Appendix C
Forest Condition

C.1. DISTRICT OVERVIEW

This appendix discusses the current conditions in the Elliott State Forest. The information for this appendix comes from the Implementation Plan (IP) (developed by the district in 2005) and the Forest Management Plan (FMP).

More detailed information can be found in the IP and FMP.

C.2. LAND OWNERSHIP

The Elliott State Forest is located primarily in the Oregon Coast Range, with some scattered tracts in the Klamath Mountains. Coos Bay and North Bend are the nearest cities to the southwest of the Elliott State Forest; Reedsport is the nearest town to the northwest. The forest is a contiguous block of land approximately 18 miles long (north to south) and 16 miles wide (west to east). The Umpqua River is located immediately north of the forest. To the west, the Elliott State Forest extends within six miles of the ocean. On the east, it extends about 21 miles inland. The contiguous Elliott State Forest covers approximately 93,000 acres, mostly located in Coos and Douglas Counties.

In addition to its main block, the Elliott State Forest includes approximately 4,000 acres of scattered Common School Forest Lands (CSFLs) located in Coos, Curry, and Douglas counties. These scattered tracts are distributed across a broad geographic area ranging from the California border to just north of the Umpqua River, and from the Pacific Ocean to Winston in the interior Umpqua River valley. Only the main block of the Elliott State Forest is included in this Habitat Conservation Plan (HCP).

Approximately 91 percent of the state forest lands in the Elliott State Forest are CSFLs, owned by the State Land Board; the remaining 9 percent of lands are Board of Forestry Lands (BOFLs), owned by the Board of Forestry (BOF).

Table C-1
Coos District Acres,[1] by County and Ownership

County	Board of Forestry	Common School	Total Acres
Coos	7,147	53,206	60,353
Douglas	1,783	32,851	34,634
Curry	0	2,035	2,035
Total Acres	**8,930**	**88,092**	**97,022**

[1] Acreage includes scattered tracts; not acres included in the HCP.

C.3. HISTORY

The Elliott State Forest, which consists of about 96 percent of the state land managed by Coos District, holds the honor of being Oregon's first state forest. Officially established in 1930, today it is well known for producing habitat for fish and wildlife species, recreational opportunities, and high-quality timber.

Prior to its official creation, 84 percent of the Elliott State Forest was public domain or national forest land administered by the U.S. Forest Service (USFS). All other state forests in Oregon were predominantly owned by private landowners.

Oregon has suffered two catastrophic events in the past 150 years that affected the Elliott State Forest: the Coos Bay Fire of 1868 and the Columbus Day Storm of 1962. The healthy, growing forest and thriving wildlife populations today show the forest's ability to recover from catastrophic disturbances. Despite the fire and windstorm, the Elliott State Forest currently has the oldest timber stands found in any of Oregon's state-owned forests.

Native Americans, including the Coos and Umpqua tribes, originally lived in the area that is now the Elliott State Forest and its surrounding area (Beckham 2001). Trappers were the earliest Euro-American presence, moving up and down the coast between northern California and Fort Clatsop in Astoria, Oregon from the 1820s to the 1840s.

Early descriptions of the Elliott State Forest area mention vast stands of Douglas-fir, western hemlock, Western red cedar, Port Orford cedar, and large stands of Sitka spruce. Settlers also sighted stands of red alder, willow, and maple along the rivers and streams.

The earliest known fires in the Elliott State Forest area include a large fire of unknown size in 1770 along the Elliott State Forest's eastern edge, and another large fire of unknown size in 1840 along the northeast portion. These fires left untouched most of the area that is now the Elliott State Forest.

The historic Coos Bay Fire of 1868 burned 90 percent of the area that is now the Elliott State Forest. It is believed that the fire started near Scottsburg from a settler's clearing fire, in an area known as Greenacres. The fire burned westward along the north bank of the Umpqua River until it jumped the river near the mouth of Mill Creek. From there, it burned in a southwesterly direction, burning nearly all of the Elliott State Forest area except for the southeast portion and small parts of the northwest portion.

The origin of the Elliott State Forest dates back to 1859, when the Oregon Territory became the State of Oregon. At that time, the federal government made Oregon the first state to receive two sections for each township in the state. Oregon was to use these lands to finance schools. The land grant amounted to about 3.5 million acres of grazing and forest lands, called Common School Trust Lands.

To turn the isolated parcels of Common School Trust Lands into one manageable block of state-owned forest land, State Forester Francis Elliott and Governor Oswald West decided to trade the state parcels inside the National Forests with the federal government for one large block of federal land. This block of land became Oregon's first state forest.

The new Elliott State Forest was to be managed as a demonstration forest for private landowners, to show the value of investing in forest management. However, the year the Elliott State Forest was officially dedicated, 1930, was the first year of The Great Depression. Although the Oregon Legislature placed the State Forester in charge of administering the forest, it provided no funds for him to complete the work. Despite the forest's potential to produce timber, formal management did not commence.

In 1940, Coos County deeded 6,500 acres of tax-delinquent forest land adjacent to the Elliott State Forest to the BOF. In return, Coos County was to receive 63¾ percent of the revenue from these lands.

Before the 1950s, the timber market was sluggish, and timber prices remained low. The Oregon Department of Forestry (ODF) set up only two timber sales, at the request of a mill owner. The mill owner paid about $2 per thousand board feet (MBF) for stumpage. By the end of World War II, demand and prices for timber increased significantly.

In 1962, the historic Columbus Day Storm had a major impact on the Elliott State Forest's management. In just a few hours, the storms blew down about 100 million board feet (MMBF) of timber. Most of the blowdown was in the western half of the forest, where few roads existed because the trees were younger. To salvage the timber before it rotted, many miles of roads had to be quickly built. Nearly one-third of the 550 miles of road that exist today in the forest were built in the early 1960s to salvage blowdown . Foresters cut an additional 200 MMBF of timber to get to the blowdown, increasing the total to 300 MMBF of timber harvested in a short amount of time.

An additional 7,000 acres of CSFLs were added to the Elliott State Forest through exchanges of isolated state parcels for privately-owned land within or next to the forest. These acquisitions helped make the forest a contiguous block, making it easier to manage.

The Elliott State Forest now includes over 93,000 acres of forest lands south of the Umpqua River, and east of Tenmile Lakes. Another 4,000 acres of scattered tracts in Coos, Curry, and Douglas counties are managed by the Elliott State Forest and included in this HCP. A majority of the timber in the forest is 90 to 160 or more years old. Douglas-fir is the dominant species, with minor amounts of western hemlock, western red cedar, red alder, and bigleaf maple. The Elliott State Forest contains an estimated 2.7 to 3.0 billion board feet of mature timber. Based on a recent analysis of the Elliott State Forest by M.B.&G., Coos District forest lands are estimated to be worth $284 to $567 million. The actual value is likely in the upper end of this range.

C.4. PHYSICAL ELEMENTS

C.4.1. Geology and Soils

The Elliott State Forest is located in the southern portion of the Oregon Coast Range physiographic province. The underlying rocks of the Coast Range province are classified as early Eocene period. The deep marine basin present at that time received massive quantities of sediment from the ancient Klamath Mountains located at the basin's southern end. The Tyee formation, which underlies most of the Elliott State Forest, is believed to have been formed from massive underwater landslides. When this material settled, the heavier sand was deposited first, and then covered by the finer silt and clays. This process created the layered siltstone over sandstone rock that is visible in many of the deeper road cuts in the Elliott State Forest. Subsequent periods of marine deposition, tectonic uplift, sea level changes, and erosion have created the landforms visible in the Elliott State Forest today.

The soils of the Elliott State Forest are composed of several different soil series. Approximately 83 percent of the forest soils are residual soils. Alluvial soils make up a small percentage of the land, and are found in river terrace areas. Agricultural land, rock outcroppings, lakes, ponds, and rivers constitute approximately one percent of the land. Most of the Elliott is Site Class II or III, indicating that trees reach heights of 95 to 134 feet at the age of 50 years (King 1966).

C.4.2. Topography

The topography on the Elliott State Forest is generally rugged and highly dissected with steep, narrow canyons, although the southeast part of the forest is less steep. The dissected landforms contain many ridges and swales. Across the forest, slopes face in all directions with no dominant exposure. Elevations range from near sea level to 2,100 feet above sea level.

C.4.3. Water

The Elliott State Forest drains into three major basins. The eastern and northern portions of the forest drain into the Umpqua River. The west side of the forest drains into the Tenmile Lake basin. The West Fork Millicoma runs through the center of the forest toward the south, and is part of the Coos River system. Loon Lake, a popular recreation site, has approximately one mile of shoreline on the Elliott State Forest. Elk Lake, also known as Gould's Lake, is a small pond located within the Elliott State Forest on Elk Creek. Outside the Elliott State Forest, Tenmile Lake is influenced by waters draining from the forest.

C.4.4. Climate

The Elliott State Forest has a strong maritime influence from the nearby Pacific Ocean. As a result, temperature fluctuations are relatively moderate and rainfall amounts are high. The

mean minimum January temperature in the Elliott State Forest is approximately 32° F, and the mean maximum July temperature is 76° F.

Recorded rainfall varies across the Elliott State Forest. Rainfall averages 65 inches per year at lower elevations on the western edge of the forest, and reaches a high of 115 inches per year on the high interior ridges. Rainfall declines slightly on the eastern side of the Elliott State Forest, to 90 inches per year. Snowfall on the forest is normally light to moderate, both in amount and duration. There is no residual snowpack.

C.4.5. Natural Disturbance

Forests along the Oregon Coast, including the Elliott State Forest, result from a typical progression of stand structures following large, relatively infrequent disturbance events and subsequent smaller, more frequent disturbances. Relatively recent, large-scale events such as the Coos Bay Fire (1868) and the Columbus Day Storm (1962) influenced the distribution, composition, and structure of vegetation across the forest. Small-scale disturbances caused by subsequent small fires, windstorms, disease, insects, and harvesting also significantly affect the characteristics of the forest across the landscape.

C.4.5.1. Fire

Fire is the primary coarse-scale disturbance agent in the western hemlock zone of the Oregon Coast (Wimberly 2000). The frequency of fire occurrence is variable, and is determined by long-term climate changes (Long et al. 1998). The average regional fire-return interval for the coastal zone is estimated at 230 years, but stands much older than this indicate the variability of a fire return interval (Long et al. 1998; Agee 1993). The randomness of natural disturbances results in some stands burning repeatedly on short cycles, while other stands escape for much longer periods (Seymour et al. 1999). The lack of long-term fire records, variability, and climate changes do not allow inference of cyclic patterns of fire return (Agee 1993). Large fires have been important historically to the development of forests in the hemlock zone.

Fire size and severity increase as the fire return interval lengthens. However, large fires do not generally burn uniformly, and fire severity varies over the area. Topographic features had a greater influence on the probability of reburns after a major fire than on the occurrence of high-severity crown fires. Dry sites have a higher probability for reburning than moist sites (Wimberly and Spies 2001). The severity of a fire is a factor in determining the successional pathway of an area. The effect of fire size and severity on seed sources is a factor in determining the structure and composition of post-fire vegetation. Forests experiencing high severity fires may require 200 years before stands develop old-growth characteristics. Areas of moderate severity fire can develop many characteristics of old growth in a much shorter time (Wimberly et al. 2000).

C.4.5.2. Wind

The continuum of disturbance by wind is difficult to characterize. Wind can cause coarse-scale disturbances (such as the Columbus Day Storm of 1962) or fine-scale disturbances.

Major wind events occur along the coast about every 20 years (Wilson 1998). Depending on the intensity, large-scale wind disturbances can create even-aged stands or increase the complexity of stand structures. The effect of wind on a forest depends on stand composition, canopy structure, size, age, and vigor. Wind direction and severity, soil and site properties, and the influence of mountains on wind flow and rainfall are also factors (Nowacki and Kramer 1998). In a study conducted on the Oregon coast, about 25 percent of the sites showed evidence of wind disturbance, characterized by one or more uprooted trees, or trees that had portions of the main stem snapped off (Wimberley and Spies 2001).

C.5. BIOLOGICAL ELEMENTS

C.5.1. Vegetation

Most of the Elliott State Forest is located within the Oregon Coast Range Ecoregion. The precipitation levels and geology of the Coast Range differ from those of its neighbors, the Klamath Mountain and Willamette Valley Ecoregions. These unique qualities result in a distinctive combination of plants within the forest ecosystem. These plants provide habitat and forage, add organic matter to forest soils, and influence the micro-climate.

No comprehensive assessments or basic systematic surveys for rare plants have been conducted in the Elliott State Forest. In the late 1990s, individual harvest units were surveyed for rare plants. The ODF has developed a list of state-listed plants, using the Oregon Natural Heritage Program list of May 2004, with the assistance of the botanist from the local office of the Bureau of Land Management (BLM).

Of the 25 species found in Coos and Douglas Counties, only 3 plant species have habitat and ranges that coincide with the forest. Most of the potential species were eliminated because they occur only on serpentine soils (a soil type not found in the main block of the Elliott State Forest), high elevations, coastal dunes, or boggy areas in the dunes. Other potential species appeared to have habitat requirements similar to those found in the forest, but there have been no discoveries within this range (i.e., north coast to south coast). None of the three listed species are confirmed to be present in the forest, although they have been discovered within reasonable proximity on other ownerships.

The three species likely to be present on the main block are Bensonia, tall bugbane, and Howell's montia. Bensonia has been found above 2,500 feet at Signal Tree, above Camas Valley. Tall bugbane is found in lowland Douglas-fir forests with maple and sword fern. There are known populations on adjacent BLM lands. Howell's montia is found on moist lowland areas in vernally wet sites. These three species are on the state candidate list.

The remaining plants have a low probability of being present on the main block of the Elliott State Forest, although the Oregon Natural Heritage Program plant list is reviewed annually for updated information regarding changes in ranges and habitats. The ODF is not aware of any other federally listed threatened or endangered plant species that are likely to occur on the main block of the Elliott State Forest.

C.5.1.1. Rare Plants

Bensoniella oregona (Bensonia) Status: State Candidate

Found in wet meadows and moist streamside sites in pre-cretaceous meta-sedimentary rock at elevations above 2,500 feet. Known at Signal Tree above Camas Valley, the northern-most location with lowest elevation confirmed.

Cimicifuga elata (tall bugbane) Status: State Candidate

Found in lowland Douglas-fir forests with maple and sword ferns.

Montia howelii (Howell's montia) Status: State Candidate

Found in moist lowland areas, vernally wet sites, often on compacted soil less than 400 meters in elevation.

Conifer forest covers most of the land in the Elliott State Forest. Before these lands became state forests, large fires killed or removed most of the older conifer forests. About half of the conifer stands in the Elliott State Forest are more than 95 years old. Conifer species found in the forest are Douglas-fir, western hemlock, western red cedar, Sitka spruce, and grand fir, with a small amount of pacific yew. Other types of vegetation dominate the remaining acres, including grass, brush, and various species of hardwood trees, such as alder and bigleaf maple.

C.5.2. Insects and Disease

The current condition of the Elliott State Forest can be ascertained partially by examining long-term trends in damage from major disturbance agents. The Elliott State Forest has not experienced the widespread deterioration that has occurred in eastern Oregon forests as a result of fire suppression and high-grade logging. Aerial and ground surveys conducted during the past 50 years show little evidence of major pest outbreaks in the Elliott State Forest. Substantial blowdown has occurred during periodic major winter storms.

Several diseases have reached noticeable levels of damage in recent decades. Swiss needle cast, the highly visible foliage disease of Douglas-fir, is causing serious growth decline over a large area along the west slope of the Coast Range. In northwest Oregon, growth reduction is severe enough on some sites that heavily infected young stands are being clearcut so more resilient multispecies stands can be planted. Though Swiss needle cast affects some stands in the district, it has not become severe enough to modify silvicultural activities. However, the amount of western hemlock and red cedar being planted has been significantly increased.

Laminated root rot, a native disease of conifers, has damaged Douglas-fir on some sites, but current management practices will stabilize or reduce unwanted effects of this disease.

Black stain root disease has reached epidemic proportions in some locations in southwest Oregon, but is found infrequently in Douglas-fir in the Elliott State Forest.

Few insect problems occur in the mid- to late-successional Douglas-fir stands that are found in the Elliott State Forest. Most insect damage on the Oregon Coast is caused by the Douglas-fir bark beetle, which tends to affect low vigor trees weakened by other factors. Major beetle populations build up after significant disturbance events such as major windthrow events. Increases in beetle populations tend to be short lived unless continued disturbance provides new habitat. The Sitka spruce weevil continues to limit Sitka spruce management. The present lack of significant insect pests in the Elliott State Forest contrasts with the situation in eastern Oregon where both bark beetles and defoliators are major pests of Douglas-fir.

Continued monitoring through aerial and ground surveys will provide early warnings of new problems, and gradually improve the ability to maintain a healthy forest.

Currently, there are no reported cases of Sudden Oak Death in the district.

C.5.3. Fish and Wildlife

The Elliott State Forest provides habitats for most native species found in forests in the Oregon Coast Range (Johnson and O'Neil 2001). Chapters 4 and 5 of the FMP describe the resource management strategies that will provide habitats to help maintain or enhance native wildlife populations at self-sustaining levels, and contribute to properly functioning aquatic habitats for salmonids and other native fish and aquatic wildlife.

Of the many wildlife species potentially found in the Elliott State Forest, four species are listed as threatened or endangered under either (or both) federal and state Endangered Species Acts (ESAs): northern spotted owl, marbled murrelet, bald eagle, and peregrine falcon. The presence of three of these species (northern spotted owl, marbled murrelet, and bald eagle) has been confirmed in the Elliott State Forest. Some species are classified in various special designations such as candidate or sensitive categories.

Bald eagles (*Haliaeetus leucocephalus*) are found on or near the Elliott State Forest year-round, and use the state forests and waters for nesting, foraging, and roosting. Because a pair of eagles often uses alternate nest sites, each nesting territory can include multiple nesting sites. In 2004, there were three occupied bald eagle nesting territories in the Elliott State Forest.

The American peregrine falcon was removed from the federal threatened and endangered species list in 1999, but is still on the state list of endangered species. No active nest sites are currently known in the Elliott State Forest.

The marbled murrelet, which was federally listed as threatened in 1992, is a seabird that nests on natural, moss-covered platforms in mature and old growth coniferous forests within 50 miles of the ocean. Surveys for marbled murrelets have been conducted in the Elliott State Forest since 1992. In addition, research on the habitat characteristics of marbled murrelet nesting habitat on state forest lands, including the Elliott State Forest, was conducted between 1993 and 1998 (Hamer and Meekins 1996; Nelson and Wilson 2002). Through surveys and research, 11 nests were located and subcanopy behaviors were observed in many survey areas in the Elliott State Forest. As of 2003, approximately 10,000 acres were

protected in Marbled Murrelet Management Areas. Additional acres of potential habitat in the Elliott State Forest have not been surveyed for marbled murrelets.

The northern spotted owl was listed as threatened by the U.S. Fish and Wildlife Service (USFWS) in 1990. Surveys for northern spotted owls took place in the Elliott State Forest and adjacent suitable habitat out 1.5 miles from the Elliott State Forest between 1990 and 1993. In addition, research on the demographics, habitat use, and habitat characteristics of northern spotted owls on state forest lands, including the Elliott State Forest, took place between 1993 and 1998 (Anthony et al. 2000a, 2000b; Tappeiner et al. 2000). In 1997 and 1998, only minimum estimates were obtained in the Elliott State Forest because only previously known sites were surveyed. Over the five years of the study, there was an apparent loss of territories, experienced in a wide range across all ownerships, but the demographic study found that the rate of population change remained relatively steady. A density survey of all suitable northern spotted owl habitat in the Elliott State Forest in 2003 was comparable to the 1996 density survey. In 2003, 12 pairs and one resident single northern spotted owl were located. However, in 2003, low productivity occurred for the northern spotted owl range-wide, including in the Elliott State Forest, where none of the pairs reportedly reproduced.

The streams, rivers, lakes, and other water bodies in the Elliott State Forest provide habitats for a variety of fish species. At least 30 species of fish use habitats in the HCP area for part or all of their life history, or use habitats downstream from the Elliott State Forest that may be influenced by state forest management.

Native salmonid species utilizing streams entirely or partially in the Elliott State Forest include fall Chinook salmon, coho salmon, chum salmon, winter steelhead, and resident populations of both anadromous and resident races of cutthroat trout. Native non-salmonid fishes include various species of lamprey, sculpin, dace, sucker, and others.

Anadromous salmonid populations have been generally depressed throughout western Oregon for a variety of reasons, including, but not limited to, reduced ocean survival, reduced productivity of freshwater habitats, and sport and commercial harvest. In recent years, numbers of spawning adults in the Elliott State Forest have improved, likely due to improved ocean conditions and a significant amount of in-stream habitat improvement projects conducted on Elliott State Forest streams since the early 1990s. Listed fish species are discussed further in Chapter 4.

Resident cutthroat trout are widely distributed and appear stable, although special consideration is warranted for populations isolated above natural barriers. There is much less information about the status of non-salmonid species. The Pacific lamprey is of concern due to limited distribution, reduced abundance, and/or special habitat needs.

C.6. HUMAN USES

C.6.1. Forest Management

In past FMPs, the predominant land use was timber production, with 95 percent of Elliott State Forest forests in this classification. The remaining acres were allocated to uses such as roads, stream buffers, inoperable terrain, watershed use, recreation use, service and transmission line use, scenic and protective conservancy, and non-commercial lands. Timber harvest was generally targeted to a sawlog market. Anticipated harvest ages for well-stocked stands ranged from age 30 to 45 years for young commercial thinning, with most clearcutting performed in stands from age 90 to 130 years.

During the six-year period from 1991 through 1996, the volume harvested on the Elliott State Forest was heavily influenced by the northern spotted owl, which was federally listed as threatened in 1990, and the marbled murrelet, also listed as threatened in 1992. The average annual volume harvested during this period was 17.74 MMBF. Because of the listing of the northern spotted owl, the State Land Board directed the ODF to prepare a new FMP for the Elliott State Forest not based on "moving northern spotted owl circles," but providing more certainty to the management of the Elliott State Forest and the production of income. In addition, the ODF decided to pursue an Incidental Take Permit (ITP) for northern spotted owls and marbled murrelets through a HCP with the USFWS.

The HCP was approved in October 1995, and the new FMP was approved in 1994. The first timber sale plan implemented under the new FMP was the fiscal year 1995 plan (July 1, 1994 through June 30, 1995). The ODF estimated an annual harvest of approximately 28 MMBF per year. From fiscal year 1997 through 2002, the average annual harvest in the Elliott State Forest was 29.54 MMBF.

The harvest volume over the past six years (above 28 MMBF) is due to the variation in the volume per acre of the stands harvested. It is also due to harvest timing, an increase in young commercial thinning, and the thinning of two mature stands in a long rotation basin. It is not due to increasing the acres that were clearcut.

The increase from an average of 17.74 MMBF per year in the six-year period from 1991 through 1996, to an average of 29.54 MMBF per year during the 1997 through 2002 fiscal years, is 67 percent.

C.6.2. Roads on State Forest Lands

The district's primary road network is an established system that has been in place for 40 to 60 years. It provides access for forest management activities, fire suppression, and public travel. Visions, guiding principles, and goals for managing the district's road network are discussed in the *Forest Roads Manual* (Oregon Department of Forestry 2000).

Roads are built or improved as projects on timber sales. They are designed and constructed to standards that provide for good road maintenance and safe log transportation. Main access

roads are surfaced with rock to provide for all-weather use and to minimize impacts from rainfall and runoff. Secondary spur roads are built to the same maintenance standards, but may have lesser specifications for width and surfacing. In many instances, secondary spurs are blocked off after a timber sale or other forest management activity is completed, to minimize disturbance of elk and deer and for other management reasons. These roads are still subject to road maintenance requirements unless they are legally closed or decommissioned by removing culverts and providing necessary long-term drainage. A significant portion of state forest land is accessed by roads that go through privately owned forest land. Legal easements are necessary when these roads are used to haul logs from timber sales or for other forest management activities. The ODF has acquired easements for many roads, and the acquisition of other easements is still required. Depending on the district's needs and the private owner's desires, easements can be temporary or permanent, and allow either public use or use only by the agency's employees and contractors.

The ODF policy on forest roads states that roads will be developed and maintained to provide access for the sale of timber and other forest products, for timber management activities, for protection from fire, and for public access. It also states that forest roads will be designed, constructed, and maintained to meet or exceed rules of the Forest Practices Act (FPA). These rules set construction and maintenance standards intended to protect water quality, forest productivity, and fish and wildlife habitat. In addition to establishing the policy, the ODF *Forest Roads Manual* sets road standards, gives design guidelines, sets an excavation and appraisal policy, and provides a wide variety of specifications and costs (Oregon Department of Forestry 2000).

The district's total system of mainline roads, collector spurs, and minor spurs currently consists of about 550 miles of single-lane roads with turnouts. A portion of the district's mainline roads were built in the late 1930s and 1940s by the Civilian Conservation Corps. The remaining mainlines and collector spurs were primarily built in the 1960s and 1970s to access timber sale units. Many of these roads were constructed with inadequate drainage systems, poor surfacing, and little regard for slope stability and fish passage. Over the past 20 years, many of these roads have been upgraded, and now have improved width, alignment features, rock surfacing, and drainage structures that provide for water management and fish passage. This road system will be maintained and expanded over time as necessary to access future harvest operations.

Elliott State Forest forest roads and private roads with easements are maintained under a road maintenance contract or by contractors as a requirement of a timber sale contract. District personnel monitor road use, determine maintenance needs, and develop maintenance plans. These plans include road surface maintenance (grading and rock application), ditch, waterbar and culvert maintenance, roadside vegetation control, storm monitoring, and damage repair.

In general, the district road network can be divided into the following categories and subcategories:

Open Road/Active Use—This category includes any road open for travel with a motorized vehicle. It includes permanent roads and also temporary roads that are currently in use or will be used in the near future. These roads are usually available for use at any time of the year.

Use may be continuous or intermittent. Roads in this category require active maintenance and have a full maintenance obligation under the FPA.

Restricted Access Road—Most roads identified as being suitable for decommissioning have been decommissioned.

This group includes two sub-categories of roads closed to vehicle use and requiring maintenance under the FPA.

- **Closed Road**—These roads have restricted access for part or all of the year. This involves placing a semi-permanent barricade at the start of the road. This barricade can be a gate, large boulders, stumps and logs, or a trench. This strategy does not significantly alter the nature of the road, and the obligation to maintain the road remains. Road maintenance needs and sediment loads are reduced due to the elimination of traffic-related wear.
- **Partially Vacated Road**—Partial vacation involves barricading the road and installing minor drainage structures, which might include the construction of water bars or rolling dips. This strategy is best suited for roads that will be needed again after long periods (perhaps as much as 15 to 20 years) of inactivity. Ridge-top roads or other roads where drainage and sediment issues are negligible are good candidates. The nature of the road may be altered somewhat through the addition of waterbars and other drainage structures, but the obligation to maintain the road remains. Sediment loads are reduced due to the elimination of traffic-related wear, and road maintenance needs are greatly reduced.

Retired Road—This group includes two sub-categories of roads not available for vehicle use and not requiring maintenance under the FPA.

- **Fully Vacated Road**—Full vacation involves removing all stream crossing structures, installing maintenance-free drainage (outsloping, water bars, rolling dips, etc.), pulling back any sidecast material, seeding grass on disturbed soil, and barricading the road. The road is effectively "put to bed." All access is prevented, and there is no maintenance obligation. Cross-drain culverts may be left in place, but will not be considered as a functional drainage feature.
- **Abandoned Road**—These roads are no longer used or maintained, but have not been formally vacated according to FPA standards. These roads were generally constructed, used, and abandoned prior to the advent of the FPA, and are unavailable for use due to encroaching vegetation or road failures preventing vehicle use.

The roads in these last two categories are predominantly short spur roads and some collector spur roads. These roads are closed to reduce or minimize vandalism, dumping, operational conflicts, road wear, water quality impacts, and maintenance costs.

The Open and Restricted Access Roads have been classified into three separate road use standards as defined in the *Forest Roads Manual* (Oregon Department of Forestry 2000), pages 3-6 and 3-7. These standards provide guidance on how roads are constructed, improved, and maintained, and are defined below:

Low Use Standard—These are individual short spur roads designed primarily for pickups and log trucks. Low use roads generally provide access to a single harvest unit. Their use is short term and may be temporary. They may be seasonal or open year-round. Use may be heavy during periods of log hauling but minimal at other times.

Medium Use Standard—These are longer spur roads designed primarily for pickups and log trucks. Medium use roads may provide access to several harvest units, and are often referred to as collector spurs. They may be seasonal or open year-round. Their use is more permanent.

High Use Standard—These are longer roads designed for all types of traffic, including large equipment. High use roads are generally permanent, can be used year-round, and provide access to large areas. They are referred to as mainline roads.

Table C-2 shows the approximate number of miles by road use standard.

Table C-2
Coos District Road System

Road Use	Standard Miles
Low use	277
Medium use	160
High use	113
Total Miles	**550**

A Road Hazard Assessment survey was conducted on the forest in 1996 to 1997. This information was gathered to identify areas of concern, prioritize needed repairs, and plan road management activities. This survey did not include enough detailed information about the road system to be useful for the long term. Therefore, another detailed inventory will be conducted in the near future. The following information has been gathered through geographic information system and a portion of the road hazard assessment.

- Approximately 57 percent of the roads are located on ridgetops, 33 percent mid-slope, and ten percent in the valley bottoms or streamside.
- Of the active and restricted access roads in the forest, 52 percent are surfaced to an All-Weather standard. A large portion of the remaining roads have had surfacing applied in the past, but will not support All-Weather traffic at present.
- The forest has 22 permanent rock stockpile locations. This rock is primarily used for the maintenance of the surfacing on the mainline roads.
- There are approximately 16 miles of fully vacated road on the forest. There are also a few abandoned roads in the forest, which are not accounted for in the vacated miles total.
- There are approximately 2,050 culverts installed across the roads in the forest. Of those, approximately 475 are located at stream crossings. Of the stream crossings (culverts or bridges), 85 percent are on non-fish-bearing streams, and 12 percent are on fish-bearing streams. Most of the fish-bearing crossings, that had barriers to fish

passage, have been upgraded with fish passage pipes in the last few years. The remaining crossings that have barriers will be systematically corrected in the near future.

- A large portion of the remaining non-stream crossing or ditch relief culverts are new. This is due to an aggressive road maintenance program that replaced old culverts or inserted new culverts where they were needed in order to disconnect ditch runoff.
- There are 18 bridges on the roads in the forest. One of these, a railcar bridge, is closed to traffic because it has been deemed unsafe. The remaining bridges are all in operable condition.

The type and level of road activity that will occur during the planning period is discussed in Chapter 8, Section 8.3.2.2 Minimization and Chapter 5, Section 5.6.7, Employ Slope Stability Management.

C.6.3. Recreation

Recreation use within the Elliott State Forest is concentrated in several small areas. The rest of the Elliott State Forest has little recreation use. The heaviest use occurs on long holiday weekends in the summer, and during deer and elk hunting seasons in the fall. Most forest visitors are local residents who like the forest because it is undeveloped and relatively unregulated, with little competition for favorite sites. Future demand will be moderate for the recreation activities currently popular.

The Elliott State Forest provides numerous areas for dispersed camping along roads and streams. Popular areas include Elk Creek and the West Fork of the Millicoma River. Use levels at other sites throughout the forest vary widely. The BLM operates the Loon Lake Recreation Area near the northeast border of the forest. This recreation area is one of the more popular destination sites in the Reedsport vicinity, with an average of 70,000 to 80,000 visitors each year.

Some visitors to the Elliott State Forest use old skid roads and trails for preseason scouting and hunting in off-highway and four-wheel drive vehicles. Most people use existing roads, many of which have been blocked off to regular vehicle activity. There is also some summer use of motorcycles and all-terrain vehicles.

Horse riding, hiking, picnicking, and mountain biking occur across the forest, but in lower to moderate levels. Hiking and mountain biking trails have not been developed, as use is fairly infrequent.

Winter steelhead fishing is popular on the West Fork Millicoma River. The Salmon Trout Enhancement Program created an increase in steelhead fishing opportunities at the Millicoma Interpretive Center.

Most recreational hunting in the forest occurs during the big game hunting season, which begins in late August and continues through November. Recreational shooting occurs throughout the forest, but few people participate in this activity due to concerns about public safety.

A small number of people use the forest for other specialized activities. Kayakers use the West Fork Millicoma River. Sightseers use the backcountry roads. School groups, universities, and forestry organizations also use the forest for various educational tours. The Millicoma Interpretive Center, which is managed by Oregon Department of Fish and Wildlife (ODFW), is used heavily by school groups.

C.6.4. Scenic Resources

State Highway 38 is designated as scenic for the purpose of visual corridor management, and is adjacent to state forest lands in the Elliott State Forest. The visually sensitive corridor is defined as the area within 150 feet of the outermost right-of-way boundary along both sides of the highway. Special rules apply to timber harvest in this corridor. Due to public safety concerns with regard to landslides, a much wider area along this highway is off limits to any harvesting activities.

Two state forest land management classifications are used to designate areas for visual sensitivity. Where legal requirements or the management of visual resources dominates over the management of other resources, the lands are classified as Special Stewardship–Visual. Where the management of visual resources allows for integrated management of other resources, but is subject to legal restrictions, supplemental planning, and/or modified management practices, the lands are classified as Focused Stewardship–Visual.

On private lands between the river and the Elliott State Forest, the lower Umpqua River along Highway 38 and its immediate visual foreground is protected either by Department of Transportation-owned scenic buffers or by scenic statutes and FPA rules. For areas farther back from the highway but still visible from the road, which are considered mid-ground scenic areas, many acres of the Elliott State Forest are designated as Special Stewardship–Visual. This means that harvesting is only allowed to enhance the visual characteristics of the forested landscape and/or viewshed. The background areas adjacent to these lands are classified as Focused Stewardship–Visual. Management activities for these areas are adjusted for visual considerations.

C.6.5. Timber

Conifer forest covers most of the land in the Elliott State Forest. Before these lands became state forests, large fires killed or removed most of the older conifer forests. About half of the conifer stands in the forest are more than 85 years old.

Other types of vegetation dominate the remaining acres, including grass, brush, and various species of hardwood trees, such as alder and bigleaf maple. All resource information in this section is based on the Stand Level Inventory Program inventories as of December 2004.

Forests are naturally divided into stands—areas of five to several hundred acres occupied by trees or other vegetation similar in age, stocking, size, and species. Each stand is identified, mapped, and described in the ODF inventory. The inventory recognizes three main types of stands:

- **Conifer Stands**—These stands occupy most of the Elliott State Forest. The ODF classifies as conifer stands those in which conifer species compose 30 percent or more of the tree canopy. Although conifers are the principal species with economic value in these stands, the stands may also include substantial amounts of other vegetation types such as hardwoods, brush, grass, and ferns, which contribute to a diverse forest ecosystem. These types are either intermixed with the conifers or are in clumps too small to map and inventory separately.
- **Hardwood Stands**—These stands are found on a minority of Elliott State Forest lands. The ODF classifies as hardwood stands those in which hardwood species constitute more than 70 percent of the tree canopy.
- **Unclassified Stands**—These stands are currently under contract for harvesting, or have already been harvested and will be planted soon.

When forest management activities were started in the Elliott State Forest in the 1950s, the forest predominantly consisted of Douglas-fir, with a minor component of other conifers (mainly hemlock and very small amounts of Western red cedar and Sitka spruce). On most Elliott State Forest timber sales, the volume of these other conifers has been less than five percent of the sale volume. It is estimated that, when management began in the Elliott State Forest, less than ten percent consisted of hardwoods, and much of that acreage was located in riparian areas. Most of the riparian hardwoods are red alder, with lesser amounts of bigleaf maple and myrtle. A higher amount of red alder is located in the Marlow Creek drainage, which was railroad logged in the 1920s to 1930s. Significant amounts of myrtle exist on south slopes in the western half of the Elliott State Forest. Other native hardwoods in the Elliott State Forest include very small amounts of bitter cherry, cascara, madrone, chinquapin, and dogwood.

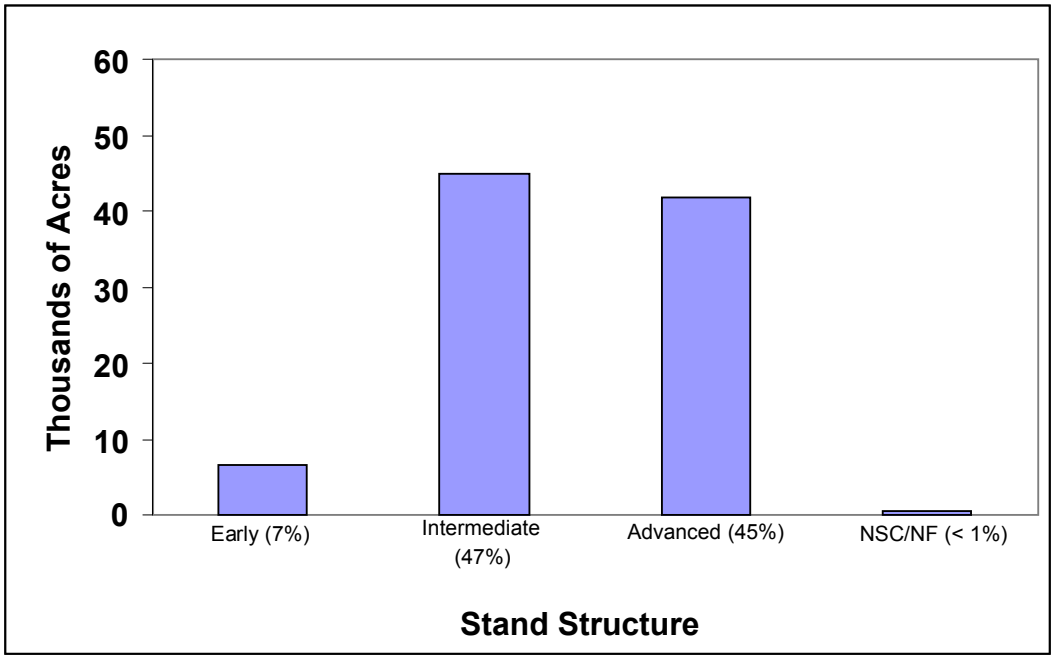
C.6.6. Forest Stand Structure: Current Condition

The current stand condition for the contiguous Elliott State Forest (93,282 acres is displayed in Figures C-1 and C-2.

Figure C-1 shows the current stand structure, acreage, and percentage. The current stand structures in the contiguous Elliott State Forest were determined by aerial photograph interpretation, coupled with Ownership, Site, Cover, Use, and Recommendations inventory and the newer Stand Level Inventory information. The Stand Level Inventory data represent the best stand structure information (e.g., information on understory species composition, nonmerchantable tree species, layering).

Figure C-2 shows the current age distribution of the Elliott State Forest, regardless of structure, by acreage and percentage.

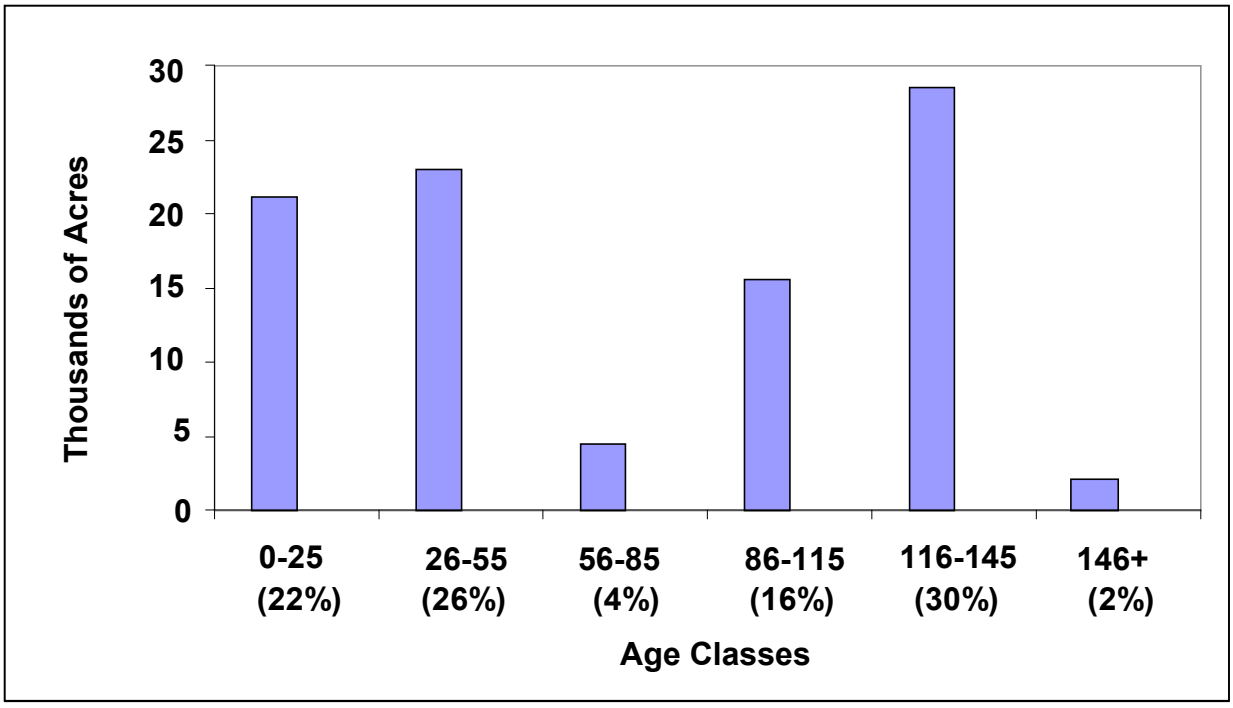
Figure C-1. Current Stand Structure, by Acres and Percent



SUMMARY OF FOREST STRUCTURE

Forest Structure	Early	Intermediate	Advanced	NSC/NF	Total
Acres	6,898	44,090	41,716	578	93,282
Percent	7%	47%	45%	<1%	100%

Figure C-2. Stand Age Distribution, by Acres and Percent



SUMMARY OF STAND AGE CLASSES							
Age Class (years)	**0-25**	**26-55**	**56-85**	**86-115**	**116-145**	**146+**	**Total**
Acres	20,734	24,253	3,731	14,925	27,985	1,654	93.282
Percent	22%	26%	4%	16%	30%	2%	100%

C.7. CURRENT CONDITION ANALYSIS

C.7.1. Stand Structures Interaction

The Current Condition Analysis and the Landscape Design sections of this HCP describe the amount of each of the identified forest stand types. As described in the FMP, the stand types represent only three points along a continuum of forest development. Three stand types were developed as a means of planning for and assessing the development of the forest toward a range of forest types over time. Because the three types are only points along a continuum, they do not express three specific habitat types nor are they perceived as discrete habitats by wildlife species. This is discussed in detail in Appendix C of the FMP.

The following concepts involve the current condition and desired future condition of the Elliott State Forest as they relate to wildlife habitat. Appendix C of the FMP contains more detail.

Three fundamental landscape patch types exist for wildlife. Table C-3 compares these three patch types to the stand types described in the FMP.

Table C-3
Comparison between Landscape Patch Types and Stand Types

Landscape Patch	Stand Type
Young forest	Early Structure
Pole-sized forest	Intermediate Structure
Mature forests	Intermediate and Advanced Structures

In examining the current and desired future conditions described by stand types, it is important to consider the combinations and aggregations of different stand types that function together to provide the benefits for each of the three broad patch types used by wildlife.

The entire array of all stand types has not been depicted because it is virtually impossible to predict how each stand on the landscape will develop over the next several decades. By focusing on where the development of layered and older forest structure stands are anticipated, the local manager is provided with the management blueprint necessary to move the landscape in the desired direction. Future adjustments will undoubtedly be required as natural disturbances, insects, and disease (or other factors) result in the failure of some stands to develop in accordance with management plans.

C.7.2. Hardwoods

In the 1950s, when forest management activities started in the Elliott State Forest, the forest predominantly consisted of Douglas-fir, with a minor component of other conifers (mainly

hemlock and very small amounts of red cedar and Sitka spruce). With most Elliott State Forest timber sales, the volume of these other conifers has been less than five percent. It is estimated that, when management began in the Elliott State Forest, less than 10 percent consisted of hardwoods, and much of this was in riparian areas. Most of the riparian hardwoods are red alder, with lesser amounts of big leaf maple and myrtle. A higher amount of red alder is located in the Marlow Creek drainage, which was railroad logged in the 1920s to 1930s. Significant amounts of myrtle exist on south slopes in the western half of the forest. Other native hardwoods include very small amounts of bitter cherry, cascara, madrone, chinquapin, and dogwood.

Under the FMP, a significant hardwood component will be located in riparian areas and threatened and endangered cores (T&E cores), and in other areas of the forest designated as advanced structure. In addition, hardwoods will be retained as an important component of live tree retention, with a particular emphasis on the less abundant myrtle and big leaf maple, which are especially important to wildlife. In addition, a certain amount of red alder that exists in current plantations and that will seed into new regeneration harvests will be retained in these stands. Overall, the strategy for hardwoods is to retain about the same amount and composition of species as was present in the forest when the FMP was first implemented. ODF estimates that approximately 10 percent of the forest is in the hardwood cover type. However, much of the hardwood forest occurs as small patches or riparian stringers within larger stands of conifer forest, and thus does not appear as hardwood stands in the forest inventory. Hardwood stands are defined as having at least 70 percent of the canopy composed of hardwoods.

C.7.3. Early Structure

Early structure covers 6,898 acres, or seven percent of the contiguous Elliott State Forest. The desired future condition target for early structure is 5 to 15 percent. This structure is currently characterized by young, even-aged Douglas-fir plantations resulting from recent clearcut harvests. These stands have two main trajectories: the first is a young clearcut harvest where high densities will be maintained throughout the life of the stand with the primary purpose of revenue production. The second is to an advanced structure stand. Stands with this trajectory will have several thinnings to promote a diverse stand structure. Some early structure stands will be tagged for an advanced structure trajectory, but for many this designation will wait until an intermediate structure is reached.

C.7.4. Intermediate Structure

The intermediate structure accounts for 44,090 acres, or 47 percent of the contiguous Elliott State Forest. The desired future conditions target for intermediate structure is 25 to 55 percent. This structure is characterized by the closed crowns of the overstory trees, which prevent light from reaching the majority of the forest floor. This low light level precludes the natural regeneration of both brush and shade tolerant tree species, thus leaving the forest floor sparsely vegetated. Overstocking results in competition for light, water, and nutrients, often leaving the stand susceptible to insects, disease, wind, or fire. Of all the structure types, this type is least used by wildlife species, especially those requiring more complex habitats.

In the Elliott State Forest, this stand type is typically in the 16- to 65-year-old age class; most conifer stands in this stand type are the result of planted and managed stands. This type also encompasses mature forest types that do not have the structural components of advanced structure. Hardwood stands in this stand type, on the other hand, are naturally regenerated. A portion of stands in this class are mixtures of managed stands with areas of low stocking that naturally regenerated in alder. Intermediate stands have two potential pathways. The first path is to a clearcut harvest as intermediate structure, and the second path is to advanced structure. Those stands designated for clearcut harvest will not receive thinnings. Clearcut harvest will occur in the 40- to 50-year age range to maximize return. The remaining stands designated for advanced structure will require one or more thinning entries.

C.7.5. Advanced Structure

The advanced structure currently covers 45 percent, or 41,716 acres of the contiguous Elliott State Forest. The desired future condition target for advanced structure is 40 to 60 percent. The advanced structure stand type is the result of continued growth and development of the intermediate stand, and is therefore more complex in vertical canopy arrangement. In addition, the vertical layering offers a diverse array of habitat niches for more complex shrub and herb plant communities as well as wildlife species. Most of the advanced structure is the result of the 1868 Coos Bay fire, and is 120 to 130 years old. A portion of the advanced structure, mostly located in the Marlow creek drainage, is in the 65-year age class, and developed after early logging in the 1920s to 1930s. A small portion of the advanced structure is considered old growth, and these stands are in reserves. For this HCP, advanced structure stands have at least 20 trees per acre of 18 inches or larger diameter breast height (DBH) and 100 feet or more in height. Ten overstory trees per acre are at least 24 inches DBH. Understory trees average 30 feet in height. Unless located in reserves, advanced structure will be designated for clearcut harvest when a surplus is attained in the basin.

C.7.6. Non-Silviculturally Capable

Non-silviculturally capable lands do not constitute a significant acreage (approximately 517 acres are in this classification). These lands are characterized by geologic and hydrologic conditions unsuitable for the commercial growth and harvest of forest tree species. Geologic conditions include rock cliffs, talus slopes, rock slopes and outcroppings, and other substrate conditions incapable of supporting forest tree species. Hydrologic conditions include floodplains, marshes, beaver ponds, and other aquatic conditions that prevent the growth of trees. These lands provide for plant and animal communities not associated with the other forest structures. These lands are not considered part of the commercial forest land base, and will not be managed for the growth and harvest of forest tree species.

C.8. CURRENT STREAM CONDITIONS

C.8.1. Water Quality

C.8.1.1. Temperature

Maximum water temperature is often expressed as the greatest seven-day running average of the maximum daily temperature. The Oregon Department of Environmental Quality (DEQ) adopted 64º F (17.8º C) as the maximum seven-day water temperature that generally applies to forested streams in the summer. Water temperature records were available for 14 sites in the West Fork Millicoma Basin (1996, 1997, or 1999) and 7 sites in the Tenmile Lakes Basin (2002). No temperature data are available for Elliott streams in the Umpqua Basin. Ten of the sites in the West Fork Millicoma Basin exceeded the DEQ temperature standard, and three in Tenmile Lakes Basin exceeded the DEQ water quality standard (Oregon Department of Forestry 2003c). The greatest annual seven-day average maximum water temperature in the Coos system was 76.1º F (24.5º C) degrees, recorded on the West Fork Millicoma. In the Tenmile region, Benson Creek had the highest recorded seven-day average maximum temperature at 70.2º F (21.2º C).

Habitat surveys conducted in the Elliott State Forest have revealed a moderate to high level of riparian shade along streams in all three regions of the forest (Kavanagh et al. 2005). Current management practices retain all vegetation within 100 feet of perennial fish-bearing streams and 50 feet of perennial non-fish-bearing streams. Streams exposed to full sunlight years ago when riparian areas were not protected from harvest have grown back to dense stands of trees (Oregon Department of Forestry 2003c).

The best available data demonstrate that many streams do not meet DEQ water quality standards. This condition may not be the direct result of low shade levels in the Elliott State Forest as, overall, streams have been found to be well shaded. In some specific cases, there may be areas of low riparian shade that elevate water temperature in a stream. Given that observed shade levels on the forest were generally not within the low classification, observations of high stream temperature may be a function of other factors. For example, stream temperature is generally expected to increase in a downstream direction from the drainage divide. This distance ranged from 1.9 miles to 35.9 miles for the monitoring locations in the Elliott State Forest. Hyporheic flow may also reduce stream temperatures. A lack of gravels in the monitored reaches may also contribute to high stream temperatures.

C.8.1.2. Suspended Sediment

Based on ODFW aquatic habitat surveys conducted in the Elliott State Forest from 1993 to 2004, average percent fines within riffle habitats was approximately 12 percent forestwide. Thirty surveyed reaches covering 40 kilometers in the Tenmile Lakes region averaged 18 percent fines in riffles. In the Umpqua basin, 31 reaches were surveyed, covering 43 kilometers with an average of 8 percent fines, and the Coos basin averaged 13 percent fines in 117 reaches over 206 kilometers (Kavanagh et al. 2005).

The amount of fine sediment embedded within riffle habitat was considered moderate (8 to 22 percent) for the Tenmile and Coos regions, while the Umpqua region met the desirable value (less than 8 percent) in comparison to similar reference reaches.

C.8.1.3. Dissolved Oxygen

Information on dissolved oxygen (DO) is scarce for streams in the plan area. DO data for six sites were collected between 1994 and 1999. Expressed as percent saturation, oxygen levels ranged from 87 to 100 percent (morning and afternoon combined) and represent favorable summer rearing conditions for fish. No data are available for the fall, which is the time most likely to experience DO problems due to low stream flows combined with the decay of leaves and algae (Oregon Department of Forestry 2003c).

There are no known data sources for intergravel DO in the Elliott State Forest to monitor the re-aeration capacity of gravels. Based on a limited amount of surface water DO samples, this water quality indicator is assumed to be properly functioning.

C.8.1.4. Nutrients

The Elliott State Forest watershed analysis (Biosystems et al. 2003) reports nutrient data collected by various agencies for seven sites in the forest. Summer orthophosphate levels were extremely low, ranging from less than the detection limit of 0.005 milligrams per liter to a maximum of 0.012 milligrams per liter. The lack of phosphorus likely limits nitrogen uptake by algae. Accordingly, summer nitrate plus nitrite concentrations are more variable, ranging from 0.04 milligrams per liter to 0.56 milligrams per liter. These values are sufficiently low that potential effects of eutrophication are not a concern in the Elliott State Forest.

Tenmile Lakes are somewhat unique in that the streams and associated sediment flow into the lake system. Sediment with phosphorus attached is deposited in the lake in the winter. Some of this phosphorus can enter the water column during the summer if DO levels on the lake bottom are low. Increasing the available phosphorus in the lakes has the potential to accelerate algae growth (Oregon Department of Forestry 2003c). This lake system is currently listed as a water quality listed stream by the DEQ for "aquatic weeds or algae." Tenmile Lakes are not within the Elliott State Forest, but the Tenmile region drains into the lake system.

C.8.1.5. Chemical Contamination

Herbicide use in the Elliott State Forest averaged approximately 550 acres per year during the 1999 to 2002 period. Most of these acres were treated with a combination of glyphosate and imazapyr. These chemicals are typically applied aerially during dry weather in September. Other chemicals used in a limited capacity during this period include: clopyralid, triclopyr, sulfometuron, and 2,4-D.

No studies have been conducted in the Elliott State Forest to monitor chemical concentrations in streams following treatments. Monitoring of similar application techniques in western Washington showed glyphosate concentration within streams typically at 0.03

percent of the 50 percent lethal toxicity concentration (LC50) for salmonids. The concentration of imazapyr was approximately 0.001 percent of the LC50 concentration for salmonids (Oregon Department of Forestry 2003c).

Insecticides and fungicides have not been used in the Elliott State Forest, and there is no anticipated need for these chemicals in the near future.

C.8.2. Habitat Access

Many of the significant artificial fish migration barriers in the Elliott State Forest have been replaced or removed. The ODF is working to address the remaining barriers over time. The 2003 watershed analysis identified 32 barrier culvert sites in fish-bearing streams. Five of these sites had been removed and the road decommissioned. Two of the sites had been washed out during high flows and not replaced. Eleven culverts were recently replaced and are expected to provide fish passage. There are 14 older culverts in place that pose some level of barriers to fish passage. Seven had a two-foot or higher outlet drop, four percent or greater gradient, or an upswept inlet creating a barrier to fish passage. The remaining culverts may have conditions less severe, but also delay passage seasonally based on water flow. Not all of the fish-bearing streams have been identified, so the actual number of culverts on fish streams is likely larger than presented in the ODF watershed analysis (Oregon Department of Forestry 2003c). According to the Streamnet barrier database, artificial barriers restrict access to approximately three miles of habitat. Fish passage will be provided for adult and juvenile fish at all stream crossing installation or replacement projects conducted in streams historically inhabited by native migratory fish.

A number of natural barriers exist in the forest that prevent or delay fish passage. Fishways have been constructed at two of these sites (Elk Creek and Stulls Falls) to facilitate fish passage at a greater range of stream flows. It is unlikely that any additional fishways will be constructed to address natural barriers.

C.9. HABITAT ELEMENTS

C.9.1. Substrate Character/Embeddedness

Based on ODFW aquatic habitat surveys conducted in the Elliott State Forest from 1993 to 2004, the average amount of gravel within riffle habitats was approximately 41 percent forestwide. Thirty surveyed reaches covering 40 kilometers in the Tenmile Lakes region averaged 40 percent gravel in riffles. In the Umpqua basin, 31 reaches were surveyed, covering 43 kilometers, which averaged 34 percent gravel in riffles. The Coos basin had 117 reaches surveyed over 206 kilometers and averaged 45 percent gravel in riffles (Kavanagh et al. 2005). In a number of streams, minimal gravel retention likely was associated with low levels of large wood present to retain gravel. The wide channels of the West Fork Millicoma have limited amounts of large wood, and also have minimal amounts of gravel retention. Overall, the amount of gravel in the streambed was considered moderate for all three regions in comparison to the identified reference streams.

The ODFW surveys also estimated the percent of substrate composed of bedrock. Forestwide, bedrock averaged 19 percent of the surveyed reaches. Broken down by basin, percent bedrock was 21 percent in Tenmile lakes, 14 percent in the Umpqua, and 19 percent in the Coos basin. This high level of bedrock composition was one of three primary areas of concern identified in the aquatic habitat surveys (Kavanagh et al. 2005). All three regions fell within the undesirable range (more than 11 percent) compared to reference streams. Stream reaches with large amounts of bedrock typically have less spawning habitat and less complex habitat available for rearing juveniles.

C.9.2. Large Woody Debris

Wood volume in forest streams with an active channel width less than 40 feet averages 28 percent in nearby reference streams bordered by 88- to 118-year-old timber, and 14 percent in those reference streams within old-growth timber. The West Fork Millicoma and Mill Creek, two of the largest streams in the Elliott State Forest, have very little wood other than areas where wood was recently added to improve habitat. Spawning habitats in the Elliott State Forest are impacted by the limited amounts of wood available to help retain and sort gravels (Biosystems et al. 2003).

Large key pieces of wood in the stream channel are an important base for forming complex pools and habitat. ODFW aquatic habitat surveys define key pieces of wood as those greater than 0.6 meter (24 inches) in diameter and greater than 12 meters (39 feet) long. Based on reference streams similar to the Elliott State Forest with low amounts of human-associated impacts, a moderate level of key pieces of wood is within 0.5 to 3 key pieces per 100 meters. The forestwide average of surveyed streams in the Elliott State Forest was approximately 1.1 key pieces per 100 meters, with a median at 0.3 key pieces per 100 meters. By basin, the number of key pieces averaged 1.2 per 100 meters (median 0.5) in Tenmile Lakes, 0.2 per 100meters (median 0.2) in the Umpqua, and 1.3 per 100 meters (median 0.4) in the Coos (Kavanagh et al. 2005).

The low level of large wood in the channel was one of three primary areas of concern identified in the aquatic habitat surveys (Kavanagh et al. 2005). Many restoration projects in recent years have been implemented to add wood to streams in the Elliott State Forest. Increasing instream large wood will create more opportunities to retain gravel in bedrock dominated substrates and improve rearing habitat by creating more complex cover.

C.9.3. Pool Frequency and Quality

Pool habitat is considered a good indicator of aquatic habitat quality. Based on ODFW aquatic habitat surveys conducted in the Elliott State Forest from 1993 to 2004, the average percent pool area was 34 percent in Tenmile and 27 percent in the Coos region, both achieving a moderate abundance level. Pool abundance in the Umpqua averaged 15 percent and is considered low in relation to reference streams. A moderate level of pool abundance in this area is considered between 19 percent and 45 percent (Kavanagh et al. 2005).

Surveyed stream reaches less than four percent gradient in the Elliott State Forest in the Coos Basin averaged 27 percent pool area, and 4.7 pools per mile considered complex due to the presence of at least three pieces of wood. The Tenmile Basin averaged 40 percent pool area and 9.7 complex pools per mile. The Umpqua Basin surveys found 25 percent of the stream area in pool habitat, with 3.2 pools per mile considered complex. While a number of streams had desirable pool habitat quality, most of the stream reaches had pool habitat values below their potential. The current low levels of large wood contribute to the lower pool area and complexity (Biosystems et al. 2003).

Pool habitat on the forest is relatively simple, with low to moderate amounts of large wood present.

C.9.4. Deep Pools

Deep pools are at least one meter deep according to ODFW survey methodology. These pools are valuable for adult holding areas, and may provide temperature refugia during the summer. Based on ODFW aquatic habitat surveys conducted in the Elliott State Forest from 1993 to 2004, the forest averaged one deep pool per kilometer. By basin, this figure was 0.5 deep pool per kilometer in the Tenmile Lakes basin, 1.2 deep pools per kilometer in the Umpqua, and 0.6 deep pools per kilometer in the Coos region (Kavanagh et al. 2005). These figures all fall within the moderate range (zero to three) in relation to reference streams. Although the Umpqua had a low level of pool abundance, as discussed previously, the number of deep pools reached the moderate classification range.

C.9.5. Off-channel Habitat/Refugia

The aquatic inventory data were incorporated into two different models to generate an assessment of conditions for coho salmon. The Habitat Limiting Factors Model focuses on the availability and type of pool habitat, particularly the amount of beaver pond and off-channel habitat that is important for winter refuge during high flows. The HabRate model considers the complexity of habitat, incorporating a combination of structural components

such as large wood, big substrate, and undercut banks, as well as gradient, secondary channels, and pool habitat.

These model runs suggest that winter rearing might be the primary factor limiting coho salmon production in the Umpqua and Coos regions of the Elliott State Forest. The capacity and quality of winter habitat in all three regions was rated low by the Habitat Limiting Factors Model. Joes Creek was an exception to this situation. It was the only stream to receive a high rating for both winter capacity and quality. The HabRate model identified a few more streams in the upper Millicoma and Palouse Creek as moderate and high-quality reaches. Downstream habitats off the Elliott State Forest are likely important to the winter survival of juvenile fish. The Tenmile Lakes region is unique in that it offers a large coastal lake environment for rearing. Coho returns in this region have remained relatively high, even with the introduction of Largemouth bass in the lakes that may prey on juvenile coho.

In contrast to the limited winter rearing opportunities, modeling suggests that high-quality spawning and summer rearing habitat is more plentiful in streams in the Elliott State Forest.

C.10. CHANNEL CONDITION AND DYNAMICS

C.10.1. Stream Bank Condition

Stabilized stream banks are valued in the aquatic environment as they are more likely to develop undercut banks, an important cover component, and contribute less turbidity than actively eroding banks. Stream bank stability has not been specifically analyzed in the Elliott State Forest. Undercut banks are a component of the HabRate model, discussed in Section C.9.5. According to this model, high-quality spawning and summer rearing habitat is present in the Elliott State Forest, but winter rearing opportunities are limited.

Current management practices utilize a 100-foot no harvest buffer adjacent to perennial streams and 75 feet adjacent to intermittent fish streams. These riparian practices reduce the likelihood that harvest activities are impacting bank stability in fish-bearing streams.

C.10.2. Floodplain Connectivity

Many of the channels in the Elliott State Forest are confined, implying a concentration of streamflow and fluvial energy. Stream channels in narrow valleys are constrained from lateral movement by adjacent hillslopes or bedrock walls.

ODFW aquatic habitat surveys report the valley width index as the number of active channels that fit between the hillslopes across the valley floor. Valley width indices less than 2.5 are considered narrow valleys with stream channels constrained from lateral movement. Valley characteristics and channel morphology are especially significant during high-flow events. During high flows, streams are more likely to form secondary channels in broad valley floors that provide important resting and over-winter habitat for fish.

Of the 117 reaches surveyed in the Elliott State Forest since 1993, 71 (61 percent) were considered constrained. The Tenmile Lakes region had the smallest percent of confined channels at 50 percent. The Coos (64 percent) and Umpqua (65 percent) regions are more laterally constrained and less likely to provide quality off-channel habitat for winter refuge.

The primary management action that could reduce floodplain connectivity is road building. As shown in Table C-4, the Elliott State Forest road system is predominantly installed on ridgeline and mid-slope locations. It is unlikely that roads located in upland areas are responsible for decreasing floodplain connectivity. Approximately 4.4 percent of the roads are located within 100 feet of a stream channel, and are likely preventing some stream areas from interacting with a floodplain. Current road management practices call for avoiding the installation of roads in the riparian area.

Table C-4
Elliott State Forest Roads Located by Landscape Position

Fifth Field HUC	Road Miles (percent)			
	Riparian	Valley	Mid-slope	Ridge
Lower Umpqua	2.7 (3.5%)	0.8 (1.0%)	23.7 (30.2%)	51.2 (65.3%)
Mill Creek [1]	2.6 (4.6%)	4.4 (8.0%)	20.8 (37.8%)	27.8 (50.5%)
Tenmile Lakes	0 (0%)	1.9 (20%)	30.2 (30.5%)	67 (67.5%)
Coos Bay	1.2 (3.3%)	0.3 (0.8%)	10.3 (30.0%)	22.7 (65.9%)
Millicoma River	16.9 (6.3%)	21.6 (8.0%)	92.4 (34.3%)	138.2 (51.4%)
Forest Total	**23.3 (4.4%)**	**29 (5.4%)**	**177.5 (33.1%)**	**306.4 (57.1%)**

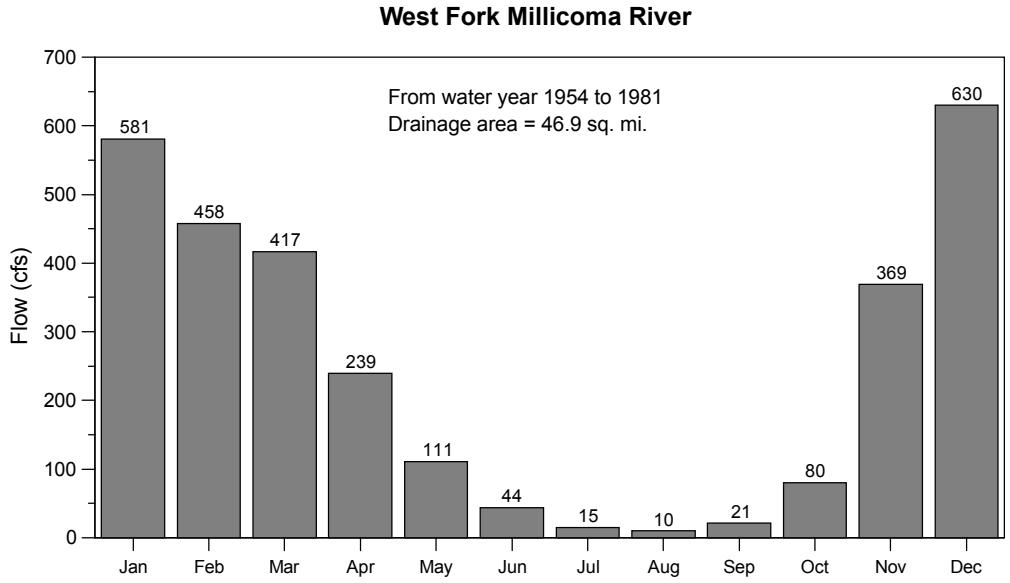
[1] Mill Creek includes 211 acres of the Middle Umpqua fifth field HUC (Biosystems 2003).

C.10.3. Flow/Hydrology

C.10.3.1. Change in Peak/Baseflows

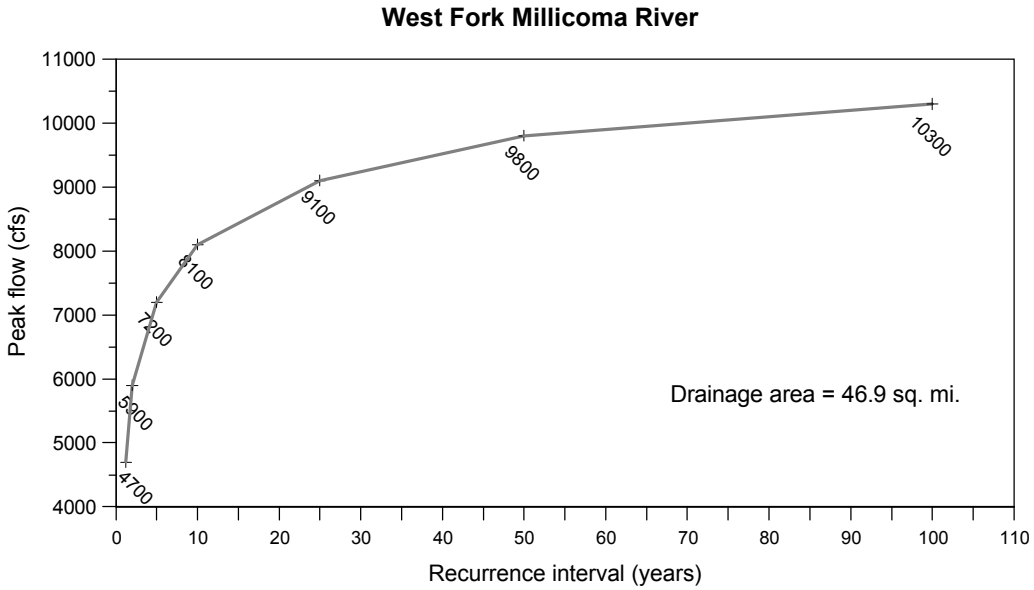
The West Fork Millicoma has the only gauging site on or near the Elliott State Forest with a record long enough to evaluate stream flow characteristics. Most of the land upstream from the gauge site is part of the Elliott State Forest. The average monthly flow from 1954 to 1981 was highest in December, with a flow of 630 cubic feet per second (cfs) and lowest in August at 10 cfs (Figure C-3). Unfortunately, no gauging data were available for a similar watershed without timber harvest that could be used as a control to examine how flows in the West Fork Millicoma changed over several decades of timber harvest and road construction (Biosystems et al. 2003).

Figure C-3. Monthly Flows for the West Fork Millicoma River



The peak flow associated with the 50-year recurrence interval was 9,800 cfs, or a unit flow of 208 cfs per square mile of drainage area for the West Fork Millicoma River (Figure C-4). This is typical for low elevation mountains of the central Coast Range (Biosystems et al. 2003).

Figure C-4. Relationship Between Peak Flow and Recurrence Interval for the West Fork Millicoma River.



Research on Pacific Northwest streams indicates that clearcut harvesting has the potential to increase peak and summer flow when a large percentage of the basin consists of early structure. Detectable changes in the streamflow regime are unlikely in basins with less than 20 to 25 percent of the land area in early structure (MFG, Inc. 2005). Basin 12 has the largest percentage of land in the early structure classification, at 17 percent in 2005 (R. Fields, personal communication, 2005).

At the Elliott State Forest or management basin scale, there are no data to suggest that changes in peak or baseflows due to timber harvest are currently occurring. Some individual small stream basins may experience a level of harvest that exceeds 25 percent, and could create a detectable change in the streamflow regime for that stream.

C.10.3.2. Increase in Drainage Network

There is no available information to assess increases in active channel length due to human caused disturbances related to roads, trails, conveyance ditches, compaction, or impervious surfaces that may lead to changes in stream flow regimes. The drainage network cannot be considered consistent with historic landscape conditions with the addition of the road system. However, the location of the roads, their proximity to stream channels, and the level of disconnection from the stream network have a large effect on whether or not the drainage network is extended.

The majority of the road system is established on ridgelines, with approximately 4.4 percent of the roads within 100 feet of a stream (Table C-4).

Roads in the Elliott State Forest are managed in accordance with the Forest Roads Manual (Oregon Department of Forestry 2000). Under this manual, roads are managed to minimize the disruption of natural drainage patterns through the following guidelines:

- Avoid increasing road mileage next to streams.
- Avoid increasing disturbance area associated with roads.
- Avoid increasing hydrologic connectivity to streams.
- Maintain or properly vacate roads not in use.

The road system in the Elliott State Forest is well maintained with improvements continuing to be made. Roads are generally located outside the riparian area, but some locations pose a risk to the aquatic environment, and the drainage network likely has been altered to some degree.

C.11. WATERSHED CONDITIONS

C.11.1. Road Density and Location

The road system in the Elliott State Forest is relatively old and in place. Approximately 1.5 miles of road are built annually to serve new landings or harvest sites. The age of this road system has allowed weak sections of road to fail. These areas are identified through routine maintenance, and then are upgraded and maintained, which contributes to the current infrequency of road-related landslides. This older road system has stabilized through time, but remains subject to fill failures due to road location, road drainage malfunctions, and sections of roadways remaining with side-cast construction. Studies in the Elliott State Forest indicate that interior roads were fairly stable during large precipitation events, such as the 1996 storm, but that the potential for a road fill failure delivering sediment to fish-bearing streams is a concern for some legacy roads that do not meet current standards.

A number of roads and road segments are identified for improvements to benefit water quality, but current maintenance practices generally keep roads in good condition (Oregon Department of Forestry 2003c).

Table C-4 lists the miles and percent of roads located by landscape position. Riparian roads are those within 100 feet of streams; valley roads are located in broad flat plains outside the 100-foot riparian zone; and ridgeline roads are those with less than 1/20 acre of upslope drainage. Mid-slope roads are those that do not meet any of the above criteria.

The majority of roads in the Elliott State Forest are situated on ridgelines, which are generally good locations to minimize fill failure hazards and the hydrologic connectivity between the road system and the stream system.

C.11.2. Disturbance History

Habitats typically vary in quality and quantity through a natural range of conditions as a result of large-scale habitat disturbances such as wildfires, floods, windstorms, tectonic uplift, mass wasting events, and debris flows. These natural disturbances have affected and created Oregon's forests for thousands of years. There is considerable debate about the frequency and magnitude of these events, and forest disturbance frequencies appear to vary considerably throughout Oregon's forests, based on location, climate, and ecosystem. The disturbance history of the Elliott State Forest is described in detail in the 2006 FMP. An overview of how past land uses have contributed to current habitat conditions in the Elliott State Forest is provided below. A more complete description is provided in the ODF Watershed Analysis (Biosystems et al. 2003).

Large stand replacing fires are thought to have occurred in the Elliott State Forest in 1850 and 1868. The fires consumed trees believed to have originated in the late 1650s (Oregon Department of Forestry 2003c). While not frequent (occurring approximately every hundred years), such large-magnitude catastrophic fires burned riparian vegetation, adversely

influencing various physical processes and functions of riparian zones and similarly influencing aquatic habitats.

The fires changed vegetative succession pathways. Periods of accelerated surface erosion and stream sedimentation likely followed the fires. As a large proportion of sediment discharged from the upper basins to storage locations in low elevation, fluvial channel environments on the Elliott State Forest may have been delivered in pulses from fire-driven events. However, the fires may also have contributed to cycling nutrients and stream substrates as well as the formation of the stream channel structure. The frequency of large stand-replacement fires in the Coast Range is typically on the order of centuries. With the advent of fire suppression, these frequencies are likely much longer today compared to a century earlier.

Streams in the Elliott State Forest generally experienced floods generated by high rainfall storm events. Floods have helped shape aquatic habitat in the Elliott State Forest by impacting channel morphology, sediment transport and deposition, and adjacent stream vegetation. Habitat quality for fish and other aquatic organisms is formed by the interaction of these elements. Channel forming flows are generally considered to occur in 2 to 2.5-year return intervals. Large catastrophic floods seem to occur every several decades to centuries.

The Elliott State Forest is in the direct path of large winter storms from the Pacific Ocean. Extreme windstorms hit the Coast Range in 1880, 1951 (blowing down 3.7 billion board feet of timber), and 1962 (the Columbus Day storm, when approximately 3 billion board feet of timber blew down) (Ruth and Yoder 1953). Less severe windstorms have also blown down trees along the edges of clearcuts, including riparian buffer areas. For the Coast Range, windstorms severe enough to cause substantial tree uprooting along clearcut edges have occurred in 1971, 1973, 1981, 1983, and 2002 (Oregon Climate Service 2003). Wind storms have shaped the Elliott State Forest by toppling trees, creating canopy openings, and changing vegetative succession. Aquatic habitats can be beneficially influenced following wind storms, with a pulse of downed wood levels across the landscape and in stream channels. However, salvage operations and stream cleaning activities prior to the 1980s removed much of this wood from the channel. As such, the riparian areas have diminished wood recruitment potential from windthrow without a corresponding benefit to in-channel wood loading levels.

Debris flows and dam-break floods are initiated by small landslides, but subsequently sustained by water and debris mass inertia. They may accumulate additional mass and volume as they travel downslope. These flows are capable of abrasive scour into bedrock. They also are capable of dislodging and transporting large boulders and wood down steep slopes. In general, debris flow return intervals in the Elliott State Forest are linked with rainfall precipitation events, and a typical event frequency is several decades to a half century. These types of flood events are common in the Elliott State Forest, and have had a direct influence on channel structures, riparian vegetation, and aquatic habitats. This natural process has redistributed both soil and wood downslope from the hillslopes to the channel systems. Similar to wildfires, a large proportion of sediment discharged from the upper basins to storage locations in low elevation environments in the Elliott State Forest may have been delivered in pulses from debris flows or dam-break floods.

Mass wasting events, like shallow-rapid landslides, are a natural occurrence in the Elliott State Forest, given the steep topography and highly dissected channel network. Landslides reaching stream channels can provide a source of coarse and fine sediment inputs and woody debris inputs to the channel network. The influence of landslides on a watershed scale, without the development of associated debris flows or dam-break floods, is generally localized. Aquatic habitats can be either beneficially or adversely influenced, depending on the level of sediment deposition. Fish spawning habitat in particular is dependent on gravel deposits and a well-sorted supply of gravels free of embedded fine sediments. Thick plugs of coarse sediment or high levels of fines are not desirable, and can reduce survival of developing fish. Channels need streambed structure such as large boulder clusters or large wood to store and stabilize the bedload of sediment inputs. Channel structure to retain the existing level of sediment inputs in the Elliott State Forest is currently lacking.

Through the 1970s, trees were commonly harvested along streams and yarded through streams. Timber harvest also was conducted on unstable slopes, and roads were often built along mid-slopes and frequently without adequate drainage systems. Removing large wood from streams was a normal course of timber harvest practices in the mid-1900s as a means of cleaning the channels. In some limited instances, heavy equipment was operated in streams and splash dams were present in channels throughout the region. These activities detrimentally affected many riparian areas and streams, resulting in soil erosion, mass wasting, loss of large woody debris from channels, and loss of most large trees within riparian areas. These activities have substantially reduced in-channel loading of large wood and the future large wood recruitment potential to channels for many decades. The current low level of large wood has been identified as one of the primary habitat indicators of concern.

Historic timber practices included the use of splash dams to store large quantities of wood and water. The timber was inexpensively transported downstream by means of sluicing with a sudden dam breach. However, compared to many other areas on the south-central Oregon Coast, the Elliott State Forest had relatively little historic splash damming activity. Splash dams were outlawed in 1956, prior to the beginning of extensive timber harvests in the Elliott State Forest. Although documentation is sparse, only four splash dam sites in or adjacent to the Elliott State Forest have been identified. Although they were generally located outside the Elliott State Forest, splash dams in headwater regions may have impacted downstream conditions within the Elliott State Forest.

Damage caused to streams and rivers by early logging operations (splash dams, slash disposal in streams, log drives, etc.) often resulted in substantial logjams. In some cases, these jams could be one mile or more in length, and may have impeded anadromous fish passage. As a result of this debris accumulation in streams, the Oregon Game Commission in the 1930s required loggers to prevent woody debris from entering streams. There is evidence of stream cleaning in the Elliott State Forest beginning in 1956, and this practice likely extended into the mid-1980s. The contribution of large wood in streams can last for many decades and/or centuries prior to depletion, decay, or downstream transport. Given the time required to grow and recruit functional-size pieces of large wood in the riparian zones, the stream cleaning efforts will have a lasting effect on the wood loading conditions of streams and rivers in the Elliott State Forest.

Roads have the potential to increase on-site erosion and sediment delivery to stream channels, and can contribute to increased peak flows in streams (Beschta 1978). In general, stream crossings present a risk for chronic sediment delivery to streams, especially during wet weather (Dent et al. 2003). Roads within riparian zones have the potential to reduce shade and disrupt future sources of large wood recruitment to streams. Road crossing failures can be a major source of sediment to streams, and may lead to catastrophic increase in stream channel sediment (Sidle et al. 1985; Robison et al. 1999). Road failures can also increase the frequency of debris flows and dam-break floods compared to natural conditions. These effects can influence aquatic habitats by increasing fine sediment levels, reducing pool volumes, increasing channel width, and increasing seasonal temperature extremes. Culverts can also be a common migration barrier to fish (Furness et al. 1991).

Road building in the Elliott State Forest began with the first "truck roads" in 1935. The first large increase in road building occurred in concert with timber sales beginning in 1955. During the seven-year period from the start of forest management until the Columbus Day windstorm, approximately 143 miles of road were built. The 1962 Columbus Day windstorm accelerated the road-building program to accomplish timber salvage harvests. An estimated 150 miles of new roads were built to access the sale areas. These roads generally were below prior engineering standards. Construction involved an abundance of side-cast, no surfacing or ditches, and a minimal 14-foot width. Starting in 1966, roads were upgraded in the Elliott State Forest (including surfacing, building of ditches, and upgrading of bridges from log stringers to concrete). By 1968, an all-weather road system in the Elliott State Forest was completed. Currently, the road building program includes extending spur roads to access individual timber harvest sites, upgrading and maintaining roads and culverts to improve their performance, and disconnecting water and sediment delivery from roads to streams.

The human-caused disturbance history has created watershed conditions that are functioning at some amount of risk for salmonid fishes due to: 1) legacy timber harvests and channel modifications (stream cleaning efforts); 2) road building and road-related failures at stream crossings and on unstable slopes; and 3) potential fish migration barriers at culverts. Recent management practices, however, avoid direct disturbances to unstable areas, riparian reserves, and known aquatic refugia. Current management practices are less destructive to watershed conditions and processes than historic management approaches.

C.11.3. Riparian Areas

The ODF Watershed Analysis characterized current streamside forests along all fish-bearing streams in the Elliott State Forest, using color orthophotos from 1996. The results indicate that the streamside vegetation is a patchy array of conifer, mixed, and hardwood-dominant vegetation classes, reflecting the history of harvesting, road building, debris flows, and natural disturbances in the Elliott State Forest. In addition, young hardwood trees along some of the large streams, especially in the Tenmile region, are a result of tree invasion into streamside areas that were previously pasture. Hardwoods are the most dominant stand type found within 100 feet of the stream for all stream size classes. Hardwood dominance decreases with increasing distance from the streams. Nevertheless, hardwoods occupy one-third of the land within 150 to 200 feet bordering large streams. Mixed conifer/hardwood stands occupy the majority of the area at distances of 100 to 200 feet from the stream.

Conifer-dominated stands constitute a minority of the streamside area for all stream size class and distance intervals (Oregon Department of Forestry 2003c). The ODFW aquatic habitat surveys found that the number of large riparian conifers was low for all three regions, with only a few individual reaches meeting the 75th percentile of reference reaches (Kavanagh et al. 2005).

Hardwood stands provide abundant shade and nitrogen-rich leaf litter to the aquatic environment. Hardwood trees provide some aquatic structure when they fall into the stream, but are short lived compared to conifers, and the ability of these stands to create a volume of large wood similar to historic levels is limited (Oregon Department of Forestry 2003c).

Beginning in the 1960s, the first riparian buffer strips were left along streams during timber harvest. The current FMP was adopted in December 1993. Under this plan, fish-bearing perennial streams have had a 100-foot Riparian Management Area, with no harvest except specific habitat enhancement projects. Fish-bearing intermittent streams were managed with a 75-foot no harvest buffer, and non-fish-bearing perennial streams with a 50-foot buffer.

Appendix D
Desired Future of Conditions for Elliott Watersheds

D.1. PRINCIPLES

Watersheds, riparian, and aquatic areas change over time and space with disturbances such as landslides, floods, debris flows, windthrow, and fires. These disturbances result in a wide range of conditions, both longitudinally and laterally, throughout a stream network. Such conditions defy precise definitions; thus, oversimplified and singular measures or benchmarks are generally used. However, no single value can accurately characterize "healthy" fish habitat and watersheds. Fish are adapted to a range of conditions, including variability generated from natural disturbance. Therefore, state and federal partners agreed to define and use a *range* of desired future conditions (DFCs) for riparian and in-channel aquatic habitat conditions for the Elliott State Forest plan area. These conditions will be used to analyze the Habitat Conservation Plan (HCP) in the Environmental Impact Statement (EIS), and are not considered benchmarks.

In this document, ecologically significant metrics of riparian, aquatic, and watershed conditions are proposed that are sensitive to management and likely to have an effect on aquatic biota (Table D-1). A range of conditions are defined for these metrics that are likely to meet the functional goals for riparian and upland management as described in the Elliott State Forest Management Plan (FMP) and HCP. Numerous other metrics can be and are in use at this time. The Oregon Department of Forestry (ODF), in collaboration with federal and state partners, has selected this subset for the EIS analysis, but may continue to evaluate the validity of the defined ranges as well as the potential for other metrics. At this time, the proposed metrics to be used in the EIS are:

- **Riparian Condition** (for coniferous and deciduous stands):
  - basal area
  - stand density
  - quadratic mean diameter (QMD)
  - number of large diameter conifers and hardwoods
  - shade over streams
- **Aquatic Condition**:
  - stream temperature
  - large wood in streams
- **Watershed Condition**:
  - hydrologic connectivity to streams
  - roads parallel to and within 100 feet of streams
  - riparian stand structure
  - wood recruitment from near-stream and upland sources

Table D-1
Summary of Proposed Metrics, Data Sources, and Proposed Ranges of Conditions for Riparian and Aquatic Resources

Resource	Selected Metric [a]	Data Sources	Proposed Range of Conditions
Riparian Condition (Type F and Large and Medium N, unless otherwise noted)	**Basal Area** (square feet per acre) 25th to 75th percentile (median)	FIA: Evaluation of FIA data representative of older forests in the Mid and South Coast Region AIP: ODFW AIP riparian data in the Oregon Coastal Region. Elliott: Riparian Data from the Elliott State Forest and the Bureau of Land Management	CON: (FIA): 203-286 (256) HWD (Elliott): 66-121 (86) MIX (Elliott): 94-253 (153)
	Total Tree Density (trees per acre) 25th to 75th percentile (median)		CON: (FIA): 61-143 (83) HWD (Elliott): 45-121 (54) MIX (Elliott): 47-133 (110)
	QMD: (inches) 25th to 75th percentile (median)		CON (Elliott): 25-41 (28) HWD (Elliott): 11-17 (14) MIX (Elliott): 16-20 (17)
	Density of **Large Diameter** (>20" DBH) Trees (trees per acre) 25th to 75th percentile (median)		CON (AIP): 41-99 (78) HWD (Elliott): 3-21 (13) MIX (Elliott): 11-29 (16)
	Shade (All Stream Types)	ODFW AIP shade angles. [AIP observed range= 76-91%, need to stratify by stream size]	Small: 80-87 Medium: 85-94 Large: 71-93

Resource	Selected Metric [a]	Data Sources	Proposed Range of Conditions
Aquatic Condition (all stream sizes and types)	Stream Temperature (7-day moving mean of daily maximum - ºC) 25th to 75th percentile	ODFW AIP for model inputs [Reference water temperatures for the stream network less than 10 miles from the topographic divide based on median stream sizes and median AIP shade levels]. Elevations based on feet above mean sea level. Use the regression equations from the Elliott State Forest Watershed Analysis (attached) for reference water temperatures for the stream network greater than 10 miles from the topographic divide	Small (10 feet): 13.5 ºC – 17.0 ºC Medium (20 feet): 13.0 ºC - 16.6 ºC Large (38 feet.): 13.1 ºC-17.7 ºC
	Large Wood in Streams: Total pieces per reach length 25th to 75th percentile (median)	ODFW AIP (53 sites) [AIP observed range = 9.4 to 29.7 pieces per 100 meters, need to stratify by stream size]	Small: 13.8-28.7 Medium: 11.5-30.7 Large: 8.2-26.6
	Large Wood in Streams: Number of Key Pieces per reach length 25th to 75th percentile (median)	ODFW AIP (124 sites because small streams were under-represented) [AIP observed range = 0.6 to 4.0 pieces per 100 meters, need to stratify by stream size]	Small: 0.9-4.3 Medium: 0.9-3.3 Large: 0.5-2.1
Watershed Condition (All Stream Types)	Hydrologic Connectivity to Streams	Numeric Range: Policy Decision	20 percent or less of road connected to streams < 0.5 percent of watershed area with roads connected to streams
	Roads: Parallel and Within 100 feet of streams	Numeric Range: Policy Decision	No net increase ≤ 5% of road network

Resource	Selected Metric [a]	Data Sources	Proposed Range of Conditions
Watershed Condition (All Stream Types) —continued	Riparian Structural Diversity: Percent of riparian areas by structural classes. Structural classes relate to species diversity, layering, and presence of snags and downed wood. Advanced structure has the greatest diversity, multiple canopy layers, and high levels of snags and downed wood.	Benda and Dunne 1997 (summarized in R2 Resource Consultants 2005); Wimberly at al. 2000; Numeric Range: Policy Decision that reflects management for mature forest condition but acknowledges disturbance is common in riparian areas	Early: 5-15% Intermediate: 15-45% Advanced: 45-70%
	Large Wood Recruitment	Near Stream Sources: Van Sickle & Gregory 1990; McDade et al. 1990; Bilby and Bisson 1998 [observed range from literature = 70% to 100%] Upslope Sources (from landslides and debris flows): Benda and Sias 1998; Benda et al. 2003; May and Gresswell 2003; Reeves et al 2003; [observed range from literature = 10% to 72%] Numeric Range: Policy Decision	70% to 100% of the natural disturbance regime's large wood recruitment from all sources (near stream and upslope sources). NOTE: Total percent of channel wood originating from upslope areas will vary by stream order (May and Gresswell 2003); larger order streams have less wood from upstream sources.

Notes:

[a] Metric is reported for conifers, hardwoods, or all trees in conifer-dominated, hardwood-dominated, and mixed stands, respectively.

CON = conifer; HWD = hardwood; MIX = mixed riparian forests

AIP = Aquatics Inventories Project; FIA = Forest Inventory and Analysis

DBH = diameter breast height; ODFW = Oregon Department of Fish and Wildlife

ºC = degrees Celsius

D.2. APPROACH AND AVAILABLE DATA

A combination of data from "reference" streams (Kavanagh et al. 2005), older upland forests (USDA Forest Service 2006), older riparian forests on the Elliott (Biosystems et al. 2003), Oregon Department of Fish and Wildlife (ODFW) Aquatics Inventories Project (AIP) reference riparian areas (http://rainbow.dfw.state.or.us/nrimp/default.aspx?p=259), and values from published literature (Table D-2) were used to describe a set of DFCs. The selected metrics were reported as a range (25^{th} to 75^{th} percentile) and median where analysis techniques and available data allowed. In some cases, available data were lacking or the literature did not provide a useful numeric range. In such cases, literature was used to guide a policy decision on the proposed range.

D.2.1. Aquatic Metrics

For the purposes of this HCP, reference streams represent a range of conditions for sites with minimal human perturbation. ODFW reference sites were selected from all AIP habitat surveys. These surveys are conducted by the ODFW using a process outlined in Thom et al. (2001). The ODFW AIP reference sites represent watershed areas with low impact from human activities such as roads, development, and forest management. The ODFW believes the sites are an accurate depiction of the stream sizes, geology, and ecoregions, and that they are representative of aquatic conditions in minimally influenced streams that exist in coastal drainages of western Oregon (Thom et al. 2001). Reference sites were chosen from coho streams, and the gradient is generally less than 5 percent; thus, they may be less representative of steep streams. The AIP surveys have been conducted since 1992. Data from streams in the plan area have been summarized by Kavanagh et al. (2005) and represent the observed range of conditions that may have occurred under inherent disturbance regimes without the additional perturbation of forest management.

D.2.2. Riparian Metrics

Riparian forest characteristics were attained through an analysis of three data sources: Forest Inventory and Analysis (FIA) (USDA Forest Service 2006), ODFW AIP surveys (http://rainbow.dfw.state.or.us/nrimp/default.aspx?p=259) (which included riparian transects), and riparian surveys from the Elliott State Forest (Biosystems et al. 2003). A subset of the FIA data collected in older forested areas (80 to 205 years old) provides a complete data set from which to derive data for all the riparian metrics, but represents mostly upland stands within the Mid and South Coast regions. ODFW AIP reference sites in the same region represent older riparian forests (no specific age available), but involve lumped data by diameter classes; thus, they cannot be used to populate all the riparian metrics. Finally, data from older riparian forests (86 to 210 years old) on the Elliott State Forest were summarized and provide a descriptor of riparian structure within the plan area but have a small sample size. The desired future conditions for shade over streams were based on reference conditions from the ODFW AIP surveys (Kavanagh et al. 2005).

D.2.3. Watershed Metrics

The desired future conditions for watersheds relied mostly on reports in the literature. Policy decisions were needed for some of the proposed ranges and are noted accordingly.

Table D-2
Data Sources for Describing Aquatic and Riparian Reference Conditions

Data Source	Description	References
ODFW AIP: Habitat Data	The ODFW AIP data were collected to provide quantitative information on habitat condition for streams throughout Oregon (Moore et al. 2002). As part of this effort, data were collected on 124 reference reaches, which were considered by the ODFW to represent a natural range of conditions (Kavanagh et al. 2005). While no explicit age limit was set for these sites, they represent low human impact (wilderness/roadless area, late-successional, or mature forest). • 53 Mid and South Coast Reference sites • 124 sites in the entire Coast Reference were used if needed due to otherwise small sample size from Mid and South Coast	Kavanagh et al. 2005
ODFW AIP: Riparian Data	Of the 124 AIP sites (as described above), 54 sites had an accessible, riparian dataset. Sites represent coho streams with least human disturbance	ODFW web site provided in text
Elliott State Forest Watershed Analysis: Riparian Data	The Elliott riparian data were collected and summarized by independent contractors to characterize riparian conditions in the Elliott State Forest. ODF re-analyzed a subset of the data consisting of all plots 86 to 210 years old (average of 150 years). These included 15 plots: 4 conifer-dominated, 5 hardwood-dominated, and 6 mixed riparian forests.	Biosystems et al. 2003
Federal FIA: For Riparian Metrics	These data are collected as part of a national project to characterize vegetation using a systematic sampling design. Independent contractors evaluated FIA data representative of forests 85 to 205 years old (average of 117 years), in the Mid and South Coast Region. A subset of plots provided 14 conifer-dominated sites and 4 alder sites with site indices of I, II, or III.	USDA Forest Service 2006
ODF Watershed Analyses	Describes current and desired conditions in the watersheds being analyzed.	ODF Watershed Analyses: Elliott (Biosystems, et al. 2003); Miami (J. Jenkins et al. 2005); Upper Nehalem (R2 Resource Consultants 2005)
Literature: References provided in text and listed under Appendix B	Published literature is used to put sideboards on potential ranges from which to establish the policy decision.	See Appendix B

D.3. RIPARIAN CONDITIONS

D.3.1. Selected Metrics

- Basal area
- QMD
- Stand density
- Numbers of large diameter conifers and hardwoods (greater or equal to 20 inches diameter breast height [DBH])
- Shade over streams

D.3.2. Rationale

Riparian areas fill a special environmental niche between aquatic and terrestrial systems and provide a unique linkage from the headwaters of a basin to the outlet. Structural characteristics of riparian areas vary greatly, in part, because plant communities reflect fluvial and fire disturbances, soil and geomorphic characteristics, and a range of historic and current management practices (Hayes et al. 1996). Riparian vegetation is important for fish because it provides nutrients from litter fall, root masses for bank stability, shade for temperature control, and large wood for habitat complexity. Upland conditions and processes influence the conditions and functions of aquatic and riparian conditions as well. Examples include landslide and debris torrents that deliver wood, boulders, and sediment to streams; wildfires that create a mosaic of upland and riparian stand structure; and roads that can chronically deliver sediment to streams or change the timing and magnitude of high stream flow events. Small headwater channels have riparian areas that can be more indicative of upland stands and are important conduits of structure and nutrients.

Decisions to manage or not manage near streams have direct influences on riparian conditions. Under the Elliott FMP and HCP, riparian areas are managed to achieve mature forest conditions within 100 feet of Type F streams and medium and large Type N streams. Once mature forest condition is achieved, these areas will not be harvested. A few studies have documented the range of riparian stand structures for old growth and mature riparian forests (Andrus and Froehlich, 1988; Carlson et al. 1990, Heimann 1988; Ursitti V.L. 1990; Pabst and Spies 1999; Thom et al. 1999) and report a wide range of conditions. A multitude of indices can be used to describe riparian forest structure, including age, basal area, stand density, mean diameter, QMD, cover, number of large trees, layering, shade over streams, downed wood, and snags. Riparian stand metrics (basal area, stand density, QMD, numbers of large diameter trees), which are responsive to management, easy to measure, and likely to register a detectable change over the plan period (approximately 50 years), were selected.

Large wood is a principal contributor to high quality fish habitat. In particular, sources of large conifer wood to streams may be more beneficial than hardwoods for the creation of pools and habitat complexity. Conifers attain larger diameters, tend to be more stable during high flows, and last longer in the stream than hardwood species. As a consequence, they offer

improved function as key pieces for the creation of wood jams and long-term habitat features. Most coastal streams are significantly lacking large wood, and in particular key pieces of large wood. Given these circumstances, it is important to evaluate the effects of the HCP on coniferous sources of large wood to streams. The numbers of large-diameter conifer trees in riparian areas provides an index of how management influences recruitment of large coniferous wood to streams. While trees with a larger DBH than 20 inches are important for channel complexity, it takes longer for trees to enter the larger size classes. "Large" is defined as greater than 20 inches DBH because it is useful for detecting change within the time period of the plan.

Hardwoods are an important component of riparian structure as well; it is likely that hardwoods historically dominated significant miles of near-stream riparian areas in the Oregon Coast Range. This is because hardwoods tend to have a competitive advantage over conifers in the highly disturbed zones next to streams and along debris torrent pathways. Current research has documented differences in nutrient cycling and nitrogen levels from streams that are alder-dominated in the coast range (Compton et al. 2003) and from small non-fish bearing alder-dominated streams in Alaska (PNW 2004). Nitrate and dissolved organic nitrogen increases as the percent of red alder increase (Compton et al. 2003). Researchers suggest that red alder increases habitat quality for wildlife; stream productivity; and nutrients for fish, amphibians, songbirds, and other invertivores. Ecological function of red alder is increased if it is grown in patches rather than as a mixed stand (PNW 2004). Hardwood riparian metrics were included in recognition of the common occurrence and important ecological function of hardwoods along streams in the Elliott State Forest.

Many riparian forests are a patchwork or mixture of hardwoods and conifers; one element of mature forests is the presence of multiple species and a layered composition. For these reasons, measures of mixed riparian forests were included in the DFCs.

D.3.3. Desired Future Conditions

Three data sets were used to determine the range of conditions, including one based on mature riparian forests in the Elliott State Forest, an ODFW data set taken from reference coho streams in the Oregon Coast Range, and FIA data collected in upland stands throughout the coast range.

In 2001, data were collected on the Elliott State Forest by Integrated Data Management (Barnes 2001) using a modification of the protocol developed by Andrus (2001a) in which all trees greater than six inches DBH were measured. These data were subsequently summarized and analyzed by Andrus (2001b) in the Elliott State Forest Watershed Analysis (Biosystems et al. 2003). For the present analysis, ODF re-analyzed the Elliott data on a sub-set of plots exceeding 80 years of age. These were further queried to derive only plots within 100 feet of streams. Riparian areas in this subset ranged in age from 86 to 210 years, and averaged 150 years.

The ODFW AIP reference stream data were available on 53 forested reaches in which all trees greater than 1.2 inches DBH were tallied into lumped diameter-class categories. Of all the riparian metrics, only the large conifer count may be compared with the other data because of the significantly lower DBH cutoff and the lumping methodology.

The Elliott and AIP plots were classified as hardwood-dominated, conifer-dominated, or mixed stands, and yielded the sample sizes shown in Table D-3. The following criteria were used for the stand-type determination:

- Conifer dominated: more than 70 percent of basal area in conifer
- Hardwood dominated: less than 30 percent of basal area in conifer
- Mixed: 30 to 70 percent of basal area in conifer

Finally, the current (2006) version of the FIA Integrated Dataset was queried to identify forest stands within Western Oregon, with an elevation less than or equal to 1,250 feet, and a stand age of 85 to 205 years old (with an average of 117 years). Data were collected on all trees with a DBH greater than 7 inches. The query produced 46 sample stands:

- 27 stands classified as Douglas-fir or western hemlock
- 4 stands classified as other conifer types (e.g., spruce, cedar, pine)
- 4 stands classified as red alder
- 11 stands classified as other hardwood types (e.g., madrone, oak, willow)

Of the 27 Douglas-fir or hemlock stands, those with a site index of I, II, or III were selected. This eliminated two stands with 30 percent hardwood basal area or more, which are more typical of dry sites in the eastern part of the region, one stand classified as hemlock, and ten stands with Site Class IV or V. The result was 14 Douglas-fir dominated stands for further analysis (Table D-3).

Table D-3
Sample Size by Forest Type for the Elliott, ODFW AIP, and FIA Data Sources

Data Source	Sample Size by Forest Type		
	Conifer	Hardwood	Mixed
Elliott	4	5	6
AIP	14	19	20
FIA	14	4	0

For each of the riparian metrics, the median, 25th percentile, and 75th percentile were determined. These non-parametric statistics were used because the sample size was too small to assume a normal distribution. The three datasets produced different ranges (Table D-4).

Table D-4
Summary of Results from Analysis of Three Data Sets Used to Characterize Desired Future Conditions of Riparian Areas Within 100 feet of Large Type F and Large and Medium Type N Streams

Riparian Metric	Data Set Results- 25th to 75th Percentile (Median)		
	AIP	FIA	Elliott
Conifer Basal Area in Conifer-dominated Riparian Areas (square feet/acre)	Not available	**203 to 286 (256)** (square feet/acre)	142 to 309 (228) (square feet/acre)
Total Tree Density in **Conifer**-dominated Riparian Areas (trees/acre)	Not available at the same DBH cutoff	**61 to 143 (83)** (trees/acre)	60 to 91 (73) (trees/acre)
Conifer QMD: (inches)	Not available	21 to 29 (25) (inches)	**25 to 41 (28)** (inches)
Density of **Large Diameter** (>20" DBH) **Conifers** (trees/acre)	**41 to 99 (78)** (trees/acre)	26 to 50 (36) (trees/acre)	25 to 38 (33) (trees/acre)
Hardwood Basal Area in Hardwood-dominated Riparian Area (square feet/acre)	Not available	62 to 119 (92) (square feet/acre)	**66 to 121 (86)** (square feet/acre)
Total Tree Density in **Hardwood**-dominated Riparian Area (trees/acre)	AIP: Not available at the same DBH cutoff	42 to 111(77) (trees/acre)	**45 to 121 (54)** (trees/acre)
Hardwood QMD: (inches)	Not available	27 to 34 (27) (inches)	**11 to 17 (14)** (inches)
Density of **Large Diameter** (>20" DBH) **Hardwoods**: (trees/acre)	Not available	1 to 15 (8) (trees/acre)	**3 to 21 (13)** (trees/acre)
Total Basal Area in **Mixed** Riparian Forests (square feet/acre)	Not available	Not available	**94 to 253 (153)** (square feet/acre)
Total Tree Density in **Mixed** Riparian Forests (trees/acre)	Not available at the same DBH cutoff	Not available	**47 to 133 (110)** (trees/acre)
QMD in **Mixed** Riparian Forests: Diameter at Breast Height (inches)	Not available	Not available	**16 to 20 (17)** (inches)
Density of **Large Diameter Trees** (>20" DBH) in **Mixed** Riparian Forests: (trees/acre)	Not available	Not available	**11 to 29 (16)** (trees/acre)

Note: **Bold text** represents the proposed range for this HCP.

The Elliott and FIA data sets provide more complete data than the ODFW AIP data set to populate the DFC metrics. Reference values based on the Elliott, however, are vulnerable to small sample size across all stand types. The same is true for hardwood stand types from the FIA data set. At present, the small set of criteria and the lack of comparability limit the usefulness of the ODFW data set. However, the original data collected by the ODFW did have tree size information that would improve the comparability with the Elliott data set. If the ODF were able to procure the original data, the relatively large sample size of the ODFW data would likely provide useful reference values for the full set of DFC metrics.

The one comparable parameter between the three data sets was the number of large trees.[1] Although no formal statistical tests were applied, the ODFW data do appear to come from a population with larger trees than were present on the Elliott and AIP plots. The reason for this difference is not immediately clear. The Elliott and FIA data were selected for stands greater than 80 years old, which represents the management objective of the FMP. While the age of the reference riparian forests from the ODFW AIP is not given, the numbers of large trees is evidence that a large proportion of the reference stands are likely well over 80 years of age. In many cases, they may represent stands that are well beyond the ODF's ability to achieve over the next 50 years.

A comparison of the FIA Douglas-fir plots to McArdle's (McArdle et al. 1949) description of unmanaged upland forests generally supports use of the 14-plot sample as representative of unmanaged Douglas-fir forest in western Oregon. For example, the sample mean QMD was 24.3 inches, versus 24.0 inches for McArdle's (*normal*) unmanaged Douglas-fir forest. The sample mean total basal area was 257 square feet, versus 258 square feet for McArdle (*average*). The sample mean tree density was 98 trees per acre, versus 101 trees per acre for McArdle *normal* (*average* stocking would be expected to be greater than *normal*, and contain more small trees). The sample mean for total conifer basal area is over 96 percent of McArdle *average* (suggesting insignificant difference for this parameter). The sample mean for basal area of conifers 12 inches DBH and larger is over 93 percent of McArdle *average,* again suggesting an insignificant difference. The sample mean density of conifers 12 inches DBH and larger is about 58 percent of McArdle *normal.* No data are available for McArdle *average* for this parameter, but the sample is likely to be slightly below *average* for tree density due to the presence of hardwoods.

While the analyses of three different data sets often resulted in different numeric ranges, for the purposes of this DFC, one range was needed. For conifer stands, a combination of data sets was selected to describe the DFC. Ideally the DFC should be derived from a single data set because stand characteristics are in large part dependent on each other. However, the advantage of mixing the data sets is to attain a set of values that is more environmentally conservative. The FIA data were selected to describe basal area and stand density because of the relatively larger sample size as compared with the Elliott. The lumping methodology for the AIP data prevents use for characterizing basal area and the small DBH cutoff prevents applicability to a stand density DFC. The Elliott data were selected for QMD because the values provide a more environmentally conservative value than the FIA data, and again

[1]It should be noted that the ODFW hardwood/conifer/mixed riparian forest classification is based on tree count, while the Elliott is based on basal area. It is not known how this would influence the reference values.

QMD could not be derived from the AIP data. The AIP data were selected for the numbers of large diameter conifer trees. The AIP data provide the advantage of conservatism and a larger sample size than the Elliott. Additionally, the ODFW large tree data provide consistency with the shade measurements, which are also based on AIP data. However, these advantages come at the cost of inconsistent data sets used for the other riparian metrics (QMD, stand density, and basal area) derived from the AIP and Elliott data sets. Because of this mixing of data sources, more information is needed to increase confidence in the riparian conifer values.

The Elliott hardwood plot data and the FIA red alder samples are both small (five sample plots for the Elliott and four sample plots for FIA) and highly variable. This suggests the use for DFC reference is questionable. However, in general, the results compare well between data sets for basal area and stand density. Results depart in terms of QMD and number of large diameter trees. FIA reports a higher QMD but fewer numbers of large-diameter trees than the Elliott. The selected values were based on the Elliott data because the data were collected from riparian areas. These results will be used to analyze the HCP. However, because of the small sample size, if these results are to be used for other purposes, more information is needed to increase confidence in the values.

The Elliott data are currently the only data available for describing mixed stands. These results will be used to analyze the HCP. Again, because of the small sample size (six sample plots), if these results are to be used for other purposes, more information is needed to increase confidence in the values.

Conifer Riparian Forests

- Basal Area: 203 to 286 square feet per acre (256 square feet per acre)
- Quadratic Mean Diameter: 25 to 41 inches (28 inches)
- Number of Large-Diameter Trees (greater or equal to 20 inches DBH): 41 to 99 trees per acre (78 trees per acre)

Deciduous Riparian Forests

- Basal Area: 66 to 121 square feet per acre (86 square feet per acre)
- Quadratic Mean Diameter: 11 to 17 inches (14 inches)
- Number of Large-Diameter Trees (greater or equal to 20 inch DBH): 3 to 21 trees per acre (13 trees per acre)

Mixed Riparian Forests

- Basal Area: 94 to 253 square feet per acre (153 square feet per acre)
- Quadratic Mean Diameter: 16 to 20 inches (17 inches)
- Number of Large-Diameter Trees (greater or equal to 20 inch DBH): 11 to 29 trees per acre (16 trees per acre)

Stream Shade

Shade DFCs were derived from ODFW AIP data, and represent the 25^{th} to 75^{th} percentile of the distribution and (median) from coastal reference sites.

- Small: 80 to 87 percent (84 percent)
- Medium: 85 to 94percent (88 percent)
- Large: 71 to 93percent (85 percent)

D.4. AQUATIC CONDITIONS

D.4.1. Selected Metrics

- Stream temperature
- Large wood in streams

D.4.2. Rationale

Stream temperature is proposed as an indicator because it is sensitive to management. Temperature also plays a critical role for a variety of fish species, with increases in temperature at certain times of their life cycle causing stress and/or mortality (Beschta et al. 1987). DFCs are presented as thermal ranges that represent reasonably achievable surface water temperatures consistent with historical conditions under occasional disturbances of mature forest conditions. DFC values are based on the same metric used in state water quality numeric criteria (seven-day moving mean of daily maximum) with an approach that is consistent with that used by the Department of Environmental Quality (DEQ) to develop total maximum daily loads (TMDLs). The advantage of this modeling approach over use of the DEQ numeric criteria is it produces a range of conditions that vary with stream and riparian characteristics rather than a relying on a single value applied to all streams.

Large wood in streams provides multiple important biological functions, including cover from predators, gravel retention, pool scouring, and creation of backwater and slow water habitat. Forest management has the potential to indirectly affect large wood loading by reducing recruitment from riparian and upslope areas. Factors influencing wood frequencies include size and topography of upstream drainage basin, valley bottom configuration, floodplain width, substrate composition, and channel sinuosity. The DFCs were derived from ODFW data (Kavanagh et al. 2005) from reference streams in the vicinity of the Elliott (numbers of pieces of wood) and throughout the coast range (numbers of key pieces). The upper and lower ends of the range represent the 25^{th} and 75^{th} percent quartiles observed at reference streams.

D.4.3. Desired Future Conditions

D.4.3.1. Stream Temperature

Reach-specific indicators were developed using a view-to-sky model (WFPB 1997) to predict a likely range in stream temperature. In this model, predicted summer surface water temperatures is a function of channel size (width and depth), elevation, riparian canopy, and closure levels. The model started with current riparian stand and shade conditions, and then grew stands forward to estimate DFCs for temperature. Model reliability declines when streams reach a width of approximately 50 feet and an elevation less than 1,000 feet. This typically will occur at approximately 10 miles from the divide. Streams and associated temperatures along the channel network greater than 10 miles from the divide are larger, low-

gradient, low-elevation channels that become too wide and deep to respond in a typical fashion to riparian shade. Therefore, a distance-to-divide model (Biosystems et al. 2003) was used for streams greater than 10 miles from the divide. Neither model can adequately account for substantial contribution of cool ground water or, conversely, warm runoff from ponded waters. These inputs are site specific and cannot be accounted for in the proposed analyses.

This approach is consistent with that used to develop TMDLs for the region. For TMDLs, the Heat Source model includes such aspects as the natural thermal potential (NTP) of a waterbody based on: 1) channel widths compared to potential vegetation heights and densities, including an allowance for canopy openings due to natural disturbances; 2) effective shade per ecoregion (meaning the potential shade from different vegetation canopy classes that can grow in an area); 3) natural streamflows; and 4) tributary inputs. The NTPs in the Umpqua ranged in classes from less than 16 degrees Celsius (ºC) in headwater areas to well over 25 ºC in low land areas. More than 50 percent of the stream miles assessed in the watershed had NTPs greater than 22 ºC and more than 70 percent had NTPs greater than 19 ºC. The Department of Environmental Quality concluded that there is no thermal assimilative capacity for waste load allocations (temperature heat sources) in sections of the basin where temperatures exceed numeric criterion.

The following model results are the predicted temperatures (25^{th} to 75^{th} quartile [and median]) for the reported elevations (feet above mean sea level). Ranges in water temperatures for the stream network were modeled based on median AIP stream sizes and shade levels.

- **Small (5 to 13 feet): 13.5 to 17.0 ºC**
  - 1,960 feet 13.5 to 14.0 ºC (13.7 ºC)
  - 1,640 feet 14.3 to 14.8 ºC (14.5 ºC)
  - 1,160 feet 15.0 to 15.5 ºC (15.2 ºC)
  - 680 feet 15.8 to 16.3 ºC (16.0 ºC)
  - 200 feet 16.5 to 17.0 ºC (16.7 ºC)
- **Medium (13 to 26 feet): 13.0 to 16.6 ºC**
  - 1,960 feet 13.0 to 13.6 ºC (13.5 ºC)
  - 1,640 feet 13.8 to 14.4 ºC (14.2 ºC)
  - 1,160 feet 14.5 to 15.1 ºC (15.0 ºC)
  - 680 feet 15.3 to 15.9 ºC (15.7 ºC)
  - 200 feet 16.0 to 16.6 ºC (16.6 ºC)
- **Large (26 to 103 feet.): 13.1 to 17.7 ºC**
  - 1,960 feet 13.1 to 14.7 ºC (13.8 ºC)
  - 1,640 feet 13.8 to 15.5 ºC (14.5 ºC)
  - 1,160 feet 14.6 to 16.2 ºC (15.3 ºC)
  - 680 feet 15.3 to 17.0 ºC (16.0 ºC)
  - 200 feet 16.1 to 17.7 ºC (16.8 ºC)

Anticipated water temperatures for streams more than 10 miles from the topographic divide were based on a multiple linear regression equation derived for the Millacoma River (BioSystems et al. 2003). For these purposes, shade was based on the ODFW AIP data. Stream temperature is a function of distance and shade:

*Temperature (°F) = 81.0 + 3.17 * ln (Distance) - 0.243 * shade;*
(adjusted square multiple R = 0.89)

At a distance of 30 to 40 miles from the divide, channels become too wide for complete shading and too deep for rapid daily responses of stream temperatures to solar radiation (Sullivan et al. 1990). Therefore, farther downstream from this point, water temperatures tend toward ambient air temperatures. Results of the linear regression combined with the very large stream response beyond 40 miles from the divide are presented in Table D-5.

Table D-5
Regression Results as a Function of Distance from the Divide with 100% Shade Levels

Distance (miles)	Natural Log of Distance ln (Distance)	Maximum Shade (%)	Moving Mean of Daily Maximum Stream Temperature Regression Results	
			Fahrenheit (°F)	Celsius (°C)
3.8	1.33500107	100	61	16.0
8.9	2.18605128	100	64	17.5
10	2.30258509	100	64	17.8
11.8	2.46809953	100	65	18.0
20	2.99573227	100	66	19.0
30	3.40119738	100	67	19.7
36.8	3.60549785	100	68	20.0
40	3.68887945	100	68	20.2
50	3.91202301	100	69	Ambient
75	4.31748811	100	70	Ambient
100	4.60517019	100	71	Ambient

D.4.3.2. Large Wood

Large wood DFCs were derived from ODFW AIP data and represent the 25th to 75th percentile of the distribution (and median) from coastal reference sites.

Total pieces per reach length (diameter is greater than 6 inches and length is 6 feet or longer):

- Small: 13.8 to 28.7 pieces per 100 meters (19.1 pieces per 100 meters)
- Medium: 11.5 to 30.7 pieces per 100 meters (16.2 pieces per 100 meters)
- Large: 8.2 to 26.6 pieces per 100 meters (15.7 pieces per 100 meters)

Number of key pieces per reach length (key piece is 24 inches in diameter or larger and 50 feet in length or longer):

- Small: 0.9 to 4.3 key pieces per 100 meters (2.3 pieces per 100 meters)
- Medium 0.9 to 3.3 key pieces per 100 meters (2.3 pieces per 100 meters)
- Large 0.5 to 2.1 key pieces per 100 meters (1.3 pieces per 100 meters)

D.5. WATERSHED CONDITION

D.5.1. Selected Metrics

- Hydrologic connectivity to streams
- Roads within 100 feet of streams
- Riparian forest structure
- Large wood recruitment

D.5.2. Rationale

Road management is an important component of the Elliott State Forests upland strategies for minimizing management effects on aquatic and riparian areas. Road-associated changes in sediment delivery have no correlation to a natural process; therefore, sediment from roads represents an increase over background conditions. Excessive fine sediment deposited in stream channels can cause decreased survival of salmonid eggs and alevin by reducing water flow through streambed gravel, thereby suffocating the eggs or preventing the eggs from hatching. Massive increases in fine sediment delivery and channel deposition can reduce pool frequency, depth, and volume. This issue has been investigated through a number of research and monitoring studies. Research has shown that newly constructed or reconstructed roads may have ten times more surface erosion during the first winter than during subsequent years after construction (Luce and Black 1999). Most fine sediment from surface erosion processes is relatively chronic. Road use during wet periods can greatly increase turbidity (Bilby et al. 1989; Reid and Dunne 1984). Research and monitoring has shown that, among other factors, road location and drainage practices can influence sediment delivery to streams (Bilby et al. 1989; Bilby 1985a; Sullivan 1985; Dent et al. 2003).

Hydrologic connectivity to streams is an accepted measure of potential impacts of roads on stream systems in western North America (Forman et al. 2003; Bilby et al. 1989; Dent et al. 2003; Reid and Dunne 1984; Wemple et al. 1997). Hydrologic connection exists when water is intercepted by the road prism and routed directly to streams, rather than to an area where drainage waters will re-infiltrate into soils. A lower value represents better conditions. Undisturbed forest soils in many areas (including most of Oregon) are extremely porous (high infiltration rates), and design standards have changed to direct as much drainage onto these porous soils and away from direct entry to streams as possible. Hydrologic connection may be by ditch, gully, or overland flow; values of 57 percent to as high as 75 percent have been reported in older studies (Reid and Dunne 1984; Wemple et al. 1997). More recently, designed or improved roads have a hydrologic connectivity between 15 and 34 percent (Weaver and Hagens 1994; Bilby et al. 1989). Without hydrologic connectivity, eroded sediment carried in drainage water cannot flow to streams.

Riparian areas are considered conservation areas under the Elliott HCP. They function to protect streams by filtering sediment, providing terrestrial food sources, cover, shade, and large wood. Riparian areas will be managed or left unharvested to achieve these functional goals. While riparian areas are managed to meet mature forest conditions, they are subject to

natural disturbances such as floods, landslides, debris flows, wind storms, insect attacks, disease, and fires. As a result, riparian structure will vary throughout the Elliott State Forest, and can be classified in the same structural categories used to define upland. Early, intermediate, and advanced forest structure for upland stands are described in detail in Chapter 5 (section 5.2.1). While riparian forest conditions may differ from upland stands, the structural type descriptions are applicable to riparian DFCs regarding development of species diversity, canopy layers, snags, and downed wood. Of the three structural types, advanced structure provides the greatest diversity. In forests with advanced structure, the understory develops (understory reinitiation) when enough light and nutrients become available to allow herbs, shrubs, and tree regeneration 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 reinitiation 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 vertical arrangement. A mixture of shade-tolerant (e.g., western red cedar, western hemlock, bigleaf maple) and shade-intolerant tree species (e.g., Douglas-fir); and shrub and herb species (vine maple, huckleberry, salmon berry, and sword fern) may be present. The plant community provides a wide range of habitat niches from the forest floor through the canopy, including snags and downed wood.

Riparian and landslide-prone areas are important sources of large wood recruitment to streams. Research has established that 70 to 100 percent of large wood in the near stream zone is recruited from within 100 feet of the stream (Van Sickle and Gregory 1990; McDade et al. 1990; Bilby and Bisson 1998). More recently, research has established that small streams can be important sources of large wood to larger downstream reaches. When a landslide and subsequent debris-flows occur, it can travel through a small stream, eventually stopping and depositing large wood and gravel along lower gradient, larger stream reaches, or at junctions between small and larger streams. In this way, small streams can provide a linkage between landslides and channel conditions.

D.5.3. Desired Future Conditions

D.5.3.1. Roads

The literature establishes that proper implementation of best management practices for roads can reduce the negative effects of roads on water quality. However, for the selected metrics, a threshold value has not been reported. Therefore, the following values reflect a policy decision based on what has been demonstrated in the literature:

- Road hydrologic connectivity to streams
  - 20 percent or less of road connected to streams
  - less than 0.5 percent of watershed area with roads connected to streams
- Roads parallel and within 100 feet of streams:
  - no net increase in roads adjacent to streams
  - less than 5 percent of the road length

D.5.3.2. Riparian Structure

Several studies have typified riparian structure in Oregon coast range watersheds as "patchy" or "heterogeneous" at multiple scales owing to both regional and site specific gradients (Hibbs and Giordano 1996, Pabst and Spies 1998, Pabst and Spies 1999, Minore and Weatherly 1994, Nierenburg and Hibbs 2000). These findings are common to studies of both managed or unmanged riparian forests as well as a study that evaluated riparian vegetation succession on a debris flow deposit (Pabst and Spies 2001).

At the basin scale riparian structure can vary with stream order, valley floor width and proximity to the ocean (Pabst and Spies 1999). At the site scale multiple factors dictate the vegetative community including distance from stream, stream gradient, elevation above the stream, time since disturbance, soil moisture, and landform.

In a study of unmanaged riparian forests, Past and Spies (1998) conclude that while riparian structure is highly variable it is ordered along a gradient from streamside to hillslope. They propose that riparian plant communities are a function of (1) hillslope processes and associated moisture gradients, (2) hydrologic disturbance, (3) species tolerance of saturated valley floor soils, (4) shade tolerance, and (5) mineral soil disturbance.

Hardwoods, shrubs and treeless areas are major components in unmanaged riparian forest structures. Red alder tends to dominate the lower elevation 3rd and 4th order streams where shrub competition can be severe, while conifers are more common in 1st order, constrained, high gradient streams with steep valley walls (Minore and Weatherly 1994, Pabst and Spies 1999). In a study focused on unmanaged riparian areas Nierenburg and Hibbs (2000) report 24 to 52 percent of plots as lacking trees completely with sites closer to the stream more commonly lacking trees than those farther from the stream.

Disturbances associated with floods and debris flows are common disturbance agents in coastal watersheds and affect riparian plant communities through scour and deposition that both damages riparian forests as well as creates openings and seedbeds for regeneration. Such disturbances can also transport seed and rhizomes to downstream locations. Pabst and Spies (2001) studied vegetation succession on a debris flow deposit in the central Oregon coast range and identified five "floristically distinct" areas along the deposit (about 120 meters in length by 10 to 20 meters wide). Within ten years red alder and salmonberry dominated plant communities on the deposit.

These studies clearly establish that riparian structure varies at both the watershed and site scales due to hydrologic and geomorphic processes, climatic constraints and plant community interactions. The research describes factors at the watershed and site scales that may control riparian structure and composition and help explain observed range of conditions. Less clear is the relative percent of riparian areas that can be expected to be in a given stand structure and how that could vary over time. Benda (1990) estimates that 13 to 25 percent of forests in the Oregon Coast range were in early successional stages. Although not riparian specific, Benda and Dunne (1997) modeled forest structural conditions that vary over time and space as a result of long-term forest disturbance regimes such as landslides, windthrow, disease, and fire. In the Upper Nehalem Watershed Analysis (R2 Resource Consultants 2005) the Benda and Dunne model was used to predict forest structural distribution on average over thousands of years. For that watershed, approximately 16

percent of the area was estimated to have forests less than 50 years old, 30 percent would have forests less than 100 years old, and 50 percent of the area would have forests greater than 250 years old. Another study of upland forests suggest that the percentages of older stand types ranged from 30 to 70 percent of the landscape for any point in time (Teensma et al. 1991). At smaller scales the variability could have been even greater ranging from 15 to 85 percent (Wimberly et al. 2000)

There is common agreement in the literature that unmanaged riparian structure is expected to vary at large and small spatial and temporal scales. However, an expected relative range in structural types (i.e. early, intermediate, advanced) specific to riparian areas has had limited attention. Therefore a policy decision was used to describe DFCs for riparian structure. Given HCP goals to manage for mature forest condition, it is likely that a greater percent of riparian areas will be in older forest structure than might otherwise be expected. This will likely be balanced by environmental gradients, geomorphic, and fluvial disturbances that dictate riparian succession effectively limiting potential to achieve advanced structure. The following DFC values are informed by the research and attempt to reflect this balance between advanced structure goals and riparian ecology:

- Early Structure: 5 to 15 percent
- Intermediate Structure: 15 to 45 percent
- Advanced Structure: 45 to 70 percent

D.5.3.3. Large Wood Recruitment

Large wood is recruited to streams sources from both the nearstream area and from upslope sources. The area within 100 feet of a stream is likely to capture 70 to 100 percent of the nearstream source. However, for any given reach, the proportion of large wood recruitment from upslope areas is highly variable, and in part depends on stream order. The potential for small-stream wood delivery to downstream reaches is dependent on many factors, including the likelihood of a debris flow occurring, channel gradient, and junction angle where the small stream joins the larger stream. Given the range of stream and hillslope conditions, the importance of wood recruitment from steep slopes and debris flows varies for larger fish-bearing streams. Reported ranges vary from ten to 72 percent in the Oregon Coast Range (Reeves et al 2003; Benda and Sias 1998; Benda et al. 2003; May and Gresswell 2003). Because of the variability associated with large wood recruitment, the DFC regarding large wood recruitment from nearstream and upslope sources reflects a policy decision:

- 70 to 100 percent of the natural disturbance regime's large wood recruitment from all sources (nearstream and upslope sources).

Appendix E
Habitat Conservation Plan Requirements and Guidelines

E.1. INCIDENTAL TAKE PERMIT PROCESS

The Incidental Take Permit (ITP) process has three phases, which are described briefly below.

E.1.1. Application Phase

The U.S. Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration Fisheries Service ((NMFS) works with the applicant while the application is being developed, providing advice on minimizing and mitigating the effects of proposed activities as well as other aspects of the Habitat Conservation Plan (HCP). This phase ends when the applicant sends a complete application package to the appropriate USFWS and NMFS Regional Offices.

An application for a Section 10(a) permit must be submitted on an official form (Form 3-200) and be accompanied by the following attachments:

- A complete description of the activity for which the ITP is being sought.
- The common and scientific names of the species to be covered by the ITP.
- An HCP that specifies:
  - The impact that will likely result from the proposed taking of the species;
  - Steps the applicant will take to monitor, minimize, and mitigate such impacts;
  - The level and source of funding available to implement such steps;
  - Procedures that will be used to deal with unforeseen circumstances;
  - The names of the responsible party or parties;
  - Alternatives to the taking and the reasons why they were not pursued; and
  - Other measures required by the USFWS and the National Marine Fisheries Service (NMFS) as necessary or appropriate;
- A signed Implementing Agreement to legally bind the state and the federal agencies to their respective obligations under the HCP.

The HCP is accompanied by a National Environmental Policy Act (NEPA) document—an Environmental Impact Statement (EIS)—which informs the public of the environmental analysis completed in developing the HCP. Using the analysis in the EIS, the USFWS and NMFS will determine if issuance of the ITP would result in significant effects to the human environment. The agency's findings will be issued in a Record of Decision.

E.1.2. Permit Application Processing Phase

The USFWS and NMFS Regional Offices review the application package for biological and statutory completeness. It is then announced in the Federal Register that the ITP application was received and that the EIS is available for public review and comment. There is also a consultation process under Section 7 of the Endangered Species Act (ESA). Once the

documents are found to be complete and public comments are addressed, the USFWS and NMFS determine if the application meets ITP issuance criteria, and if so, issues the ITP.

E.1.2.1. Issuance Criteria for an ITP

The application must meet the following issuance criteria for the ITP to be granted:

- The taking will be incidental.
- The ITP applicant will, to the maximum extent practicable, minimize and mitigate the impacts of such taking.
- The applicant will ensure that adequate funding for the HCP and procedures to deal with unforeseen circumstances will be provided.
- The taking will not appreciably reduce the likelihood of survival and recovery of the species in the wild.
- The applicant will ensure that other measures that the USFWS may require as being necessary or appropriate will be provided.
- The USFWS has received such other assurances as may be required that the HCP will be implemented.

E.1.3. Post-Issuance Phase

The USFWS and NMFS may publish notice of the ITP issuance in the Federal Register, although this is not required by the ESA. The post-issuance phase also includes monitoring of the permittee's compliance with the HCP and monitoring of the HCP's effects.

E.2. GUIDELINES FOR HABITAT CONSERVATION PLANS

The USFWS and NMFS requirements for a HCP are summarized below. The sections in the HCP are not required to appear in the same sequence as listed below.

Impacts likely to result from the proposed taking of one or more federally listed wildlife species

The following four tasks must be completed to determine the impacts:

- Delineate the boundaries of the HCP area.
- Collect and synthesize the biological data for all species covered by the HCP.
- Identify the proposed activities that are likely to result in incidental take.
- Quantify anticipated take levels.

The impact assessment must also meet the requirements of NEPA and the ESA (Section 7).

Measures the applicant will undertake to monitor, minimize, and mitigate such impacts; the funding that will be made available to undertake such measures; and the procedures to deal with unforeseen circumstances

HCP mitigation programs are extremely varied. Section 10(a) of the ESA requires that ITP issuance does not "appreciably reduce the likelihood of the survival and recovery of the species in the wild." The ESA does not require that HCPs result in the recovery of species covered under such plans. In fact, such a standard would be nearly impossible to meet. Most landowners manage only small percentages of a species' total range or population. Much of the threat to a species is therefore beyond the control or influence of management actions undertaken on any given ownership.

Congressional intent and related agency policy do, however, indicate that, as a condition of ITP issuance, each HCP must contain measures and result in impacts that are consistent with the long-term survival of covered species. Long-term survival is defined not as mere persistence, but as the maintenance of genetically and demographically healthy, viable, well-distributed populations throughout the range of a species.

The specific measures and permissible impacts that can accommodate this will vary by species, location, and time, according to the status and needs of the species, as well as the type of management being proposed. In some cases, reductions in baseline conditions will be consistent with long-term survival. In other cases, maintenance or even enhancement of baseline conditions may be necessary.

The Section 10(a) regulations require that a HCP describe the specific monitoring measures the applicant will carry out during the proposed activities.

The applicant and the USFWS and NMFS must agree on procedures to deal with unforeseen circumstances.

Alternative actions the applicant considered that would not result in take, and the reasons why such alternatives are not being utilized

This section of the HCP should include at least two alternatives: a no-take alternative and a no-action alternative (no activities would be carried out).

Economic considerations may be cited as a reason for rejecting project alternatives.

Additional measures the USFWS and NMFS may require as necessary or appropriate for purposes of the plan

The most significant additional measure required by the USFWS and NMFS is the Implementing Agreement, which is a legal contract that identifies the responsibilities of all HCP participants, legally binds the parties to their obligations, and is signed by all parties with HCP responsibilities or statutory authority over the HCP program.

Appendix F
Final Report: Northern Spotted Owl Surveys Elliott State Forest 2003

F.1. INTRODUCTION

The Oregon Department of Forestry (ODF) manages approximately 800,000 acres of state forestlands within the physiographic range of the northern spotted owl. This includes the 93,500-acre Elliott State Forest in the west Coast Range of Douglas and Coos counties, Oregon.

In 1990, ODF personnel began conducting northern spotted owl surveys on some state lands, including the Elliott State Forest. In 1991, Oregon Department of Fish and Wildlife (ODFW) crews surveyed a larger portion of state lands. In 1992, the Oregon Cooperative Fish and Wildlife Research Unit (OCFWRU) of Oregon State University began conducting northern spotted owl surveys on state lands throughout western Oregon. These survey efforts included density study areas on the Elliott State Forest and in the Astoria District, demographic study areas on the Elliott State Forest and on the North Coast, and timber sale surveys. OCFWRU crews completely surveyed the Elliott State Forest for northern spotted owls from 1992 through 1996. In 1997 and 1998, only known sites were surveyed. Telemetry data were also collected at a number of northern spotted owl sites on the Elliott State Forest in 1997 and 1998 to assess home range and habitat use.

In 1995, the ODF obtained approval from the U. S. Fish and Wildlife Service (USFWS) to implement a Habitat Conservation Plan (HCP) for the northern spotted owl on the Elliott State Forest. As part of the HCP monitoring, a density survey of northern spotted owls was conducted on the Elliott State Forest in 2003. A density survey involves surveying all potential habitat within the study area. These survey results are used to estimate the density of northern spotted owl activity centers on the Elliott State Forest and to provide site occupancy and reproductive information. 1996 marked the last year in which a complete density survey for northern spotted owls was conducted on the Elliott State Forest. Density estimates were also made for 1997 and 1998 when only known sites were surveyed.

F.2. ACKNOWLEDGEMENTS

Kingfisher would like to thank Randy Smith, who served as the ODF contract administrator for this project, and Marcia Humes and Rosemary Mannix for administrative support. We also thank Mike Wilson at the Salem office for his help throughout the season. We appreciate the assistance of everyone at the Coos Bay District office. We also thank Stuart Love of the ODFW, and Greg Kreimeyer and Norma Kline of the ODF for their assistance in designating northern spotted owl activity centers.

F.3. SURVEY AREA

The 2003 density survey area was located in the Oregon Coast Range near Reedsport and Coos Bay, and included the 378-square kilometer Elliott State Forest, plus a small area of Coos Bay Bureau of Land Management (BLM) land adjacent to northeast Elliott State Forest (43° 24'- 43° 42' N, 123° 50'- 124° 05' E). Most of the survey area was in the western hemlock (*Tsuga heterophylla*) vegetation zone. The Sitka spruce (*Picea sitchensis*) zone is represented on the western edge of the survey area. The forest is dominated by conifers, primarily Douglas-fir (*Pseudotsuga menziesii*), western hemlock, and western red cedar (*Thuja plicata*) (Franklin and Dyrness 1988). Red alder (*Alnus rubra*) often pioneers on disturbed sites or is associated with bigleaf maple (*Acer macrophyllum*), and Oregon-myrtle (*Umbellularia californica*) is well distributed throughout the forest.

In 1868, the Coos Bay Fire burned about 90 percent of the Elliott State Forest; thus, most of the forest is less than 140 years old. As of 1995, approximately ten percent of the forest was clearcuts and saplings, 53 percent was early-successional forest (pole-aged, younger mixed age, or alder-dominated), and 33 percent was late-successional forest (mature or old forest) (OCFWRU 2000). The topography is very steep with narrow ridges and deeply incised drainages; the elevation ranges from approximately 100 to 800 meters above mean sea level. The climate is maritime with mild, wet, and cloudy winters, and dry summers. Annual precipitation typically ranges from 1,700 to 3,000 millimeters (Franklin and Dyrness 1988).

F.4. METHODS

All potential northern spotted owl habitat (forest with trees 11 inches diameter breast height [DBH] or larger) on the Elliott State Forest was surveyed using the six-visits, one-year survey method, in accordance with the 1992 Revised Version of "Protocol For Surveying Proposed Management Activities That May Impact Northern Spotted Owls," endorsed by the USFWS. Surveys were conducted from March 15, 2003 to August 31, 2003. Survey visits were conducted at night to determine initial occupancy. Day visits were conducted to determine site status and reproductive success.

The crude density estimate of northern spotted owl activity centers is based on the combined number of pair and resident-single sites divided by the size of the survey area, i.e., 378 square kilometers. From 1992 through 1996, crude density estimates for the Elliott State Forest were calculated based on demographic survey protocol (Miller et al. 1990). In 2003, northern spotted owl surveys on the Elliott State Forest were conducted following the six-visit methodology outlined in the protocol for surveying proposed management activities. This protocol is less rigorous, in terms of survey effort to determine reproductive success, than survey protocol for demographic studies. However, the protocol for management activities does provide the necessary information for determining the number of individual northern spotted owls and activity centers present over a given area. The difference in protocols does not affect the overall density estimate, and how density was calculated in 2003 is comparable to how it was calculated for data collected on the Elliott State Forest from 1992 through 1996, when the entire forest was surveyed for northern spotted owls.

An activity center meeting was held on September 16, 2003 at the Western Lane District office in Veneta, Oregon, where representatives from ODF and ODFW determined the status of each northern spotted owl detected and the location of its respective activity center. Kingfisher facilitated these meetings and provided technical information and input to the process. Activity center locations are typically designated in accordance with the "Guidelines for Identifying and Designating Northern Spotted Owl Activity Centers," recommended by the ODFW on June 29, 1992 and amended October 1, 1994.

F.5. PERSONNEL

All Kingfisher personnel went through intensive class work and field training prior to the survey season. To prepare surveyors for fieldwork, survey protocol and northern spotted owl biology and ecology were thoroughly covered. Kingfisher also provided information about other northern spotted owl species and safety and emergency procedures, and conducted map and compass orienteering in the field.

Amy Ellingson served as Project Manager, and John Perkins served as Field Coordinator for this project. John Perkins, Tim Grubert, and Robert Potts conducted all station setups, surveys, and follow-up visits. The primary district representative for the ODF was Randy Smith, Southern Oregon Area Wildlife Biologist, and the primary contact at the Salem office was Mike Wilson, Staff Biological Specialist.

F.6. RESULTS

F.6.1. Surveys

In 2003, Kingfisher surveyed all potential habitat on the Elliott State Forest for northern spotted owls using the six-visit, one-year survey method. A total of 47 northern spotted owl sites (including prior non-territorial response locations and historic status sites) on the Elliott State Forest were surveyed using protocol for management activities.

Based on the survey protocol for management activities, there were 12 active pair sites, including the new West Glenn Creek site, and 1 resident-single site, for a total of 13 activity centers (active pair and resident-single sites combined). Based on the more rigorous protocol for demographic studies, there were ten active pair sites and three resident-single sites (two with pair status unknown) for a total of 13 activity centers.

There were no known nesting attempts at any of the known northern spotted owl sites on the Elliott State Forest in 2003. The Fourmile pair reportedly attempted to nest on private land close to the Elliott State Forest, but failed.

Non-territorial single ("floater") northern spotted owls were detected at four sites, including Palouse Creek, Luder Creek, East Hakki Ridge, and Shake Creek. A female northern spotted owl was detected on nearby Coos Bay BLM lands (Upper Sock Creek); however, stations in that area were dropped in early May, because it was not actually intended to be part of the density survey. That response received a Status Unknown designation. Biologists observed the uncommon appearance of an additional male at the Wind Creek pair site in early May.

The Bickford Creek site, on adjacent private property, was downgraded from pair to historic status, for the following reasons: the historic male was found dead in 1998; there was only one male night response during surveys conducted by consultants from 1999 through 2001; and the core area has since been clearcut. Panther Creek received resident-single status, because a male was detected at that site on three occasions. Regardless of survey results for this year, all other sites retain their previous status per the management protocol, because no northern spotted owl surveys have been conducted on the Elliott State Forest since 1998.

Barred owls (*Strix varia*) were detected at eight northern spotted owl sites, including Alder Creek, Benson Creek, Bickford Creek, Johnson Creek, Murphy Creek, Roberts Creek, Tom Fool Creek, and Upper Mill Creek. Bickford Creek and Murphy Creek northern spotted owls sites were not active in 2003.

F.6.2. Density Estimates

Part of the monitoring component of the HCP is to estimate the density of northern spotted owls and northern spotted owl activity centers on the Elliott State Forest. Crude density is the number of northern spotted owls or activity centers divided by the size of survey area, i.e., 378 square kilometers. Based on demographic protocol, there were ten pair sites, two resident-single sites with pair status unknown, and one resident-single site, for a total of 25

northern spotted owls and 13 activity centers in 2003. As with past estimates, the Fourmile northern spotted owl site on nearby private land was included in the 2003 density estimates for the Elliott State Forest (see Table F-1).

Table F-1
Number of Northern Spotted Owls and Northern Spotted Owl Activity Centers Observed, and the Crude Density of Northern Spotted Owls and Activity Centers, Elliott State Forest (378 square kilometers), 1991–1998, 2003

Year	Number Observed[a]		Density (per square kilometer)[b]	
	Activity Centers	Northern Spotted Owls	Activity Centers	Northern Spotted Owls
1991	25	51	0.066	0.135
1992	22	44	0.058	0.116
1993	21	40	0.056	0.106
1994	18	35	0.048	0.093
1995	19	30	0.050	0.079
1996	13	23	0.034	0.061
1997[c]	11	20	0.029	0.053
1998[c]	11	19	0.029	0.050
2003[d]	13	25	0.034	0.066

[a] Includes active pair and resident single sites

[b] Crude density, i.e., number of northern spotted owls or territories per 378 square kilometers

[c] Minimum estimates, i.e., only previously known northern spotted owl sites were surveyed

[d] One-year (six-visit) surveys

F.7. NORTHERN SPOTTED OWL SITES

The updated survey results for each known northern spotted owl site on the Elliott State Forest through 2003 are discussed in this section. Tables F-2, F-3, and F-4 (in Section F.8) summarize the survey results and present the status of the northern spotted owl sites investigated.

Please note that northern spotted owl sites are separated into two categories. The first group includes all sites that are currently occupied by resident northern spotted owls or that had resident northern spotted owls at one time (as defined by the management protocol). This includes pairs; resident singles; two birds, pair status unknown (with at least one bird meeting resident single status); and historical sites. The second group includes response areas where the residency criteria of the management protocol were never met. These include non-territorial singles and status unknown.

F.7.1. Pairs, Resident Singles, and Historic

Alder Creek 2924 (Pair)

This pair site was established in 1991. The female (green-right) that nested and was banded at the Noble Creek site in 1991 moved to Alder Creek in 1992. In 1992, the non-nesting pair was found farther to the north, and the activity center was moved. The male was banded (orange-left) in 1992. This pair produced two young in 1993, both of which were banded. The nest tree was not located, and the activity center location was moved to the earliest juvenile location. The pair did not nest in 1994. The pair produced one young in 1995, which was banded. The activity center was moved to the nest tree location 0.4 mile to the northwest. The 1996 season resulted in two male responses at night during nine visits. There were no responses in 1997 or 1998, and the site retained pair status with two years of vacancy. In 2003, there was one nighttime pair response and several individual male and female responses, and the female took one mouse from the road at nighttime. No bands were read, and nesting status was unknown. Barred owls were detected near this site.

Benson Creek 2929 (Pair)

This pair site was established in 1991. In 1992, the pair was found nesting just outside state land on Sun Studs property. The pair produced at least one young. Both adults and one juvenile were banded in 1992 (female, yellow-right; male, white-left). In 1993, only the historic male was found. Pair status and activity center were unchanged. The historic male was found in 1994 paired with a new female, which was banded as a juvenile in the Coos Bay BLM district (re-banded, black-left). The pair did not nest and the activity center was not changed. In 1995, the female was found once during the day. The historic male was found during the day in June and then found dead in July during a day visit. A new male was found near this activity center a week after the historic male was found dead. This new male had been re-banded (black with orange tab-left) at the Upper Palouse Creek site in 1993. In August, he was seen again in the same vicinity. Nesting status was unknown, and the pair status and activity center remained the same. In 1996, the pair was confirmed and observed

to be non-nesting. The activity center was moved to the northeast to more accurately reflect habitat usage. In 1997, a new male (yellow/black/yellow with blue tab-right) was paired with the historic female. He was banded at the Roberts Creek site in 1996 as a juvenile. They did not nest. The pair occupied this site in 1998 but did not nest. Site and location status did not change. In early June 2003, the historic female ate all four mice offered her. There was one nighttime pair response, and the unidentified male took three mice that night. On another night, the female took two more mice. Both sexes were twice heard on other nights. Nesting status was unknown, but observations suggest the pair was not nesting.

Bickford Creek 2932 (Historic)

This pair site was located in 1991, and the male was banded (orange-left). Early visits to the site produced no responses in 1992. Further survey responsibility for this site was then given to Beak Consultants surveyors, because they were surveying adjacent Weyerhaeuser land. Beak Consultants surveyors heard a pair and juveniles at night. The OCFWRU crew visited the site with Beak Consultants surveyors and banded the female (green-right) and two juveniles. They also confirmed the presence of the 1991 male. In 1993, only the historic male was found near the activity center. In 1994, the pair fledged one young, which was banded. In 1995, the same pair was found, but they did not nest. In 1996, the same pair attempted to nest in the same tree as 1994 but failed. Only the male was found at this site in 1997, when a radio transmitter was attached to him. In 1998, the male occupied the site until August, when his carcass and transmitter were found in Surprise Creek. Pair status and activity center location remained the same. The landowner contracted Mason, Bruce, and Girard, Inc. to conduct surveys from 1999 through 2001. A single nighttime male response was heard in 2001. In 2003, no northern spotted owls were detected at this site. Site status has been downgraded to historic, because there was only one northern spotted owl response after three years of surveys (1999 to 2001), and the Bickford Creek activity center on private land has recently been clearcut. A male barred owl was detected in the area on several visits.

Big Creek 2923 (Historic)

A pair was found at this site in 1991. The 1992 survey was incomplete, because surveyors did not survey land owned by International Paper. One pair and two male responses on International Paper land were heard from state land on separate nights, and a female was heard near the 1991 activity center. It is likely that the northern spotted owls used both ODF and International Paper lands. The 1992 activity center was closer to International Paper land, but still on state land. The data likely did not reflect the true activity center because of the incomplete survey. No northern spotted owls were banded at the Big Creek site, and pair status remained for 1992. In 1993, OCFWRU surveyors heard a male on two separate nights, and Beak Consultants surveyors heard a male at night and once on a day follow-up visit. The 1993 data did not produce evidence for either an activity center or status change. There were no responses in 1994, and the status and activity center location remained the same. In 1995, there was a male response at night, northeast of the activity center. However, the response was attributed to the Noble Creek site due to northern spotted owl behavior. No responses were detected at this site in 1996, so the site received historic status after three years of vacancy. There were no responses in 1997, 1998, or 2003.

Charlotte Creek 2917 (Historic)

In 1991, there was a resident single female at this site. There were two female responses near the site in 1992. Resident single female status remained for 1992. In 1993, a pair was heard at night early in the season and a sub-adult male was found during the day. On subsequent and separate night visits, one unknown, one male, and two female responses were detected. A pair was found at this site at the end of the season. The female was banded (red-right). The site received pair status in 1993, and the activity center location remained the same. Early in the 1994 survey season, a sub-adult male was found at this site during the day, and the 1993 female was found here once late in the season. The male that was re-banded (orange with blue tab-right) at the Luder Creek site earlier that year was also found at this site in mid-season. There were numerous male and female responses at night. Site status and activity center location remained the same. In 1995, the male re-banded at the Luder Creek site in 1994 was paired at this site with the female banded in 1993. They did not nest, and site status remained the same. Daytime locations were centered about 1.25 miles northeast of the activity center, but it did not change. There were no responses in 1996, 1997, or 1998, and pair status changed to historic after three years of vacancy. There were no responses at this site in 2003.

Dean Creek 2916 (Pair)

A male was heard in this area in 1987. The site was first established in 1990 with a pair that nested. In 1991, a non-nesting pair occupied the site. The male was banded (black-right). In 1992, the pair nested in the same general area as in 1990, and the female (green-left) and two juveniles were banded. In 1993, the pair was found near the historic activity center. The first day visit identified a nesting attempt in a different tree than in previous years. Subsequent visits indicated that the nest had failed. In 1994, the same pair fledged two young. Return visits to band the juveniles were unsuccessful, and it is thought that both may have died. The pair did not nest in 1995. In 1996, the pair attempted to nest, but failed. In 1997, the pair was observed once attempting to nest, but subsequent visits yielded non-nesting behavior. In 1998, the female was detected multiple times, but there was only one response at night from a male. The pair did not nest. Site status and activity center location remained unchanged. A pair occupied this site in 2003, but biologists were not able to find the pair during the day to determine reproduction.

Deer Creek 4170 (Historic)

In 1991, there was one response from a single male in this area; its status was designated as "other single" and it was named Upper Charlotte Creek. In 1992, there was one male response, but follow-ups and additional night calling detected no response. The site was classified as status unknown. In 1993, this site was renamed Deer Creek and given pair status after an ODFW murrelet surveyor heard a pair response and a response from a single male on separate nights. OCFWRU surveyors did not detect any northern spotted owls during six night surveys and two daytime follow-up visits to the site. There were no responses in 1994, 1995, or 1996. Site status was changed to historic after three years of vacancy. The site was not surveyed in 1997 or 1998. There were no responses in 2003.

East Hakki Ridge 2914 (Historic)

This site was classified as a resident single in 1991 when a male was banded (blue-right). In 1992, the bird banded in 1991 was found paired with the female at the Fish Creek site, so the resident status was dropped and East Hakki Ridge was considered a historic site. No responses were heard in 1993 or 1994. In 1995, one male response was heard at night early in the season on private land, but inability to contact the landowner resulted in no follow-up. This northern spotted owl was considered a non-territorial single. No responses were detected in 1996. The site was not surveyed in 1997 or 1998. In early April 2003, a northern spotted owl of unknown sex was heard near the 1991 response site. A single male hoot was heard in the area on the daytime follow-up visit, but biologists were unable to visually locate the bird. No other responses were detected at this site in 2003.

Fish Creek 2926 (Historic)

This pair site was discovered early in the 1992 field season. In 1991, a single female response was heard from nearby Fish Ridge. This response was combined with the Fish Creek site for 1992. The female was banded in 1992, and the male had been banded in 1991 at the East Hakki Ridge site, a movement of eight miles (female, yellow-right; male, blue-right). The pair did not nest in 1992. In 1993, this male moved an additional three miles to the Middle Mill Creek site during the middle of the summer. The original female remained in the Fish Creek site, and the activity center did not change. In 1994, the male returned to Fish Creek and was paired with a female. Surveyors were unable to see the female's band, but her behavior was indicative of the historic female. In both 1993 and 1994, the same pair was consistently found to the east of the activity center. The activity center was, therefore, moved to that location. There were no responses in 1995, 1996, 1997, or 1998. Site status changed to historic in 1997 after three years of vacancy. There were no responses at this site in 2003.

Fourmile Creek 3977 (Pair)

This site was established in 1994 when a male (white-right) northern spotted owl and a female barred owl were found. The male was banded, and the site was designated “two birds, status unknown” for 1994. In 1995, Beak Consultants surveyors monitored the site and detected three male responses at night, two of which were on the same night. The male banded at this site in 1994 was found at the Hodges Creek site in 1995, 1.25 miles to the southeast, and it was thought that these three responses may be from that same northern spotted owl. In 1996, Beak Consultants surveyors monitored the site and detected two male responses at night. A male was seen on a day visit, but the bands were not read. However, it is likely that this was the male re-banded on May 20 at Marlow Creek. It was decided at the activity center meeting that these responses should be attributed to the Lockhart Road site. Beak Consultants again monitored the site in 1997 with no responses. Surveyors found a pair at this site in 1998. As a result, the site received pair status in 1998. The activity center location did not change. A pair was present at this site in 1999, but there were no responses in 2000 or 2001. The pair nested at this site in 2002 and fledged one young. In 2003, Environmental Services Northwest, Inc. and Pacific Biota found a pair at this site (female, white/sky blue/white-right; male, green-left). The pair attempted to nest on private land, very close to the Elliott State Forest border, but the attempt was determined a failure when biologist visited the site in mid June.

Johnson Creek 2933 (Pair)

In 1990, there were two responses from a northern spotted owl of unknown sex, and there was one male response in this area. A resident-single male occupied this site in 1991. In 1992, a nesting pair was found less than 0.25 mile from the 1991 activity center, and both adults and two juveniles were banded (female, white-right; male, green-left). The South Fork Johnson Creek pair site from 1991 was located about 0.5 mile away, but no northern spotted owls were found there in 1992. It is possible the same pair of northern spotted owls used both sites in 1991. For this reason, the data for both sites were combined in 1992 and called Johnson Creek. In 1993, the 1992 pair nested in the same tree again and produced one young, which was banded. Only the male was found at this site in 1994 and 1995. In 1996, the 1992 male paired with a sub-adult female, who had been banded as a juvenile in Martin Tributary by Roseburg BLM the previous year. She was subsequently re-banded (yellow/black/yellow-right). They did not nest. In 1997, the pair nested and fledged one young that was banded. Status remained the same, as did the activity center, given that the 1997 nest tree is in the existing core area. The female was not found in 1998, but the male was present. Site and location status did not change. In 2003, the Roberts Creek male was found near the Johnson Creek activity center, but he was later found paired with the historic Roberts Creek female to the north. The historic Johnson Creek female was found occupying the drainage to the south of the historic activity center. Later in the season, she was found paired with a new male in that area. He was subsequently banded (blue-left), and the female's broken band was replaced (horizontal orange/black-left). They did not attempt to nest. Barred owls were detected near this site.

Larson Creek 2936 (Historic)

A pair was banded at this site in 1991 (female, yellow-left; male, blue-left). In 1992, the pair was found in late June and two juveniles that were with them were banded. The activity center was located adjacent to state land on private property. In 1993, 1994, and 1995, only the banded male was found, and pair status and activity center location remained the same. Biologists were unable to determine nesting and site status, because they were unable to acquire permission to survey on private land. In 1996, no responses were detected, and the 1991 male from this site was found at the Palouse Creek site paired with a 1992 female juvenile from Johnson Creek. Site status was changed to resident single. In 1997 and 1998, there were no responses, and site status was changed to historic in 1998 after three years of vacancy. There were no responses at this site in 2003.

Lower Camp Creek 2922 (Historic)

This site had pair status in 1991. In 1992, the pair was heard near the 1991 site on two nights. On both occasions, the female responded first, and the male flew in from BLM land at the head of the drainage. The male was heard but not seen during the day on BLM land. There were no responses in 1993 or 1994, and the status and activity center location remained the same. Surveys in 1995 detected three pair and two male responses. A male was eventually found and re-banded (white with blue tab-left), but the female was not seen. The male had been banded as a juvenile in 1993 at the Alder Creek site. In 1996, two male responses at night were later associated with the Upper Mill Creek site. The male found at the Lower Camp Creek site in 1995 was found paired with an un-banded female at the Upper Mill

Creek site. In 1997, there were no responses. One female response in 1998 was later attributed to the Lower Mill Creek site, and there were no other responses from this site. As a result, site status was changed to historic in 1998. There were no northern spotted owl responses attributed to this site in 2003. Two female responses detected between the Lower Camp Creek and Lower Mill Creek activity centers were attributed to the Lower Mill Creek site.

Lower Mill Creek 2919 (Pair)

This site had a known pair as early as 1986 when the male was banded. A pair nested at this site in 1990. A non-nesting pair resided here in 1991. In 1992, a sub-adult female (red/white/red-right) that was radio-tagged replaced the 1991 female. The pair was non-nesting. The pair was found but did not nest in 1993, and site status remained the same. In 1994, the pair fledged one young. The female was re-banded (white-right), and the juvenile was banded. The activity center was moved to the 1994 nest tree location. The pair did not nest in 1995. In 1996, the pair fledged two young, and both were banded. The pair did not nest in 1997. The pair was found in this site in 1998, but they did not nest. Site status and activity center location remained the same. In 2003, the historic female was found paired with an un-banded male. They did not attempt to nest.

Lower Millicoma 3529 (Historic)

In 1992, a resident-single female (red-right) occupied this site. That year, the male from Eleven Creek #2 was heard once at night near the area, and the Jim Whitty floater male (yellow-right) was found in the area, but there did not seem to be any pair association. In 1993, there was one night response from a northern spotted owl of unknown sex. Site status and activity center location remained the same. In 1994, a male was heard in the area at night and the following day, but status was changed to historic, because the 1992 female was found on Coos Bay BLM land. There were no responses in 1995. In 1996, there was one male (triangle, red with yellow-left) visual response, which was identified as the bird banded the same year at Marlow Creek. This response was associated with the Lockhart Road site. In 1997, there were no responses, and historic site status remained unchanged. A sub-adult male was re-banded (white-left) at this site in 1998. He was originally banded as a juvenile at Big Creek on Weyerhaeuser ownership. Weyerhaeuser surveyors found him later in the season at Packard Creek. Site status did not change. There were no northern spotted owl responses at this site in 2003.

Luder Creek 2920 (Historic)

There was a female response here in 1982, and a male response in 1990. A pair site was established here in 1991. In 1992, the female was heard several times at night, and was eventually found during the day. The male was with her but was unable to vocalize. They were both banded (female, black-left; male, red-right). The birds were not seen in 1993, but one male response was heard at night, one night response from a northern spotted owl of unknown sex was heard, and one female daytime response was detected. The male still had a very weak vocalization. Site status and activity center location remained the same. Early in 1994, biologist "moused" the 1992 male at this site. In May, however, the banded female was paired with a sub-adult male that was re-banded (orange with blue tab-right). This male had

been banded as a juvenile in 1992 at the Roberts Creek site. This male was also found at the Charlotte Creek site mid-season. The original male was not seen again in 1994. Non-nesting was confirmed, and site status and activity center location remained the same. In 1995, there were three male responses but no visual was obtained. There were no responses in 1996, 1997, or 1998, and site status changed to historic after three years of vacancy. In 2003, a northern spotted owl of unknown sex was heard in this area, but nothing was found on the follow-up visit, and no other responses were detected at this site.

Marlow Creek 2938 (Pair)

There was a northern spotted owl of unknown sex at the site in 1982, a resident single male in 1991, and a pair in 1992. The female was banded that year (orange-right). Repeated attempts to band the male were unsuccessful. The activity center was moved to the location of the daytime pair response. In 1993 and 1994, there were no responses at this site. In July 1995, Beak Consultants surveyors detected a nighttime response from a northern spotted owl of unknown sex, but OCFWRU crews detected no responses during six night visits. Pair status was changed to status unknown. In 1996, two separate males and a female were seen at the site. In late May 1996, a sub-adult male was re-banded (triangle, red with yellow-left). He was originally banded as a juvenile at the Roberts Creek site in 1995. A female from the North Fork Coquille site (Coos Bay BLM) that had been banded as a juvenile in 1994 was re-banded here in late August (blue with black tab-right). A second male was believed to occupy this site in late August, because the sub-adult male was found at the Lower Millicoma site 1.5 miles away later that evening. The activity center remained at the same location. The status of this site was changed from status unknown to resident-single male with pair status unknown. In 1997, OCFWRU and Beak Consultants surveyors confirmed pair status at this site with the 1996 female and the 1992 Jim Whitty male who was re-banded (green-right). Nesting status was not determined to protocol, but there was no evidence of reproduction. The site was upgraded from resident single to pair status, and the activity center was moved 1.25 miles to the northeast. The 1997 pair was found at the site in 1998, but they did not nest. There was no change in site status or activity center location. The historic pair occupied this site in 2003, but they did not nest. The female's broken band was replaced (white with blue dots-right).

Marlow Ridge 2937 (Historic)

A resident-single male occupied this site in 1991. In 1992, no northern spotted owls were detected at this site, but surveys were incomplete due to access problems on private land. The resident of a private house on the West Fork Millicoma River reported hearing northern spotted owls frequently behind his house from January to April 1992. No northern spotted owls were banded at this site. There were no responses at this site in 1993. That year, a new Lower West Fork Millicoma site was established on Weyerhaeuser land. Marlow Ridge was considered an historic site, because it may have been the northern spotted owl from Lower West Fork Millicoma. There were no responses at this site in 1994, 1995, or 1996. The site was not surveyed in 1997 or 1998. There was one male night response from this general area in 2003, but that was attributed to the Marlow Creek site.

Middle Mill Creek 2921 (Historic)

This site has existed since 1986 when a pair of northern spotted owls was present. A resident-single male was present from 1987 to 1991. In 1992, a non-nesting pair was banded near the 1991 site, and the site received pair status (female, green-right; male, white-left). In 1993, the male from the Fish Creek site (blue-right) moved to Middle Mill Creek and was found with the Middle Mill Creek female. He was re-banded (black-right) in 1993 to avoid confusion with the male at Upper Mill Creek. In 1994, the 1992 female paired with a new sub-adult male that was re-banded (orange-left). They did not nest. This male had been banded as a juvenile on the Roseburg BLM district. The 1993 male occupied the Fish Creek site in 1994. In April 1995, a biologist "moused" the 1994 male at this site. However, only one subsequent response that year was attributed to this site—a male 1.25 miles northwest of the activity center. The male was then found in early July on the Coos Bay BLM district 7.7 miles to the southeast, paired with an established female. Pair status and the activity center location remained the same. In 1996, the Upper Mill Creek male (white with blue tab-left) was seen here twice. These responses were attributed to the Upper Mill Creek site. The Upper Mill Creek male was seen here again in 1997, and the response was attributed to the Upper Mill Creek site. There were no responses in 1998, and site status was changed to historic after three years of vacancy. There were no northern spotted owl responses at this site in 2003.

Murphy Creek 2918 (Pair)

A male was heard in this area in 1990, and a pair was heard in 1991 when an activity center was established. In 1992, a female was detected several times close to the 1991 site on Sun Studs property, and a male was found close to the creek bottom twice. Both northern spotted owls were banded and the activity center was moved to the location of the 1992 female daytime sightings (female, green-left; male, white-right). The pair did not nest. In 1993, the non-nesting pair was found several times about one mile to the east of the 1991/92 site, but site status and activity center location remained the same. In 1994, the 1992 female paired with a new un-banded adult male that was subsequently banded (blue-right). They were found several times one mile to the east of the activity center, in the same area as in 1993. As a result, the activity center was moved to that area and is now on state land. They did not nest. In 1995, the male was found several times, but the female was only heard. Nesting status was unknown. In 1996, the 1992 female paired with the 1995 Noble Creek male (yellow/black/yellow-left) at this site. This male was seen later in the year at the Wind Creek site, but he was not seen paired with the Wind Creek female. There were no responses in 1997 or 1998. In 1998, the 1992 female moved to the Palouse Creek site. Site status and activity center location remained the same with two years of vacancy. No northern spotted owl responses were detected at this site in 2003.

Noble Creek 2925 (Resident single)

This site had a nesting pair in 1991, and the female was banded (green-right). No northern spotted owls were detected at this site in 1992. The female that was banded in 1991 moved to the adjacent Alder Creek site and was paired with another male. In 1993, surveyors heard one nighttime male response, and Beak Consultants surveyors heard three nighttime male responses at this site. There were no responses at this site in 1994, and the pair status was changed to resident single. In 1995, there were several male responses, and a sub-adult male

was re-banded (yellow/black/yellow-left) 0.75 mile west of the activity center. He was originally banded as a juvenile at the Roberts Creek site in 1994. There was one response at night, but two different males were found at this site. There were no responses in 1996. In April 1997, there was one visual of a female at night, and several female responses were detected in August. A female was identified only once in late August when the northern spotted owl was re-banded (yellow/black/yellow-right). She was originally banded as a juvenile at the Roberts Creek site in 1996. There were no responses in 1998, and site status remained resident single, with one year of vacancy. There were no northern spotted owl responses at this site in 2003.

Palouse Creek 4362 (Pair)

A northern spotted owl of unknown sex was detected at this site in 1990, and a pair occupied this site in 1991. In 1992, there were no responses, but the site retained pair status. In 1993, a sub-adult male was twice found during the day. Beak Consultants and OCFWRU surveyors also heard him several times at night. Pair status and the activity center location were retained. There were no responses at this site in 1994. It was decided that the sub-adult male found in 1993 was probably the Upper Palouse male. This site received historic status in 1994, because no birds were banded at this site. In April 1995, there was a male nighttime response; a sub-adult male was found on the follow-up visit. Surveyors also heard a male response during the day a month later, but no visual was obtained. The site was classified as status unknown. In 1996, a pair was found at this site. The male (blue-left) was identified as the Larson Creek northern spotted owl, and the female (red-left) was a 1992 juvenile from Johnson Creek. This pair nested and fledged one young, which was banded but not found on later visits. The site received pair status, and the activity center was moved to the 1996 nest site. In 1997, the same pair was found nesting in the 1996 tree. They fledged one young, which was subsequently banded. It should be noted that, during one night of calling the Upper Palouse Creek site, the male from Palouse Creek responded and flew into the Upper Palouse Creek area. In 1998, the female (green-left) from Murphy Creek paired with the 1997 male from this site. They did not nest. Site and location status did not change. In late April 2003, an un-banded male was found in the area. On a rainy follow-up visit, he ate one mouse and refused more. No more northern spotted owls were detected at this site in 2003.

Panther Creek 4641 (Resident single)

This site was designated as “other single” female in 1991. No birds were heard near the activity center after six visits in 1992, but there was a response from a male approximately 0.75 mile away near the Millicoma River. The status of this site was not determined in 1992. In 1993, there was one male response near this area, but it was considered to be a non-territorial single. There were no responses at this site in 1994. In 1995, there was one male response at night near the activity center that was considered to be a non-territorial single. There were no responses in 1996, 1997, or 1998. In mid-July 2003, a male northern spotted owl was heard at this site. He was heard twice more on additional night visits to the area, and surveyors were able to “mouse” him on the road at night. Surveyors were unable to find him on follow-up visits, so no bands were read. The site received resident-single status, and the activity center was placed in the center of all three responses.

Roberts Creek 2931 (Pair)

A pair occupied this site in 1991. In 1992, the pair was found nesting very close to the 1991 activity center. Surveyors banded the male (red-left) and two young. The female had been banded as a juvenile in 1987 at a BLM site 15 miles to the east. In 1993, the pair was re-observed, the female was re-banded (orange-left), and non-nesting was determined. In 1994, the pair fledged two young, which were banded. In 1995, the pair fledged one young that was banded. In 1996, the pair nested in the 1994 nest tree and fledged two young, which were banded. The pair was confirmed in 1997. They did not nest. The pair did nest in 1998 and fledged two young, which were banded. Site status and activity center location did not change. In 2003, the historic Roberts Creek pair was non-nesting. They were detected on a number of occasions over a large home range, mostly to the east of the historic activity center location. The Roberts Creek male was also found near the historic Johnson Creek activity center to the south in mid-May. An aggressive male barred owl occupied the historic Roberts Creek activity center.

Salander Creek 2928 (Pair)

Although there was a northern spotted owl of unknown sex seen here in 1982, the site was not given pair status until 1991 when both adults were banded (female, yellow-left; male, red-right). The pair occupied the site in 1992 and nested close to the 1991 activity center. Surveyors saw two juveniles soon after fledging but never relocated them. Feathers from one juvenile were found, indicating possible predation. The pair did not nest in 1993. In 1994, the pair fledged one young that was banded. In 1995, the pair nested in the 1992 nest tree, and they fledged two young that were banded. The activity center location remained the same. In 1996, the pair nested and fledged one young that was banded. The pair nested in the same tree used in 1992 and 1995, and the location of that tree was determined using a global positioning system (GPS) unit. This changed the activity center location slightly and placed it on private land. In 1997, the pair nested in the 1994 nest tree and fledged two young, which were banded. In 1998, the pair nested in the 1992 nest tree and fledged one young that was banded. Site status and activity center location remained unchanged. In mid-April 2003, the historic male was found north of the historic activity center. Later in the season, the pair was found together at the historic activity center and determined to be non-nesting. The female's broken band was replaced (striped, black with white-left).

Shake Creek 3530 (Historic)

In 1991, a response was heard from a single male, and "other single" status was given to this site. In 1992, surveyors detected two male responses at night and one daytime audio response by a male. Site status was changed to resident single, and the activity center was moved to the 1992 daytime location. There were no responses at this site in 1993. In 1994, a male that had been banded as a juvenile in 1993 at the Alder Creek site was found and re-banded here (yellow/black/yellow-right). One female response was also heard at this site, but there was not enough evidence to determine pair status. The activity center location remained the same, and site status was classified as "two birds, status unknown." In 1995, there were two female responses at night. Even though the first response was between the Trout Creek and Shake Creek sites, it was attributed to the Shake Creek site because of the subsequent response near the Shake Creek activity center. There were no responses in 1996. In 1997, there were no

responses, and pair status unknown was changed to resident-single status with two years of vacancy. There were no responses in 1998, and site status was changed to historic after three years of vacancy. In mid-May 2003, an un-banded female, which was subsequently banded (dots, black with white-left), was found at the historic activity center. "Mousing" her at that time suggested non-nesting status. This was the only northern spotted owl detection at this site the whole season.

Sock Creek (BLM) 3158 (Resident single)

This site was first surveyed in 1990 by the BLM. A pair was present in 1991 (female, vertical red with yellow-right), in 1992 (female, diagonal green with white-right; male, vertical red with yellow-right), and in 1993 and 1994. An active nest was found at this site in 1993, but failed. The pair was non-nesting in 1994. The site was not surveyed in 1995. In 1996, the OCFWRU began surveying the site for the BLM; only the banded male was present. Pair status was retained, and the activity center location was changed to the 1993 nest site. In 1997, there were no responses attributed to this site, but a male heard in early April was believed to be the Tom Fool Creek male. On a subsequent visit, the Tom Fool Creek male was heard in the same general area and flew to the Tom Fool Creek site as daybreak neared. The site was occupied in 1998 by the 1996 male. Site status changed to resident-single (male); the activity center location did not change. In mid-April 2003, a male northern spotted owl was heard near the historic activity center, but a male barred owl responded at the same time. Surveyors were unable to find the male northern spotted owl on the follow-up visit. No other northern spotted owls were detected at this site after five additional nighttime surveys, so that male response was attributed to the nearby Tom Fool pair.

Tom Fool Creek (BLM) 3159 (Pair)

The Coos Bay BLM began surveying this site in 1988. That year, a male and female (yellow-left) were found at the site. No northern spotted owl responses were detected during surveys in 1989 and 1990. A pair was found at this site in 1991 (male, white-left), in 1992, in 1993 (female, diagonal, pink with purple-left; male, vertical yellow with black-left), and 1994. An active nest tree was found in 1994 and presumed to have failed. The activity center was re-located at this nest tree site. This site was not surveyed in 1995. In 1996, the OCFWRU began surveying the site for the BLM. There was one male response at night, in which the band was partially identified and presumed to be the historic male. The pair was present in 1997, but nesting protocol was not met. No young were detected. The male was heard at the Sock Creek activity center on at least one night, and two males were heard simultaneously on one night. The female was heard first at the end of June, but she was not observed until August. The 1997 pair nested on a rock shelf in 1998 and fledged two young, which were banded. The nest rock location was determined using a GPS unit and found to be inside the Elliott State Forest boundary. Site status and location did not change. In 2003, the female banded at this site in 1993 was paired near the 1994 activity center with an un-banded male. They were non-nesting. Surveyors replaced her broken band (stripe, green with white-left), and the male was also banded (orange-right). Timing and other convincing evidence suggest that this pair occupied the nearby Upper Mill Creek site early in the season. The activity center was moved to the 1998 nest cliff location, because this was the most recent known nest site, and it was closer to the 2003 locations.

Trout Creek 2934 (Historic)

In 1991, two male responses were heard at night in this area. Two female night responses were also heard 0.75 mile south of the male responses. Both response sites were given resident-single status. In 1992, there was one response at night from a northern spotted owl of unknown sex. This response was combined with the 1991 male responses, and the site retained resident-single status. The 1991 female responses were within 0.25 mile of the 1992 male responses at Eleven Creek, so her records were moved to the Eleven Creek #1 file. There were no northern spotted owl responses in this area in 1993, 1994, 1995, 1996, 1997, or 1998. This site was assigned historic status in 1995. There were no northern spotted owl responses in this area in 2003.

Upper Mill Creek (BLM) 2176 (Pair)

This site was first surveyed by the BLM in 1986 when a pair fledged two young. A pair occupied this site through 1993, but 1988 was the only year young were found (female, red-right). The birds attempted to nest in 1993, but were unsuccessful. The nest was found and believed to be the nest used in past years. There were no responses in 1994, and the site was not surveyed in 1995. In 1996, the OCFWRU began surveying this site, and a pair was found. The male (white with blue tab-left) was identified as the 1995 Lower Camp Creek northern spotted owl. The un-banded female was banded (blue-left). In 1997, the pair nested in a new tree and fledged one young. The female and juvenile were last seen at the end of June, and subsequent visits yielded only male responses. In 1996 and 1997, the male at this site was also observed at the Middle Mill Creek activity center. In 1998, the 1997 male paired with an un-banded sub-adult female that was banded (fluorescent pink-left). The pair did not nest, and site status and activity center location did not change. In mid-April 2003, a pair was detected at the activity center. An un-banded male was found the next day; he ate two mice and refused more. No northern spotted owls were found at this site during the rest of the season, and a male barred owl occupied this site after that. About the same time that this northern spotted owl pair disappeared, the very nearby Tom Fool pair was detected. At the activity center meeting, it was decided that the Upper Mill Creek pair moved to the Tom Fool site after being displaced by the barred owl. They were determined to be non-nesting (see Tom Fool site for more information).

Upper Millicoma 2927 (Historic)

In 1991, this site was designated a resident-single site, and the male was banded yellow/ black/yellow-right). There were no responses in this area during 1992, 1993, 1994, or 1995, so site status was changed to historic. In 1994, the male that was banded at this site in 1991 was found on the Siuslaw National Forest. In 1996, one nighttime female response was designated as a non-territorial single. There were no responses in 1997, 1998, or 2003.

Upper Palouse Creek 2935 (Historic)

A pair was heard at this site in 1991. In 1992, no responses were heard at or near the site. The site was classified as status unknown in 1992, because of concern that the northern spotted owls heard in 1991 were the same as those found at the Palouse Creek site. In 1993, a sub-adult male, banded as a juvenile at Dean Creek in 1992, was found near this site several times and re-banded (black with orange tab-left). The site received resident-single status, and

the activity center location was moved. There were male responses at this site in 1994, but it was the Johnson Creek male on at least one occasion. In 1995, there were three male responses at night, but follow-up visits yielded no results. There were no responses in 1996 or 1997. In 1997, however, the Palouse Creek male (blue-left) was found near the Upper Palouse Creek area. In 1998, one nighttime female response was heard, but that was attributed to the Palouse Creek site. Site status changed to historic after three years of vacancy. In 2003, no northern spotted owl responses were detected at this site.

Upper Roberts Creek 2930 (Historic)

In 1991, a pair was heard twice at this site. In 1992, no responses were heard in three night visits. One night in 1993, two northern spotted owls of unknown sex were heard issuing four-note calls at each other. They were in the area between the Roberts Creek and Upper Roberts Creek sites. Pair status and the activity center location were retained. There were three responses at night from a male at this site in 1994. The activity center was moved to the approximate center of these three responses, and site status was changed to resident single. In 1995, there was one male response at night. There were no responses at this site in 1996, but the Benson Creek male was confirmed near this site. Subsequently, the 1995 response was attributed to the Benson Creek site. There were no responses in 1997. This was the third year of vacancy, and site status was changed from resident single to historic. There were no responses in 1998. In 2003, barred owls displaced the Roberts Creek pair further to the east into the Upper Roberts Creek site. The Roberts Creek birds were the only northern spotted owls confirmed in this area in 2003.

West Glenn Creek 4636 (Pair)

In late May 2003, a pair of northern spotted owls was found at the headwaters of West Glenn Creek. The sub-adult female was originally banded as a juvenile at the Noti site in 2001. She was re-banded (dot, white with red-right). The un-banded sub-adult male was subsequently captured and banded (black-left). They were determined to be non-nesting. Later in the season, this pair was found farther to the west near Gould's Lake. The activity center was placed at the May 29 pair location.

Wind Creek 2915 (Pair)

In 1982, a northern spotted owl of unknown sex was heard twice in Wind Creek, 1.5 miles to the west of the current activity center. A male was heard here in 1987, closer to the current activity center. In 1990, a non-nesting pair occupied this site. By 1991, these birds had moved to Dry Creek and established a nest site. Both birds were banded (female, black-left; male, orange-right). These birds used the area near the 1991 Scholfield Creek site in 1992, so the two sites were combined into the Wind Creek site. They did not nest in 1992. The pair nested in 1993 and fledged one young that was banded. The same pair did not nest in 1994. In 1995, the pair nested in the 1991 nest tree and fledged one young that was banded. In 1996, the female was found, as was the 1996 Murphy Creek male (yellow with black stripe with orange tab-left), but never together. In 1997, the female was paired with the 1996 Murphy Creek male. They nested in a new tree, but the nest failed. The same pair nested in 1998 in a new nest tree, and fledged two young, which were banded. Site status and location did not change. In 2001, Beak Consultants surveyors located the historic male and heard a

female at night. Nesting status was unknown. In 2003, the historic pair occupied the activity center. They were non-nesting. A second male (banded, dots-blue with white-right) northern spotted owl was found with the historic female at the site in early May.

F.7.2. Non-territorial Singles and Unknowns

Beaver Creek 7021 (Non-territorial single)

In 1991, there were no responses in this area. Beak Consultants surveyors heard a pair in the area in June 1992. Two days later, a male was heard about one mile from the pair location. Three additional visits at night yielded no responses, and the area was classified as status unknown. The activity center was located at the male location of the pair response because of its proximity to potential habitat. There were no responses in 1993 or 1994, and the status was dropped to non-territorial single. In 1995, there was one male response at night. There were no responses in 1996. The area was not surveyed in 1997 or 1998. There were no responses in 2003.

Benson Ridge 7009 (Non-territorial single)

A single female response at night was heard in 1991. This northern spotted owl was considered a non-territorial single. There were no responses in 1992, 1993, 1994, 1995, or 1996. The area was not surveyed in 1997 or 1998. In early April 2003, a female was seen at night near the 1991 floater response site, but this female response was attributed to the Benson Creek site.

Eleven Creek 7016 (Non-territorial single)

In 1991, a female was heard on two nighttime surveys and during a daytime follow-up. She was presumed to be associated with the 1991 Trout Creek male. She was not found at this site in 1992, and site status was changed to status unknown, because the 1991 responses did not meet full protocol for residency. In 1992, there were two responses from a single male at night 0.25 mile south of where the female was heard in 1991. Initially, this male was called Eleven Creek with status unknown. Names for the 1991 female and 1992 male responses were changed to Eleven Creek #1 (the female) and Eleven Creek #2 (the male), because it was confusing to have the 1991 Trout Creek site so close to the 1992 Eleven Creek site. A common activity center was established in the best habitat intermediate between these two locations. In 1993, no responses were detected in this area, and the two Eleven Creek sites were combined into a single Eleven Creek site. All responses were considered to be from non-territorial singles. There were no responses at this site in 1994, 1995, 1996, 1997, 1998, or 2003.

Howell Creek 7047 (Non-territorial single)

In 1996, two nighttime male responses were assigned non-territorial single status. The area was not surveyed in 1997 or 1998. There were no responses at this site in 2003.

Johanneson Creek 7049 (Non-territorial single)

In 1991, a female response was heard in the Johanneson Creek drainage, but it was grouped with the Dean Creek site. In 1992, a male was heard at night in the same drainage, but he did not show any strong territorial behavior. The next day a male was heard, but again he was not aggressive. The area was visited a total of six times, so this northern spotted owl was considered a non-territorial single. There were no responses at this site in 1993, 1994, 1995, or 1996. The area was not surveyed in 1997 or 1998. In 2003, a female was heard in this area, but that response was attributed to the Dean Creek site.

Otter Creek 7011 (Non-territorial single)

In 1991, two female responses were attributed to a non-territorial single. There were no responses in 1992, 1993, 1994, 1995, or 1996. The area was not surveyed in 1997 or 1998. There were no northern spotted owl responses in this area in 2003.

Scholfield Creek 7007 (Non-territorial single)

In 1990, there were two responses from a northern spotted owl of unknown sex, and a pair was found there in 1991. In 1992, it was determined that the Wind Creek pair used both this site and their current site. Therefore, the 1991 data from both sites were combined and called Wind Creek. In 1993, both a pair and a single male were heard farther up Scholfield Creek than the 1991 responses. The new area was given the old site name and classified as status unknown, because concern was expressed that they may have been the Wind Creek birds. There were no responses at this site in 1994. That year, it was decided that the pair responses in 1993 were Wind Creek birds, and the single male response was classified as a non-territorial single. There were no northern spotted owl responses at this site in 1995 or 1996. The area was not surveyed in 1997 or 1998. There were no northern spotted owl responses in this area in 2003.

Schumacher Ridge 7050 (Non-territorial single)

In 1993, there was one female response at night in this area that was determined to be a non-territorial single. There were no responses in this area in 1994, 1995, or 1996. The area was not surveyed in 1997 or 1998. There were no northern spotted owl responses in this area in 2003.

Totten Creek 7015 (Non-territorial single)

In 1991, a non-territorial single male was detected in this area. There were no responses in 1992, 1993, 1994, 1995, or 1996. The area was not surveyed in 1997 or 1998. There were no northern spotted owl responses in this area in 2003.

Umpcoos Ridge 7051 (Non-territorial single)

In 1995, an un-banded sub-adult male was detected at night. He was considered to be a non-territorial single. There were no responses in 1996, and the area was not surveyed in 1997 or 1998. There were no northern spotted owl responses in this area in 2003.

Upper Benson Creek (Non-territorial single)

In 1995, a female was detected at night. She was considered to be a non-territorial single. There were no responses in 1996, and the area was not surveyed in 1997 or 1998. There were no northern spotted owl responses in this area in 2003.

Upper Johnson Creek 7053 (Non-territorial single)

In 1993, a northern spotted owl of unknown sex was detected at night. This bird was considered to be a non-territorial single. There were no responses in 1994, 1995, or 1996. The area was not surveyed in 1997 or 1998. There were no northern spotted owl responses in this area in 2003.

Upper Noble Creek 7010 (Non-territorial single)

In 1991, a single female was detected in this area. This response was classified as a non-territorial single in 1992 when no birds were detected in the area during three night visits. There were no responses in 1993, 1994, 1995, or 1996. The area was not surveyed in 1997 or 1998. In early May 2003, a male was heard near the 1991 response location, but this response was attributed to the Benson Creek site.

Upper Sock Creek 7093 (Status unknown)

In 2003, there was one nighttime female response during two visits to this area, but no birds were found on the follow-up visit. The ODF determined that it was not necessary to survey this area, because it was not part of the original density study area; thus, additional visits were not conducted.

F.8. RECOMMENDATIONS FOR FUTURE NORTHERN SPOTTED OWL SURVEYS

When future northern spotted owl surveys are conducted on the Elliott State Forest, it is recommended that survey station/compartment associations be rearranged so that stations in compartments with known northern spotted owl sites are geographically centered on that northern spotted owl site. This one step will simplify paperwork and reduce confusion when planning surveys and interpreting data.

Table F-2
Number of Northern Spotted Owl Pairs, Pair Status Unknowns, Resident Singles, Total Activity Centers (used for density estimates), Status Unknowns, and Non-Territorial Singles Found on or Adjacent to the Elliott State Forest During 2003 Surveys

Survey Protocol	Pairs[b]	Pair Unknowns	Resident Singles	Total[a] Activity Centers	Status[b] Unknowns	Non-territorial Singles
Demographic Protocol	10	2	1	13	1	4
Management Protocol	12	0	1	13	1	4

[a] Numbers for Pair and Total Activity Centers include the Fourmile northern spotted owl site on private land, a site included in previous density estimates for the Elliott State Forest.

[b] The only Status Unknown was a site on Coos Bay BLM land that was dropped from surveys in early May.

Note: Numbers are presented based on demographic and management protocols. Demographic protocol typically requires two responses from a northern spotted owl pair or single to determine status, instead of the one or three required by the management protocol.

Table F-3
Total Number of Northern Spotted Owl Pair Sites, Pair Status Unknown Sites, Resident Single Sites, Status Unknown Sites, Non-Territorial Single Sites, and Historic Sites on or Adjacent to the Elliott State Forest, 2003

Pair* (PR)	Pair Status Unknown (PU)	Resident Single (RS)	Status Unknown** (SU)	Non-territorial Single (FL)	Historic (HS)
16	0	4	1	11	16

[a] Pair sites include the Fourmile and Lockhart Road northern spotted owl sites on adjacent private land. Northern spotted owls from these sites were detected on the Elliott State Forest at least once during the 2003 survey season.

[b] The only Status Unknown site was a site on Coos Bay BLM that was dropped from surveys in early May.

FL = non-territorial, single; HS = historical site; PR = pair site; PU = two birds, pair status unknown;
RS = resident single (male or female); SU = status unknown

Table F-4
Site Name, Status, and Occupancy for
Northern Spotted Owl Sites in the Elliott State Forest, 2003

Site Name	Site Status	Survey 2003	Adult/ Sub-adult Males	Adult/ Sub-adult Females	Unknown Sex	Young
Alder Creek	PR	Yes	1	1	0	0
Beaver Creek	FL	Yes	0	0	0	0
Benson Creek	PR	Yes	1	1	0	0
Benson Ridge	FL	Yes	0	0	0	0
Bickford Creek (Pvt)	HS	Yes	0	0	0	0
Big Creek	HS	Yes	0	0	0	0
Charlotte Creek	HS	Yes	0	0	0	0
Dean Creek	PR	Yes	1	1	0	0
Deer Creek	HS	Yes	0	0	0	0
East Hakki Ridge	HS	Yes	1	0	0	0
Eleven Creek	FL	Yes	0	0	0	0
Fish Creek	HS	Yes	0	0	0	0
Four-Mile (Pvt)[a]	PR	Yes	1	1	0	0
Howell Creek	FL	Yes	0	0	0	0
Johanneson Creek	FL	Yes	0	0	0	0
Johnson Creek	PR	Yes	1	1	0	0
Larson Creek	HS	Yes	0	0	0	0
Lockhart Road (Pvt)[a]	PR	Yes	1	1	0	0
Lower Camp Creek	HS	Yes	0	0	0	0
Lower Mill Creek	PR	Yes	1	1	0	0
Lower Millicoma	HS	Yes	0	0	0	0
Luder Creek	HS	Yes	0	0	1	0
Marlow Creek	PR	Yes	1	1	0	0
Marlow Ridge	HS	Yes	0	0	0	0
Middle Mill Creek	HS	Yes	0	0	0	0
Murphy Creek	PR	Yes	0	0	0	0
Noble Creek	RS	Yes	0	0	0	0
Otter Creek	FL	Yes	0	0	0	0

Table F-4 – continued

Site Name	Site Status	Survey 2003	Adult/ Sub-adult Males	Adult/ Sub-adult Females	Unknown Sex	Young
Palouse Creek	PR	Yes	1	0	0	0
Panther Creek	RS	Yes	1	0	0	0
Roberts Creek	PR	Yes	1	1	0	0
Salander Creek	PR	Yes	1	1	0	0
Schumacher Ridge	FL	Yes	0	0	0	0
Scholfield Creek	FL	Yes	0	0	0	0
Shake Creek	HS	Yes	0	1	0	0
Sock Creek	RS	Yes	0	0	0	0
Tom Fool Creek	PR	Yes	1	1	0	0
Totten Creek	FL	Yes	0	0	0	0
Trout Creek	HS	Yes	0	0	0	0
Upper Johnson Creek	FL	Yes	0	0	0	0
Upper Mill Creek	PR	Yes	0	0	0	0
Upper Millicoma	HS	Yes	0	0	0	0
Upper Noble Creek	FL	Yes	0	0	0	0
Upper Palouse Creek	HS	Yes	0	0	0	0
Upper Roberts Creek	HS	Yes	0	0	0	0
Upper Sock Creek[b]	SU	Yes	0	1	0	0
West Glenn Creek	PR	Yes	1	1	0	0
Wind Creek	PR	Yes	2	1	0	0

[a] The Lockhart Road and Fourmile northern spotted owl sites are located on private industry lands that border southern portions of the Elliott State Forest. Pacific Biota and Environmental Services Northwest, Inc. surveyed these two sites.

[b] Upper Sock Creek was the only Status Unknown site. This Coos Bay BLM site was dropped from surveys in early May.

Appendix G
Marbled Murrelet Management Areas on the Elliott State Forest 2006

G.1. INTRODUCTION

This document summarizes the survey information for each of the Marbled Murrelet Management Areas (MMMAs) that have been established on the Elliott State Forest. MMMAs are designated on ODF lands for marbled murrelet occupied sites. These areas are subject to special management considerations for the purpose of maintaining habitat suitable for successful nesting.

Considerations in designating MMMAs include contiguous suitable habitat and likely nest locations, with a focus on providing interior forest conditions to minimize edge effects. Survey results and related habitat and landscape information are used to determine the boundaries of these areas.

ODF has conducted surveys for marbled murrelets on the Elliott State Forest since 1992 for a variety of reasons. The majority of surveys have been conducted for the purposes of conducting management activities. Survey areas for management activities are given an identifier beginning with ESF followed by a number, for example ESF100. Other types of surveys were conducted for different purposes, such as transect surveys to gather general information about the presence of murrelets in the forest (GEN); extra surveys at occupied sites to gain more information about the habitat murrelets were using, or to attempt to locate nest trees (NSS, FCS, or RTS); and surveys to determine the need for continuing seasonal restrictions (SRS). In 2002, survey contractors conducted both general and intensive surveys within 240 acre grids for the purposes of locating additional occupied sites in areas of the forest where few surveys for management activities had been conducted (GRID). These other acronyms are labels for the other types of surveys, as the ESF is a label for the management activity surveys.

Survey and research information has been examined, and each occupied detection or nest location has been assigned to an occupied site. In some cases, multiple detections in the same area over one or many years are considered part of the same site. In other cases, detections during surveys of the same survey site may have been split into different occupied sites due to habitat, distance, topography, or some other factor. MMMAs often include several different survey areas and may include one or several occupied sites. The descriptions in this document note how many occupied sites are contained within each MMMA, as well as which survey areas have covered all or a portion of the MMMA.

Some sub-canopy behaviors are not associated with a MMMA. These are described in the section following the MMMA descriptions. In some cases, these detections were determined not to be indicative of occupied sites in the immediate vicinity. In other cases, the sites were considered to be occupied, but the detections were within another protected designation (such as a habitat conservation area). MMMA designation has been postponed in other areas pending additional surveys.

Further information about individual MMMAs, including their location and boundaries, is on file with the Oregon Department of Forestry (ODF)

G.2. MARBLED MURRELET MANAGEMENT AREAS

G.2.1. Beaver Headwaters MMMA (EST. 1994)

199 Acres

Surveys were conducted by the ODF in 1992 at planned timber sales Beaver Creek No. 2 and Beaver Creek No. 3, with no resulting detections of marbled murrelets. In 1993, surveyors from the Oregon Department of Fish and Wildlife (ODFW) observed occupied sub-canopy behaviors on two occasions, along with detections indicating presence at survey area ESF902. The MMMA was established in 1994 as a result of these detections. In 1995, three nests were located within this MMMA at Silver Creek as part of a research project. In 1996, a nest tree was located at Silver Beaver (also called Beaver Creek) in this MMMA as part of this same research project. In 2000, ODF staff conducted two surveys to evaluate the need for continued seasonal restrictions, and recorded occupied sub-canopy behavior. Multiple occupied behaviors were recorded again in 2004 during a one-survey monitoring effort at survey area ESF22.

Occupied Sites: 1

(Includes survey areas ESF1, ESF22, ESF902, ESF903)

G.2.2. Benson Headwaters MMMA (EST. 2003)

92 Acres

This area was first surveyed in 1994 as Upper Joes Creek thinning. Contracted biologists reported no marbled murrelet detections. In 2003, the area was surveyed again as Shoefly Joe and included two survey sites. Site 1 had one survey with presence detected. Site 2 visits resulted in three surveys with presence, with one of the presence surveys accompanied by a sub-canopy marbled murrelet detection. The MMMA was established in 2003 as a result of these detections. In 2004 and 2005, surveys were conducted in two sites in close proximity to the MMMA boundary. There were no detections in 2004, but presence was recorded during two surveys in 2005.

Occupied Sites: 1

(Includes survey areas ESF75, ESF148, and ESF158)

G.2.3. Big Deer MMMA (EST. 1995)

472 Acres

The ODFW first surveyed the Upper Deer Creek and Deer Creek No. 5 areas in 1993. Marbled murrelet presence was detected during two surveys. Contractor surveys began in 1994 at Deer Creek No. 5, Upper Deer Creek, and Upper Joes Creek Thinning. Four surveys

yielded multiple sub-canopy detections within these survey areas (ESF34, ESF44, and ESF75). A MMMA encompassing contiguous habitat in all three survey areas was established in 1995. In 2003, surveys at the Shoefly Joe area detected marbled murrelet presence during three surveys. During these three years of surveys, a cumulative total of 44 presence detections were reported inside the MMMA boundary.

Occupied Sites: 3

(Includes survey areas ESF34, ESF44, ESF75, and ESF148)

G.2.4. Charlotte Headwaters MMMA (EST. 1994)

736 Acres

First surveyed as Charlotte Luder (ESF906) in 1992 and 1993, there were 98 presence detections recorded and two surveys, one each year, that yielded detections of sub-canopy marbled murrelets. A second major survey effort, Deer Knife Thinning (ESF54), took place in and around the southern region of the current MMMA boundary in 1994. These surveys recorded 50 presence detections and two surveys with sub-canopy behavior, including one with a marbled murrelet observed landing. Surveys were conducted in 2003 and 2004 in and around the southern portion of the MMMA for East Deer Top (ESF147). During these surveys, a total of 28 presence detections, all occurring in 2004, were observed by survey biologists inside the current MMMA boundary.

Occupied Sites: 3

(Includes survey areas ESF54, ESF114, ESF147, and ESF906)

G.2.5. Daggett Headwaters MMMA (EST. 2006)

21 Acres

The W. Fork Headlands A:3 was surveyed by contractors during 2005 and 2006. The first year of surveys resulted in a single survey with four presence detections of marbled murrelets. Surveys in 2006 captured 35 marbled murrelet presence detections and a single sub-canopy behavior at 0.1 canopy height. A MMMA was established based on these observations. This is an isolated patch of habitat surrounded by plantations less than 40 years old.

Occupied Sites: 1

(Includes survey area ESF162)

G.2.6. Dry Ridge MMMA (EST. 2003)

97 Acres

Timber sale surveys for Dry Moby were initiated in 2002 and resulted in no marbled murrelet detections. This same year, grid surveys were conducted in the vicinity, which also resulted in no marbled murrelet detections. In 2003, four surveys of the Dry Moby timber sale

detected marbled murrelet presence, and two surveys detected sub-canopy behaviors, including one observation of marbled murrelets seen landing. The MMMA was established in 2003 based on these observations.

Occupied Sites: 1

(Includes survey areas ESF120 and ESF Grid 42)

G.2.7. Elk Forks MMMA (EST. 1994)

304 Acres

Surveys by ODF staff in Elk Forks confirmed a single marbled murrelet presence detection in 1992. In 1993, ODFW surveyors observed multiple sub-canopy behaviors during a single survey at ESF913. There were presence detections to the north in 1992, 1993, 1994, and 1995. A MMMA was designated in 1994 that incorporated this occupied site, as well as the area of presence detections to the north. Nest search surveys were conducted in 1995, and five surveys resulted in sub-canopy behavior detections and the location of a nest. Additional surveys to the Elk Forks area resulted in only one survey with marbled murrelet presence in 1995, no detections in 1996, but sub-canopy observations in 2001. Surveys of Middle Elk (ESF135) in 2003 resulted in a single sub-canopy observation in the northern portion of the MMMA, establishing another occupied site, already included in the MMMA.

Occupied Sites: 2

(Includes survey areas ESF03, ESF35, ESF89, ESF135, and ESF913)

G.2.8. Elk Pass MMMA (EST. 1994)

358 Acres

ODF staff surveys in the West Fork Glenn Creek area in 1992 resulted in no detections of marbled murrelets. The ODFW conducted surveys at the Elk Pass No. 3, Elk Creek Divide, and West Fork Glenn Creek areas in 1993. Sub-canopy behaviors were observed during seven surveys at these three areas (ESF39, ESF914, and ESF 939). In 1994, one contractor survey had sub-canopy behavior at ESF39. In 2003, a survey at ESF135 adjacent to the MMMA resulted in one sub-canopy marbled murrelet observation. This contiguous habitat consisting of approximately nine acres was added to the MMMA.

Occupied Sites: 5

(Includes survey areas ESF39, ESF51, ESF135, ESF914, ESF938, ESF939, and ESF940)

G.2.9. Fish Knife MMMA (EST. 1993; Revised 1994 and 1995)

780 Acres

Murrelets were first detected in this area in 1993, during surveys of Knife Otter (ESF925) and Fish Ridge No. 2 (ESF916) by ODFW. Previous surveys by ODF in the area in 1992 had resulted in no observations of marbled murrelets in the vicinity. The observations in 1993 included four surveys with occupied sub-canopy behaviors, including a bird landing. An occupied site was established in 1993 based on these observations. Contractor surveys in the Fish Ridge Thinning (ESF81) and Panther Creek areas in 1994 resulted in an additional five surveys with sub-canopy behavior. In 1994, the MMMA was created to include these occupied sites as well as the earlier observations. A nest search in 1995 resulted in discovery of an inactive nest cup in occupied site 59. An addition to the MMMA in 1995 incorporated this site. In early August 1999, a survey performed by ODF staff to determine whether seasonal operating restrictions were necessary resulted in the detection of a sub-canopy marbled murrelet. Contractor surveys in the Kelly Fish No. 3 area, along with a seasonal operating restriction survey by the ODF, revealed no marbled murrelets in 2000. In 2001, a sub-canopy marbled murrelet detection was recorded in the MMMA boundary, and a single monitoring survey inside the MMMA in 2005 recorded no marbled murrelet activity.

Occupied Sites: 4

(Includes survey areas ESF4, ESF27, ESF81, ESF104, ESF144, ESF145, ESF909, ESF916, ESF924, ESF925, ESFMMMA2, FCS Panther Creek, SRS Fish Knife MMMA, SRS Knife Creek, and SRS Elk Creek)

G.2.10. Footlog Ridge MMMA (EST. 2006)

34 Acres

Umpcoos Ridge A:1 site 1 was surveyed in 2005 and 2006 by ODF contractors. Three surveys were conducted, with a total of 11 marbled murrelet presence detections reported in 2005. Five surveys with marbled murrelet presence, including one survey with a single sub-canopy observation, were reported in 2006. The MMMA was established based on this observation.

Occupied Sites: 1

(Includes survey area ESF 163)

G.2.11. Glenn Headwaters MMMA (EST. 1994)

142 Acres

In 1992, surveys performed by ODF staff resulted in one survey with presence detections at Glenn Top. The ODFW continued surveys at Glenn Top and the Bickford Creek Thinning area in 1993, with no marbled murrelet detections. Contractors began a larger scale survey effort in 1994 at the Bickford Creek Thinning area and Cedar Creek No. 5 that resulted in

three surveys with sub-canopy marbled murrelet behaviors and four surveys with presence at ESF50. The MMMA was established in 1994 as a result of these detections. In 1996, a morning and an evening survey at the Glenn Headwaters area produced no marbled murrelet observations. Contractor surveys in 2002 to the Cedar Glenns area resulted in one survey with a single marbled murrelet presence detection. Surveys to the same area in 2004 did not detect marbled murrelets.

Occupied Sites: 1

(Includes survey areas ESF24, ESF50, ESF130, ESF917, ESF918, and SRS Bickford Creek)

G.2.12. Goody Ridge MMMA (EST. 1994)

118 Acres

Initial surveys to the Goody Ridge No. 2 sale in 1992 conducted by ODF staff resulted in no observation of marbled murrelets. In 1993, surveys by the ODFW and contractors at Goody Ridge No. 2 (ESF23) resulted in two observations of sub-canopy behavior during one survey. In 1994, contractors detected sub-canopy behavior during one survey, and three presence detections during a separate survey. The MMMA was established based on these detections.

Occupied Sites: 1

(Includes survey areas ESF23 and ESF919)

G.2.13. Henry's Bend MMMA (EST. 1994)

263 Acres

Two sites were surveyed as Henry's Bend in 1994. Thirty plus sub-canopy behaviors were observed over three surveys in site 1, including two observations of marbled murrelets landing. Site 2 had a cumulative total of 15 presence detections over two surveys. Both sites are included within the MMMA boundary. Two surveys in the vicinity of the sub-canopy detections were conducted in 1996, with presence detections during one survey. Grid surveys conducted in 2002 in this vicinity resulted in no detections of marbled murrelets.

Occupied Sites: 1

(Includes survey areas ESF56 and ESF Grid 12)

G.2.14. Indian Charlie Johanneson MMMA (EST. 2002)

90 Acres

In 2002, surveys of West Charlotte Creek resulted in sub-canopy activity during three surveys accompanied by 35 presence detections over the season. The activity was in both the Johanneson Creek and the Indian Charlie Creek basins. Surveys were halted after the first

year of effort, and the MMMA was designated. During grid surveys in 2002 in this vicinity, marbled murrelet presence was detected.

Occupied Sites: 2

(Includes survey areas ESF118 and ESF Grid 15)

G.2.15. Joe Buck MMMA (EST. 1993; Revised 2006)

670 Acres

Occupied sites were established in this area in 1993 following observations of sub-canopy behavior on five occasions along with numerous presence detections during surveys of Buck Ridge and Knife Otter in 1992 and 1993 (ESF904 and ESF925). The MMMA was created in 1994 and included three separate occupied sites. Nest search surveys were conducted in 1994 with nine sub-canopy surveys reported including a landing. In 1996, surveys were conducted with no detections. Surveys to evaluate the need for seasonal restrictions were performed late in the season in 1999, with additional sub-canopy behaviors observed. Surveys in 2002 produced one survey with presence detections, but there were no detections in 2003. Areas in the vicinity of the MMMA were surveyed again in 2006 under the site names Lower Deer (ESF168) and North Buck (ESF169). The Lower Deer surveys resulted in 20 surveys with marbled murrelet presence detections, including four surveys where sub-canopy behavior was observed. Surveys at North Buck yielded seven surveys with marbled murrelet presence detections, including one survey with multiple sub-canopy behaviors reported. As a result of sub-canopy marbled murrelet detections during the 2006 survey year, 90 acres were added to the Joe Buck MMMA.

Occupied Sites: 7

(Includes survey areas ESF2, ESF124, ESF168, ESF169, ESF904, ESF922, ESF925, FCS1, NSS1, SRS Joe Buck, and SRS Joe Buck MMMA)

G.2.16. Kentuck Ridge MMMA (EST. 2001; expanded in 2003)

279 Acres

A single subcanopy behavior was observed during surveys of Kentuck Ridge No. 4 (ESF94) in 1999 and 2000. Previous surveys in 1994 and 1995 for Kentuck Ridge No. 3, had recorded seven total presence detections in 14 surveys, but no occupied behaviors. A MMMA was established in 2001 for this occupied site. In 2003, a survey at the Stonehouse Point survey area (ESF136) north of the MMMA resulted in sub-canopy behavior, accompanied by numerous presence detections during six surveys in two sites. The MMMA was expanded in 2003 to include these two additional occupied sites.

Occupied Sites: 3

(Includes survey areas ESF65, ESF94, ESF100, ESF136, ESF161, and ESF912)

G.2.17. Knife Forks MMMA (EST. 1994)

265 Acres

A single ODFW survey in the Knife Forks area (ESF32) in 1993 resulted in the observation of occupied sub-canopy behaviors. A contractor survey in Knife Forks in 1994 also observed marbled murrelets exhibiting sub-canopy behaviors. In addition, Fish/Knife restricted team surveys resulted in two additional surveys with sub-canopy marbled murrelet observations further up in the headwaters of Knife Creek. The MMMA was designated in 1994 to include these two occupied sites. There were no observations of marbled murrelets during 1995 (a single survey to Knife Ridge No. 3), 2000 (Knife Fork seasonal restriction surveys), 2001, or 2002 (timber sale surveys of Knife Ridge No. 5).

Occupied Sites: 2

(Includes survey areas ESF32, ESF40, ESF54, ESF60, ESF115, RTS Fish/Knife Restricted Team Survey, and SRS Knife Fork)

G.2.18. Knife Point MMMA (EST. 2003)

34 Acres

In 2003, a single sub-canopy detection of a marbled murrelet diving to 0.2 canopy occurred during surveys of Knife Point (ESF146) in July, leading to the creation of this MMMA. Surveys at the adjacent (within 330 feet) Western Knife survey area in 2005 detected no marbled murrelets. Earlier surveys of the Knife Ridge No. 2 sale area in 1992 detected murrelet presence.

Occupied Sites: 1

(Includes survey areas ESF27 and ESF146)

G.2.19. Larson Bottom MMMA (EST. 2005; Revised 2006)

78 Acres

This area was surveyed by contractors in 2005 as Larson Creek No. 2 (ESF165). During one survey, seven sub-canopy behaviors were reported. Additionally, seven of the ten total surveys performed within the MMMA boundary resulted in marbled murrelet presence detections. The MMMA was established in 2005 to include the survey station with the sub-canopy detections and nearby mapped habitat. Contractors continued surveys of Larson Creek No. 2 in 2006 and reported 25 surveys with marbled murrelet presence detections, including five surveys where sub-canopy behaviors were observed. As a result of the sub-canopy marbled murrelet behavior during 2006 surveys, 83 acres were added to the Larson Bottom MMMA.

Occupied Sites: 2

(Includes survey area ESF165)

G.2.20. Larson Point MMMA (EST. 2003)

59 Acres

This area was surveyed by contractors in 2002 and 2003 as Larson Point. There were no detections of marbled murrelets in 2002. Surveys performed in 2003 resulted in two surveys with sub-canopy marbled murrelet behaviors observed and four surveys with marbled murrelet presence detections. The MMMA was established in 2003 as a result of these surveys.

Occupied Sites: 1

(Includes survey area ESF131)

G.2.21. Lower Charlotte MMMA (EST. 2002)

74 Acres

During grid surveys in 2002, there was one observation of a sub-canopy marbled murrelet in this area. There were additional presence detections during these surveys. The MMMA was designated in 2002 based on these surveys.

Occupied Sites: 1

(Includes survey area ESF Grid 24)

G.2.22. Lower Mill MMMA (EST. 2001; Revised 2002, 2003)

1,127 Acres

General surveys in the area in 1994 resulted in two surveys with sub-canopy marbled murrelet observations. Additional general surveys in 1995 resulted in a single presence detection. In 1999, protocol surveys at Clinton Head (ESF93)resulted in sub-canopy behavior reported on three separate occasions, including an observation of birds landing after the survey time. A new round of contractor surveys in 2000 and 2001 in the Camp Creek No. 3 area (ESF106) resulted in three surveys with sub-canopy behavior. The MMMA was established in 2001 based on the detections in 1999-2001. This MMMA incorporated lands classified as SUVs that connected five separate occupied sites. In 2002, grid surveys resulted in three surveys documenting sub-canopy behaviors at two sites. The MMMA was expanded to include these additional two occupied sites. In 2003, protocol surveys of the Curvy Puckett area yielded three surveys with sub-canopy marbled murrelet observations. Again, the MMMA was expanded to incorporate an additional occupied site.

Occupied Sites: 8

(Includes surveys areas ESF93, ESF106, ESF152, GEN Puckett Creek, GPSC Puckett Creek General Survey, and Grid 26E)

G.2.23. Lower Totten MMMA (EST. 2003)

82 Acres

During the second year of protocol surveys of Lower Totten Group in 2003, there were seven surveys with multiple presence detections and one survey during which two murrelet pairs were seen flying at 1.0 canopy height. The MMMA was established in 2003 based on these detections. There were no detections during the first year of survey effort, or during previous surveys in the area in 1994. Grid surveys conducted in 2002 resulted in a single auditory presence detection.

Occupied Sites: 1

(Includes survey area ESF80, ESF129, and ESF Grid 13)

G.2.24. Luder Footlog MMMA (EST. 2002)

129 Acres

During grid surveys in 2002, two intensive surveys reported sub-canopy marbled murrelets. That same year, contractor surveys in the East Luder survey area resulted in eighteen presence detections, but no sub-canopy marbled murrelets were observed. The MMMA was established in 2002 incorporating the sub-canopy detections at the ridgetop and down into the Luder Creek drainage. Previous surveys for Luder Forks in 1992, had recorded a total of two presence detections over a span of three surveys in the vicinity.

Occupied Sites: 1

(Includes survey areas ESF133, ESF926, and ESF Grid 26S)

G.2.25. Luder Umpqua MMMA (EST. 2002)

338 Acres

The Luder Umpqua MMMA was delineated after grid surveys in 2002 revealed occupied marbled murrelet behaviors during two general surveys and ten intensive surveys. No marbled murrelets were detected in the Luder Forks area during ODF staff surveys in 1992.

Occupied Sites: 4

(Includes survey areas ESF926, Grid 25, Grid 25N, Grid 25S, Grid 26, Grid 26E, and Grid 26S)

G.2.26. Marlow Bottom (EST. 2001; Revised 2006)

170 Acres

Surveys commenced in the South Marlow Ridge area in 1999 and ran through 2001. Sub-canopy behaviors were observed during three surveys. The MMMA was established in 2001

following these surveys. Additional survey effort in the South Marlow Switch area in 2003 resulted in one additional survey with sub-canopy behavior reported in the southern half of the MMMA. Surveys continued in the vicinity of this MMMA in 2005 and 2006 under the name South Marlow Switch A:1. Contractors reported two surveys with marbled murrelet presence detections in 2005. During surveys in 2006, five surveys reported marbled murrelet presence detections, including one survey with a single sub-canopy observation. As a result of the sub-canopy marbled murrelet behavior reported during 2006 surveys, 23 acres were added to the Marlow Bottom MMMA. Previous surveys in the South Marlow area in 1994 detected marbled murrelet presence.

Occupied Sites: 3

(Includes survey areas ESF78, ESF95, and ESF134)

G.2.27. Marlow Lockhart MMMA (EST. 2002; Revised 2006)

325 Acres

Surveys in 2001 and 2002 in the Marlow Lockhart Trio area (ESF108), resulted in four sub-canopy marbled murrelet observations. The MMMA was established in 2002 as a result of these detections. Locked Marlow was surveyed in 2003 and 2004, and resulted in additional surveys with marbled murrelet presence reported to the west of this MMMA. Surveys continued in the vicinity of this MMMA in 2006 under the site name Piledup Marlow No. 2. Eight surveys yielded marbled murrelet presence detections, including two surveys with multiple sub-canopy observations. As a result of the sub-canopy marbled murrelet behaviors reported during 2006 surveys, 55 acres were added to the Marlow Lockhart MMMA.

Occupied Sites: 3

(Includes survey areas ESF79, ESF99, ESF108, ESF138, and ESF167)

G.2.28. Middle Dean MMMA (EST. 2002)

85 Acres

Grid surveys in 2002 resulted in five observations of sub-canopy marbled murrelet behavior. An additional 17 surveys yielded presence detections. The MMMA was established in 2002 based on these detections. The MMMA overlaps with the Dean Johanneson Habitat Conservation Area.

Occupied Sites: 1

(Includes survey areas ESF Grids 16 and 16E)

G.2.29. Millicoma Schumacher MMMA (EST. 2002)

60 Acres

Surveys conducted in the vicinity in 1994, 2000, and 2001 resulted in no detections of marbled murrelets. Grid surveys in 2002 resulted in four surveys with sub-canopy marbled murrelets observed. More than 90 cumulative presence detections were reported during 2002. The MMMA was established in 2002 based on these sub-canopy observations.

Occupied Sites: 1

(Includes survey areas ESF80, ESF 97, and ESF Grid 7)

G.2.30. Palouse Larson MMMA (EST. 2002)

107 Acres

During grid surveys in 2002, contractors reported two surveys with sub-canopy marbled murrelet activity, as well as 13 surveys with presence. A MMMA was established in 2002 following these surveys.

Occupied Sites: 1

(Includes survey area ESF Grid 5)

G.2.31. Panther Bench MMMA (EST. 2006)

38 Acres

Five of the surveys initiated in Panther Headwaters No. 3 in 2006 recorded marbled murrelet presence, including two surveys with observations of sub-canopy behavior. A MMMA was established based on these observations.

Occupied Sites: 1

(Includes survey area ESF166)

G.2.32. Panther Headwaters MMMA (EST. 1994)

367 Acres

Surveys by ODF staff at East Fork Howell Creek No. 2 in 1992 resulted in no detections of marbled murrelets. ODFW visits to the nearby Howell Top area (ESF41)in 1993 resulted in a single marbled murrelet presence detection. Contractors took over the Howell Top surveys in 1994 and observed the first sub-canopy marbled murrelet. The South Panther area (ESF70) was also surveyed in 1994 with sub-canopy marbled murrelet behavior being reported during three surveys. Two of these three surveys with sub-canopy behavior occurred at stations outside the current MMMA boundary in adjacent non-habitat. The MMMA was established in 1994 based on these observations. A nest research project failed to turn up marbled murrelets at Howell Top in 1995 and Panther Elk Plot in 1996.

Occupied Sites: 2

(Includes survey areas ESF41, ESF70, ESF911, and ESF 933)

G.2.33. Right Fork Johnson MMMA (EST. 2004)

54 Acres

This area was first surveyed in 2002 as Two Bowls A:1 (ESF 121) with presence detected. It was again surveyed in 2003 with multiple audio and circling above canopy presence detections at Station 1 late in the survey season. Additional surveys were recommended in 2004. This area was included into another sale in 2004 and surveyed as Trout Dry Bowl A:1 (ESF156) with two sites. Twenty presence (audio and fly over) and over thirty cumulative sub-canopy behaviors were observed during three surveys throughout the survey season in site 1, at the same station location that recorded audio and circling above canopy detections in 2003. Based on 2004 survey and behavior information, the Right Fork Johnson MMMA was drawn encompassing portions of site 1. Trout Head A:1 was surveyed by contractors in 2005 with one auditory presence detection reported.

Occupied Sites: 1

(Includes survey areas ESF121 and ESF156)

G.2.34. Roberts Ridge MMMA (EST. 1994; Revised 2002)

664 Acres

ODF staff surveyed the Roberts Creek No. 6 area (ESF2) in 1992 and observed a single sub-canopy marbled murrelet landing in a tree near a ridgetop. The USFWS visited the location in 1992, and indicated a strong belief that birds were using the stand for nesting. The ODFW recommended that the stand be considered occupied. During 1993 surveys in the same area, one presence detection was recorded approximately 2,000 feet away at the bottom of the draw. General surveys, performed by contractors in the Roberts Creek General Survey area in 1994 (over one mile from the ridgetop detection), reported presence detections on four occasions. The MMMA was established in 1994 based on the sub-canopy observations and recommendations by agency biologists. In 2002, grid surveys southwest of this MMMA resulted in sub-canopy detections during eight surveys. The MMMA was expanded to include this area of detections. In 2005, a station within the MMMA was surveyed once as part of a monitoring effort, and tallied zero detections.

Occupied Sites: 3

(Includes survey areas ESF2, ESFMMMA3, GEN Roberts Creek General Survey, ESF Grid 35, ESF Grid 37, ESF Grid 38, and ESF Grid 41)

G.2.35. Schumacher Headwaters MMMA (EST. 1994)

169 Acres

The first year of survey effort at Schumacher Ridge No. 2 (ESF29) was 1993. The ODFW observed four sub-canopy marbled murrelet detections over a two-survey span, with additional presence detections during the later part of the survey season. One sub-canopy detection and presence detections were recorded during year 2 by contractors. The MMMA was established in 1994 based on these detections. Surveys were resumed in 2000 and 2001 in the Schumacher Ridge No. 3 area (ESF97), with one survey reporting sub-canopy behavior in the southern portion of the MMMA.

Occupied Sites: 2

(Includes survey areas ESF29, ESF74, and ESF97)

G.2.36. South Umpcoos MMMA (EST. 1994)

877 Acres

The ODF first surveyed this area in 1992 as Slingshot Ridge and West Fork Headwaters, and had no marbled murrelet detections. The ODFW surveyed this area in 1993 for Millicoma Maid (ESF927), Slingshot Ridge (ESF936), West Fork Headwaters (ESF941), and Salander Headwaters (ESF28). Sub-canopy marbled murrelet behaviors were detected during five surveys. In 1994, contracted surveyors reported one survey with sub-canopy behavior in the Salander Headwaters area. In total, 112 visits occurred at 56 stations on approximately 1,130 acres. Eight of these surveys were conducted at six stations and recorded observations of sub-canopy behavior. Presence was also detected during four visits to other stations. The MMMA was established in 1994 to incorporate these occupied sites.

Occupied Sites: 3

(Includes survey areas ESF10, ESF28, ESF55, ESF59, ESF111, ESF151, ESF159, ESF927, ESF936, ESF941, and ESFMMMA1)

G.2.37. Sullivan Headwaters MMMA (EST. 1994)

190 Acres

The ODF and contractors surveyed the Sullivan Creek Headwaters area (ESF12) in 1992 and 1993. There was one sub-canopy detection and other surveys with presence detections. The Sullivan Creek Headwaters area was surveyed by contractors in 1994, resulting in an additional detection of sub-canopy behavior to the south. The MMMA was established in 1994 to encompass these two occupied sites. The Western Sullivan area was surveyed by contractors for a three-year duration starting in 2002. There were no reports of marbled murrelets resulting from these surveys.

Occupied Sites: 2

(Includes survey areas ESF12, ESF123, and ESF939)

G.2.38. Trout Mouth MMMA (EST. 2001)

276 Acres

Contractor surveys began in the Panther Creek and Ramrod Ridge No. 2 in 1994, with one marbled murrelet presence detection reported. In 1995, at the Ramrod Ridge No. 2 survey area (ESF69), a single survey with sub-canopy marbled murrelet activity was recorded by contractors. However, no MMMA was established at this time because the observation was of birds near a ridgetop, and they were not believed to be associated with the habitat at the survey station. In 2001, two surveys of Beartooth Point (ESF109) resulted in sub-canopy detections of marbled murrelets. Additional surveys of Stulls Ridge No. 3, Beartooth, and Beartooth Point areas in 2001 and 2002 resulted in no further sub-canopy detections. The MMMA was established based on the 2001 detections. The sub-canopy observation from 1995 was included within the MMMA boundary. Bowl Bound Beaver area surveys in 2004 and 2005 resulted in one survey where marbled murrelet presence was reported.

Occupied Sites: 1

(Includes survey areas ESF69, ESF87, ESF98, ESF109, ESF155, and FCS Panther Creek)

G.2.39. West Charlotte MMMA (EST. 2002)

71 Acres

This area was surveyed by contractors as West Charlotte Creek and as Grid 15 in 2002. Presence was recorded in four of eight intensive surveys at West Charlotte Creek. A single sub-canopy behavior was recorded during one intensive Grid survey (ESF Grid 15). This MMMA was established in 2002 based on these observations of marbled murrelet activity.

Occupied Sites: 1

(Includes survey areas ESF118 and ESF Grid 15)

G.3. MARBLED MURRELET OBSERVATIONS OUTSIDE OF MMMAS

G.3.1. Alder Fork No. 4

A single sub-canopy detection by the ODFW in 1993 occurred in non-habitat. The stand is 28 years old and composed primarily of alder. No occupied site was designated due to the lack of suitable habitat.

Occupied sites: 0

(Includes survey area ESF900)

G.3.2. Big Little Salander

One survey was conducted with a single sub-canopy detection in 2005. There were no further detections of murrelets at this survey site during nine protocol surveys in 2006. Sale unit and occupancy determination are deferred pending further surveys.

Occupied sites: pending

(Includes survey area ESF159)

G.3.3. Fish Ridge No. 3

One survey in May 1994 by a contractor biologist recorded 56 total detections, including 2 that were sub-canopy. Six follow-up surveys at the same station that year revealed no marbled murrelets. Numerous surveys in the vicinity in 1994 and in previous years also yielded no detections of marbled murrelets. The ODF consulted with the ODFW, and both agencies agreed that the stand with the detections did not appear to have a significant level of suitable nesting platforms, and that the detections recorded on the one survey did not indicate a nesting location in that stand. This consultation was formalized in a Memorandum of Agreement signed by representatives of both agencies. No occupied site was designated because of the lack of suitable habitat.

Occupied sites: 0

(Includes survey area ESF40)

G.3.4. Grid No. 20

Grid surveys in 2002 resulted in one presence detection and one detection of a single bird at 1.0 canopy during a single general survey visit. No occupied site was designated because the sub-canopy observation was not verified. Further protocol surveys of the area would be required prior to including the area in a proposed timber sale.

Occupied sites: 1

(Includes survey area GRID20)

G.3.5. Johanneson Creek No. 1

A general survey by contracted biologists in 1994 yielded four sub-canopy detections. These detections are located within the riparian zone adjacent to the Dean Johanneson Habitat Conservation Area.

Occupied sites: 1

(Includes survey area ESF923)

G.3.6. Larson Ridge No. 6

Four sub-canopy detections were reported by a contractor biologist during a single visit in 1995, including two birds circling below the canopy. The behavior was observed in riparian habitat along Larson Creek, in a stand lacking apparent marbled murrelet nesting structure. Mapped marbled murrelet habitat is located approximately 800 feet to the south and to the north of the detections. There were presence detections nearby during surveys in 2001 and in 2005. No occupied site was designated due to the lack of suitable habitat. It was determined that the behaviors observed were most likely those of birds commuting to or from suitable habitat upstream or downstream of the survey station.

Occupied Sites: 0

(Includes survey area ESF66)

G.3.7. Lone Buck

There was one detection of a marbled murrelet at canopy height in 2003. No birds were detected during an extra survey three days later or during two additional protocol surveys conducted that year. The area was not surveyed again in 2004 because the survey site for the planned timber sale was redrawn and the District had no plans to harvest in the area in the near future. There is mapped marbled murrelet habitat near the survey station. No occupied site was designated because the sub-canopy observation was not verified. Further protocol surveys of the area would be required prior to including the area in a proposed timber sale.

Occupied sites: 1

(Includes survey area ESF140)

G.3.8. Lower Deer

Two detections of sub-canopy marbled murrelets were observed during one survey at the Lower Deer site in 2006. The observations took place in close proximity, and in between, two MMMAs along the West Fork Millicoma River. The West Fork Millicoma River is likely functioning as a flight corridor for marbled murrelets. Future survey information may

be helpful in determining if the survey area is occupied by murrelets or is being used as a flight corridor. Sale unit and occupancy determination deferred pending further surveys.

Occupied sites: pending

(Includes survey area ESF168)

G.3.9. Lower Fish Nest Site Search

Two silent marbled murrelets were observed during a nest search survey in 1995 at 96 percent canopy, entering the stand to the immediate southeast of the surveyor. The station is located in a young plantation, and the stand the marbled murrelets entered is unsuitable habitat but is within 400 feet of mapped habitat. This station was not included in the adjacent MMMA and T&E core because of the lack of suitable habitat.

Occupied sites: 0

(Includes survey area NSS81)

G.3.10. Puckett Creek

Contractor general surveys in July 1994 recorded one bird flying through the canopy at this station. The station was located in a 31-year-old stand adjacent to young plantations. An occupied site was not established due to a lack of suitable habitat. The station is located approximately ¼ mile from the Lower Mill MMMA, and likely indicates a marbled murrelet commuting to or from that area

Occupied sites: 0

(Includes survey area GEN Puckett Creek)

G.3.11. Umpcoos Ridge A:2

One survey was conducted with a single stationary detection in 2005. The surveyor reporting this detection was not experienced. There were no other detections at this survey site during nine protocol surveys in 2006. Occupancy determination was postponed pending further surveys.

Occupied sites: pending

(Includes survey area ESF164)

G.3.12. West Fork Headwaters No. 2

There were two sub-canopy detections in 1993 during one survey by the ODFW. A follow-up survey in 1993 and four surveys in 1994 failed to detect marbled murrelets at this location. The station is located near a ridgetop between two occupied sites (Panther Headwaters and Umpcoos Ridge MMMAs). Although this station is adjacent to mapped

habitat, it was thought that the marbled murrelets observed were commuting through a saddle in close proximity to the survey station. For this reason, no occupied site was designated. The area being surveyed has since been harvested.

Occupied sites: 0

(Includes survey area ESF10)

Table G-1
Marbled Murrelet Occupied sites, Marbled Murrelet Management Areas, and HCP T&E Core Areas HCP T&E Core Areas

Marbled Murrelet Management Area	HCP T&E Core Area
Beaver Headwaters	Beaver Headwaters
Benson Headwaters	Benson Top
Big Deer	Middle Deer, Big Otter
Charlotte Headwaters	Middle Charlotte
Daggett Headwaters	None
Dry Ridge	Dry Ridge
Elk Forks	Elk Forks
Elk Pass	Elk Pass
Fish Knife	Fish Knife
Footlog Ridge	None
Glenn Headwaters	Glenn Headwaters
Goody Ridge	Goody Ridge
Henrys Bend	Marlow Henry
Indian Charlie Johanneson	Johanneson
Joe Buck	Joe Buck
Kentuck Ridge	Stonehouse Point
Knife Forks	Knife Forks
Knife Point	None
Larson Bottom	Larson Bottom
Larson Point	Larson Point
Lower Charlotte	Luder Umpqua
Lower Mill	Lower Mill
Lower Totten	None
Luder Footlog	Luder Footlog

Marbled Murrelet Management Area	HCP T&E Core Area
Luder Umpqua	Luder Umpqua, Lower Mill
Marlow Bottom	Marlow Bottom
Marlow Lockhart	Marlow Lockhart
Middle Dean	Dean Creek
Millicoma Schumacher	Millicoma Schumacher
Palouse Larson	Larson Palouse
Panther Bench	Panther Bench
Panther Headwaters	Panther Howell
Right Fork Johnson	Right Fork Johnson
Roberts Ridge	Lower Roberts
Schumacher Headwaters	Schumacher Headwaters
Sullivan Headwaters	Sullivan Creek
South Umpcoos	Old Maids Cabin
Trout Mouth	Trout Mouth
West Charlotte	None