWS, NMFS, and ODF agree that such information indicates silvicultural treatments or other management activities in conservation areas would be beneficial for covered species and cost effective to perform, such management activities may occur in conservation areas. However at the time of the preparation of this HCP, only the management activities previously discussed in this subsection or in the introduction to Section 5.3 are anticipated.

5.4. Develop Implementation Plans to Achieve a Landscape Design that Provides Functional Habitat for Native Species

The district Implementation Plan (Oregon Department of Forestry. 2007) will include a landscape design that is consistent with the guidelines and standards outlined below, and that strives to achieve the variety of patch types, sizes, and arrangements necessary to provide functional habitat for covered species. The guidelines apply to all habitat types, from early to advanced structure. The application of these principles, guidelines, and standards will be discussed in the landscape design section of the district Implementation Plan.

Implementation—Each basin will have a different amount and placement of conservation areas, advanced habitat patches, riparian corridors, and other unique habitat areas. Each of these areas can maximize its contribution to overall wildlife diversity when considered in relation to other similar habitat within the basin, as well as in relation to similar habitat within adjacent basins. During implementation planning, the following standards and guidelines will be considered in selecting stands for development and maintenance of advanced structure.

5.4.1. Maintain Connectivity Between T&E Core Areas and Advanced Structure in each Management Basin

Conservation Measure 5.6
Manage for Larger Blocks of Advanced Structure

In each management basin, develop and maintain advanced structure so that a minimum of 500 acres of advanced structure is provided that includes at least one T&E core and other advanced structure within 0.7 mile of the outer boundary of the core. Advanced structure patches must be at least 20 acres to count toward this target. These acres may be within one mile of the core's boundary if they are contiguous. Part or all of the 500 acres may reside in an adjacent basin and may include other conservation areas. Intermediate structure within conservation areas counts toward the 500 acres.

Rationale—T&E core areas provide core habitat to support threatened species. However, it is recognized that the species may require, and would likely benefit from, additional habitat in these areas. For example, T&E cores provide a nesting core use area for known northern spotted owl pairs, but northern spotted owls require additional habitat for roosting and foraging. By providing some advanced structure adjacent to core areas, larger patches of interior habitat will be provided to support occupancy by threatened species.

The purpose of this standard is to ensure that, for the most part, T&E core areas do not become isolated from other advanced structure in a basin. Another result of the application of this standard is to provide better connectivity and functional arrangement among T&E core areas.

5.4.2. Apply Other Landscape Design Principles

The following landscape design principles will be used in developing Implementation Plans (these are not requirements, but are guidelines to be followed as practicable):

- Limit the amount of early structure adjacent to T&E core areas. The juxtaposition of early structure with advanced structure produces areas of high edge contrast. Although this edge habitat is valuable to many species, it is detrimental to others—in particular, to the northern spotted owl and marbled murrelet. By limiting the amount of early structure adjacent to T&E cores, and providing advanced and intermediate structure surrounding T&E cores, interior habitat values for these species will be enhanced.
- Locate advanced structure stands in proximity to other advanced structure stands to promote connectivity within this habitat type.
- In general, avoid creating small isolated patches of advanced structure to prevent excessive fragmentation. In this HCP, it is assumed that isolated patches are those with greater than 50 percent of the boundary adjacent to early structure or surrounded by forest land where future patch contributions are not anticipated, such as plantations on other land ownerships. It is assumed that isolated patches of less than 120 acres will provide benefits for only a limited array of species inhabiting advanced structure conditions (Rosenberg and Raphael 1986).
- Maintain riparian inner zones in an advanced structure condition. Stands that are in early structure condition may contain RMAs that are linear strips of advanced structure. Although these features do not provide the same benefits on the landscape as larger patches of interior habitat, they do serve an important function in providing habitat for stream-dwelling species, as well as providing connectivity to other patches of advanced structure on the landscape.
- Provide a variety of patch sizes across the landscape.
- Consider the shape of patches, and provide patches that are circular in shape to provide better interior habitat.
- Ensure that the minimum distance between patches is a function of size and frequency within a management basin. Smaller patches should be placed closer together than larger patches.

Rationale—Forestwide and basin-specific targets for advanced structure stands, coupled with a logical landscape design that incorporates these guidelines and principles developed during implementation planning, will provide for connectivity of advanced structure habitats across the Elliott State Forest. In management basins with relatively high levels of advanced structure, connectivity is likely to be provided for many species by the increased amount of

this habitat type. However, where advanced structure targets are relatively low, the arrangement of advanced structure patches becomes more important.

5.5. MAINTAIN OR INCORPORATE HABITAT COMPONENTS INTO THE FOREST AT A LANDSCAPE LEVEL

Summary of Conservation Measures

In regeneration harvests:

- Retain an average of three (no fewer than two) live trees per acre.
- Retain existing snags and downed wood of all decay classes where operationally feasible.
- Retain at least three hard snags per acre, 15 inches DBH or larger, and at least 20 feet tall; or create one snag per two acres using live trees greater than 20 inches DBH when three snags per acre are not available.
- Retain 300 to 600 cubic feet per acre of hard logs with the minimum volume of 20 cubic feet for any individual piece.
    - At least two logs per acre, 26-inch-diameter large end or larger, when available.
    - 50 percent volume should be conifer logs, when available.

When harvested stands are composed predominately of trees less than 20 inches DBH:

- Snag creation is not required.
- Retain an average of three to six logs per acre (decay class 1 or 2), with the minimum volume of 20 cubic feet for any individual piece.
- 50 percent of volume should be conifer logs.

Structural complexity provides the basis for much of the variety and richness of species, habitats, and processes. The important structural attributes include the size of standing live and dead trees, the condition of those trees, and the size, amount, and condition of downed wood on the forest floor. The canopies and boles of standing trees provide important habitats for a variety of wildlife. Downed wood provides habitat and a long-term source of nutrients. It also fulfills many important roles in stream ecosystems by forming pools and backwaters, providing nutrients, dissipating the energy of flowing water, and trapping sediment.

Active management outside of conservation areas has the potential to provide stand structural complexity while retaining habitat connectivity. If these areas are managed to provide the appropriate vegetation cover or key structures for species across the landscape, the intervening landscape is not a barrier to dispersal (Lindenmayer and Franklin 2002). Managing for connectivity outside conservation areas in this manner may result in increasing the effective size of small- and medium-sized conservation areas, reducing edge effects, and increasing the effectiveness of corridors (Lindenmayer and Franklin 2002).

This strategy presents approaches for managing the following structural components:

- Live trees
- Snags
- Downed wood

Although these approaches were developed specifically for retention in regeneration harvest units, retaining these structures in all stand structure types provides valuable wildlife habitat and other ecological values. Individual stands should meet or exceed these standards. However, sometimes individual harvest units may not meet these standards due to operational constraints. Monitoring efforts will test the viability of these approaches over time.

5.5.1. Structural Component Standards

The following conservation measures address standards for retention of structural components in regeneration harvest units. These standards are to be met outside the streambank and inner zones of Type F (fish-bearing) and large or medium Type N (non-fish-bearing) streams in the harvest unit. Individual stands should meet or exceed these standards. However, sometimes individual harvest units may not meet these standards due to operational constraints. Trees and logs left to meet the legacy wood standard will not be salvaged.

5.5.1.1. Live Tree Retention

Conservation Measure 5.7
Live Tree Retention in Regeneration Harvest Units

Retain an average of three (no fewer than two) live trees per acre

- Retained trees will be larger trees, in general greater than or equal to the stand's average DBH.
- Retain minor species (conifer or hardwood) of any diameter as part of, or in addition to, this target where operationally feasible and practical.
- To address the needs of a broader variety of wildlife species, retain at least 25 percent of the leave trees required to meet the standard in upslope areas or in RMAs that extend well into upslope areas.
- Consider the guidelines for live tree retention.

Rationale—Live trees will be retained to meet the short-term habitat needs of species, to serve as a source of future snags and downed wood, and to provide legacy trees in future stands. Legacy trees are living trees that are carried forward into a new stand following disturbance, with the intent that most will persist through future rotations. There may be times when forest conditions preclude achievement of the above averages within a stand. However, in the long term, legacy structures will be present in all stand types across the landscape.

Additional Guidelines for Live Tree Retention

- Consider a variety of types of live trees for retention, including:
  - Larger trees (trees that exceed the average DBH of the stand)
  - Defective trees, such as broken or multiple topped, damaged, diseased, or other deformed live trees
  - Sound, healthy trees with good crowns
  - Minor hardwood or conifer species
- Trees may be retained in a variety of arrangements throughout each harvest unit, including uniform or random distributions as well as dispersed clumps.
- Trees may be retained at greater levels in some units, and lesser levels in others, with the intent of achieving the average for all regeneration harvest units in a given Annual Operations Plan (AOP). Considerations include providing potential recruitment for snags or downed wood where these structural elements fall short of landscape objectives. For example, if insufficient hard snags are available, more live trees should be left.
- Retain a level of scattered native hardwoods as a minor component in stands where such trees occur naturally.

5.5.1.2. Snags

Conservation Measure 5.8
Snag Retention in Regeneration Harvest Units

- Retain existing snags of all decay classes where operationally feasible during harvest activities.
- Retain at least three hard snags per acre (decay class 1 or 2), 15 inches DBH or larger and at least 20 feet tall.
- If fewer than three hard snags per acre exist after harvest, create one snag per two acres, using live trees greater than 20 inches DBH. Created snags should be a minimum of 20 feet tall, and preferably larger.
- When harvested stands are composed predominately of trees less than 20 inches DBH, snag creation is not required.
- Consider the guidelines for snag management.

Rationale—Snags will be provided to meet the habitat needs of cavity-using species, and to serve as a source of future downed wood. Management will be designed to provide snags within all stand types over time, through a combination of existing snag retention, natural mortality in maturing stands, and artificial creation.

Additional Guidelines for Snag Management

- Snags should be retained in a variety of arrangements throughout the landscape. Uniform or random distributions, as well as dispersed clumping, will be used to provide for a variety of habitat and predator/prey conditions.
- Some snags should be left on or near ridgetops when possible and practical.

5.5.1.3. Downed Wood

Conservation Measure 5.9
Downed Wood Retention in Regeneration Harvest Units

- Retain existing downed wood of all decay classes where operationally feasible during harvest activities.
- Retain an average of 300 to 600 cubic feet per acre of hard logs (decay class 1 or 2), with the minimum volume of 20 cubic feet for any individual piece.
    - When available, at least two logs per acre must meet or exceed 26 inches diameter at the large end.
    - 50 percent of volume will be conifer logs when available.

The following exceptions to the standards above apply when harvested stands are composed predominately of trees less than 20 inches DBH:

- Retain an average of three to six logs per acre (decay class 1 or 2), with the minimum volume of 20 cubic feet for any individual piece.
- 50 percent of volume should be conifer logs.
- Consider the guidelines for downed wood management.

Rationale—Downed wood will be provided to meet the habitat needs of wildlife species, to provide for other key ecosystem functions, and to provide the structural legacy necessary for advanced structure development. Achieving the downed wood component will often require a significant amount of time (many decades), especially in areas where existing stands are deficient in this material. Management will be designed to provide downed wood within all stand structures through time, through a combination of existing downed wood retention, natural mortality in maturing stands, and artificial creation. Large-diameter logs (greater than 26 inches) are an important component of advanced structure. In addition, because larger logs decompose more slowly, large logs placed during regeneration harvests will contribute to downed wood needs into the future.

Additional Guidelines for Downed Wood Management

- Retain downed wood in a variety of arrangements within individual harvest units and throughout the landscape. Uniform or random distributions as well as dispersed clumping should be used to provide for a variety of habitat and predator/prey conditions.
- Retain a portion of the downed wood when salvaging windthrow and other dead timber.
- Retain live trees and snags to provide for downed wood contributions through the course of forest development during the life of each stand.
- Retain and, where necessary, provide for the supply of downed wood at the time of partial cut harvests to supplement downed wood in more developed structure stands.

5.5.2. Guidelines for Special Circumstances

It is expected that structural components will be retained at the desired levels during any management activity, unless they create clear safety or fire hazards, or if their retention would result in unacceptable additional operational difficulties, environmental hazards, or threats to public improvements. The following guidelines will govern special circumstances affecting retention of the structural components.

5.5.2.1. Safety Concerns

Where retention would constitute a significant safety hazard or result in a violation of state or federal law, individual trees or snags may be removed.

5.5.2.2. Pest Management Concerns

Where retention would constitute a significant threat to surrounding stands because of the presence of insect or disease agents, individual trees or snags may be removed. The ODF's forest entomologist or forest pathologist will be consulted in making the determination of significant threat.

5.5.2.3. Severe Operational Concerns

Where retention would affect the ability of the ODF to protect other key resources identified in this HCP, trees or snags may be removed.

5.5.2.4. Salvage

In the event of a major fire, windstorm, or other catastrophic disturbance, prompt salvage operations will be conducted to prevent build-up of epidemic insect populations and to minimize economic loss. In the absence of a catastrophic disturbance, it is unlikely that significant amounts of salvage will occur. Salvage refers to the harvest of trees that have died, are dying, have blown down, or are hazardous to public safety. The age and size of salvaged trees may vary. Trees may be salvaged individually or in larger parcels, depending on the cause and extent of the damaging agent. The economic return and the benefits of leaving all or a portion of the dead trees on an area are weighed when considering salvage operations. The same retention guidelines will be used as for other harvest operations.

5.6. APPLY AQUATIC AND RIPARIAN STRATEGIES

Summary of Aquatic and Riparian Conservation Measures

- Implement Watershed Analysis and use results to inform management and restoration decisions, including the Elliott Watershed Analysis (Biosystems et al 2003).
- Establish and maintain RMAs adjacent to all streams in accordance with the standards and guidelines.
- Use results from the Elliott Watershed Analysis to identify, design, and implement projects to restore or improve aquatic and riparian habitat.
- Use basin-level assessments to evaluate the need for alternative vegetation treatments.
- Where appropriate, plan alternative vegetation treatments, in collaboration with ODFW, that will contribute to achieving properly functioning aquatic habitat conditions in a timely manner.
- Monitor and evaluate alternative vegetation treatment projects over time, using results in an adaptive management context.
- Establish and maintain RMAs adjacent to other aquatic habitat areas in accordance with the standards and guidelines described in this HCP.
- Use watershed analysis (initially completed in October 2003) and other information to enhance current understanding of the processes that influence slope stability in the Elliott State Forest.
- Evaluate alternatives and design operations that can minimize, mitigate for, or avoid risk in high and moderate landslide hazard locations during district implementation and project planning.
- Design, construct, improve, and maintain forest roads in accordance with the processes and standards described in the Forest Roads Manual.
- Identify and prioritize roads for closure and/or vacation using information gained from the comprehensive forest roads inventory, and in accordance with the standards described in the Forest Roads Manual.

5.6.1. Riparian and Aquatic Ecosystems

The goals for riparian and aquatic habitat conditions and functions are described in the Elliott State Forest Management Plan (FMP) in Chapter 4 under concept 5. Based on the best available stream data, there are an estimated 771 miles of stream on the Elliott State Forest; these streams are distributed as shown in Table 5-4 among fish-bearing, and seasonal and perennial non-fish-bearing streams. The biological and ecological objectives for these streams are to maintain and enhance the key ecological functions of aquatic, riparian, and upland areas that directly influence the freshwater habitat of aquatic species, within the context of the natural disturbance regimes that created habitat for these species.

Table 5-4
Estimated Stream Miles by Watershed and for the Entire Forest for Fish-Bearing and Non-Fish-Bearing Streams (data source is district stream layer)

Stream Miles	Coos (miles)	TenMile (miles)	Umpqua (miles)	Elliott (miles)	Elliott (%)
Fish-Bearing and Large & Medium Non-Fish-Bearing	113	36	52	200	26%
Perennial Small Type N	173	84	91	348	45%
Seasonal Small Type N	113	47	62	222	29%
Total	**398**	**167**	**205**	**771**	

Aquatic ecosystems interact closely with the surrounding terrestrial systems, both at the landscape scale and at the scale of stream reaches and riparian zones. Therefore, the health of the aquatic system depends on forest management practices that recognize, maintain, and enhance the functions and processes that compose these terrestrial-aquatic interactions at a variety of scales. For this reason, the FMP uses a blended approach that applies the concepts of landscape ecology to manage riparian and aquatic habitats at the landscape level and through site-specific prescription. This type of two-tiered approach was cited by the Independent Multidisciplinary Science Team as necessary to achieve a high likelihood of providing properly functioning aquatic systems (Independent Multidisciplinary Science Team 1999).

In determining what constitutes key functioning aquatic systems, the overall approach is based on the following assumptions:

- Native aquatic species have co-evolved with the forest ecosystems in western Oregon.
- High quality aquatic habitats result from the interaction of many processes, some of which have been influenced by human activity.
- Aquatic habitats are dynamic and variable in quality for specific species, through time and across the landscape.
- No single habitat condition constitutes a "properly functioning" condition. Rather, providing diverse aquatic and riparian conditions over time and space would more closely emulate the natural disturbance regimes under which native species evolved.

The landscape level component of the aquatic and riparian strategies consists of the sustainable forest ecosystem management strategies for upslope stand structure (described earlier in this chapter), road management, and slope stability. Over time, the application of these strategies is intended to create forest conditions on the landscape that will emulate historic conditions and processes relative to aquatic systems.

The approach also incorporates a set of variable, site-specific riparian strategies to address the range of desired conditions along the stream network. Desired conditions vary depending on the functions provided by streams in different portions of the landscape, and are described

in Chapter 4 of the FMP. In summary, the goal of management along fish-bearing streams and larger non-fish-bearing streams is to grow and retain vegetation so that, over time, riparian and aquatic habitat conditions are maintained as, or become similar to, those associated with mature forest stands. Mature forest conditions should support functions and processes associated with properly functioning aquatic habitats.

Along small non-fish-bearing streams, the overall goal of riparian vegetation management is to grow and retain vegetation sufficient to support important functions and processes within the various streams, and to contribute to achieving properly functioning conditions in downstream fish-bearing waters. The functions of these streams will be maintained by the influence and contributions of adjacent stands managed to meet the landscape-level stand structure desired conditions, and by vegetation retained in riparian areas during harvest activities. This FMP recognizes that a variety of small Type N streams exist across the forest landscape, and that these streams may differ in their physical characteristics, dominant functional processes, and contribution to watershed-level processes. As a result, strategies for Type N streams vary according to which functions and processes are dominant within an individual stream.

The site-specific strategies are prescriptive and designed to protect key resource elements or provide for specific functional elements not necessarily addressed by the forest landscape strategies.

Finally, critical to the evaluation and refinement of both the landscape level and site-specific approaches is watershed analysis. Watershed analysis is a strategy designed to collect and synthesize key watershed information that will be used to further evaluate the two components listed above.

5.6.2. Use Watershed Analysis to Inform Management Decisions

Conservation Measure 5.10
Use Watershed Analysis in Making Management Decisions

- Implement watershed analysis and use results to inform management decisions.

A watershed analysis for the Elliott State Forest was completed in October 2003 (Biosystems et al 2003). The Coos Watershed Association served as a sub-contractor in developing the analysis. Both the Tenmile Lakes Basin Partnership and the Lower Umpqua Watershed Council reviewed assessment and analysis documents and provided input. The purpose of the watershed analysis is to measure current resources and assist in improving the understanding of natural processes that influence fish and wildlife habitat, and water resources throughout the Elliott State Forest. Consequences of human activities on these resources were also addressed through the analysis.

The analysis was based on protocols suited to Elliott State Forest management needs utilizing the Oregon Watershed Enhancement Board manual and protocols as a foundation. The

protocols were adjusted to include more rigorous information collection protocols for specific information "modules" based on forest management topics. The watershed analysis used basins based on fifth field scale hydrologic unit codes as developed by the U.S. Geological Survey. In most cases, these fifth field analysis basins are consistent with the Elliott State Forest's 13 management basins.

Information in the watershed analysis has been and will continue to be considered and, as appropriate, applied through the district Implementation Plan (Oregon Department of Forestry 2007). The existing watershed analysis will be supplemented with additional resource information as more data become available on watershed processes and interactions in the Elliott State Forest.

Using current inventories of the forest, or those that could be extrapolated from studies conducted on similar areas, the analysis may be applied, but not limited, to the following:

- **Implementation planning:** Watershed analysis recommendations are incorporated into the current Coos District Implementation Plan (Oregon Department of Forestry 2006a). A summary of watershed analysis findings and related ODF actions is provided in Appendix B of the Coos District Implementation Plan. Examples include identifying small non-fish-bearing streams that can deliver wood to fish-bearing streams, conducting forest management around unstable slopes, working with Watershed councils on basin-scale priorities for wood placement, and developing noxious weed policy.
- **Annual operational planning:** Many recommendations apply to annual operations planning. Examples include, but are not limited to: use of field surveys for determining perennial stream flow and fish distribution, stream protection upstream of domestic water sources, large wood placement to increase gravel retention, road segments in need of improvements, management for conifer stocking in riparian areas, and identifying wood placement locations.
- **Total maximum daily load studies:** Coos district will continue to work with partners on issues of total maximum daily load. Examples include, but are not limited to: exploring opportunities to collaborate with Coos Watershed Council for more stream temperature monitoring. ODF will evaluate potential sediment sources and mitigation using our established road current condition and environmental risk survey and a standardized process for documenting landslides.
- **Restoration activities:** Restoration activities include road and fish passage improvement projects, large wood placement opportunities associated with annual operations plans, and basin-scale prioritization. Prioritization is based on watershed analysis findings, ODF&W input and any other available information. For example High Intrinsic Potential (HIP) maps could be used. The HIP model predicts stream reaches that due to valley and channel morphology have the potential to provide high quality habitat.
- **Public education and outreach:** These activities include domestic water source protection.
- **Long-term resource monitoring:** In addition to those listed above, other examples include: large wood in steep draws and ODFW habitat surveys.

5.6.3. Apply Management Standards for Aquatic and Riparian Areas

Conservation Measure 5.11
Establish Riparian Management Areas

- Establish and maintain RMAs adjacent to all streams, in accordance with the standards and guidelines.

Site-specific prescriptive standards for aquatic and riparian areas constitute a key piece of the second tier of the balanced approach, and will guide forest management activities to achieve properly functioning aquatic and riparian habitat conditions over time. All management actions will be consistent with these standards.

The management standards include specific provisions for establishing RMAs and describe how management is to occur within these areas. The standards will be applied within the context of adaptive management process. As new information and a better understanding of the watershed functions and processes become available, this knowledge will be integrated into the management of riparian and aquatic habitat.

RMAs will be established immediately adjacent to waterways to protect aquatic and riparian resources, and maintain the functions and ecological processes of the waterways. Within these areas, special management considerations and operational restrictions will apply, and the protection of aquatic resources will be a high priority.

The width of RMAs will vary by type and classification of the water body. These widths were developed by considering the functions and processes to be achieved or maintained by management activities. The RMA width is measured horizontally beginning at the average high-water level of the water body, or the edge of stream-associated wetland, side channel, or channel migration zone (whichever is farthest from the waterway), and extending toward the uplands. The width of these areas will be expanded, if necessary, to fully encompass certain sensitive sites such as seeps, waterfalls, or other special sites noted in the management prescriptions.

RMA widths are intended to be averages applied over the length of a management site. The actual extent of a specific RMA can be varied to tailor vegetation retention to site-specific conditions, or to address special resource considerations. For example, an RMA boundary may be expanded where a potentially unstable slope adjacent to a stream could deliver materials to the stream. The intent of this action is to increase the potential for large wood delivery should a disturbance event occur. Variations in RMA design will always be completed in a manner consistent with the management objectives for the specific aquatic or riparian area.

5.6.3.1. Guidelines: The Four Zones of a Stream Riparian Management Area

RMAs established along streams will contain four zones. The purposes and differences between these four zones are discussed below.

Aquatic Zone—The aquatic zone is the area that includes the stream channel(s) and associated aquatic habitat features. This zone includes beaver ponds, stream-associated wetlands, side channels, and the channel migration zone. The other zones of a RMA are established upslope from the outer edge of these features.

Stream Bank Zone—The stream bank zone is the land nearest to the stream, including the stream banks. Most riparian functions are supported to some extent by vegetation in this zone, which provides aquatic shade, delivers downed wood and organic inputs (leaves and tree litter) to the stream and riparian area, stabilizes the stream bank, contributes to floodplain functions, and influences sediment routing processes.

The stream bank zone is defined as the area within 25 feet of the outer edge of the aquatic zone for all streams. This zone exists on both sides of a stream.

Inner RMA Zone—The inner RMA zone exists on both sides of a stream, from 25 feet (the outer edge of the stream bank zone) to 100 feet from the stream. Vegetation within this zone contributes substantially to desired riparian functions, including providing aquatic shade, delivering a high proportion of the potential large wood available, and contributing organic inputs to the stream. Vegetation within this area also provides some protection to certain aspects of riparian micro-climate. Because vegetation in this zone has a relatively greater role in supporting riparian functions and processes, a high priority is being placed on management actions in this area.

Outer RMA Zone—The outer RMA zone is the portion of the RMA farthest away from the stream extending from the edge of the inner zone at 100 feet out to 160 feet on both sides of a stream. Vegetation within this zone may still contribute to certain riparian functions and processes, but to a lesser extent than the two zones nearest the stream. The primary functions provided by vegetation in this area include additional contributions of large wood to the riparian zone and stream channel, and the protection of riparian micro-climate. In some cases, the outer zone may also partially buffer the two inner zones from certain disturbance events such as windthrow.

5.6.3.2. Stream Classification

Determination of the applicable management standards for riparian areas is based on a stream classification system. Streams are grouped into two major categories based on the primary beneficial uses of the stream. Streams are further classified according to size, based on average annual flow. Flow pattern (perennial and seasonal) is also considered for small non-fish-bearing waters. This classification system is generally consistent with the method used for administration of the FPA, as described in the ODF's Forest Practice Technical Note FP1—Water Classification (Oregon Department of Forestry 1994).

Beneficial Use Classifications

Streams and other aquatic habitats are classified into two major groups based on the presence or absence of certain fish species. The following definitions will be applied in classifying streams:

- **Fish-bearing (Type F)—**Waters that are inhabited at any time of the year by anadromous or game fish species, or by fish species that are listed as threatened or endangered under either federal or state ESA, or by fish species (including lamprey) covered for incidental take under this HCP.
- **Non-fish-bearing (Type N)—**Waters that are not fish-bearing (see previous definition).

Stream Size Classifications

Streams are further classified by size, based on estimated average annual flow. The following definitions apply to these size categories.

- **Small—**Average annual flow of two cubic feet per second (cfs) or less.
- **Medium—**Average annual flow greater than two cfs, but less than ten cfs.
- **Large—**Average annual flow of ten cfs or greater.

Flow Pattern Classifications

Small Type N streams are also classified according to the flow pattern exhibited in normal water years. For the purposes of this HCP, the following definitions will be used.

- **Perennial Type N Streams—**Streams that are expected to have summer surface flow after July 15.
- **Seasonal Type N Streams—**Streams that only flow during portions of the year; these streams are not expected to have summer surface flow after July 15.

Some seasonal non-fish-bearing streams are further classified as:

- **Seasonal High-energy Streams—**Seasonal streams with physical conditions that favor the periodic transport of coarse sediments and wood during high-flow events. For the purposes of this HCP, and in the absence of specific geomorphologic identification, stream reaches with an average gradient exceeding 15 percent and an active channel width of five feet or more will be defined as seasonal high energy streams.
- **Potential Debris Flow Track Reaches—**Potential channelized debris flow track reaches exist on seasonal Type N streams, and have been determined to have a high likelihood of delivering wood to a Type F stream.

ODF field staff will determine the likelihood that a reach will deliver wood to a Type F stream via a channelized debris flow, using the following criteria:

- The seasonal stream reach must terminate at or below a high landslide hazard location. High landslide hazard locations are specific sites that are subject to initiation

of shallow, rapidly moving landslides. The specific criteria for determination of these sites is found in Technical Notes 2 and 6 (Oregon Department of Forestry 2003a and b) as:

- The presence, as measured on site, of any slope in western Oregon (excluding competent rock outcrops) steeper than 80 percent, except in the Tyee Core Area, where it is any slope steeper than 75 percent; or

- The presence, as measured on site, of any headwall or draw in western Oregon steeper than 70 percent, except in the Tyee Core Area, where it is any headwall or draw steeper than 65 percent.

- Notwithstanding the slopes specified above, field identification of atypical conditions by a geotechnical specialist may be used to develop site specific slope steepness thresholds for any part of the state where the hazard is equivalent to one of the above.

- The path of a potential channelized debris flow and the likelihood that a debris flow will reach a Type F stream. Determination of such conditions is described in detail in Technical Note 6 (reference). If any one of the following conditions is present along the path from the high landslide hazard location to the Type F stream, a debris flow is likely to stop and the stream reach would be determined to have a low probability of wood delivery to the Type F stream (Benda and Cundy 1990):
  - The presence of a channel junction that is 70 degrees or more, provided the channel downstream of the junction is less than 35 percent gradient;
  - The presence of a stream reach that is less than six percent gradient for at least 300 feet;
  - The stream channel is unconfined; or
  - Other characteristics which, in the judgment of the geotechnical specialist, are likely to cause debris flow deposition

5.6.3.3. Management Standards for RMAs

The following standards will guide management activities so that properly functioning riparian and aquatic conditions will be created over time. These standards will apply until alternative standards are identified through the adaptive management process. As new information and a better understanding of the watershed functions and processes become available, this knowledge will be integrated into the management of riparian and aquatic habitat through the adaptive management process. The management standards are presented in Tables 5-5 and 5-6.

Table 5-5
Management Standards for Type F Stream Riparian Management Areas

All Stream Sizes: Large, Medium, and Small	
Stream bank zone 0 to 25 feet	No harvest. Full suspension required during cable yarding; minimize the number and width of cable yarding corridors through retained RMA zone. No ground-based equipment operation. Leave any trees damaged or felled from yarding activities.
Inner RMA zone 25 to 100 feet	Manage for mature forest condition.[1] No management activity where mature forest condition exists, or where conditions are suitable for development of mature forest condition in a reasonable time frame without further treatment. Allow active management where necessary to achieve the desired future condition in a timely manner. Minimum 15-year interval between harvest entries, and minimum number of entries necessary to achieve the desired future condition. Partial cutting will maintain a conifer SDI of at least 25, and will retain at least 50 trees per acre. Full suspension wherever possible, or one-end suspension on all cable-yarded material. Ground-based equipment operation limited to area more than 50 feet from aquatic zone and slopes less than 35 percent, and allowed on no more than 10 percent of area. Leave any trees damaged or felled from yarding activities and additional felled, girdled, or topped trees to contribute toward downed wood targets.[2] Retain all dead and downed material that was present prior to the operation.
Outer RMA zone 100 to 160 feet	Retain at least 10 to 45[3] conifer trees and snags per acre (15 to 70 trees per 1,000 feet of RMA). [4] Retain all snags as safety permits. Less than 10 percent ground disturbance from yarding activities. Retain all dead and downed material that was present prior to the operation.

[1] Desired mature forest condition consists of a stand dominated by large conifer trees or, where hardwood-dominated conditions are expected to be the natural plant community, a mature hardwood/shrub community. For conifer stands, this equates to a basal area of 220 square feet or more per acre, inclusive of all conifers over 11 inches DBH. At a mature age (80 to 100 years or greater), this equals 40 to 45 conifer trees of 32 inches DBH per acre.

[2] Up to ten trees per acre will be retained as felled, girdled, or topped trees during partial cutting, to reach a target of 600 to 900 cubic feet per acre of hard downed wood.

[3] Outer zone tree retention target will be increased when less than the target number of conifers is present in the inner zone. The process for calculating the outer zone retention target is described in the section following the RMA prescription tables.

[4] All trees retained will be dominant or co-dominant conifer trees (if available). To balance the need for short-term and long-term recruitment of large wood to the aquatic zone, preference will be given to retaining trees on adjacent slopes, trees leaning toward the aquatic zone, and trees nearest the channel.

SDI = stand density index

Table 5-6
Management Standards for Type N Stream RMAs

Large and Medium Type N Streams	
Stream bank zone 0 to 25 feet	No harvest. Full suspension required; minimize the number and width of cable yarding corridors through retained RMA zone. No ground-based equipment operation. Leave any trees damaged or felled from yarding activities.
Inner RMA zone 25 to 100 feet	Manage for mature forest condition.[1] No management activity where mature forest condition target already exists. Allow active management where beneficial to achieve desired future condition. Minimum 15-year interval between harvest entries, and minimum number of entries necessary to achieve the desired future condition. Partial cutting will maintain a conifer SDI of at least 25, and will retain at least 50 trees per acre. Full suspension wherever possible, or one-end suspension on all cable-yarded material. Ground-based equipment operation limited to area more than 50 feet from aquatic zone and slopes less than 35 percent, and allowed on no more than 10 percent of area. Leave any trees damaged or felled from yarding activities and additional felled, girdled, or topped trees to contribute to downed wood targets.[2] Retain all dead and downed material that was present prior to the operation.
Outer RMA zone 100 to 160 feet	Manage to retain at least 10 conifer trees and snags per acre (15 trees per 1,000 feet of RMA).[3] Retain all snags as safety permits.

[1] Desired mature forest condition consists of a stand dominated by large conifer trees or, where hardwood-dominated conditions are expected to be the natural plant community, a mature hardwood/shrub community. For conifer stands, this equates to a basal area of 220 square feet or more per acre, inclusive of all conifers over 11 inches DBH. At a mature age (80 to 100 years or greater), this equals 40 to 45 conifer trees of 32 inches in DBH per acre.

[2] Up to ten trees per acre will be retained as felled, girdled, or topped trees during partial cutting, to reach a target of 600 to 900 cubic feet per acre of hard downed wood.

[3] All trees retained will be dominant or co-dominant conifer trees (if available). To balance the need for short-term and long-term recruitment of large wood to the aquatic zone, preference will be given to retaining trees on adjacent slopes, trees leaning toward the aquatic zone, and trees nearest the channel.

SDI = stand density index

Table 5-6 continued

Small Perennial Type N Streams (applied to at least 75 percent of stream reach contained within the Harvest Unit)[1]	
Stream bank zone 0 to 25 feet	No harvest. No ground-based equipment operation.
Inner RMA zone 25 to 100 feet	Manage to retain at least 15 to 25 conifer trees and snags per acre (25 to 40 trees per 1,000 feet of RMA).[2,3] Retain all other snags as safety permits. Within 500 feet of a confluence with a Type F stream, retain all hardwoods, non-merchantable trees, and other conifers as necessary, to achieve 80 percent shade over aquatic zone. Retain all dead and downed material that was present prior to the operation.
Outer RMA zone 100 to 160 feet	Manage to retain 0 to 10 conifer trees and snags per acre (0 to 15 trees per 1,000 feet of RMA).[2,3] Retain all snags as safety permits.

[1] Prescription to be applied to at least 75 percent of perennial stream reach contained within the harvest unit, including the first 500 feet above the confluence with a Type F stream, and areas that meet the definition of a special emphasis area according to the definitions in the section following these tables. This approach is designed to provide flexibility for operational constraints typically encountered around these small streams.

[2] All trees retained will be dominant or co-dominant conifer trees (if available). To balance the need for short-term and long-term recruitment of large wood to the aquatic zone, preference will be given to retaining trees on adjacent slopes, trees leaning toward the aquatic zone, and trees nearest the channel. See measure 9.8 in Chapter 9 for a related headwall amphibian conservation measure.

[3] In meeting the tree retention target for the inner and outer zones, preference will be given to retaining trees within the inner zone. Where there are sufficient trees within the inner zone to meet the combined target for the two zones (40 trees per 1,000 feet), no additional leave trees are required in the outer zone.

Table 5-6 continued

Small Seasonal Type N Streams: High Energy Reaches (applied to at least 75 percent of stream reach contained within the harvest unit)[1]	
Stream bank zone 0 to 25 feet	No harvest. No ground-based equipment operation.
Inner RMA zone 25 to 100 feet	Manage to retain at least 15 to 25 conifer trees and snags per acre (25 to 40 trees per 1,000 feet of RMA).[2,3] Retain all other snags as safety permits. Retain all dead and downed material that was present prior to the operation.
Outer RMA zone 100 to 160 feet	Manage to retain 0 to 10 conifer trees and snags per acre (0 to 15 trees per 1,000 feet of RMA).[2,3] Retain all snags as safety permits.
Small Seasonal Type N Streams: Potential Debris Flow Track Reaches (applied to at least 75 percent of reach)[1]	
Stream bank zone 0 to 25 feet	No harvest. No ground-based equipment operation.
Inner RMA zone 25 to 100 feet	Manage to retain at least 10 conifer trees and snags per acre (15 trees per 1,000 feet of RMA).[2,4] Retain all other snags as safety permits. Retain all dead and downed material that was present prior to the operation.
Outer RMA zone 100 to 160 feet	Retain trees and snags sufficient to meet landscape management strategy targets.

[1] Prescription to be applied to at least 75 percent of stream reach contained within the harvest unit, including the first 500 feet above the confluence with a Type F stream. This approach is designed to provide flexibility for operational constraints typically encountered around these small streams.

[2] All trees retained will be dominant or co-dominant conifer trees (if available). To balance the need for short-term and long-term recruitment of large wood to the aquatic zone, preference will be given to retaining trees on adjacent slopes, trees leaning toward the aquatic zone, and trees nearest the channel.

[3] In meeting the tree retention target for the inner and outer zones, preference will be given to retaining trees within the inner zone. Where there are sufficient trees within the inner zone to meet the combined target for the two zones (40 trees per 1,000 feet), no additional leave trees will be required in the outer zone.

[4] To maximize the influence of retained trees on debris flow processes, preference will be given to retaining these trees as close to the stream channel as operationally feasible, or on adjacent slope features that exhibit a high potential for failure and delivery to the stream.

Table 5-6 continued

Other Small Seasonal Type N Streams (applied to at least 75 percent of reach)	
Stream bank zone 0 to 25 feet	Maintain integrity of stream channel. No ground-based equipment operation.
Inner RMA zone 25 to 100 feet	Manage to retain at least 10 conifer trees and snags per acre where operationally feasible (15 trees per 1,000 feet of RMA).[1] Retain all other snags as safety permits. Retain all dead and downed material that was present prior to the operation.
Outer RMA zone 100 to 160 feet	Retain trees and snags sufficient to meet landscape management strategy targets.

[1] All trees retained will be dominant or co-dominant conifer trees (if available). To balance the need for short-term and long-term recruitment of large wood to the aquatic zone, preference will be given to retaining trees on adjacent slopes, trees leaning toward the aquatic zone, and trees nearest the channel.

Outer Zone Conifer Retention on Type F Streams

On Type F streams, in situations where the number of conifers available for retention within the streambank and inner zones is not adequate to achieve the large wood delivery potential of a mature forest condition, additional conifers will be retained in the outer zone to provide additional large wood recruitment potential. This additional outer zone target will apply when the number of conifers of suitable size (11 inches or greater DBH) in the inner zone is less than the mature forest condition target of 45 trees per acre (approximately 100 trees per 1,000 lineal feet of stream for a 25-foot stream bank zone and a 75-foot inner zone).

The number of additional conifers to be retained in the outer zone will be equal to the deficit from the streambank and inner zone target, adjusted to account for the different widths of the zones. The streambank zone and inner zone combine for a width of 100 feet, whereas the outer zone is 60 feet. For example, if the streambank and inner zone have an average of 70 suitable conifers per 1,000 feet of stream, the additional retention level for the outer zone would equal 30 times 0.6, or an additional 18 conifers per 1,000 feet of outer zone.

In no case shall the number of conifers required to be retained in the outer zone exceed the inner zone target for mature forest condition; i.e., no more than 63 conifers per 1,000 feet of outer zone, or 45 trees per acre, are required. In addition, no trees shall be required to be retained in the outer zone in locations where, due to topography, they would have no opportunity to reach the area within the channel migration zone and thus potentially function as large wood in the stream channel. All conifers retained under this strategy shall meet the conifer retention criteria as described in footnotes to Tables 5-5 and 5-6: dominant or co-dominant trees, with preference given to retaining trees on adjacent slopes, trees leaning toward the aquatic zone, and trees nearest the channel.

Estimated acreages in stream-associated riparian areas are shown in Table 5-7. There are an estimated total of 10,419 acres of riparian areas, mostly associated with fish-bearing, large and medium non-fish-bearing, and perennial non-fish-bearing streams. This is a conservative estimate, as additional strategies (described above) apply out to 160 feet from the stream on most stream types while the widths used to calculate RMA acres were 100 feet and less.

Table 5-7
Estimated Acres of Riparian Area by Stream Type

Stream Type	Coos (acres)	TenMile (acres)	Umpqua (acres)	Elliott (acres)	Elliott (%)
Fish-Bearing and Large & Medium Non-Fish-Bearing	2736	864	1251	4851	46%
Small Perennial Non-Fish-Bearing	2094	1024	1104	4222	41%
Small Seasonal Non-Fish-Bearing	683	287	377	1346	13%
Total	**5513**	**2174**	**2733**	**10419**	

A width of 100 feet, 50 feet, and 25 feet was assumed for fish-bearing, perennial small non-fish-bearing, and seasonal small non-fish-bearing streams, respectively. Estimates represent RMAs assumed on both sides of the stream.

Perennial Type N Stream Special Emphasis Areas

On small Type N streams, the required RMAs will be located to provide protection to the following special emphasis areas. These special emphasis areas may be especially important to certain species (such as amphibians), or to the functions and processes within a watershed.

- **Seeps and Springs in Inner RMA Zone, Connected to Aquatic Zone—**The 25-foot stream bank zone of the stream, which is the no-harvest zone, will be extended around the outer perimeter of side slope seeps and springs that are within 100 feet of the aquatic zone and connected to the channel via overland flow. The inner zone will follow that boundary.
- **Source Areas of Perennial Streams—**The 25-foot stream bank zone, which is the no-harvest zone, will be extended for a distance of 100 feet above the initiation point of perennial flow.
- **Stream-associated Wetlands—**The 25-foot stream bank zone, which is the no-harvest zone, will be extended around the outer perimeter of the wetland area.
- **Stream Junctions—**The 25-foot stream bank zone (no harvest) will be extended for a minimum of 100 feet upstream and downstream, on each stream, where two or more small Type N perennial streams intersect.
- **Significant Waterfalls—**A significant waterfall is one that has an identifiable splash zone. The splash zone is the area immediately adjacent to the stream channel that is occupied by vegetation commonly associated with wet areas, i.e., mosses, maidenhair or licorice fern, and other hydric species.

For these sites, the stream bank zone (no harvest) will be extended around the outer perimeter of the splash zone of the waterfall.

Key Terms

Active channel width—The average width of the stream channel at the normal high-water level. The normal high-water level is the stage reached during average annual high flow. This high-water level mark often corresponds with the edge of streamside terraces; a change in vegetation, soil, or litter characteristics; or the uppermost scour limit (bankfull stage) of a channel.

Average high-water level—The stage reached during the average annual high-flow period. This level often corresponds with the edge of streamside terraces, marked changes in vegetation, or changes in soil or litter characteristics.

Bog—A wetland that is characterized by the formation of peat soils and that supports specialized plant communities. A bog is a hydrologically closed system without flowing water. It is usually saturated, relatively acidic, and dominated by ground mosses, especially sphagnum. Bogs are distinguished from other wetlands by the dominance of mosses and the presence of extensive peat deposits.

Channel migration zone—An area adjacent to an unconfined stream channel where channel migration is likely to occur during high-flow events. The presence of side channels or oxbows, stream-associated wetlands, and low terraces are indicators of these zones. The extent of these areas will be determined through site inspections.

Stream-associated wetland—A wetland that is immediately adjacent to a stream. This includes wetlands that are adjacent to beaver ponds, side channels, or oxbows that are hydrologically connected to the stream channel by surface flow at any time of the year.

Wetland—An area that is inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal conditions does support, a prevalence of vegetation typically adapted for life in saturated soil conditions. The process used to determine the presence of wetlands will be consistent with the method described in the *Federal Manual for Identifying and Delineating Jurisdictional Wetlands* (USDI Fish and Wildlife Service et al. 1989).

5.6.4. Maintain or Improve Aquatic Habitats

Conservation Measure 5.12
Maintain or Improve Aquatic Habitat

- Use results from the Elliott watershed analysis to identify, design, and implement projects to maintain or improve aquatic and riparian habitat.

The aquatic habitat maintenance or improvement strategies are intended to correct human-induced conditions in the forest that may contribute to aquatic habitat deficiencies, or that may limit desired aquatic habitat conditions. These strategies will promote aquatic habitat conditions that support the short- and long-term survival needs of aquatic organisms. Also, these strategies will make it more likely that properly functioning aquatic habitat conditions will be attained in a timely manner. Finally, these strategies will encourage forest conditions that support the ecological processes necessary to naturally create and maintain complex aquatic habitats on a self-sustaining basis.

This approach addresses aquatic habitat maintenance or improvement on a comprehensive basis, and uses both short- and long-term management actions. These strategies will improve levels of aquatic function in the short term (to meet the immediate habitat needs of aquatic species and place aquatic habitats on a pathway toward desired conditions), while at the same time site-specific and landscape actions are carried out to establish and maintain self-sustaining habitats over the long term. The following strategies and actions will be implemented as part of the aquatic habitat maintenance or improvement strategy.

Use the Elliott Watershed Analysis to identify potential factors contributing to undesirable aquatic habitat conditions.

An Elliott Watershed Analysis Implementation Plan was developed by a group composed of the ODF, the ODFW, and area watershed councils. The Watershed Analysis Implementation Plan identifies the significant recommendations from the watershed analysis (Biosystems et al 2003) and describes the ODF's response and proposed actions to address these issues. The Watershed Analysis Implementation Plan has been incorporated into the district Implementation Plan.

Identify, design, and implement projects to correct identified problems in a timely manner.

Aquatic and riparian projects will continue to be implemented at or above current levels, as projects are needed. For the five-year period from 1999 to 2003, the ODF provided an annual average of $34,300 of cash and in-kind contributions toward projects to address fish passage, instream, and riparian improvements. From 1996 through 2003, in cooperation with three watershed associations, ODF's contribution was leveraged into an annual average of $203,546 in cash and in-kind contributions invested in restoration projects. These projects include 56 riparian projects, 38 in-stream projects, 1 upland project, 22 road projects, and 19 fish passage projects. In addition to these cooperative watershed projects, ODF invests about

$200,000 in annual road improvement and maintenance projects that help improve water quality conditions.

The watershed analysis identified 5.9 miles of stream with wood levels less than 250 cubic feet per 100 feet, and 25.3 miles of stream with less than 20 percent pools and wood less than 250 cubic feet per 100 feet of stream.

The watershed analysis identified potential stream restoration sites based on the numbers of pools by reach and the volume of wood per 100 feet of stream. These results were reported for streams less than and greater than 40 feet in width. There are approximately 18.4 miles of streams less than 40 feet wide and 25.3 miles of stream wider than 40 feet that would benefit from wood placement. Specific reaches were identified in the Coos, Umpqua, and Tenmile basins (see Tables 8-14 and 8-15 in Chapter 8 of this HCP) (Biosystems et al 2003). Opportunities to implement restoration in these reaches in collaboration with the Coos Watershed Association will continue to be explored over the life of this HCP.

In addition to the Watershed Analysis Implementation Plan, opportunistic projects associated with harvest operations will be conducted that can take advantage of existing equipment on site. Instream wood placement projects will be conducted on fish-bearing streams within or adjacent to all harvest operations when the stream is below the desired level of wood and the operation contains wood meeting size requirements for the intended stream.

The following guidelines will be considered when planning restoration projects:

- Aquatic habitat improvement projects will be designed with the intent of mimicking natural processes. The use of "engineered" or "constructed habitat" approaches to stream enhancement will be minimized.
- Projects will be designed and implemented using a multidisciplinary approach, in direct consultation with the ODFW and in cooperation with local watershed councils.
- Project planning and design will consider habitat conditions, stream processes, and the disturbance regime at both the watershed and site-specific scale.
- Projects will be designed and implemented consistent with the natural dynamics and geomorphology of the site, and with the recognition that introduction of materials will cause changes to the stream channel.
- A priority will be placed on projects that supplement natural "legacy" elements (large wood) that are lacking due to previous disturbance events, and/or management activities.
- Projects will be designed to create conditions and introduce materials sufficient to enhance or re-establish natural physical and biological processes. An emphasis will be placed on projects that re-introduce large "key" pieces of large wood to stream channels in natural configurations.
- Wood placement activities will utilize materials that are expected to be relatively "stable" yet functional in these dynamic stream systems. The intent is to maximize the functional attributes of large wood, and minimize potential conflicts with public safety in downstream reaches. Reliance on artificial "anchoring" methods (such as cables) will be minimized, and will only be used in cases of significant concern for public safety.

- Projects will be implemented in a manner that minimizes the potential for negative effects to riparian areas.

5.6.5. Apply Alternative Vegetation Treatment to Achieve Habitat Objectives in Riparian Areas

Conservation Measure 5.13
Apply Alternative Vegetation Treatment to Achieve Objectives

- Use basin-level assessments to evaluate the need for alternative vegetation treatments.
- Where appropriate, plan alternative vegetation treatments that will contribute to achieving properly functioning aquatic habitat conditions in a timely manner.
- Monitor and evaluate alternative vegetation treatment projects over time, using results in an adaptive management context.

The term "alternative vegetation treatment" refers to the application of silvicultural tools and management techniques in RMAs, using approaches that differ from the aquatic and riparian management strategies, to change the vegetative community so that the HCP's aquatic and riparian habitat objectives can be more easily achieved. These treatments are primarily designed to address recruitment of large conifers trees to streams for the purpose of improving fish habitat.

Potential projects include silvicultural treatments such as the conversion of hardwood stands to conifer species; selective removal of hardwoods from mixed-species stands and the establishment of shade-tolerant conifer seedlings; the creation of gaps in hardwood stands to establish conifer seedlings (shade-intolerant and shade-tolerant); or other similar practices designed to improve aquatic and riparian conditions.

The alternative vegetation treatment strategies will apply silvicultural approaches in riparian areas where basin-level riparian stand conditions are inconsistent with achieving properly functioning aquatic habitat conditions in a timely manner. These strategies will be implemented in a way that maintains diverse riparian plant communities (heterogeneity) at the landscape and basin scales, and that minimizes the potential for adverse effects to aquatic resources.

Use basin-level assessments to evaluate the need for alternative vegetation treatment projects.

This strategy will be implemented primarily through the watershed analysis strategies described earlier, applied at the basin level.

Plan alternative vegetation treatment projects to achieve properly functioning aquatic habitat conditions in a timely manner.

These projects will be designed to achieve properly functioning aquatic habitat conditions in a timely manner, and involve a variety of resource specialists from the ODF and ODFW. The specialists involved in a given project will vary according to the resources and physical conditions present at the site.

Monitor and evaluate alternative vegetation treatment projects through time using results in an adaptive management context.

The HCP recognizes that these treatments are experimental actions, and that, over time, managers will gain additional knowledge and experience through monitoring and research. These projects will be monitored and evaluated over time to ensure that the objectives are being achieved, and that undesirable effects are being minimized. The knowledge gained will be applied in an adaptive management context so that the multiple resource objectives for riparian and aquatic habitats can be more successfully met.

5.6.6. Apply Specific Strategies to Other Aquatic Habitats

Conservation Measure 5.14
Apply Strategies to Other Aquatic Habitats

- Establish and maintain RMAs adjacent to other aquatic habitat areas in accordance with the standards described in this HCP.

The Elliot State Forest contains aquatic habitats other than streams, such as wetlands, lakes, ponds, bogs, seeps, and springs. The management objectives for these waters are generally similar to the objectives for streams, but the specific prescriptions are sometimes different. RMAs will be established and maintained adjacent to these habitats in accordance with the standards described below.

These waters support diverse plant and animal communities, are connected to other waters in a basin, and play a significant role in the hydrologic patterns and functions of watersheds. Some species have adapted to, or are dependent on, the conditions found in and near these other aquatic habitats. These areas can also be sensitive to land management activities.

The strategies for other aquatic habitats will maintain the productivity of these habitats, protect the integrity of these sites and maintain hydrologic functions, provide suitable habitats for fish and wildlife dependent on these unique habitats, and contribute to habitat conditions needed for maintaining other native wildlife species of concern.

Prescriptions—The prescriptions for other aquatic habitats are presented in Tables 5-8 and 5-9.

Table 5-8
Management Prescriptions for Lakes, Ponds, and Wetlands

Greater Than 1 Acre
Establish a 25-foot no-harvest zone, starting from the high-water line or wetland boundary (whichever is greater). Establish an RMA of 100 feet from the high-water line or wetland boundary (whichever is greater). Manage vegetation to achieve and maintain mature forest conditions. The site-specific prescription will classify the wetland.
From 1/4 Acre to 1 Acre
Establish a 25-foot no harvest zone, starting from the high-water line, or wetland boundary (whichever is greater). Establish a RMA of 50 feet from the high-water line or wetland boundary (whichever is greater). Within the RMA, harvest activities will retain at least 50 percent of the existing live tree basal area, or 110 square feet of basal area per acre (whichever is greater). Retained trees will generally be representative of the existing diameter classes and species distribution, with a preference for retaining trees greater than 20 inches DBH. If the waterway is inhabited by fish, or is identified as an important area for temperature-sensitive amphibian species, at least 80 percent shade will be maintained over the aquatic area. The site-specific prescription will classify the wetland.
Less Than 1/4 Acre
Establish an RMA of 50 feet for Type F waters and 25 feet for Type N waters. These areas will be measured from the high-water line or wetland boundary (whichever is greater). For Type F waters, harvest within the RMA will retain at least 50 percent of the existing live tree basal area or 110 square feet of basal area per acre (whichever is greater). Retained trees will generally be representative of the existing diameter classes and species distribution, with a preference for retaining trees greater than 20 inches DBH. For Type N waters, hardwood trees and brush will be retained to protect the hydrologic functions and wildlife habitat values of the site. If the waterway is inhabited by fish, or is identified as an important area for temperature-sensitive amphibian species, at least 80 percent shade will be maintained over the aquatic area.
Stream-Associated Wetlands
Stream-associated wetlands are considered to be components of the aquatic habitat of streams, and will be managed according to the objectives and prescriptions specified for the associated stream.

Table 5-9
Management Prescriptions for Bogs, Seeps, and Springs

Bogs
Establish a 25-foot no-harvest zone, starting from the high-water line or wetland boundary (whichever is greater). Establish an RMA of 100 feet from the high-water line or wetland boundary (whichever is greater). Manage vegetation within the RMA to achieve and maintain mature forest conditions.
Seeps and Springs
Where possible, these aquatic areas should be incorporated into the RMAs of adjacent streams, and vegetation retention should be provided according to the stream prescription. In practice, this may simply require adjusting the boundary of a stream's RMA to fully encompass the spring or seep. Other management considerations for some of these areas are described in Section 5.6.2.8, "Perennial Type N Stream Special Emphasis Areas."

5.6.7. Employ Slope Stability Management

Conservation Measure 5.15
Employ Slope Stability Management

- Use watershed analysis (initially completed in October 2003) and other information to enhance the current understanding of the processes that influence slope stability in the Elliott State Forest.
- Evaluate alternatives and design operations that can minimize, mitigate for, or avoid risk in high and moderate landslide hazard locations during district implementation and project planning.

Landslides and other geologic processes can have significant effects on watersheds, including aquatic and riparian areas. The objective in relation to landslides and slope stability management is to minimize the occurrence of management-induced slope failures and mitigate potential negative impacts on aquatic and riparian habitats. This will be accomplished through application of risk-based management principles and best management practices. Minimizing road-related landslides and chronic erosion (sedimentation to streams) is fundamental to this objective. Hazard assessment and risk-based management for in-unit slides, and ensuring that large wood is available in the track of potential debris slides and torrents, will promote properly functioning conditions for future aquatic habitat inputs.

A focus of the strategies is on high landslide hazard locations. High landslide hazard locations are specific sites that are subject to initiation of shallow, rapidly moving landslides. A process for screening and identifying high landslide hazard locations is described in detail in Technical Notes 2 and 6 (Oregon Department of Forestry 2003a and b). The initial screen determines if there may be high landslide hazard locations within the operation area. The

initial screen is based on slope steepness and should use USGS 1:24,000 topographic maps, a ten-meter digital elevation model (DEM) based on these maps, or more accurate slope steepness information. Because USGS maps tend to underestimate actual slope steepness, map- or ten-meter DEM-determined slopes steeper than 65 percent for most of western Oregon, and 60 percent in the Tyee Core Area (described later in this Technical Note) are considered likely to have high landslide hazard locations in the field. For operations that meet the initial screen, further investigation is needed to identify High Landslide Hazard Locations.

Upon further investigation, the specific criteria for determination of high landslide hazard locations are described in Technical Note 2 (Oregon Department of Forestry 2003a) as:

(a) The presence, as measured on site, of any slope in western Oregon (excluding competent rock outcrops) steeper than 80 percent, except in the Tyee Core Area, where it is any slope steeper than 75 percent; or

(b) The presence, as measured on site, of any headwall or draw in western Oregon steeper than 70 percent, except in the Tyee Core Area, where it is any headwall or draw steeper than 65 percent.

(c) Notwithstanding the slopes specified in (a) or (b) above, field identification of atypical conditions by a geotechnical specialist may be used to develop site specific slope steepness thresholds for any part of the state where the hazard is equivalent to (a) or (b) above.

Enhance current understanding of the processes that influence slope stability in the Elliott State Forest.

Factors that influence slope stability on the Elliott State Forest include but are not limited to slope steepness, root strength, road construction, stand age, and rainfall intensity. Tools used to assess slope stability when available include, but are not limited to, soil type mapping, slope mapping, geologic history, review of historic slope failures and relevant case studies. In addition, ODF is developing a slope and channel stability modeling tool that, when validated, can be used to further evaluate processes that influence slope stability in the Elliott State Forest. The geotechnical specialist may choose to use other means and methods of evaluating risk.

Information obtained from the watershed analysis (initially completed in October 2003) and other documents will be used to inform management decisions in the Elliott State Forest, including slope stability strategies. Relevant information will be incorporated into Implementation Plans and AOPs.

Evaluate alternatives and design operations that minimize, mitigate for, or avoid risk in high and moderate landslide hazard locations.

During district implementation planning and annual operations planning, alternatives will be evaluated that can minimize, mitigate for, or avoid risk in high and moderate hazard areas. During project planning and design, operations will be designed to minimize, mitigate for, or avoid identified risks.

Geotechnical specialist input will be used as appropriate when alternatives are being considered for proposed operations. The district will coordinate geotechnical specialist review, and will be responsible for subsequent evaluation of alternatives and selection of the course of action.

Timber harvesting and road construction operations will be assessed for hazard and risk by a geotechnical specialist when appropriate. Road alternatives will receive site-specific geotechnical evaluation when the forest engineer must compare risk of road location, design, or construction alternatives.

Steep, unique, or visual (SUV) areas have been established around some of the steepest slopes on the Elliott where little or no management is expected. These lands constitute 6,419 acres of the forest. The function of these areas is described in more detail in section 5.3.1.2. SUVs include areas almost exclusively associated with the steep, rocky slopes on either side of major rivers or streams, including portions of the Umpqua River, Mill Creek, and the West Fork Millicoma River. These protected corridors vary in width from 1,000 to 4,000 feet. Slopes affected by public safety considerations fall within this category. Timber harvest may take place if compatible with resource values in these areas; however, little active management is expected other than occasional removal of danger trees.

Annual Operations Plans—A geotechnical specialist will provide initial hazard and risk assessment for timber harvesting and road construction operations in the AOP, early enough in the process to allow for proper consideration of alternatives (boundary changes, leave tree placement, etc.). Risk management may include ensuring that large wood is available in the track of potential debris slides and torrents, to promote proper conditions for future aquatic habitat inputs. The district is responsible for requesting the initial hazard and risk assessment, and any subsequent site specific review, from the geotechnical specialist. For timber harvesting and road construction operations, the following process will be used:

- Operations will be screened for high-hazard level areas (those areas of probable high slope hazards) by district personnel during operations planning field work. The findings will be reviewed by the geotechnical specialist during the AOP for assessment of risk. If the risk presents unique concerns (e.g. an active, deep-seated failure; debris flow likely to deliver to a fish stream; public safety issue) further review in the field by a geo-technical specialist may be warranted.

- Operations will be screened for moderately high-hazard level areas (those areas of probable moderately-high slope hazards) by district personnel during operations planning field work. The findings will be reviewed by the geotechnical specialist during the AOP for assessment of risk. If the risk presents unique concerns (e.g. an active, deep-seated failure; debris flow likely to deliver to a fish stream; public safety issue) further review in the field by a geo-technical specialist may be warranted.

- Operations in low-hazard level areas (those with a low chance of containing sites with a high probability of failure) will not be expected to undergo further geotechnical review. If high or moderate landslide hazard locations are identified at some other point in the planning process, the geotechnical specialist will be consulted and the site will be evaluated in the same manner as high- or moderate-hazard level areas.

The effect of the forest operation on the landslide potential (potential increase in the probability of failure or landslide rate) will be judged based on slope, landform, underlying rock material, type of operation (road building, regeneration harvest, partial cut, thinning, etc), or other geomorphic or management characteristics.

5.6.7.1. Manage Risk

If the risk is low (minimal or no likelihood of delivery to aquatic system), no management modification will be recommended.

If the risk is moderate or high, management modifications may improve the likelihood of beneficial results.

If the risk is moderate (potential to deliver but likelihood is low), further assessment will be made of the condition and significance of the aquatic resource. If the aquatic resource is already significantly degraded, the geotechnical specialist will develop recommendations for mitigating the harvest operation. Otherwise, no modifications to the operation will be made.

If the risk is high (likely to deliver to the aquatic system), the geotechnical specialist will develop recommendations for avoiding, mitigating, or minimizing the risk. This will include an evaluation of the potential debris chute or run-out channel, consistent with the criteria provided for identification of debris flow track reaches in the RMA strategies.

5.6.8. Use Forest Road Management

Conservation Measure 5.16
Manage Forest Roads

- Design, construct, improve, and maintain forest roads in accordance with the processes and standards described in the Forest Roads Manual.
- Identify and prioritize roads for closure and/or vacation using information gained from the comprehensive forest roads inventory, and in accordance with the standards described in the Forest Roads Manual.

The construction and use of forest roads is an integral part of actively managing state forest lands. Roads provide essential access for forest management activities, fire protection, and a variety of recreational uses. However, roads can be a major source of erosion and sedimentation. Proper road system planning, design, construction, and maintenance will prevent or minimize water quality problems and associated impacts on aquatic resources, and will significantly extend the useful life of a forest road. Quality information on the status and condition of existing roads is also essential to an effective maintenance or improvement program designed to meet the objectives stated above.

For the ODF transportation system, the vision is a road network that will provide effective access for all necessary activities taking place in the forest. The transportation system will be actively managed to protect all forest resources. The road network will be kept to the minimum needed to achieve forest management objectives. Barriers to fish passage created

by road crossings will be corrected. Roads will be constructed in the best locations for carrying out anticipated activities, and the standard for forest roads will be a suitable match for the terrain and type of access needed. The roads will be effectively maintained to prevent degradation to other forest resources. Unnecessary roads will be closed or vacated and, where appropriate, the land they occupied will be returned to active forest management. Adaptive resource management processes will be used to modify future practices as managers gain additional knowledge of resource needs and protection, and to learn more appropriate methods for meeting the objectives of this HCP.

The four primary areas of road system management, addressed in detail in the ODF's *Forest Roads Manual* (Oregon Department of Forestry 2000), are listed below.

- Transportation planning
- Road design, construction, and improvement (including drainage systems)
- Road maintenance
- Road closure

5.6.8.1. Design, Construct, Improve, and Maintain Forest Roads

The *Forest Roads Manual* (Oregon Department of Forestry 2000) contains specific processes, procedures, and standards for road system management. It also describes the roles and responsibilities of the various resource specialists and land managers involved in road system management.

The road system will be managed to prevent water quality problems and associated impacts on aquatic and riparian resources; minimize disruption of natural drainage patterns; provide for adequate fish passage where roads cross fish-bearing streams; and minimize acceleration of natural mass-wasting processes.

Through development and updating of the district Implementation Plan (Oregon Department of Forestry 2007), the processes and standards for transportation planning described in the Forest Roads Manual will be applied. The initial district Implementation Plan will not contain all of the transportation planning elements described in the *Forest Roads Manual* (Oregon Department of Forestry 2000), but will include information obtained from the watershed analysis.

The district has conducted a comprehensive road hazard inventory to a common standard specified through Oregon Plan for Salmon and Watersheds (Oregon Watershed Enhancement Board 1999) protocols. The information from this inventory is being used to identify priority restoration and improvement projects related to the forest roads system. The October 2003 watershed analysis for the Elliott State Forest (Biosystems et al 2003), as described in Section 5.6 of this document, "Apply Aquatic and Riparian Strategies," identified additional information needs relevant to ongoing improvement of the Elliott State Forest road network. These will be addressed through the implementation planning process.

5.6.9. Aquatic and Riparian Monitoring

There is a general need to understand implementation of the aquatic and riparian strategies, including the amount of riparian areas with management in the inner zone. In addition, one of the key aquatic and riparian assumptions that should be tested is that tree retention standards along small perennial non-fish-bearing stream reaches are sufficient to meet management goals related to properly functioning conditions. The following monitoring projects will be conducted to address these needs.

Implementation Monitoring

Comprehensive monitoring will be conducted on a subset of harvest units to determine implementation of riparian and aquatic strategies. The proportion of harvest plans to manage riparian inner zones will be quantified, or alternative vegetation treatments will be applied.

Shade, Riparian Characteristics, and Water Quality on Small Perennial Type N Streams

On a subset of harvest units with small perennial Type N streams, riparian and buffer characteristics, shade, and water quality parameters (e.g., stream temperature, macroinvertebrates, or sediment) will be monitored before and after harvesting. This project will be coordinated with amphibian-related monitoring as described in Chapter 9.

Key Terms

Basal area—The area of the cross-section of a tree stem near the base, generally at breast height (4.5 feet above ground) and including the bark. The basal area per acre is the total basal area of all trees on that acre.

Co-dominant—Trees with crowns that form a general level of crown stratum and are not physically restricted from above, but are more or less crowded by other trees from the sides.

Cohort—A group of trees regenerating after a single disturbance. The age range within a cohort may be as narrow as one year or as wide as several decades, depending on how long trees continue invading after a disturbance.

Connectivity—A measure of how well different areas (patches) of a landscape are connected by linkages, such as habitat patches or corridors. At a landscape level, the connectivity of ecosystem functions and processes is of equal importance to the connectivity of habitats.

Danger tree—A standing tree, alive or dead, that presents a hazard to personnel due to deterioration or physical damage to the root system, trunk (stem), or limbs, and the degree and direction of lean.

Diameter breast height—Diameter of a tree at breast height (4.5 feet above the forest floor on the uphill side of the tree).

Decadence—Process of decay, or condition of being in a decayed state, particularly as related to trees or stands of trees. Typified by the presence of pathogens causing various forms of rot, and often used to refer to the presence of snags and downed wood. A process influential in multiple aspects of ecosystem development from providing cavities for wildlife, to creating gaps in the canopy, to altering forest floor climate and structure.

Disturbance—A force that causes significant change in an ecosystem's structure and/or composition. Disturbance can be caused by natural events such as fire, flood, wind, earthquake, and insect or disease outbreak, or by human activities.

Dominant—Trees with crowns that extend above the general level of crown cover of other trees of the same stratum and are not physically restricted from above, although possibly somewhat crowded by other trees on the sides.

Downed wood—Fallen trees or pieces of trees on the forest floor or in the stream channel that provide many important functions such as mineral cycling, nutrient mobilization, maintenance of site productivity, natural forest regeneration (nurse logs), substrates for mycorrhizal formation, and diverse habitats for fish and wildlife species.

Interior habitat—The portion of the older forest patch that remains effective when the negative effects of high-contrast edge are removed.

Late successional habitat—A forest stand typically characterized by a multi-layered, multi-species canopy dominated by large overstory trees; numerous large snags; and abundant large woody debris (such as fallen trees) on the ground. Other characteristics such as canopy closure may vary by the forest zone (lodgepole, ponderosa, mixed conifer, etc.).

Key Terms (continued)

Legacy structures—Structural components within a forest stand that are retained during harvest operations, and that provide habitat diversity in the future stand. Examples of legacy structure include live trees, snags, and downed wood.

Minor tree species—For a given stand, tree species that occur as a relatively small component of the stand, such as western red cedar or alder in a stand consisting mostly of Douglas-fir trees.

Non-silviculturally capable—Areas that are rocky, swampy, covered by water, or for various other reasons have little to no commercial value for timber production. The Elliott State Forest has a few parcels of rocky or swampy lands scattered throughout the forest. Most are less than 5 acres, although a few are as large as 20 acres.

Old growth—A forest stand typically characterized by a patchy, multi-layered, multi-species canopy dominated by large overstory trees, some with broken tops and decaying wood; numerous large snags; and abundant large woody debris (such as fallen trees) on the ground. In western Oregon, old-growth characteristics begin to appear in unmanaged forests at 175 to 250 years of age. (See "late successional habitat.")

Patch—The landscape patch is an environmental unit between which "quality" differs, such as a habitat patch.

Regeneration harvest—The removal of trees to make regeneration possible or to assist in the development of the established regeneration (young trees). The most common type of regeneration harvest in the Elliott State Forest is a modified clearcut, leaving specified amounts of live trees, snags, and downed wood.

Residual live trees—Live trees that are retained to provide short-term habitat needs of wildlife species, to serve as a source of future snags and downed wood, and to provide legacy trees in future stands. This term also refers to live trees present in a stand that are legacies of a previous cohort of trees.

Salvage—Salvage cutting is the utilization of standing or downed trees that are dead, dying, or deteriorating, for whatever reason, before the timber values are lost.

Snag—The standing portion of a dead tree

Stand—A patch of forest distinct in composition or structure, or both, from adjacent areas.

Suppressed—Trees with crowns entirely below the general level of dominant and co-dominant trees and physically restricted from immediately above.

Telemetry—The process of remotely monitoring an animal and its movements by radio transmissions from a device attached to the animal.

Windthrow—Trees felled by high winds.

Chapter 6
Northern Spotted Owls

This chapter describes benefits and effects, additional minimization and mitigation measures, and monitoring and adaptive management methods specific to the northern spotted owl.

Other chapters in this Habitat Conservation Plan (HCP) present information essential to understanding this chapter. Chapter 5 details the underlying landscape management context in which northern spotted owl conservation strategies will be implemented, Chapter 4 provides biological information for northern spotted owls on Elliott State Forest lands, and Chapter 11 presents a framework for adaptive management. It is necessary to read all chapters to understand completely the Oregon Department of Forestry's (ODF's) habitat conservation strategies.

6.1. BACKGROUND

6.1.1. Northern Spotted Owl Recovery Plan

The *Recovery Plan for the Northern Spotted Owl* (the NSO Recovery Plan) was finalized in May 2008 (U.S. Fish and Wildlife Service 2008). This Plan describes long-term and interim objectives (for the next ten years) for northern spotted owl recovery and outlines the strategies designed to address the most important range-wide threats to the northern spotted owl. The Recovery strategy has three essential elements: barred owl control, dry-forest landscape management strategy, and Managed Owl Conservation Areas (MOCAs).

The NSO Recovery Plan relies on Federal lands to provide the major contribution for spotted owl recovery. In addition to more recent information on threats to the northern spotted owl posed by the barred owl, the recovery strategy builds on concepts presented in earlier documents such as the Interagency Scientific Committee (ISC) report "A Conservation Strategy for the Northern Spotted Owls, and the 1992 Final Draft Recovery Plan for the Northern Spotted Owl (USFWS 1992). The 1992 draft Recovery Plan remains the most recent northern spotted owl-specific analysis of habitat needed to provide for a sustainable population of northern spotted owls across the species' range. The 2008 NSO Recovery Plan relies on this analysis and is focused on managing large blocks of suitable habitat in designated conservation areas throughout the range of the northern spotted owl, and spacing the blocks and managing the areas between them to permit movement of northern spotted owls between blocks.

6.1.2. Federal Land Commitments to Northern Spotted Owl Conservation

The Forest Ecosystem Management Assessment Team developed a series of alternatives on how best to provide habitat for late-successional and old-growth forest related species, including the northern spotted owl. These alternatives were also designed to meet other management goals on federal lands administered by the U.S. Fish and Wildlife Service and the Bureau of Land Management within the range of the northern spotted owl. Based on the 1992 Draft NSO Recovery Plan and the ISC report (Thomas et al. 1990), the Forest Ecosystem Management Assessment Team proposed a network of habitat conservation areas throughout the range of the northern spotted owl. The management objective for these conservation areas is the development and maintenance of habitat that will support well-distributed population clusters of northern spotted owls. As a result, a network of late successional reserves is now spread across federal lands in western Washington, western Oregon, and northern California (USDA Forest Service et al. 1993). For late successional reserves, the management emphasis is for "restoration and maintenance of late-successional forest habitat" (USDA Forest Service et al. 1994a). These commitments are currently being implemented by the Federal Northwest Forest Plan adopted in 1994 (USDA Forest Service et al. 1994a), which defines the federal land contribution to northern spotted owl recovery. The 2008 NSO Recovery Plan considered these commitments in development of the strategy for MOCAs and Conservation Support Areas (CSAs).

6.1.3. Northern Spotted Owl Conservation on Non-Federal Lands

Although the NSO Recovery Plan relies on federal lands to provide the major contribution for northern spotted owl recovery, it also recognizes that non-federal forests are important to the northern spotted owl's conservation needs in some key areas of the species range, in part because federal lands are limited in distribution or in habitat condition. In particular, Conservation Support Areas between or adjacent to MOCAs are identified where habitat contributions by private, State, and Federal lands are expected to support the MOCA network and the dry-forest landscape management approach. In addition, all landowners (federal and non-federal) are encouraged to maintain older, multi-layered forests. The Elliott State Forest is not included in any CSA designation.

Overall, the contribution to recovery by non-federal lands will be to enhance the viability of the local or regional northern spotted owl population beyond that which is possible solely through federal land conditions.

6.1.4. Northern Spotted Owls on the Elliott State Forest

Northern spotted owl surveys were conducted in the Elliott State Forest from 1992 to 1998. In 2003, a survey for northern spotted owls in the Elliott State Forest was conducted to compare the population density of northern spotted owls on the forest with previous years. (Appendix F). This survey covered 48 areas where northern spotted owls had been observed in the past (Appendix F; Table F-4). These 48 areas represented 17 sites that were occupied during the last survey in 1998, two new resident sites, one new status unknown site, 11 areas where owl responses were determined to be non-territorial and 17 sites that once were occupied and that had been vacant for three consecutive years and classified as historic at some point in the past. The 2003 density study estimated 25 northern spotted owls present in 13 activity centers for a density of 0.034 activity centers per square kilometer, which is similar to the densities estimated from 1996 through 1998.

Although only 13 activity centers counted towards the density estimates in 2003, according to the management survey protocol, 20 sites were considered to be occupied in 2003: 16 pairs, three resident singles, and one status unknown (see key terms; Appendix F; Table F-3). The seven sites not included in the density estimates include three sites that were outside of the area covered by the original density study (including two sites on adjacent landowners), and four sites where no owls were located in 2003, but that continue to have resident status according to the management protocol because they have not been surveyed for three consecutive years with no response.

Northern spotted owl density in the Elliott State Forest declined from 1993 to 1998, but it appeared to remain relatively stable level through 2003. The declining trends in density and adult survival over the initial five-year period of the density study are cause for concern in the Elliott State Forest. However, because northern spotted owl sites in the Elliott State Forest are not isolated from one another or from adjacent populations, immigration to the area should contribute to population stability.

The home range and habitat use of 16 northern spotted owls were studied in the Elliott State Forest between 1997 and 1998. Home ranges on the Elliott State Forest ranged from 1,425 to 5,555 acres, with the mean home range size of 2,735 acres. The mean core use area was 214 acres (Anthony et al. 2000b).

Northern spotted owl habitat has been described in the literature as follows:

> "…a multilayered, multispecies canopy dominated by large (larger than 30 inches in DBH) conifer overstory trees, and an understory of shade-tolerant conifers or hardwoods; a moderate to high (60 to 80 percent) canopy closure; substantial decadence in the form of large, live coniferous trees with deformities—such as cavities, broken tops, and dwarf mistletoe infections; numerous large snags; ground-cover characterized by large accumulations of logs and other woody debris; and a canopy that is open enough to allow owls to fly within and beneath it." Thomas et al. (1990)

Blakesley (2004) summarized literature published since 1990, and concluded that the results of more recent studies characterizing stand structural attributes associated with northern spotted owl foraging, roosting, and nesting are consistent with Thomas et al. (1990), and include vertical canopy layering, tall tree height or diameter diversity, high canopy volume and canopy closure, large tree diameter, and abundant snags and logs. These stand structural attributes were characteristic of habitat whether it occurred in old-growth forest or in managed stands.

Studies conducted on northern spotted owl habitat characteristics in the Elliott State Forest (see Chapter 4) found that nesting habitat was characterized by large trees, moderate relative densities and basal areas, three snags per acre over 20 inches diameter breast height (DBH), and high amounts of downed wood (see Table 6-1). Foraging habitat had similar characteristics. Nest and foraging areas tended to have a greater abundance of large trees than did areas that received little or no use by northern spotted owls. At a landscape level, northern spotted owls selected mature, old, and "mixed age" coniferous habitats, but also selected hardwood habitats. An analysis of habitat edge types showed that northern spotted owls also selected the edge (or ecotone) between hardwood and conifer stands, and avoided certain edge types that contained pole or open components. Analysis of Stand Level Inventory (SLI) information on stands with northern spotted owl nest sites in the Elliott State Forest resulted in similar structural information (Table 6-1).

Stands with large trees, multiple canopy layers, and sufficient amounts of snags and downed wood are the most likely to provide suitable habitat for northern spotted owls in the Elliott State Forest. Advanced structure with at least eight trees per acre at least 32 inches DBH provides the most likely nesting, roosting, and foraging habitat for northern spotted owls on the Elliott State Forest, while advanced structure without the large tree component is likely to provide adequate foraging habitat for northern spotted owls. Some intermediate structure stands in a more mature stage of development may also provide adequate structure for foraging habitat for northern spotted owls, especially those intermediate structure stands at least 70 years of age.

Table 6-1
Selected Structural Characteristics of Northern Spotted Owl Nesting Sites on the Elliott State Forest as determined through Research and Inventory Plots

Characteristic	Elliott State Forest Research [1] (range) n = 9	Inventoried Stands [2] (range) n = 20
Tree diameter (inches)	24.4 (18–37)	28.4 (20.5–43)
Relative density	0.37 (0.20–0.49)	0.54 (0.24–0.94)
Basal area (square feet per acre)	203.3 (90–322)	227 (99–461)
Number of snags/acre (>20-inch DBH)	3 (1–8)	1.8 (0.3–4.7)
Volume of down wood (cubic feet per acre)	2,559 (599–7396)	1,744 (197–3792)

[1] Tappeiner, et al. 2000. Values are mean values from the "Whole Elliott," and represent values measured in fixed radius plots of 1/10 to 1/4 acre around nest sites.

[2] These values are from the inventory of stand polygons within 0.1 mile (528 feet) of known nest trees. Stand polygons varied from 22 acres to 205 acres in size, and were sampled using the ODF's SLI methodology. Therefore, these values represent a stand level compared to the plot level measured in the Elliott State Forest research studies.

6.2. CONSERVATION OBJECTIVE

The Elliott State Forest is located in a region in which northern spotted owl populations are in decline. Adjacent federal lands are being managed to provide future habitat in late successional reserves. The Millicoma Tree Farm, to the south of the Elliott State Forest, is being managed by Weyerhaeuser Corporation under an HCP to provide dispersal habitat and limited nesting, roosting, and foraging habitat for northern spotted owls.

The conservation objective for the Elliott State Forest relative to northern spotted owls is to support the distribution of northern spotted owls on federal lands by providing habitat sufficient to allow the persistence of northern spotted owls on the Elliott State Forest, and habitat sufficient to accommodate the movement and interaction of northern spotted owls across the regional landscape.

6.3. CONSERVATION STRATEGIES

The habitat conservation strategies described in Chapter 5 provide the basis for conservation of northern spotted owls under this HCP. Specifically, the following habitat conservation strategies contribute to the maintenance and development of northern spotted owl habitat and the maintenance of northern spotted owl sites on the Elliott State Forest:

- **Strategy 5.2: Manage for a Range of Stand Structures Across the Landscape**
- **Strategy 5.3: Establish Conservation Areas to Protect Special Resources**
- **Strategy 5.4: Develop Implementation Plans to Achieve a Landscape Design that Provides Functional Habitat for Native Species**

Under the forest management strategies, forestwide and basin-specific targets for advanced structure stands have been established. Threatened and endangered core (T&E core) areas surrounding occupied northern spotted owl sites have also been established. In combination with a logical landscape design, these strategies will contribute to the conservation of northern spotted owls and their habitat in the Elliott State Forest. These conservation strategies will:

- Maintain known northern spotted owl sites
- Maintain nesting, roosting, and foraging habitat across the forest through time
- Maintain habitat connectivity

6.4. KEY INDICATORS

Key indicators for the success of the habitat conservation strategies for northern spotted owls include:

- Persistence of northern spotted owl sites on the Elliott State Forest over time
- Contribution of habitat (nesting, roosting, and foraging) throughout the forest that allows northern spotted owl sites to persist
- Functional arrangement of habitat on the landscape that accommodates movement and interaction of northern spotted owls across the regional landscape

The following sections describe each indicator and the potential effects of activities covered under this HCP on the indicator, followed by the minimization and mitigation provided by the conservation strategies.

6.4.1. Persistence of Northern Spotted Owl Sites

6.4.1.1. Summary of Potential Effects

During the most recent survey of northern spotted owls on the Elliott State Forest in 2003, 13 active northern spotted owl activity centers were identified (Appendix F, p. F-7). An additional seven sites also have resident status that are either not located on state forest land, or were not located in 2003, but retained resident status from previous surveys. Harvest activities have the potential to affect these sites and sites discovered in the future through:

1. Removal or modification of habitat in proximity to nest sites, resulting in temporary or permanent displacement of northern spotted owls from nesting sites or shifts in habitat use
2. Disturbance to nesting northern spotted owls from the use of harvest-related equipment
3. Reduction of habitat within a home range below what is needed to meet the life history needs of individual sites

6.4.1.2. Summary of Minimization and Mitigation

Maintaining northern spotted owl sites involves both protecting their nesting sites and providing sufficient habitat for foraging and other activities within their home ranges.

T&E Core Areas

Conservation areas have been established, which included T&E core areas (Conservation Measure 5.5). The T&E core areas contain the nest area or activity centers for all 13 northern spotted owl sites that were active in 2003 and counted toward the density estimate. In addition, two additional T&E cores that protect sites did not meet the protocol for resident status in 2003, but northern spotted owls had been located there and had nested there in

previous years. Details on each of these activity centers and core areas are provided in Table 6-2.

Table 6-2
Northern Spotted Owl Activity Centers and T&E Core Areas

Northern Spotted Owl Activity Center	Core Area	Acres	Status	Basin	Comments
Alder Creek	Big Alder	477	Pair	5	
Benson Creek	Barn Gulch	146	Pair	6	
Dean Creek	Dean Creek	263	Pair	3	
Fourmile Creek	Fourmile Creek	174	Pair	10	
Johnson Creek	Lower Johnson	214	Pair	7	
Lockhart Road	None (within ¼ mile of Marlow Lockhart)	na	Pair	10	On private land
Lower Mill	Lower Mill	2,029	Pair	1, 2	
Marlow Creek	Lockhart Ridge	196	Pair	10	
Murphy Creek*	None	na	Pair	5	No response in 1997, 1998, 2003
Noble Creek*	None	na	Resident single	5	No response 1998, 2003
Palouse Creek*	Palouse Creek	249	Pair	8	
Panther Creek	Fish Knife	831	Resident single	11	
Roberts Creek	Lower Roberts	781	Pair	6	
Salander Creek	Salander Creek	523	Pair	13	
Sock Creek	None (within 0.15 mile of SUV and 0.5 mile of Loon Lake East)	na	Resident single	13	On BLM
Tom Fool	Loon Lake East	60	Pair	1	
Upper Mill Creek *	Camp Creek	120	Pair	1	
Upper Sock Creek*	None	na	Status unknown	13	
West Glenn	Elk Pass	304	Pair	10 11	
Wind Creek	Wind Ridge	300	Pair	4	
Total Acres		**6,667**			

*Site not meeting resident status in 2003.

The T&E core areas were designated based on specific information about the northern spotted owls on the Elliott State Forest. The median size of these T&E cores is 250 to 300 acres, and is based on the average size of the core use areas that were measured in 1997 and 1998 (approximately 214 acres). The boundaries of these T&E cores were based on telemetry information from northern spotted owls on the Elliott State Forest gathered between 1997 and 1998, where available. In particular, areas where northern spotted owls showed more concentrated use was used as a basis for these T&E core areas. Where telemetry information was not available, the location of individual core areas was based on survey and habitat information as well as on consistency with the average size of measured core use areas. Some T&E core areas do incorporate small areas of non-habitat because boundaries were drawn to maximize interior habitat by minimizing convoluted edges and discontinuous stands.

Because T&E core areas are based on known telemetry and survey information, and the selection of best available habitat adjacent to nest sites, these areas have a high likelihood of providing sufficient protection for nesting sites. In addition, other conservation areas that are at least 150 to 200 acres in size have the potential to provide new nest areas for additional northern spotted owls over time.

Management activities, if they occur at all, will be very infrequent and low intensity within T&E cores. Therefore, the habitat within these T&E cores is expected to be maintained in a suitable condition for northern spotted owls throughout the term of the Incidental Take Permit (ITP).

Two sites that have resident status and are located on the Elliott State Forest are not included in T&E core areas: Murphy Creek and Noble Creek. Although these sites have resident status according to the management protocol, they do not appear to be currently occupied. No owls were located in these areas during six surveys in 2003. No owls were located at either site during three surveys in 1998. Murphy Creek also was vacant in 1997, and in 1998, the Murphy Creek female was found at the Palouse Creek site. In addition, no T&E core areas were established specifically for the Sock Creek (BLM) or Lockhart Road (private) sites because the activity centers are not located on the Elliott State Forest. However, both of these sites are within 0.25 miles of designated conservation areas, either SUV or T&E core. Finally, no T&E core was established for the Upper Sock Creek site where status was not determined.

Seasonal Restrictions

Northern spotted owl sites discovered in the future outside of conservation areas will not be specifically designated as new T&E core areas. However, seasonal restrictions to minimize disturbance will be applied to all active northern spotted owl nest trees on ODF lands or on adjacent ownership during the term of the ITP, according to the following conservation measure. Appropriate disturbance standards will be applied in proximity to known nest sites when management activities are planned. As a result, the potential for disturbance to nest sites during the nesting season will be minimized.

Northern Spotted Owl Conservation Measure 6.1:
Apply Seasonal Restrictions to Known Active Nest Trees Outside of T&E Core Areas

Outside of T&E core areas, seasonal restrictions to minimize disturbance will be applied to known active owl nest trees during the term of the ITP. When management activities are planned, the following disturbance standards will be applied, unless there is a fire emergency in the ITP area (USDI Fish and Wildlife Service 2004b):

- Harvest of advanced structure within ¼ mile of known active nest trees will not be allowed from March 1 to July 7.
- Harvest in a 70-acre core surrounding an active nest tree will not be allowed from March 1 to September 30, unless there is contiguous advanced structure to the core area that is not part of the harvest operation.
- Known nest trees will be retained as part of the live tree retention in harvest units, unless prohibited by safety concerns or operational constraints.
- From March 1 to July 7, the use of explosives will be prohibited as follows: those associated with rock quarries in or within 1.0 mile of an active tree nest, and those associated with road construction in or within 0.25 mile of an active nest tree.
- Aircraft conducting work for the ODF (including Type I helicopters) will be prohibited from flying within 500 feet of an active nest tree from March 1 through July 7.
- The operation of chainsaws will not be allowed within 200 feet of an active nest tree from March 1 through July 7, except as described below.
- The operation of heavy equipment will not be allowed within 100 feet of an active nest tree from March 1 through July 7, except as described below.
- Burning will not be allowed within ¼ mile of an active nest tree from March 1 through September 30.

The following activities are not considered disturbance:

- Ground application of chemicals and fertilizer, trapping, forage seeding, manual brush cutting without chainsaws, planting, surveying, pruning, roadside seeding, harvest of minor forest products, and snag creation by girdling or chemical injection
- The operation of chainsaws between July 7 and March 1, or farther than 200 feet from an active nest tree

Habitat Outside of T&E Cores

Additional protection for northern spotted owls inhabiting these T&E core areas will be provided through maintenance and development of habitat outside of T&E core areas that is needed to meet the basin targets for advanced structure (Conservation Measure 5.4; Table 5-1). Because all conservation areas are counted as advanced structure, Basins 1, 2, and 9 meet the basin targets for advanced structure within the conservation areas (Table 6-3). No additional advanced structure is required to be maintained or developed outside of conservation areas in these basins. For the remaining basins that do not meet the basin targets for advanced structure within the conservation areas, additional advanced structure will be maintained and developed on the landscape outside of conservation areas.

Basins with at least 40 percent advanced structure are likely to provide sufficient amounts of advanced structure habitat for connectivity of habitat for northern spotted owls on the landscape, particularly if they are in a functional arrangement (minimizing fragmentation).

The guidelines for landscape design encourage a functional arrangement of habitats within a basin (5.4.2). Only basins 9 and 10 have advanced structure targets less than 40 percent. There is a higher risk of insufficient habitat to sustain northern spotted owls in these basins over the long term. Basins 2 and 12 have advanced structure targets of 40 percent. Because a portion of this target will be met by riparian areas, which will provide functional habitat only if located adjacent to other habitat, there is also a risk of insufficient habitat in these basins to support resident northern spotted owls. However, these basins are likely to provide for dispersal of northern spotted owls through the landscape. There were no resident northern spotted owls in basins 2, 9, or 12 as of 2003.

The remaining basins—1, 3, 5, 8, 11, and 13 (50 percent target) and 4, 6, and 7 (60 percent target)—currently have or will achieve 40 percent advanced structure or more, not including the riparian areas, and are likely to provide sufficient amounts of habitat for support of resident northern spotted owls. These basins all had resident northern spotted owls as of 2003.

The requirement for 500 acres of advanced structure incorporating a T&E core area in each basin (Conservation Measure 5.6) will ensure that habitat will be provided in proximity to T&E core areas, and that nest sites are not isolated but connected to other advanced structure habitats.

Table 6–3
Advanced Structure in T&E Core and SUV Areas and Outside Conservation Areas

Basin Name	Basin Acres	Acres in T&E Core and SUV	% Basin in T&E Cores and SUV	% Basin in Riparian Outside T&E Cores and SUV	Basin Target for Advanced Structure
1 - Mill Creek	5,354	2,452	46%	4%	50%
2 - Charlotte-Luder	6,422	2,187	34%	5%	40%
3 - Dean Johanneson	7,296	612	8%	6%	50%
4 - Scholfield Creek	4,990	351	7%	8%	60%
5 - Big Creek	7,823	558	7%	9%	50%
6 - Benson-Roberts	7,417	1,171	16%	7%	60%
7 - Johnson Creek	6,322	271	4%	8%	60%
8 - Palouse Larson	6,541	1,082	17%	7%	50%
9 - Henrys Bend	8,284	1,787	22%	7%	30%
10 - Marlow-Glenn	6,512	1,152	18%	8%	30%
11 - Millicoma Elk	10,873	1,395	13%	9%	50%
12 - Trout Deer	11,314	1,840	16%	9%	40%
13 - Ash Valley	4,132	968	24%	6%	50%

6.4.2. Contribution of Nesting, Roosting, and Foraging Habitat Across the Forest Through Time

Foraging habitat for northern spotted owls is assumed to be equivalent to advanced structure under this HCP. Under this assumption, at the initiation of this HCP, approximately 43 percent of the Elliott State Forest consisted of foraging habitat for northern spotted owls (Table 6-4). Nesting and roosting habitat for northern spotted owls in this HCP is assumed to be equivalent to advanced structure that has at least 8 trees per acre greater than 32 inches DBH. Under this assumption, at the initiation of this HCP, approximately 28 percent of the Elliott State Forest consisted of nesting and roosting habitat for northern spotted owls (see Table 6-4). In addition to advanced structure, some intermediate structure stands in later stages of structure development will provide suitable habitat for foraging and roosting.

Table 6-4
Northern Spotted Owl Habitat on the ESF at Initiation of HCP – Acres Within Conservation Areas, by Type, and Outside of Conservation Areas

Habitat Type	Total Habitat in Plan Area at Start of Plan	Habitat within Conservation Areas				Outside Conservation Areas
		Total	T&E Core	SUV	Riparian	
Nesting, roosting, foraging habitat (advanced structure with eight trees per acre at least 32" DBH)	25,698	8,622	5,857	976	1,789	17,076
Foraging habitat (all advanced structure)	41,716	13,159	8,410	2,070	2,679	28,557
Intermediate structure	44,090	8,723	3,219	1,851	3,653	35,367
Early structure & Non forest	7,476	716	180	96	440	6,760

6.4.2.1. Summary of Potential Effects

Harvest activity has the potential to effect nesting, roosting, and foraging habitat through:

1. Removal of advanced structure. An estimated 20,000 acres of advanced structure will be harvested over the 50-year term of this plan (Table 6-5). Included in this number is approximately 12,500 acres of advanced structure with at least eight 32-inch DBH trees per acre (62 percent).
2. Development of advanced structure. It is projected that approximately 13,000 acres of advanced structure ingrowth will have been retained on the landscape by the end of the permit term. Approximately 5,400 of these acres are projected to have at least eight trees per acre greater than or equal to 32 inches DBH (41 percent).
3. Reduction in amount of advanced structure through removal and modification within a home range below what is needed to meet the life history needs of individual sites.

See Table 6-5 for a summary of effects to advanced structure.

Table 6-5
Projected Effects of the Plan on Acres of Advanced Structure According to Harvest Model

Structure Type	Total Time 0[1]	Inside Conservation Areas			Outside Conservation Areas					Total Time 50[6]
		Time 0	Ingrowth[2]	Time 50[3]	Time 0	Harvest[4]	Ingrowth	Maintenance[5]	Time 50	
Advanced structure (foraging habitat)	41,716	13,159	7,767	20,926	28,557	20,081	13,136	11,518	21,612	42,538
Advanced structure with large trees (nesting, roosting, foraging habitat)	25,698	8,622	5,919	14,541	17,076	12,488	5,432	7,534	10,020	24,561

[1] Time "0" acres are from District GIS. Ingrowth, Harvest, and Maintenance acres are from harvest model.

[2] Ingrowth = acres developed into advanced structure during the 50-year period.

[3] Time 50 acres are sum of Time 0 acres plus ingrowth, and subtracting any harvest. This number may differ from the harvest model estimate since it uses District GIS information.

[4] Harvest = total acres of advanced structure regeneration harvested for 50 years

[5] Maintenance = total acres of advanced structure maintained as advanced structure throughout the 50-year period (subject to partial cutting only).

[6] Total Time 50 = total acres of advanced structure present on the forest at year 50. This number may differ from the harvest model estimate since it uses District GIS information.

6.4.2.2. Summary of Minimization and Mitigation

Suitable habitat for northern spotted owls will be provided on the Elliott State Forest through conservation areas, and through the maintenance and development of advanced structure outside of conservation areas to meet basin targets for advanced structure.

Conservation Areas

T&E core areas (approximately 11,800 acres) and SUVs (an additional 4,500 acres outside of T&E cores) have been established within all management basins where little or no active management will occur (Conservation Measure 5.5). These areas provide stands of advanced structure in configurations functional for use by northern spotted owls. T&E core areas comprising over 6,800 acres of conservation areas currently include nesting areas for northern spotted owls. The remaining T&E cores that do not currently contain the activity center for a northern spotted owl are, however, composed primarily of advanced structure stands; nine of these are at least 200 acres in size. Thus, several additional T&E core areas currently provide habitat for northern spotted owls and have the potential to provide core nesting areas for northern spotted owls in the future (see Table 5-2). The majority of area in SUV outside of T&E cores occurs in larger contiguous patches with the potential to provide core nesting areas for northern spotted owls.

Maintenance and Development of Advanced Structure

At the initiation of this HCP, approximately 66 percent of the area within T&E Cores and SUVs was classified as advanced structure, with an estimated 65 percent of this advanced structure having at least eight trees per acre greater than or equal to 32 inches DBH. No advanced structure will be harvested within the conservation areas. In addition, over the permit term, intermediate structure will eventually develop into advanced structure. By the end of the permit term, model projections indicate that 91 percent of the area within T&E cores and SUVs will consist of advanced structure habitats, and that 78 percent of this total will have eight trees per acre at least 32 inches DBH.

Additional nesting, roosting, and foraging habitat will be provided through the maintenance and development of advanced structure outside conservation areas. A range of 40 to 60 percent advanced structure will be maintained across the Elliott State Forest (including conservation areas) through time. Fifty percent of the advanced structure across the forest will have at least eight trees per acre greater than or equal to 32 inches DBH (Conservation Measure 5.2). Basin targets for advanced structure (Conservation Measure 5.4; see Table 5-1) are in place to ensure that the advanced structure is distributed across the forest and is focused in areas where northern spotted owls are resident.

Outside of the conservation areas, development and maintenance of advanced structure will be achieved through stand management activities to increase stand diversity (thinning and partial cuts). According to model projections, an estimated 11,500 acres of current advanced structure will be maintained outside conservation areas over the term of the permit, through these types of management activities and approximately 7,500 acres of this advanced structure will have larger trees. In addition, model projections estimate that approximately 13,000 acres of advanced structure ingrowth would be retained on the forest outside of

conservation areas at the end of the permit term, with approximately 5,400 of these acres having the eight larger trees per acre (see Table 6-5).

Two key assumptions of this HCP are that advanced stand structure[1] provides foraging habitat for northern spotted owls, and that advanced structure with eight trees per acres at least 32 inches DBH provides nesting and roosting habitat for northern spotted owls. These assumptions are based on information from the literature and from research in the Elliott State Forest. To test these assumptions about northern spotted owl habitat, monitoring projects will be established in a sub-sample of stands to determine and track development of stand structure and northern spotted owl habitat suitability (see Section 6.5 and Chapter 11).

6.4.3. Maintaining Habitat Connectivity Through Application of Landscape Design Principles

6.4.3.1. Summary of Potential Effects

Harvest activity has the potential to affect habitat connectivity through:

1. Reduction in amount of advanced structure through removal and modification within a home range below what is needed to meet the life history needs of individual sites
2. Change in arrangement of advanced structure on the landscape that affects the connectivity of suitable habitat

Because spatial locations of advanced structure outside core areas are not spatially explicit, the possibility exists that habitat will not be in a functional arrangement.

6.4.3.2. Summary of Minimization and Mitigation

This HCP includes both forestwide and basin-specific targets for advanced structure stands, establishment of conservation areas, and a logical landscape design developed during implementation planning. Combined, these strategies will provide for landscape connectivity for northern spotted owls across the Elliott State Forest. In management basins with relatively high levels of advanced structure (at least 40 percent), connectivity is likely to be provided for many species by the high amount of this habitat type. However, in basins where advanced structure targets are relatively low, the arrangement of advanced structure patches becomes more important.

There are several approaches to achieving connectivity of habitat on a landscape, including reserves, corridors, riparian habitats, stepping stones, stand structural complexity, and landscape level habitat goals. Approaches used in this HCP are described briefly below.

[1] Advanced structure is defined as having 20 or more trees per acre of 18 inches or larger DBH and 100 feet or more in height, of which at least 10 overstory trees per acre are at least 24 inches DBH (the quadratic mean diameter is 15 inches or more based on trees of at least 4 inches DBH); understory trees average 30 feet in height; the basal area of these stands will be at least 150 square feet per acre, and no more than 325 square feet per acre.

Conservation Areas

An analysis of the late successional reserves in the Northwest Forest Plan concluded that the reserves on their own do not maintain late seral connectivity for all species, particularly in the Coast Range, or for species with large home ranges (Richards et al. 2002). Midspatial-scale reserves managed primarily for conservation goals (Lindenmayer and Franklin 2002) can provide connectivity between larger scale reserves on the landscape (e.g., late successional reserves on federal lands).

T&E core areas and SUVs function as midspatial-scale reserves by providing patches of primarily advanced structure habitats, which will be maintained throughout the term of the ITP with minimal if any management. T&E core areas provide core habitat to support occupied northern spotted owl sites. Combined with SUVs, they facilitate connectivity between late successional reserves on federal lands (Conservation Measure 5.5).

By developing and maintaining at least one patch of at least 500 acres of advanced structure in each basin (Conservation Measure 5.6), larger patches of interior habitat will be provided to support occupancy by northern spotted owls. In addition, better connectivity between T&E core areas will be ensured by minimizing the distance between patches of advanced structure in a basin. By limiting the amount of early structure that is adjacent to T&E cores, and providing some advanced structure around T&E cores, interior habitat values for northern spotted owls will be enhanced (Conservation Measure 5.6).

Finally, the Riparian Management Areas described in the aquatic and riparian strategies provide connectivity on the landscape. Riparian inner zones are linear reserves along aquatic habitat features that provide connectivity throughout the stream network of a watershed. Riparian reserves may provide connectivity for northern spotted owls and other upland species when they are adjacent to stands with habitat values for northern spotted owls, including advanced structure and some intermediate structure stands.

Maintenance and Development of Advanced Structure

In addition to midspatial-scale reserves, stepping stones patches of late seral habitat can be provided through the management of patches of suitable habitat on a landscape over time that are not necessarily in reserves (Richards et al. 2002). These stepping stones may be the best way of providing connectivity for mobile species that can readily move across the matrix between roosting and foraging locations (Lindenmayer and Franklin 2002). Maintenance and development of advanced stand structure outside the conservation areas provides stepping stones of habitat on the landscape.

Stands that are managed to develop into advanced structure will be managed to include at least six snags per acre and abundant downed logs. When the "matrix" between reserves is managed such that appropriate vegetation cover or key structures for species are provided for across the landscape, the intervening landscape acts as a movement filter rather than a movement barrier (Lindenmayer and Franklin 2002). Rosenburg and Raphael noted that even small forest patches retaining down logs or large snags appeared to support forest-interior species associated with those elements (Rosenburg and Raphael 1986). Stands with these characteristics will support connectivity for northern spotted owl habitats.

Basin Targets for Advanced Structure

Landscape-level goals for structures and habitat conditions are another approach to achieving landscape connectivity. Examples include minimum area-based objectives for northern spotted owl dispersal and nesting, roosting, and foraging habitat, and maximum limits in the amount of recently cutover areas (Lindenmayer and Franklin 2002).

In this HCP, 40 to 60 percent of the forest landscape will be managed for advanced structure, with targets in individual management basins varying from 30 to 60 percent advanced structure. Another 25 to 55 percent of the forest will be in intermediate structure; the later stages of this structure will be likely to provide adequate foraging and dispersal habitat. The targets for advanced structure across the forest and by basin should be sufficient to provide habitat connectivity for northern spotted owls. Basin targets guarantee that distribution of habitat occurs across the forest and is not concentrated in one area.

In a study modeling northern spotted owl habitat in the Coast Range, Richards et al. (2002) found that a threshold of 40 percent habitat within a northern spotted owl home range resulted in a distribution of home ranges throughout the study area similar to known distribution of northern spotted owl habitat. In addition, a range of 30 to 60 percent advanced structure is consistent with the results of modeling efforts examining levels of habitat that may provide connectivity on a landscape (Andrén 1994; Monkkonen and Reunanen 1999; Richards et al. 2002; With and Crist 1995; With et al. 1997). When habitat is below the critical threshold, some of the potential effects include: 1) disrupted ecological processes; 2) increased potential for disturbance; 3) altered interactions between species; 4) altered movement patterns; and 5) destabilized population dynamics (Lindenmayer and Franklin 2002).

Other Stand Structure Types

In addition to advanced structure, intermediate structure will range from 25 to 55 percent of the forest. Many intermediate structure stands also will provide habitat that allows for movement and interaction of northern spotted owls across the regional landscape. In addition, some intermediate structure stands in later stages of structure development will provide suitable habitat for foraging and roosting.

Landscape Design Principles

Section 5.4.2 describes landscape design principles that will be applied during implementation planning. These principles include planning for larger blocks of advanced structure, locating smaller patches closer together than larger patches, and maintaining riparian inner zones in an advanced structure condition. Application of these principles during implementation planning will improve connectivity of the landscape for northern spotted owls.

6.5. MONITORING

Assumptions

The landscape management strategies will provide habitat sufficient for the persistence of northern spotted owl sites in the Elliott State Forest, and sufficient to accommodate movement and interaction of the northern spotted owl across the regional landscape.

- T&E core areas will maintain habitat sufficient to allow northern spotted owl pairs to persist.
- Advanced stand structure provides nesting, roosting, and foraging habitats for northern spotted owls.
- Advanced structure stands are provided in a sufficient quantity and distribution in the Elliott State Forest to allow northern spotted owls to persist.
- Active silvicultural management can result in the development of habitat for northern spotted owls.
- Intermediate structure stands provide some foraging habitat and allow for movement and interaction of northern spotted owls across the regional landscape.
- Implementation of landscape design principles results in a landscape that provides connectivity for northern spotted owls.

Activities

- Establish monitoring projects in a sub-sample of stands to determine and track development of stand structure and northern spotted owl habitat suitability as an objective of activities described in Section 11.3.3.5 at 10-year intervals. This study would determine what proportion of advanced structure stands also have characteristics of northern spotted owl habitat. Northern spotted owl habitat suitability would be determined by similarity to inventoried stands occupied by northern spotted owls (see Table 6-1).
- Conduct periodic density studies to assess the population of northern spotted owls on the Elliott State Forest and where they are located. Studies would use established density protocols for one year and survey all suitable habitat. Studies would occur at approximately eight-year intervals. These studies would address the questions of whether northern spotted owls are persisting on the Elliott State Forest; whether they are continuing to use T&E cores; and whether or not northern spotted owls are using developed habitat.

Key Terms

Active nest tree—A tree or snag in which a nest is tended during the breeding season by a pair of northern spotted owls.

Activity center—The nest tree, or the location best describing the focal point of the activity of a northern spotted owl or pair of northern spotted owls when the nest location is not known.

Core area—An area of contiguous suitable habitat surrounding a nest site or activity center.

Core use area—Areas of concentrated use within the home range identified by calculating an average observation density of all locations for an individual northern spotted owl and determining the contour where the observation density is greater than average. This contour does not have a connotation of statistical significance, but it delimits an area of concentrated use. The advantage to this approach is that it avoids arbitrary selection of contours, and each core area is based only on the density of locations for that particular northern spotted owl (Seaman et al. 1998).

Historic status (aka unoccupied) – Established by:

- No responses from an historical site after 3 years of protocol survey

Home range—The area within which an animal conducts its activities during a defined period of time (generally determined through radio-telemetry monitoring).

Non-territorial – Established by:

Responses over the survey period that to not meet resident status. As opposed to the status unknown category, this category is commonly used when the survey protocol (1 year or 2 year) has been completed and 2 or fewer responses were observed.

Northern spotted owl circle—An area defined by the provincial radius circle around a northern spotted owl activity center. On the Elliott State Forest, the provincial radius is 1.5 miles.

Northern spotted owl site—A territory occupied by northern spotted owls.

Pair status—Established by any of the following:

- A male and female are heard and/or observed (either initially or through their movement) in proximity (less than 1/4 mile apart) to each other on the same visit; or
- A male takes a mouse to a female; or
- A female is detected (seen) on a nest; or
- One or both adults are observed with young.

Resident single status—Established by:

- The presence or response of a single northern spotted owl within the same general area on three or more occasions within a breeding season; or
- Multiple responses over several years (e.g., two responses in year 1 and one response in year 2, from the same general area).
- The presence or response of two birds of the opposite sex where pair status cannot be determined and where at least one member meets the other resident single requirements. (Note: This is considered "two birds, pair status unknown" in the survey protocol. This is lumped with the resident single category because management options are the same as for resident singles.)

Key Terms (continued)

Site status—The occupancy status of a surveyed area, as defined by the survey protocol (USFWS 1990).

Status Unknown – Established by:

- The response of a male and/or female which does not meet any other definition (e.g. fewer than three responses during a survey period). This is generally used after the first year of a two year survey.

Chapter 7
Marbled Murrelets

This chapter describes the benefits and potential effects of the conservation strategies on marbled murrelets outlined in Chapter 5. Additional minimization and mitigation measures specific to the marbled murrelet are also described.

Other chapters present additional information essential to understanding this chapter. Chapter 4 describes the current condition of marbled murrelets on Elliott State Forest lands. Chapter 5 details the underlying landscape management context in which marbled murrelet conservation strategies will be implemented. Chapter 10 provides a framework for adaptive management, within which can be found a discussion of monitoring activities specific to the marbled murrelet. It is important to read all chapters to understand completely the Oregon Department of Forestry's (ODF's) habitat conservation strategies.

7.1. BACKGROUND

7.1.1. Marbled Murrelet Recovery Plan

The federal *Recovery Plan for the Marbled Murrelet* (USDI Fish and Wildlife Service 1997) (hereinafter referred to as the Recovery Plan) details the major threats to marbled murrelet populations in six recovery zones along the coast of Washington, Oregon, and California. Within these recovery zones, the following overall federal recovery objectives for the species are noted (USDI Fish and Wildlife Service 1997):

- To stabilize and then increase population size throughout the listed range
- To provide conditions in the future that allow for a reasonable likelihood of continued existence of viable populations
- To gather necessary information to develop de-listing criteria

Although the marbled murrelet is dependent on ocean habitats for much of its life cycle, the role of forest habitats in supporting nesting and reproduction makes forest management a factor in whether the above objectives ultimately will be achieved. In recognition of this, the Recovery Plan makes a number of recommendations specific to forest management. (After each of these federal recommendations, a citation to the appropriate section of the Recovery Plan is given in parentheses.)

- Maintain currently occupied sites and minimize the loss of suitable unoccupied habitat on non-federal lands, until additional information is obtained and the Recovery Plan objectives can be revised and updated (3.1.1.1 and p.123).
- Maintain potential and suitable habitat in larger blocks, while maintaining north-south and east-west distribution of habitat (3.1.1.2).
- Maintain and enhance buffer habitat surrounding occupied habitat. Buffer habitat will mediate the effects of edge and should be a minimum of 300 to 600 feet and consist of whatever stand age is present (3.1.1.3).
- Minimize nest disturbances to increase reproductive success (3.1.3).
- Increase the amount and quality of suitable nesting habitat (3.2.1).
- Decrease fragmentation by increasing size of suitable stands for interior habitat (3.2.1.1).
- Protect "recruitment" nesting habitat (3.2.1.2).
- Use silvicultural techniques to decrease development time for new habitat (3.2.1.3).
- Improve and develop north-south distribution of nesting habitat (3.2.2.1).
- Improve and develop east-west distribution of habitat (3.2.2.2).
- Initiate research to guide the recovery effort (4).

7.1.2. Federal Land Commitments to Marbled Murrelet Conservation

A network of late successional reserves creates the foundation of the federal conservation strategy (USDA Forest Service et al. 1994a). These reserves and other designated areas (e.g., Congressionally withdrawn lands) encompass approximately 89 percent of the estimated marbled murrelet habitat on lands managed by the U.S. Forest Service and the Bureau of Land Management. Suitable habitat within these designated areas will be protected, and stands that are not currently suitable will be protected or managed to develop characteristics that support nesting marbled murrelets.

Outside of designated withdrawals, suitable habitat on federal lands will be surveyed before forest-modifying activities. If behaviors indicating marbled murrelet occupancy are observed, protections will be placed on the contiguous suitable and recruitment habitat within 0.5 mile of the occupied behavior.

The use of reserves, coupled with the survey and protection of occupied marbled murrelet habitat within matrix lands, attempts a "very low risk" strategy aimed at achieving three primary goals on federal lands. These goals, outlined in the Recovery Plan, are: "(1) the stabilization or improvement of nesting habitat through protection of all occupied habitat (both current and future), (2) the development of future habitat in large blocks (creating more interior habitat and thereby possibly decreasing avian predation), and (3) the improvement of distribution of habitat, thereby improving distribution of marbled murrelet populations."

7.1.3. Marbled Murrelet Conservation on Non-Federal Lands

7.1.3.1. Conservation Recommendations

The Recovery Plan provides the guidance and information necessary to determine whether the Habitat Conservation Plan (HCP) will adequately address conservation of the species. The planning area for this HCP is primarily in the Oregon Coast Range Recovery Zone, designated as Zone 3 in the Recovery Plan. Within this zone, non-federal lands are identified as being critical to the survival and recovery of local and regionwide marbled murrelet populations, and the Elliott State Forest is noted as having large areas of suitable nesting habitat (USDI Fish and Wildlife Service 1997). Some management recommendations noted in the Recovery Plan include:

- Maintain occupied nesting habitat
- Maintain potential and suitable habitat in larger contiguous blocks
- Maintain and enhance buffer habitat surrounding occupied habitat
- Minimize nest disturbances to increase reproductive success

7.1.4. Marbled Murrelets on the Elliott State Forest

Surveys for marbled murrelets from 1992 through 2006 resulted in the discovery of 85 occupied marbled murrelet sites on the Elliott State Forest (see Appendix G for details on each site). In addition, between 1995 and 1999, Nelson and Wilson (2002) studied the characteristics of marbled murrelet nesting habitat on state lands in the Elliott State Forest, as well as other state forestlands. Included in the 37 nests examined in this study were 11 nests located in the Elliott State Forest. The characteristics of nests and nest trees, nest and random platforms, successful and failed nests, and nest and non-nest plots were summarized in 25-meter-radius plots centered on the nest trees or climbing plots.

This research confirmed that marbled murrelets select large conifer trees with numerous platforms for nesting (see Chapter 4). A key finding is that nests are predominately found in trees more than 200 years old (two or three were found in 140- to 170-year-old trees). These nest trees are part of the dominant cohort of the stands in which they occur. Stand Level Inventory (SLI) information on stands with occupied marbled murrelet sites in the Elliott State Forest indicates that these stands contain large diameter trees and a range of relative densities and basal areas (Table 7-1).

Marbled murrelets nest on platforms formed on large or deformed branches with moss covering. This type of platform is generally found on large trees, greater than 30 inches in diameter—in Oregon, usually Douglas-fir, western hemlock, or Sitka spruce. Nests are generally found in stands of mature or old trees.

However, not all stands of mature trees maintain the right conditions for formation of platforms. Existing timber inventory information does not include information on availability of large platforms, and stand age or stand diameter are not reliable indicators of the presence of these structural features. The presence of large trees with deep crowns often indicates that platforms may be present. These trees often are apparent on aerial photographs and occur in patches of varying sizes, from small patches within individual stands to larger patches that cross stand boundaries.

Marbled murrelet habitat in the Elliott State Forest has been identified through analysis of aerial photos and orthophotos, and subsequently digitized as polygons. Appendix H describes the process for this mapping, and discusses a study conducted to test the effectiveness of this method. This mapped habitat has a high likelihood of representing occupied habitat in the Elliott State Forest because characteristics of mapped habitat have been demonstrated to be similar to characteristics of occupied habitat (see Appendix H). This mapped habitat constitutes approximately 18 percent of the Elliott State Forest. All mapped marbled murrelet habitat is included as advanced structure, regardless of whether or not the stand polygon within which it was mapped meets the characteristics of advanced structure.

Table 7-1
Selected Structural Characteristics of Marbled Murrelet Nesting Sites on the Elliott State Forest as Determined through Research and Inventory Plots

Characteristic	Elliott State Forest Research [1] (range) n = 10	Elliott State Forest Marbled Murrelet Habitat Mapping [2] n= 53	Inventoried Stands [3] (range) n = 43
Mean tree diameter (inches)	20 (10–37)	38 (0–62)	30 (18–39)
Relative density	47 [4]	42 [4]	53 (33–76)
Basal area (square feet per acre)	212 [4]	260 [4]	233 (145–361)
Number of snags per acre (>20-inch DBH)	Not available	Not available	4.5 (0.5–16.5)
Volume of down wood (cubic feet per acre)	Not available	Not available	1745 (0–5,521)

[1] Nelson and Wilson 2002. Values are mean values from Table 24 of this report, and represent values measured in fixed radius plots of 0.5 acre around nest sites.

[2] Appendix G. Values are mean values from Table 5 and represent values measured in 0.5-acre plots centered on occupied detections.

[3] These values are from the SLI of stand polygons within 0.1 mile (528 feet) of occupied detections. Stand polygons varied from 11 acres to 198 acres in size and were sampled using the ODF's SLI methodology. Therefore, they represent stand levels compared to the plot levels measured in the other studies.

[4] Relative density and basal area are calculated from the mean for trees per acre and the mean for tree diameter. No ranges are available.

DBH = diameter breast height

7.2. CONSERVATION OBJECTIVE

The Elliott State Forest is located in a region in which marbled murrelet populations have been declining. Adjacent federal lands are being managed to protect existing habitat and provide future habitat in late successional reserves. The conservation objective for the Elliott State Forest relative to marbled murrelets is to support regional populations of marbled murrelets by maintaining habitat sufficient for the persistence of marbled murrelet sites in the Elliott State Forest through time.

7.3. CONSERVATION STRATEGIES

The habitat conservation strategies described in Chapter 5 provide the basis for conservation of marbled murrelets under this HCP. Specifically, the following habitat conservation strategies contribute to the maintenance of habitat sufficient for the persistence of marbled murrelet sites in the Elliott State Forest through time:

- Strategy 5.2: Manage for a Range of Stand Structures Across the Landscape
- Strategy 5.3: Establish Conservation Areas to Protect Special Resources
- Strategy 5.4: Develop Implementation Plans to Achieve a Landscape Design that Provides Functional Habitat for Native Species

Under these strategies, threatened and endangered core (T&E core) areas have been established for occupied marbled murrelet sites, and forestwide and basin-specific targets for advanced structure stands have been established. These strategies will contribute to the conservation of marbled murrelets and their habitat in the Elliott State Forest by:

- Maintaining marbled murrelet occupied sites in T&E core areas.
- Maintaining marbled murrelet habitat across the forest through time.

In addition, fine filter strategies have been developed to minimize any potential negative effects of management activities on marbled murrelets. These strategies minimize the likelihood that habitat important to nesting is removed or modified during the nesting season in occupied marbled murrelet sites, and establish limits on and criteria for the harvest of marbled murrelet habitat.

7.4. KEY INDICATORS

Key indicators for the success of the habitat conservation strategies for marbled murrelets include:

- Maintaining occupied marbled murrelet sites on the Elliott State Forest over time
- Maintaining marbled murrelet habitat across the forest through time

The following sections describe each indicator and the potential effects of activities covered under this HCP on the indicator, followed by the minimization and mitigation provided by the conservation strategies.

7.4.1. Maintaining Occupied Marbled Murrelet Sites

7.4.1.1. Summary of Potential Effects

Surveys of marbled murrelets conducted from 1992 through 2006 have resulted in the discovery of 85 occupied marbled murrelet sites on the Elliott State Forest (see Appendix G for details on each site). Harvest activities have the potential to affect these sites and sites discovered in the future through:

1. Removal or modification of habitat in nesting areas that affects occupancy or nesting success. Ten of 85 occupied sites are not located within T&E core areas. One of the ten is located within a steep, unique, or visual area (SUV), leaving nine known occupied sites without specific protection within conservation areas. In addition, occupied sites located after 2006 will not be included in new T&E core areas.
2. Removal or modification of habitat in proximity to nesting areas that affects the suitability of the nesting stand or increases the susceptibility of nests to predation.
3. Disturbance to nesting marbled murrelets from the use of harvest-related equipment.

7.4.1.2. Summary of Minimization and Mitigation

The establishment of T&E core areas, the maintenance and development of advanced structure, and the application of appropriate seasonal disturbance standards will minimize the potential that habitat is removed or modified in or in proximity to marbled murrelet nesting areas, and the potential that nesting marbled murrelets are disturbed by harvest-related activities in proximity to nesting stands.

T&E Core Areas

Seventy-five of the 85 occupied sites are included within the boundaries of T&E core areas. Details on each core area are provided in Table 7-2. The boundaries of these T&E cores were based on survey information, selection of the best available habitat adjacent to observations of sub-canopy behavior, and the presence of a forested or topographic buffer designed to protect the integrity of that occupied site. The median size of the 34 marbled murrelet T&E cores is 122 acres, and these T&E cores contain over 9,300 total acres. The T&E core areas have a high likelihood of providing sufficient protection for these occupied sites, because

they are based on site specific information and include features that buffer the occupied stands.

The remaining T&E cores that do not currently contain known marbled murrelet-occupied sites have not been surveyed. These T&E cores do contain mapped marbled murrelet habitat (see Table 5-2), and may contain occupied sites currently or may provide habitat for nesting marbled murrelets in the future. Thus, the remaining T&E core areas (over 2,400 acres) have the potential to protect occupied marbled murrelet sites that have not yet been discovered.

In addition, there are approximately 4,500 acres of SUV conservation areas outside of T&E cores. These areas contain an additional 1,000 acres of mapped marbled murrelet habitat (Table 7-3). One of the occupied sites not located within a T&E core area is located within an SUV. Many other SUV areas have not been surveyed, and may contain occupied sites currently or may provide habitat for nesting marbled murrelets in the future.

Management activities within T&E cores and other conservation areas will be infrequent and of low intensity. Therefore, the habitat within these T&E cores is expected to be maintained in a suitable condition for marbled murrelets throughout the term of the Incidental Take Permit (ITP).

Table 7-2
Marbled Murrelet Occupied Sites Located in T&E Core Areas

Core Area	Acres	Number of Occupied Sites	Mapped Marbled Murrelet Habitat (acres)	Basin
Beaver Headwaters	211	1	108	10 12
Benson Top	76	1	8	6
Big Otter	97	1	48	5 12
Charlotte Knife	116	1	9	2
Dean Creek	263	1	93	3
Dry Ridge	94	1	28	6
Elk Forks	235	2	130	11
Elk Pass	304	5	71	10 11
Fish Knife	831	4	392	11 12
Glenn Headwaters	67	1	0	10
Goody Ridge	55	1	37	4
Joe Buck	772	7	285	12

Table 7-2 continued

Core Area	Acres	Occupied Sites	Mapped Marbled Murrelet Habitat (acres)	Basin
Johanneson	89	2	41	2 3
Kentuck Ridge	55	1	26	9
Knife Forks	139	2	39	12
Larson Bottom	105	2	31	8
Larson Palouse	109	1	43	8
Larson Point	58	1	24	8
Lower Mill	2029	7	712	1 2
Lower Roberts	781	2	217	6
Luder Footlog	67	1	15	2
Luder Umpqua	454	5	145	2
Marlow Bottom	143	2	41	10
Marlow Henry	257	1	86	9
Marlow Lockhart	206	3	40	10
Middle Charlotte	151	2	61	2
Middle Deer	169	2	70	12
Millicoma Schumacher	56	1	13	9
Old Maids Cabin	275	2	68	11
Panther Bench	38	1	19	11
Panther Howell	242	2	103	10 11
Right Fork Johnson	54	1	13	7
Salander Headwaters	115	1	41	13
Schumacher Headwaters	71	2	23	9
Stonehouse Point	113	2	55	9
Sullivan Creek	122	2	66	8
Trout Mouth	305	1	122	9
TOTAL	9,324	75	3,323	

Table 7-3
Mapped Marbled Murrelet Habitat by Basin
Amount and Percentage of Mapped Habitat in Different Types of Conservation Areas

Basin	Acres in Basin	Mapped Habitat in Basin (acres)	% of Basin in Mapped Habitat	Mapped Habitat in T&E Core (acres)	% of Mapped Habitat in T&E Core	Mapped Habitat in Steep, Unique, Visual Lands (acres)	% of Mapped Habitat in Steep, Unique, Visual Lands not T&E Core	Mapped Habitat in Riparian Special 1 (acres)	% of Mapped Habitat in Riparian not T&E Core or Steep, Unique, Visual Lands
1 – Mill	5,356	939	18%	715	75%	37	4%	22	2%
2 – Charlotte-Luder	6,422	1,609	25%	288	18%	425	26%	92	6%
3 – Dean-Johanneson	7,296	1,766	24%	110	6%	125	7%	144	8%
4 – Scholfield	4,990	1,182	24%	259	22%	2	0%	128	11%
5 – Big Creek	7,823	2,420	31%	221	9%	0	0%	232	10%
6 – Benson-Roberts	7,417	1,726	23%	285	17%	0	0%	108	6%
7 – Johnson	6,322	1,119	18%	71	6%	0	0%	77	7%
8 – Palouse-Larson	6,541	841	13%	187	22%	91	11%	40	5%
9 – Henry's Bend	8,284	828	10%	325	39%	141	17%	29	3%
10 – Marlow-Glenn	6,512	462	7%	294	63%	42	9%	18	4%
11 – Millicoma Elk	10,873	1,846	17%	589	30%	35	2%	253	13%
12 – Trout Deer	11,314	1,466	13%	612	40%	43	3%	132	9%
13 – Ash Valley	4,132	473	11%	246	51%	61	13%	10	2%
Total	93,282	16,680	18%	4,202	25%	1,002	6%	1,285	8%

[1] Riparian Special = Inner Zone extending 100 feet on either side of perennial stream

Outside of T&E Core Areas

Of the ten occupied sites not included within a core area, one is located in a conservation area designated as SUV. The remaining nine sites are not included in any specific conservation area. These sites represent either areas that are small and isolated from other T&E cores, or areas where there is little or questionable information on the murrelet occupancy. To minimize potential negative effects to these sites, five of the nine sites will be deferred from harvest for at least ten years, as described in Conservation Measure 7.1. The remaining four sites (1, 73, 74, and 77), totaling approximately 200 acres, will be available for harvest activities, subject to application of seasonal restrictions as described in Conservation Measure 7.2 and consideration of the retention priorities for murrelet habitat described below.

Marbled Murrelet Conservation Measure 7.1:
Defer Harvest of Selected Occupied Sites for Ten Years

The following five occupied murrelet sites are located outside of T&E cores and SUVs: Sites 32, 38, 76, 78, and 79 (see Appendix G). Harvest of these areas will not occur during the first ten years of plan implementation. After the first ten years of plan implementation, these areas will be available for harvest activities. To avoid disturbance to nesting adults and chicks, the ODF will apply seasonal restrictions during the murrelet nesting season (April 1 to September 15), as described in Conservation Measure 7.2

Additional information on marbled murrelets in the Elliott State Forest may be found in Chapter 4 and Appendix G.

Maintenance and Development of Advanced Structure

Most T&E core areas should provide adequate buffering of occupied habitat within the core area. The basin requirements for advanced structure (Conservation Measure 5.4), combined with the requirement for 500 acres of advanced structure that incorporates a T&E core area in each basin (Conservation Measure 5.6), will increase the likelihood that marbled murrelet nest sites are buffered sufficiently. Between 40 and 60 percent of the forest will be in advanced structure at any given point in time, with 25 to 55 percent of the forest in intermediate structure. These stand structure targets will increase the likelihood that potential and suitable habitat is maintained in larger contiguous blocks, and that buffer habitat surrounding occupied habitat is maintained and enhanced.

Marbled Murrelet Conservation Measure 7.2:
Apply Seasonal Disturbance Restrictions to Known Occupied Sites

To avoid disturbance to nesting adults and chicks, the ODF will apply management standards during the murrelet nesting season (April 1 to September 15) for conservation areas with murrelet-occupied sites, and for other occupied sites located on ODF forest lands or adjacent ownerships in the future. With the exception of those sites covered by Conservation Measure 7.1, sites not located in conservation areas will be available for management activities outside the nesting season. Site-specific topographic features will be considered when seasonal restrictions are applied. The following restrictions apply between April 1 and September 15, unless a fire emergency occurs in the ITP area:

- Prohibit aircraft conducting work for the ODF (including Type I helicopters) from flying within 1,320 feet (0.25 mile) and small aircraft conducting work for the ODF, including single-engine airplanes and Type II and III helicopters, from flying within 330 feet of the likely nesting habitat. Over flights must be greater than 500 feet above the likely nesting habitat.
- Prohibit the use of explosives associated with rock quarries in or within 1.0 mile, and the use of explosives associated with road construction in or within 0.25 mile of the likely nesting habitat.
- Prohibit timber harvest activities—including the use of chainsaws, yarding, and loading, and the hauling of logs, rock, and heavy equipment—or the use of heavy equipment (includes vibratory rollers) on roads that are not commonly used within 330 feet of the likely nesting habitat from April 1 through August 5. Allow these activities from August 6 to September 15 only after consultation with the Area Biologist.
- The following activities are not considered disturbance, and may proceed without restrictions during the nesting season:
  - Hauling of logs, rock, or heavy equipment involving the use of unmuffled compression brakes on commonly used roads
  - Ground application of chemicals and fertilizer, trapping, forage seeding, manual brush cutting without chainsaws, planting, surveying, pruning, roadside seeding, harvest of minor forest products, and snag creation by girdling or chemical injection

Seasonal Restrictions

Seasonal restrictions to minimize disturbance will be applied to all active marbled murrelet nest stands on ODF lands or on adjacent ownership during the term of the ITP, as described in Conservation Measure 7.2. Appropriate disturbance standards will be applied in proximity to known nest stands when management activities are planned. As a result, the potential for disturbance to nest stands during the nesting season will be minimized.

In addition, seasonal restrictions will be applied to mapped marbled murrelet habitat where occupancy is unknown, in order to minimize the potential for removal and modification of nesting habitat and disturbance during the breeding season (Conservation Measure 7.3).

Marbled Murrelet Conservation Measure 7.3:
Apply Seasonal Restrictions to Mapped Murrelet Habitat

To minimize the risk of modifying habitat or causing murrelets to abandon nesting during the breeding season in mapped habitat in which murrelets may be nesting, the ODF will choose from several options designed to limit the likelihood of disrupting nesting during critical nesting periods. This approach applies to felling and yarding activities in and around mapped murrelet habitat during the murrelet nesting season. Other harvest-related activities, including loading, hauling, and use of tailholds, will not be restricted. Any of the options listed below are acceptable. Option 1 is the most conservative approach to limiting disturbance, with somewhat more risk associated with each following option.

The ODF may choose to implement the option that effectively and efficiently reconciles the numerous timing and cost constraints to which operations are subject, such as restrictions for winter hauling and fire season restrictions. Various other constraints—such as, but not limited to, contract duration, numerous operations on a road system, right-of-way limitations, etc.—may limit ODF's ability to apply the most conservative option. Site-specific topographic features will be considered when seasonal restrictions are applied.

1. Between April 1 and September 15, prohibit felling and yarding in and within 330 feet of mapped habitat.
2. Between April 1 and September 15, prohibit felling and yarding in mapped habitat. During this period, felling and yarding are allowed within 330 feet of mapped habitat from 2 hours after sunrise to 2 hours before sunset.
3. Between May 1 and September 15, prohibit felling in mapped habitat. During this period, allow yarding adjacent to and through mapped habitat without restrictions.

If the mapped habitat has been felled prior to April 1, seasonal restrictions do not apply.

7.4.2. Maintaining Marbled Murrelet Habitat Across the Forest Through Time

Marbled murrelet habitat in the Elliott State Forest has been identified through analysis of aerial photos and orthophotos, and subsequently digitized as polygons (Appendix H). This mapped habitat constitutes approximately 18 percent of the Elliott State Forest. All mapped marbled murrelet habitat is included as advanced structure, regardless of whether or not the stand polygon within which it was mapped meets the characteristics of advanced structure.

7.4.2.1. Summary of Potential Effects

Harvest activity has the potential to affect marbled murrelet habitat through:

1. Removal or modification of mapped marbled murrelet habitat to the point that it no longer provides suitable habitat for marbled murrelets. Between 4,000 and 6,800 acres of mapped marbled murrelet habitat may be harvested during the permit term.
2. Development of additional marbled murrelet habitat.

7.4.2.2. Summary of Minimization and Mitigation

Conservation Areas

Approximately 39 percent of mapped marbled murrelet habitat (6,489 acres) is located in conservation areas, including T&E core areas (Table 7-3). Because little if any management will occur in these areas, this habitat is expected to be maintained in these areas. Because these conservation areas are distributed throughout the Elliott State Forest, the east-west and north-south distribution of marbled murrelet habitat in the Coast Range will be facilitated.

A Harvest Scheduling and Economic Analysis Model generated for the Elliott State Forest used the strategies associated with the HCP, and projected an increase of approximately 7,700 acres of advanced structure stands in conservation areas (see Table 6-5). The net result is that approximately 21,000 acres (93 percent) of the conservation areas will meet the advanced structure definition at the end of the HCP term.

Limiting Harvest of Unsurveyed Mapped Marbled Murrelet Habitat

The remaining 61 percent of mapped marbled murrelet habitat (10,191 acres) is located outside conservation areas. A limited amount of mapped habitat, 4,000 to 6,800 acres, will be available for management activities over the term of the permit, as described in Conservation Measure 7.4. As a result, 3,400 to 6,200 acres of mapped habitat will be retained on the landscape outside Conservation Areas.

Additional marbled murrelet habitat is expected to develop on the forest at a level that will offset the loss of habitat to harvesting operations over time. In addition to the increase in advanced structure within conservation areas (see above), the model also projected that approximately 11,500 acres of conifer stands outside conservation areas and that currently meet the advanced structure definition will persist on the landscape over the term of the HCP (Table 6-5). Some of these stands of advanced structure may have the structures needed for marbled murrelet nesting.

Because of the uncertainty associated with the modeled-predicted, future development of marbled murrelet habitat, the harvest of the initial 4,000 acres of mapped marbled murrelet habitat will be limited by decade. The harvest of an additional 2,800 acres will be contingent on demonstrating the development of marbled murrelet habitat (Figure 7-1).

When harvest units are selected, those containing mapped marbled murrelet habitat polygons will be selected using criteria that delay the harvest of large habitat polygons. Units that contain all or a portion of mapped marbled murrelet habitat polygons that are less than 50 acres would be selected for harvest before units containing larger polygons. The largest patches (90 acres or larger), and presumably the most functional patches of marbled murrelet habitat, will persist on the landscape as a component of the advanced structure. These Conservation Guidelines are described below.

Marbled Murrelet Conservation Measure 7.4:
Maintain Habitat Through Limiting
Harvest of Unsurveyed Mapped Habitat

Over the term of the ITP, ODF will limit harvest of mapped murrelet habitat. The initial 4,000 acres of mapped murrelet habitat outside of conservation areas subject to regeneration harvest activities will occur according to the following schedule:

- Decade 1 – 1,200 acres
- Decade 2 – 1,000 acres
- Decade 3 – 1,000 acres
- Decade 4 – 800 acres
- Decade 5 – 0 acres

An additional 2,800 acres (for a maximum of 6,800 acres) of mapped murrelet habitat may be harvested over the term of the permit, contingent upon demonstrating ingrowth of marbled murrelet habitat. Additional acres of murrelet habitat may be harvested if the ODF demonstrates that an equivalent amount of new marbled murrelet habitat has developed on the forest. Figure 7-1 illustrates the allowable harvest of mapped murrelet habitat by decade during the permit term. During the first three decades, no more than 1,200 acres of marbled murrelet habitat will be harvested in any one decade. In the last two decades, no more than 1,600 acres of marbled murrelet habitat will be harvested in any one decade.

When operationally feasible, patches or groups of trees in these mapped murrelet habitat polygons within harvest unit boundaries will be retained as live trees to meet live tree retention targets.

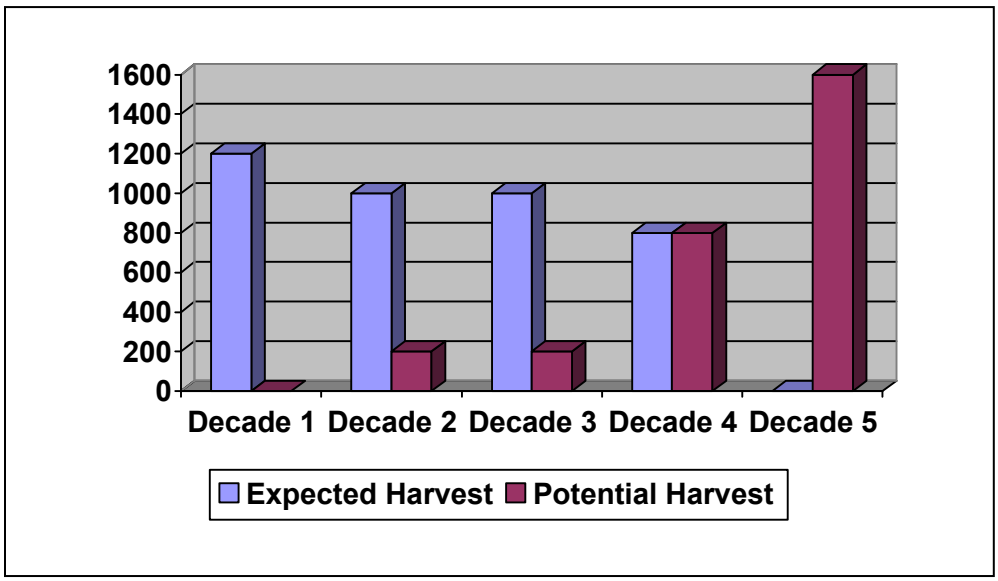


Figure 7-1. Expected Harvest of Murrelet Habitat (acres) and Potential Harvest Based on Projected Ingrowth by Decade

Conservation Guidelines:
Retention Priorities for Marbled Murrelet Habitat

Within a management basin, harvest units with mapped murrelet habitat polygons will be selected in the following priority order, when operationally feasible:

1. Units that contain all or a portion of mapped murrelet habitat polygons that are less than 50 acres, except when other constraints prevent their selection.
2. Units that contain all or a portion of mapped murrelet habitat polygons 50 acres or larger, but less than 90 acres, except when other constraints prevent their selection.
3. Units that contain all or a portion of mapped murrelet habitat polygons 90 acres or larger, except when other constraints prevent their selection.
4. Any units that contain known occupied murrelet sites that are located outside of conservation areas (including sites 1, 73, 74, and 77) will have a low priority for selection, regardless of the amount of mapped murrelet habitat in the unit.

Maintenance and Development of Advanced Structure

Through the term of the permit, additional advanced structure will be developed on the landscape. The advanced structure that develops will provide some additional nesting habitat, because at least 50 percent of it will have eight or more live trees per acre at least 32 inches in diameter. The presence of these large dominant trees in the overstory may be a good indicator of the presence of platform trees, and ultimately of marbled murrelet nesting habitat.

A key assumption of this HCP is that advanced stand structure provides nesting habitats for marbled murrelets. The ODF will assess and identify the quantity of marbled murrelet habitat ingrowth that is generated on the forest landscape over the term of this HCP. To test the assumption that marbled murrelet habitat will be developed over the permit term, a monitoring strategy will be implemented that utilizes field data to compare polygons in stands believed to have the characteristics of occupied marbled murrelet habitat with known occupied stands already measured. Polygons will be considered to qualify as mapped marbled murrelet habitat if they are similar to occupied polygons already measured on the Elliott State Forest (see Section 7.5, Monitoring).

7.5. MONITORING

7.5.1. Assumptions

The landscape management strategies will maintain habitat sufficient for the persistence of marbled murrelet sites in the Elliott State Forest through time.

- T&E core areas provide sufficient protection to maintain occupied marbled murrelet sites.
- Advanced stand structure provides nesting habitats for marbled murrelets.
- Advanced structure stands are provided in a sufficient quantity and distribution in the Elliott State Forest to allow marbled murrelets to persist.
- Active silvicultural management can result in the development of habitat for marbled murrelets.

7.5.2. Activities

Periodic surveys of marbled murrelet T&E core areas will be conducted to determine the proportion that remains in occupied status. Surveys will be discontinued when marbled murrelet occupancy is confirmed, or after a period of five consecutive years of surveying. Surveys will use established protocols and occur at ten-year intervals.

Marbled Murrelet Conservation Measure 7.5: Monitoring the Development of Marbled Murrelet Habitat

At approximately 10-year intervals, the ODF will digitize areas (polygons) in advanced structure stands believed to have the characteristics of occupied murrelet habitat. Field data will be collected on all or a sample of these polygons and will be used to compare these polygons with known occupied stands already measured. Polygons currently mapped as Marbled Murrelet Habitat would not be part of these samples.

Polygons will be considered to qualify as mapped murrelet habitat if they are similar to occupied polygons already measured in the Elliott State Forest (see Appendix G). The following table lists variables that varied significantly between occupied habitat and unmapped polygons, but not between occupied habitat polygons and mapped habitat polygons. Values in the following table represent the lower 95 percent confidence interval on the mean values in occupied habitat polygons. These characteristics and associated values would provide the basis for determining when a polygon is considered murrelet habitat.

Variable	Value (lower 95% confidence interval on the mean value in occupied habitat polygons)
Mean DBH[1] (conifers >24" DBH) - inches	≥ 35.2 inches
Mean percent moss cover	≥ 52 percent
Conifer Trees per acre with platforms (see key terms)	≥ 6.0

1 DBH = diameter breast height

Surveys for marbled murrelets may be used to demonstrate suitability of habitat; however, marbled murrelet surveys are not required.

Key Terms

Buffer habitat—Stands surrounding occupied stands that do not have the characteristics of suitable habitat, but that buffer the occupied stand from wind and other environmental factors as well as from other potential deleterious effects of edge, such as increased predation.

Commonly used road—A road that receives frequent traffic during the marbled murrelet breeding season, including, but not limited to, a mainline road and roads connecting mainline roads.

Confirmed occupancy—Occupied behaviors observed on more than one visit.

Disturbance—The disruption of marbled murrelet reproductive activities.

Likely nesting habitat—Occupied marbled murrelet habitat that is considered to be the most likely location for nesting sites, based on information from surveys, aerial photos, stand information, and the judgment of biologists or others familiar with the area. Stand type breaks or topography may be used to delineate the boundaries of likely nesting habitat.

Mapped marbled murrelet habitat—Polygons of suitable marbled murrelet habitat digitized from aerial photos, and validated, as described in Appendix G.

Not commonly used road—Roads not commonly used may include, but are not limited to, spur roads, and blocked or decommissioned roads.

Occupied habitat—Suitable habitat that has been surveyed and determined to be occupied by marbled murrelets.

Occupied sites—Sites determined to be occupied by marbled murrelets based on the observation of subcanopy behaviors during protocol surveys, or the observation of nest trees, eggshell fragments, or other evidence of marbled murrelet reproductive activities.

Platform—A relatively flat surface at least 5 inches in diameter and at least 50 feet high in the live crown of a coniferous tree. A platform includes the limb and any deformities of, or epiphyte cover growing on, the limb. For instance, a four-inch-diameter limb with moss cover that increases the overall diameter to five inches is a platform.

Platform tree—Any tree having a single platform capable of hosting a nest for a marbled murrelet.

Potential habitat—Stands with the characteristics of occupied marbled murrelet habitat, but that have not been surveyed for the presence of this species.

Recruitment nesting habitat—Stands that do not exhibit the characteristics of occupied habitat, but that could be managed to develop such characteristics in the future.

Sub-canopy behaviors—Behaviors occurring at or below the forest canopy strongly indicating that the site has some importance for breeding, including flying through the canopy, circling below canopy, and landing**.**

Suitable habitat—Stands with the characteristics suitable for marbled murrelet nesting (including both occupied habitat and potential habitat).